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Department of Energy
Environmental Management Los Alamos Field Office (EM-LA)
Los Alamos, New Mexico 87544

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NMED Hazardous
Waste Bureau

EMLA-23-BF174-2-1

April 20, 2023

Mr. Rick Shean
Acting Bureau Chief
Hazardous Waste Bureau
New Mexico Environment Department
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

Subject: Submittal of the Addendum to the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2

Dear Mr. Shean:

Enclosed please find two hard copies with electronic files of the "Addendum to the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2." Also enclosed is an electronic copy of a redline strikeout version of the report that includes all changes made in response to the New Mexico Environment Department's (NMED's) draft comments dated July 20, 2022, and October 26, 2022. Also enclosed are the responses to NMED's comments, which were submitted on August 24, 2022, and December 6, 2022, and approved by NMED on February 27, 2023.

If you have any questions, please contact Brenda Bowlby at (360) 930-4353 (brenda.bowlby@em-la.doe.gov) or Cheryl Rodriguez at (505) 414-0450 (cheryl.rodriguez@em.doe.gov).

Sincerely,

ARTURO DURAN

Digitally signed by ARTURO DURAN
Date: 2023.04.19 11:34:27 -06'00'

Arturo Q. Duran
Compliance and Permitting Manager
U.S. Department of Energy
Environmental Management
Los Alamos Field Office

Enclosures:

1. Two hard copies with electronic files (including a redline strikeout version) – Addendum to the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2 (EM2023-0186)
2. Response to New Mexico Environment Department Draft Comments for Addendum to the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 1, April 9, 2020, HWB-LANL-19-014, Dated July 20, 2022 (EM2022-0580)

3. Addendum to the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 1: Proposed Revisions in Response to NMED July 20, 2022 Draft Comments and October 26, 2022 NMED Responses to the Draft Comments for the Addendum to the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 1 (EM2022-0795)

cc (letter with CD/DVD enclosure[s]):
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Addendum to the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 1

Proposed Revisions in Response to NMED July 20, 2022 Draft Comments and October 26, 2022 NMED responses to the Draft Comments for the Addendum to the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 1

The following pages present the New Mexico Environment Department's (NMED's) July 20, 2022 draft comments on Revision 1 to the Addendum to the Phase II investigation report for Middle Los Alamos Canyon Aggregate Area; DOE's August 24, 2022 draft comment responses; and NMED's October 26, 2022 responses to DOE. Following each of the comments and responses, proposed redline revisions to the report are provided for NMED's review and approval. No revisions are required for comments 1, 2, and 5.

Comment 1

NMED Comment

1. *Only Technical Area (TA) 2, Solid Waste Management Unit (SWMU) 02-014 was addressed in this report. Based on the report, soil excavations were conducted primarily due to the presence of polychlorinated biphenyls (PCBs). However, only two figures are provided in the report (Figures 3.4-1 and 3.4-2) that show the extent of the removals. An exterior and interior removal was conducted. However, the provided figures do not show the locations of all the confirmatory samples collected post removals. Figures showing the confirmation samples are needed to ensure coverage of the excavation area is sufficient for risk evaluation. Revise the report to include a figure showing the locations of all confirmation samples (and samples used in the risk assessment).*

DOE Response

1. Sample analytical results are presented on figures unless there are too many sample locations or results to clearly present on a figure, in which case they are presented on plates. Results for organic chemicals other than PCBs and radionuclides were presented on figures (Figures 3.4-1 and 3.4-2, respectively) because there were relatively few detections of those constituents. Plates were used to present the results for inorganic chemicals (Plate 2) and PCBs (Plate 3). Plate 3 presents the information requested in NMED's comment. The plate includes all post-removal sample results for PCBs, including all results used in the risk assessment. Plate 3 also shows the extent and boundaries of the exterior and interior removal areas. No revision to the report is necessary.

NMED Response

1. Response is adequate a provided and no revision to the text is necessary.

Comment 2

NMED Comment

2. *Soil was analyzed for only PCB mixtures (Aroclors) rather than congeners. Typically for risk assessments, and especially ecological risk assessments, where PCBs have weathered, congener-specific data along with toxicity equivalency factors (TEFs) are used to determine adverse effects. Aroclors may be appropriate when there is a presumptive remedy to prevent exposure and weathering of Aroclors has not occurred. Provide justification for analyses of the soil for Aroclors rather than congeners.*

DOE Response

2. The analytical suites used in the investigation were those specified in the approved Phase II investigation work plan for Middle Los Alamos Canyon Aggregate Area (LANL 2009, 105073; NMED 2009, 105595). The use of PCB (i.e., Aroclors) analysis of soil samples, rather than congeners, is consistent with all aggregate area investigations conducted under the 2016 Compliance Order on Consent. DOE notes that evaluation of ecological risk due to PCBs in the Technical Area 2 (TA-02) core area, which includes Solid Waste Management Unit (SWMU) 02-014, is not based on comparison of measured concentrations of PCBs in soil to ecological screening levels. Rather, the ecological risk for receptors most sensitive to PCBs are based on the results of a site-specific baseline risk assessment. The baseline risk assessment evaluated the site-specific impacts to small mammal and avian species in the TA-02 core area due to the PCB contamination present in on-site soils, and are not based on use of ecological screening levels for Aroclors. DOE notes that the small mammal study (LANL 2017, 700035) conducted as part of the baseline ecological risk assessment included analysis of soil and small mammal samples for PCB congeners using U.S. Environmental Protection Agency Method 1668A to evaluate bioaccumulation. No revision to the report is necessary.

NMED Response

2. Response is adequate a provided and no revision to the text is necessary.

Comment 3

NMED Comment

3. <u>Section 3.4.4 Nature and Extent of Contamination, (pg. 12-13)</u>.

<u>Permittee Statement</u>:

"Aroclor-1260 was detected in 317 samples with a maximum concentration of 23.9 mg/kg. Concentrations increased with depth at locations 02-600449, 02-612452, 02-613626, 02-613668, 02-613700, 02-61479, 02-61488, 02-61489, and 02-61553 and did not change substantially with depth (0.0078 mg/kg to 0.033 mg/kg) at locations 02-61436, 02-61445, 02-61486, and 02-61490; only 1 depth was sampled at locations 02-612451, 02-613292, 02-613699, 02-61478, 02-61492, and 02-61539 through 02-61543; and concentrations decreased with depth at all other locations. Concentrations decreased downgradient. Vertical extent is defined at locations where only 1 depth was sampled by decreasing concentrations in deeper samples from nearby locations. Concentrations in samples collected at 0.0-1.0 ft bgs, 2.0-3.0 ft bgs, 4.0 to 4.2 ft bgs, and 4.0 to 5.0 ft bgs at location 02-613289 were 1520 mg/kg, 7.51 mg/kg, 0.68 mg/kg, and 33.1 mg/kg, respectively, and concentrations decreased with depth at this location. These samples were excavated, and the results are not included in Table 3.4-4 but are included in Appendix E.

The maximum concentration at locations where concentrations increased with depth or did not change substantially with depth (3.3 mg/kg at location 02-613626) was approximately 1.4 times the residential SSL, and the industrial SSL was approximately 3.4 times this concentration. Although concentrations decreased with depth at location 02-613289, the concentration of Aroclor-1260 in the deepest sample at this location (11.0 ft to 11.25 ft bgs) is 1.9 times the industrial SSL and 8.5 times the residential SSL. Further sampling at this location is not warranted based on the results in deeper samples at adjacent location 02-61432 (11ft from location 02-613289), 02-61440 (9 ft from location 02-613289), 02-61441 (10ft from location 02-613289), 02-61448 (6 ft from location 02-613289), and 02-61455 (1 ft from location 02-613289). Aroclor-1260 concentrations decreased with depth at all 5 locations. A total of 15 samples were collected from these 5 locations at depths greater than the deepest sample at location 02-613289 (1.0 to 15.0 ft bgs, 16.0 to 17.0 ft bgs, and 19.0 to 20.0 ft bgs at each location). As shown on Plate 3, Aroclor-1260 was detected in 7 of these samples at concentrations ranging from 0.00316 mg/kg to 0.0707 mg/kg, all more than 2 orders of magnitude less than the concentration in the deepest sample at location 02-613289. Aroclor-1260 was not detected in the samples from 19.0 ft to 20.0 ft bgs at any of the 5 locations except location 02-61448, where it was detected at 0.0186 mg/kg. Aroclor-1260 does not pose an unacceptable risk under the industrial and recreational scenarios (Appendix F, Tables F-4.2-1 and F-4.2-3). Lateral extent of Aroclor-1260 is defined and further sampling for vertical extent is not warranted."

<u>NMED Comment:</u>

a. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, indicate that the concentration of Aroclor-1260 was above the residential SSL in the only sample collected at location 02-612451. The detected value at location 02-612451 for the sampling depth (6-6.2 ft bgs) is 4 mg/kg, which is approximately 164% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to* *support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-612451.*

b. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, indicate that the concentration of Aroclor-1260 increased with depth for location 02-612452. The detected value at location 02-612452 for the deepest sampling depth (8-8.2 ft bgs) is 2.14 mg/kg, which is approximately 88% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-612452.*

c. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, indicate that the concentration of Aroclor-1260 increased with depth for location 02-613626. The detected value at location 02-613626 for the deepest sampling depth (10-11 ft bgs) is 3.3 mg/kg, which is approximately 135% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. NMED understands that the additional lines of evidence requested would not change the results of the risk assessment, as the depth of contamination is defined to 10 ft bgs in many cases. However, the nature and extent must be defined, regardless of whether it extends beyond the soil exposure interval for risk assessments. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-613626.*

d. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, indicate that the concentration of Aroclor-1260 increased with depth for location 02- 613667. The detected value at location 02-613667 for the deepest sampling depth (10-10.2 ft bgs) is 7.73 mg/kg, which is approximately 318% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. NMED understands that the additional lines of evidence requested would not change the results of the risk assessment, as the depth of contamination is defined to 10 ft bgs in many cases. However, the nature and extent must be defined, regardless of whether it extends beyond the soil exposure interval for risk assessments. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-613667.*

e. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, indicate that the concentration of Aroclor-1260 increased with depth for location 02- 613668. The detected value at location 02-613668 for the deepest sampling depth (10-10.2 ft bgs) is 3.21 mg/kg, which is approximately 132% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. NMED understands that the additional lines of evidence requested would not change the results of the risk assessment, as the depth of contamination is defined to 10 ft bgs in many cases. However, the nature and extent must be defined, regardless of whether it extends beyond the soil exposure interval for risk assessments. If using nearby locations as evidence to* *support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-613668.*

f. Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, state that only one sample was collected for the sample location 02-613699. The detected value at location 02-613699 for the deepest sampling depth (12-12.2 ft bgs) is 3.34 mg/kg, which is approximately 137% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include specific lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-613699. NMED understands that the additional lines of evidence requested would not change the results of the risk assessment, as the depth of contamination is defined to 10 ft bgs in many cases. However, the nature and extent must be defined, regardless of whether it extends beyond the soil exposure interval for risk assessments.

g. Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, indicate that the concentration of Aroclor-1260 increased with depth for location 02-613700. The detected value at location 02-613700 for the deepest sampling depth (14-14.2 ft bgs) is 2.27 mg/kg, which is approximately 93% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. NMED understands that the additional lines of evidence requested would not change the results of the risk assessment, as the depth of contamination is defined to 10 ft bgs in many cases. However, the nature and extent must be defined, regardless of whether it extends beyond the soil exposure interval for risk assessments. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-613700.

h. Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, state that only one sample was collected for the sample location 02-61478. The detected value at location 02-61478 for the deepest sampling depth (2-3 ft bgs) is 2.41 mg/kg, which is approximately 99% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include specific lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-61478.

i. Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, indicate that the concentration of Aroclor-1260 increased with depth for location 02- 61479. The detected value at location 02-61479 for the deepest sampling depth (4-5 ft bgs) is 1.57 mg/kg, which is approximately 64% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-61479.

j. Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, indicate that the concentration of Aroclor-1260 increased with depth for location 02- 61488. The detected value at location

02-61488 for the deepest sampling depth (4-4.1 ft bgs) is 2.25 mg/kg, which is approximately 92% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-61488.

k. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, indicate that the concentration of Aroclor-1260 increased with depth for location 02-61489. The detected value at location 02-61489 for the deepest sampling depth (7-7.5 ft bgs) is 0.733 mg/kg, which is approximately 30% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-61489.*

l. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, indicate that the concentration of Aroclor-1260 increased with depth for location 02- 61537. The detected value at location 02-61537 for the deepest sampling depth (11-12 ft bgs) is 2.48 mg/kg, which is approximately 102% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. NMED understands that the additional lines of evidence requested would not change the results of the risk assessment, as the depth of contamination is defined to 10 ft bgs in many cases. However, the nature and extent must be defined, regardless of whether it extends beyond the soil exposure interval for risk assessments. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-61537.*

m. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, state that only one sample was collected for the sample location 02-61539. The detected value at location 02-61539 for the deepest sampling depth (1-2 ft bgs) is 5.28 mg/kg, which is approximately 217% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include specific lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-61539.*

n. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, state that only one sample was collected for the sample location 02-61540. The detected value at location 02-61540 for the deepest sampling depth (1-2 ft bgs) is 12.3 mg/kg, which is approximately 506% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include specific lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly* *stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-61540.*

o. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, state that only one sample was collected for the sample location 02-61541. The detected value at location 02-61541 for the deepest sampling depth (6-7 ft bgs) is 0.963 mg/kg, which is approximately 39% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include specific lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-61541.*

p. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, state that only one sample was collected for the sample location 02-61542. The detected value at location 02-61542 for the deepest sampling depth (1-2 ft bgs) is 1.43 mg/kg, which is approximately 58% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include specific lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-61542.*

q. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, state that only one sample was collected for the sample location 02-61543. The detected value at location 02-61543 for the deepest sampling depth (1-1.5 ft bgs) is 6.77 mg/kg, which is approximately 278% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include specific lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-61543.*

r. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, demonstrate that the concentration increased with depth for the sample location 02- 61553. The detected value at location 02-61553 for the deepest sampling depth (6-7 ft bgs) is 1.25 mg/kg, which is approximately 51% of the residential SSL of 2.43 mg/kg. Revise the discussion in Section 3.4.4 to include specific lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1260 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-61553.*

DOE Response

3. The sample locations addressed in comments 3.a through 3.r above (locations 02-612451, 02-612452, 02-613626, 02-613667, 02-613668, 02-613699, 02-613700, 02-61478, 02-61479, 02-61488, 02-61489, 02-61537, 02-61539, 02-61540, 02-61541, 02-61542, 02-61543, and 02-61533) are all locations where removal of PCB-contaminated soil occurred, or are adjacent to locations where removal occurred. Thus, evaluation of vertical extent of PCB contamination at these locations should be based on the vertical distribution of concentrations before soil removal occurred. The

sample results that were excavated, however, are not included in Table 3.4-4, and the data in the table are representative of current conditions, rather than pre-removal conditions.

The vertical extent of PCB contamination at the locations identified in comments 3.a through 3.r will be reevaluated to determine whether vertical extent of contamination is defined and whether additional sampling for vertical extent is required. This evaluation will consider concentrations of PCB in soil that has been removed, as well as results from nearby locations. The locations and depths of data are used in the evaluation will be described in the revised text.

NMED Response

3. *Provide redline of the revisions to the text for each of the location identified in comments 3.a through 3.r for NMED approval.*

Organic Chemicals

Organic COPCs at SWMU 02-014 include anthracene; Aroclor-1254; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; 1,2,3,4,6,7,8-heptachlorodibenzodioxin; 1,2,3,4,6,7,8-heptachlorodibenzofuran; 1,2,3,4,7,8,9-heptachlorodibenzofuran; 1,2,3,4,7,8-hexachlorodibenzodioxin; 1,2,3,6,7,8-hexachlorodibenzodioxin; 1,2,3,7,8,9-hexachlorodibenzodioxin; 1,2,3,4,7,8-hexachlorodibenzofuran; 1,2,3,6,7,8-hexachlorodibenzofuran; 1,2,3,7,8,9-hexachlorodibenzofuran; 2,3,4,6,7,8-hexachlorodibenzofuran; indeno(1,2,3-cd)pyrene; 1,2,3,4,6,7,8,9-octachlorodibenzodioxin; 1,2,3,4,6,7,8,9-octachlorodibenzofuran; 1,2,3,7,8-pentachlorodibenzodioxin; 1,2,3,7,8-pentachlorodibenzofuran; 2,3,4,7,8-pentachlorodibenzofuran; phenanthrene; pyrene; 2,3,7,8-tetrachlorodibenzofuran; and toluene.

The polycyclic aromatic hydrocarbons (PAHs) anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; indeno(1,2,3-cd)pyrene; phenanthrene; and pyrene were each detected in 2 samples at location 02-600387 at concentrations ranging from 0.00727 mg/kg to 0.0984 mg/kg. Concentrations of pyrene decreased with depth and concentrations of all other PAHs did not change substantially with depth (0.00176 mg/kg to 0.0455 mg/kg). Concentrations increased laterally at location 02-600387. Of the 22 detected concentrations, 11 were below EQLs. The residential SSLs ranged from approximately 20 times to 1,930,000 times the maximum concentrations, and the residential SSLs of all PAHs, except benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene were more than 100 times the maximum concentration. The residential SSL for benzo(a)anthracene was approximately 30 times the maximum concentration, and the industrial SSL was approximately 626 times the maximum concentration (0.0516 mg/kg). The residential SSL for benzo(a)pyrene was approximately 20 times the maximum concentration, and the industrial SSL was approximately 428 times the maximum concentration (0.0551 mg/kg). The residential SSL for indeno(1,2,3-cd)pyrene was approximately 61 times the maximum concentration, and the industrial SSL was approximately 1280 times the maximum concentration (0.0252 mg/kg). Further sampling for extent of PAHs is not warranted.

Aroclor-1254 was detected in 31 samples with a maximum concentration of 7.11 mg/kg. Concentrations increased with depth at locations 02-613122, 02-613124, and 02-613700 and did not change substantially with depth (0.0082 mg/kg) at location 02-61490; only 1 depth was sampled at locations 02-613699 and 02-61492; concentrations decreased with depth at all other locations; and concentrations decreased downgradient. The residential SSL was approximately 1.5 times and the industrial SSL was approximately 14 times the maximum concentration where vertical extent is not defined (0.779 mg/kg at location 02-613700). Aroclor-1254 does not pose an unacceptable risk under the industrial and recreational scenarios (Appendix F, Tables F-4.2-1 through F-4.2-4). Lateral extent of Aroclor-1254 is defined, and further sampling for vertical extent is not warranted.

Aroclor-1260 was detected in 317 samples with a maximum concentration of 23.9 mg/kg. Concentrations increased with depth at locations 02-600449, 02-612452, 02-613626, 02-613668, 02-613700, 02-61479, 02-61488, 02-61489, and 02-61553; ~~and~~ did not change substantially with depth (0.0078 mg/kg to 0.033 mg/kg) at locations 02-61436, 02-61445, 02-61486, and 02-61490; only 1 depth was sampled at locations 02-612451, 02-613292, and ~~02-613699, 02-61478,~~ 02-61492~~, and 02-61539 through 02-61543~~; and concentrations decreased with depth at all other locations. Concentrations decreased downgradient. ~~Vertical extent is defined at locations where only 1 depth was sampled by decreasing concentrations in deeper samples from nearby locations.~~

Only one depth was sampled at location 02-612451, and concentrations increased with depth at location 02-612452. Concentrations in the deep samples at these locations were 1.6 times and 0.9 times the residential SSL, respectively. As described in Revision 1 to the Phase II investigation report for Middle Los Alamos Canyon Aggregate Area (LANL 2011, 205220, p. 398), locations 02-612451 and 02-612452 were sampled to define the lateral extent of PCB contamination at location 02-600449, where Aroclor-1260 was detected at 28 mg/kg at 0.0 to 0.5 ft bgs and 44.8 mg/kg at 2.0 to 4.5 ft bgs. The Phase II investigation work plan had proposed excavating the area around location 02-600449 to a depth of 6 ft bgs (LANL 2009, 105073, p.9). As a result, samples at locations 02-612451 and 02-612452 were only collected below 6 ft bgs, and samples were not specifically collected to define vertical extent at these locations. Because this area, including the elevated PCBs in shallow samples at location 02-600449, has now been excavated, further sampling for vertical extent of Aroclor-1260 at locations 02-612451 and 02-612452 is not warranted.

Only one sample depth is presented in Table 3.4-4 for locations 02-613699, 02-61478, and 02-61539 through 02-61543. At each of these locations, however, additional shallower samples had been collected and Aroclor-1260 was detected in these samples at concentrations ranging from 11.5 mg/kg to 3790 mg/kg. Shallow surface soil with elevated Aroclor-1260 at these locations was subsequently excavated, and the shallow sample results are no longer representative of site conditions and are not presented in Table 3.4-4. Prior to excavation, Aroclor-1260 concentrations decreased with depth at each of these locations. Vertical extent of contamination is defined at each of these locations based on concentrations in the shallow, pre-excavation sample results, which are included in Appendix E.

Concentrations increase with depth at locations 02-600449, 02-613668, 02-61479, 02-61488, 02-61489, and 02-61553 based on the results presented in Table 3.4-4. At each of these locations, however, additional shallower samples had been collected and Aroclor-1260 was detected in these samples at concentrations ranging from 7.86 mg/kg to 91.7 mg/kg. Shallow surface soil with elevated Aroclor-1260 at these locations was subsequently excavated, and the shallow sample results are no longer representative of site conditions and are not presented in Table 3.4-4. Prior to excavation, Aroclor-1260 concentrations decreased with depth at each of these locations. Vertical extent of contamination is defined at each of these locations based on the shallow, pre-excavation sample results, which are included in Appendix E.

Aroclor-1260 concentrations decrease with depth at location 02-613667, although the concentration in the deepest sample (7.73 mg/kg at 10.0 to 10.2 ft bgs) is approximately 3 times the residential SSL. Based on the results presented in Table 3.4-4, the concentration in the deepest sample was only 5.57 mg/kg less than the maximum concentration (13.3 mg/kg at 6.0 to 6.2 ft bgs), indicating further sampling for vertical extent could be warranted. However, the concentration in the surface sample (0.0 to 1.0 ft bgs) at this location was 190 mg/kg. Soil in this depth interval was subsequently excavated, and the shallow sample results are no longer representative of site conditions and are not presented in Table 3.4-4. Based on the decrease in concentrations with depth considering the pre-excavation sample results at location 02-613667, which are included in Appendix E, further sampling for vertical extent of Aroclor-1260 at location 02-613667 is not warranted.

Aroclor-1260 concentrations at locations 02-613626 and 02-613700 increased with depth and the concentrations in the deepest samples were approximately 1.4 times and 0.9 times the residential SSL, respectively. As described in Revision 1 to the Phase II investigation report for Middle Los Alamos Canyon Aggregate Area (LANL 2011, 205220, p. 398), locations 02-613626 and 02-613700 were sampled to define the lateral extent of PCB contamination at location 02-600449, where Aroclor-1260 was detected at 28 mg/kg at 0.0 to 0.5 ft bgs and 44.8 mg/kg at 2.0 to 4.5 ft bgs. The Phase II investigation work plan had proposed excavating the area around location 02-600449 to a depth of 6 ft bgs (LANL 2009, 105073, p.9). As a result, samples at locations 02-613626 and 02-613700 were only collected below 6 ft bgs and samples were not specifically collected to define vertical extent at these locations. Because this area, including the elevated PCBs in shallow samples at location 02-600449 has now been excavated, further sampling for vertical extent at locations 02-613626 and 02-613700 is not warranted.

Concentrations decreased with depth at location 02-61537, but the concentration in the deepest sample at 11.0 to 121.0 ft bgs was slightly greater than the residential SSL. Location 02-61537 was sampled in January 2018 to help define the southern extent of the exterior excavation boundary (Plate 3) and is within the area that was excavated to 1 ft bgs. Concentrations decrease vertically by almost one order of magnitude from 23.9 mg/kg at 2.0 to 3.0 ft bgs to 2.48 mg/kg at 11.0 to 12.0 ft bgs and the slight increase from 1.44 mg/kg at 8.0 to 9.0 ft bgs to 2.48 mg/kg at 11.0 to 12.0 ft bgs does not warrant continued sampling for vertical extent.

Concentrations increased with depth at location 02-613289 based on the results presented in Table 3.4-4. Samples had also been collected at this location from the depth intervals ~~Concentrations in samples collected at~~ 0.0 to 1.0 ft bgs, 2.0 to 3.0 ft bgs, 4.0 ft to 4.2 ft bgs, and 4.0 ft to 5.0 ft bgs ~~at location 02-613289 were~~ and Aroclor-1260 was detected at concentrations of 1520 mg/kg, 7.51 mg/kg, 0.68 mg/kg, and 33.1 mg/kg, respectively. Soil in these depth intervals was subsequently excavated, and the shallow sample results are no longer representative of site conditions and are not presented in Table 3.4-4 but are included in Appendix E.~~,~~ Prior to excavation, Aroclor-1260 concentrations decreased with depth at location 02-613289 and vertical extent of contamination is defined based on the shallow, pre-excavation sample results. ~~and concentrations decreased with depth at this location. These samples were excavated and the results are not included in Table 3.4-4 but are included in Appendix E.~~

~~The maximum concentration at locations where concentrations increased with depth or did not change substantially with depth (3.3 mg/kg at location 02-613626) was approximately 1.4 times the residential SSL, and the industrial SSL was approximately 3.4 times this concentration.~~ Although concentrations decreased with depth at location 02-613289, the concentration of Aroclor-1260 in the deepest sample at this location (11.0 ft to 11.25 ft bgs) is 1.9 times the industrial SSL and 8.5 times the residential SSL. Further sampling at this location is not warranted based on the results in deeper samples at adjacent locations 02-61432 (11 ft from location 02-613289), 02-61440 (9 ft from location 02-613289), 02-61441 (10 ft from location 02-613289), 02-61448 (6 ft from location 02-613289), and 02-61455 (13 ft from location 02-613289). Aroclor-1260 concentrations decreased with depth at all 5 locations. A total of 15 samples were collected from these 5 locations at depths greater than the deepest sample at location 02-613289 (14.0 to 15.0 ft bgs, 16.0 to 17.0 ft bgs, and 19.0 to 20.0 ft bgs at each location). As shown on Plate 3, Aroclor-1260 was detected in 7 of these 15 samples at concentrations ranging from 0.00316 mg/kg to 0.0707 mg/kg, all more than 2 orders of magnitude less than the concentration in the deepest sample at location 02-613289. Aroclor-1260 was not detected in the samples from 19.0 ft to 20.0 ft bgs at any of the 5 locations except location 02-61448, where it was detected at 0.0186 mg/kg.

The maximum concentration at locations where concentrations increased with depth or did not change substantially with depth (3.3 mg/kg at location 02-613626) was approximately 1.4 times the residential SSL, and the industrial SSL was approximately 3.4 times this concentration. Aroclor-1260 does not pose an unacceptable risk under the industrial, ~~and~~ recreational, and residential scenarios with cancer risks ranging from 3.53×10^{-6} to 9.47×10^{-6} (Appendix F, Tables F-4.2-1, ~~and~~ F-4.2-~~3~~4, and F-4.2-7). Lateral extent of Aroclor-1260 is defined and further sampling for vertical extent is not warranted.

A total of 16 dioxin/furan congeners were each detected in 2 or 3 samples with maximum concentrations ranging from 0.000000204 mg/kg to 0.00123 mg/kg. Concentrations at location 02-600387 did not change substantially with depth (0.000000028 mg/kg to 0.00003 mg/kg) or decreased with depth, and only 1 depth was sampled at location 02-600449. Concentrations of 2,3,4,7,8-pentachlorodibenzofuran and 2,3,7,8-tetrachlorodibenzofuran increased downgradient at location 02-600449 and concentrations of all other congeners decreased downgradient or did not change substantially downgradient (0.00000001 mg/kg to 0.00000155 mg/kg). The maximum concentrations were converted to toxicity equivalency concentrations (TECs) using congener-specific toxicity equivalency factors (NMED 2017, 602273). The residential SSL for 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD [not detected but the

Comment 4

NMED Comment

4. ***Section 3.4.4, Nature and Extent of Contamination, (pg. 12)*.**

   ***Permittee Statement*:**

   "Aroclor-1254 was detected in 31 samples with a maximum concentration of 7.11 mg/kg. Concentrations increased with depth at locations 02-613122, 02-613124, and 02-613700 and did not change substantially with depth (0.0082 mg/kg) at location 02-61490; only 1 depth was sampled at locations 02-613699 and 02-61492; concentrations decreased with depth at all other locations; and concentrations decreased downgradient. The residential SSL was approximately 1.5 times and the industrial SSL was approximately 14 times the maximum concentration where vertical extent is not defined (0.779 mg/kg at location 02-613700). Aroclor-1254 does not pose an unacceptable risk under the industrial and recreational scenarios (Appendix F, Tables F-4.2-1 through F-4.2-4). Lateral extent of Aroclor-1254 is defined and further sampling for vertical extent is not warranted."

   ***NMED Comment*:**

   a. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, demonstrate that the concentration increased with depth for the sample location 02- 613667. The detected value at location 02-613667 for the deepest sampling depth (10-10.2 ft bgs) is 4.93 mg/kg, which is approximately 432% of the residential SSL of 1.14 mg/kg. Revise the discussion in Section 3.4.4 to include specific lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor- 1254 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-613667. NMED understands that the additional lines of evidence requested would not change the results of the risk assessment, as the depth of contamination is defined to 10 ft bgs in many cases. However, the nature and extent must be defined, regardless of whether it extends beyond the soil exposure interval for risk assessments.*

   b. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, demonstrate that only one sample depth was collected for the sample location 02- 613699. The detected value at location 02-613699 for the deepest sampling depth (12-12.2 ft bgs) is 0.636 mg/kg, which is approximately 55% of the residential SSL of 1.14 mg/kg. Revise the discussion in Section 3.4.4 to include specific lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1254 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-613699. NMED understands that the additional lines of evidence requested would not change the results of the risk assessment, as the depth of contamination is defined to 10 ft bgs in many cases. However, the nature and extent must be defined, regardless of whether it extends beyond the soil exposure interval for risk assessments.*

   c. *Data presented in Table 3.4-4, PCBs Detected at SWMU 02-014, demonstrate that the concentration increased with depth for the sample location 02- 613700. The detected value at location 02-613700 for the deepest sampling depth (14-14.2 ft bgs) is 0.779 mg/kg, which is* *approximately 68% of the residential SSL of 1.14 mg/kg. Revise the discussion in Section 3.4.4 to include specific lines of evidence demonstrating that the vertical extent of contamination has been defined for Aroclor-1254 or propose additional sampling to further define the vertical extent of contamination for this location. If using nearby locations as evidence to support that the extent is defined, it must be clearly stated which sample depths at which nearby locations are used to define the vertical extent of contamination for location 02-613700. NMED understands that the additional lines of evidence requested would not change the results of the risk assessment, as the depth of contamination is defined to 10 ft bgs in many cases. However, the nature and extent must be defined, regardless of whether it extends beyond the soil exposure interval for risk assessments.*

DOE Response

4. The sample locations addressed in comments 4.a through 4.c above (locations 02-613667, 02-613699, and 02-613700) are all locations where removal of PCB-contaminated soil occurred, or are adjacent to locations where removal occurred. Thus, evaluation of vertical extent of PCB contamination at these locations should be based on the vertical distribution of concentrations before soil removal occurred. The results from sample locations that were excavated, however, are not included in Table 3.4-4, and the data in the table are representative of current conditions, rather than pre-removal conditions.

   The vertical extent of PCB contamination at the locations identified in comments 4.a through 4.c will be reevaluated to determine whether vertical extent of contamination is defined and whether additional sampling for vertical extent is required. This evaluation will consider concentrations of PCB in soil that has been removed, as well as results from nearby locations. The locations and depths of data are used in the evaluation will be described in the revised text.

NMED Response

4. *Provide redline of the revisions to the text for each of the location identified in comments 4.a through 4.c for NMED approval.*

Organic Chemicals

Organic COPCs at SWMU 02-014 include anthracene; Aroclor-1254; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; 1,2,3,4,6,7,8-heptachlorodibenzodioxin; 1,2,3,4,6,7,8-heptachlorodibenzofuran; 1,2,3,4,7,8,9-heptachlorodibenzofuran; 1,2,3,4,7,8-hexachlorodibenzodioxin; 1,2,3,6,7,8-hexachlorodibenzodioxin; 1,2,3,7,8,9-hexachlorodibenzodioxin; 1,2,3,4,7,8-hexachlorodibenzofuran; 1,2,3,6,7,8-hexachlorodibenzofuran; 1,2,3,7,8,9-hexachlorodibenzofuran; 2,3,4,6,7,8-hexachlorodibenzofuran; indeno(1,2,3-cd)pyrene; 1,2,3,4,6,7,8,9-octachlorodibenzodioxin; 1,2,3,4,6,7,8,9-octachlorodibenzofuran; 1,2,3,7,8-pentachlorodibenzodioxin; 1,2,3,7,8-pentachlorodibenzofuran; 2,3,4,7,8-pentachlorodibenzofuran; phenanthrene; pyrene; 2,3,7,8-tetrachlorodibenzofuran; and toluene.

The polycyclic aromatic hydrocarbons (PAHs) anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; indeno(1,2,3-cd)pyrene; phenanthrene; and pyrene were each detected in 2 samples at location 02-600387 at concentrations ranging from 0.00727 mg/kg to 0.0984 mg/kg. Concentrations of pyrene decreased with depth and concentrations of all other PAHs did not change substantially with depth (0.00176 mg/kg to 0.0455 mg/kg). Concentrations increased laterally at location 02-600387. Of the 22 detected concentrations, 11 were below EQLs. The residential SSLs ranged from approximately 20 times to 1,930,000 times the maximum concentrations, and the residential SSLs of all PAHs, except benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene were more than 100 times the maximum concentration. The residential SSL for benzo(a)anthracene was approximately 30 times the maximum concentration, and the industrial SSL was approximately 626 times the maximum concentration (0.0516 mg/kg). The residential SSL for benzo(a)pyrene was approximately 20 times the maximum concentration, and the industrial SSL was approximately 428 times the maximum concentration (0.0551 mg/kg). The residential SSL for indeno(1,2,3-cd)pyrene was approximately 61 times the maximum concentration, and the industrial SSL was approximately 1280 times the maximum concentration (0.0252 mg/kg). Further sampling for extent of PAHs is not warranted.

Aroclor-1254 was detected in 31 samples with a maximum concentration of 7.11 mg/kg. Concentrations increased with depth at locations 02-613122, 02-613124, and 02-613700 and did not change substantially with depth (0.0082 mg/kg) at location 02-61490; only 1 depth was sampled at location~~s 02-613699 and~~ 02-61492; concentrations decreased with depth at all other locations; and concentrations decreased downgradient.

Aroclor-1254 concentrations at locations 02-613124 and 02-613700 increased with depth, and the concentrations in the deepest samples were approximately 0.2 times and 0.7 times the residential SSL, respectively. As described in Revision 1 to the Phase II investigation report for Middle Los Alamos Canyon Aggregate Area (LANL 2011, 205220, pp. 397–398), locations 02-613124 and 02-613700 were sampled to define the lateral extent of PCB contamination at location 02-600449, where Aroclor-1260 was detected at 28 mg/kg at 0.0 to 0.5 ft bgs and 44.8 mg/kg at 2.0 to 4.5 ft bgs. The Phase II investigation work plan had proposed excavating the area around location 02-600449 to a depth of 6 ft bgs (LANL 2009, 105073, p.9). As a result, samples at locations 02-613124 and 02-613700 were only collected below 6 ft bgs, and samples were not specifically collected to define vertical extent at these locations. Because this area, including the elevated PCBs in shallow samples at location 02-600449 has now been excavated, further sampling for vertical extent at locations 02-613124 and 02-613700 is not warranted.

Concentrations increased with depth at location 02-613122 and did not change substantially with depth at location 02-61490, but the residential SSL was approximately 28 times and 31 times the concentrations at these locations, respectively. Further sampling for vertical extent at locations 02-613122 and 02-61490 is not warranted.

Only one depth was sampled at location 02-61492, but the residential SSL was approximately 27 times the detected concentration. Further sampling for vertical extent at location 02-61492 is not warranted.

Only one sample depth is presented in Table 3.4-4 for location 02-613699. At this location, however, additional shallower samples had been collected, and Aroclor-1254 was detected in these samples at concentrations ranging from 4 mg/kg to 14.3 mg/kg. Shallow surface soil with elevated Aroclor-1254 at location 02-613699 was subsequently excavated, and the shallow sample results are no longer representative of site conditions and are not presented in Table 3.4-4. Prior to excavation, Aroclor-1254 concentrations decreased with depth at location 02-613699. Vertical extent of contamination is defined at this location based concentrations in the shallow, pre-excavation sample results, which are included in Appendix E.

Aroclor-1254 concentrations decreased with depth at location 02-613667, although the concentration in the deepest sample (4.93 mg/kg at 10.0 to 10.2 ft bgs) is approximately 4 times the residential SSL. The concentration in the deepest sample was only 2.18 mg/kg less than the maximum concentration (7.11 mg/kg at 6.0 to 6.2 ft bgs), indicating further sampling for vertical extent could be warranted. The vertical extent of contamination at location 02-613667, however, is defined by Aroclor-1254 results from deeper samples collected at adjacent locations 02-61436 to the southwest, 02-61452 to the southeast, and 02-61254 to the northeast. Aroclor-1254 was not detected in any samples collected at these three locations, including samples from depth intervals of 11.0 to 12.0, 14.0 to 15.0, 16.0 to 17.0, and 19.0 to 20.0 ft bgs.

~~The residential SSL was approximately 1.5 times and the industrial SSL was approximately 14 times the maximum concentration where vertical extent is not defined (0.779 mg/kg at location 02-613700).~~ Aroclor-1254 does not pose an unacceptable risk under the industrial, ~~and~~ recreational, residential, and construction worker scenarios with cancer risks ranging from 5.43×10^{-7} to 7.87×10^{-7} and HIs ranging from 0.0269 to 0.142 (Appendix F, Tables F-4.2-1, F-4.2-2, ~~through~~ F-4.2-4, F-4.2-5, F-4.2-7, F-4.2-8, and F-4.2-10). Lateral extent of Aroclor-1254 is defined, and further sampling for vertical extent is not warranted.

Aroclor-1260 was detected in 317 samples with a maximum concentration of 23.9 mg/kg. Concentrations increased with depth at locations 02-600449, 02-612452, 02-613626, 02-613668, 02-613700, 02-61479, 02-61488, 02-61489, and 02-61553 and did not change substantially with depth (0.0078 mg/kg to 0.033 mg/kg) at locations 02-61436, 02-61445, 02-61486, and 02-61490; only 1 depth was sampled at locations 02-612451, 02-613292, 02-613699, 02-61478, 02-61492, and 02-61539 through 02-61543; and concentrations decreased with depth at all other locations. Concentrations decreased downgradient. Vertical extent is defined at locations where only 1 depth was sampled by decreasing concentrations in deeper samples from nearby locations. Concentrations in samples collected at 0.0 to 1.0 ft bgs, 2.0 to 3.0 ft bgs, 4.0 ft to 4.2 ft bgs, and 4.0 ft to 5.0 ft bgs at location 02-613289 were 1520 mg/kg, 7.51 mg/kg, 0.68 mg/kg, and 33.1 mg/kg, respectively, and concentrations decreased with depth at this location. These samples were excavated and the results are not included in Table 3.4-4 but are included in Appendix E. The maximum concentration at locations where concentrations increased with depth or did not change substantially with depth (3.3 mg/kg at location 02-613626) was approximately 1.4 times the residential SSL, and the industrial SSL was approximately 3.4 times this concentration. Although concentrations decreased with depth at location 02-613289, the concentration of Aroclor-1260 in the deepest sample at this location (11.0 ft to 11.25 ft bgs) is 1.9 times the industrial SSL and 8.5 times the residential SSL. Further sampling at this location is not warranted based on the results in deeper samples at adjacent locations 02-61432 (11 ft from location 02-613289), 02-61440 (9 ft from location 02-613289), 02-61441

Comment 5

NMED Comment

5. ***Sections 3.6, 4.2.2, and F-5.0, Ecological Risk-Screening, (pg. 15, pg. 15, F-13).***

   Permittee Statement:

   "Ecological risk was evaluated collectively for sites within the TA-02 core area, including SWMU 02-014, in the "Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2" (N3B 2018, 700091). Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations (individuals for T&E species), LOAEL analyses, the relationship of detected concentrations and screening levels to background concentrations, and results of site-specific ecological risk studies conducted within the TA-02 core area, not potential ecological risks exist for the TA-02 core area, which includes SWMU 02-014."

   NMED Comment:

   Ecological risk was not evaluated for SWMU 02-014. The justification provided was that the TA-02 core area was evaluated in the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2. As noted with the other sites within TA-02, the Revision 2 report indicated that "ecological risk-screening assessment will be conducted for the sites within the TA-02 core area as one exposure unit after the investigation at this site has been completed." The previously provided risk assessment in Revision 2 Investigation Report is not sufficient to address potential exposure to residual levels of contamination at SWMU 02-014. As nature and extent of contamination in SWMU 02-014 has now been defined, ecological risks to PCBs and other contaminants of potential ecological concern, including dioxin/furans, must be conducted. Ecological risk must be quantified for the COPECs (including PCBs) as they tend to bioaccumulate, are persistent and are toxic. An ecological risk assessment is required to demonstrate that removals were conducted to levels protective of ecological risk. Revise the report to include an ecological risk assessment.

DOE Response

5. As described in the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2 (hereafter the Phase II IR) (N3B 2018, 700091), sites in the TA-02 core area, including SWMU 02-014, were evaluated as one exposure unit because many of the sites overlap or are adjacent to other sites. The ecological risk assessment of the TA-02 core area in the Phase II IR included a screening level risk assessment, which indicated potential ecological risk due to several contaminants of potential ecological concern (COPECs), and a baseline ecological risk assessment to evaluate COPECs and assessment endpoints associated with potential unacceptable risk. The scope of the baseline risk assessment included:

   - seedling germination testing and chemical analysis of associated soil samples;
   - earthworm bioaccumulation testing, measures of growth and survival, and chemical analysis of whole organisms and associated soil samples;
   - cavity-nesting bird monitoring and chemical analysis of eggs; and
   - small-mammal trapping and chemical analysis of whole organisms and associated soil samples.

The screening level risk assessment for the TA-02 core area was based on results of investigation sampling conducted prior to cleanup activities associated with SWMU 02-014. Therefore, exposure point concentrations used in the ecological risk assessment would be higher than those based on current conditions and would overestimate potential risk. The baseline risk assessment was also conducted before cleanup of SWMU 02-014 and the results are reflective of pre-cleanup conditions. COPECs for the baseline risk assessment included those identified in NMED's comment as being of concern due to bioaccumulation (i.e., PCBs and dioxins/furans). The Phase II IR concluded that no potential ecological risks exist for the Middle Los Alamos Canyon Aggregate Area sites (N3B 2018, 7000091). Because the ecological risk assessment for the TA-02 core area was representative of conditions existing before SWMU 02-014 cleanup, it would overestimate risk associated with current conditions, and further cleanup based on ecological risk would not be warranted. No revision to the report is necessary.

NMED Response

5. *It is agreed that the baseline risk assessment included pre-remediation levels and as such, risks would be less conservative if re-done using post-remediation levels. The risk assessment as provided for the TA-02 core area is conservative and acceptable. No revisions to the report are necessary.*

April 2023
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Addendum to the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2

EM2023-0186

Addendum to the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2

April 2023

Responsible program director:

Brenda Bowlby		Acting Program Director	RCRA Remediation Program	4/13/23
Printed Name	Signature	Title	Organization	Date

Responsible N3B representative:

Troy Thomson	Troy Thomson	Program Manager	N3B Environmental Remediation Program	4/13/23
Printed Name	Signature	Title	Organization	Date

Responsible DOE EM-LA representative:

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EXECUTIVE SUMMARY

This addendum to the 2018 “Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2” (Phase II IR) evaluates the nature and extent of contamination and potential human health and ecological risks for Solid Waste Management Unit (SWMU) 02-014. This SWMU is located within Technical Area 02 (TA-02) at Los Alamos National Laboratory (LANL or the Laboratory). This site was identified as a new SWMU during efforts to discover the source of polychlorinated biphenyl (PCB) contamination from investigation sampling at Area of Concern (AOC) 02-011(a)(ii). SWMU 02-014 consists of three former electrical transformer stations that served buildings in TA-02. The investigations revealed that PCB contamination at this site was more extensive than expected and remediation of soil contamination was required. As a result, investigation and remediation activities could not be completed in time for the results to be included in the Phase II IR. Remediation activities were planned for completion in late 2018/early 2019 with the results to be provided in an addendum to the Phase II IR.

Characterization data for SWMU 02-014 consist of results from samples collected in 2007, 2010, 2017, and 2018. Removal of PCB-contaminated soil was conducted to address potentially unacceptable risk for industrial workers and recreational users in the depth interval 0.0–1.0 ft below ground surface (bgs) and to meet the Toxic Substances Control Act bulk PCB remediation waste cleanup level for low-occupancy areas. Soil was excavated during 2018 and removal areas were expanded both laterally and vertically based on confirmation sampling results. A total of 282 yd^3 of PCB-contaminated soil was excavated and packaged for transportation to an off-site disposal facility.

Following completion of investigation sampling and remediation activities, characterization data for SWMU 02-014 were evaluated in the same manner as described in the Phase II IR for the other SWMUs and AOCs within Middle Los Alamos Canyon Aggregate Area to identify chemicals of potential concern, evaluate nature and extent of contamination, and assess risk to human health. SWMU 02-014 was determined to not pose an unacceptable human health risk or dose under the industrial, recreational, residential, and construction worker scenarios. As described in the Phase II IR, ecological risk was evaluated for all SWMUs and AOCs within the TA-02 core area, including SWMU 02-014, rather than by individual SWMU or AOC. The Phase II IR concluded no potential ecological risks exist for the TA-02 core area. Based on the results of data evaluations presented in this addendum, the Department of Energy Environmental Management Los Alamos Field Office and Newport News Nuclear BWXT-Los Alamos, LLC, recommend corrective action complete without controls for SWMU 02-014.

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1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE). The Laboratory is located in north-central New Mexico, approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site covers approximately 36 mi^2 of the Pajarito Plateau, which consists of a series of fingerlike mesas that are separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 ft to 7800 ft above mean sea level.

The Laboratory has been a participant in a national effort by DOE to clean up sites and facilities formerly involved in weapons research and development. The goal of this effort is to ensure past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, the Laboratory has investigated sites potentially contaminated by past Laboratory operations.

This investigation report addendum addresses one solid waste management unit (SWMU) within the Middle Los Alamos Canyon Aggregate Area at the Laboratory. This site is potentially contaminated with both hazardous and radioactive components. The New Mexico Environment Department (NMED), pursuant to the New Mexico Hazardous Waste Act, regulates cleanup of hazardous wastes and hazardous constituents. DOE regulates cleanup of radioactive contamination, pursuant to DOE Order 5400.5, “Radiation Protection of the Public and the Environment”; DOE Order 435.1, “Radioactive Waste Management”; and DOE Order 458.1, “Administrative Change 3, Radiation Protection of the Public and the Environment.” Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with DOE policy.

Corrective actions at the Laboratory are subject to a Compliance Order on Consent (the Consent Order). This investigation report addendum describes work activities that were completed in accordance with the Consent Order.

1.1 General Site Information

The Middle Los Alamos Canyon Aggregate Area consists of 80 SWMUs and areas of concern (AOCs), 40 of which did not warrant investigation (LANL 2008, 101669.12). The remaining 40 SWMUs and AOCs underwent sampling activities in 2007 and Phase II investigation sampling activities in 2010. These 40 sites are located at Technical Area 02 (TA-02), TA-21, and TA-26 and include 13 SWMUs and 27 AOCs. Details of previous investigations, including the results of the 2007 sampling activities, are provided in the “Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 1” (LANL 2008, 101669.12). Results from sampling activities conducted in 2010 for the 40 sites, as well as supplemental sampling performed in 2017 are provided in the “Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2” (Phase II IR) (N3B 2018, 700091).

1.2 Purpose of Investigation

During the course of the Phase II investigation activities being conducted to discover a source of polychlorinated biphenyl (PCB) contamination at storm drain AOC 02-011(a)(ii), a new SWMU (SWMU 02-014) was discovered. SWMU 02-014 consists of three former electrical transformer stations in TA-02. The investigations revealed that PCB contamination at this site was more extensive than expected and remediation of soil contamination was required. As a result, investigation and remediation activities could not be completed in time for the results to be included in the Phase II IR. Remediation activities were planned for completion in late 2018/early 2019 with the results to be provided in an addendum to the Phase II IR.

All analytical data collected during the 2018–2019 remediation and investigation activities are presented and evaluated in this addendum, in conjunction with decision-level data previously associated with AOC 02-011(a)(ii), and are now associated with SWMU 02-014.

1.3 Document Organization

This investigation report addendum is organized in six sections, including this introduction, with multiple supporting appendices. Section 2 provides an overview of the scope of the activities performed at the site. Section 3 presents an overview of the operational history of the site, summaries of previous investigations, results of the field activities performed during the 2018–2019 investigation, site contamination, evaluation of the nature and extent of contamination, and summaries of human health and ecological risk-screening assessments. Section 4 presents the conclusions of the nature and extent of contamination and risk assessments. Section 5 discusses recommendations based on applicable data and the risk-screening assessments. Section 6 includes a list of references cited and the map data sources used in all the figures and plates.

The appendices include acronyms, a metric conversion table, and definitions of data qualifiers (Appendix A); field methods (Appendix B); waste management (Appendix C); analytical program descriptions and summaries of data quality (Appendix D); analytical suites and results and analytical reports (Appendix E, on DVD including with this document); risk-screening assessments (Appendix F); and box plots and statistical results (Appendix G).

2.0 SCOPE OF ACTIVITIES

This section presents an overview of activities performed during the implementation of investigation and remediation activities at SWMU 02-014 in 2018–2019. Field activities during previous investigations at AOC 02-011(a) were described in the Phase II IR (N3B 2018, 700091). The field investigation results are presented in detail in section 3 and in the appendices. The scope of activities for the 2018–2019 investigation included geodetic surveys, surface and shallow-subsurface sampling, soil excavation, health and safety monitoring, waste management activities, and sample analysis.

2.1 Premobilization Activities

Premobilization activities included preparation of work planning documents including a site-specific safety and health plan, site-specific environmental safety and health plan, integrated work document, and quality assurance plan.

2.2 Summary of Field Activities

This section describes the field activities conducted during the 2018–2019 investigation and remediation activities. Additional details regarding the field methods and procedures used to perform these field activities are presented in Appendix B.

2.2.1 Geodetic Survey

Real-time kinematic (RTK) global positioning system (GPS) surveying was conducted to establish the coordinates of sample locations and to lay out planned soil excavation areas. Surveying was performed using Topcon HiPer V Navigation Satellite System antennas coupled with a Topcon FC-5000 Data Collector Controller. This system was used to stake sampling locations, locations to be left unexcavated (i.e., uncontaminated locations), locations excavated, planned excavation boundaries, and pre- and post-excavation topographic elevations. A light detection and ranging (LiDAR) survey was used for pre- and post-excavation topographic elevation data collection, specifically for excavations too deep to safely check via RTK GPS. The surveyed coordinates for all sampling locations not previously reported are presented in Table 2.2-1. All coordinates are expressed as State Plane Coordinate System 83, New Mexico Central, U.S. feet. All surveyed coordinates for sampling locations were submitted for upload to the Environmental Information Management Database.

2.2.2 Field Screening

All samples collected were field screened for radioactivity and some were also screened for volatile organic compounds (VOCs) using a photoionization detector. A radiological control technician (RCT) conducted radiological screening using a ThermoFisher Model SHP-380, with Eberline Model E600 Geiger Counter, for detection of low-energy radiation. All field results for alpha and beta/gamma radioactivity were recorded on the field sample collection log/chain-of-custody (SCL/COC) forms. The SCLs/COC forms are provided on CD in Appendix E. The radiological and VOC screening results not previously reported are presented in Table 2.2-2.

2.2.3 Surface and Shallow-Subsurface Soil Investigation

Surface and shallow-subsurface samples were collected using a stainless-steel hand auger to collect material within the prescribed sampling intervals. For samples collected at depths greater than 3 ft, 4-in. polyvinyl chloride pipe was decontaminated and inserted into the hole to prevent hole collapse and cross-contamination of samples. A stainless-steel bowl and scoop were used to capture the sample from the hand-auger bucket. The sample was then transferred to sterile sample collection jars for transport to the Sample Management Office (SMO).

Quality assurance (QA)/quality control (QC) samples consisted of field duplicates and rinsate blanks. Field duplicate samples were collected at a minimum rate of 1 per 10 investigation samples. Rinsate blanks were also collected at a minimum rate of 1 per 10 investigation samples to confirm decontamination of the sampling equipment.

All sample collection activities were coordinated with the SMO. Upon collection, samples remained at all times in the controlled custody of the field team until delivered to the SMO. Sample custody was then relinquished to the SMO for delivery to a preapproved off-site contract analytical laboratory.

2.2.4 Equipment Decontamination

Between collection of each sample and between sampling locations, all field equipment with the potential to contact sample material (e.g., hand augers, sampling scoops, and bowls) was decontaminated using dry decontamination methods to prevent cross-contamination of samples and locations. Rinsate blanks were used to check the effectiveness of decontamination.

2.2.5 Excavation

Excavation of PCB-contaminated soil was performed during 2018–2019. Results of the previous investigations at SWMU 02-014 were used to define the area requiring excavation. The following cleanup goals were considered in defining the excavation area:

- industrial and recreational soil screening levels (SSLs) (11 mg/kg and 5.53 mg/kg, respectively for Aroclor-1254 and 11.1 mg/kg and 10.3 mg/kg, respectively for Aroclor-1260) for the depth interval 0.0–1.0 ft below ground surface (bgs) and

- the Toxic Substances Control Act (TSCA) bulk PCB remediation waste cleanup level (25 mg/kg for total PCBs) for low-occupancy areas.

Based on consideration of the above goals, an excavation area was defined where all soil within the depth interval 0.0–1.0 ft bgs would be removed to address potential risk to industrial workers and recreational users. This area is shown on Plate 1. Within this area, four additional areas requiring deeper excavation were defined to meet the TSCA cleanup level. Excavation depths in these areas ranged from 4.5 ft bgs to 10.5 ft bgs.

The planned excavation areas were staked in the field and soil was excavated to the required depths using a Yanmar mini-excavator and Volvo excavator. Approximately 255 yd^3 of soil was excavated from these areas. Following excavation, confirmatory samples were collected to determine whether additional removal was needed to meet cleanup goals. Based on this evaluation, additional excavation from the interval 0.0–1.0 ft bgs was required to the east of the northeast corner of the original excavation area and to the west at two locations on the west boundary of the original excavation area. One area where additional deeper excavation was required was also identified at the northwest corner of the original excavation area. This area was excavated to a depth of approximately 6 ft bgs. Excavation from these areas resulted in removal of approximately 27 yd^3 of soil.

2.2.6 Health and Safety Measures

Health and safety measures were identified based on the results of previous investigations at SWMU 02-014. Monitoring of airborne particulates was required to monitor for potential exposure to PCBs during soil excavation activities. Airborne particulate measurements were made using a Thermo Andersen MIE Personal Dust Monitor Model 1000. Because heavy equipment was being used for soil excavation, noise monitoring was also conducted using a Quest NoisePro DLX noise level meter.

During excavation of deep interior area I-1, two asbestos-wrapped pipes (assumed to be decommissioned gas and water lines based on conversations with LANL Utilities Management) were exposed within the first 1–2 feet bgs. A “pause work” commenced the afternoon of November 19, 2018, and went to December 3, 2018. During this time, an asbestos abatement plan and integrated work document addendum were developed. The approved asbestos abatement included use of personal protective equipment and collection of airborne asbestos samples. The approved asbestos abatement plan was then implemented and the exposed pipes and wrapping were removed from the excavation and properly packaged and labeled. About 1 yd^3 of waste (pipe, asbestos wrapping, contact waste materials) was generated in the process.

2.2.7 Waste Management

The waste streams associated with investigation and remediation activities included excavated soil, contact waste, and asbestos-containing materials. All waste, including excavated soil, was managed in accordance with the project waste characterization strategy form (WCSF). All excavated media at SWMU 02-014 was placed in 5.18-yd^3 soft-sided IP-1 bags. IP-1 bags were positioned on pallets for loading and staging. After a bag was sealed, an RCT screened all sides of the bag before releasing the bag for staging at TA-41. Contact waste was stored in labeled 1-gal. plastic bags in the radioactive waste accumulation area on-site until it could be transferred to a 5.18-yd^3 soft-sided IP-1 bag. Temporary storage was within a posted radiological waste storage area at TA-41. All waste containers that were staged at TA-41 were covered with tarps for additional protection from the elements.

The management of wastes is described in greater detail in Appendix C. The WCSF is provided in Appendix C (Attachment C-1 on CD).

2.3 Sample Analyses

The SMO shipped all samples to off-site contract analytical laboratories for the requested analyses. All samples collected during the 2018–2019 investigation and remediation activities were submitted for analysis of PCBs.

Analytical methods and summaries of data quality are presented in Appendix D. Analytical results, analytical reports, and SCLs/COCs are included on DVD in Appendix E.

2.4 Deviations

The 2018–2019 sampling and remediation activities at SWMU 02-014 were not addressed in the approved Phase II investigation work plan for Middle Los Alamos Canyon Aggregate Area (LANL 2009, 105073; NMED 2009, 105595). The need for these activities was identified as a result of the Phase II sampling performed at AOC 02-011(a)(ii) and the subsequent discovery of SWMU 02-014.

3.0 FIELD INVESTIGATION RESULTS FOR SWMU 02-014

3.1 Site Description and Operational History

SWMU 02-014 consists of three former electrical transformer stations (structures 02-31, 02-45, and 02-51) that served buildings in TA-02 (Plate 1). This site was identified during efforts to discover the source of PCB contamination identified during investigation sampling at storm drain AOC 02-011(a)(ii). Historical records, including engineering drawings and photographs, were reviewed and three potential sources of PCBs were identified. Former structure 02-31 was an electrical transformer station located 40 ft behind building 02-1. The transformer station was built in 1944 and was removed in 1950. Former structure 02-45 was built in 1954 to serve building 02-44. The transformer station consisted of three transformers mounted across two telephone poles approximately 14 ft above the ground. The transformer station was replaced with another transformer station (structure 02-51). Former structure 02-51 was an electrical transformer station located approximately 20 ft southwest of former structure 02-31 and 20 ft southeast of former structure 02-45. Historical records indicated PCB-containing transformer oil had been used at this former transformer station. Structure 02-51 was constructed in 1961 and demolished in 2003.

3.2 Relationship to Other SWMUs and AOCs

SWMU 02-014 is adjacent to and northwest of AOC 02-011(a) segments (i), (ii), and (iii). SWMU 02-014 is the source of the PCB contamination previously detected at AOC 02-011(a).

3.3 Summary of Previous Investigations

No previous investigations have been performed at SWMU 02-014. The area of SWMU 02-014 was previously sampled as part of the investigations performed for AOC 02-011(a).

3.4 Site Contamination

3.4.1 Soil and Rock Sampling

SWMU 02-014 was sampled during 2017 to characterize the areas potentially requiring removal of PCB-contaminated soil. A total of 256 samples were collected at 46 locations around areas where PCB contamination was previously detected during the investigation of AOC 02-011(a). Samples were collected at various depth intervals based on previous results, to a maximum of 20 ft bgs or until refusal. Following evaluation of initial results, additional sampling was performed in 2018 to better characterize extent of potential excavation areas. During January 2018, 102 samples were collected from 21 existing locations and 7 new locations. In September 2018, 6 samples were collected from 5 new locations to refine the area requiring excavation. Based on these results, PCB-contaminated soil was excavated during November and December 2018, and 30 confirmation samples were collected at 10 new locations on the western side of the site.

3.4.2 Soil and Rock Sample Field-Screening Results

No radiological-screening results exceeded twice the daily site background levels and no VOCs were detected.

3.4.3 Soil and Rock Sample Analytical Results

Decision-level data at SWMU 02-014 consist of results from 436 samples collected from 83 locations in 2007, 2010, 2017, and 2018. The 436 samples include 272 soil/Qal, 6 Qbt 3, 7 Qbt 1g, 1 Qct, and 150 Qbo samples. Plate 1 shows the sample locations and Table 3.4-1 presents the samples collected and the analyses requested for SWMU 02-014.

Inorganic Chemicals

A total of 92 samples (70 soil/Qal, 1 Qbt 3, and 21 Qbo) were analyzed for target analyte list (TAL) metals, and 3 soil/Qal samples were analyzed for nitrate, perchlorate, and total cyanide. Table 3.4-2 presents the inorganic chemicals detected or detected above background values (BVs). Plate 2 shows the spatial distribution of inorganic chemicals detected or detected above BVs.

Aluminum was detected above the Qbt 1g, Qct, Qbo BV (3560 mg/kg) in 18 samples with a maximum concentration of 15,000 mg/kg. The Gehan and quantile tests indicated site concentrations of aluminum in tuff are statistically different from background (Figure G-1 and Table G-1). Aluminum is retained as a chemical of potential concern (COPC).

Arsenic was detected above the Qbt 1g, Qct, Qbo BV (0.56 mg/kg) in 18 samples with a maximum concentration of 0.94 mg/kg. The quantile and slippage tests indicated site concentrations of arsenic in tuff are statistically different from background (Figure G-2 and Table G-1). Arsenic is retained as a COPC.

Barium was detected above the Qbt 1g, Qct, Qbo BV (25.7 mg/kg) in 17 samples with a maximum concentration of 96.1 mg/kg. The Gehan and quantile tests indicated site concentrations of barium in tuff are statistically different from background (Figure G-3 and Table G-1). Barium is retained as a COPC.

Cadmium was not detected above the soil and Qbt 1g, Qct, Qbo BVs (0.4 mg/kg for both) but had detection limits (DLs) (0.497 mg/kg to 0.517 mg/kg) above BV in five soil samples and one tuff sample. The DLs were only 0.097 mg/kg and 0.117 mg/kg above the BVs, and the maximum DL is below or equivalent to the three highest concentrations (0.6 mg/kg, 1.4 mg/kg, and 2.6 mg/kg) and the highest DL (2 mg/kg) in the soil background data set. Cadmium is not a COPC.

Calcium was detected above the Qbt 1g, Qct, Qbo BV (1900 mg/kg) in three samples with a maximum concentration of 7260 mg/kg. The quantile and slippage tests indicated site concentrations of calcium in tuff are not statistically different from background (Figure G-4 and Table G-1). Calcium is not a COPC.

Chromium was detected above the Qbt 1g, Qct, Qbo BV (2.6 mg/kg) in 12 samples with a maximum concentration of 14.5 mg/kg. The Gehan and quantile tests indicated site concentrations of chromium in tuff are statistically different from background (Figure G-5 and Table G-1). Chromium is retained as a COPC.

Copper was detected above the soil and Qbt 1g, Qct, Qbo BVs (14.7 mg/kg and 3.96 mg/kg) in one soil sample and two tuff samples with a maximum concentration of 47.5 mg/kg. The Gehan and quantile tests indicated site concentrations of copper in soil are not statistically different from background (Figure G-6 and Table G-2). The Gehan and quantile tests indicated site concentrations of copper in tuff are statistically different from background (Figure G-7 and Table G-1). Copper is retained as a COPC.

Iron was detected above the Qbt 1g, Qct, Qbo BV (3700 mg/kg) in 17 samples with a maximum concentration of 7560 mg/kg. The Gehan and quantile tests indicated site concentrations of iron in tuff are statistically different from background (Figure G-8 and Table G-1). Iron is retained as a COPC.

Magnesium was detected above the Qbt 1g, Qct, Qbo BV (739 mg/kg) in ten samples with a maximum concentration of 1710 mg/kg. The Gehan and quantile tests indicated site concentrations of magnesium in tuff are statistically different from background (Figure G-9 and Table G-1). Magnesium is retained as a COPC.

Manganese was detected above the Qbt 1g, Qct, Qbo BV (189 mg/kg) in eight samples with a maximum concentration of 274 mg/kg. The Gehan and quantile tests indicated site concentrations of manganese in tuff are statistically different from background (Figure G-10 and Table G-1). Manganese is retained as a COPC.

Mercury was detected above the soil BV (0.1 mg/kg) in six samples with a maximum concentration of 0.538 mg/kg. Mercury is retained as a COPC.

Nickel was detected above the Qbt 1g, Qct, Qbo BV (2 mg/kg) in 15 samples with a maximum concentration of 4.37 mg/kg. The quantile test indicated site concentrations of nickel in tuff are statistically different from background (Figure G-11 and Table G-1). Nickel is retained as a COPC.

Nitrate was detected in two samples with a maximum concentration of 1.77 mg/kg. Nitrate is naturally occurring, and the concentrations likely reflect naturally occurring levels. In addition, SWMU 02-014 consists of former electrical transformer stations and is not a source of nitrate. Nitrate is not a COPC.

Perchlorate was detected in one sample at a concentration of 0.000813 mg/kg. Perchlorate is retained as a COPC.

Selenium was detected above the Qbt 3 and Qbt 1g, Qct, Qbo BVs (0.3 mg/kg for both) in 1 Qbt 3 sample and 5 Qbo samples with a maximum concentration of 1.11 mg/kg and was not detected but had DLs (0.403 mg/kg to 2.5 mg/kg) above the soil BV (1.52 mg/kg) and Qbt 1g, Qct, Qbo BV in 15 soil samples and 12 Qbo samples. Selenium is retained as a COPC.

Thallium was not detected above the soil and Qbt 1g, Qct, Qbo BVs (0.73 mg/kg and 1.22 mg/kg) but had a DL (2.5 mg/kg) above BV in three soil samples and two tuff samples. The slippage test indicated site concentrations of thallium in soil are statistically different from background (Figure G-12 and Table G-2).

The quantile and slippage tests indicated site concentrations of thallium in tuff are not statistically different from background (Figure G-13 and Table G-1). Thallium is retained as a COPC.

Vanadium was detected above the Qbt 1g, Qct, Qbo BV (4.59 mg/kg) in eight samples with a maximum concentration of 6.43 mg/kg. The Gehan and quantile tests indicated site concentrations of vanadium in tuff are statistically different from background (Figure G-14 and Table G-1). Vanadium is retained as a COPC.

Zinc was detected above the soil BV (48.8 mg/kg) in four samples with a maximum concentration of 105 mg/kg. The quantile and slippage tests indicated site concentrations of zinc in soil are not statistically different from background (Figure G-15 and Table G-2). Zinc is not a COPC.

Organic Chemicals

A total of 353 samples (209 soil/Qal, 5 Qbt 3, 7 Qbt 1g, 1 Qct, and 131 Qbo) were analyzed for PCBs, 3 soil/Qal samples were analyzed for semivolatile organic compounds (SVOCs) and dioxins/furans, and 2 soil/Qal samples were analyzed for VOCs. Table 3.4-3 presents detected organic chemicals other than PCBs, and Table 3.4-4 presents detected PCBs. Figure 3.4-1 shows the spatial distribution of detected organic chemicals other than PCBs, and Plate 3 shows the spatial distribution of PCBs.

Organic chemicals detected at SWMU 02-014 include anthracene; Aroclor-1254; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; 1,2,3,4,6,7,8-heptachlorodibenzodioxin; 1,2,3,4,6,7,8-heptachlorodibenzofuran; 1,2,3,4,7,8,9-heptachlorodibenzofuran; 1,2,3,4,7,8-hexachlorodibenzodioxin; 1,2,3,6,7,8-hexachlorodibenzodioxin; 1,2,3,7,8,9-hexachlorodibenzodioxin; 1,2,3,4,7,8-hexachlorodibenzofuran; 1,2,3,6,7,8-hexachlorodibenzofuran; 1,2,3,7,8,9-hexachlorodibenzofuran; 2,3,4,6,7,8-hexachlorodibenzofuran; indeno(1,2,3-cd)pyrene; 1,2,3,4,6,7,8,9-octachlorodibenzodioxin; 1,2,3,4,6,7,8,9-octachlorodibenzofuran; 1,2,3,7,8-pentachlorodibenzodioxin; 1,2,3,7,8-pentachlorodibenzofuran; 2,3,4,7,8-pentachlorodibenzofuran; phenanthrene; pyrene; 2,3,7,8-tetrachlorodibenzofuran; and toluene. The detected organic chemicals are retained as COPCs.

Radionuclides

A total of 92 samples (70 soil/Qal, 1 Qbt 3, and 21 Qbo) were analyzed for gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and strontium-90; 7 soil/Qal samples were analyzed for americium-241; and 3 soil/Qal samples were analyzed for tritium. Table 3.4-5 presents the radionuclides detected or detected above BVs/fallout values (FVs). Figure 3.4-2 shows the spatial distribution of radionuclides detected or detected above BVs/FVs.

Cesium-134 was detected in three soil samples and two tuff samples with a maximum activity of 0.066 pCi/g. Cesium-134 is retained as a COPC.

Cesium-137 was detected in two soil samples below 0.0 ft to 1.0 ft bgs with a maximum activity of 0.759 pCi/g. Cesium-137 is retained as a COPC.

Plutonium-238 was detected in two soil samples below 0.0 ft to 1.0 ft bgs and one tuff sample with a maximum activity of 0.019 pCi/g. Plutonium-238 is retained as a COPC.

Plutonium-239/240 was detected above the soil FV (0.054 pCi/g) in three samples, detected in seven soil samples below 0.0 ft to 1.0 ft bgs, and detected in two tuff samples with a maximum activity of 0.076 pCi/g. Plutonium-239/240 is retained as a COPC.

3.4.4 Nature and Extent of Contamination

The nature and extent of inorganic and organic COPCs at SWMU 02-014 are discussed below.

Inorganic Chemicals

Inorganic COPCs at SWMU 02-014 include aluminum, arsenic, barium, chromium, copper, iron, magnesium, manganese, mercury, nickel, perchlorate, selenium, thallium, and vanadium.

Aluminum was detected above the Qbt 1g, Qct, Qbo BV in 18 samples with a maximum concentration of 15,000 mg/kg. Concentrations increased with depth at locations 02-61435, 02-61439, 02-61442, 02-61450, 02-61451, 02-61452, and 02-61454; did not change substantially with depth (170 mg/kg) at location 02-61445; decreased with depth at all other locations; and decreased downgradient (the concentration in a shallow sample at location 02-61445 was 10,200 mg/kg and below the soil BV [Appendix E, Pivot Tables]). The residential and industrial SSLs were approximately 5 times and 86 times the maximum concentration, respectively (63,000 mg/kg and 1,280,000 mg/kg below the respective SSLs). The lateral extent of aluminum is defined and further sampling for vertical extent is not warranted.

Arsenic was detected above the Qbt 1g, Qct, Qbo BV in 18 samples with a maximum concentration of 0.94 mg/kg. Concentrations decreased with depth and decreased downgradient. The lateral and vertical extent of arsenic are defined. Arsenic concentrations did not vary substantially vertically or horizontally. The range of concentrations detected in soil (0.321 mg/kg to 2.38 mg/kg), Qbt 3 (0.791 mg/kg), and Qbo (0.354 mg/kg to 0.94 mg/kg) were similar and do not indicate any spatial concentration trends. The residential and industrial SSLs were approximately 8 times and 38 times the maximum concentration above BV (0.94 mg/kg). Further sampling for extent of arsenic is not warranted.

Barium was detected above the Qbt 1g, Qct, Qbo BV in 17 samples with a maximum concentration of 96.1 mg/kg. Concentrations increased with depth at locations 02-61435, 02-61442, 02-61446, and 02-61454; decreased with depth at all other locations; and decreased downgradient (the concentrations in shallow samples at locations 02-61443, 02-61445, 02-61450, and 02-61451 were 31.2 mg/kg, 73.9 mg/kg, 29.7 mg/kg, and 69.5 mg/kg, respectively, and below the soil BV [Appendix E, Pivot Tables]). The residential SSL was approximately 162 times the maximum concentration. The lateral extent of barium is defined and further sampling for vertical extent is not warranted.

Chromium was detected above the Qbt 1g, Qct, Qbo BV in 12 samples with a maximum concentration of 14.5 mg/kg. Concentrations increased with depth at locations 02-61436 and 02-61454, did not change substantially with depth (0.12 mg/kg) at locations 02-61442 and 02-61451, decreased with depth at all other locations, and decreased downgradient (concentrations in shallow samples at locations 02-613763, 02-61435, 02-61439, 02-61442, 02-61446, and 02-61451 were 3.86 mg/kg, 4.92 mg/kg, 3.52 mg/kg, 2.73 mg/kg, 4.16 mg/kg, and 3.15 mg/kg, respectively, and below the soil BV [Appendix E, Pivot Tables]). As described in section 4.2 of the Phase II IR (LANL 2018, 700091), SWMU 02-014 is not a potential source of hexavalent chromium and use of the SSL for trivalent chromium to determine whether additional sampling is warranted is appropriate. The residential SSL for trivalent chromium (117,000 mg/kg) was approximately 8070 times the maximum concentration. The lateral extent of chromium is defined and further sampling for vertical extent is not warranted.

Copper was detected above the soil and Qbt 1g, Qct, Qbo BVs in one soil sample and two tuff samples with a maximum concentration of 47.5 mg/kg. Concentrations increased with depth at location 02-61438, decreased with depth at location 02-61435, and decreased downgradient. The residential SSL was approximately 66 times the maximum concentration. The lateral extent of copper is defined and further sampling for vertical extent is not warranted.

Iron was detected above the Qbt 1g, Qct, Qbo BV in 17 samples with a maximum concentration of 7560 mg/kg. Concentrations increased with depth at locations 02-61442, 02-61451, 02-61452, and 02-61454; did not change substantially with depth (60 mg/kg and 80 mg/kg) at locations 02-61443 and 02-61450; decreased with depth at all other locations; and decreased downgradient (concentrations in shallow samples at locations 02-61435, 02-61436, 02-61438, 02-61439, 02-61441, 02-61443, and 02-61450 were 12,800 mg/kg, 5380 mg/kg, 6140 mg/kg, 4850 mg/kg, 7020 mg/kg, 4060 mg/kg, and 4720 mg/kg, respectively, and below the soil BV [Appendix E, Pivot Tables]). The residential and industrial SSLs were approximately 7 times and 120 times the maximum concentration, respectively (47,200 mg/kg and 972,000 mg/kg below the respective SSLs). The lateral extent of iron is defined and further sampling for vertical extent is not warranted.

Magnesium was detected above the Qbt 1g, Qct, Qbo BV in 10 samples with a maximum concentration of 1710 mg/kg. Concentrations increased with depth at locations 02-61435, 02-61438, 02-61442, 02-61452, and 02-61454; did not change substantially with depth (12 mg/kg) at location 02-61451; decreased with depth at all other locations; and decreased downgradient (the concentration in a shallow sample at location 02-61451 was 839 mg/kg and below the soil BV [Appendix E, Pivot Tables]). The residential essential nutrient SSL was approximately 12,200 times the maximum concentration. The lateral extent of magnesium is defined and further sampling for vertical extent is not warranted.

Manganese was detected above the Qbt 1g, Qct, Qbo BV in eight samples with a maximum concentration of 274 mg/kg. Concentrations increased with depth at locations 02-61435, 02-61436, 20-61442, and 02-61445; did not change substantially with depth (11 mg/kg and 29 mg/kg) at locations 02-61451 and 02-61454; decreased with depth at all other locations; and decreased downgradient (concentrations in shallow samples at locations 02-61438, 02-61450, 02-61451, and 02-61454 were 236 mg/kg, 247 mg/kg, 218 mg/kg, and 245 mg/kg, respectively, and below the soil BV [Appendix E, Pivot Tables]). The residential SSL was approximately 38 times the maximum concentration. The lateral extent of manganese is defined and further sampling for vertical extent is not warranted.

Mercury was detected above the soil BV in six samples with a maximum concentration of 0.538 mg/kg. Concentrations decreased with depth at all locations and decreased downgradient. The lateral and vertical extent of mercury are defined.

Nickel was detected above the Qbt 1g, Qct, Qbo BV in 15 samples with a maximum concentration of 4.37 mg/kg. Concentrations increased with depth at locations 02-61435, 02-61442, and 02-61454; did not change substantially with depth (0.05 mg/kg to 0.2 mg/kg) at locations 02-61436, 02-61439, and 02-61451; decreased with depth at all other locations; and decreased downgradient. The residential SSL was approximately 357 times the maximum concentration. The lateral extent of nickel is defined and further sampling for vertical extent is not warranted.

Perchlorate was detected in one sample at a concentration of 0.000813 mg/kg. Concentrations increased with depth and increased laterally at location 02-600387. The detected concentration was below the estimated quantitation limit (EQL). Perchlorate was not detected in samples collected downgradient of location 02-600387 at AOC 02-011(a)(i,ii,iii,iv,v,vi) location 02-600407. The residential SSL was approximately 67,400 times the detected concentration. The lateral extent of perchlorate is defined and further sampling for vertical extent is not warranted.

Selenium was detected above the Qbt 3 and Qbt 1g, Qct, Qbo BVs in 1 Qbt 3 sample and 5 Qbo samples with a maximum concentration of 1.11 mg/kg and was not detected but had DLs (0.403 mg/kg to 2.5 mg/kg) above the soil BV and Qbt 1g, Qct, Qbo BV in 15 soil samples and 12 Qbo samples. Concentrations increased with depth at locations 02-61442, 02-61443, and 02-61446; decreased with depth at all other locations; and decreased downgradient (concentrations in shallow samples at locations 02-61432, 02-61435, and 02-61445 were 0.375 mg/kg, 1.15 mg/kg, and 0.537 mg/kg, respectively, and below the soil BV [Appendix E, Pivot Tables]). The residential SSL was approximately 352 times the maximum concentration and approximately 156 times the maximum DL. The lateral extent of selenium is defined and further sampling for vertical extent is not warranted.

Thallium was not detected above the soil and Qbt 1g, Qct, Qbo BVs but had a DL (2.5 mg/kg) above the soil and Qbt 1g, Qct, Qbo BVs in three soil samples and two tuff samples. The maximum DL was approximately 3.2 times the residential SSL, and the industrial SSL was approximately 5.2 times the maximum DL. Samples with DLs above BV were collected at locations 02-61436, 02-61441, 02-61444, and 02-61454. At locations 02-61436, 02-61441, and 02-61444, thallium was not detected or detected above BVs in any other samples and DLs were all below BV (0.043 mg/kg to 0.14 mg/kg [Appendix E, Pivot Tables]). At location 02-61454, thallium was not detected (with a DL of 2.5 mg/kg) in samples from 2.0 to 3.0 ft bgs and 4.0 to 5.0 ft bgs and was detected at 0.053 mg/kg (below BV) in a sample from 6.0 to 7.0 ft bgs (Appendix E, Pivot Tables). At all other locations, thallium was detected in 23 samples at concentrations ranging from 0.027 mg/kg to 0.312 mg/kg and was not detected in 53 samples, with DLs ranging from 0.044 mg/kg to 0.316 mg/kg (Appendix E, Pivot Tables). All concentrations and DLs at these locations were below the residential SSL. Further sampling for extent of thallium is not warranted.

Vanadium was detected above the Qbt 1g, Qct, Qbo BV in eight samples with a maximum concentration of 6.43 mg/kg. Concentrations increased with depth at locations 02-61442 and 02-61454, decreased with depth at all other locations, and decreased downgradient. The residential SSL was approximately 61 times the maximum concentration. The lateral extent of vanadium is defined and further sampling for vertical extent is not warranted.

Organic Chemicals

Organic COPCs at SWMU 02-014 include anthracene; Aroclor-1254; Aroclor-1260; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; 1,2,3,4,6,7,8-heptachlorodibenzodioxin; 1,2,3,4,6,7,8-heptachlorodibenzofuran; 1,2,3,4,7,8,9-heptachlorodibenzofuran; 1,2,3,4,7,8-hexachlorodibenzodioxin; 1,2,3,6,7,8-hexachlorodibenzodioxin; 1,2,3,7,8,9-hexachlorodibenzodioxin; 1,2,3,4,7,8-hexachlorodibenzofuran; 1,2,3,6,7,8-hexachlorodibenzofuran; 1,2,3,7,8,9-hexachlorodibenzofuran; 2,3,4,6,7,8-hexachlorodibenzofuran; indeno(1,2,3-cd)pyrene; 1,2,3,4,6,7,8,9-octachlorodibenzodioxin; 1,2,3,4,6,7,8,9-octachlorodibenzofuran; 1,2,3,7,8-pentachlorodibenzodioxin; 1,2,3,7,8-pentachlorodibenzofuran; 2,3,4,7,8-pentachlorodibenzofuran; phenanthrene; pyrene; 2,3,7,8-tetrachlorodibenzofuran; and toluene.

The polycyclic aromatic hydrocarbons (PAHs) anthracene; benzo(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; benzo(g,h,i)perylene; benzo(k)fluoranthene; chrysene; fluoranthene; indeno(1,2,3-cd)pyrene; phenanthrene; and pyrene were each detected in 2 samples at location 02-600387 at concentrations ranging from 0.00727 mg/kg to 0.0984 mg/kg. Concentrations of pyrene decreased with depth and concentrations of all other PAHs did not change substantially with depth (0.00176 mg/kg to 0.0455 mg/kg). Concentrations increased laterally at location 02-600387. Of the 22 detected concentrations, 11 were below EQLs. The residential SSLs ranged from approximately 20 times to 1,930,000 times the maximum concentrations, and the residential SSLs of all PAHs, except benzo(a)anthracene, benzo(a)pyrene, and indeno(1,2,3-cd)pyrene, were more than 100 times the maximum concentration. The residential SSL for benzo(a)anthracene was approximately 30 times the maximum concentration, and the industrial SSL was approximately 626 times the maximum concentration (0.0516 mg/kg). The residential SSL for benzo(a)pyrene was approximately 20 times the maximum concentration, and the industrial SSL was approximately 428 times the maximum concentration (0.0551 mg/kg). The residential SSL for indeno(1,2,3-cd)pyrene was approximately 61 times the maximum concentration, and the industrial SSL was approximately 1280 times the maximum concentration (0.0252 mg/kg). Further sampling for extent of PAHs is not warranted.

Aroclor-1254 was detected in 31 samples with a maximum concentration of 7.11 mg/kg. Concentrations increased with depth at locations 02-613122, 02-613124, and 02-613700 and did not change substantially with depth (0.0082 mg/kg) at location 02-61490; only 1 depth was sampled at location 02-61492; concentrations decreased with depth at all other locations; and concentrations decreased downgradient.

Aroclor-1254 concentrations at locations 02-613124 and 02-613700 increased with depth, and the concentrations in the deepest samples were approximately 0.2 times and 0.7 times the residential SSL, respectively. As indicated in Revision 1 to the Phase II investigation report for Middle Los Alamos Canyon Aggregate Area (LANL 2011, 205220, pp. 397–398), locations 02-613124 and 02-613700 were sampled to define the lateral extent of PCB contamination at location 02-600449, where Aroclor-1260 was detected at 28 mg/kg at 0.0 to 0.5 ft bgs and 44.8 mg/kg at 2.0 to 4.5 ft bgs. The Phase II investigation work plan had proposed excavating the area around location 02-600449 to a depth of 6 ft bgs (LANL 2009, 105073, p.9). As a result, samples at locations 02-613124 and 02-613700 were collected only below 6 ft bgs, and samples were not specifically collected to define vertical extent at these locations. Because this area, including the elevated PCBs in shallow samples at location 02-600449, has now been excavated, further sampling for vertical extent at locations 02-613124 and 02-613700 is not warranted.

Concentrations increased with depth at location 02-613122 and did not change substantially with depth at location 02-61490, but the residential SSL was approximately 28 times and 31 times the concentrations at these locations, respectively. Further sampling for vertical extent at locations 02-613122 and 02-61490 is not warranted.

Only one depth was sampled at location 02-61492, but the residential SSL was approximately 27 times the detected concentration. Further sampling for vertical extent at location 02-61492 is not warranted.

Only one sample depth is presented in Table 3.4-4 for location 02-613699. At this location, however, additional shallower samples had been collected, and Aroclor-1254 was detected in these samples at concentrations ranging from 4 mg/kg to 14.3 mg/kg. Shallow surface soil with elevated Aroclor-1254 concentrations at location 02-613699 was subsequently excavated, and the shallow sample results are no longer representative of site conditions and are not presented in Table 3.4-4. Before excavation, Aroclor-1254 concentrations decreased with depth at location 02-613699. Vertical extent of contamination is defined at this location based on concentrations in the shallow, pre-excavation sample results, which are included in Appendix E.

Aroclor-1254 concentrations decreased with depth at location 02-613667, although the concentration in the deepest sample (4.93 mg/kg at 10.0 to 10.2 ft bgs) is approximately 4 times the residential SSL. The concentration in the deepest sample was only 2.18 mg/kg less than the maximum concentration (7.11 mg/kg at 6.0 to 6.2 ft bgs), indicating further sampling for vertical extent could be warranted. The vertical extent of contamination at location 02-613667, however, is defined by Aroclor-1254 results from deeper samples collected at adjacent locations 02-61436 to the southwest, 02-61452 to the southeast, and 02-61254 to the northeast. Aroclor-1254 was not detected in any samples collected at these three locations, including samples from depth intervals of 11.0 to 12.0, 14.0 to 15.0, 16.0 to 17.0, and 19.0 to 20.0 ft bgs.

Aroclor-1254 does not pose an unacceptable risk under the industrial, recreational, residential, and construction worker scenarios with cancer risks ranging from 5.43×10^{-7} to 7.87×10^{-7} and hazard indices (HIs) ranging from 0.0269 to 0.142 (Appendix F, Tables F-4.2-1, F-4.2-2, F-4.2-4, F-4.2-5, F-4.2-7, F-4.2-8, and F-4.2-10). Lateral extent of Aroclor-1254 is defined, and further sampling for vertical extent is not warranted.

Aroclor-1260 was detected in 317 samples with a maximum concentration of 23.9 mg/kg. Concentrations increased with depth at locations 02-600449, 02-612452, 02-613626, 02-613668, 02-613700, 02-61479, 02-61488, 02-61489, and 02-61553; did not change substantially with depth (0.0078 mg/kg to 0.033 mg/kg) at locations 02-61436, 02-61445, 02-61486, and 02-61490; only 1 depth was sampled at locations 02-612451, 02-613292, and 02-61492; and concentrations decreased with depth at all other locations. Concentrations decreased downgradient.

Only one depth was sampled at location 02-612451, and concentrations increased with depth at location 02-612452. Concentrations in the deep samples at these locations were 1.6 times and 0.9 times the residential SSL, respectively. As indicated in Revision 1 to the Phase II investigation report for Middle Los Alamos Canyon Aggregate Area (LANL 2011, 205220, p. 397), locations 02-612451 and 02-612452 were sampled to define the lateral extent of PCB contamination at location 02-600449, where Aroclor-1260 was detected at 28 mg/kg at 0.0 to 0.5 ft bgs and 44.8 mg/kg at 2.0 to 4.5 ft bgs. The Phase II investigation work plan had proposed excavating the area around location 02-600449 to a depth of 6 ft bgs (LANL 2009, 105073, p.9). As a result, samples at locations 02-612451 and 02-612452 were collected only below 6 ft bgs, and samples were not specifically collected to define vertical extent at these locations. Because this area, including the elevated PCBs in shallow samples at location 02-600449, has now been excavated, further sampling for vertical extent of Aroclor-1260 at locations 02-612451 and 02-612452 is not warranted.

Only one sample depth is presented in Table 3.4-4 for locations 02-613699, 02-61478, and 02-61539 through 02-61543. At each of these locations, however, additional shallower samples had been collected and Aroclor-1260 was detected in these samples at concentrations ranging from 11.5 mg/kg to 3790 mg/kg. Shallow surface soil with elevated Aroclor-1260 concentrations at these locations was subsequently excavated, and the shallow sample results are no longer representative of site conditions and are not presented in Table 3.4-4. Before excavation, Aroclor-1260 concentrations decreased with depth at each of these locations. Vertical extent of contamination is defined at each of these locations based on concentrations in the shallow, pre-excavation sample results, which are included in Appendix E.

Concentrations increased with depth at locations 02-600449, 02-613668, 02-61479, 02-61488, 02-61489, and 02-61553 based on the results presented in Table 3.4-4. At each of these locations, however, additional shallower samples had been collected and Aroclor-1260 was detected in these samples at concentrations ranging from 7.86 mg/kg to 91.7 mg/kg. Shallow surface soil with elevated Aroclor-1260 concentrations at these locations was subsequently excavated, and the shallow sample results are no longer representative of site conditions and are not presented in Table 3.4-4. Before excavation, Aroclor-1260 concentrations decreased with depth at each of these locations. Vertical extent of contamination is defined at each of these locations based on the shallow, pre-excavation sample results, which are included in Appendix E.

Aroclor-1260 concentrations decreased with depth at location 02-613667, although the concentration in the deepest sample (7.73 mg/kg at 10.0 to 10.2 ft bgs) is approximately 3 times the residential SSL. Based on the results presented in Table 3.4-4, the concentration in the deepest sample was only 5.57 mg/kg less than the maximum concentration (13.3 mg/kg at 6.0 to 6.2 ft bgs), indicating further sampling for vertical extent could be warranted. However, the concentration in the surface sample (0.0 to 1.0 ft bgs) at this location was 190 mg/kg. Soil in this depth interval was subsequently excavated, and the shallow sample results are no longer representative of site conditions and are not presented in Table 3.4-4. Based on the decrease in concentrations with depth considering the pre-excavation sample results at location 02-613667, which are included in Appendix E, further sampling for vertical extent of Aroclor-1260 at location 02-613667 is not warranted.

Aroclor-1260 concentrations at locations 02-613626 and 02-613700 increased with depth and the concentrations in the deepest samples were approximately 1.4 times and 0.9 times the residential SSL, respectively. As indicated in Revision 1 to the Phase II investigation report for Middle Los Alamos Canyon Aggregate Area (LANL 2011, 205220, p. 398), locations 02-613626 and 02-613700 were sampled to define the lateral extent of PCB contamination at location 02-600449, where Aroclor-1260 was detected at 28 mg/kg at 0.0 to 0.5 ft bgs and 44.8 mg/kg at 2.0 to 4.5 ft bgs. The Phase II investigation work plan had proposed excavating the area around location 02-600449 to a depth of 6 ft bgs (LANL 2009, 105073, p.9). As a result, samples at locations 02-613626 and 02-613700 were collected only below 6 ft bgs and samples were not specifically collected to define vertical extent at these locations. Because this area, including the elevated PCBs in shallow samples at location 02-600449, has now been excavated, further sampling for vertical extent at locations 02-613626 and 02-613700 is not warranted.

Concentrations decreased with depth at location 02-61537, but the concentration in the deepest sample at 11.0 to 12.0 ft bgs was slightly greater than the residential SSL. Location 02-61537 was sampled in January 2018 to help define the southern extent of the exterior excavation boundary (Plate 3) and is within the area that was excavated to 1 ft bgs. Concentrations decrease vertically by almost one order of magnitude from 23.9 mg/kg at 2.0–3.0 ft bgs to 2.48 mg/kg at 11.0–12.0 ft bgs, and the slight increase from 1.44 mg/kg at 8.0–9.0 ft bgs to 2.48 mg/kg at 11.0–12.0 ft bgs does not warrant continued sampling for vertical extent.

Concentrations increased with depth at location 02-613289 based on the results presented in Table 3.4-4. Samples had also been collected at this location from the depth intervals 0.0 to 1.0 ft bgs, 2.0 to 3.0 ft bgs, 4.0 ft to 4.2 ft bgs, and 4.0 ft to 5.0 ft bgs and Aroclor-1260 was detected at concentrations of 1520 mg/kg, 7.51 mg/kg, 0.68 mg/kg, and 33.1 mg/kg, respectively. Soil in these depth intervals was subsequently excavated, and the shallow sample results are no longer representative of site conditions and are not presented in Table 3.4-4 but are included in Appendix E. Before excavation, Aroclor-1260 concentrations decreased with depth at location 02-613289 and vertical extent of contamination is defined based on the shallow, pre-excavation sample results.

Although concentrations decreased with depth at location 02-613289, the concentration of Aroclor-1260 in the deepest sample at this location (11.0 to 11.25 ft bgs) is 1.9 times the industrial SSL and 8.5 times the residential SSL. Further sampling at this location is not warranted based on the results in deeper samples at adjacent locations 02-61432 (11 ft from location 02-613289), 02-61440 (9 ft from location 02-613289), 02-61441 (10 ft from location 02-613289), 02-61448 (6 ft from location 02-613289), and 02-61455 (13 ft from location 02-613289). Aroclor-1260 concentrations decreased with depth at all 5 locations. A total of 15 samples were collected from these 5 locations at depths greater than the deepest sample at location 02-613289 (14.0 to 15.0 ft bgs, 16.0 to 17.0 ft bgs, and 19.0 to 20.0 ft bgs at each location). As shown on Plate 3, Aroclor-1260 was detected in 7 of these 15 samples at concentrations ranging from 0.00316 mg/kg to 0.0707 mg/kg, all more than 2 orders of magnitude less than the concentration in the deepest sample at location 02-613289. Aroclor-1260 was not detected in the samples from 19.0 ft to 20.0 ft bgs at any of the 5 locations except location 02-61448, where it was detected at 0.0186 mg/kg.

The maximum concentration at locations where concentrations increased with depth or did not change substantially with depth (3.3 mg/kg at location 02-613626) was approximately 1.4 times the residential SSL, and the industrial SSL was approximately 3.4 times this concentration. Aroclor-1260 does not pose an unacceptable risk under the industrial, recreational, and residential scenarios with cancer risks ranging from 3.53×10^{-6} to 9.47×10^{-6} (Appendix F, Tables F-4.2-1, F-4.2-4, and F-4.2-7). Lateral extent of Aroclor-1260 is defined and further sampling for vertical extent is not warranted.

A total of 16 dioxin/furan congeners were each detected in 2 or 3 samples with maximum concentrations ranging from 0.000000204 mg/kg to 0.00123 mg/kg. Concentrations at location 02-600387 did not change substantially with depth (0.000000028 mg/kg to 0.00003 mg/kg) or decreased with depth, and only 1 depth was sampled at location 02-600449. Concentrations of 2,3,4,7,8-pentachlorodibenzofuran and 2,3,7,8-tetrachlorodibenzofuran increased downgradient at location 02-600449 and concentrations of all other congeners decreased downgradient or did not change substantially downgradient (0.00000001 mg/kg to 0.00000155 mg/kg). The maximum concentrations were converted to toxicity equivalency concentrations (TECs) using congener-specific toxicity equivalency factors (NMED 2017, 602273). The residential SSL for 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD [not detected but the only dioxin with an SSL]) ranged from approximately 13 times to 2080 times the TECs and was more than 100 times the TECs for all congeners except 1,2,3,4,6,7,8-heptachlorodibenzodioxin; 1,2,3,4,7,8-hexachlorodibenzofuran; 2,3,4,7,8-pentachlorodibenzofuran; and 2,3,7,8-tetrachlorodibenzofuran. The residential SSL for 2,3,7,8-TCDD was approximately 30 times the TEC, and the industrial SSL for 2,3,7,8-TCDD was approximately 143 times the TEC for 1,2,3,4,6,7,8-heptachlorodibenzodioxin (0.00000166 mg/kg). The residential SSL for 2,3,7,8-TCDD was approximately 76 times the TEC, and the industrial SSL for 2,3,7,8-TCDD was approximately 371 times the TEC for 1,2,3,4,7,8-hexachlorodibenzofuran (0.000000641 mg/kg). The residential SSL for 2,3,7,8-TCDD was approximately 13 times the TEC, and the industrial SSL for 2,3,7,8-TCDD was approximately 62 times the TEC for 2,3,4,7,8-pentachlorodibenzofuran (0.00000384 mg/kg). The residential SSL for 2,3,7,8-TCDD was approximately 77 times the TEC, and the industrial SSL for 2,3,7,8-TCDD was approximately 372 times the TEC for 2,3,7,8-tetrachlorodibenzofuran (0.000000639 mg/kg). Further sampling for extent of dioxin and furan congeners is not warranted.

Toluene was detected in one sample at a concentration of 0.000465 mg/kg. Only one depth was sampled at location 02-600387 and concentrations decreased downgradient. The residential SSL is approximately 11,200,000 times the maximum concentration. Lateral extent of toluene is defined and further sampling for vertical extent is not warranted.

Radionuclides

Radionuclide COPCs at SWMU 02-014 include cesium-134, cesium-137, plutonium-238, and plutonium-239/240.

Cesium-134 was detected in three soil samples and two tuff samples with a maximum activity of 0.066 pCi/g. Activities increased with depth at location 02-61452; decreased with depth at locations 02-61442, 02-61454, and 02-61455; and decreased downgradient. The residential SAL was approximately 76 times the maximum activity. Lateral extent of cesium-134 is defined and further sampling for vertical extent is not warranted.

Cesium-137 was detected in two soil samples below 0.0 ft to 1.0 ft bgs with a maximum activity of 0.759 pCi/g. Activities decreased with depth at location 02-61451 and decreased downgradient. The lateral and vertical extent of cesium-137 are defined.

Plutonium-238 was detected in two soil samples below 0.0 ft to 1.0 ft bgs and one tuff sample with a maximum activity of 0.019 pCi/g. Activities did not change substantially with depth (0.003 pCi/g) at location 02-61450, decreased with depth at location 02-61428, and decreased downgradient. The residential SAL was approximately 4420 times the maximum activity. Lateral extent of plutonium-238 is defined and further sampling for vertical extent is not warranted.

Plutonium-239/240 was detected above the soil FV (0.054 pCi/g) in three samples, detected in seven soil samples below 0.0 ft to 1.0 ft bgs, and detected in two tuff samples with a maximum activity of 0.076 pCi/g. Activities increased with depth at locations 02-61452 and 02-61453, did not change substantially with depth (0.007 pCi/g) at location 02-61448, decreased with depth at all other locations, and decreased downgradient. The residential SAL was approximately 1040 times the maximum activity. Lateral extent of plutonium-239/240 is defined and further sampling for vertical extent is not warranted.

Summary of Nature and Extent

The lateral and vertical extent of inorganic and organic COPCs is defined or no further sampling for extent is warranted at SWMU 02-014.

3.5 Summary of Human Health Risk Screening

Industrial Scenario

The total excess cancer risk for the industrial scenario is 5×10^{-6}, which is less than the NMED target risk level of 1×10^{-5} (NMED 2017, 602273). The industrial HI is 0.06, which is less than the NMED target HI of 1 (NMED 2017, 602273). The total dose is 0.0009 mrem/yr, which is less than the target dose of 25 mrem/yr as authorized by DOE Order 458.1.

Recreational Scenario

The total excess cancer risk for the recreational scenario is 5×10^{-6}, which is less than the NMED target risk level of 1×10^{-5} (NMED 2017, 602273). The recreational HI is 0.2, which is less than the NMED target HI of 1 (NMED 2017, 602273). The total dose is 0.0008 mrem/yr, which is less than the target dose of 25 mrem/yr as authorized by DOE Order 458.1.

Construction Worker Scenario

The construction worker HI is 0.8, which is less than the NMED target risk level of 1 (NMED 2017, 602273). The residential exposure scenario is protective of construction workers for carcinogenic risk and total dose.

Residential Scenario

The total excess cancer risk for the residential scenario is 1×10^{-5}, which is equivalent to the NMED target risk level of 1×10^{-5} (NMED 2017, 602273). The residential HI is 0.6, which is less than the NMED target HI of 1 (NMED 2017, 602273). The total dose is 2 mrem/yr, which is less than the target dose of 25 mrem/yr as authorized by DOE Order 458.1.

Based on the risk-screening assessment results, no potential unacceptable risks or doses exist for the industrial, recreational, construction worker, and residential scenarios at SWMU 02-014.

3.6 Summary of Ecological Risk Screening

SWMU 02-014 is within the TA-02 core area. Ecological risk for the TA-02 core area was evaluated in the “Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2” (N3B 2018, 700091). Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations (individuals for threatened or endangered [T&E] species), lowest observed adverse effect level (LOAEL) analyses, the relationship of detected concentrations and screening levels to background concentrations, and results of site-specific ecological risk studies, the Phase II IR concluded no potential ecological risks exist for the TA-02 core area, which includes SWMU 02-014.

4.0 CONCLUSIONS

4.1 Nature and Extent of Contamination

Based on the evaluation of the sampling data, the nature and extent of contamination have been defined and/or no further sampling for extent is warranted for SWMU 02-014.

4.2 Summary of Risk-Screening Assessments

4.2.1 Human Health Risk-Screening Assessment

There were no potential unacceptable risks or doses for SWMU 02-014 under the industrial, recreational, and residential scenarios. There was no potential noncarcinogenic risk to construction workers, and the residential scenario demonstrated protection of construction workers for carcinogenic risk and dose.

SWMU 02-014 is not accessible by the public. Therefore, an as low as reasonably achievable (ALARA) evaluation for radiological exposure to the public is not currently required. An ALARA evaluation will be conducted should DOE plan to release this area.

4.2.2 Ecological Risk-Screening Assessment

Ecological risk was evaluated collectively for sites within the TA-02 core area, including SWMU 02-014, in the “Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2” (N3B 2018, 700091). Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations (individuals for T&E species), LOAEL analyses, the relationship of detected concentrations and screening levels to background concentrations, and results of site-specific ecological risk studies conducted within the TA-02 core area, no potential ecological risks exist for the TA-02 core area, which includes SWMU 02-014.

5.0 RECOMMENDATIONS

SWMU 02-014 was found to pose no potential unacceptable risks to human health under the industrial, recreational, construction worker, and residential scenarios and to ecological receptors. Residual PCB contamination is below the TSCA cleanup level of 25 mg/kg for low-occupancy areas. This site is appropriate for corrective action complete without controls.

6.0 REFERENCES AND MAP DATA SOURCES

6.1 References

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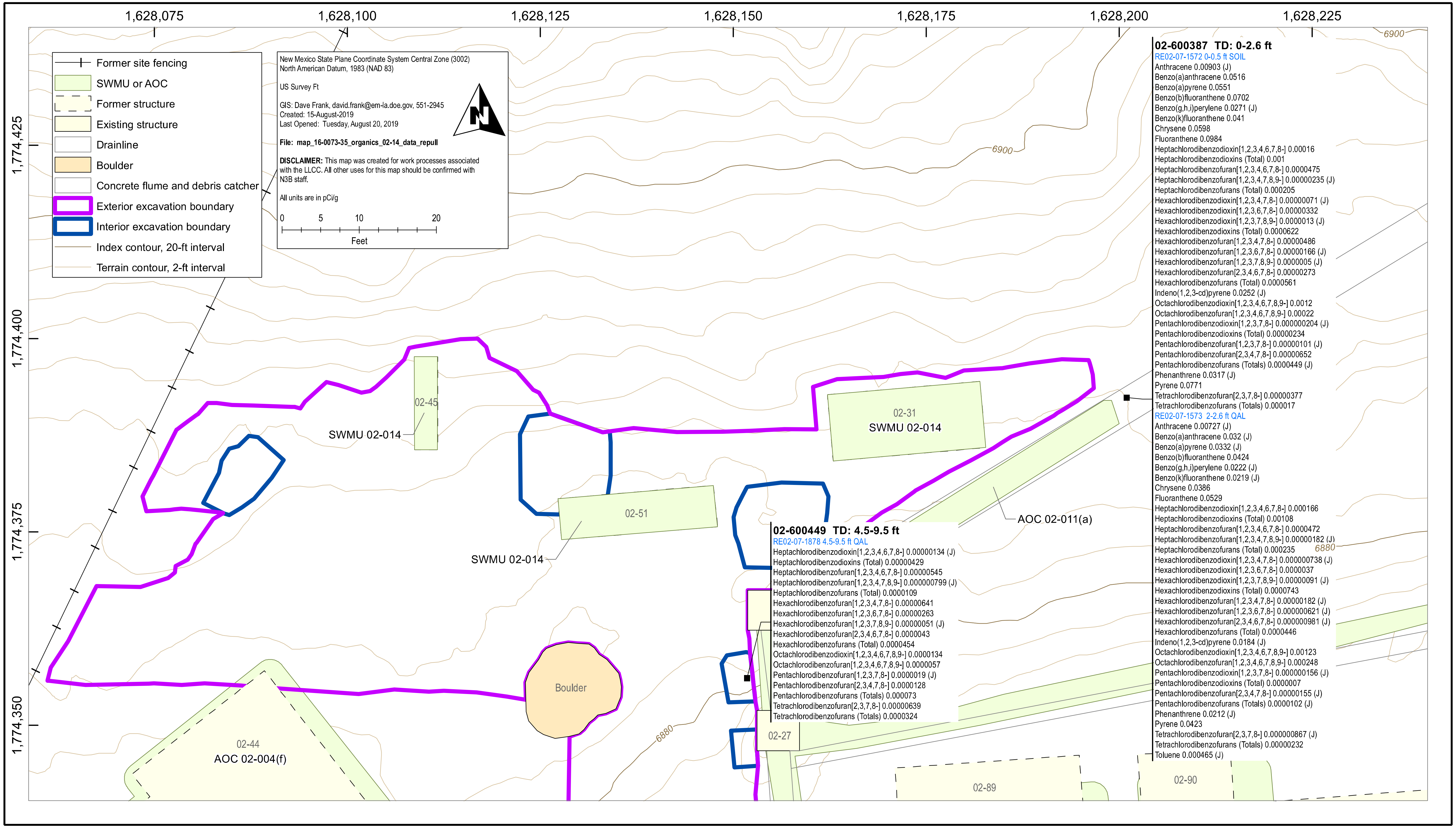

New Mexico State Plane Coordinate System Central Zone (3002)
North American Datum, 1983 (NAD 83)

US Survey Ft

GIS: Dave Frank, david.frank@em-la.doe.gov, 551-2945
Created: 15-August-2019
Last Opened: Tuesday, August 20, 2019

File: map_16-0073-35_organics_02-14_data_repull

DISCLAIMER: This map was created for work processes associated with the LLCC. All other uses for this map should be confirmed with N3B staff.

All units are in pCi/g

02-600387 TD: 0-2.6 ft
RE02-07-1572 0-0.5 ft SOIL
Anthracene 0.00903 (J)
Benzo(a)anthracene 0.0516
Benzo(a)pyrene 0.0551
Benzo(b)fluoranthene 0.0702
Benzo(g,h,i)perylene 0.0271 (J)
Benzo(k)fluoranthene 0.041
Chrysene 0.0598
Fluoranthene 0.0984
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-] 0.00016
Heptachlorodibenzodioxins (Total) 0.001
Heptachlorodibenzofuran[1,2,3,4,6,7,8-] 0.0000475
Heptachlorodibenzofuran[1,2,3,4,7,8,9-] 0.00000235 (J)
Heptachlorodibenzofurans (Total) 0.000205
Hexachlorodibenzodioxin[1,2,3,4,7,8-] 0.00000071 (J)
Hexachlorodibenzodioxin[1,2,3,6,7,8-] 0.00000332
Hexachlorodibenzodioxin[1,2,3,7,8,9-] 0.0000013 (J)
Hexachlorodibenzodioxins (Total) 0.0000622
Hexachlorodibenzofuran[1,2,3,4,7,8-] 0.00000486
Hexachlorodibenzofuran[1,2,3,6,7,8-] 0.00000166 (J)
Hexachlorodibenzofuran[1,2,3,7,8,9-] 0.0000005 (J)
Hexachlorodibenzofuran[2,3,4,6,7,8-] 0.00000273
Hexachlorodibenzofurans (Total) 0.0000561
Indeno(1,2,3-cd)pyrene 0.0252 (J)
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-] 0.0012
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-] 0.00022
Pentachlorodibenzodioxin[1,2,3,7,8-] 0.000000204 (J)
Pentachlorodibenzodioxins (Total) 0.00000234
Pentachlorodibenzofuran[1,2,3,7,8-] 0.00000101 (J)
Pentachlorodibenzofuran[2,3,4,7,8-] 0.00000652
Pentachlorodibenzofurans (Totals) 0.0000449 (J)
Phenanthrene 0.0317 (J)
Pyrene 0.0771
Tetrachlorodibenzofuran[2,3,7,8-] 0.00000377
Tetrachlorodibenzofurans (Totals) 0.000017
RE02-07-1573 2-2.6 ft QAL
Anthracene 0.00727 (J)
Benzo(a)anthracene 0.032 (J)
Benzo(a)pyrene 0.0332 (J)
Benzo(b)fluoranthene 0.0424
Benzo(g,h,i)perylene 0.0222 (J)
Benzo(k)fluoranthene 0.0219 (J)
Chrysene 0.0386
Fluoranthene 0.0529
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-] 0.000166
Heptachlorodibenzodioxins (Total) 0.00108
Heptachlorodibenzofuran[1,2,3,4,6,7,8-] 0.0000472
Heptachlorodibenzofuran[1,2,3,4,7,8,9-] 0.00000182 (J)
Heptachlorodibenzofurans (Total) 0.000235
Hexachlorodibenzodioxin[1,2,3,4,7,8-] 0.000000738 (J)
Hexachlorodibenzodioxin[1,2,3,6,7,8-] 0.0000037
Hexachlorodibenzodioxin[1,2,3,7,8,9-] 0.00000091 (J)
Hexachlorodibenzodioxins (Total) 0.0000743
Hexachlorodibenzofuran[1,2,3,4,7,8-] 0.00000182 (J)
Hexachlorodibenzofuran[1,2,3,6,7,8-] 0.000000621 (J)
Hexachlorodibenzofuran[2,3,4,6,7,8-] 0.000000981 (J)
Hexachlorodibenzofurans (Total) 0.0000446
Indeno(1,2,3-cd)pyrene 0.0184 (J)
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-] 0.00123
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-] 0.000248
Pentachlorodibenzodioxin[1,2,3,7,8-] 0.000000156 (J)
Pentachlorodibenzodioxins (Total) 0.0000007
Pentachlorodibenzofuran[2,3,4,7,8-] 0.00000155 (J)
Pentachlorodibenzofurans (Totals) 0.0000102 (J)
Phenanthrene 0.0212 (J)
Pyrene 0.0423
Tetrachlorodibenzofuran[2,3,7,8-] 0.000000867 (J)
Tetrachlorodibenzofurans (Totals) 0.00000232
Toluene 0.000465 (J)

02-600449 TD: 4.5-9.5 ft
RE02-07-1878 4.5-9.5 ft QAL
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-] 0.00000134 (J)
Heptachlorodibenzodioxins (Total) 0.00000429
Heptachlorodibenzofuran[1,2,3,4,6,7,8-] 0.00000545
Heptachlorodibenzofuran[1,2,3,4,7,8,9-] 0.000000799 (J)
Heptachlorodibenzofurans (Total) 0.0000109
Hexachlorodibenzofuran[1,2,3,4,7,8-] 0.00000641
Hexachlorodibenzofuran[1,2,3,6,7,8-] 0.00000263
Hexachlorodibenzofuran[1,2,3,7,8,9-] 0.00000051 (J)
Hexachlorodibenzofuran[2,3,4,6,7,8-] 0.0000043
Hexachlorodibenzofurans (Total) 0.0000454
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-] 0.0000134
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-] 0.0000057
Pentachlorodibenzofuran[1,2,3,7,8-] 0.0000019 (J)
Pentachlorodibenzofuran[2,3,4,7,8-] 0.0000128
Pentachlorodibenzofurans (Totals) 0.000073
Tetrachlorodibenzofuran[2,3,7,8-] 0.00000639
Tetrachlorodibenzofurans (Totals) 0.0000324

Figure 3.4-1 Organic chemicals other than PCBs detected at SWMU 02-014

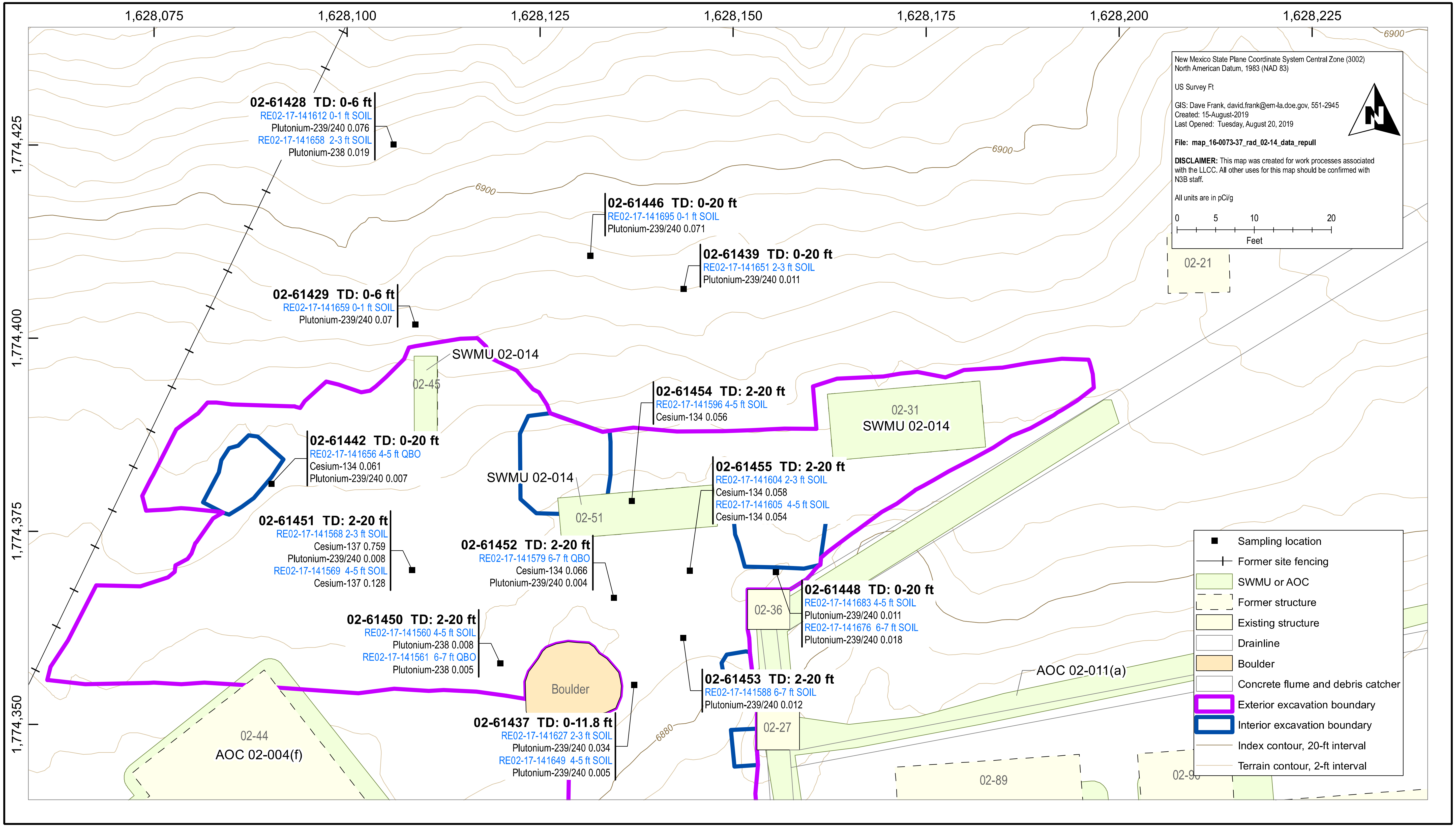

Figure 3.4-2 Radionuclides detected or detected above BVs/FVs at SWMU 02-014

Table 2.2-1
Surveyed Coordinates of Sample Locations at SWMU 02-014

Location ID	Easting (ft)	Northing (ft)
02-600387	1628200.95	1774392.37
02-600449	1628151.78	1774356.13
02-612451	1628151.78	1774360.13
02-612452	1628151.78	1774352.13
02-612453	1628147.78	1774356.13
02-613001	1628152.37	1774347.01
02-613002	1628151.78	1774364.13
02-613122	1628147.78	1774348.13
02-613124	1628147.78	1774352.13
02-613287	1628144.19	1774344.67
02-613288	1628144.48	1774365.63
02-613289	1628156.32	1774375.53
02-613292	1628179.77	1774384.08
02-613626	1628139.68	1774352.22
02-613627	1628139.24	1774371.95
02-613667	1628128.70	1774374.69
02-613668	1628132.69	1774348.76
02-613699	1628127.92	1774383.70
02-613700	1628135.67	1774352.38
02-613761	1628116.07	1774386.04
02-613762	1628116.07	1774393.22
02-61428	1628106.00	1774425.05
02-61429	1628108.86	1774401.79
02-61432	1628147.47	1774382.07
02-61435	1628098.51	1774371.75
02-61436	1628118.98	1774370.88
02-61437	1628137.16	1774355.10
02-61438	1628141.28	1774417.69
02-61439	1628143.58	1774406.38
02-61440	1628157.63	1774384.36
02-61441	1628165.80	1774378.78
02-61442	1628090.23	1774381.14
02-61443	1628087.15	1774367.30
02-61444	1628108.57	1774357.65
02-61445	1628122.45	1774351.33
02-61446	1628131.53	1774410.66
02-61447	1628141.00	1774394.41
02-61448	1628155.53	1774369.75
02-61450	1628119.84	1774357.92
02-61451	1628108.41	1774370.00

Table 2.2-1 (continued)

Location ID	Easting (ft)	Northing (ft)
02-61452	1628134.53	1774366.40
02-61453	1628143.55	1774361.22
02-61454	1628136.89	1774378.94
02-61455	1628144.37	1774369.91
02-61474	1628147.87	1774337.53
02-61475	1628134.91	1774331.46
02-61476	1628115.98	1774350.53
02-61477	1628091.65	1774346.90
02-61478	1628095.26	1774363.51
02-61479	1628080.82	1774358.13
02-61480	1628070.92	1774380.57
02-61481	1628082.09	1774394.89
02-61482	1628099.42	1774396.68
02-61483	1628122.09	1774402.79
02-61486	1628175.20	1774361.63
02-61487	1628177.53	1774383.54
02-61488	1628164.78	1774393.19
02-61489	1628177.37	1774392.79
02-61490	1628161.70	1774409.30
02-61491	1628176.65	1774405.29
02-61492	1628157.65	1774417.01
02-61493	1628168.42	1774418.46
02-61494	1628185.18	1774411.65
02-61526	1628195.96	1774398.92
02-61528	1628115.36	1774326.09
02-61529	1628099.68	1774323.29
02-61530	1628071.55	1774346.83
02-61537	1628099.45	1774356.78
02-61538	1628077.29	1774354.58
02-61539	1628074.25	1774359.06
02-61540	1628073.85	1774365.97
02-61541	1628086.43	1774383.55
02-61542	1628185.49	1774387.19
02-61543	1628185.81	1774394.23
02-61544	1628079.96	1774386.23
02-61545	1628069.32	1774365.16
02-61547	1628077.23	1774350.25
02-61548	1628086.82	1774388.51
02-61549	1628083.30	1774380.59

Table 2.2-1 (continued)

Location ID	Easting (ft)	Northing (ft)
02-61550	1628064.40	1774365.03
02-61551	1628064.79	1774359.02
02-61552	1628074.78	1774376.40
02-61553	1628070.73	1774361.03

Table 2.2-2
Field-Screening Results for Samples Collected at SWMU 02-014

Location ID	Sample ID	Depth (ft)	Alpha (dpm)[a]	Beta/Gamma (dpm)	VOCs (ppm)
02-613001	RELA-18-151143	6–7	35	3130	—[b]
02-613001	RELA-18-151144	8–9	41	3110	—
02-613001	RE02-17-141631	10–11	13	2100	0.0
02-613001	RE02-17-141633	16–17	20	2030	0.0
02-613001	RE02-17-141634	19–20	6	2020	0.0
02-613287	RELA-18-151133	2–3	16	1271	—
02-613287	RELA-18-151134	4–5	60	2570	—
02-613287	RELA-18-151135	6–7	10	2510	—
02-613287	RE02-17-136051	8–9	27	1850	0.0
02-613289	RE02-17-141635	6–7	20	2030	0.0
02-613289	RELA-18-151137	6–7	21	2730	—
02-613289	RELA-18-151138	9–10	32	2410	—
02-613289	RELA-18-151139	11–11.25	16	2480	—
02-613667	RELA-18-151122	2–3	41	3230	—
02-613667	RELA-18-151123	4–5	35	3170	—
02-613667	RELA-18-151124	6–7	53	3230	—
02-613667	RELA-18-151125	8–9	41	3250	—
02-613668	RELA-18-151127	2–3	16	2510	—
02-613668	RELA-18-151128	4–5	37	2530	—
02-613668	RELA-18-151129	6–7	53	2750	—
02-613668	RELA-18-151130	8–9	32	2680	—
02-613762	RE02-17-141642	2–3	40	2070	0.0
02-613762	RELA-18-151117	2–3	37	2710	—
02-613762	RE02-17-141643	4–5	40	2290	0.0
02-613762	RELA-18-151118	4.25–5	53	2780	—
02-613762	RELA-18-151119	6–7	26	2780	—
02-613762	RE02-17-141644	6–7	40	2030	0.0

Table 2.2-2 (continued)

Location ID	Sample ID	Depth (ft)	Alpha (dpm)	Beta/Gamma (dpm)	VOCs (ppm)
02-613762	RELA-18-151120	8–9	21	2790	—
02-61428	RE02-17-135776	0–1	67	2480	0.0
02-61428	RE02-17-141612	0–1	67	2480	0.0
02-61428	RE02-17-135777	2–3	74	2570	0.0
02-61428	RE02-17-141658	2–3	74	2570	0.0
02-61428	RE02-17-141645	4–5	22	2330	0.0
02-61428	RE02-17-135778	4–5	22	2330	0.0
02-61428	RE02-17-135779	5–6	33	2560	0.0
02-61428	RE02-17-141621	5–6	33	2560	0.0
02-61429	RE02-17-135780	0–1	47	1812	0.0
02-61429	RE02-17-141659	0–1	47	1812	0.0
02-61429	RE02-17-141646	2–3	61	1840	0.0
02-61429	RE02-17-135781	2–3	61	1840	0.0
02-61429	RE02-17-135782	4–5	56	2380	0.0
02-61429	RE02-17-141622	4–5	56	2380	0.0
02-61429	RE02-17-141613	5–6	28	2360	0.0
02-61429	RE02-17-135783	5–6	28	2360	0.0
02-61432	RE02-17-141660	0–1	20	2350	0.0
02-61432	RE02-17-141623	2–3	33	2450	0.0
02-61432	RELA-18-151045	2–3	42	2480	—
02-61432	RELA-18-151046	4–5	48	2530	—
02-61432	RE02-17-141647	4–5	33	2520	0.0
02-61432	RE02-17-141614	6–7	27	2660	0.0
02-61432	RELA-18-151047	6.75–7	24	2410	—
02-61432	RELA-18-151048	8–8.75	48	2770	—
02-61432	RE02-17-135853	11–12	27	2300	0.0
02-61432	RE02-17-135854	14–15	26.7	2630	0.0
02-61432	RE02-17-135855	16–17	33	2650	0.0
02-61432	RE02-17-135856	19–20	40	2810	0.0
02-61435	RE02-17-141615	0–1	33	2110	0.0
02-61435	RE02-17-141624	2–3	101	2260	0.0
02-61435	RELA-18-151057	2–3	37	2370	—
02-61435	RELA-18-151058	4–5	48	2400	—
02-61435	RE02-17-141625	4–5	50	2200	0.0
02-61435	RELA-18-151059	6–7	48	2650	—
02-61435	RE02-17-141648	6–7	33	2340	0.0
02-61435	RE02-17-135893	11–12	16	2170	0.0
02-61435	RE02-17-135894	14–15	56	2320	0.0

Table 2.2-2 (continued)

Location ID	Sample ID	Depth (ft)	Alpha (dpm)	Beta/Gamma (dpm)	VOCs (ppm)
02-61435	RE02-17-135895	16–17	11	2320	0.0
02-61435	RE02-17-135896	19–20	11	2320	0.0
02-61436	RE02-17-141661	0–1	40	2150	0.0
02-61436	RE02-17-141626	2–3	92	1712	0.0
02-61436	RELA-18-151062	2–3	47	3220	—
02-61436	RELA-18-151063	4–5	53	3290	—
02-61436	RE02-17-141616	4–5	28	1602	0.0
02-61436	RE02-17-141617	6–7	42	1726	0.0
02-61436	RELA-18-151064	6–7	35	3300	—
02-61436	RE02-17-135901	8–9	49	1688	0.0
02-61436	RE02-17-135902	11–12	35	1753	0.0
02-61436	RE02-17-135903	14–15	42	1705	0.0
02-61436	RE02-17-135904	16–17	7	1527	0.0
02-61436	RE02-17-135905	19–20	42	1956	0.0
02-61437	RE02-17-141618	0–1	27	1923	0.0
02-61437	RE02-17-141627	2–3	34	1913	0.0
02-61437	RE02-17-144637	2–3	114	2300	—
02-61437	RE02-17-144638	4–5	87	2350	—
02-61437	RE02-17-141649	4–5	47	1920	0.0
02-61437	RE02-17-141662	6–7	34	1822	0.0
02-61437	RELA-18-151065	6–7	5	2570	—
02-61437	RELA-18-151066	8–9	16	2520	—
02-61437	RELA-18-151067	11–11.8	17	2820	—
02-61438	RE02-17-141663	0–1	56	2290	0.0
02-61438	RE02-17-135916	0–1	56	2290	0.0
02-61438	RE02-17-135917	2–3	73	2340	0.0
02-61438	RE02-17-141650	2–3	73	2340	0.0
02-61438	RE02-17-135918	4–5	16	2770	0.0
02-61438	RE02-17-141628	4–5	16	2270	0.0
02-61438	RE02-17-141619	6–7	44	2150	0.0
02-61438	RE02-17-135919	6–7	44	2150	0.0
02-61438	RE02-17-135920	8–9	28	2110	0.0
02-61438	RE02-17-135921	11–12	50	2190	0.0
02-61438	RE02-17-135922	14–15	27	2120	0.0
02-61438	RE02-17-135923	16–17	6	2190	0.0
02-61438	RE02-17-135924	19–20	20	1880	0.0
02-61439	RE02-17-135925	0–1	47	1902	0.0
02-61439	RE02-17-141664	0–1	47	1902	0.0

Table 2.2-2 (continued)

Location ID	Sample ID	Depth (ft)	Alpha (dpm)	Beta/Gamma (dpm)	VOCs (ppm)
02-61439	RE02-17-135926	2–3	68	2120	0.0
02-61439	RE02-17-141651	2–3	68	2120	0.0
02-61439	RE02-17-141629	4–5	34	2040	0.0
02-61439	RE02-17-135933	4–5	34	2040	0.0
02-61439	RE02-17-141620	6–7	6	1844	0.0
02-61439	RE02-17-135928	6–7	6	1849	0.0
02-61439	RE02-17-135929	8–9	34	2120	0.0
02-61439	RE02-17-135930	11–12	27	2060	0.0
02-61439	RE02-17-135931	14–15	54	1783	0.0
02-61439	RE02-17-135932	16–17	27	1884	0.0
02-61439	RE02-17-135927	19–20	13	2020	0.0
02-61440	RE02-17-141665	0–1	20	1952	0.0
02-61440	RE02-17-141652	2–3	20	2020	0.0
02-61440	RELA-18-151069	2–3	24	2680	—
02-61440	RELA-18-151070	4–5	48	2540	—
02-61440	RE02-17-141653	4–5	27	1851	0.0
02-61440	RE02-17-141666	6–7	6	1958	0.0
02-61440	RELA-18-151071	6–7	12	2520	—
02-61440	RELA-18-151072	8–9	18	2400	—
02-61440	RE02-17-135939	11–12	13	1952	0.0
02-61440	RE02-17-135940	14–15	20	1974	0.0
02-61440	RE02-17-135941	16–17	34	2120	0.0
02-61440	RE02-17-135942	19–20	6	2170	0.0
02-61441	RE02-17-141668	0–1	20	1847	0.0
02-61441	RE02-17-141667	2–3	13	1819	0.0
02-61441	RE02-17-144671	2–3	33	2570	—
02-61441	RE02-17-144672	4–5	87	2630	—
02-61441	RE02-17-141654	4–5	47	1973	0.0
02-61441	RE02-17-141655	6–7	13	1766	0.0
02-61441	RELA-18-151043	6–7	48	2500	—
02-61441	RELA-18-151073	8–8.5	18	2400	—
02-61441	RE02-17-135948	11–12	13	2070	0.0
02-61441	RE02-17-135949	14–15	34	1945	0.0
02-61441	RE02-17-135950	16–17	13	1847	0.0
02-61441	RE02-17-135951	19–20	20	2100	0.0
02-61442	RE02-17-141670	0–1	33	2220	0.0
02-61442	RE02-17-141669	2–3	50	2360	0.0
02-61442	RELA-18-151075	2–3	21	2270	—

Table 2.2-2 (continued)

Location ID	Sample ID	Depth (ft)	Alpha (dpm)	Beta/Gamma (dpm)	VOCs (ppm)
02-61442	RELA-18-151076	4–5	26	2330	—
02-61442	RE02-17-141656	4–5	78	2110	0.0
02-61442	RELA-18-151077	6–7	32	2420	—
02-61442	RE02-17-141657	6–7	44	2240	0.0
02-61442	RELA-18-151078	8–9	64	2470	—
02-61442	RE02-17-135957	11–12	39	2200	0.0
02-61442	RE02-17-135958	14–15	50	2510	0.0
02-61442	RE02-17-135959	16–17	73	2490	0.0
02-61442	RE02-17-135960	19–20	28	2450	0.0
02-61443	RELA-18-151084	11–12	10	2520	—
02-61443	RELA-18-151080	2–3	48	2470	—
02-61443	RE02-17-141678	2–3	20	2410	0.0
02-61443	RE02-17-141685	4–5	67	2300	0.0
02-61443	RELA-18-151081	4–5	64	2690	—
02-61443	RELA-18-151082	6–7	26	2720	—
02-61443	RE02-17-141785	6–7	60	2350	0.0
02-61443	RELA-18-151083	8–9	58	2670	—
02-61444	RE02-17-141693	0–1	57	1613	0.0
02-61444	RE02-17-141686	2–3	35	1640	0.0
02-61444	RELA-18-151086	2–3	47	3090	—
02-61444	RELA-18-151087	4–5	53	3340	—
02-61444	RELA-18-151088	6–7	59	3370	—
02-61444	RE02-17-141672	6–7	28	1733	0.0
02-61444	RELA-18-151089	8–8.85	59	3230	—
02-61444	RE02-17-136003	11–12	27	2000	0.0
02-61444	RE02-17-136004	14–15	6	1864	0.0
02-61444	RE02-17-136005	16–17	41	1994	0.0
02-61444	RE02-17-136006	19–20	27	1840	0.0
02-61445	RE02-17-141673	0–1	54	1682	0.0
02-61445	RE02-17-136007	0–1	54	1682	0.0
02-61445	RE02-17-136010	6–7	61	1949	0.0
02-61445	RE02-17-141694	6–7	61	1949	0.0
02-61445	RE02-17-136011	8–9	47	1970	0.0
02-61445	RE02-17-136012	11–12	13	1899	0.0
02-61445	RE02-17-136015	14–20	27	2000	—
02-61446	RE02-17-139388	0–1	41	1885	0.0
02-61446	RE02-17-141695	0–1	61	1949	0.0
02-61446	RE02-17-139389	2–3	54	1766	0.0

Table 2.2-2 (continued)

Location ID	Sample ID	Depth (ft)	Alpha (dpm)	Beta/Gamma (dpm)	VOCs (ppm)
02-61446	RE02-17-141688	2–3	54	1766	0.0
02-61446	RE02-17-141681	4–4.5	34	1812	0.0
02-61446	RE02-17-139390	4–4.5	34	1812	0.0
02-61446	RE02-17-139391	6–7	47	1996	0.0
02-61446	RE02-17-141674	6–7	47	1996	0.0
02-61446	RE02-17-139392	8–9	12	2530	0.0
02-61446	RE02-17-139393	11–12	27	2530	0.0
02-61446	RE02-17-139394	14–15	94	2270	0.0
02-61446	RE02-17-139395	16–17	33	2240	0.0
02-61446	RE02-17-139396	19–20	47	2390	0.0
02-61447	RE02-17-141696	0–1	27	1783	0.0
02-61447	RELA-18-151037	0–1	27	2650	—
02-61447	RE02-17-141689	2–3	27	2150	0.0
02-61447	RELA-18-151038	2–3	21	2680	—
02-61447	RE02-17-141682	4–5	75	2011	0.0
02-61447	RELA-18-151039	4–5	74	2730	—
02-61447	RE02-17-141675	6–7	34	2050	0.0
02-61447	RELA-18-151040	6–7	8	2037	—
02-61447	RELA-18-151041	8–9	6	2025	—
02-61447	RE02-17-139402	11–12	40	1874	0.0
02-61447	RE02-17-139403	14–15	20	1866	0.0
02-61447	RE02-17-139404	16–17	34	2080	0.0
02-61447	RE02-17-139405	19–20	34	1923	0.0
02-61448	RE02-17-141697	0–1	6	1945	0.0
02-61448	RELA-18-151050	2–3	26	2490	—
02-61448	RELA-18-151051	4–5	21	2660	—
02-61448	RE02-17-141683	4–5	54	1601	0.0
02-61448	RE02-17-141676	6–7	13	1647	0.0
02-61448	RELA-18-151052	6–7	26	2560	—
02-61448	RELA-18-151053	8–9	42	2670	—
02-61448	RELA-18-151054	11–12	32	2600	—
02-61448	RELA-18-151055	13–14	6	2024	—
02-61448	RE02-17-139413	16–17	34	1903	0.0
02-61448	RE02-17-139414	19–20	27	2020	0.0
02-61450	RE02-17-141559	2–3	54	1633	0.0
02-61450	RELA-18-151091	2–3	29	3050	—
02-61450	RELA-18-151092	4–5	41	2970	—
02-61450	RE02-17-141560	4–5	54	1791	0.0

Table 2.2-2 (continued)

Location ID	Sample ID	Depth (ft)	Alpha (dpm)	Beta/Gamma (dpm)	VOCs (ppm)
02-61450	RE02-17-141561	6–7	27	1899	0.0
02-61450	RE02-17-141562	8–9	34	1987	0.0
02-61450	RE02-17-141563	11–12	47	1840	0.0
02-61450	RE02-17-141564	14–15	82	1808	0.0
02-61450	RE02-17-141565	16–17	6	1899	0.0
02-61450	RE02-17-141566	19–20	61	1924	0.0
02-61451	RE02-17-141568	2–3	74	2570	0.0
02-61451	RELA-18-151094	2–3	41	3360	—
02-61451	RELA-18-151095	4–5	59	3370	—
02-61451	RE02-17-141569	4–5	27	1877	0.0
02-61451	RE02-17-141570	6–7	13	1794	0.0
02-61451	RELA-18-151096	6.25–7	23	3280	—
02-61451	RELA-18-151097	8–9	59	3290	—
02-61451	RE02-17-141572	11–12	20	1988	0.0
02-61451	RE02-17-141573	14–15	13	1877	0.0
02-61451	RE02-17-141574	16–17	13	1784	0.0
02-61451	RE02-17-141575	19–20	34	2070	0.0
02-61452	RE02-17-141577	2–3	0	1747	0.0
02-61452	RELA-18-151099	2–3	24	2460	—
02-61452	RELA-18-151100	4–5	48	2540	—
02-61452	RE02-17-141578	4–5	20	2010	0.0
02-61452	RE02-17-141579	6–7	13	1754	0.0
02-61452	RELA-18-151101	6–7	41	2380	—
02-61452	RELA-18-151102	8–9	36	2300	—
02-61452	RE02-17-141581	11–12	13	1949	0.0
02-61452	RE02-17-141582	14–15	6	2020	0.0
02-61452	RE02-17-141583	16–17	20	1855	0.0
02-61452	RE02-17-141584	19–20	54	1909	0.0
02-61453	RE02-17-141586	2–3	54	1887	0.0
02-61453	RELA-18-151104	2–3	23	2359	—
02-61453	RELA-18-151105	4–5	31	2390	—
02-61453	RE02-17-141587	4–5	20	1945	0.0
02-61453	RE02-17-141588	6–7	27	1967	0.0
02-61453	RE02-17-141692	6–7	27	1967	0.0
02-61453	RELA-18-151106	6–7	31	2960	—
02-61453	RELA-18-151107	8–9	37	2365	—
02-61453	RE02-17-141590	11–12	47	2000	0.0
02-61453	RE02-17-141592	16–17	20	1866	0.0

Table 2.2-2 (continued)

Location ID	Sample ID	Depth (ft)	Alpha (dpm)	Beta/Gamma (dpm)	VOCs (ppm)
02-61453	RE02-17-141593	19–20	13	1920	0.0
02-61454	RE02-17-141595	2–3	20	2020	0.0
02-61454	RELA-18-151109	2–3	36	2650	—
02-61454	RELA-18-151110	4–5	18	2640	—
02-61454	RE02-17-141596	4–5	27	1905	0.0
02-61454	RE02-17-141597	6–7	61	1920	0.0
02-61454	RE02-17-141598	8–9	0	2126	0.0
02-61454	RE02-17-141599	11–12	20	1916	0.0
02-61454	RE02-17-141600	14–15	1	2080	0.0
02-61454	RE02-17-136031	16–17	20	1895	0.0
02-61454	RE02-17-141602	19–20	13	2080	0.0
02-61455	RE02-17-141608	11–12	129	2000	0.0
02-61455	RE02-17-141609	14–15	13	1905	0.0
02-61455	RE02-17-141610	16–17	6	2000	0.0
02-61455	RE02-17-141611	19–20	27	2070	0.0
02-61455	RE02-17-141604	2–3	6	1981	0.0
02-61455	RELA-18-151112	2–3	36	2630	—
02-61455	RELA-18-151113	4–5	36	2510	—
02-61455	RE02-17-141605	4–5	40	1967	0.0
02-61455	RE02-17-141606	6–7	13	1949	0.0
02-61455	RELA-18-151114	6–7	30	2660	—
02-61455	RELA-18-151115	8–8.75	30	2530	—
02-61474	RE02-17-145060	2–3	20	1454	—
02-61474	RE02-17-145072	4–5	20	1686	—
02-61474	RE02-17-145084	6–7	34	1549	—
02-61475	RE02-17-145049	0–1	34	1388	—
02-61475	RE02-17-145061	2–3	41	1514	—
02-61475	RE02-17-145073	4–5	20	1486	—
02-61476	RE02-17-145050	0–1	13	1644	—
02-61476	RE02-17-145062	2–3	13	1472	—
02-61476	RE02-17-145074	4–5	34	1552	—
02-61476	RE02-17-145086	6–7	20	1626	—
02-61476	RE02-17-145098	8–9	13	1430	—
02-61476	RE02-17-145110	9–10	41	1742	—
02-61477	RE02-17-145051	0–1	54	1556	—
02-61477	RE02-17-145063	2–3	20	1507	—
02-61478	RE02-17-145064	2–3	20	1423	—
02-61479	RE02-17-145065	2–3	6	1580	—

Table 2.2-2 (continued)

Location ID	Sample ID	Depth (ft)	Alpha (dpm)	Beta/Gamma (dpm)	VOCs (ppm)
02-61479	RE02-17-145077	4–5	20	1563	—
02-61480	RE02-17-145054	0–1	41	1640	—
02-61480	RE02-17-145066	2–3	13	1735	—
02-61480	RE02-17-145078	4–5	27	1591	—
02-61480	RE02-17-145090	6–7	20	1491	—
02-61480	RE02-17-145102	8–8.5	34	1594	—
02-61481	RE02-17-145055	0–1	34	1871	—
02-61481	RE02-17-145067	2–3	13	1549	—
02-61481	RE02-17-145079	4–5	61	1640	—
02-61481	RE02-17-145091	6–7	20	1700	—
02-61481	RE02-17-145103	8–9	27	1703	—
02-61481	RE02-17-145115	9–10	47	1402	—
02-61482	RE02-17-145056	0–1	68	1573	—
02-61482	RE02-17-145068	2–3	136	1524	—
02-61482	RE02-17-145080	4–5	34	1672	—
02-61482	RE02-17-145092	6–7	34	1658	—
02-61482	RE02-17-145116	8–9	20	1419	—
02-61482	RE02-17-145104	9–10	34	1542	—
02-61483	RE02-17-145057	0–1	47	1780	—
02-61483	RE02-17-145069	2–3	34	1598	—
02-61483	RE02-17-145081	4–5	47	1577	—
02-61483	RE02-17-145093	6–7	41	1682	—
02-61483	RE02-17-145105	8–9	20	1700	—
02-61483	RE02-17-145117	9–10	54	1549	—
02-61486	RE02-17-145120	0–1	102	1482	—
02-61486	RE02-17-145130	2–3	41	1426	—
02-61487	RE02-17-145131	2–3	41	1770	—
02-61487	RE02-17-145141	4–5	47	1696	—
02-61487	RE02-17-145151	5–5.5	47	1698	—
02-61488	RE02-17-145132	2–3	39	2090	—
02-61488	RE02-17-145142	4–4.1	67	2130	—
02-61489	RE02-17-145133	2–3	56	2350	—
02-61489	RE02-17-145143	4–5	39	2370	—
02-61489	RE02-17-145153	6–7	41	1100	—
02-61489	RE02-17-145163	7–7.5	76	716	—
02-61490	RE02-17-145124	0–1	34	1381	—
02-61490	RE02-17-145134	2–3	20	1416	—
02-61491	RE02-17-145125	0–1	106	2480	—

Table 2.2-2 (continued)

Location ID	Sample ID	Depth (ft)	Alpha (dpm)	Beta/Gamma (dpm)	VOCs (ppm)
02-61491	RE02-17-145135	2–3	61	2610	—
02-61491	RE02-17-145145	4–5	33	2380	—
02-61492	RE02-17-145126	0–0.5	20	1566	—
02-61493	RE02-17-145127	0–1	61	1623	—
02-61493	RE02-17-145137	2–3	13	1777	—
02-61493	RE02-17-145147	4–4.5	27	1524	—
02-61494	RE02-17-145128	0–1	61	1559	—
02-61494	RE02-17-145138	2–3	82	1637	—
02-61526	RELA-18-151015	0–1	42	2540	—
02-61526	RELA-18-151020	2–3	58	2430	—
02-61526	RELA-18-151021	4–5	96	2390	—
02-61526	RELA-18-151022	6–7	16	2500	—
02-61528	RELA-18-151017	0–1	27	2390	—
02-61528	RELA-18-151023	2–3	22	2470	—
02-61528	RELA-18-151024	4–5	5	2590	—
02-61529	RELA-18-151018	0–1	67	2470	—
02-61529	RELA-18-151027	2–3	50	2590	—
02-61529	RELA-18-151028	4–4.65	39	2560	—
02-61530	RELA-18-151019	0–1	56	2810	—
02-61530	RELA-18-151030	2–3	37	2680	—
02-61530	RELA-18-151031	4–5	50	2610	—
02-61530	RELA-18-151032	6–7	45	2790	—
02-61537	RELA-18-151036	11–12	42	1360	—
02-61537	RELA-18-151033	2–3	28	2490	—
02-61537	RELA-18-151034	4–5	33	2510	—
02-61537	RELA-18-151035	6–7	42	2580	—
02-61537	RELA-18-151263	8–9	32	2580	—
02-61538	RELA-18-161238	0–0.9	NDA[c]	1700	—
02-61538	RELA-18-161242	1–2	NDA	1600	—
02-61539	RELA-18-161239	1–2	NDA	1500	—
02-61540	RELA-18-161244	1–2	NDA	1500	—
02-61541	RELA-18-164444	6–7	NDA	NDA	—
02-61542	RELA-18-161248	1–2	NDA	1200	—
02-61543	RELA-18-161249	1–1.5	NDA	1400	—
02-61544	RELA-18-164455	2–3	NDA	NDA	—
02-61544	RELA-18-164465	4.25–5	NDA	NDA	—
02-61544	RELA-18-164475	6–7	NDA	NDA	—
02-61545	RELA-18-164456	2–3	NDA	NDA	—

Table 2.2-2 (continued)

Location ID	Sample ID	Depth (ft)	Alpha (dpm)	Beta/Gamma (dpm)	VOCs (ppm)
02-61545	RELA-18-164466	4–5	NDA	NDA	—
02-61545	RELA-18-164476	6–7	NDA	NDA	—
02-61547	RELA-18-164448	0–1	NDA	NDA	—
02-61547	RELA-18-164458	2–3	NDA	NDA	—
02-61547	RELA-18-164468	4–5	NDA	NDA	—
02-61547	RELA-18-164478	6–7	NDA	NDA	—
02-61548	RELA-18-164459	2–3	NDA	NDA	—
02-61548	RELA-18-164469	4–4.5	NDA	NDA	—
02-61548	RELA-18-164479	6–7	NDA	NDA	—
02-61549	RELA-18-164470	4–5	NDA	NDA	—
02-61549	RELA-18-164480	6–7	NDA	NDA	—
02-61550	RELA-18-164451	0–1	NDA	NDA	—
02-61550	RELA-18-164461	2–3	NDA	NDA	—
02-61550	RELA-18-164471	4–5	NDA	NDA	—
02-61550	RELA-18-164481	6–7	NDA	NDA	—
02-61551	RELA-18-164462	2–3	NDA	NDA	—
02-61551	RELA-18-164472	4–5	NDA	NDA	—
02-61551	RELA-18-164482	6–7	NDA	NDA	—
02-61552	RELA-18-164453	0–1	NDA	NDA	—
02-61552	RELA-18-164463	2–3	NDA	NDA	—
02-61552	RELA-18-164473	4–5	NDA	NDA	—
02-61552	RELA-18-164483	6–7	NDA	NDA	—
02-61553	RELA-18-164464	2–3	NDA	NDA	—
02-61553	RELA-18-164474	4–5	NDA	NDA	—
02-61553	RELA-18-164484	6–7	NDA	NDA	—

[a] dpm = Disintegrations per minute.

[b] — = Measurement not performed.

[c] NDA = No detectable activity.

Table 3.4-1
Samples Collected and Analyses Requested at SWMU 02-014

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RE02-07-1572	02-600387	0–0.5	ALLH	07-543[a]	07-542	07-543	07-543	07-543	07-543	07-542	07-541	07-542	07-543	07-541	—[b]	07-530	07-542
RE02-07-1573	02-600387	2–2.6	QAL	07-543	07-542	07-543	07-543	07-543	07-543	07-542	07-541	07-542	07-543	07-541	07-541	07-530	07-542
RE02-07-1878	02-600449	4.5–9.5	QAL	07-956	07-956	07-956	07-956	07-956	07-956	07-956	07-956	07-956	07-956	07-956	07-956	07-955	07-956
RE02-10-22130	02-600449	6–6.2	ALLH	—	—	—	—	—	—	—	10-4285	—	—	—	—	—	—
RE02-10-22133	02-612451	6–6.2	ALLH	—	—	—	—	—	—	—	10-4285	—	—	—	—	—	—
RE02-10-22136	02-612452	6–6.2	ALLH	—	—	—	—	—	—	—	10-4285	—	—	—	—	—	—
RE02-10-22137	02-612452	8–8.2	ALLH	—	—	—	—	—	—	—	10-4285	—	—	—	—	—	—
RE02-10-22139	02-612453	6–6.2	ALLH	—	—	—	—	—	—	—	10-4285	—	—	—	—	—	—
RE02-10-22140	02-612453	8–8.2	ALLH	—	—	—	—	—	—	—	10-4285	—	—	—	—	—	—
RE02-10-26105	02-613001	6–6.5	ALLH	—	—	—	—	—	—	—	10-4454	—	—	—	—	—	—
RELA-18-151143	02-613001	6–7	ALLH	—	—	—	—	—	—	—	2018-1518	—	—	—	—	—	—
RE02-10-26106	02-613001	7–7.5	ALLH	—	—	—	—	—	—	—	10-4454	—	—	—	—	—	—
RELA-18-151144	02-613001	8–9	ALLH	—	—	—	—	—	—	—	2018-1518	—	—	—	—	—	—
RE02-17-141631	02-613001	10–11	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-141633	02-613001	16–17	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-141634	02-613001	19–20	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-10-26107	02-613002	6–6.5	ALLH	—	—	—	—	—	—	—	10-4454	—	—	—	—	—	—
RE02-10-26108	02-613002	8–8.5	ALLH	—	—	—	—	—	—	—	10-4454	—	—	—	—	—	—
RE02-10-26638	02-613122	2–2.2	ALLH	—	—	—	—	—	—	—	10-4707	—	—	—	—	—	—
RE02-10-26639	02-613122	4–4.2	ALLH	—	—	—	—	—	—	—	10-4707	—	—	—	—	—	—
RE02-10-26640	02-613124	6–6.2	ALLH	—	—	—	—	—	—	—	10-4707	—	—	—	—	—	—
RE02-10-26641	02-613124	8–8.2	ALLH	—	—	—	—	—	—	—	10-4707	—	—	—	—	—	—
RELA-18-151133	02-613287	2–3	ALLH	—	—	—	—	—	—	—	2018-1518	—	—	—	—	—	—
RELA-18-151134	02-613287	4–5	ALLH	—	—	—	—	—	—	—	2018-1518	—	—	—	—	—	—
RE02-11-315	02-613287	6–6.2	ALLH	—	—	—	—	—	—	—	11-186	—	—	—	—	—	—
RELA-18-151135	02-613287	6–7	ALLH	—	—	—	—	—	—	—	2018-1518	—	—	—	—	—	—
RE02-11-316	02-613287	8–8.2	ALLH	—	—	—	—	—	—	—	11-186	—	—	—	—	—	—
RE02-17-136051	02-613287	8–9	QBO	—	—	—	—	—	—	—	2017-2087	—	—	—	—	—	—
RE02-11-317	02-613288	6–6.2	ALLH	—	—	—	—	—	—	—	11-186	—	—	—	—	—	—
RE02-11-318	02-613288	8–8.2	ALLH	—	—	—	—	—	—	—	11-186	—	—	—	—	—	—
RE02-11-320	02-613289	6–6.2	ALLH	—	—	—	—	—	—	—	11-209	—	—	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RE02-17-141635	02-613289	6–7	ALLH	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—
RELA-18-151137	02-613289	6–7	ALLH	—	—	—	—	—	—	—	2018-1580	—	—	—	—	—	—
RELA-18-151138	02-613289	9–10	ALLH	—	—	—	—	—	—	—	2018-1580	—	—	—	—	—	—
RELA-18-151139	02-613289	11–11.25	ALLH	—	—	—	—	—	—	—	2018-1587	—	—	—	—	—	—
RE02-11-325	02-613292	4–4.2	ALLH	—	—	—	—	—	—	—	11-235	—	—	—	—	—	—
RE02-11-2218	02-613626	8–9	ALLH	—	—	—	—	—	—	—	11-541	—	—	—	—	—	—
RE02-11-2219	02-613626	10–11	ALLH	—	—	—	—	—	—	—	11-541	—	—	—	—	—	—
RE02-11-2220	02-613627	6–7	ALLH	—	—	—	—	—	—	—	11-541	—	—	—	—	—	—
RE02-11-2221	02-613627	8–9	ALLH	—	—	—	—	—	—	—	11-541	—	—	—	—	—	—
RE02-11-2222	02-613627	10–11	ALLH	—	—	—	—	—	—	—	11-686	—	—	—	—	—	—
RELA-18-151122	02-613667	2–3	ALLH	—	—	—	—	—	—	—	2018-1525	—	—	—	—	—	—
RELA-18-151123	02-613667	4–5	ALLH	—	—	—	—	—	—	—	2018-1525	—	—	—	—	—	—
RE02-11-2523	02-613667	6–6.2	ALLH	—	—	—	—	—	—	—	11-687	—	—	—	—	—	—
RELA-18-151124	02-613667	6–7	ALLH	—	—	—	—	—	—	—	2018-1525	—	—	—	—	—	—
RE02-11-2524	02-613667	8–8.2	ALLH	—	—	—	—	—	—	—	11-687	—	—	—	—	—	—
RELA-18-151125	02-613667	8–9	QBO	—	—	—	—	—	—	—	2018-1525	—	—	—	—	—	—
RE02-11-2525	02-613667	10–10.2	ALLH	—	—	—	—	—	—	—	11-687	—	—	—	—	—	—
RELA-18-151127	02-613668	2–3	ALLH	—	—	—	—	—	—	—	2018-1573	—	—	—	—	—	—
RELA-18-151128	02-613668	4–5	ALLH	—	—	—	—	—	—	—	2018-1573	—	—	—	—	—	—
RELA-18-151129	02-613668	6–7	ALLH	—	—	—	—	—	—	—	2018-1573	—	—	—	—	—	—
RE02-11-2526	02-613668	8–8.2	ALLH	—	—	—	—	—	—	—	11-729	—	—	—	—	—	—
RELA-18-151130	02-613668	8–9	ALLH	—	—	—	—	—	—	—	2018-1573	—	—	—	—	—	—
RE02-11-2527	02-613668	10–10.2	ALLH	—	—	—	—	—	—	—	11-729	—	—	—	—	—	—
RE02-11-2798	02-613699	12–12.2	QBT3	—	—	—	—	—	—	—	11-904	—	—	—	—	—	—
RE02-11-2799	02-613700	8–8.2	ALLH	—	—	—	—	—	—	—	11-904	—	—	—	—	—	—
RE02-11-2800	02-613700	10–10.2	ALLH	—	—	—	—	—	—	—	11-904	—	—	—	—	—	—
RE02-11-2801	02-613700	12–12.2	ALLH	—	—	—	—	—	—	—	11-904	—	—	—	—	—	—
RE02-11-3145	02-613700	14–14.2	ALLH	—	—	—	—	—	—	—	11-1006	—	—	—	—	—	—
RE02-11-3146	02-613761	6–6.2	ALLH	—	—	—	—	—	—	—	11-1009	—	—	—	—	—	—
RE02-11-3147	02-613761	8–8.2	ALLH	—	—	—	—	—	—	—	11-1009	—	—	—	—	—	—
RE02-11-3148	02-613761	10–10.2	ALLH	—	—	—	—	—	—	—	11-1009	—	—	—	—	—	—
RE02-11-3149	02-613761	12–12.2	QBT3	—	—	—	—	—	—	—	11-1009	—	—	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RE02-11-3150	02-613761	14–14.2	QBT3	—	—	—	—	—	—	—	11-1009	—	—	—	—	—	—
RE02-17-141642	02-613762	2–3	ALLH	—	—	2017-2035	—	2017-2035	2017-2035	2017-2035	—	—	2017-2035	—	—	—	—
RELA-18-151117	02-613762	2–3	ALLH	—	—	—	—	—	—	—	2018-1580	—	—	—	—	—	—
RE02-17-141643	02-613762	4–5	QBO	—	—	2017-2035	—	2017-2035	2017-2035	2017-2035	—	—	2017-2035	—	—	—	—
RELA-18-151118	02-613762	4.25–5	QBO	—	—	—	—	—	—	—	2018-1580	—	—	—	—	—	—
RE02-17-141644	02-613762	6–7	QBO	—	—	2017-2035	—	2017-2035	2017-2035	2017-2035	—	—	2017-2035	—	—	—	—
RELA-18-151119	02-613762	6–7	QBO	—	—	—	—	—	—	—	2018-1580	—	—	—	—	—	—
RELA-18-151120	02-613762	8–9	QBO	—	—	—	—	—	—	—	2018-1580	—	—	—	—	—	—
RE02-17-135776	02-61428	0–1	ALLH	—	—	—	—	—	—	—	2017-1984	—	—	—	—	—	—
RE02-17-141612	02-61428	0–1	ALLH	—	—	2017-1981	—	2017-1981	2017-1981	2017-1981	—	—	2017-1981	—	—	—	—
RE02-17-135777	02-61428	2–3	ALLH	—	—	—	—	—	—	—	2017-1984	—	—	—	—	—	—
RE02-17-141658	02-61428	2–3	ALLH	—	—	2017-1981	—	2017-1981	2017-1981	2017-1981	—	—	2017-1981	—	—	—	—
RE02-17-141645	02-61428	4–5	ALLH	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RE02-17-135778	02-61428	4–5	ALLH	—	—	—	—	—	—	—	2017-1997	—	—	—	—	—	—
RE02-17-135779	02-61428	5–6	ALLH	—	—	—	—	—	—	—	2017-1997	—	—	—	—	—	—
RE02-17-141621	02-61428	5–6	ALLH	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RE02-17-135780	02-61429	0–1	ALLH	—	—	—	—	—	—	—	2017-1983	—	—	—	—	—	—
RE02-17-141659	02-61429	0–1	ALLH	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—
RE02-17-141646	02-61429	2–3	ALLH	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—
RE02-17-135781	02-61429	2–3	ALLH	—	—	—	—	—	—	—	2017-1983	—	—	—	—	—	—
RE02-17-135782	02-61429	4–5	ALLH	—	—	—	—	—	—	—	2017-1997	—	—	—	—	—	—
RE02-17-141622	02-61429	4–5	ALLH	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RE02-17-141613	02-61429	5–6	ALLH	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RE02-17-135783	02-61429	5–6	ALLH	—	—	—	—	—	—	—	2017-1997	—	—	—	—	—	—
RE02-17-141660	02-61432	0–1	ALLH	—	—	2017-1981	—	2017-1981	2017-1981	2017-1981	—	—	2017-1981	—	—	—	—
RE02-17-141623	02-61432	2–3	ALLH	—	—	2017-1981	—	2017-1981	2017-1981	2017-1981	—	—	2017-1981	—	—	—	—
RELA-18-151045	02-61432	2–3	ALLH	—	—	—	—	—	—	—	2018-1534	—	—	—	—	—	—
RELA-18-151046	02-61432	4–5	ALLH	—	—	—	—	—	—	—	2018-1534	—	—	—	—	—	—
RE02-17-141647	02-61432	4–5	ALLH	—	—	2017-1981	—	2017-1981	2017-1981	2017-1981	—	—	2017-1981	—	—	—	—
RE02-17-141614	02-61432	6–7	QBT3	—	—	2017-1981	—	2017-1981	2017-1981	2017-1981	—	—	2017-1981	—	—	—	—
RELA-18-151047	02-61432	6.75–7	QBO	—	—	—	—	—	—	—	2018-1534	—	—	—	—	—	—
RELA-18-151048	02-61432	8–8.75	QBO	—	—	—	—	—	—	—	2018-1534	—	—	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RE02-17-135853	02-61432	11–12	ALLH	—	—	—	—	—	—	—	2017-1984	—	—	—	—	—	—
RE02-17-135854	02-61432	14–15	ALLH	—	—	—	—	—	—	—	2017-1984	—	—	—	—	—	—
RE02-17-135855	02-61432	16–17	ALLH	—	—	—	—	—	—	—	2017-1984	—	—	—	—	—	—
RE02-17-135856	02-61432	19–20	ALLH	—	—	—	—	—	—	—	2017-1984	—	—	—	—	—	—
RE02-17-141615	02-61435	0–1	ALLH	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RE02-17-141624	02-61435	2–3	ALLH	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RELA-18-151057	02-61435	2–3	ALLH	—	—	—	—	—	—	—	2018-1458	—	—	—	—	—	—
RELA-18-151058	02-61435	4–5	QBO	—	—	—	—	—	—	—	2018-1458	—	—	—	—	—	—
RE02-17-141625	02-61435	4–5	QBO	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RELA-18-151059	02-61435	6–7	QBO	—	—	—	—	—	—	—	2018-1458	—	—	—	—	—	—
RE02-17-141648	02-61435	6–7	QBO	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RE02-17-135893	02-61435	11–12	QBO	—	—	—	—	—	—	—	2017-1997	—	—	—	—	—	—
RE02-17-135894	02-61435	14–15	QBO	—	—	—	—	—	—	—	2017-1997	—	—	—	—	—	—
RE02-17-135895	02-61435	16–17	QBO	—	—	—	—	—	—	—	2017-1997	—	—	—	—	—	—
RE02-17-135896	02-61435	19–20	QBO	—	—	—	—	—	—	—	2017-1997	—	—	—	—	—	—
RE02-17-141661	02-61436	0–1	ALLH	—	—	2017-1932	—	2017-1932	2017-1932	2017-1932	—	—	2017-1932	—	—	—	—
RE02-17-141626	02-61436	2–3	ALLH	—	—	2017-1932	—	2017-1932	2017-1932	2017-1932	—	—	2017-1932	—	—	—	—
RELA-18-151062	02-61436	2–3	ALLH	—	—	—	—	—	—	—	2018-1501	—	—	—	—	—	—
RELA-18-151063	02-61436	4–5	ALLH	—	—	—	—	—	—	—	2018-1501	—	—	—	—	—	—
RE02-17-141616	02-61436	4–5	ALLH	—	—	2017-1932	—	2017-1932	2017-1932	2017-1932	—	—	2017-1932	—	—	—	—
RE02-17-141617	02-61436	6–7	QBO	—	—	2017-1932	—	2017-1932	2017-1932	2017-1932	—	—	2017-1932	—	—	—	—
RELA-18-151064	02-61436	6–7	QBO	—	—	—	—	—	—	—	2018-1501	—	—	—	—	—	—
RE02-17-135901	02-61436	8–9	QBO	—	—	—	—	—	—	—	2017-1931	—	—	—	—	—	—
RE02-17-135902	02-61436	11–12	QBO	—	—	—	—	—	—	—	2017-1931	—	—	—	—	—	—
RE02-17-135903	02-61436	14–15	QBO	—	—	—	—	—	—	—	2017-1931	—	—	—	—	—	—
RE02-17-135904	02-61436	16–17	QBO	—	—	—	—	—	—	—	2017-1931	—	—	—	—	—	—
RE02-17-135905	02-61436	19–20	QBO	—	—	—	—	—	—	—	2017-1931	—	—	—	—	—	—
RE02-17-141618	02-61437	0–1	ALLH	—	—	2017-2035	—	2017-2035	2017-2035	2017-2035	—	—	2017-2035	—	—	—	—
RE02-17-141627	02-61437	2–3	ALLH	—	—	2017-2035	—	2017-2035	2017-2035	2017-2035	—	—	2017-2035	—	—	—	—
RE02-17-144637	02-61437	2–3	ALLH	2017-2523	—	2017-2523	—	2017-2523	2017-2523	2017-2523	2017-2523	—	2017-2523	—	—	—	—
RE02-17-144638	02-61437	4–5	ALLH	2017-2523	—	2017-2523	—	2017-2523	2017-2523	2017-2523	2017-2523	—	2017-2523	—	—	—	—
RE02-17-141649	02-61437	4–5	ALLH	—	—	2017-2035	—	2017-2035	2017-2035	2017-2035	—	—	2017-2035	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RE02-17-141662	02-61437	6–7	ALLH	—	—	2017-2080	—	2017-2080	2017-2080	2017-2080	—	—	2017-2080	—	—	—	—
RELA-18-151065	02-61437	6–7	ALLH	—	—	—	—	—	—	—	2018-1573	—	—	—	—	—	—
RELA-18-151066	02-61437	8–9	ALLH	—	—	—	—	—	—	—	2018-1573	—	—	—	—	—	—
RELA-18-151067	02-61437	11–11.8	QBO	—	—	—	—	—	—	—	2018-1573	—	—	—	—	—	—
RE02-17-141663	02-61438	0–1	ALLH	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RE02-17-135916	02-61438	0–1	ALLH	—	—	—	—	—	—	—	2017-1997	—	—	—	—	—	—
RE02-17-135917	02-61438	2–3	ALLH	—	—	—	—	—	—	—	2017-1997	—	—	—	—	—	—
RE02-17-141650	02-61438	2–3	ALLH	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RE02-17-135918	02-61438	4–5	QBO	—	—	—	—	—	—	—	2017-1997	—	—	—	—	—	—
RE02-17-141628	02-61438	4–5	QBO	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RE02-17-141619	02-61438	6–7	QBO	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RE02-17-135919	02-61438	6–7	QBO	—	—	—	—	—	—	—	2017-1997	—	—	—	—	—	—
RE02-17-135920	02-61438	8–9	QBO	—	—	—	—	—	—	—	2017-1998	—	—	—	—	—	—
RE02-17-135921	02-61438	11–12	QBO	—	—	—	—	—	—	—	2017-1998	—	—	—	—	—	—
RE02-17-135922	02-61438	14–15	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-135923	02-61438	16–17	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-135924	02-61438	19–20	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-135925	02-61439	0–1	ALLH	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-141664	02-61439	0–1	ALLH	—	—	2017-2021	—	2017-2021	2017-2021	2017-2021	—	—	2017-2021	—	—	—	—
RE02-17-135926	02-61439	2–3	ALLH	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-141651	02-61439	2–3	ALLH	—	—	2017-2021	—	2017-2021	2017-2021	2017-2021	—	—	2017-2021	—	—	—	—
RE02-17-141629	02-61439	4–5	QBO	—	—	2017-2021	—	2017-2021	2017-2021	2017-2021	—	—	2017-2021	—	—	—	—
RE02-17-135933	02-61439	4–5	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-141620	02-61439	6–7	QBO	—	—	2017-2021	—	2017-2021	2017-2021	2017-2021	—	—	2017-2021	—	—	—	—
RE02-17-135928	02-61439	6–7	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-135929	02-61439	8–9	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-135930	02-61439	11–12	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-135931	02-61439	14–15	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-135932	02-61439	16–17	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-135927	02-61439	19–20	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-141665	02-61440	0–1	ALLH	—	—	2017-2080	—	2017-2080	2017-2080	2017-2080	—	—	2017-2080	—	—	—	—
RE02-17-141652	02-61440	2–3	ALLH	—	—	2017-2080	—	2017-2080	2017-2080	2017-2080	—	—	2017-2080	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RELA-18-151069	02-61440	2–3	ALLH	—	—	—	—	—	—	—	2018-1572	—	—	—	—	—	—
RELA-18-151070	02-61440	4–5	ALLH	—	—	—	—	—	—	—	2018-1572	—	—	—	—	—	—
RE02-17-141653	02-61440	4–5	ALLH	—	—	2017-2080	—	2017-2080	2017-2080	2017-2080	—	—	2017-2080	—	—	—	—
RE02-17-141666	02-61440	6–7	ALLH	—	—	2017-2080	—	2017-2080	2017-2080	2017-2080	—	—	2017-2080	—	—	—	—
RELA-18-151071	02-61440	6–7	ALLH	—	—	—	—	—	—	—	2018-1572	—	—	—	—	—	—
RELA-18-151072	02-61440	8–9	ALLH	—	—	—	—	—	—	—	2018-1572	—	—	—	—	—	—
RE02-17-135939	02-61440	11–12	QBO	—	—	—	—	—	—	—	2017-2086	—	—	—	—	—	—
RE02-17-135940	02-61440	14–15	QBO	—	—	—	—	—	—	—	2017-2086	—	—	—	—	—	—
RE02-17-135941	02-61440	16–17	QBO	—	—	—	—	—	—	—	2017-2086	—	—	—	—	—	—
RE02-17-135942	02-61440	19–20	QBO	—	—	—	—	—	—	—	2017-2086	—	—	—	—	—	—
RE02-17-141668	02-61441	0–1	ALLH	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—
RE02-17-141667	02-61441	2–3	ALLH	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—
RE02-17-144671	02-61441	2–3	ALLH	2017-2523	—	2017-2523	—	2017-2523	2017-2523	2017-2523	2017-2523	—	2017-2523	—	—	—	—
RE02-17-144672	02-61441	4–5	ALLH	2017-2523	—	2017-2523	—	2017-2523	2017-2523	2017-2523	2017-2523	—	2017-2523	—	—	—	—
RE02-17-141654	02-61441	4–5	ALLH	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—
RE02-17-141655	02-61441	6–7	QBO	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—
RELA-18-151043	02-61441	6–7	QBO	—	—	—	—	—	—	—	2018-1551	—	—	—	—	—	—
RELA-18-151073	02-61441	8–8.5	QBO	—	—	—	—	—	—	—	2018-1551	—	—	—	—	—	—
RE02-17-135948	02-61441	11–12	QBO	—	—	—	—	—	—	—	2017-1983	—	—	—	—	—	—
RE02-17-135949	02-61441	14–15	QBO	—	—	—	—	—	—	—	2017-1983	—	—	—	—	—	—
RE02-17-135950	02-61441	16–17	QBO	—	—	—	—	—	—	—	2017-1983	—	—	—	—	—	—
RE02-17-135951	02-61441	19–20	QBO	—	—	—	—	—	—	—	2017-1983	—	—	—	—	—	—
RE02-17-141670	02-61442	0–1	ALLH	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RE02-17-141669	02-61442	2–3	ALLH	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RELA-18-151075	02-61442	2–3	ALLH	—	—	—	—	—	—	—	2018-1458	—	—	—	—	—	—
RELA-18-151076	02-61442	4–5	QBO	—	—	—	—	—	—	—	2018-1458	—	—	—	—	—	—
RE02-17-141656	02-61442	4–5	QBO	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RELA-18-151077	02-61442	6–7	QBO	—	—	—	—	—	—	—	2018-1458	—	—	—	—	—	—
RE02-17-141657	02-61442	6–7	QBO	—	—	2017-1999	—	2017-1999	2017-1999	2017-1999	—	—	2017-1999	—	—	—	—
RELA-18-151078	02-61442	8–9	QBO	—	—	—	—	—	—	—	2018-1458	—	—	—	—	—	—
RE02-17-135957	02-61442	11–12	QBO	—	—	—	—	—	—	—	2017-1998	—	—	—	—	—	—
RE02-17-135958	02-61442	14–15	QBO	—	—	—	—	—	—	—	2017-1998	—	—	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RE02-17-135959	02-61442	16–17	QBO	—	—	—	—	—	—	—	2017-1998	—	—	—	—	—	—
RE02-17-135960	02-61442	19–20	QBO	—	—	—	—	—	—	—	2017-1998	—	—	—	—	—	—
RELA-18-151080	02-61443	2–3	ALLH	—	—	—	—	—	—	—	2018-1441	—	—	—	—	—	—
RE02-17-141678	02-61443	2–3	ALLH	—	—	2017-1981	—	2017-1981	2017-1981	2017-1981	—	—	2017-1981	—	—	—	—
RE02-17-141685	02-61443	4–5	QBO	—	—	2017-1981	—	2017-1981	2017-1981	2017-1981	—	—	2017-1981	—	—	—	—
RELA-18-151081	02-61443	4–5	QBO	—	—	—	—	—	—	—	2018-1441	—	—	—	—	—	—
RE02-17-141785	02-61443	6–7	QBO	—	—	2017-1981	—	2017-1981	2017-1981	2017-1981	—	—	2017-1981	—	—	—	—
RELA-18-151082	02-61443	6–7	QBO	—	—	—	—	—	—	—	2018-1441	—	—	—	—	—	—
RELA-18-151083	02-61443	8–9	QBO	—	—	—	—	—	—	—	2018-1441	—	—	—	—	—	—
RELA-18-151084	02-61443	11–12	QBO	—	—	—	—	—	—	—	2018-1441	—	—	—	—	—	—
RE02-17-141693	02-61444	0–1	ALLH	—	—	2017-1932	—	2017-1932	2017-1932	2017-1932	—	—	2017-1932	—	—	—	—
RE02-17-141686	02-61444	2–3	ALLH	—	—	2017-1932	—	2017-1932	2017-1932	2017-1932	—	—	2017-1932	—	—	—	—
RELA-18-151086	02-61444	2–3	ALLH	—	—	—	—	—	—	—	2018-1501	—	—	—	—	—	—
RELA-18-151087	02-61444	4–5	ALLH	—	—	—	—	—	—	—	2018-1501	—	—	—	—	—	—
RELA-18-151088	02-61444	6–7	ALLH	—	—	—	—	—	—	—	2018-1501	—	—	—	—	—	—
RE02-17-141672	02-61444	6–7	ALLH	—	—	2017-1932	—	2017-1932	2017-1932	2017-1932	—	—	2017-1932	—	—	—	—
RELA-18-151089	02-61444	8–8.85	ALLH	—	—	—	—	—	—	—	2018-1501	—	—	—	—	—	—
RE02-17-136003	02-61444	11–12	QBO	—	—	—	—	—	—	—	2017-1944	—	—	—	—	—	—
RE02-17-136004	02-61444	14–15	QBO	—	—	—	—	—	—	—	2017-1944	—	—	—	—	—	—
RE02-17-136005	02-61444	16–17	QBO	—	—	—	—	—	—	—	2017-1944	—	—	—	—	—	—
RE02-17-136006	02-61444	19–20	QBO	—	—	—	—	—	—	—	2017-1944	—	—	—	—	—	—
RE02-17-141673	02-61445	0–1	ALLH	—	—	2017-1945	—	2017-1945	2017-1945	2017-1945	—	—	2017-1945	—	—	—	—
RE02-17-136007	02-61445	0–1	ALLH	—	—	—	—	—	—	—	2017-1944	—	—	—	—	—	—
RE02-17-136010	02-61445	6–7	QBO	—	—	—	—	—	—	—	2017-1944	—	—	—	—	—	—
RE02-17-141694	02-61445	6–7	QBO	—	—	2017-1945	—	2017-1945	2017-1945	2017-1945	—	—	2017-1945	—	—	—	—
RE02-17-136011	02-61445	8–9	QBO	—	—	—	—	—	—	—	2017-1944	—	—	—	—	—	—
RE02-17-136012	02-61445	11–12	QBO	—	—	—	—	—	—	—	2017-1944	—	—	—	—	—	—
RE02-17-136015	02-61445	14–20	QBO	—	—	—	—	—	—	—	2017-1970	—	—	—	—	—	—
RE02-17-139388	02-61446	0–1	ALLH	—	—	—	—	—	—	—	2017-1982	—	—	—	—	—	—
RE02-17-141695	02-61446	0–1	ALLH	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—
RE02-17-139389	02-61446	2–3	ALLH	—	—	—	—	—	—	—	2017-1982	—	—	—	—	—	—
RE02-17-141688	02-61446	2–3	ALLH	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RE02-17-141681	02-61446	4–4.5	QBO	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—
RE02-17-139390	02-61446	4–4.5	QBO	—	—	—	—	—	—	—	2017-1982	—	—	—	—	—	—
RE02-17-139391	02-61446	6–7	ALLH	—	—	—	—	—	—	—	2017-1984	—	—	—	—	—	—
RE02-17-141674	02-61446	6–7	QBO	—	—	2017-1981	—	2017-1981	2017-1981	2017-1981	—	—	2017-1981	—	—	—	—
RE02-17-139392	02-61446	8–9	ALLH	—	—	—	—	—	—	—	2017-1984	—	—	—	—	—	—
RE02-17-139393	02-61446	11–12	ALLH	—	—	—	—	—	—	—	2017-1984	—	—	—	—	—	—
RE02-17-139394	02-61446	14–15	QBO	—	—	—	—	—	—	—	2017-1984	—	—	—	—	—	—
RE02-17-139395	02-61446	16–17	QBO	—	—	—	—	—	—	—	2017-1984	—	—	—	—	—	—
RE02-17-139396	02-61446	19–20	ALLH	—	—	—	—	—	—	—	2017-1984	—	—	—	—	—	—
RE02-17-141696	02-61447	0–1	ALLH	—	—	2017-2021	—	2017-2021	2017-2021	2017-2021	—	—	2017-2021	—	—	—	—
RELA-18-151037	02-61447	0–1	ALLH	—	—	—	—	—	—	—	2018-1596	—	—	—	—	—	—
RE02-17-141689	02-61447	2–3	ALLH	—	—	2017-2021	—	2017-2021	2017-2021	2017-2021	—	—	2017-2021	—	—	—	—
RELA-18-151038	02-61447	2–3	ALLH	—	—	—	—	—	—	—	2018-1596	—	—	—	—	—	—
RE02-17-141682	02-61447	4–5	ALLH	—	—	2017-2021	—	2017-2021	2017-2021	2017-2021	—	—	2017-2021	—	—	—	—
RELA-18-151039	02-61447	4–5	QBO	—	—	—	—	—	—	—	2018-1596	—	—	—	—	—	—
RE02-17-141675	02-61447	6–7	ALLH	—	—	2017-2021	—	2017-2021	2017-2021	2017-2021	—	—	2017-2021	—	—	—	—
RELA-18-151040	02-61447	6–7	QBO	—	—	—	—	—	—	—	2018-1596	—	—	—	—	—	—
RELA-18-151041	02-61447	8–9	QBO	—	—	—	—	—	—	—	2018-1596	—	—	—	—	—	—
RE02-17-139402	02-61447	11–12	QBO	—	—	—	—	—	—	—	2017-2037	—	—	—	—	—	—
RE02-17-139403	02-61447	14–15	QBO	—	—	—	—	—	—	—	2017-2037	—	—	—	—	—	—
RE02-17-139404	02-61447	16–17	QBO	—	—	—	—	—	—	—	2017-2037	—	—	—	—	—	—
RE02-17-139405	02-61447	19–20	QBO	—	—	—	—	—	—	—	2017-2037	—	—	—	—	—	—
RE02-17-141697	02-61448	0–1	ALLH	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—
RELA-18-151050	02-61448	2–3	ALLH	—	—	—	—	—	—	—	2018-1587	—	—	—	—	—	—
RELA-18-151051	02-61448	4–5	ALLH	—	—	—	—	—	—	—	2018-1587	—	—	—	—	—	—
RE02-17-141683	02-61448	4–5	ALLH	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—
RE02-17-141676	02-61448	6–7	ALLH	—	—	2017-1985	—	2017-1985	2017-1985	2017-1985	—	—	2017-1985	—	—	—	—
RELA-18-151052	02-61448	6–7	ALLH	—	—	—	—	—	—	—	2018-1587	—	—	—	—	—	—
RELA-18-151053	02-61448	8–9	ALLH	—	—	—	—	—	—	—	2018-1587	—	—	—	—	—	—
RELA-18-151054	02-61448	11–12	ALLH	—	—	—	—	—	—	—	2018-1587	—	—	—	—	—	—
RELA-18-151055	02-61448	13–14	ALLH	—	—	—	—	—	—	—	2018-1596	—	—	—	—	—	—
RE02-17-139413	02-61448	16–17	QBO	—	—	—	—	—	—	—	2017-1982	—	—	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RE02-17-139414	02-61448	19–20	QBO	—	—	—	—	—	—	—	2017-1982	—	—	—	—	—	—
RE02-17-141559	02-61450	2–3	ALLH	—	—	2017-2078	—	2017-2078	2017-2078	2017-2078	—	—	2017-2078	—	—	—	—
RELA-18-151091	02-61450	2–3	ALLH	—	—	—	—	—	—	—	2018-1518	—	—	—	—	—	—
RELA-18-151092	02-61450	4–5	ALLH	—	—	—	—	—	—	—	2018-1518	—	—	—	—	—	—
RE02-17-141560	02-61450	4–5	ALLH	—	—	2017-2078	—	2017-2078	2017-2078	2017-2078	—	—	2017-2078	—	—	—	—
RE02-17-141561	02-61450	6–7	QBO	—	—	2017-2078	—	2017-2078	2017-2078	2017-2078	2017-2087	—	2017-2078	—	—	—	—
RE02-17-141562	02-61450	8–9	QBO	—	—	—	—	—	—	—	2017-2087	—	—	—	—	—	—
RE02-17-141563	02-61450	11–12	QBO	—	—	—	—	—	—	—	2017-2087	—	—	—	—	—	—
RE02-17-141564	02-61450	14–15	QBO	—	—	—	—	—	—	—	2017-2087	—	—	—	—	—	—
RE02-17-141565	02-61450	16–17	QBO	—	—	—	—	—	—	—	2017-2087	—	—	—	—	—	—
RE02-17-141566	02-61450	19–20	QBO	—	—	—	—	—	—	—	2017-2087	—	—	—	—	—	—
RE02-17-141568	02-61451	2–3	ALLH	—	—	2017-2080	—	2017-2080	2017-2080	2017-2080	—	—	2017-2080	—	—	—	—
RELA-18-151094	02-61451	2–3	ALLH	—	—	—	—	—	—	—	2018-1501	—	—	—	—	—	—
RELA-18-151095	02-61451	4–5	ALLH	—	—	—	—	—	—	—	2018-1501	—	—	—	—	—	—
RE02-17-141569	02-61451	4–5	ALLH	—	—	2017-2080	—	2017-2080	2017-2080	2017-2080	—	—	2017-2080	—	—	—	—
RE02-17-141570	02-61451	6–7	QBO	—	—	2017-2080	—	2017-2080	2017-2080	2017-2080	—	—	2017-2080	—	—	—	—
RELA-18-151096	02-61451	6.25–7	QBO	—	—	—	—	—	—	—	2018-1501	—	—	—	—	—	—
RELA-18-151097	02-61451	8–9	QBO	—	—	—	—	—	—	—	2018-1501	—	—	—	—	—	—
RE02-17-141572	02-61451	11–12	QBO	—	—	—	—	—	—	—	2017-2081	—	—	—	—	—	—
RE02-17-141573	02-61451	14–15	QBO	—	—	—	—	—	—	—	2017-2081	—	—	—	—	—	—
RE02-17-141574	02-61451	16–17	QBO	—	—	—	—	—	—	—	2017-2087	—	—	—	—	—	—
RE02-17-141575	02-61451	19–20	QBO	—	—	—	—	—	—	—	2017-2087	—	—	—	—	—	—
RE02-17-141577	02-61452	2–3	ALLH	—	—	2017-2080	—	2017-2080	2017-2080	2017-2080	—	—	2017-2080	—	—	—	—
RELA-18-151099	02-61452	2–3	ALLH	—	—	—	—	—	—	—	2018-1558	—	—	—	—	—	—
RELA-18-151100	02-61452	4–5	ALLH	—	—	—	—	—	—	—	2018-1558	—	—	—	—	—	—
RE02-17-141578	02-61452	4–5	ALLH	—	—	2017-2080	—	2017-2080	2017-2080	2017-2080	—	—	2017-2080	—	—	—	—
RE02-17-141579	02-61452	6–7	QBO	—	—	2017-2080	—	2017-2080	2017-2080	2017-2080	—	—	2017-2080	—	—	—	—
RELA-18-151101	02-61452	6–7	QBO	—	—	—	—	—	—	—	2018-1558	—	—	—	—	—	—
RELA-18-151102	02-61452	8–9	QBO	—	—	—	—	—	—	—	2018-1558	—	—	—	—	—	—
RE02-17-141581	02-61452	11–12	QBO	—	—	—	—	—	—	—	2017-2081	—	—	—	—	—	—
RE02-17-141582	02-61452	14–15	QBO	—	—	—	—	—	—	—	2017-2081	—	—	—	—	—	—
RE02-17-141583	02-61452	16–17	QBO	—	—	—	—	—	—	—	2017-2081	—	—	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RE02-17-141584	02-61452	19–20	QBO	—	—	—	—	—	—	—	2017-2081	—	—	—	—	—	—
RE02-17-141586	02-61453	2–3	ALLH	—	—	2017-2021	—	2017-2021	2017-2021	2017-2021	—	—	2017-2021	—	—	—	—
RELA-18-151104	02-61453	2–3	ALLH	—	—	—	—	—	—	—	2018-1572	—	—	—	—	—	—
RELA-18-151105	02-61453	4–5	ALLH	—	—	—	—	—	—	—	2018-1572	—	—	—	—	—	—
RE02-17-141587	02-61453	4–5	ALLH	—	—	2017-2021	—	2017-2021	2017-2021	2017-2021	—	—	2017-2021	—	—	—	—
RE02-17-141588	02-61453	6–7	ALLH	—	—	2017-2021	—	2017-2021	2017-2021	2017-2021	—	—	2017-2021	—	—	—	—
RELA-18-151106	02-61453	6–7	ALLH	—	—	—	—	—	—	—	2018-1572	—	—	—	—	—	—
RELA-18-151107	02-61453	8–9	ALLH	—	—	—	—	—	—	—	2018-1572	—	—	—	—	—	—
RE02-17-141590	02-61453	11–12	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-141592	02-61453	16–17	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-141593	02-61453	19–20	QBO	—	—	—	—	—	—	—	2017-2020	—	—	—	—	—	—
RE02-17-141595	02-61454	2–3	ALLH	—	—	2017-2035	—	2017-2035	2017-2035	2017-2035	—	—	2017-2035	—	—	—	—
RELA-18-151109	02-61454	2–3	ALLH	—	—	—	—	—	—	—	2018-1534	—	—	—	—	—	—
RELA-18-151110	02-61454	4–5	ALLH	—	—	—	—	—	—	—	2018-1534	—	—	—	—	—	—
RE02-17-141596	02-61454	4–5	ALLH	—	—	2017-2035	—	2017-2035	2017-2035	2017-2035	—	—	2017-2035	—	—	—	—
RE02-17-141597	02-61454	6–7	QBO	—	—	2017-2035	—	2017-2035	2017-2035	2017-2035	2017-2037	—	2017-2035	—	—	—	—
RE02-17-141598	02-61454	8–9	QBO	—	—	—	—	—	—	—	2017-2037	—	—	—	—	—	—
RE02-17-141599	02-61454	11–12	QBO	—	—	—	—	—	—	—	2017-2037	—	—	—	—	—	—
RE02-17-141600	02-61454	14–15	QBO	—	—	—	—	—	—	—	2017-2037	—	—	—	—	—	—
RE02-17-136031	02-61454	16–17	QBO	—	—	—	—	—	—	—	2017-2038	—	—	—	—	—	—
RE02-17-141602	02-61454	19–20	QBO	—	—	—	—	—	—	—	2017-2037	—	—	—	—	—	—
RE02-17-141604	02-61455	2–3	ALLH	—	—	2017-2035	—	2017-2035	2017-2035	2017-2035	—	—	2017-2035	—	—	—	—
RELA-18-151112	02-61455	2–3	ALLH	—	—	—	—	—	—	—	2018-1551	—	—	—	—	—	—
RELA-18-151113	02-61455	4–5	ALLH	—	—	—	—	—	—	—	2018-1551	—	—	—	—	—	—
RE02-17-141605	02-61455	4–5	ALLH	—	—	2017-2035	—	2017-2035	2017-2035	2017-2035	—	—	2017-2035	—	—	—	—
RE02-17-141606	02-61455	6–7	ALLH	—	—	2017-2035	—	2017-2035	2017-2035	2017-2035	—	—	2017-2035	—	—	—	—
RELA-18-151114	02-61455	6–7	ALLH	—	—	—	—	—	—	—	2018-1551	—	—	—	—	—	—
RELA-18-151115	02-61455	8–8.75	ALLH	—	—	—	—	—	—	—	2018-1551	—	—	—	—	—	—
RE02-17-141608	02-61455	11–12	QBO	—	—	—	—	—	—	—	2017-2036	—	—	—	—	—	—
RE02-17-141609	02-61455	14–15	QBO	—	—	—	—	—	—	—	2017-2036	—	—	—	—	—	—
RE02-17-141610	02-61455	16–17	QBO	—	—	—	—	—	—	—	2017-2036	—	—	—	—	—	—
RE02-17-141611	02-61455	19–20	QBO	—	—	—	—	—	—	—	2017-2036	—	—	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RE02-17-145060	02-61474	2–3	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145072	02-61474	4–5	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145084	02-61474	6–7	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145049	02-61475	0–1	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145061	02-61475	2–3	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145073	02-61475	4–5	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145050	02-61476	0–1	ALLH	—	—	—	—	—	—	—	2017-2678	—	—	—	—	—	—
RE02-17-145062	02-61476	2–3	ALLH	—	—	—	—	—	—	—	2017-2678	—	—	—	—	—	—
RE02-17-145074	02-61476	4–5	ALLH	—	—	—	—	—	—	—	2017-2678	—	—	—	—	—	—
RE02-17-145086	02-61476	6–7	QBO	—	—	—	—	—	—	—	2017-2678	—	—	—	—	—	—
RE02-17-145098	02-61476	8–9	QBO	—	—	—	—	—	—	—	2017-2678	—	—	—	—	—	—
RE02-17-145110	02-61476	9–10	QBO	—	—	—	—	—	—	—	2017-2678	—	—	—	—	—	—
RE02-17-145051	02-61477	0–1	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145063	02-61477	2–3	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145064	02-61478	2–3	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145065	02-61479	2–3	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145077	02-61479	4–5	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145054	02-61480	0–1	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145066	02-61480	2–3	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145078	02-61480	4–5	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145090	02-61480	6–7	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145102	02-61480	8–8.5	QBT3	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145055	02-61481	0–1	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145067	02-61481	2–3	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145079	02-61481	4–5	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145091	02-61481	6–7	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145103	02-61481	8–9	QBO	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145115	02-61481	9–10	QBO	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145056	02-61482	0–1	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145068	02-61482	2–3	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145080	02-61482	4–5	QBO	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145092	02-61482	6–7	QBT3	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RE02-17-145116	02-61482	8–9	QBO	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145104	02-61482	9–10	QBO	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145057	02-61483	0–1	ALLH	—	—	—	—	—	—	—	2017-2678	—	—	—	—	—	—
RE02-17-145069	02-61483	2–3	ALLH	—	—	—	—	—	—	—	2017-2678	—	—	—	—	—	—
RE02-17-145081	02-61483	4–5	ALLH	—	—	—	—	—	—	—	2017-2678	—	—	—	—	—	—
RE02-17-145093	02-61483	6–7	QBO	—	—	—	—	—	—	—	2017-2678	—	—	—	—	—	—
RE02-17-145105	02-61483	8–9	QBO	—	—	—	—	—	—	—	2017-2678	—	—	—	—	—	—
RE02-17-145117	02-61483	9–10	QBO	—	—	—	—	—	—	—	2017-2678	—	—	—	—	—	—
RE02-17-145120	02-61486	0–1	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145130	02-61486	2–3	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145131	02-61487	2–3	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145141	02-61487	4–5	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145151	02-61487	5–5.5	QBO	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145132	02-61488	2–3	QBO	—	—	—	—	—	—	—	2017-2695	—	—	—	—	—	—
RE02-17-145142	02-61488	4–4.1	QBO	—	—	—	—	—	—	—	2017-2695	—	—	—	—	—	—
RE02-17-145133	02-61489	2–3	ALLH	—	—	—	—	—	—	—	2017-2695	—	—	—	—	—	—
RE02-17-145143	02-61489	4–5	ALLH	—	—	—	—	—	—	—	2017-2695	—	—	—	—	—	—
RE02-17-145153	02-61489	6–7	QBO	—	—	—	—	—	—	—	2017-2710	—	—	—	—	—	—
RE02-17-145163	02-61489	7–7.5	QBO	—	—	—	—	—	—	—	2017-2710	—	—	—	—	—	—
RE02-17-145124	02-61490	0–1	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145134	02-61490	2–3	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145125	02-61491	0–1	ALLH	—	—	—	—	—	—	—	2017-2695	—	—	—	—	—	—
RE02-17-145135	02-61491	2–3	ALLH	—	—	—	—	—	—	—	2017-2695	—	—	—	—	—	—
RE02-17-145145	02-61491	4–5	QBO	—	—	—	—	—	—	—	2017-2695	—	—	—	—	—	—
RE02-17-145126	02-61492	0–0.5	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145127	02-61493	0–1	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145137	02-61493	2–3	ALLH	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145147	02-61493	4–4.5	QBO	—	—	—	—	—	—	—	2017-2647	—	—	—	—	—	—
RE02-17-145128	02-61494	0–1	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RE02-17-145138	02-61494	2–3	ALLH	—	—	—	—	—	—	—	2017-2667	—	—	—	—	—	—
RELA-18-151015	02-61526	0–1	ALLH	—	—	—	—	—	—	—	2018-1441	—	—	—	—	—	—
RELA-18-151020	02-61526	2–3	ALLH	—	—	—	—	—	—	—	2018-1441	—	—	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RELA-18-151021	02-61526	4–5	ALLH	—	—	—	—	—	—	—	2018-1441	—	—	—	—	—	—
RELA-18-151022	02-61526	6–7	QCT	—	—	—	—	—	—	—	2018-1458	—	—	—	—	—	—
RELA-18-151017	02-61528	0–1	ALLH	—	—	—	—	—	—	—	2018-1422	—	—	—	—	—	—
RELA-18-151023	02-61528	2–3	ALLH	—	—	—	—	—	—	—	2018-1422	—	—	—	—	—	—
RELA-18-151024	02-61528	4–5	ALLH	—	—	—	—	—	—	—	2018-1422	—	—	—	—	—	—
RELA-18-151018	02-61529	0–1	ALLH	—	—	—	—	—	—	—	2018-1422	—	—	—	—	—	—
RELA-18-151027	02-61529	2–3	ALLH	—	—	—	—	—	—	—	2018-1422	—	—	—	—	—	—
RELA-18-151028	02-61529	4–4.65	ALLH	—	—	—	—	—	—	—	2018-1422	—	—	—	—	—	—
RELA-18-151019	02-61530	0–1	ALLH	—	—	—	—	—	—	—	2018-1422	—	—	—	—	—	—
RELA-18-151030	02-61530	2–3	ALLH	—	—	—	—	—	—	—	2018-1422	—	—	—	—	—	—
RELA-18-151031	02-61530	4–5	QBO	—	—	—	—	—	—	—	2018-1422	—	—	—	—	—	—
RELA-18-151032	02-61530	6–7	QBO	—	—	—	—	—	—	—	2018-1422	—	—	—	—	—	—
RELA-18-151033	02-61537	2–3	ALLH	—	—	—	—	—	—	—	2018-1422	—	—	—	—	—	—
RELA-18-151034	02-61537	4–5	ALLH	—	—	—	—	—	—	—	2018-1422	—	—	—	—	—	—
RELA-18-151035	02-61537	6–7	ALLH	—	—	—	—	—	—	—	2018-1441	—	—	—	—	—	—
RELA-18-151263	02-61537	8–9	QBO	—	—	—	—	—	—	—	2018-1441	—	—	—	—	—	—
RELA-18-151036	02-61537	11–12	QBO	—	—	—	—	—	—	—	2018-1441	—	—	—	—	—	—
RELA-18-161238	02-61538	0–0.9	ALLH	—	—	—	—	—	—	—	N3B-2018-3962-1	—	—	—	—	—	—
RELA-18-161242	02-61538	1–2	ALLH	—	—	—	—	—	—	—	N3B-2018-3962-1	—	—	—	—	—	—
RELA-18-161239	02-61539	1–2	ALLH	—	—	—	—	—	—	—	N3B-2018-3962-1	—	—	—	—	—	—
RELA-18-161244	02-61540	1–2	ALLH	—	—	—	—	—	—	—	N3B-2018-3962-1	—	—	—	—	—	—
RELA-18-164444	02-61541	6–7	QBT1G	—	—	—	—	—	—	—	N3B-2019-380	—	—	—	—	—	—
RELA-18-161248	02-61542	1–2	ALLH	—	—	—	—	—	—	—	N3B-2018-3962-1	—	—	—	—	—	—
RELA-18-161249	02-61543	1–1.5	ALLH	—	—	—	—	—	—	—	N3B-2018-3962-1	—	—	—	—	—	—
RELA-18-164455	02-61544	2–3	ALLH	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164465	02-61544	4.25–5	QBT1G	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164475	02-61544	6–7	QBT1G	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164456	02-61545	2–3	ALLH	—	—	—	—	—	—	—	N3B-2019-412	—	—	—	—	—	—
RELA-18-164466	02-61545	4–5	ALLH	—	—	—	—	—	—	—	N3B-2019-412	—	—	—	—	—	—
RELA-18-164476	02-61545	6–7	ALLH	—	—	—	—	—	—	—	N3B-2019-412	—	—	—	—	—	—
RELA-18-164448	02-61547	0–1	ALLH	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164458	02-61547	2–3	ALLH	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—

Table 3.4-1 (continued)

Sample ID	Location ID	Depth (ft)	Media	Americium-241	Nitrate	Gamma-emitting Radionuclides	Tritium	Isotopic Plutonium	Isotopic Uranium	TAL Metals	PCBs	Perchlorate	Strontium-90	SVOCs	VOCs	Dioxins/Furans	Cyanide (Total)
RELA-18-164468	02-61547	4–5	ALLH	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164478	02-61547	6–7	ALLH	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164459	02-61548	2–3	ALLH	—	—	—	—	—	—	—	N3B-2019-380	—	—	—	—	—	—
RELA-18-164469	02-61548	4–4.5	ALLH	—	—	—	—	—	—	—	N3B-2019-380	—	—	—	—	—	—
RELA-18-164479	02-61548	6–7	QBT1G	—	—	—	—	—	—	—	N3B-2019-380	—	—	—	—	—	—
RELA-18-164470	02-61549	4–5	QBT1G	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164480	02-61549	6–7	QBT1G	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164451	02-61550	0–1	ALLH	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164461	02-61550	2–3	ALLH	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164471	02-61550	4–5	ALLH	—	—	—	—	—	—	—	N3B-2019-412	—	—	—	—	—	—
RELA-18-164481	02-61550	6–7	ALLH	—	—	—	—	—	—	—	N3B-2019-412	—	—	—	—	—	—
RELA-18-164462	02-61551	2–3	ALLH	—	—	—	—	—	—	—	N3B-2019-412	—	—	—	—	—	—
RELA-18-164472	02-61551	4–5	ALLH	—	—	—	—	—	—	—	N3B-2019-412	—	—	—	—	—	—
RELA-18-164482	02-61551	6–7	ALLH	—	—	—	—	—	—	—	N3B-2019-412	—	—	—	—	—	—
RELA-18-164453	02-61552	0–1	ALLH	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164463	02-61552	2–3	ALLH	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164473	02-61552	4–5	ALLH	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164483	02-61552	6–7	QBT1G	—	—	—	—	—	—	—	N3B-2019-391	—	—	—	—	—	—
RELA-18-164464	02-61553	2–3	ALLH	—	—	—	—	—	—	—	N3B-2019-412	—	—	—	—	—	—
RELA-18-164474	02-61553	4–5	ALLH	—	—	—	—	—	—	—	N3B-2019-412	—	—	—	—	—	—
RELA-18-164484	02-61553	6–7	ALLH	—	—	—	—	—	—	—	N3B-2019-412	—	—	—	—	—	—

[a] Analytical request number.

[b] — = Analysis not requested.

Table 3.4-2
Inorganic Chemicals Detected or Detected above BVs at SWMU 02-014

Field Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Copper	Iron	Magnesium
Qbt 1g, Qct, Qbo Background Value[a]				**3560**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**3.96**	**3700**	**739**
Qbt 2,3,4 Background Value[a]				**7340**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**4.66**	**14,500**	**1690**
Soil Background Value[a]				**29,200**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**14.7**	**21,500**	**4610**
Industrial SSL[b]				**1,290,000**	**35.9**	**255,000**	**1110**	**40,700,000**	**505**[c]	**51,900**	**908,000**	**5,680,000**
Recreational SSL[d]				**619,000**	**42.9**	**124,000**	**457**	**na**[e]	**281**[c]	**24,800**	**434,000**	**na**
Residential SSL[b]				**78,000**	**7.07**	**15,600**	**70.5**	**13,000,000**	**96.6**[c]	**3130**	**54,800**	**20,900,000**
RE02-07-1572	02-600387	0–0.5	SOIL	—[f]	—	—	—	—	—	—	—	—
RE02-07-1573	02-600387	2–2.6	QAL	—	—	—	0.497 (U)	—	—	—	—	—
RE02-07-1878	02-600449	4.5–9.5	QAL	—	—	—	0.517 (U)	—	—	—	—	—
RE02-17-141643	02-613762	4–5	QBO	10,800	0.735 (J)	57.1	—	7260	3.16	—	4860	1270
RE02-17-141644	02-613762	6–7	QBO	5020	—	—	—	—	2.74	—	—	—
RE02-17-141646	02-61429	2–3	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141660	02-61432	0–1	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141614	02-61432	6–7	QBT3	—	—	—	—	—	—	—	—	—
RE02-17-141615	02-61435	0–0.1	SOIL	—	—	—	—	—	—	47.5	—	—
RE02-17-141625	02-61435	4–5	QBO	6440	0.662 (J)	29.9	—	—	—	—	5250	808
RE02-17-141648	02-61435	6–7	QBO	9180	0.855 (J)	47.5	—	2130	3.46	7.2	7560	1560
RE02-17-141661	02-61436	0–1	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141626	02-61436	2–3	SOIL	—	—	—	0.5 (U)	—	—	—	—	—
RE02-17-141617	02-61436	6–7	QBO	—	0.647 (J)	—	0.5 (U)	—	14.5	—	3810	—
RE02-17-141618	02-61437	0–1	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-144637	02-61437	2–3	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-144638	02-61437	4–5	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141662	02-61437	6–7	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141663	02-61438	0–1	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141628	02-61438	4–5	QBO	15,000	0.94 (J)	96.1	—	—	4.08	4.91	5700	1340
RE02-17-141619	02-61438	6–7	QBO	10,900	0.821 (J)	43.8	—	—	3	—	5580	1710
RE02-17-141651	02-61439	2–3	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141629	02-61439	4–5	QBO	9010	—	60.2	—	—	2.79	—	—	—
RE02-17-141620	02-61439	6–7	QBO	9420	0.628 (J)	49.3	—	—	2.81	—	3760	—
RE02-17-141668	02-61441	0–1	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-144671	02-61441	2–3	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141654	02-61441	4–5	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-144672	02-61441	4–5	SOIL	—	—	—	—	—	—	—	—	—

Table 3.4-2 (continued)

Field Sample ID	Location ID	Depth (ft)	Media	Aluminum	Arsenic	Barium	Cadmium	Calcium	Chromium	Copper	Iron	Magnesium
Qbt 1g, Qct, Qbo Background Value[a]				**3560**	**0.56**	**25.7**	**0.4**	**1900**	**2.6**	**3.96**	**3700**	**739**
Qbt 2,3,4 Background Value[a]				**7340**	**2.79**	**46**	**1.63**	**2200**	**7.14**	**4.66**	**14,500**	**1690**
Soil Background Value[a]				**29,200**	**8.17**	**295**	**0.4**	**6120**	**19.3**	**14.7**	**21,500**	**4610**
Industrial SSL[b]				**1,290,000**	**35.9**	**255,000**	**1110**	**40,700,000**	**505[c]**	**51,900**	**908,000**	**5,680,000**
Recreational SSL[d]				**619,000**	**42.9**	**124,000**	**457**	**na[e]**	**281[c]**	**24,800**	**434,000**	**na**
Residential SSL[b]				**78,000**	**7.07**	**15,600**	**70.5**	**13,000,000**	**96.6[c]**	**3130**	**54,800**	**20,900,000**
RE02-17-141655	02-61441	6–7	QBO	—	0.583 (J)	—	—	—	—	—	4040	—
RE02-17-141670	02-61442	0–1	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141656	02-61442	4–5	QBO	4450	0.604 (J)	25.9	—	—	—	—	5360	—
RE02-17-141657	02-61442	6–7	QBO	6880	0.762 (J)	43.2	—	—	2.85	—	5460	882
RE02-17-141685	02-61443	4–5	QBO	—	0.652 (J)	25.8	—	1950	—	—	4120	—
RE02-17-141785	02-61443	6–7	QBO	4560	0.653 (J)	29.8	—	—	—	—	5010	—
RE02-17-141693	02-61444	0–1	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141672	02-61444	6–7	SOIL	—	—	—	0.5 (U)	—	—	—	—	—
RE02-17-141673	02-61445	0–1	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141694	02-61445	6–7	QBO	3670	0.621 (J)	34.5	—	—	—	—	4320	—
RE02-17-141688	02-61446	2–3	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141681	02-61446	4–4.5	QBO	6520	0.591 (J)	40	—	—	2.62	—	—	871
RE02-17-141674	02-61446	6–7	QBO	9250	0.722 (J)	72.9	—	—	—	—	—	—
RE02-17-141696	02-61447	0–1	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141689	02-61447	2–3	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141682	02-61447	4–5	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141675	02-61447	6–7	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141697	02-61448	0–1	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141683	02-61448	4–5	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141561	02-61450	6–7	QBO	4070	—	25.8	—	—	—	—	4800	—
RE02-17-141570	02-61451	6–7	QBO	6250	0.594 (J)	31	—	—	3.27	—	6030	851
RE02-17-141579	02-61452	6–7	QBO	5380	0.564 (J)	—	—	—	—	—	5650	819
RE02-17-141586	02-61453	2–3	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141588	02-61453	6–7	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141595	02-61454	2–3	SOIL	—	—	—	—	—	—	—	—	—
RE02-17-141596	02-61454	4–5	SOIL	—	—	—	0.5 (U)	—	—	—	—	—
RE02-17-141597	02-61454	6–7	QBO	5760	0.733 (J)	34.5	—	—	2.96	—	6050	785

Table 3.4-2 (continued)

Field Sample ID	Location ID	Depth (ft)	Media	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Thallium	Vanadium	Zinc
Qbt 1g, Qct, Qbo Background Value[a]				**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1.22**	**4.59**	**40**
Qbt 2,3,4 Background Value[a]				**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1.1**	**17**	**63.5**
Soil Background Value[a]				**671**	**0.1**	**15.4**	**na**	**na**	**1.52**	**0.73**	**39.6**	**48.8**
Industrial SSL[b]				**160,000**	**389**	**25,700**	**2,080,000**	**908**	**6490**	**13**	**6530**	**389,000**
Recreational SSL[d]				**14,800**	**186**	**12,400**	**991,000**	**434**	**3100**	**6.19**	**3100**	**186,000**
Residential SSL[b]				**10,500**	**23.5**	**1560**	**125,000**	**54.8**	**391**	**0.782**	**394**	**23,500**
RE02-07-1572	02-600387	0–0.5	SOIL	—	—	—	1.71 (J-)	—	—	—	—	78.2
RE02-07-1573	02-600387	2–2.6	QAL	—	—	—	1.77 (J-)	0.000813 (J)	—	—	—	—
RE02-07-1878	02-600449	4.5–9.5	QAL	—	—	—	—	—	—	—	—	—
RE02-17-141643	02-613762	4–5	QBO	—	—	2.76	NA[g]	NA	0.462 (U)	—	4.95	—
RE02-17-141644	02-613762	6–7	QBO	—	—	2.26	NA	NA	—	—	—	—
RE02-17-141646	02-61429	2–3	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-141660	02-61432	0–1	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-141614	02-61432	6–7	QBT3	—	—	—	NA	NA	1.11 (J)	—	—	—
RE02-17-141615	02-61435	0–0.1	SOIL	—	0.538 (J)	—	NA	NA	—	—	—	58.7
RE02-17-141625	02-61435	4–5	QBO	—	—	2.32	NA	NA	—	—	4.62	—
RE02-17-141648	02-61435	6–7	QBO	232	—	3.64	NA	NA	0.576 (J)	—	6.43	—
RE02-17-141661	02-61436	0–1	SOIL	—	0.127 (J)	—	NA	NA	—	—	—	54.6
RE02-17-141626	02-61436	2–3	SOIL	—	—	—	NA	NA	—	—	—	—
RE02-17-141617	02-61436	6–7	QBO	251	—	2.21	NA	NA	0.697 (U)	2.5 (U)	—	—
RE02-17-141618	02-61437	0–1	SOIL	—	0.209 (J)	—	NA	NA	—	—	—	—
RE02-17-144637	02-61437	2–3	SOIL	—	—	—	NA	NA	—	—	—	—
RE02-17-144638	02-61437	4–5	SOIL	—	—	—	NA	NA	—	—	—	—
RE02-17-141662	02-61437	6–7	SOIL	—	0.116 (J)	—	NA	NA	—	—	—	—
RE02-17-141663	02-61438	0–1	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-141628	02-61438	4–5	QBO	213	—	4.37	NA	NA	—	—	6.34	—
RE02-17-141619	02-61438	6–7	QBO	—	—	3.32	NA	NA	—	—	5.83	—
RE02-17-141651	02-61439	2–3	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-141629	02-61439	4–5	QBO	—	—	2.36	NA	NA	2.5 (U)	—	—	—
RE02-17-141620	02-61439	6–7	QBO	—	—	2.56	NA	NA	2.5 (U)	—	—	—
RE02-17-141668	02-61441	0–1	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-144671	02-61441	2–3	SOIL	—	—	—	NA	NA	—	—	—	—
RE02-17-141654	02-61441	4–5	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—

Table 3.4-2 (continued)

Field Sample ID	Location ID	Depth (ft)	Media	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Thallium	Vanadium	Zinc
Qbt 1g, Qct, Qbo Background Value[a]				**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1.22**	**4.59**	**40**
Qbt 2,3,4 Background Value[a]				**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1.1**	**17**	**63.5**
Soil Background Value[a]				**671**	**0.1**	**15.4**	**na**	**na**	**1.52**	**0.73**	**39.6**	**48.8**
Industrial SSL[b]				**160,000**	**389**	**25,700**	**2,080,000**	**908**	**6490**	**13**	**6530**	**389,000**
Recreational SSL[d]				**14,800**	**186**	**12,400**	**991,000**	**434**	**3100**	**6.19**	**3100**	**186,000**
Residential SSL[b]				**10,500**	**23.5**	**1560**	**125,000**	**54.8**	**391**	**0.782**	**394**	**23,500**
RE02-17-144672	02-61441	4–5	SOIL	—	—	—	NA	NA	—	—	—	—
RE02-17-141655	02-61441	6–7	QBO	—	—	—	NA	NA	2.5 (U)	2.5 (U)	—	—
RE02-17-141670	02-61442	0–1	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-141656	02-61442	4–5	QBO	—	—	—	NA	NA	0.476 (J)	—	—	—
RE02-17-141657	02-61442	6–7	QBO	242	—	2.65	NA	NA	2.5 (U)	—	5.74	—
RE02-17-141685	02-61443	4–5	QBO	—	—	—	NA	NA	0.363 (J)	—	—	—
RE02-17-141785	02-61443	6–7	QBO	—	—	2.1	NA	NA	2.5 (U)	—	—	—
RE02-17-141693	02-61444	0–1	SOIL	—	0.289 (J)	—	NA	NA	—	—	—	—
RE02-17-141672	02-61444	6–7	SOIL	—	—	—	NA	NA	—	2.5 (U)	—	—
RE02-17-141673	02-61445	0–1	SOIL	—	0.434 (J)	—	NA	NA	—	—	—	—
RE02-17-141694	02-61445	6–7	QBO	240	—	—	NA	NA	0.42 (J)	—	—	—
RE02-17-141688	02-61446	2–3	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-141681	02-61446	4–4.5	QBO	—	—	2.31	NA	NA	2.5 (U)	—	—	—
RE02-17-141674	02-61446	6–7	QBO	—	—	2.06	NA	NA	0.464 (J)	—	—	—
RE02-17-141696	02-61447	0–1	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-141689	02-61447	2–3	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-141682	02-61447	4–5	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-141675	02-61447	6–7	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-141697	02-61448	0–1	SOIL	—	—	—	NA	NA	—	—	—	105
RE02-17-141683	02-61448	4–5	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-141561	02-61450	6–7	QBO	210	—	—	NA	NA	0.403 (U)	—	—	—
RE02-17-141570	02-61451	6–7	QBO	229	—	2.48	NA	NA	2.5 (U)	—	4.86	—
RE02-17-141579	02-61452	6–7	QBO	—	—	—	NA	NA	0.445 (U)	—	—	—
RE02-17-141586	02-61453	2–3	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—

Table 3.4-2 (continued)

Field Sample ID	Location ID	Depth (ft)	Media	Manganese	Mercury	Nickel	Nitrate	Perchlorate	Selenium	Thallium	Vanadium	Zinc
Qbt 1g, Qct, Qbo Background Value[a]				**189**	**0.1**	**2**	**na**	**na**	**0.3**	**1.22**	**4.59**	**40**
Qbt 2,3,4 Background Value[a]				**482**	**0.1**	**6.58**	**na**	**na**	**0.3**	**1.1**	**17**	**63.5**
Soil Background Value[a]				**671**	**0.1**	**15.4**	**na**	**na**	**1.52**	**0.73**	**39.6**	**48.8**
Industrial SSL[b]				**160,000**	**389**	**25,700**	**2,080,000**	**908**	**6490**	**13**	**6530**	**389,000**
Recreational SSL[d]				**14,800**	**186**	**12,400**	**991,000**	**434**	**3100**	**6.19**	**3100**	**186,000**
Residential SSL[b]				**10,500**	**23.5**	**1560**	**125,000**	**54.8**	**391**	**0.782**	**394**	**23,500**
RE02-17-141588	02-61453	6–7	SOIL	—	—	—	NA	NA	2.5 (U)	—	—	—
RE02-17-141595	02-61454	2–3	SOIL	—	—	—	NA	NA	—	2.5 (U)	—	—
RE02-17-141596	02-61454	4–5	SOIL	—	—	—	NA	NA	—	2.5 (U)	—	—
RE02-17-141597	02-61454	6–7	QBO	274	—	2.45	NA	NA	0.657 (U)	—	5.84	—

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] BVs are from LANL (1998, 059730).

[b] SSLs are from NMED (2017, 602273), unless otherwise noted.

[c] SSLs are for total chromium.

[d] SSLs are from LANL (2017, 602581).

[e] na = Not available.

[f] — = Not detected or not detected above BV.

[g] NA = Not analyzed.

Table 3.4-3
Organic Chemicals other than PCBs Detected at SWMU 02-014

Sample ID	Location ID	Depth (ft)	Media	Anthracene	Benzo(a)anthracene	Benzo(a)pyrene	Benzo(b)fluoranthene	Benzo(g,h,i)perylene	Benzo(k)fluoranthene	Chrysene	Fluoranthene	Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	Heptachlorodibenzodioxins (Total)	Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	Heptachlorodibenzofuran[1,2,3,4,7,8,9-]
Industrial SSL[a]				**253,000**	**32.3**	**23.6**	**32.3**	**25,300**[b]	**323**	**3230**	**33,700**	**na**[c]	**na**	**na**	**na**
Recreational SSL[d]				**86,300**	**88.8**	**8.88**	**88.8**	**8630**[b]	**888**	**8880**	**11,500**	**na**	**na**	**na**	**na**
Residential SSL[a]				**17400**	**1.53**	**1.12**	**1.53**	**1740**[b]	**15.3**	**1530**	**2320**	**na**	**na**	**na**	**na**
RE02-07-1572	02-600387	0–0.5	SOIL	0.00903 (J)	0.0516	0.0551	0.0702	0.0271 (J)	0.041	0.0598	0.0984	0.00016	0.001	0.0000475	0.00000235 (J)
RE02-07-1573	02-600387	2–2.6	QAL	0.00727 (J)	0.032 (J)	0.0332 (J)	0.0424	0.0222 (J)	0.0219 (J)	0.0386	0.0529	0.000166	0.00108	0.0000472	0.00000182 (J)
RE02-07-1878	02-600449	4.5–9.5	QAL	—[e]	—	—	—	—	—	—	—	0.00000134 (J)	0.00000429	0.00000545	0.000000799 (J)

Table 3.4-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Heptachlorodibenzofurans (Total)	Hexachlorodibenzodioxin[1,2,3,4,7,8-]	Hexachlorodibenzodioxin[1,2,3,6,7,8-]	Hexachlorodibenzodioxin[1,2,3,7,8,9-]	Hexachlorodibenzodioxins (Total)	Hexachlorodibenzofuran[1,2,3,4,7,8-]	Hexachlorodibenzofuran[1,2,3,6,7,8-]	Hexachlorodibenzofuran[1,2,3,7,8,9-]	Hexachlorodibenzofuran[2,3,4,6,7,8-]	Hexachlorodibenzofurans (Total)	Indeno(1,2,3-cd)pyrene
Industrial SSL[a]				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**32.3**
Recreational SSL[c]				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**88.8**
Residential SSL[a]				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**na**	**1.53**
RE02-07-1572	02-600387	0–0.5	SOIL	0.000205	0.00000071 (J)	0.00000332	0.0000013 (J)	0.0000622	0.00000486	0.00000166 (J)	0.0000005 (J)	0.00000273	0.0000561	0.0252 (J)
RE02-07-1573	02-600387	2–2.6	QAL	0.000235	0.000000738 (J)	0.0000037	0.00000091 (J)	0.0000743	0.00000182 (J)	0.000000621 (J)	—	0.000000981 (J)	0.0000446	0.0184 (J)
RE02-07-1878	02-600449	4.5–9.5	QAL	0.0000109	—	—	—	—	0.00000641	0.00000263	0.00000051 (J)	0.00000430	0.0000454	—

Table 3.4-3 (continued)

Sample ID	Location ID	Depth (ft)	Media	Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	Pentachlorodibenzodioxin[1,2,3,7,8-]	Pentachlorodibenzodioxins (Total)	Pentachlorodibenzofuran[1,2,3,7,8-]	Pentachlorodibenzofuran[2,3,4,7,8-]	Pentachlorodibenzofurans (Totals)	Phenanthrene	Pyrene	Tetrachlorodibenzofuran[2,3,7,8-]	Tetrachlorodibenzofurans (Totals)	Toluene
Industrial SSL[a]				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**25,300**	**25,300**	**0.00243**	**na**	**61,100**
Recreational SSL[c]				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**8630**	**8630**	**0.00297**	**na**	**47,600**
Residential SSL[a]				**na**	**na**	**na**	**na**	**na**	**na**	**na**	**1740**	**1740**	**0.00049**	**na**	**5220**
RE02-07-1572	02-600387	0–0.5	SOIL	0.0012	0.00022	0.000000204 (J)	0.00000234	0.00000101 (J)	0.00000652	0.0000449 (J)	0.0317 (J)	0.0771	0.00000377	0.000017	NA[f]
RE02-07-1573	02-600387	2–2.6	QAL	0.00123	0.000248	0.000000156 (J)	0.0000007	—	0.00000155 (J)	0.0000102 (J)	0.0212 (J)	0.0423	0.000000867 (J)	0.00000232	0.000465 (J)
RE02-07-1878	02-600449	4.5–9.5	QAL	0.0000134	0.0000057	—	—	0.0000019 (J)	0.0000128	0.000073	—	—	0.00000639	0.0000324	—

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] SSLs are from NMED (2017, 602273), unless otherwise noted.

[b] Pyrene used as a surrogate based on structural similarity.

[c] na = Not available.

[d] SSLs are from LANL (2017, 602581).

[e] — = Not detected.

[f] NA = Not analyzed.

Table 3.4-4
PCBs Detected at SWMU 02-014

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Industrial SSL[a]				**11**	**11.1**
Recreational SSL[b]				**5.53**	**10.3**
Residential SSL[a]				**1.14**	**2.43**
RE02-07-1572	02-600387	0–0.5	SOIL	0.234	0.553
RE02-07-1573	02-600387	2–2.6	QAL	0.0532	0.105
RE02-07-1878	02-600449	4.5–9.5	QAL	—[c]	0.171
RE02-10-22130	02-600449	6–6.2	SOIL	—	0.69
RE02-10-22133	02-612451	6–6.2	SOIL	—	4
RE02-10-22136	02-612452	6–6.2	SOIL	—	1.1
RE02-10-22137	02-612452	8–8.2	SOIL	—	2.14
RE02-10-22139	02-612453	6–6.2	SOIL	—	0.377
RE02-10-22140	02-612453	8–8.2	SOIL	—	0.191
RE02-10-26105	02-613001	6–6.5	SOIL	—	0.536
RELA-18-151143	02-613001	6–7	SOIL	—	5.15
RE02-10-26106	02-613001	7–7.5	SOIL	—	5.48
RELA-18-151144	02-613001	8–9	SOIL	—	1.47
RE02-10-26107	02-613002	6–6.5	SOIL	—	7.98
RE02-10-26108	02-613002	8–8.5	SOIL	—	1.67
RE02-10-26638	02-613122	2–2.2	SOIL	—	0.328
RE02-10-26639	02-613122	4–4.2	SOIL	0.0407 (J)	0.178
RE02-10-26640	02-613124	6–6.2	SOIL	—	2.03
RE02-10-26641	02-613124	8–8.2	SOIL	0.17	1.24
RELA-18-151133	02-613287	2–3	SOIL	—	0.485
RELA-18-151134	02-613287	4–5	SOIL	—	0.769
RE02-11-315	02-613287	6–6.2	SOIL	—	13.9
RELA-18-151135	02-613287	6–7	SOIL	—	1.92
RE02-11-316	02-613287	8–8.2	SOIL	—	12.6
RE02-17-136051	02-613287	8–9	QBO	—	0.586
RE02-11-317	02-613288	6–6.2	SOIL	—	2.48
RE02-11-318	02-613288	8–8.2	SOIL	—	1.07
RE02-11-320	02-613289	6–6.2	SOIL	—	3.39
RELA-18-151137	02-613289	6–7	SOIL	—	0.767
RELA-18-151138	02-613289	9–10	SOIL	—	10.8
RELA-18-151139	02-613289	11–11.25	SOIL	—	20.7

Table 3.4-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Industrial SSL[a]				**11**	**11.1**
Recreational SSL[b]				**5.53**	**10.3**
Residential SSL[a]				**1.14**	**2.43**
RE02-11-325	02-613292	4–4.2	SOIL	—	0.825
RE02-11-2218	02-613626	8–9	SOIL	0.197	1.03
RE02-11-2219	02-613626	10–11	SOIL	—	3.3
RE02-11-2220	02-613627	6–7	SOIL	1.39	7.29
RE02-11-2221	02-613627	8–9	SOIL	—	4.16
RE02-11-2222	02-613627	10–11	SOIL	—	1.89
RELA-18-151122	02-613667	2–3	SOIL	—	0.199
RELA-18-151123	02-613667	4–5	SOIL	—	0.107
RE02-11-2523	02-613667	6–6.2	SOIL	7.11	13.3
RELA-18-151124	02-613667	6–7	SOIL	—	0.0347
RE02-11-2524	02-613667	8–8.2	SOIL	3.74	6.3
RELA-18-151125	02-613667	8–9	QBO	—	0.013
RE02-11-2525	02-613667	10–10.2	SOIL	4.93	7.73
RELA-18-151127	02-613668	2–3	SOIL	—	0.552
RELA-18-151128	02-613668	4–5	SOIL	—	0.0465
RELA-18-151129	02-613668	6–7	SOIL	—	0.144
RE02-11-2526	02-613668	8–8.2	SOIL	—	1.52
RELA-18-151130	02-613668	8–9	SOIL	—	0.0694
RE02-11-2527	02-613668	10–10.2	SOIL	—	3.21
RE02-11-2798	02-613699	12–12.2	QBT3	0.636 (J)	3.34
RE02-11-2799	02-613700	8–8.2	SOIL	0.0505	0.258
RE02-11-2800	02-613700	10–10.2	SOIL	0.0617	0.327
RE02-11-2801	02-613700	12–12.2	SOIL	0.256 (J)	1.19
RE02-11-3145	02-613700	14–14.2	SOIL	0.779	2.27
RE02-11-3146	02-613761	6–6.2	SOIL	—	10.7
RE02-11-3147	02-613761	8–8.2	SOIL	—	3.85
RE02-11-3148	02-613761	10–10.2	SOIL	—	1.53
RE02-11-3149	02-613761	12–12.2	QBT3	—	1.75
RE02-11-3150	02-613761	14–14.2	QBT3	—	0.0445
RELA-18-151117	02-613762	2–3	SOIL	—	1.82
RELA-18-151118	02-613762	4.25–5	QBO	—	0.0673
RELA-18-151119	02-613762	6–7	QBO	—	0.0464
RELA-18-151120	02-613762	8–9	QBO	—	0.0432

Table 3.4-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Industrial SSL[a]				**11**	**11.1**
Recreational SSL[b]				**5.53**	**10.3**
Residential SSL[a]				**1.14**	**2.43**
RE02-17-135776	02-61428	0–1	SOIL	—	0.0227
RE02-17-135778	02-61428	4–5	SOIL	—	0.00645 (J)
RE02-17-135780	02-61429	0–1	SOIL	—	0.333
RE02-17-135781	02-61429	2–3	SOIL	—	0.0457
RE02-17-135782	02-61429	4–5	SOIL	—	0.0106
RE02-17-135783	02-61429	5–6	SOIL	—	0.0133
RELA-18-151045	02-61432	2–3	SOIL	0.00811	0.0169
RELA-18-151046	02-61432	4–5	SOIL	—	0.128
RELA-18-151047	02-61432	6.75–7	QBO	—	0.974
RELA-18-151048	02-61432	8–8.75	QBO	0.0618	0.116
RE02-17-135854	02-61432	14–15	SOIL	—	0.00381 (J)
RE02-17-135855	02-61432	16–17	SOIL	0.0193	—
RE02-17-135856	02-61432	19–20	SOIL	0.00388 (J)	—
RELA-18-151057	02-61435	2–3	SOIL	—	0.00467
RELA-18-151058	02-61435	4–5	QBO	—	0.00253 (J)
RELA-18-151059	02-61435	6–7	QBO	—	0.00755
RE02-17-135893	02-61435	11–12	QBO	—	0.0184
RE02-17-135894	02-61435	14–15	QBO	—	0.00879
RELA-18-151062	02-61436	2–3	SOIL	—	0.264
RELA-18-151063	02-61436	4–5	SOIL	—	0.0586
RELA-18-151064	02-61436	6–7	QBO	—	0.288
RE02-17-144637	02-61437	2–3	SOIL	—	1.41
RE02-17-144638	02-61437	4–5	SOIL	—	1.9
RELA-18-151065	02-61437	6–7	SOIL	—	0.324
RELA-18-151066	02-61437	8–9	SOIL	—	0.036
RELA-18-151067	02-61437	11–11.8	QBO	—	0.0106
RE02-17-135916	02-61438	0–1	SOIL	—	0.0228
RE02-17-135917	02-61438	2–3	SOIL	—	0.00532 (J)
RE02-17-135919	02-61438	6–7	QBO	—	0.00369 (J)
RE02-17-135920	02-61438	8–9	QBO	—	0.00417 (J)
RE02-17-135921	02-61438	11–12	QBO	—	0.00314 (J)
RE02-17-135922	02-61438	14–15	QBO	—	0.00422 (J)
RE02-17-135923	02-61438	16–17	QBO	—	0.00368 (J)

Table 3.4-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Industrial SSL[a]				**11**	**11.1**
Recreational SSL[b]				**5.53**	**10.3**
Residential SSL[a]				**1.14**	**2.43**
RE02-17-135925	02-61439	0–1	SOIL	—	0.0928
RE02-17-135926	02-61439	2–3	SOIL	—	0.0183
RE02-17-135928	02-61439	6–7	QBO	—	0.00459 (J)
RE02-17-135929	02-61439	8–9	QBO	—	0.00411 (J)
RE02-17-135930	02-61439	11–12	QBO	—	0.00441 (J)
RE02-17-135931	02-61439	14–15	QBO	—	0.0111
RE02-17-135932	02-61439	16–17	QBO	—	0.00586 (J)
RE02-17-135927	02-61439	19–20	QBO	—	0.0207
RELA-18-151069	02-61440	2–3	SOIL	—	0.423
RELA-18-151070	02-61440	4–5	SOIL	—	0.257
RELA-18-151071	02-61440	6–7	SOIL	—	3.75 (J)
RELA-18-151072	02-61440	8–9	SOIL	—	0.0545
RE02-17-135939	02-61440	11–12	QBO	—	0.0511
RE02-17-135940	02-61440	14–15	QBO	—	0.00316 (J)
RE02-17-144671	02-61441	2–3	SOIL	—	16.1
RE02-17-144672	02-61441	4–5	SOIL	—	0.919
RELA-18-151043	02-61441	6–7	QBO	—	0.0636
RELA-18-151073	02-61441	8–8.5	QBO	—	0.0277
RE02-17-135948	02-61441	11–12	QBO	—	0.0123
RE02-17-135949	02-61441	14–15	QBO	—	0.0077
RELA-18-151075	02-61442	2–3	SOIL	—	0.888
RELA-18-151076	02-61442	4–5	QBO	—	0.911
RELA-18-151077	02-61442	6–7	QBO	—	3.4
RELA-18-151078	02-61442	8–9	QBO	—	0.15
RE02-17-135957	02-61442	11–12	QBO	—	0.0193
RE02-17-135958	02-61442	14–15	QBO	—	0.0221
RELA-18-151080	02-61443	2–3	SOIL	—	0.824
RELA-18-151081	02-61443	4–5	QBO	—	0.21
RELA-18-151082	02-61443	6–7	QBO	—	0.028
RELA-18-151083	02-61443	8–9	QBO	—	0.0434
RELA-18-151084	02-61443	11–12	QBO	—	0.016
RELA-18-151086	02-61444	2–3	SOIL	—	0.0227
RELA-18-151087	02-61444	4–5	SOIL	—	0.0356

Table 3.4-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Industrial SSL[a]				**11**	**11.1**
Recreational SSL[b]				**5.53**	**10.3**
Residential SSL[a]				**1.14**	**2.43**
RELA-18-151088	02-61444	6–7	SOIL	—	0.0283
RELA-18-151089	02-61444	8–8.85	SOIL	—	1.55
RE02-17-136003	02-61444	11–12	QBO	—	0.00645 (J)
RE02-17-136004	02-61444	14–15	QBO	—	0.00938
RE02-17-136005	02-61444	16–17	QBO	—	0.0117
RE02-17-136006	02-61444	19–20	QBO	—	0.00667 (J)
RE02-17-136007	02-61445	0–1	SOIL	—	0.0869
RE02-17-136010	02-61445	6–7	QBO	—	0.0225
RE02-17-136011	02-61445	8–9	QBO	—	0.00381 (J)
RE02-17-136015	02-61445	14-20	QBO	—	0.0746
RE02-17-139388	02-61446	0–1	SOIL	—	0.0593
RE02-17-139389	02-61446	2–3	SOIL	—	0.00725
RE02-17-139390	02-61446	4–4.5	QBO	—	0.0132
RE02-17-139391	02-61446	6–7	SOIL	—	0.0227
RE02-17-139392	02-61446	8–9	SOIL	—	0.00911
RE02-17-139393	02-61446	11–12	SOIL	—	0.0164
RE02-17-139394	02-61446	14–15	QBO	—	0.004 (J)
RE02-17-139395	02-61446	16–17	QBO	—	0.00974
RE02-17-139396	02-61446	19–20	SOIL	—	0.0064 (J)
RELA-18-151037	02-61447	0–1	SOIL	3.93	8.91
RELA-18-151038	02-61447	2–3	SOIL	0.174	0.348
RELA-18-151039	02-61447	4–5	QBO	0.0461	0.112
RELA-18-151040	02-61447	6–7	QBO	0.15	0.319
RE02-17-139403	02-61447	14–15	QBO	—	0.141
RE02-17-139404	02-61447	16–17	QBO	—	0.0663
RE02-17-139405	02-61447	19–20	QBO	—	0.174
RELA-18-151050	02-61448	2–3	SOIL	—	0.0562
RELA-18-151051	02-61448	4–5	SOIL	—	0.0103
RELA-18-151052	02-61448	6–7	SOIL	—	0.0233
RELA-18-151053	02-61448	8–9	SOIL	—	0.00685
RELA-18-151054	02-61448	11–12	SOIL	—	0.591
RELA-18-151055	02-61448	13–14	SOIL	—	0.0707
RE02-17-139413	02-61448	16–17	QBO	—	0.00424 (J)

Table 3.4-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Industrial SSL[a]				**11**	**11.1**
Recreational SSL[b]				**5.53**	**10.3**
Residential SSL[a]				**1.14**	**2.43**
RE02-17-139414	02-61448	19–20	QBO	—	0.0186
RELA-18-151091	02-61450	2–3	SOIL	—	0.0224
RELA-18-151092	02-61450	4–5	SOIL	—	0.00351 (J)
RE02-17-141562	02-61450	8–9	QBO	—	0.0131
RE02-17-141564	02-61450	14–15	QBO	—	0.0701
RE02-17-141565	02-61450	16–17	QBO	—	0.0201
RELA-18-151094	02-61451	2–3	SOIL	—	0.067
RELA-18-151095	02-61451	4–5	SOIL	—	0.0382
RELA-18-151096	02-61451	6.25–7	QBO	—	0.0205
RELA-18-151097	02-61451	8–9	QBO	—	0.0244
RE02-17-141572	02-61451	11–12	QBO	—	0.0113
RE02-17-141573	02-61451	14–15	QBO	—	0.0396
RE02-17-141574	02-61451	16–17	QBO	—	0.0132
RELA-18-151099	02-61452	2–3	SOIL	—	21
RELA-18-151100	02-61452	4–5	SOIL	—	0.827
RELA-18-151101	02-61452	6–7	QBO	—	0.307
RELA-18-151102	02-61452	8–9	QBO	—	0.0167
RE02-17-141582	02-61452	14–15	QBO	—	0.218
RE02-17-141583	02-61452	16–17	QBO	—	0.0329
RE02-17-141584	02-61452	19–20	QBO	—	0.174
RELA-18-151104	02-61453	2–3	SOIL	—	2.34 (J)
RELA-18-151105	02-61453	4–5	SOIL	—	0.0121
RELA-18-151106	02-61453	6–7	SOIL	—	0.372
RELA-18-151107	02-61453	8–9	SOIL	—	0.0095
RE02-17-141590	02-61453	11–12	QBO	—	0.0405
RE02-17-141592	02-61453	16–17	QBO	—	0.0832
RE02-17-141593	02-61453	19–20	QBO	—	0.0522
RELA-18-151109	02-61454	2–3	SOIL	—	0.022
RELA-18-151110	02-61454	4–5	SOIL	—	0.00136 (J)
RE02-17-141597	02-61454	6–7	QBO	—	0.00933
RE02-17-141598	02-61454	8–9	QBO	—	0.00346 (J)
RE02-17-141599	02-61454	11–12	QBO	—	0.00921
RE02-17-136031	02-61454	16–17	QBO	—	0.0101

Table 3.4-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Industrial SSL[a]				**11**	**11.1**
Recreational SSL[b]				**5.53**	**10.3**
Residential SSL[a]				**1.14**	**2.43**
RELA-18-151112	02-61455	2–3	SOIL	—	0.00263 (J)
RELA-18-151113	02-61455	4–5	SOIL	—	0.00898
RELA-18-151114	02-61455	6–7	SOIL	—	0.035
RELA-18-151115	02-61455	8–8.75	SOIL	—	0.0112
RE02-17-141608	02-61455	11–12	QBO	—	0.172 (J+)
RE02-17-141609	02-61455	14–15	QBO	—	0.0531 (J+)
RE02-17-145060	02-61474	2–3	SOIL	—	1.67
RE02-17-145072	02-61474	4–5	SOIL	—	5.53
RE02-17-145084	02-61474	6–7	SOIL	—	3.54
RE02-17-145049	02-61475	0–1	SOIL	—	0.452
RE02-17-145061	02-61475	2–3	SOIL	—	0.073
RE02-17-145073	02-61475	4–5	SOIL	—	0.0395
RE02-17-145050	02-61476	0–1	SOIL	—	1.29
RE02-17-145062	02-61476	2–3	SOIL	—	0.0178
RE02-17-145074	02-61476	4–5	SOIL	—	0.0478
RE02-17-145086	02-61476	6–7	QBO	—	0.053
RE02-17-145098	02-61476	8–9	QBO	—	0.1
RE02-17-145110	02-61476	9–10	QBO	—	0.023
RE02-17-145051	02-61477	0–1	SOIL	—	5
RE02-17-145063	02-61477	2–3	SOIL	—	1.21
RE02-17-145064	02-61478	2–3	SOIL	—	2.41
RE02-17-145065	02-61479	2–3	SOIL	—	1.25
RE02-17-145077	02-61479	4–5	SOIL	—	1.57
RE02-17-145054	02-61480	0–1	SOIL	—	0.976
RE02-17-145066	02-61480	2–3	SOIL	—	0.0653
RE02-17-145078	02-61480	4–5	SOIL	—	0.179
RE02-17-145090	02-61480	6–7	SOIL	—	0.063
RE02-17-145102	02-61480	8–8.5	QBT3	—	0.101
RE02-17-145055	02-61481	0–1	SOIL	—	0.551
RE02-17-145067	02-61481	2–3	SOIL	—	0.192
RE02-17-145079	02-61481	4–5	SOIL	—	0.12
RE02-17-145091	02-61481	6–7	SOIL	—	0.0876
RE02-17-145103	02-61481	8–9	QBO	—	0.0505

Table 3.4-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Industrial SSL[a]				**11**	**11.1**
Recreational SSL[b]				**5.53**	**10.3**
Residential SSL[a]				**1.14**	**2.43**
RE02-17-145115	02-61481	9–10	QBO	—	0.0243
RE02-17-145056	02-61482	0–1	SOIL	—	11.3
RE02-17-145068	02-61482	2–3	SOIL	—	0.642
RE02-17-145080	02-61482	4–5	QBO	—	0.77
RE02-17-145092	02-61482	6–7	QBT3	—	0.471
RE02-17-145116	02-61482	8–9	QBO	—	0.456
RE02-17-145104	02-61482	9–10	QBO	—	0.641
RE02-17-145057	02-61483	0–1	SOIL	—	0.132
RE02-17-145069	02-61483	2–3	SOIL	—	0.0309
RE02-17-145081	02-61483	4–5	SOIL	—	0.0079
RE02-17-145093	02-61483	6–7	QBO	—	0.0107
RE02-17-145105	02-61483	8–9	QBO	—	0.00545
RE02-17-145117	02-61483	9–10	QBO	—	0.00353 (J)
RE02-17-145120	02-61486	0–1	SOIL	—	0.3
RE02-17-145130	02-61486	2–3	SOIL	—	0.333
RE02-17-145131	02-61487	2–3	SOIL	—	0.768
RE02-17-145141	02-61487	4–5	SOIL	—	1.59
RE02-17-145151	02-61487	5–5.5	QBO	—	0.476
RE02-17-145132	02-61488	2–3	QBO	—	1.6
RE02-17-145142	02-61488	4–4.1	QBO	—	2.25
RE02-17-145133	02-61489	2–3	SOIL	—	0.456
RE02-17-145143	02-61489	4–5	SOIL	—	0.422
RE02-17-145153	02-61489	6–7	QBO	—	0.0512
RE02-17-145163	02-61489	7–7.5	QBO	—	0.733
RE02-17-145124	02-61490	0–1	SOIL	0.0366	0.0572
RE02-17-145134	02-61490	2–3	SOIL	0.0284	0.0449
RE02-17-145125	02-61491	0–1	SOIL	—	0.016
RE02-17-145135	02-61491	2–3	SOIL	—	0.00456
RE02-17-145145	02-61491	4–5	QBO	—	0.00623
RE02-17-145126	02-61492	0–0.5	SOIL	0.0418	0.0792
RE02-17-145127	02-61493	0–1	SOIL	0.0248	0.043
RE02-17-145137	02-61493	2–3	SOIL	0.00632	0.011
RE02-17-145147	02-61493	4–4.5	QBO	0.00327 (J)	0.006

Table 3.4-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Industrial SSL[a]				**11**	**11.1**
Recreational SSL[b]				**5.53**	**10.3**
Residential SSL[a]				**1.14**	**2.43**
RE02-17-145128	02-61494	0–1	SOIL	0.0344	0.066
RE02-17-145138	02-61494	2–3	SOIL	—	0.00525
RELA-18-151015	02-61526	0–1	SOIL	—	0.531
RELA-18-151020	02-61526	2–3	SOIL	—	0.0232
RELA-18-151021	02-61526	4–5	SOIL	—	0.0439
RELA-18-151022	02-61526	6–7	QCT	—	0.00279 (J)
RELA-18-151017	02-61528	0–1	SOIL	—	0.0791
RELA-18-151023	02-61528	2–3	SOIL	—	0.0491
RELA-18-151024	02-61528	4–5	SOIL	—	0.00672
RELA-18-151018	02-61529	0–1	SOIL	—	3.77
RELA-18-151027	02-61529	2–3	SOIL	0.149	0.0754
RELA-18-151028	02-61529	4–4.65	SOIL	0.0401	0.0451
RELA-18-151019	02-61530	0–1	SOIL	—	1.68
RELA-18-151030	02-61530	2–3	SOIL	—	0.1
RELA-18-151031	02-61530	4–5	QBO	—	0.0251
RELA-18-151032	02-61530	6–7	QBO	—	0.0375
RELA-18-151033	02-61537	2–3	SOIL	—	23.9
RELA-18-151034	02-61537	4–5	SOIL	—	7.09
RELA-18-151035	02-61537	6–7	SOIL	—	0.614
RELA-18-151263	02-61537	8–9	QBO	—	1.44
RELA-18-151036	02-61537	11–12	QBO	—	2.48
RELA-18-161238	02-61538	0–0.9	SOIL	—	17.3
RELA-18-161242	02-61538	1–2	SOIL	—	1.1
RELA-18-161239	02-61539	1–2	SOIL	—	5.28
RELA-18-161244	02-61540	1–2	SOIL	—	12.3
RELA-18-164444	02-61541	6–7	QBT1G	—	0.963
RELA-18-161248	02-61542	1–2	SOIL	—	1.43
RELA-18-161249	02-61543	1–1.5	SOIL	—	6.77
RELA-18-164455	02-61544	2–3	SOIL	—	1.1
RELA-18-164465	02-61544	4.25–5	QBT1G	—	0.00375
RELA-18-164475	02-61544	6–7	QBT1G	—	0.413
RELA-18-164456	02-61545	2–3	SOIL	—	2.03
RELA-18-164466	02-61545	4–5	SOIL	—	0.446

Table 3.4-4 (continued)

Sample ID	Location ID	Depth (ft)	Media	Aroclor-1254	Aroclor-1260
Industrial SSL[a]				**11**	**11.1**
Recreational SSL[b]				**5.53**	**10.3**
Residential SSL[a]				**1.14**	**2.43**
RELA-18-164476	02-61545	6–7	SOIL	—	0.041
RELA-18-164448	02-61547	0–1	SOIL	—	0.921
RELA-18-164458	02-61547	2–3	SOIL	—	0.0299
RELA-18-164468	02-61547	4–5	SOIL	—	0.104
RELA-18-164478	02-61547	6–7	SOIL	—	0.00849
RELA-18-164459	02-61548	2–3	SOIL	—	0.684
RELA-18-164469	02-61548	4–4.5	SOIL	—	2.98
RELA-18-164479	02-61548	6–7	QBT1G	—	0.578
RELA-18-164470	02-61549	4–5	QBT1G	—	4.17
RELA-18-164480	02-61549	6–7	QBT1G	—	3.65
RELA-18-164451	02-61550	0–1	SOIL	—	5.35
RELA-18-164461	02-61550	2–3	SOIL	—	0.115
RELA-18-164471	02-61550	4–5	SOIL	—	0.157
RELA-18-164481	02-61550	6–7	SOIL	—	0.0342
RELA-18-164462	02-61551	2–3	SOIL	—	0.155
RELA-18-164472	02-61551	4–5	SOIL	—	0.169
RELA-18-164482	02-61551	6–7	SOIL	—	0.0631
RELA-18-164453	02-61552	0–1	SOIL	—	1.18
RELA-18-164463	02-61552	2–3	SOIL	—	0.031
RELA-18-164473	02-61552	4–5	SOIL	—	0.0205
RELA-18-164483	02-61552	6–7	QBT1G	—	0.0248
RELA-18-164464	02-61553	2–3	SOIL	—	0.834
RELA-18-164474	02-61553	4–5	SOIL	—	0.828
RELA-18-164484	02-61553	6–7	SOIL	—	1.25

Notes: Results are in mg/kg. Data qualifiers are defined in Appendix A.

[a] SSLs are from NMED (2017, 602273), unless otherwise noted.

[b] SSLs are from LANL (2017, 602581).

[c] — = Not detected.

Table 3.4-5
Radionuclides Detected or Detected above BV/FV at SWMU 02-014

Field Sample ID	Location ID	Depth (ft)	Media	Cesium-134	Cesium-137	Plutonium-238	Plutonium-239/240
Soil Background Value/Fallout Value[a]				**na**[b]	**1.65**	**0.023**	**0.054**
Qbt 1g, Qct, Qbo Background Value/Fallout Value[a]				**na**	**na**	**na**	**na**
Industrial SAL[c]				**17**	**41**	**1300**	**1200**
Recreational SAL[c]				**150**	**370**	**1400**	**1300**
Residential SAL[c]				**5**	**12**	**84**	**79**
RE02-17-141612	02-61428	0–1	SOIL	—[d]	—	—	0.076
RE02-17-141658	02-61428	2–3	SOIL	—	—	0.019	—
RE02-17-141659	02-61429	0–1	SOIL	—	—	—	0.07
RE02-17-141627	02-61437	2–3	SOIL	—	—	—	0.034
RE02-17-141649	02-61437	4–5	SOIL	—	—	—	0.005
RE02-17-141651	02-61439	2–3	SOIL	—	—	—	0.011
RE02-17-141656	02-61442	4–5	QBO	0.061	—	—	0.007
RE02-17-141695	02-61446	0–1	SOIL	—	—	—	0.071
RE02-17-141683	02-61448	4–5	SOIL	—	—	—	0.011
RE02-17-141676	02-61448	6–7	SOIL	—	—	—	0.018
RE02-17-141560	02-61450	4–5	SOIL	—	—	0.008	—
RE02-17-141561	02-61450	6–7	QBO	—	—	0.005	—
RE02-17-141568	02-61451	2–3	SOIL	—	0.759	—	0.008
RE02-17-141569	02-61451	4–5	SOIL	—	0.128	—	—
RE02-17-141579	02-61452	6–7	QBO	0.066	—	—	0.004
RE02-17-141588	02-61453	6–7	SOIL	—	—	—	0.012

Table 3.4-5 (continued)

Field Sample ID	Location ID	Depth (ft)	Media	Cesium-134	Cesium-137	Plutonium-238	Plutonium-239/240
Soil Background Value/Fallout Value[a]				**na**[b]	**1.65**	**0.023**	**0.054**
Qbt 1g, Qct, Qbo Background Value/Fallout Value[a]				**na**	**na**	**na**	**na**
Industrial SAL[c]				**17**	**41**	**1300**	**1200**
Recreational SAL[c]				**150**	**370**	**1400**	**1300**
Residential SAL[c]				**5**	**12**	**84**	**79**
RE02-17-141596	02-61454	4–5	SOIL	0.056	—	—	—
RE02-17-141604	02-61455	2–3	SOIL	0.058	—	—	—
RE02-17-141605	02-61455	4–5	SOIL	0.054	—	—	—

Notes: Results are in pCi/g. Data qualifiers are defined in Appendix A.

[a] BVs/FVs are from LANL (1998, 059730).

[b] na = Not available.

[c] SALs are from LANL (2015, 600929).

[d] — = Not detected or not detected above BV/FV.

Appendix A

Acronyms and Abbreviations,
Metric Conversion Table, and Data Qualifier Definitions

A-1.0 ACRONYMS AND ABBREVIATIONS

AK	acceptable knowledge
ALARA	as low as reasonably achievable
AOC	area of concern
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BV	background value
CCV	continuing calibration verification
COC	chain of custody
Consent Order	Compliance Order on Consent
COPC	chemical of potential concern
DAF	dilution attenuation factor
D&D	decontamination and decommissioning
DL	detection limit
DOE	Department of Energy (U.S.)
dpm	disintegrations per minute
Eh	oxidation-reduction potential
EPA	Environmental Protection Agency (U.S.)
EPC	exposure point concentration
EQL	estimated quantitation limit
ESL	ecological screening level
FV	fallout value
GPS	global-positioning system
HI	hazard index
HQ	hazard quotient
ICS	interference check sample
ICV	initial calibration verification
IR	investigation report
IS	internal standard
K_d	soil-water partition coefficient
K_{oc}	organic carbon-water partition coefficient
K_{ow}	octanol-water partition coefficient
LANL	Los Alamos National Laboratory

LAL	lower acceptance limit
LCS	laboratory control sample
LiDAR	light detection and imaging
LLW	low-level waste
LOAEL	lowest observed adverse effect level
MDC	minimum detectable concentration
MDL	method detection limit
mmHg	millimeters of mercury
MS	matrix spike
N3B	Newport News Nuclear BWXT-Los Alamos, LLC
NDA	no detectable activity
NMED	New Mexico Environment Department
NOAEL	no observed adverse effect level
OWR	Omega West Reactor
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
QA	quality assurance
QC	quality control
%R	percent recovery
%RSD	percent relative standard deviation
RCT	radiological control technician
RESRAD	Residual Radioactivity (computer code)
RfD	reference dose
RPD	relative percent difference
RTK	real-time kinematic
SAL	screening action level
SCL	sample collection log
SF	slope factor
SMO	Sample Management Office
SOP	standard operating procedure
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
T&E	threatened and endangered

TA	technical area
TAL	target analyte list
TCDD[2,3,7,8]	2,3,7,8-tetrachlorodibenzo-p-dioxin
TEC	toxicity equivalency concentration
TEF	toxic equivalency factor
TSCA	Toxic Substances Control Act
UAL	upper acceptance limit
UCL	upper confidence limit
VOC	volatile organic compound
WBR	water boiler reactor
WCSF	waste characterization strategy form

A-2.0 METRIC CONVERSION TABLE

Multiply SI (Metric) Unit	by	To Obtain US Customary Unit
kilometers (km)	0.622	miles (mi)
kilometers (km)	3281	feet (ft)
meters (m)	3.281	feet (ft)
meters (m)	39.37	inches (in.)
centimeters (cm)	0.03281	feet (ft)
centimeters (cm)	0.394	inches (in.)
millimeters (mm)	0.0394	inches (in.)
micrometers or microns (µm)	0.0000394	inches (in.)
square kilometers (km^2)	0.3861	square miles (mi^2)
hectares (ha)	2.5	acres
square meters (m^2)	10.764	square feet (ft^2)
cubic meters (m^3)	35.31	cubic feet (ft^3)
kilograms (kg)	2.2046	pounds (lb)
grams (g)	0.0353	ounces (oz)
grams per cubic centimeter (g/cm^3)	62.422	pounds per cubic foot (lb/ft^3)
milligrams per kilogram (mg/kg)	1	parts per million (ppm)
micrograms per gram (µg/g)	1	parts per million (ppm)
liters (L)	0.26	gallons (gal.)
milligrams per liter (mg/L)	1	parts per million (ppm)
degrees Celsius (°C)	9/5 + 32	degrees Fahrenheit (°F)

A-3.0 DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
U	The analyte was analyzed for but not detected.
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.
J+	The analyte was positively identified, and the result is likely to be biased high.
J-	The analyte was positively identified, and the result is likely to be biased low.
UJ	The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit.
R	The data are rejected as a result of major problems with quality assurance/quality control parameters.

Appendix B

Field Methods

B-1.0 INTRODUCTION

This appendix summarizes field methods implemented during the 2018–2019 sampling and remediation activities at Solid Waste Management Unit (SWMU) 02-014 within the Middle Los Alamos Canyon Aggregate Area at Los Alamos National Laboratory (LANL or the Laboratory). Descriptions of field methods for previous investigations at SWMU 02-014 are included in the Phase II Investigation Report for Middle Los Alamos Canyon Aggregate, Revision 2 (N3B 2018, 700091). Table B-1.0-1 summarizes the field investigation methods, and the following sections provide more detailed descriptions of these methods.

B-2.0 FIELD-SCREENING METHODS

This section summarizes the field-screening methods used during the investigation activities. Field-screening results are presented in Table 2.2-2 of the addendum.

All soil/tuff samples were screened for radioactivity before submittal to the Sample Management Office (SMO). Samples submitted to the SMO were screened in the field by radiological control technicians (RCTs) using a ThermoFisher Model SHP-380, with Eberline Model E600 Geiger Counter, for detection of low-energy radiation. Gross alpha and beta/gamma screening measurements were recorded on the sample collection log/chain-of-custody (SCL/COC) forms and are reported in Table 2.2-2.

The outside of sealed sample containers, as well as sampling tools and equipment, were screened using smears and counted by the Ludlum Model 3030 Alpha Beta Sample Counter for detection of removable alpha and beta contamination.

B-3.0 FIELD-SCREENING INSTRUMENT CALIBRATION

The RCT calibrated field screening instruments daily before local background levels for radioactivity were measured. Instruments were calibrated using plutonium-239 and chloride-36 sources for alpha and beta emissions, respectively. All calibrations met the manufacturer's specifications and specifications in the applicable radiation detection instrument manual.

B-4.0 SURFACE AND SUBSURFACE SAMPLING

This section summarizes the methods used for collecting surface and subsurface samples.

B-4.1 Sample Collection

Surface and shallow subsurface samples were collected using a stainless-steel hand auger to collect material within the prescribed sampling intervals. For samples collected at depths greater than 3 ft, 4-in. polyvinyl chloride pipe was decontaminated and inserted into the hole to prevent hole collapse and cross-contamination of samples. A stainless-steel bowl and scoop were used to capture the sample from the hand-auger bucket. The sample was then transferred to sterile sample collection jars. Samples were appropriately labeled, sealed with custody seals, and documented before transporting to the SMO. Samples were transported to the SMO for processing and shipment to off-site contract analytical laboratories. The SMO personnel reviewed and approved the SCLs and accepted custody of the samples.

B-4.2 Subsurface Sampling Methods

Subsurface samples were collected in accordance with approved subcontractor procedures technically equivalent to standard operating procedure (SOP) ER-SOP-20069, "Soil, Tuff, and Sediment Sampling." Borehole samples were collected in a stainless-steel split-spoon core-barrel sampler that retrieved core in 2.5-ft intervals. The samples collected, listed by location and depth, are provided in tables for each site in the addendum to the Phase II investigation report.

Core retrieved from the subsurface was field screened for radioactivity and was visually inspected and logged. Following inspection, the 2.5-ft core section to be sampled was removed from the core barrel and placed in a stainless-steel bowl and homogenized. The material was crushed, if necessary, with a decontaminated rock hammer and stainless-steel spoon to allow core material to fit into sample containers.

No samples were collected for volatile organic compound (VOC) analysis. The sample collection tools were decontaminated immediately before each sample was collected in accordance with an approved subcontractor procedure technically equivalent to ER-SOP-5061, "Field Decontamination of Equipment" (section B-5.4).

B-4.3 Quality Control Samples

Quality assurance/quality control samples were collected in accordance with an approved subcontractor procedure technically equivalent to ER-SOP-20235, R0, "Sample Containers, Preservation, and Field Quality Control." The quality control samples included field duplicates and field rinsate blanks. Field duplicate samples were collected from the same material as a regular investigation sample and submitted for the same analyses. Field duplicate samples were collected at a frequency of at least 1 duplicate sample for every 10 samples submitted to the SMO. A total of 6 field duplicate samples were collected.

Field rinsate blanks were collected to evaluate field decontamination procedures. Rinsate blanks were collected by rinsing sampling equipment (i.e., auger buckets, sampling bowls, and scoops) with deionized water after decontamination. The rinsate water was collected in a sample container and submitted to the SMO. A total of four field rinsate samples were collected.

B-4.4 Decontamination of Sampling Equipment

The split-spoon core barrels and all other sampling equipment that came (or could have come) in contact with sample material were decontaminated after each core was retrieved and logged. Decontamination included wiping the equipment with Fantastik and paper towels. The drilling equipment was decontaminated before mobilization of the drill rig to another borehole to avoid cross-contamination between samples and borehole locations. Residual material adhering to equipment was removed using dry decontamination methods such as the use of wire brushes and scrapers. Decontamination activities were performed in accordance with an approved subcontractor procedure technically equivalent to ER-SOP-5061, "Field Decontamination of Equipment." Field rinsate blank samples were collected in accordance with an approved procedure technically equivalent to ER-SOP-5059, "Field Quality Control Samples."

B-5.0 SOIL REMEDIATION

B-5.1 Radiological Controls

Heavy equipment entering and leaving the site was monitored for radioactivity using smear samples. Heavy equipment screening smears were taken by the RCT and counted by a Ludlum Model 3030 Alpha Beta Sample Counter for detection of removable alpha and beta contamination. A ThermoFisher Model SHP-380, with Eberline Model E600 Geiger Counter, was used for direct screening of alpha and beta contamination of personnel after completing daily work, as requested. Any tools and personnel entering an excavation were screened out by an RCT.

B-5.2 Soil Excavation

Between November 7, 2018, and December 17, 2018, approximately 282 yd^3 of polychlorinated biphenyl–(PCB-) contaminated soil was removed from the excavation sites at SWMU 02-014. Soil was removed from the entire excavation area to a depth of 1 ft and deeper excavation was performed at five interior areas to depths of 4.5 ft to 10.5 ft. Excavation areas are shown on Plate 1.

The planned extent and depths of excavations were initially identified based on the results of previous sampling for PCBs. Following collection and analysis of confirmation samples, several areas were identified where excavation had to be extended vertically within the interior of the original area (interior areas) or laterally beyond the original excavation area. Excavation was determined to be complete upon confirmation of excavation depth and extent using several methods. Both the Topcon HiPer V real-time kinematic (RTK) global positioning system (GPS) unit and visual measurements were used to confirm the 1-ft excavation depth and extent. RTK GPS and visual tape measurements were used to confirm depth extent of most of the deep, interior excavations. Elevation was recorded at the original surface and at the bottom of the excavation at locations no more than 2 ft apart and these elevations were compared to confirm the planned excavation depth was reached. Points along the edges were often slightly higher than the central depth because of sloping during the excavation process and some sloughing of surface material. For the deepest interior excavation, a laser tape measure was affixed to a 10 ft × 2 in. × 4 in. wood beam to safely check the depth of excavation. In addition, 10-ft, 10.5-ft, and 11-ft lengths were marked with tape on the excavator arm for a second visual check.

Both a Yanmar mini-excavator and Volvo excavator were used for excavation as well as the placement and tamping of backfill and base course materials. Excavated material was placed in 5.18-yd^3 soft-sided IP-1 bags with 6-mil polypropylene built-in inner liners. After an IP-1 bag was filled, the inner liners of the bags were sealed per manufacturer's instructions and discussions with the waste management coordinator and Field Execution Team lead. Once sealed, IP-1 bags were secured to a telehandler and moved to Technical Area 41 (TA-41) where they were staged.

During excavation of deep interior area I-1, two asbestos-wrapped pipes (assumed to be decommissioned gas and water lines based on conversations with LANL Utilities Management) were exposed within the first 1–2 feet below ground surface (bgs). A "pause work" commenced the afternoon of November 19, 2018, and went to December 3, 2018. During this time, an asbestos abatement plan and integrated work document addendum were developed. The approved asbestos abatement plan was then implemented and the exposed pipes and wrapping were removed from the excavation and properly packaged and labeled. Abatement took place from December 4, 2018, through December 6, 2018. About 1 yd^3 of waste (pipe, asbestos wrapping, contact waste materials) is estimated to have been generated in the process.

Restoration at SWMU 02-014 began on December 18, 2018, and was completed on January 28, 2019. Fill was first placed into the deep excavation areas. Material was spread and compressed by the Volvo excavator in 6–8-in. lifts to 1 ft below grade (same level as the 1-ft deep excavation) and tamped after each lift using the approximately 1-yd^3 bucket. Visual and tape measure methods were used to confirm that fill was deposited to 4–6 in. below grade. Base course was then placed on top of the fill. Visual observation and the Topcon RTK GPS system were used to confirm that base course was deposited as close to original grade as possible.

B-6.0 GEODETIC SURVEYING

RTK GPS surveying was conducted using Topcon HiPer V Navigation Satellite System antennas coupled with a Topcon FC-5000 Data Collector Controller. This system was used to stake sampling locations, locations to be left unexcavated (i.e., uncontaminated locations), locations excavated, planned excavation boundaries, and pre- and post-excavation topographic elevations. Light detection and ranging (LiDAR) was also used for pre- and post-excavation topographic elevation data collection, specifically for excavations too deep to safely check via RTK GPS.

If a planned sampling location needed to be offset more than 1 ft because of surface or subsurface obstructions, the relocated point was re-surveyed. Surveyed coordinates for sampling locations of samples submitted to the SMO are presented in Table 2.2-1 of the addendum.

B-7.0 WASTE STORAGE AND DISPOSAL

All excavated media at SWMU 02-014 was placed in 5.18-yd^3 soft-sided IP-1 bags. IP-1 bags were positioned on pallets for loading and staging. After the bag was sealed, an RCT screened all sides of the bag before releasing the bag for staging at TA-41. Temporary storage was within a posted radiological waste storage area at TA-41. All waste containers that were staged at TA-41 were covered with tarps for additional protection from the elements.

All waste was managed in accordance with the project waste characterization strategy form (WCSF) and an approved subcontractor procedure technically equivalent to ER-DIR-SOP-10021, R1, “Characterization and Management of Environmental Programs Waste.” Contact waste was stored in labeled 1-gal. plastic bags in the radioactive waste accumulation area on-site until it could be transferred to a 5.18-yd^3 soft-sided IP-1 bag.

B-8.0 DEVIATIONS FROM THE WORK PLAN

The 2018–2019 sampling and remediation activities at SWMU 02-014 were not in the approved Phase II investigation work plan for Middle Los Alamos Canyon Aggregate Area (LANL 2009, 105073; NMED 2009, 105595). The need for these activities was identified as a result of the Phase II sampling performed at Area of Concern 02-011(a) and the subsequent identification of a new SWMU.

B-9.0 REFERENCES

The following reference list includes documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ERID, ESHID, or EMID. ERIDs were assigned by Los Alamos National Laboratory's (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 (IDs 700000 and above).

LANL (Los Alamos National Laboratory), February 2009. "Phase II Investigation Work Plan for Middle Los Alamos Canyon Aggregate Area, Revision 1," Los Alamos National Laboratory document LA-UR-09-1206, Los Alamos, New Mexico. (LANL 2009, 105073)

N3B (Newport News Nuclear BWXT-Los Alamos, LLC), September 2018. "Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2," Newport News Nuclear BWXT-Los Alamos, LLC, document EM2018-0039, Los Alamos, New Mexico. (N3B 2018, 700091)

NMED (New Mexico Environment Department), March 25, 2009. "Approval, Middle Los Alamos Canyon Aggregate Area Phase II Work Plan, Revision 1," New Mexico Environment Department letter to D. Gregory (DOE LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2009, 105595)

Table B-1.0-1
Summary of Field Investigation Methods

Method	Summary
Hand-Auger Sampling	This method is typically used for sampling soil or sediment at depths of less than 10–15 ft, but in some cases may be used to collect samples of weathered or nonwelded tuff. The method involves hand-turning a stainless-steel bucket auger (typically 3–4 in. inside diameter), creating a vertical hole that can be advanced to the desired sampling depth. When the desired depth was reached, the auger was decontaminated before advancing the hole through the sampling depth. The sample material was transferred from the auger bucket to a stainless-steel sampling bowl before the various required sample containers were filled.
Split-Spoon Core-Barrel Sampling	A stainless-steel core barrel was advanced using a hollow-stem auger drilling rig. The core barrel extracted a continuous length of soil and/or rock. The split-spoon core barrel is a cylindrical barrel split lengthwise so the two halves can be separated to expose the core sample. If necessary, pieces small enough to fit into the sample container were removed from the core using a decontaminated rock hammer or stainless-steel spoon. The section of core in the core barrel was then screened for radioactivity. A portion of the core was then collected as a discrete sample from the desired depth for remaining analyses.
Handling, Packaging, and Shipping of Samples	Field team members sealed and labeled samples before packing them to ensure the sample containers and the containers used for transport were free of external contamination. Field team members packaged all samples to minimize the possibility of breakage during transport. After all environmental samples were collected, packaged, and preserved, a field team member transported them to the SMO. The SMO arranged to ship the samples to the analytical laboratories.
Sample Control and Field Documentation	The collection, screening, and transport of samples were documented on standard forms generated by the SMO. These included SCLs and sample container labels. SCLs were completed at the time of sample collection, and the logs were signed by the sampler and a reviewer who verified the logs for completeness and accuracy. Corresponding labels were initialed and applied to each sample container, and custody seals were placed around each sample container. SCLs were completed and signed to verify that the samples were not left unattended.
Field Quality Control Samples	Field quality control samples were collected as follows: *Field Duplicates*: At a frequency 10%; collected at the same time as a regular sample and submitted for the same analyses. *Equipment Rinsate Blank*: At a frequency of 10%; collected by rinsing decontaminated sampling equipment with deionized water, which was collected in a sample container and submitted for laboratory analysis.
Field Decontamination of Drilling and Sampling Equipment	Dry decontamination was used to minimize the generation of liquid waste. Dry decontamination included the use of a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by use of a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes.
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on U.S. Environmental Protection Agency guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample were printed on the SCL provided by the SMO (size and type of container [e.g., glass, amber glass, and polyethylene]). All samples were preserved by placing them with ice in insulated containers to maintain a temperature of 4°C.

Table B-1.0-1 (continued)

Method	Summary
Coordinating and Evaluating Geodetic Surveys	Geodetic surveys focused on obtaining survey data of acceptable quality to use during project investigations. Geodetic surveys were conducted with Topcon HiPer V Navigation Satellite System Antennas coupled with a Topcon FC-5000 Data Collection Controller. All coordinates were expressed as State Plane Coordinate System 83, NM Central, U.S. feet. All elevation data were reported relative to the National Geodetic Vertical Datum of 1983.
Management of Environmental Restoration Project Waste, Waste Characterization	Waste was managed, characterized, and stored in accordance with an approved WCSF that documented the site history, field activities, and characterization approach for each waste stream managed. Waste characterization complied with on- or off-site waste acceptance criteria. All stored waste was marked with appropriate signage and labels. Drummed waste was stored on pallets to prevent deterioration of containers. A waste storage area was established before waste was generated. Waste storage areas were located in controlled areas of the Laboratory to prevent unauthorized personnel from inadvertently adding or managing wastes. Each container of waste generated was individually labeled with waste classification, item identification number, and radioactivity category (if applicable), immediately following containerization. All waste was segregated by classification and compatibility to prevent cross-contamination. Management of waste is described in Appendix C.

Appendix C

Waste Management

C-1.0 INTRODUCTION

This appendix describes management of the waste generated during the 2018–2019 investigation and remediation activities at solid waste management unit (SWMU) 02-014 within the Middle Los Alamos Canyon Aggregate Area of Los Alamos National Laboratory (the Laboratory) and during sampling activities conducted in 2017 to characterize the area requiring remediation. In general, waste generated during the investigation and remediation activities was managed in accordance with approved subcontractor procedures technically equivalent to standard operating procedure (SOP) EP-DIR-SOP-10021, R1, "Characterization and Management of Environmental Program Waste." This procedure incorporates the requirements of applicable U.S. Environmental Protection Agency and New Mexico Environment Department regulations, and U.S. Department of Energy orders.

Waste characterization strategy forms (WCSFs) were prepared to address characterization approaches, on-site management, and final disposition options for wastes. Analytical data and information on wastes generated during previous investigations and/or acceptable knowledge (AK) were used to complete the WCSF. WCSF EP2016-0128 was prepared in October 2016 to address Middle Los Alamos Canyon Aggregate Area site characterization activities. WCSF EM2018-0021 was prepared in July 2018 to address SWMU 02-014 remediation activities. The WCSFs are provided in Attachment C-1 (on CD).

The selection of waste containers was based on appropriate U.S. Department of Transportation requirements, waste types, and estimated volumes of wastes to be generated. Immediately following containerization, each waste container was individually labeled with a unique identification number and with information regarding waste classification, contents, and radioactivity, if applicable.

Wastes were staged in clearly marked, appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements were based on the type of waste and its classification. Container and storage requirements were detailed in the WCSFs and approved before waste was generated.

To the extent possible, investigation and remediation activities were conducted in a manner that minimized the generation of waste.

C-2.0 WASTE STREAMS

The waste streams generated and managed during the investigation are described below and are summarized in Table C-2.0-1. The waste stream numbers correspond with those identified in the WCSFs. Waste streams 1, 2, 5, and 6 are the same for the two WCSFs.

- WCSF Waste Stream #1: Contact Waste—This waste stream is composed of solid waste generated during investigation and removal activities that has come into contact with contaminated environmental media and equipment. This includes, but is not limited to, personal protective equipment (e.g., gloves), plastic sheeting (e.g., tarps, liners), plastic and glass sample bottles, disposable sampling supplies (e.g., filters, tubing, plastic bags), and dry decontamination wastes (e.g., paper items). Less than 1 yd^3 of contact waste was generated and was combined with excavated media.
- WCSF Waste Streams #2, #5, and #6—No municipal solid waste (waste stream #2), petroleum-contaminated soils (waste stream #5), or decontamination fluids (waste stream #6) were generated.

- WCSF EP2016-0128 Waste Stream #3: Drill cuttings—This waste stream consisted of sediment, soil, and rock removed during mechanical auger drilling. Approximately 4 yd^3 of drill cuttings was generated during this investigation and stored in 55-gal. drums.
- WCSF EP2016-0128 Waste Stream #4/WCSF EM2018-0021 Waste Stream # 3: Environmental Media—This waste stream consists of contaminated soil, sediment, and tuff excavated to remove media that exceeds polychlorinated biphenyl cleanup levels. Approximately 282 yd^3 of this waste was generated. This waste stream also includes media from surface and subsurface sampling.
- WCSF EM2018-0021 Waste Stream #4: Excavated Debris—This waste stream consists of residual manmade debris encountered during soil excavation. Debris encountered during the soil excavation includes asbestos-wrapped pipe. Approximately 1 yd^3 of this waste was generated.

Table C-2.0-1
Summary of Waste Generation and Management

WCSF EP2016-0128 Waste Stream #	WCSF EM2018-0021 Waste Stream #	Waste Stream	Waste Type	Volume	Characterization Method	On-Site Management	Disposition
1	1	Contact waste	LLW[a] TSCA[b]	<1 yd3	AK and analytical results of site characterization	Plastic bags, 5.18 yd^3 IP-1 hard-side bags	Energy Solutions, Clive UT
2	2	Municipal solid waste	n/a[c]	0	n/a	n/a	n/a
3	n/a	Drill cuttings	Industrial	4 yd^3	Direct sampling	55-gal. drum	Waste Control Specialists, Andrews TX
4	3	Environmental media	LLW TSCA	282 yd^3	AK and analytical results of site characterization	5.18 yd^3 IP-1 hard-side bags	Energy Solutions, Clive UT
n/a	4	Excavated debris	LLW TSCA	1 yd^3	AK and analytical results of site characterization	5.18 yd^3 IP-1 hard-side bags	Energy Solutions, Clive UT
5	5	Petroleum-contaminated soils	n/a	0	n/a	n/a	n/a
6	6	Decontamination fluids	n/a	0	n/a	n/a	n/a

[a] LLW = Low-level waste.

[b] TSCA = Toxic Substances Control Act.

[c] n/a = Not applicable.

Attachment C-1

Waste Characterization Strategy Forms
(on CD included with this document)

Waste Characterization Strategy Form

Project Title:	WCSF: Middle Los Alamos Canyon PCB Cleanup
Solid Waste Management Unit or Area of Concern #	SWMU 02-014
Activity Type:	Remediation
Project Manager:	Brenda Bowlby
Waste Management Coordinator:	Jeff Lee
Waste Generator:	Ron DeSotel
Completed by:	Ron DeSotel
Date:	7/10/2018

The SUBCONTRACTOR shall implement the requirements under this CONTRACTOR-prepared Waste Characterization Strategy Form (WCSF).

Description of Activity:

The objective of the project is to remediate polychlorinated biphenyl- (PCB-) contaminated soil to industrial and recreational risk screening levels at solid waste management unit (SWMU) 02-014 in Middle Los Alamos Canyon Aggregate Area. The following activities are planned:

<u>Site preparation</u> – This activity includes establishment of site access control immediately before performing survey, site characterization, or remediation activities.

<u>Non-intrusive field surveys</u> – This activity includes the use of various instruments to perform non-intrusive geodetic site surveys. Geodetic surveys will involve the use of Global Positioning System (GPS) or Total Station instruments to determine coordinates of sampling locations and structures as necessary.

<u>Surface and subsurface sampling</u> – This activity includes collection of samples using a hand auger to confirm the excavation boundary on the west and east sides of the site.

<u>Removal of contaminated environmental media</u> – This activity includes the excavation and disposal of contaminated environmental media from SWMU 02-014.

All wastes will be managed in accordance with Newport News Nuclear BWXT – Los Alamos, LLC (N3B) procedures “LANL Waste Management” (N3B 2018) and “Characterization and Management of Environmental Programs Waste” (N3B 2018) and approved integrated work documents.

This WCSF will be implemented before any waste generating activity is undertaken. An amendment to this WCSF will be prepared and submitted for review and approval if any of the waste streams change in description or characterization approach or unanticipated waste streams are generated. The generation of no path forward waste must be approved by the U.S. Department of Energy (DOE) before waste generation.

The activities described in this WCSF will be conducted in a manner that minimizes the generation of waste. Waste streams will be recycled/reused, as appropriate.

Relevant Site History and Description

SWMU 02-014 consists of three former electrical transformer stations (structures 02-31, 02-45, and 02-51) that served buildings in Technical Area 02. Former structure 02-31 was an electrical transformer station located 40 ft behind building 02-01. The transformer station was built in 1944 and was removed in 1950. Former structure 02-45 was built in 1954 to serve building 02-44. The transformer structure consisted of three transformers mounted across two telephone poles approximately 14 ft above the ground. The transformer station was replaced with another transformer station (structure 02-51). Former structure 02-51 was an electrical transformer station located approximately 20 ft southwest of former structure 02-31 and 20 ft southeast of former structure 02-45. Historical records indicated PCB-containing transformer oil had been used at this former transformer station. Structure 02-51 was constructed in 1961 and demolished in 2003.

CHARACTERIZATION STRATEGY

The Subcontractor shall furnish qualified personnel, equipment, materials, and facilities to remove, package, label, and transfer to staging area, all waste generated under this activity. The Subcontractor will coordinate and work with N3B-assigned personnel to ensure that all N3B requirements, DOE orders, and State and Federal regulations are met.

The characterization strategy for waste generated for the identified activities in this WCSF will be based upon direct sampling of the waste, historical site sampling, and approved acceptable knowledge (AK) data/documentation. AK includes a review of existing historical documentation associated with the site, and source term/process identification to identify whether listed hazardous waste may be present (i.e., due diligence review). Waste storage area postings, regulated storage duration, and inspection requirements will be based on the waste type and its regulatory classification.

The selection of waste containers is based on U.S. Department of Transportation requirements, waste types, estimated volumes of waste to be generated, transportation, and the disposal facility waste acceptance criteria. The Contractor (N3B) has determined that use of IP-1 bags are appropriate containers for the remediated soil. The Contractor will be responsible for providing compliant waste containers, pallets, a covering (for filled bags), a bag loading frame, a bag lifting device attachment; establishing staging/storage areas; required staging/storage area inspections; weighing, loading for transportation for disposal; and final disposal of wastes.

Note: The Subcontractor is responsible for the removal of the filled bags from the loading frame and closure of waste bags for on-site movement of filled bags to the staging area.

Immediately following containerization, each waste container will be individually labeled with a unique container identification number and with information regarding waste classification, contents, date generated (out of service date for PCBs), and responsible generator (individual responsible for the management of waste container). Waste containers shall be placed in a Contractor-designated staging/storage area. Containerized waste will be stored on pallets (to be provided by the Contractor) and covered to prevent deterioration. The Subcontractor shall provide a daily waste inventory to the Contractor.

Required sampling and documentation will be performed in accordance with the U.S. Environmental Protection Agency (EPA) Resource Conservation and Recovery Act "RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, and Assessment" (EPA530-D-02-002), and EPA publication "Test Methods for Evaluating Solid Waste: Physical Chemical Methods SW-846" (https://www.epa.gov/hw-sw846).

Sampling personnel must record waste sampling information in accordance with EPA's RCRA Waste Sampling Draft Technical Guidance Section 7.2.3 *Documentation of Field Activities*. Sampling personnel must also record field conditions, problems encountered, local sources of contamination (e.g., operating generators or vehicles), the personnel involved, equipment and supplies used, waste generated, and field observations.

Expected Waste Streams:

Waste #1 — Contact Investigation Derived Waste (IDW): This waste stream is comprised of solid waste generated during investigation and removal activities that has come into contact with contaminated environmental media and equipment. This includes, but is not limited to, personal protective equipment (e.g., gloves), plastic sheeting (e.g., tarps, liners), plastic and glass sample bottles, disposable sampling supplies (e.g., filters, tubing, plastic bags), and dry decontamination wastes (e.g., paper items). It is estimated that less than 55 gal. of Contact IDW will be generated.

Anticipated Regulatory Status: Industrial, Radioactive Low-Level, Toxic Substances Control Act (TSCA)

Characterization Approach: Contact IDW will be managed based upon the regulatory classification of the waste in which it came into contact with.

Storage and Disposal Method: Contact IDW may be containerized in drums or placed into the same containers as the media with which they are contaminated, or may be stored separately from the environmental media until the waste determination is made. At that time, the contact waste may be combined with the environmental media for disposal if appropriate (the waste profile form will document the decision to combine the waste streams). These wastes will be stored in secure, designated waste staging areas. Wastes will be treated and/or disposed in authorized facilities.

Waste #2 — Municipal Solid Waste (MSW): This waste stream primarily consists of non-contact trash including but not limited to paper, cardboard, wood, plastic, food and beverage containers, empty solution containers, and other non-contact trash. This waste stream may also include vegetation from sites with no radioactive contamination. It is estimated that less than 1 yd^3 of MSW will be generated. (Note: the volume may change if vegetation removal is required)

Anticipated Regulatory Status: MSW

Characterization Approach: MSW will be characterized based on AK of the waste materials and the methods of generation or safety data sheets.

Management and Disposal Method: MSW will be segregated from all other waste streams. It is anticipated that the waste will be stored in plastic trash bags or other appropriate containers and disposed of at the Los Alamos County Eco Station or other authorized solid waste facility.

Waste # 3 — Environmental Media: Contaminated soil, sediment, and tuff will be excavated to remove media that exceeds PCB cleanup objectives. This waste stream also includes borehole cuttings from surface and subsurface sampling. Manmade debris may be encountered during soil removal and if possible, will be segregated from the soil and managed appropriately based upon AK of the soil. The small amounts of manmade debris and vegetation that may be present in the excavated material waste stream must be reported in the profile. The total amount of media generated is estimated to be 220 yd^3.

Anticipated Regulatory Status: Radioactive Low-Level, TSCA

Characterization Approach: Characterization will be based upon historical site sampling and approved AK data/documentation. Historical site sampling indicated locations 02-613289 and 02-61452 (identified in Figure 2.2-1 SWMU 02-014, Field Implementation Plan for PCB cleanup at SWMU 02-14) contained detected PCBs greater than 500 mg/kg. All remediated PCB contaminated environmental media will be classified and disposed of as greater than 500 ppm. Historical site sampling detected radionuclides above background values; therefore, in addition to PCB contaminated, this waste will also be classified as radiological contaminated. Historical site samples were, at a minimum, analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total metals, PCBs, total cyanide, nitrates, perchlorate, toxicity characteristic metals, gamma spectroscopy, isotopic uranium, isotopic plutonium, americium-241, tritium, and strontium-90.

If process knowledge, odors, or staining indicates the media may be contaminated with petroleum products, the materials will be analyzed for total petroleum hydrocarbons (TPH) diesel range organics/gasoline range organics (DRO/GRO). Other constituents may be analyzed as necessary to meet the waste acceptance criteria for a receiving facility.

Storage and Disposal Method: The excavated media will be containerized at the point of generation and stored in secure, designated waste staging areas. The containers will be appropriate for the quantity of wastes generated. Media will be managed in a registered PCB storage area until it can be shipped for disposal. Excavated environmental media will be treated and/or disposed of in authorized facilities appropriate for the waste regulatory classification.

Waste # 4 — Excavated Debris: This waste stream consists of residual manmade debris encountered during soil excavation and if possible, the debris will be segregated from the soil and managed appropriately based upon AK of the soil. Debris will contain less than 1% associated soil. The total amount of debris to be generated is estimated to be less than 0.5 yd^3.

Anticipated Regulatory Status: Industrial, Radioactive Low-Level, TSCA

Characterization Approach: Characterization of the excavated debris will be based on AK of the waste materials, the methods of generation, the extent of contamination, and analysis of the material contacted (e.g., excavated soil).

Storage and Disposal Method: The excavated debris will be containerized at the point of generation and stored in secure, designated waste staging areas. Excavated debris will be treated and/or disposed of in authorized facilities appropriate for the waste regulatory classification.

Waste # 5 — Petroleum Contaminated Soils (PCS) (potential): This waste stream is comprised of soils contaminated because of the accidental release of commercial products such as hydraulic fluid, motor oil, unleaded gasoline, or diesel fuel (e.g., from the rupture of hydraulic or fuel hoses, or spills during maintenance, etc.). The waste stream may also include adsorbent padding, paper towels, spill pillows or other adsorbent material used to contain the released material and added to the containerized PCS waste for storage and disposal. The amount of potential PCS is expected to be less than 1 yd^3.

Anticipated Regulatory Status: New Mexico Special Waste (NMSW), Hazardous, Radioactive Low-Level, TSCA, Industrial

Characterization Approach: PCS will be characterized based upon either AK or direct waste sampling. If the material spilled is known and the spill occurs on known material (historical site sample data, clean base course), AK can be used to characterize the waste. If the spill is of an unknown material/origin or occurs in an area with no historical sampling data, characterization will be based upon the analytical results from direct sampling either performed in place (same day as spill/containerization) or from the containerized waste within 10 days of final generation. For spills of an unknown material/origin, samples will be collected in the following way:

- For spills containerized, or shallow spills being sampled in place, the samples will be collected in accordance with EPA "RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, and Assessment" (EPA530-D-02-002)

The analysis of the samples will be dependent on where the spill occurred as follows:

- If the spill occurred on soil (non-hazardous, non-radioactive), samples will be analyzed for VOCs, TPH DRO/GRO, and toxicity characteristic leaching procedure (TCLP) metals, at a minimum. These analytical suites are required to determine whether the waste is NMSW. Other constituents may be analyzed as necessary to meet the disposal facility waste acceptance criteria.
- If the spill occurs on soils with no available/reliable AK documentation, soil will be sampled for TCLP VOCs, TCLP SVOCs, pesticides, herbicides, TCLP metals, PCBs, cyanide, nitrates, perchlorate, gamma spectroscopy, isotopic uranium, isotopic plutonium, americium-241, tritium, strontium-90, and TPH DRO/GRO.

All samples will be submitted with a 21-day turnaround time for analysis so that a waste determination can be made within 30 days of generation. The "initial" date or date of generation for NMSW is the date the container is completely full or the date in which no additional NMSW will be added to the container. The "final" date (or the date starting the 90-day NMSW clock) is the date that the validated analytical data is received.

Sampling personnel must record waste sampling information in accordance with EPA "RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, and Assessment" (EPA530-D-02-002).

Storage and Disposal Method: PCS will be containerized at the point of generation on the same day that the spill occurred. If AK for the site indicates that the soil will not be contaminated with radioactive or hazardous materials, the PCS will be managed as NMSW and the NMSW start date will be the date the container is completely full or the date in which no additional NMSW will be added to the container. If AK for the site indicates that the soil could be contaminated with hazardous materials, the PCS will be stored in a clearly marked and constructed waste accumulation area appropriate to the anticipated waste type. Waste accumulation area postings, regulated storage duration, and inspection requirements will be based upon the waste classification.

Waste # 6 — Decontamination Fluids (potential): This waste stream consists of liquid wastes generated from the decontamination of excavation, sampling, and drilling equipment. This waste stream will be generated only if dry decontamination methods are not effective. It is estimated that less than 55 gal. of decontamination fluids will be generated.

Anticipated Regulatory Status: Radioactive Low-Level, TSCA

Characterization Approach: The decontamination water will be characterized by direct sampling of the containerized fluids within 10 days after final generation. Representative waste characterization samples will be collected with a 21-day analytical data turnaround to ensure that wastes can be dispositioned within 90 days, if necessary. Analyses of the media associated with the decontamination fluids may also be used to augment the characterization.

Storage and Disposal Method: Decontamination water will be containerized at the point of generation and initially managed as non-hazardous/radioactive low-level pending review of analytical results to determine final waste characterization.

If the fluids are characterized as PCB-contaminated at greater than 50 ppm, they will be managed in a registered PCB storage area until they can be shipped for disposal. Decontamination fluids will be treated and/or disposed of in authorized facilities appropriate for the waste regulatory classification.

CHARACTERIZATION TABLE

Waste Description	**Waste #1** Contact IDW	**Waste #2** MSW	**Waste #3** Environmental Media	**Waste #4** Excavated Debris	**Waste #5** PCS	**Waste #6** Decon Fluids
Estimated Volume	<55 gal.	<1yd^3	220 yd^3	<0.5 yd^3	<1 yd^3	<55 gal.
Packaging	Approved Containers	Approved Containers	IP-1 Bags	Approved Containers	Approved Containers	Approved Containers
Regulatory classification:						
Radioactive Waste	X		X	X	X	X
MSW		X				
Waste destined for LANL's SWWS or RLWTF[1]						
Hazardous Waste					X	
Mixed (hazardous and radioactive) Waste						
PCBs-Contaminated Waste	X		X	X	X	X
NMSW					X	
Industrial Waste	X				X	
Characterization Method						
AK: Existing Data/Documentation	X	X	X	X	X	X
AK: Site Characterization	X			X	X	
Direct Sampling of Waste					X	X
Analytical Testing						
VOCs (EPA 8260-B)			X	X	X	X
SVOCs (EPA 8270-C)			X	X	X	X
Organic Pesticides (EPA 8081-A)				X		X
Organic Herbicides (EPA 8151-A)				X		X
PCBs (EPA 8082)			X	X	X	X
Total Metals (EPA 6010-B/7471-A or EPA 6020)			X	X		
Total Cyanide (EPA 9012-A)			X	X		X
High Explosives Constituents (EPA 8330/8321-A)						
Asbestos (EPA 600M4)						
TPH-GRO (EPA 8015-M)					X*	
TPH-DRO (EPA 8015-M)					X*	
TCLP Metals (EPA 1311/6010-B)			X		X	X
TCLP Organics (EPA 1311/8260-B & 1311/8270-C)						
TCLP Pest. & Herb. (EPA 1311/8081-A/1311/8151-A)						
Gross Alpha (alpha counting) (EPA 900)			X	X	X	X
Gross Beta (beta counting) (EPA 900)			X	X	X	X
Tritium (liquid scintillation) (EPA 906.0)			X	X	X	X
Gamma spectroscopy (EPA 901.1)			X	X	X	X
Isotopic plutonium (HASL-300)			X	X	X	X

CHARACTERIZATION TABLE

Waste Description	**Waste #1** Contact IDW	**Waste #2** MSW	**Waste #3** Environmental Media	**Waste #4** Excavated Debris	**Waste #5** PCS	**Waste #6** Decon Fluids
Isotopic uranium (HASL-300)			X	X	X	X
Americium-241 (HASL-300)			X	X	X	X
Strontium-90 (EPA 905)			X	X	X	X
Perchlorates (EPA 6850)			X	X		X
Nitrates/Nitrites (EPA 300.09-soil or 343.2-water)			X	X		X
Oil / Grease (EPA 1665)						
Fluorine, Chorine, Sulfate (EPA 300)						
TTO (EPA 8260-B and EPA 8270-C)[2]	**Request VOCs and SVOCs above**					
TSS and TDS (EPA 160.1 and 160.2)						X
COD (EPA 410.4)						X
pH (EPA 904c)						X
Microtox or BOD[3]						X
Waste Stream Profile	TBD[4]	TBD	TBD	TBD	TBD	TBD

* As needed.1 in addition to other analytes needed to characterize the waste (e.g., VOC, SVOC, total metals), analyze for total suspended solids (TSS), total dissolved solids (TDS), oil and grease, gross alpha, gross beta, tritium, and potential of hydrogen (pH) for liquids destined for the Los Alamos National Laboratory (LANL) sanitary waste water system (SWWS). For wastes destined for the Radioactive Liquid Waste Treatment Facility (RLWTF), additional constituents include total toxic organics (TTO), TSS, chemical oxygen demand (COD), pH, total nitrates/nitrites, and gross alpha, gross beta (not including tritium), and gross gamma **or** the sum of individual alpha-, beta-, and gamma-emitting nuclides.

[2] TTO is the total of VOC and SVOC contaminants. Request methods EPA 8260-B (VOCs) and EPA 8270-C (SVOCs).

[3] If Microtox analysis is not available, request biological oxygen demand (BOD).

[4] TBD = to be determined.

References:

- 40 Code of Federal Regulations 261.24, 40 Code of Federal Regulations Part 261, Identification and Listing of Hazardous Waste, Subpart C, Section 24, Toxicity Characteristic.
- EPA (U.S. Environmental Protection Agency) 2002. “RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, and Assessment,” EPA document number EPA530-D-02-002 (August 2002).
- EPA (U.S. Environmental Protection Agency) 2014 “Test Methods for Evaluating Solid Waste: Physical Chemical Methods SW-846” (https://www.epa.gov/hw-sw846) (July 2014).
- “Field Implementation Plan for PCB Cleanup at SWMU 02-014.” (in draft form)
- N3B (Newport News Nuclear BWXT – Los Alamos, LLC) 2018. “Characterization and Management of Environmental Programs Waste,” N3B document number EP-DIR-SOP-10021 RI.
- N3B (Newport News Nuclear BWXT – Los Alamos, LLC) 2018. “Characterization and Management of Environmental Programs Waste,” N3B document number EP-DIR-SOP-10021 RI.
- N3B (Newport News Nuclear BWXT – Los Alamos, LLC) 2018. N3B document number P-409 R7, “LANL Waste Management,” (effective June 08, 2018).

Signatures	**Date**
Project Manager (Print name and then sign below.) Brenda Bowlby	8/7/18
Waste Generator (Print name and then sign below.) Ron DeSotel	8/7/18
Waste Management Coordinator (Print name and then sign below.) Jeff Lee	8/7/18
N3B RCRA Representative (Print name and then sign below.) Emily Day	8/7/18
Waste Acceptance Representative (Print name and then sign below.) Ellen Gammon	8/9/18
Waste Certification Program Representative (Print name and then sign below.) Ellen Gammon	8/9/18

Waste Characterization Strategy Form

Project Title:	Middle Los Alamos Canyon, PRSs 02-005, AOC 02-011(d), AOC 02-011(a)(ii)
Solid Waste Management Unit or Area of Concern #	SWMUs/AOCs: 02-005, AOC 02-011(d), AOC 02-011(a)(ii)
Activity Type:	Investigation Sampling and Remediation
Project Manager:	Todd Haagenstad
Waste Management Coordinator:	Jon Roberson
Waste Generator:	Ryan Wells
Completed by:	Jon Roberson
Date:	10/12/2016

The SUBCONTRACTOR shall implement the requirements under this CONTRACTOR prepared Waste Characterization Strategy Form (WCSF).

Description of Activity:

The objective of the project is to complete sampling and remediation activities for the three identified SWMUs and AOCs. The project is to be executed in accordance with the supplied exhibit "D" Scope of Work and Technical Specifications, Middle Los Alamos Canyon, PRSs 02-005, AOC 02-011(d), AOC 02-011(a)(ii). The following activities are planned:

Site preparation – This activity includes establishment of site access control immediately prior to performing survey, site characterization, or remediation activities.

Non-intrusive field surveys – This activity includes the use of various instruments to perform non-intrusive geodetic and geophysical site surveys. Geodetic surveys will involve the use of GPS or Total Station instruments to determine coordinates of sampling locations and structures as necessary.

Surface and subsurface sampling – This activity includes collection of samples using hand auger, spade and scoop, and/or core-barrel (hollow-stem auger drill rig) methods. The method(s) used will depend on site conditions and depth of required samples; all samples will be collected using hand methods if possible, and a drill rig will be used only at sites where samples cannot be collected by hand.

Removal of contaminated environmental media – This activity includes the characterization, removal and disposal of contaminated excavated environmental media from AOC 02-011(a)(ii).

Relevant Site History and Description

TA-02

TA-02 was used to house a series of research reactors from 1943 to 2003 when the decontamination and decommissioning (D&D) of the site occurred. The main reactor building (02-1) was constructed in 1943. It housed five separate nuclear reactors: three iterations of water boiler reactors (WBRs) located on the east side of the building, one plutonium fueled reactor (the Clementine Reactor) followed by an enriched uranium reactor, and the Omega West Reactor (OWR). A number of facilities were constructed over the years to support the TA-02 research activities. TA-02 was active from 1943 to 1993.

Various remedial actions such as soil removal and D&D were conducted at TA-02 after the Cerro Grande fire. These actions were taken to reduce the risk of contaminants dispersing from post-fire floods. Approximately 54 yd^3 of soil contaminated with cesium-137 was removed in 2000 following an extensive field survey for gross-gamma radiation. The OWR and associated structures underwent D&D in 2002 and 2003. After all structures at TA-02 were removed, field radiological surveys were conducted to confirm that surface contamination release limits were not exceeded. The land was returned to its original contour and reseeded.

Table 1 provides a summary of the areas, site descriptions and proposed activities which are addressed in this WCSF:

Table 1
Middle Los Alamos Canyon SWMUs and AOCs

AOC/SWMU	Site Description	Investigation Activities	Potential Contaminants	Potential Waste Determinations
SWMU 02-005	SWMU 02-005 consists of an area of soil potentially affected by the airborne drift of potassium dichromate used to inhibit corrosion in the OWR cooling tower (former structure 02-049). Potassium dichromate was added to the circulating water to inhibit corrosion of the heat exchangers. In 1975, stainless-steel heat exchangers were installed to eliminate the use of potassium dichromate. The cooling tower operated until the OWR was shut down in 1993. In 1995, all liquid was drained from the system. In 2000, the cooling tower structure and associated equipment were removed and disposed of. In 2003, the remaining buried pipes and drains were removed.	Sampling to characterize nature and extent of PCB contamination present at the site.	2007 and 2010 sampling data showed PCBs detected above 1 mg/kg but less than 50 mg/kg in multiple samples. Am-241, Cs-137, Pu-238, Pu-239/240 and Tritium were detected above background values. Metals were detected above background values.	Industrial LLW
AOC 02-011(d)	AOC 02-011(d) is a former NPDES-permitted outfall that discharged effluent from the reactor facility equipment building [former building 02-44, AOC 02-004(f)]. Discharges consisted of primary cooling water from an ion-exchange system. Primary cooling water was circulated in the ion-exchange system to remove contaminants. Periodically flushing municipal water through the system would regenerate the ion-exchangers. Before 1963, effluent discharged directly to Los Alamos Creek. From 1963 to 1968, the effluent was held in three 1200-gal. storage tanks [AOCs 02-004(b-d)] until short-lived radionuclides decayed or were diluted to a safe level before it was discharged to the	Sampling to characterize the nature and extent of any contamination present at the site.	2007 and 2010 sampling data showed PCBs detected less than 1 mg/kg in 3 samples. PAHs were detected in 3 samples. Metals were detected above background values. Cs-137, Pu-239/240, Tritium, and U-234 were detected above background values.	Industrial LLW

AOC/SWMU	Site Description	Investigation Activities	Potential Contaminants	Potential Waste Determinations
	creek. After 1968, the effluent transferred to the three 1200-gal. tanks and was transported to the TA-50 RLWTF. AOC 02-011(d) was removed from the NPDES-permit effective July 11, 1995.			
AOC 02-011(a)(ii)	AOC 02-011(a) consists of 11 drain segments and associated outfalls across TA-02. These individual segments drain either directly or indirectly to Los Alamos Creek. 02-011(a)(ii) was a 24-in.-diameter, 8-ft-long underground corrugated metal pipe between catch basin 02-036 and catch basin 02-027, as shown on engineering drawing R-5102, sheet 2 of 2. There is no information that the drain handled anything but stormwater.	Sampling to characterize nature and extent of PCB contamination present at the site. Remove approximately 450 cubic yards of PCB-contaminated soil.	2007 and 2010 sampling data showed PCBs detected above 1 mg/kg in multiple samples and above 50 mg/kg in one sample. PAHs were detected in 3 samples from 1 location. Tritium, Pu-239/240, and U-235/236 were detected above background in one sample each. Metals were detected above background values.	Industrial LLW TSCA

CHARACTERIZATION STRATEGY

Subcontractor shall furnish qualified personnel, equipment, materials, waste containers, and facilities to remove, package, label, stage, load, transport, and dispose all waste generated under this activity. The Subcontractor will coordinate and work with LANL's STR to ensure that all LANL requirements, DOE Orders, State, and Federal regulations are met.

The characterization strategy for waste generated for the identified activities in this WCSF will be based upon direct sampling and/or approved AK data/documentation with each site. AK includes review of existing historical documentation associated with each site, and may also include source term/process identification performed to identify whether listed hazardous waste may be present (i.e., due diligence review). Waste accumulation area postings, regulated storage duration, and inspection requirements will be based on the waste type and its regulatory classification.

If analytical data or AK documentation indicate the presence of listed constituents that are not associated with a listed source, a due diligence document review may be performed to identify whether the contaminants are from a listed process. If no or inconclusive documentation of a listed source exists, the waste will not carry the listed hazardous waste numbers(s). If documentation exist that the contaminant(s) originated from a listed source but the levels are below residential screening levels and the land disposal restriction treatment standards, a "contained-in" request may be submitted to the NMED, who may approve dropping the listings from the waste stream. A copy of either the ECP-CP approved due diligence or the NMED contained-in approval letter must accompany all waste profiles prepared for the subject waste(s).

The selection of waste containers will be based on U.S. Department of Transportation requirements, waste types, estimated volumes of waste to be generated, and the disposal facility Waste Acceptance Criteria (WAC). The Subcontractor will be responsible for providing compliant waste containers. The LANL WMC may be consulted for the appropriate waste containers, if needed. Subcontractor shall submit a draft Waste Profile to LANL for each waste stream. The draft Waste Profile shall include all supporting documentation (e.g., analytical data, COC's, radiological data, sampling methods, frequency and location).

Immediately following containerization, each waste container will be individually labeled with a unique container identification number and with information regarding waste classification, contents, date generated, and responsible generator (individual responsible for the generation and management of waste container). A waste determination must be made within 30 days of the generation of the waste. A WAC waste exception form (WEF) can be used if the generator does not meet the 30 day deadline. If waste is intended to be disposed of at NNSS, contact LANL WCO prior to waste generation activities and packaging of waste. Subcontractor shall verify all waste containers were closed and sealed per manufactures or recommended industry standards written instructions for packaging type. Container and waste weights and volumes shall be provided for waste profile and manifest documents.

Required sampling and documentation will be performed in accordance with EPA RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, and Assessment (EPA530-D-02-002), and EPA publication, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods SW-846.

A representative sample will be taken within 10 days of generation (i.e., date of initial placement into container) so that a waste determination can be made within 30 days of generation and wastes disposed within 90 days, if necessary. All samples will be submitted with a 21-day turnaround time for analyses. Multiple sampling events may be required to ensure WAC requirements are met. Standard analytical turnaround time is anticipated to be 30 calendar days. In the event a waste is suspected to be hazardous, the total waste volume exceeds 55 gallons and a <90-day Accumulation Area is required, then an expedited analytical turnaround time will be needed to meet the 90-day time limit. Environmental Stewardship sample support will be notified if an expedited analysis is necessary.

Sampling personnel must record sampling information in accordance with EPA's RCRA Waste Sampling Draft Technical Guidance Section 7.2.3 Documentation of Field Activities. Sampling personnel must also record field conditions, problems encountered, local sources of contamination (e.g., operating generators or vehicles), the personnel involved, equipment and supplies used, waste generated, and field observations.

Expected Waste Streams:

Waste #1 - Contact IDW: This waste stream is comprised of solid waste generated during investigation and removal activities that has come into contact with contaminated environmental media and equipment. This includes, but is not limited to: personal protective equipment (PPE) (e.g., gloves); plastic sheeting (e.g., tarps, liners); plastic and glass sample bottles; disposable sampling supplies (e.g., filters, tubing, plastic bags); and dry decontamination wastes, such as paper items. It is estimated that less than 55 gallons of Contact IDW will be generated.

Anticipated Regulatory Status: Industrial, LLW, TSCA

Characterization Approach: Contact IWD will be managed based upon the regulatory classification of the waste in which it came into contact with.

Storage and Disposal Method: The contact waste may be containerized in drums or placed into the same containers as the media with which they are contaminated, or may be stored separately from the environmental media until the waste determination is made. At that time the contact waste may be combined with the environmental media for disposal if appropriate (the WPF will document the decision to combine the waste streams). These wastes will be stored in secure, designated waste staging areas. Wastes will be treated and/or disposed in authorized facilities.

Waste #2 - Municipal Solid Waste (MSW): This waste stream primarily consists of non-contact trash including but not limited to paper, cardboard, wood, plastic, food and beverage containers, empty solution containers, and other non-contact trash. This waste stream may also include vegetation from sites with no radioactive contamination (Note: Volume may change if vegetation removal is required).

Anticipated Regulatory Status: Municipal solid waste

Characterization Approach: MSW will be characterized based on AK of the waste materials and the methods of generation or Safety Data Sheets (SDSs).

Management and Disposal Method: MSW will be segregated from all other waste streams. It is anticipated that the waste will be stored in plastic trash bags or other appropriate containers and disposed of at the County of Los Alamos Landfill or other authorized solid waste facility.

Waste # 3 - Drill Cuttings IDW This waste stream consists of soil and rock chips generated by the mechanized drilling of boreholes with the intent to collect a sample. This may include small chips or unused core samples collected with a hollow-stem auger core barrel. Cuttings will not contain residue of drilling additives (drilling mud or foam) as only dry drilling will be used. It is estimated that approximately 5 yds^3 of drill cuttings will be generated.

Anticipated Regulatory Status: Industrial, LLW, TSCA, Reusable (land applied)

Characterization Approach: This waste stream will be characterized based on direct sampling of the waste. A representative sample of the cuttings will be collected for every 40 yd^3 generated. Drill cuttings from a single potential release site (PRS) may be combined into a single container before sampling, but cuttings from different PRSs will not be combined prior to sampling. Samples will, at a minimum, be analyzed for volatile organic compounds (VOCs); semi-volatile organic compounds (SVOCs); pesticides, herbicides, PCBs, total metals, total cyanide, nitrates, perchlorate, toxicity characteristic (TCLP) metals, gamma spec, isotopic uranium, isotopic plutonium, isotopic thorium, americium-241, radium, tritium, strontium-90, gross alpha, and gross beta.
If process knowledge, odors, or staining indicates the cuttings may be contaminated with petroleum products, the materials will be analyzed for total petroleum hydrocarbons (TPH DRO/GRO). Other constituents may be analyzed as necessary to meet the waste acceptance criteria (WAC) for a receiving facility.

Storage and Disposal Method: The cuttings will be collected and containerized at the point of generation and stored in secure, designated waste staging areas. The containers will be appropriate for the quantity of wastes generated (e.g., roll-off bins for large quantities of wastes and drums for small quantities of waste). If the cuttings are characterized as PCB-contaminated at greater than 50 parts per million (ppm), then the cuttings will be managed in a registered PCB storage area until they can be shipped for disposal. If there is no known PCB source and the PCB concentration is less than 50 ppm, then the IDW may be managed as non-PCB contaminated. Cuttings meeting the criteria of the NMED approved NOI decision tree for land application, ENV-RCRA-QP-011, may be land applied. Cuttings that cannot be land applied will be treated and/or disposed of in authorized facilities appropriate for the waste regulatory classification.

Waste # 4 – Environmental Media: Contaminated soil, sediment, and tuff will be excavated from AOC 02-011(a)(ii) to remove media that exceeds cleanup objectives for PCBs. Manmade debris is not expected but small amounts may be encountered during soil removal and if possible, will be segregated from the soil and managed appropriately, based upon AK of the soil. Small amounts of manmade debris and vegetation may be present in the excavated material waste stream; however, it must be reported in the profile. The total amount of media removed is expected to be approximately 450 yd^3.

Anticipated Regulatory Status: Industrial, LLW, TSCA

Characterization Approach: A minimum of one composite sample will be collected from each 40 yd^3 of material excavated and submitted for laboratory analyses. Incremental samples of the excavated media

will be collected as it is excavated or representative samples may be collected from the containers. Samples will, at a minimum, be analyzed for volatile organic compounds (VOCs); semi-volatile organic compounds (SVOCs); pesticides, herbicides, PCBs, total metals, total cyanide, nitrates, perchlorate, toxicity characteristic (TCLP) metals, gamma spec, isotopic uranium, isotopic plutonium, isotopic thorium, americium-241, radium, tritium, strontium-90.
If process knowledge, odors, or staining indicates the media may be contaminated with petroleum products, the materials will be analyzed for total petroleum hydrocarbons (TPH DRO/GRO). Other constituents may be analyzed as necessary to meet the waste acceptance criteria (WAC) for a receiving facility.

Storage and Disposal Method: The excavated media will be containerized at the point of generation and stored in secure, designated waste staging areas. .The containers will be appropriate for the quantity of wastes generated (e.g., roll-off bins for large quantities of wastes and drums for small quantities of waste). The media will initially be managed as PCB <50 ppm based on historical samples collected from the AOC. If the media is characterized as PCB-contaminated at greater than 50 parts per million (ppm), it will be managed in a registered PCB storage area until it can be shipped for disposal. If there is no known PCB source and the PCB concentration is less than 50 ppm, then the IDW may be managed as non-PCB contaminated. Excavated environmental media will be treated and/or disposed of in authorized facilities appropriate for the waste regulatory classification.

Waste # 5- Petroleum Contaminated Soils (PCS) (potential): This waste stream is comprised of soils contaminated due to the accidental release of commercial products such as hydraulic fluid, motor oil, unleaded gasoline, or diesel fuel (e.g., from the rupture of hydraulic or fuel hoses, or spills during maintenance, etc.). It may also include adsorbent padding, paper towels, spill pillows or other adsorbent material used to contain the released material and added to the containerized PCS waste for storage and disposal. The amount of potential PCS is expected to be less than 1 yd^3.

Anticipated Regulatory Status: New Mexico Special Waste (NMSW), Hazardous, LLW, Mixed, TSCA, Industrial

Characterization Approach: PCS will be characterized based upon either AK or direct waste sampling. If the material spilled is known and the spill occurs on clean base course (non-hazardous, non-radioactive), AK can be used to characterize the waste as NMSW. If the spill is of an unknown material/origin or occurs in a SWMU or AOC, characterization will be based upon the analytical results from direct sampling either performed in place (same day as spill/containerization) or from the containerized waste within 10 days of generation. For spills of an unknown material/origin, or within an AOC, PRS, or SWMU, samples will be collected in one of the following two ways:

- For spills containerized, or shallow spills being sampled in place, the samples will be collected in accordance with *EPA RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, and Assessment (EPA530-D-02-002)*

The analysis of the samples will be dependent on where the spill occurred as follows:

- If the spill occurred on clean soil (non-hazardous, non-radioactive), samples will be analyzed for VOCs, TPH, gasoline-range and diesel-range (DRO/GRO), and TCLP metals, at a minimum. These analytical suites are required to determine whether the waste is NMSW. Other constituents may be analyzed as necessary to meet the WAC of the disposal facility.
- If the spill occurs on soils with known hazardous or radioactive contaminants, or soils with no available/reliable AK documentation, soil will be sampled for TCLP VOCs, SVOCs, pesticides,

herbicides, TCLP Metals, PCBs, cyanide, nitrates, perchlorate, gamma spectroscopy, isotopic uranium, isotopic plutonium, americium-241, tritium, strontium-90, and TPH DRO/GRO.

All samples will be submitted with a 21 day turnaround time for analysis so that a waste determination can be made within 30 days of generation. The "initial" date or date of generation for NMSW is the date the container is completely full or the date in which no additional NMSW will be added to the container. The "final" date (or the date starting the 90 day NMSW clock) is the date that the validated analytical data is received.

Sampling personnel must record sampling information in accordance with EPA RCRA Waste Sampling Draft Technical Guidance, Planning, Implementation, and Assessment (EPA530-D-02-002).

Storage and Disposal Method: PCS will be containerized at the point of generation on the same day that the spill occurred. If AK for the site indicates that the soil will not be contaminated with radioactive or hazardous materials, the PCS will be managed as NMSW and the NMSW start date will be the date the container is completely full or the date in which no additional NMSW will be added to the container. If AK for the site indicates that the soil could be contaminated with hazardous materials the PCS will be stored in a clearly marked and constructed waste accumulation area appropriate to the anticipated waste type. Waste accumulation area postings, regulated storage duration, and inspection requirements will be based upon the waste classification. The following provides the management and disposal pathways for PCS that has a final waste determination:

1. PCS that is not contaminated with radioactive or hazardous materials will be managed as NMSW if one or more of the following conditions are met:
    - If the sum of benzene, toluene, ethyl benzene, and xylene isomer concentrations are greater than 50mg/kg.
    - If benzene individually is equal to or greater than 10 mg/kg (Note: If benzene concentrations are equal to or greater than 0.5 mg/L, based upon TCLP, it is a hazardous waste, not a NMSW).
    - If TPH (DRO + GRO) concentration is greater than 100 mg/kg. PCS that is characterized as NMSW will remain in the registered NMSW area until it is shipped for disposal to an authorized off-site facility.
2. PCS that is not contaminated with radioactive or hazardous materials will be managed as industrial waste if the contaminant levels are less than the NMSW and/or PCB regulatory levels. PCS that is characterized as industrial waste will be removed from the registered NMSW area and stored as industrial waste until it is shipped for disposal to an authorized off-site facility.
3. PCS that is characterized as LLW will be moved to a radioactive waste staging or storage area it can be shipped for disposal to an authorized off-site facility.
4. PCS characterized as Hazardous or MLLW will be managed in a less than 90-Day Storage Area (with a start date equal to the earliest date of generation by container) or SAA until it can be shipped for disposal to an authorized off-site facility.

Waste # 6 - Decontamination Fluids (potential): This waste stream consists of liquid wastes generated from the decontamination of excavation, sampling and drilling equipment. This waste stream will be generated only if dry decontamination methods are not effective. It is estimated that less than 55 gallons of decontamination fluids will be generated.

NOTE: Decontamination fluids that include surfactants (e.g., Alconox) can be difficult to dispose of if the analytical results indicate a Chemical Oxygen Demand (COD) that exceeds the RLWTF WAC of 250 mg/L (P930-1, Attachment 1, 1.4.1 Unacceptable Wastewaters). Surfactants are acceptable to use in decontamination solutions but in limited quantities (not in excess of manufacturer recommendations or less than 0.2% by weight).

***Anticipated Regulatory Status**:* Industrial, LLW, TSCA

Characterization Approach: The decontamination water will be characterized by direct sampling of the containerized fluids within 10 days after generation. Representative waste characterization samples will be collected with a 21-day analytical data turnaround to ensure that wastes can be dispositioned within 90 days, if necessary. Analyses of the media associated with the decontamination fluids may also be used to augment the characterization.

***Storage and Disposal Method*:** Decontamination water will be containerized at the point of generation and initially managed as non-hazardous/non-radiological pending review of analytical results to determine final waste characterization.

If the fluids are characterized as PCB-contaminated at greater than 50 parts per million (ppm), they will be managed in a registered PCB storage area until they can be shipped for disposal. Decontamination fluids will be treated and/or disposed of in authorized facilities appropriate for the waste regulatory classification.

TABLE 2- CHARACTERIZATION TABLE

NOTE: Multiple sampling may be required to ensure WAC requirements are met.

Waste Description	Waste #1 Contact Waste	Waste #2 Municipal Solid Waste	Waste #3 Drill Cuttings IDW	Waste #4 Environmental Media	Waste #5 PCS (potential)	Waste #6 Decon Fluids (potential)
Estimated Volume	55 gallons	5 yd^3	20 yd^3	450 yd^3	<1 yd^3	<55 gallons
Packaging	Approved Container	Approved Container	Approved Container	Approved Container	Approved Container	Approved Container
Regulatory classification:						
Radioactive Waste	X		X	X	X	X
Reusable Material/ Recycle			X			
Municipal Solid Waste (MSW)		X				
Waste destined for LANL's SWWS or RLWTF [1]						X
Hazardous Waste					X	
Mixed (hazardous and radioactive) Waste			X	X	X	
Toxic Substances Control Act (TSCA)	X		X	X	X	X
New Mexico Special Waste					X	
Industrial Waste	X		X	X	X	X
Characterization Method						
Acceptable knowledge (AK): Existing Data/Documentation	X	X			X	
AK: Site Characterization	X					
Direct Sampling of Waste			X	X	X	X
Analytical Testing						
Volatile Organic Compounds (EPA 8260-B)			X	X	X	X
Semivolatile Organic Compounds (EPA 8270-C)			X	X	X As needed	X
Organic Pesticides (EPA 8081-A)			X	X	X As needed	X
Organic Herbicides (EPA 8151-A)			X	X	X As needed	X
PCBs (EPA 8082)			X	X	X As needed	X
Total Metals (EPA 6010-B/7471-A)			X	X	X As needed	X
Total Cyanide (EPA 9012-A)			X	X	X As needed	X
Nitrates/Nitrites (EPA 300.09)			X	X	X As needed	X[1]
Dioxins/Furans (EPA 1613B)						
Oil/Grease (EPA 1665)						X[1]
Fluoride, Chlorine, Sulfate (EPA 300)						X[1]
TTO (EPA 8260-B and EPA 8270-C) [2]						X[1]
Total Suspended & Dissolved Solids (TSS) and Total Dissolved Solids (TDS) (EPA 160.1 and 160.2)						X[1]
Chemical Oxygen Demand (COD) (EPA 410.4)						X[1]
pH (EPA 904c)						X
Microtox or Biological Oxygen Demand (BOD) [3]						X[1]
Perchlorates (EPA 6850)			X	X	X As needed	X
High Explosives Constituents (EPA 8330/8321-A)						
Asbestos						
BTEX (EPA-8021b)						

Waste Description	Waste #1 Contact Waste	Waste #2 Municipal Solid Waste	Waste #3 Drill Cuttings IDW	Waste #4 Environmental Media	Waste #5 PCS (potential)	Waste #6 Decon Fluids (potential)
Total petroleum hydrocarbon (TPH)-GRO (EPA 8015-M) TPH-DRO (EPA 8015-M)			X[4] as needed	X[4] As needed	X	
Toxicity characteristic leaching procedure (TCLP) Metals (EPA 1311/6010-B)			X	X	X	
TCLP Organics (EPA 1311/8260-B & 1311/8270-C)					X As needed	
TCLP Pest. & Herb. (EPA 1311/8081-A/1311/8151-A)						
Radium 226 & 228 (EPA 9320)			X	X		X
Gross Alpha (alpha counting) (EPA 900)			X			X[1]
Gross Beta (beta counting) (EPA 900)			X			X[1]
Tritium (liquid scintillation) (EPA 906.0)			X	X	X As needed	X
Gamma spectroscopy (EPA 901.1)			X	X	X As needed	X
Isotopic plutonium (Chem. Separation/alpha spec.) (HASL-300)			X	X	X As needed	X
Isotopic uranium (Chem. Separation/alpha spec.) (HASL-300)			X	X	X As needed	X
Total uranium (EPA 6020)						X[1]
Strontium-90 (EPA 905)			X	X	X As needed	X
Americium-241 (Chem. Separation/alpha spec.) (HASL-300)			X	X	X As needed	X
Isotopic Thorium			X	X	X As needed	X
Waste Profile Form #	TBD	TBD	TBD	TBD	TBD	TBD

1 Additional analyses required for wastes destined for SWWS and/or RLWTF. Also request total phosphorus and total nitrogen for disposal at SWWS and/or RLWTF.
2 TTO is the total of volatile organic and semi-volatile organic compound contaminants. Request methods EPA 8260-B (VOCs) and EPA 8270-C (SVOCs).
3 If Microtox analysis is not available, request BOD.
4 If required by a receiving facility's WAC or if required due to discovered contamination (e.g., TPH and PCBs).

Notes: If data are insufficient to make a definitive regulatory classification at the time of WCSF completion, more than one box on the characterization table may be checked, along with an explanation in the text section. The final regulatory classification will be reflected on the waste profile form. The table identifies the suite of analyses required based on site knowledge, information needed by the anticipated receiving facility, or for land application, if applicable.

Section 1.2 of the TCLP method 1311 states "If a total analysis of the waste demonstrates that individual analytes are not present in the waste, or that they are present but at such low concentrations that the appropriate regulatory levels could not possibly be exceeded, the TCLP need not be run." The methodology for using total waste analyses determination for the 40 TC constituents in soil is as follows:

Liquids – Wastes containing less than 0.5% filterable solids do not require extraction and therefore by filtering the waste and measuring the total constituent level of the filtrate and comparing those levels to regulatory levels is appropriate.

Solids – Constituent concentrations from the extraction fluid of wastes that are 100% physical solids are divided by 20 (reflecting the 20 to 1 ratio of TCLP extraction) and then compared to the regulatory levels. If the theoretical levels do not equal or exceed the regulatory levels, the TCLP need not be run. If the levels do equal or exceed the regulatory levels, the generator may either declare the waste hazardous or run TCLP analyses.

References:

- Exhibit “D” Scope of Work and Technical Specifications, Middle Los Alamos Canyon PRSs 02-005, AOC 02-011(d), AOC 02-011(a)(ii)
- 40 CFR 261.24, 40 *Code of Federal Regulations* Part 261, Identification and Listing of Hazardous Waste, Subpart C, Section 24, Toxicity Characteristic.
- ENV-RCRA-QP-011.3, *Land Application of Drill Cuttings*
- EP-DIR-SOP-10021 R1, *Characterization and Management of Environmental Programs Waste*
- P-409 R5, LANL *Waste Management*
- P930-1 R6, *LANL Waste Acceptance Criteria*

Waste *Characterization Strategy Form*

Signatures	**Date**
Project Manager: (Todd Haagenstad) Todd Haagenstad	10/12/16
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Waste Management Coordinator: (Jon Roberson)	10/12/16
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Project Manager: **Todd Haagenstad**

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<u>Approval signatures on final WCSF</u>.

	Signature	***Date***
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Appendix D

Analytical Program

D-1.0 INTRODUCTION

This appendix discusses the analytical methods and data-quality review for samples collected during investigations at Solid Waste Management Unit (SWMU) 02-014 within the Middle Los Alamos Canyon Aggregate Area at Los Alamos National Laboratory (LANL or the Laboratory). All decision-level data presented in the investigation report addendum are evaluated, including data from samples collected in 2007, 2010, 2017, and 2018. Additionally, this appendix gives a summary of the effects of data-quality issues on the acceptability of the analytical data.

The results of the quality assurance/quality control (QA/QC) procedures were used to estimate the accuracy, bias, and precision of the analytical measurements. Samples for QC include method blanks, matrix spikes (MSs), laboratory control samples (LCSs), internal standards, initial calibration verifications (ICVs) and continuing calibration verifications (CCVs), surrogates, and tracers.

The type and frequency of laboratory QC analyses are described in the statements of work for analytical laboratories. Other QC factors, such as sample preservation and holding times, were also assessed in accordance with the requirements outlined in Standard Operating Procedure (SOP) 5056, “Sample Containers and Preservation.”

The following SOPs were used for data validation:

- SOP-5161, “Routine Validation of Volatile Organic Compound (VOC) Analytical Data”
- SOP-5162, “Routine Validation of Semivolatile Organic Compound (SVOC) Analytical Data”
- SOP-5163, “Routine Validation of Organochlorine Pesticide (PEST) and Polychlorinated Biphenyl (PCB) Analytical Data”
- SOP-5165, “Routine Validation of Metals Analytical Data”
- SOP-5166, “Routine Validation of Gamma Spectroscopy, Chemical Separation Alpha Spectrometry, Gas Proportional Counting, and Liquid Scintillation Analytical Data”
- SOP-5169, “Routine Validation of Dioxin Furan Analytical Data (EPA Method 1618 and SW-846 EPA Method 8290)”
- SOP-5191, “Routine Validation of LC/MS/MS Perchlorate Analytical Data” (SW-846 EPA Method 6850)

Routine data validation was performed for each data package (referred to by a request number), and analytical data were reviewed and evaluated based on U.S. Environmental Protection Agency (EPA) National Functional Guidelines, where applicable (EPA 1994, 048639; EPA 1999, 066649). As a result of the data validation and assessment efforts, qualifiers are assigned to the analytical records as appropriate. The data qualifier definitions are provided in Appendix A. Sample collection logs (SCLs) and chain of custody forms (COCs) are provided in Appendix E (on CD included with this document). The analytical data, instrument printouts, and data validation reports are provided in Appendix E.

D-2.0 ANALYTICAL DATA ORGANIZATION

Historical data evaluated in this report were collected during Resource Conservation and Recovery Act facility investigations, other corrective actions, and other investigations. All historical investigation samples were submitted to and analyzed by approved off-site laboratories. These data are determined to be of sufficient quality for decision-making purposes and have been reviewed and revalidated to current QA standards.

D-3.0 INORGANIC CHEMICAL ANALYSES

A total of 92 samples (plus 8 field duplicates) collected at SWMU 02-014 were analyzed for inorganic chemicals. Ninety-two samples (plus 8 field duplicates) were analyzed for target analyte list (TAL) metals; three of these samples were also analyzed for nitrate, perchlorate, and total cyanide. The analytical methods used for inorganic chemicals are listed in Table D-1.0-1.

Tables in the addendum to the investigation report summarize all samples collected and the analyses requested for the investigation of SWMU 02-014. All analyses conducted during the investigation are presented in Appendix E (on CD included with this document).

D-3.1 Inorganic Chemical QA/QC Samples

QA/QC samples are used to produce measures of the reliability of the data. The results of the QA/QC analyses performed on a sample provide confidence about whether the analyte is present and whether the concentration reported is accurate. To assess the accuracy and precision of inorganic chemical analyses, this investigation included analyses of LCSs, preparation blanks, MSs, laboratory duplicate samples, interference check samples (ICSs), and serial dilution samples. Each of these QA/QC sample types is described briefly in the paragraphs below.

The LCS serves as a monitor of the overall performance of each step during the analysis, including sample digestion. For inorganic chemicals in soil or tuff, LCS percent recoveries (%R) should fall within the control limits of 75% to 125% (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962).

The preparation blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing; it is extracted and analyzed in the same manner as the corresponding environmental samples. Preparation blanks are used to measure bias and potential cross-contamination. All inorganic chemical results should be below the method detection limit (MDL).

MS samples assess the accuracy of inorganic chemical analyses. These samples are designed to provide information about the effect of the sample matrix on the sample preparation procedures and analytical technique. The MS acceptance criterion is 75% to 125% recovery, inclusive, for all spiked analytes (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962).

Laboratory duplicate samples assess the precision of inorganic chemical analyses. All relative percent differences (RPDs) between the sample and laboratory duplicate should be ±35% for soil (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962).

The ICSs assess the accuracy of the analytical laboratory’s interelement and background correction factors used for inductively coupled plasma emission spectroscopy. The ICS %R should be within the acceptance range of 80% to 120%. The QC acceptance limits are ±20%.

Serial dilution samples measure potential physical or chemical interferences and correspond to a sample dilution ratio of 1:5. The chemical concentration in the undiluted sample must be at least 50 times the MDL (100 times for inductively coupled plasma mass spectroscopy) for valid comparison. For sufficiently high concentrations, the RPD should be within 10%.

D-3.2 Data-Quality Results for Inorganic Chemicals

The majority of the analytical results for inorganic chemicals were either not assigned a qualifier or qualified as not detected (U) because the analytes were not detected by the respective analytical methods. These data do not have any quality issues associated with the values presented.

D-3.2.1 Maintenance of COC

SCL/COC forms were maintained properly for all samples analyzed for inorganic chemicals (see Appendix E, on CD included with this document).

D-3.2.2 Sample Documentation

All samples analyzed for inorganic chemicals were properly documented on SCL/COC forms in the field (see Appendix E, on CD included with this document).

D-3.2.3 Sample Dilutions

Some samples were diluted for inorganic chemical analyses. No qualifiers were applied to any inorganic chemical sample results because of dilutions.

D-3.2.4 Sample Preservation

Preservation criteria were met for all samples analyzed for inorganic chemicals.

D-3.2.5 Holding Times

Holding-time criteria were met for all samples analyzed for inorganic chemicals.

D-3.2.6 ICVs and CCVs

ICV and CCV criteria were met for all samples analyzed for inorganic chemicals.

D-3.2.7 Interference Check Sample and/or Serial Dilutions

One vanadium result was qualified as estimated (J) because the serial dilution sample RPD exceeded criteria.

D-3.2.8 Laboratory Duplicate Samples

One barium result was qualified as estimated (J) because the duplicate result exceeded the RPD requirements.

A total of 20 TAL metals results were qualified as estimated (J) because a duplicate sample was not prepared and/or analyzed with the samples for unspecified reasons.

D-3.2.9 Blanks

A total of 193 TAL metals results were qualified as not detected (U) because the sample result was less than 5 times the concentration of the related analyte in the method blank.

D-3.2.10 MS Samples

Six TAL metals results were qualified as estimated and biased high (J+) because the spike percent recovery value is less than 30%.

One calcium result and two nitrate results were qualified as estimated and biased low (J-) because the MS %R value was less than the lower acceptance limit (LAL) but greater than 30%.

Three antimony results were qualified as estimated not detected (UJ) because the MS %R value was less than the LAL but greater than 30%.

One aluminum result was qualified as estimated and biased high (J+) because of MS recovery problems.

D-3.2.11 LCS Recoveries

No inorganic chemical results were qualified because of LCS recovery.

D-3.2.12 Detection Limits

A total of 388 TAL metals results, 1 nitrate result, and 1 perchlorate result were qualified as estimated (J) because the sample result was reported as detected between the instrument detection limit and the estimated detection limit.

D-3.2.13 Rejected Results

No inorganic chemical results were qualified as rejected (R).

D-4.0 ORGANIC CHEMICAL ANALYSES

A total of 353 samples (plus 21 field duplicates) collected at SWMU 02-014 were analyzed for organic chemicals. A total of 353 samples (plus 21 field duplicates) were analyzed for polychlorinated biphenyls (PCBs); 2 of these samples were also analyzed for volatile organic compounds (VOCs); and 3 samples were also analyzed for semivolatile organic compounds (SVOCs) and for dioxins and furans. The analytical methods used for organic chemicals are listed in Table D-1.0-1.

Tables within the addendum to the investigation report summarize all samples collected at SWMU 02-014 and the analyses requested. All organic chemical results are provided on CD in Appendix E.

D-4.1 Organic Chemical QA/QC Samples

QA/QC samples are used to produce measures of the reliability of the data. The results of the QA/QC analyses performed on a sample provide confidence about whether the analyte is present and whether the concentration reported is accurate. To assess the accuracy and precision of organic chemical analyses, this investigation included calibration verifications and the analysis of LCSs, method blanks, MSs, surrogates, and internal standards (ISs). Each of these QA/QC sample types is described briefly in the paragraphs below.

Calibration verification is the establishment of a quantitative relationship between the response of the analytical procedure and the concentration of the target analyte. There are two aspects of calibration verification: initial and continuing. The initial calibration verifies the accuracy of the calibration curve as well as the individual calibration standards used to perform the calibration. The continuing calibration ensures that the initial calibration is still holding and correct as the instrument is used to process samples. The continuing calibration also serves to determine that analyte identification criteria such as retention times and spectral matching are being met.

The LCS is a sample of a known matrix that has been spiked with compounds that are representative of the target analytes, and it serves as a monitor of overall performance on a “controlled” sample. The LCS is the primary demonstration, on a daily basis, of the ability to analyze samples with good qualitative and quantitative accuracy. The LCS recoveries should within the method-specific acceptance criteria.

A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing; it is extracted and analyzed in the same manner as the corresponding environmental samples. Method blanks are used to assess the potential for sample contamination during extraction and analysis. All target analytes should be below the contract-required detection limit in the method blank.

MS samples are used to measure the ability to recover prescribed analytes from a native sample matrix and consist of aliquots of the submitted samples spiked with a known concentration of the target analyte(s). Spiking typically occurs before sample preparation and analysis. The spike sample recoveries should be between the LAL and the upper acceptance limit (UAL).

A surrogate compound (surrogate) is an organic compound used in the analyses of target analytes that is similar in composition and behavior to the target analytes but not normally found in environmental samples. Surrogates are added to every blank, sample, and spike to evaluate the efficiency with which analytes are recovered during extraction and analysis. The recovery percentage of the surrogates must be within specified ranges or the sample may be rejected or assigned a qualifier.

ISs are chemical compounds added to every blank, sample, and standard extract at a known concentration. They are used to compensate for (1) analyte concentration changes that might occur during storage of the extract, and (2) quantitation variations that can occur during analysis. ISs are used as the basis for quantitation of target analytes. The %R for ISs should be within the range of 50% to 200%.

D-4.2 Data-Quality Results for Organic Chemicals

The majority of the analytical results for organic chemicals were either not assigned a qualifier or qualified as not detected (U) because the analytes were not detected by the respective analytical methods. These data do not have any quality issues associated with the values presented.

One dioxin/furan result was qualified as estimated (J) because the analytical laboratory qualified the detected result as estimated.

D-4.2.1 Maintenance of COC

SCL/COC forms were maintained properly for all samples analyzed for organic chemicals (see Appendix E, on CD included with this document).

D-4.2.2 Sample Documentation

All samples analyzed for organic chemicals were properly documented on the SCL in the field (see Appendix E, on CD included with this document).

D-4.2.3 Sample Dilutions

Some samples were diluted for organic chemical analyses. No qualifiers were applied to any organic chemical sample results because of dilutions.

D-4.2.4 Sample Preservation

Preservation criteria were met for all samples analyzed for organic chemicals.

D-4.2.5 Holding Times

Holding-time criteria were met for all samples analyzed for organic chemicals.

D-4.2.6 ICVs and CCVs

Ten SVOC and eight VOC results were qualified as estimated not detected (UJ) because the initial calibration curve exceeded the percent relative standard deviation (%RSD) criteria and/or the associated multipoint calibration correlation coefficient was less than 0.995.

D-4.2.7 Surrogate Recoveries

No organic chemical results were qualified because of surrogate recovery.

D-4.2.8 IS Responses

No organic chemical results were qualified because of IS response.

D-4.2.9 Blanks

Three PCB results and two dioxin/furan results were qualified as estimated (J) because the sample concentration was greater than 5 times the amount in the method blank.

D-4.2.10 MS Samples

No organic chemical results were qualified because of MS analyses.

D-4.2.11 Laboratory Duplicate Samples

Laboratory duplicates collected for organic chemical analyses indicated acceptable precision for all samples.

D-4.2.12 LCS Recoveries

Two PCB results were qualified as estimated and biased high (J+) because the LCS recovery was greater than the UAL.

Three SVOC results were qualified as estimated not detected (UJ) because the LCS documentation is missing.

D-4.2.13 Detection Limits

A total of 11 SVOC results, 1 VOC result, 30 PCB results, and 19 dioxin/furan results were qualified as estimated (J) because the sample result was reported as detected between the instrument detection limit and the estimated detection limit.

D-4.2.14 Rejected Data

No organic chemical results were qualified as rejected (R).

D-5.0 RADIONUCLIDE ANALYSES

A total of 92 samples (plus 7 field duplicates) collected at SWMU 02-014 were analyzed for radionuclides. A total of 92 samples (plus 7 field duplicates) were analyzed for gamma-emitting radionuclides, isotopic plutonium, isotopic uranium, and strontium-90. Seven of these samples were also analyzed for americium-241 and three samples were also analyzed for tritium. The analytical methods used for radionuclides are listed in Table D-1.0-1.

Tables in the addendum to the investigation report summarize all samples collected at SWMU 02-014 and the analyses requested. All radionuclide results are provided on CD (Appendix E).

D-5.1 Radionuclide QA/QC Samples

To assess the accuracy and precision of radionuclide analyses, this investigation included analyses of LCSs, method blanks, MS samples, laboratory duplicate samples, and tracers. Each of these QA/QC sample types is described briefly in the paragraphs below.

The LCS serves as a monitor of the overall performance of each step during the analysis, including sample digestion. For radionuclides in soil or tuff, LCS %R should fall between the control limits of 80% and 120%.

A method blank is an analyte-free matrix to which all reagents are added in the same volumes or proportions as those used in the environmental sample processing; it is analyzed in the same manner as the corresponding environmental samples. Method blanks are used to assess the potential for sample contamination during analysis. All radionuclide results should be below the minimum detectable concentration (MDC).

MS samples assess the accuracy of radionuclide analyses. These samples are designed to provide information about the effect of the sample matrix on the sample preparation procedures and analytical technique. The MS acceptance criterion is 75% to 125% recovery.

Tracers are radioisotopes added to a sample for the purposes of monitoring losses of the target analytes. The tracer is assumed to behave in the same manner as the target analyte. The tracer recoveries should fall between the LAL and UAL.

Laboratory duplicate samples assess the precision of radionuclide analyses. All RPDs between the sample and laboratory duplicate should be ±35% for soil (LANL 1995, 049738; LANL 2000, 071233; LANL 2008, 109962).

D-5.2 Data-Quality Results for Radionuclides

Approximately one-fifth (202) of the analytical results for radionuclides were not assigned a qualifier. These data do not have any quality issues associated with the values presented.

The majority of results (623) were qualified as not detected (U) because the associated sample activity was less than or equal to the minimum detectable activity.

D-5.2.1 Maintenance of COC

SCL/COC forms were maintained properly for all samples (see Appendix E, on CD included with this document).

D-5.2.2 Sample Documentation

All samples were properly documented on the SCL/COC forms in the field (see Appendix E, on CD included with this document).

D-5.2.3 Sample Dilutions

Some samples were diluted for radionuclide analyses. No qualifiers were applied to any radionuclide sample results because of dilutions.

D-5.2.4 Sample Preservation

Preservation criteria were met for all samples analyzed for radionuclides.

D-5.2.5 Holding Times

Holding-time criteria were met for all samples analyzed for radionuclides.

D-5.2.6 Method Blanks

No radionuclide results were qualified because of method blank analyses.

A total of 14 isotopic uranium results were qualified as not detected (U) because the sample results were equal to or less than 5 times the activity of the related analyte in the method blank.

A total of 14 isotopic uranium results were qualified as estimated (J) and 66 isotopic uranium results were qualified as estimated and biased high (J+) because the sample activities were greater than 5 times the amount in the method blank.

D-5.2.7 MS Samples

No radionuclide results were qualified because of MS recovery.

D-5.2.8 Tracer Recoveries

Two isotopic uranium results were qualified as estimated and biased low (J-) because the tracer receiver was less than the LAL but equal to or greater than 10%.

Three isotopic uranium results were qualified as estimated and biased high (J+) because the tracer recovery was greater than the UAL.

D-5.2.9 LCS Recoveries

No radionuclide results were qualified because of LCS recovery.

One strontium-90 result was qualified as estimated and biased high (J+) because the LCS recovery was greater than the UAL.

D-5.2.10 Laboratory Duplicate Sample Recoveries

No radionuclide results were qualified because of laboratory duplicate sample recovery.

D-5.2.11 Rejected Data

Two cesium-134 results and one cesium-137 result were qualified as rejected (R) because the minimum detectable activity and/or total propagated uncertainty documentation was missing.

D-6.0 REFERENCES

The following reference list includes documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ERID, ESHID, or EMID. ERIDs were assigned by Los Alamos National Laboratory's (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 (IDs 700000 and above).

EPA (U.S. Environmental Protection Agency), February 1994. "USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review," EPA-540/R-94/013, Office of Emergency and Remedial Response, Washington, D.C. (EPA 1994, 048639)

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LANL (Los Alamos National Laboratory), July 1995. "Statement of Work (Formerly Called "Requirements Document") - Analytical Support, (RFP number 9-XS1-Q4257), (Revision 2 - July, 1995)," Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1995, 049738)

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), June 30, 2008. "Exhibit 'D' Scope of Work and Technical Specifications, Analytical Laboratory Services for General Inorganic, Organic, Radiochemical, Asbestos, Low-Level Tritium, Particle Analysis, Bioassay, Dissolved Organic Carbon Fractionation, and PCB Congeners," Los Alamos National Laboratory document RFP No. 63639-RFP-08, Los Alamos, New Mexico. (LANL 2008, 109962)

Table D-1.0-1
Inorganic Chemical, Organic Chemical, and Radionuclide Analytical Methods for Samples Collected at SWMU 02-014

Analytical Method	Analytical Description	Analytical Suite
Inorganic Chemicals		
EPA 300.0	Ion chromatography	Anions (nitrate)
EPA SW-846: 6010B/6010C	Inductively coupled plasma emission spectroscopy—atomic emission spectroscopy	Aluminum, antimony, arsenic, barium, beryllium, calcium, cadmium, cobalt, chromium, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, uranium, vanadium, and zinc (TAL metals)
EPA SW-846:6020/6020B	Inductively coupled plasma mass spectrometry	Aluminum, antimony, arsenic, barium, beryllium, calcium, cadmium, cobalt, chromium, copper, iron, lead, magnesium, manganese, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc (TAL metals)
EPA SW-846:9012A	Automated colorimetric/off-line distillation	Total cyanide
EPA SW-846:6850	Liquid chromatography–mass spectrometry/mass spectrometry	Perchlorate
EPA SW-846:7471A	Cold vapor atomic absorption	Mercury
Organic Chemicals		
EPA SW-846: 8082	Gas chromatography	PCBs
EPA SW-846:8260B	Gas chromatography–mass spectrometry	VOCs
EPA SW-846:8270C	Gas chromatography–mass spectrometry	SVOCs
EPA SW-846:8290	High-resolution gas chromatography/high-resolution mass spectrometry	Dioxins/furans
Radionuclides		
EPA 901.1	Gamma spectroscopy	Cesium-134, cesium-137, cobalt-60, sodium-22
HASL Method 300:AM-241 HASL Method 300:ISOPU HASL Method 300:ISOU	Chemical separation alpha spectrometry	Americium-241 Isotopic plutonium Isotopic uranium
EPA 905.0	Gas proportional counting	Strontium-90
EPA 906.0	Liquid scintillation	Tritium

Appendix E

Analytical Suites and Results and Analytical Reports
(on CD included with this document)

Appendix F

Risk Assessments

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F-1.0 INTRODUCTION

This appendix presents the results of the human health risk-screening evaluations conducted in support of the environmental characterization of Solid Waste Management Unit (SWMU) 02-014, located in the northern portion of Los Alamos National Laboratory (LANL or the Laboratory). The evaluations of potential risk at this SWMU are based on decision-level data from the 2007, 2010, 2017, and 2018 investigations.

F-2.0 BACKGROUND

A brief description of SWMU 02-014, which was assessed for potential risks and dose in this addendum, is presented below.

F-2.1 Site Description and Operational History

SWMU 02-014 is located within Technical Area 02 (TA-02) at the Laboratory. TA-02 was used to house a series of research reactors from 1943 to 2003 when decontamination and decommissioning (D&D) of the site occurred. The main reactor building (02-1) was constructed in 1943. It housed five separate nuclear reactors: three iterations of water boiler reactors located on the east side of the building, one plutonium-fueled reactor (the Clementine Reactor), and the Omega West Reactor (OWR). A number of facilities were constructed over the years to support the TA-02 research activities. TA-02 was active from 1943 to 1993 (WD-3 2003, 082646, pp. 1–2). Various remedial actions, such as soil removal and D&D, were conducted in the bottom of Los Alamos Canyon, including at TA-02, after the Cerro Grande fire. These actions were taken to reduce the risk of contaminants dispersing from post-fire floods. Approximately 54 yd^3 of soil contaminated with cesium-137 was removed in 2000, following an extensive field survey for gross-gamma radiation (LANL 2001, 070352). The OWR and associated structures underwent D&D in 2002 and 2003 (WD-3 2003, 082646). After all structures at TA-02 were removed, field radiological surveys were conducted to confirm that surface contamination release limits were not exceeded (WD-3 2003, 082646, pp. 18–19). The land was returned to its original contour and reseeded (WD-3 2003, 082646, pp. 1–2). The road accessing the reactor site is controlled by the Laboratory via a locked gate.

F-2.1.1 SWMU 02-014

SWMU 02-014 consists of three former electrical transformer stations (structures 02-31, 02-45, and 02-51) that served buildings in TA-02. This site was not identified as a SWMU or AOC in the 1990 SWMU report. (LANL 1990, 007511). This site was identified during efforts to discover the source of polychlorinated biphenyl (PCB) contamination identified during investigation sampling at storm drain area of concern (AOC) 02-011(a)(ii). Historical records, including engineering drawings and photographs, were reviewed and three potential sources of PCBs were identified. Former structure 02-31 was an electrical transformer station located 40 ft behind building 02-1. The transformer station was built in 1944 and was removed in 1950. Former structure 02-45 was built in 1954 to serve building 02-44. The transformer structure consisted of three transformers mounted across two telephone poles approximately 14 ft above the ground. The transformer station was replaced with another transformer station (structure 02-51). Former structure 02-51 was an electrical transformer station located approximately 20 ft southwest of former structure 02-31 and 20 ft southeast of former structure 02-45. Historical records indicated PCB-containing transformer oil had been used at this former transformer station. Structure 02-51 was constructed in 1961 and demolished in 2003. Soil at SWMU 02-014 was remediated in 2018.

F-2.2 Investigation Sampling

The final data set used to identify chemicals of potential concern (COPCs) for SWMU 02-014 and used in this appendix to evaluate the potential risks to human health and the environment are the qualified analytical results from the 2007–2018 investigations. Only those data determined to be of decision-level quality following the data-quality assessment (Appendix D) are included in the final data set evaluated in this appendix.

F-2.3 Determination of COPCs

Section 5.0 of the Phase II investigation report (Phase II IR) (N3B 2018, 700091) summarizes the COPC selection process. Only COPCs detected above background (inorganic chemicals and naturally occurring radionuclides); with detection limits greater than background values (BVs) (inorganic chemicals); and detected organic chemicals, inorganic chemicals with no BVs, and fallout radionuclides were retained. The industrial scenario and the recreational scenario used data for samples collected from 0.0 to 1.0 ft below ground surface (bgs). The residential scenario used data for samples collected from 0.0 to 10.0 ft bgs. However, sampling depths often overlapped because of multiple investigations; therefore, samples with a starting depth less than the lower bound of the interval were included in the risk-screening assessments for a given scenario as appropriate.

Tables F-2.3-1 and F-2.3-2 summarize the COPCs evaluated for potential risk at SWMU 02-014. Some of the COPCs identified in this addendum may not be evaluated for potential risk under one or more scenarios because they were not detected within the specified depth intervals associated with a given scenario.

F-3.0 CONCEPTUAL SITE MODEL

The primary mechanisms of release related to historical contaminant sources are described in detail in the approved investigation work plan for the Middle Los Alamos Canyon Aggregate Area (LANL 2006, 092571.12; NMED 2006, 095416). Releases from the sites at TA-02 may have occurred as a result of air emissions, surface releases, subsurface leaks, or effluent discharges. Previous sampling results indicated contamination from inorganic chemicals, organic chemicals, and radionuclides (LANL 2008, 101669.12).

F-3.1 Receptors and Exposure Pathways

The primary exposure pathway for human receptors is surface soil and subsurface soil/tuff that may be brought to the surface through intrusive activities. Migration of contamination to groundwater through the vadose zone is unlikely given the depth to regional groundwater (more than 500 ft bgs). Human receptors may be exposed through direct contact with soil or suspended particulates by ingestion, inhalation, dermal contact, and external irradiation pathways. Direct contact exposure pathways from subsurface contamination to human receptors are complete for the resident. The exposure pathways are the same as those for surface soil. Sources, exposure pathways, and receptors are shown in the conceptual site model (Figure F-3.1-1). Complete exposure pathways having soil/tuff as a secondary source are addressed in section F-4.2 and volatilization to air is addressed in section F-4.3.

New Mexico Environment Department (NMED) guidance (NMED 2017, 602273) requires that sites larger than 2 acres be evaluated to determine if beef ingestion is a plausible and complete exposure pathway. SWMU 02-014 is smaller than 2 acres. In addition, grazing is not allowed on Laboratory property. Therefore, further evaluation of the beef ingestion pathway is not necessary.

The Middle Los Alamos Canyon Aggregate Area is primarily a former industrial area, and all sites are on Laboratory property. None of the sites are active and therefore they currently provide habitat for ecological receptors. Weathering of tuff is the only viable natural process that may result in the exposure of receptors to COPCs in tuff. However, because of the slow rate of weathering expected for tuff, exposure to COPCs in tuff is negligible, although it is included in the assessments. Exposure pathways to subsurface contamination below 10.0 ft (human health) are not complete and would be complete only if contaminated soil or tuff were excavated and brought to the surface.

F-3.2 Environmental Fate and Transport

The evaluation of environmental fate addresses the chemical processes affecting the persistence of chemicals in the environment, and the evaluation of transport addresses the physical processes affecting mobility along a migration pathway. Migration into soil and tuff depends on precipitation or snowmelt, soil moisture content, depth of soil, soil hydraulic properties, and properties of the COPCs. Migration into and through tuff also depends on the unsaturated flow properties of the tuff and the presence of joints and fractures.

The most important factor with respect to the potential for COPCs to migrate to groundwater is the presence of saturated conditions. Downward migration in the vadose zone is also limited by a lack of hydrostatic pressure as well as the lack of a source for the continued release of contamination. Without sufficient moisture and a source, there is little or no potential for migration of materials through the vadose zone to groundwater.

Contamination at depth is addressed in the discussion of nature and extent in the Phase II IR (N3B 2018, 700091). Results from the deepest samples collected at most sites showed either no detected concentrations of COPCs or low- to trace-level concentrations of only a few inorganic, radionuclide, and/or organic COPCs in tuff. The limited extent of contamination is related to the absence of the key factors that facilitate migration, as discussed above. Given how long the contamination has been present in the subsurface, the physical and chemical properties of the COPCs, and the lack of saturated conditions, the potential for contaminant migration to groundwater is very low.

NMED guidance (NMED 2017, 602273) contains screening levels that consider the potential for contaminants in soil to result in groundwater contamination. These screening levels consider equilibrium partitioning of contaminants among solid, aqueous, and vapor phases and account for dilution and attenuation in groundwater through the use of dilution attenuation factors (DAFs). These DAF soil screening levels (SSLs) may be used to identify chemical concentrations in soil that have the potential to contaminate groundwater (EPA 1996, 059902). Screening contaminant concentrations in soil against these DAF SSLs does not, however, provide an indication of the potential for contaminants to migrate to groundwater. The assumptions used in the development of these DAF SSLs include an assumption of uniform contaminant concentrations from the contaminant source to the water table (i.e., migration to groundwater is assumed to have already occurred). Furthermore, this assumption is inappropriate for cases such as SWMU 02-014, where sampling has shown that contamination is vertically bounded near the surface and the distance from the surface to the water table is large. For these reasons, screening of contaminant concentrations in soil against the DAF SSLs was not performed.

The relevant release and transport processes of the COPCs are a function of chemical-specific properties that include the relationship between the physical form of the constituents and the nature of the constituent transport processes in the environment. Specific properties include the degree of saturation and the potential for ion exchange (barium and other inorganic chemicals) or sorption and the potential for natural bioremediation. The transport of volatile organic compounds (VOCs) occurs primarily in the vapor phase by diffusion or advection in subsurface air.

Current potential transport mechanisms that may lead to exposure include

- dissolution and/or particulate transport of surface contaminants during precipitation and runoff events,
- airborne transport of contaminated surface soil,
- continued dissolution and advective/dispersive transport of chemical contaminants contained in subsurface soil and tuff as a result of past operations,
- disturbance of contaminants in shallow soil and subsurface tuff by Laboratory operations, and
- disturbance and uptake of contaminants in shallow soil by plants and animals.

Contaminant distributions indicate that after the initial deposition of contaminants from operational activities and historical remediation efforts, elevated levels of COPCs tend to remain concentrated in the vicinity of the original release points. The primary potential release and transport mechanisms identified for the site in the Middle Los Alamos Canyon Aggregate Area addendum include direct discharge; precipitation, sorption, and mechanical transport; dissolution and advective transport in water; and volatilization, diffusion, and dispersion. Less significant transport mechanisms include wind entrainment and, given the asphalt pavement covering most sites, dispersal of surface soil and uptake of contaminants from soil and water by biota.

Gas or vapor-phase contaminants such as VOCs are likely to volatilize to the atmosphere from near-surface soil and sediment and/or migrate by diffusion through air-filled pores in the vadose zone. Migration of vapor-phase contaminants from tuff into ambient air may occur by diffusion or advection driven by barometric pressure changes.

F-3.2.1 Inorganic Chemicals

In general, and particularly in a semiarid climate, inorganic chemicals are not highly soluble or mobile in the environment, although there are exceptions. The physical and chemical factors that determine the distribution of inorganic COPCs within the soil and tuff at SWMU 02-014 include the soil-water partition coefficient (K_d) of the inorganic chemicals, the pH of the soil, soil characteristics (such as sand or clay content), and the redox potential (Eh). The interaction of these factors is complex, but the K_d values provide a general assessment of the potential for migration through the subsurface; chemicals with higher K_d values are less likely to be mobile than those with lower ones. Chemicals with K_d values greater than 40 are very unlikely to migrate through soil towards the water table (Kincaid et al. 1998, 093270). Table F-3.2-1 presents the K_d values and water solubility for the inorganic COPCs at SWMU 02-014. Based on this criterion, the following COPCs have a low potential to mobilize and migrate through soil and the vadose zone: aluminum, barium, chromium, manganese, mercury, nickel, thallium, and vanadium. The K_d values for arsenic, copper, iron, and selenium are less than 40 and may indicate a greater potential to mobilize and migrate through soil and the vadose zone beneath the sites. A K_d is not available for perchlorate.

It is important to note that other factors besides the K_d values (e.g., speciation in soil, oxidation-reduction potential, pH, and soil mineralogy) also play significant roles in the likelihood that inorganic chemicals will migrate. The COPCs with K_d values less than 40 are discussed further below. Information about the fate and transport properties of inorganic chemicals was obtained from individual chemical profiles published by the Agency for Toxic Substances and Disease Registry (ATSDR) (ATSDR 1997, 056531, and http://www.atsdr.cdc.gov/toxpro2).

Arsenic may undergo a variety of reactions, including oxidation-reduction reactions, ligand exchange, precipitation, and biotransformation. Arsenic forms insoluble complexes with iron, aluminum, and magnesium oxides found in soil and in this form, arsenic is relatively immobile. However, under low pH and reducing conditions, arsenic can become soluble and may potentially leach into groundwater or result in runoff of arsenic into surface waters. Arsenic is expected to have low mobility under the environmental conditions (neutral to alkaline soil pH and oxidizing near-surface conditions) present in the Middle Los Alamos Canyon Aggregate Area.

Copper movement in soil is determined by physical and chemical interactions with the soil components. Most copper deposited in soil will be strongly adsorbed and remains in the upper few centimeters of soil. Copper will adsorb to organic matter, carbonate minerals, clay minerals, or hydrous iron, and manganese oxides. In most temperate soil, pH, organic matter, and ionic strength of the soil solutions are the key factors affecting adsorption. Soil in the area is neutral to slightly alkaline, so the leaching of copper is not a concern at this site. Copper binds to soil much more strongly than other divalent cations, and the distribution of copper in the soil solution is less affected by pH than other metals. Copper is expected to be bound to the soil and move in the system by water transport of soil particles as opposed to dissolved species.

Iron is naturally occurring in soil and tuff and may be relatively mobile under reducing conditions. Iron is sensitive to soil pH conditions, occurring in two oxidation states, iron(III), the insoluble oxidized form, and iron(II), the reduced soluble form. Most iron in well-drained neutral-to-alkaline soil is present as precipitates of iron(III) hydroxides and oxides. With time, these precipitates are mineralized and form various iron minerals, such as lepidcrocite, hematite, and goethite. Iron is not expected to be mobile in the neutral to slightly alkaline, well-drained soil at the Middle Los Alamos Canyon Aggregate Area.

Perchlorate is somewhat soluble in water and may migrate with water molecules in saturated soil. As noted above, the subsurface material beneath the sites has low moisture content, which inhibits the mobility of perchlorate as well as most other inorganic chemicals.

Selenium is not often found in the environment in its elemental form but is usually combined with sulfide minerals or with silver, copper, lead, and nickel minerals. In soil, pH and Eh are determining factors in the transport and partitioning of selenium. In soil with a pH of greater than 7.5, selenates, which have high solubility and a low tendency to adsorb onto soil particles, are the major selenium species and are very mobile. The soil pH at most sites in the Middle Los Alamos Canyon Aggregate Area is neutral to slightly alkaline, indicating that selenium is not likely to migrate.

F-3.2.2 Organic Chemicals

Table F-3.2-2 presents the physical and chemical properties (organic carbon-water partition coefficient [K_{oc}], logarithm to the base 10 octanol/water partition coefficient [log K_{ow}], solubility, and vapor pressure) of the organic COPCs identified at SWMU 02-014. The physical and chemical properties of organic chemicals are important when evaluating their fate and transport. The following physiochemical property information illustrates some aspects of the fate and transport of COPCs at SWMU 02-014. The information is summarized from Ney (1995, 058210).

Water solubility may be the most important chemical characteristic used to assess mobility of organic chemicals. The higher the water solubility of a chemical, the more likely it is to be mobile and the less likely it is to accumulate, bioaccumulate, volatilize, or persist in the environment. A highly soluble chemical (water solubility greater than 1000 mg/L) is prone to biodegradation and metabolism that may detoxify the parent chemical. No chemicals detected at SWMU 02-014 in the Middle Los Alamos Canyon Aggregate Area have water solubilities greater than 1000 mg/L.

The lower the water solubility of a chemical, especially below 10 mg/L, the more likely it will be immobilized by adsorption. Chemicals with lower water solubilities are more likely to accumulate or bioaccumulate and persist in the environment, are slightly prone to biodegradation, and are metabolized in plants and animals. The chemicals identified as having water solubilities less than 10 mg/L are the polycyclic aromatic hydrocarbons (PAHs), PCBs, and 2,3,7,8-tetrachlorodibenzodioxin (2,3,7,8-TCDD).

Vapor pressure is a characteristic used to evaluate the tendency of organic chemicals to volatize. Chemicals with vapor pressure greater than 0.01 millimeters of mercury (mmHg) are likely to volatilize and, therefore, concentrations at the site are reduced over time; vapors of these chemicals are more likely to travel toward the atmosphere and not migrate towards groundwater. Toluene has vapor pressure greater than 0.01 mmHg.

Chemicals with vapor pressures less than 0.000001 mmHg are less likely to volatilize and, therefore, tend to remain immobile. Benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, indeno(1,2,3-cd)pyrene, and 2,3,7,8-TCDD have vapor pressures less than 0.000001 mmHg.

The K_{ow} is an indicator of a chemical's potential to bioaccumulate or bioconcentrate in the fatty tissues of living organisms. The unitless K_{ow} value is an indicator of water solubility, mobility, sorption, and bioaccumulation. The higher the K_{ow} above 1000, the greater the affinity the chemical has for bioaccumulation/bioconcentration in the food chain, the greater the potential for sorption in the soil, and the lower the mobility (Ney 1995, 058210).

No COPCs have a K_{ow} greater than 1000. A K_{ow} of less than 500 indicates high water solubility; mobility; little to no affinity for bioaccumulation; and degradability by microbes, plants, and animals. PAHs; PCBs; 2,3,7,8-TCDD; and toluene have a K_{ow} much less than 500.

The K_{oc} measures the tendency of a chemical to adsorb to organic carbon in soil. K_{oc} values above 500 L/kg indicate a strong tendency to adsorb to soil, leading to low mobility (NMED 2017, 602273). Most organic chemicals detected have K_{oc} values above 500 L/kg, indicating a very low potential to migrate toward groundwater. The only organic chemical with a K_{oc} value less than 500 L/kg is toluene.

The PAHs; PCBs; and 2,3,7,8-TCDD are the least mobile and the most likely to bioaccumulate. Toluene is more soluble and volatile and is more likely to travel toward the atmosphere and not migrate toward groundwater. Because the organic chemicals detected were at low concentrations and extent is defined, they are not likely to migrate to groundwater.

F-3.2.3 Radionuclides

Radionuclides are generally not highly soluble or mobile in the environment, particularly in the semiarid climate of the Laboratory. The physical and chemical factors that determine the distribution of radionuclides within soil and tuff are the K_d, the pH of the soil and other soil characteristics (e.g., sand or clay content), and the Eh. The interaction of these factors is complex, but K_d values provide a general assessment of the potential for migration through the subsurface: chemicals with higher K_d values are less likely to be mobile than those with lower values. Radionuclides with K_d values greater than 40 are very unlikely to migrate through soil towards the water table (Kincaid et al. 1998, 093270).

Table F-3.2-3 gives physical and chemical properties of the radionuclide COPCs identified at sites in SWMU 02-014. Based on K_d values, cesium-134, cesium-137, plutonium-238, and plutonium-239/240 have a very low potential to migrate towards groundwater at SWMU 02-014.

F-3.3 Exposure Point Concentration Calculations

The exposure point concentrations (EPCs) represent upper-bound concentrations of COPCs. For comparison with risk-screening levels, the upper confidence limit (UCL) of the arithmetic mean was calculated when possible and used as the EPC. The UCLs were calculated using all available decision-level data within the depth range of interest. If an appropriate UCL of the mean could not be calculated, the maximum detected concentration of the COPC was used as the EPC. The summary statistics, including the EPC for each COPC for the human health risk-screening assessments and the distribution used for the calculation, are presented in Tables F-2.3-1 and F-2.3-2.

The EPCs for the dioxin and furan congeners are the sums of the detected congeners weighted by the toxic equivalency factors (TEFs) (NMED 2017, 602273); the sum is expressed as the 2,3,7,8-TCDD- equivalent concentration. The toxic equivalency factors used are presented in Table F-3.3-1. The results of the TEF calculations for each site where dioxins/furans are COPCs are presented in Attachment F-1 and the 2,3,7,8-TCDD-equivalent concentrations (95% UCLs or maximum concentrations) are presented in the section F-4.2 tables.

The UCLs of the mean concentrations were calculated using the U.S. Environmental Protection Agency (EPA) ProUCL 5.1.002 software (EPA 2015, 601725), which is based on EPA guidance (EPA 2002, 085640). Consistent with the ProUCL v5.1 Technical Guide, a minimum of eight samples and five detections are needed to calculate UCLs (EPA 2015, 601724). The ProUCL program calculates 95%, 97.5%, and 99% UCLs and recommends a distribution and UCL. The 95% UCL for the recommended calculation method was used as the EPC. The ProUCL software performs distributional tests on the data set for each COPC and calculates the most appropriate UCL based on the distribution of the data set. Environmental data may have a normal, lognormal, or gamma distribution but are often nonparametric (no definable shape to the distribution). The ProUCL documentation strongly recommends against using the maximum detected concentration for the EPC. The maximum detected concentration was used to represent the EPC for COPCs only when there were too few detections to calculate a UCL. Input and output data files for ProUCL calculations are provided on CD as Attachment F-2.

F-4.0 HUMAN HEALTH RISK-SCREENING EVALUATIONS

The human health risk-screening assessment for SWMU 02-014 evaluated residential, industrial, and recreational exposure scenarios. SWMU 02-014 was screened for the residential scenario using data from 0.0 to 10.0 ft bgs and screened for industrial and recreational scenarios using data from 0.0 to 1.0 ft bgs, where available. The human health risk-screening assessments compared either the 95% UCL of the mean concentration or the maximum detected concentration of each COPC with SSLs for chemicals.

For most constituents, the residential exposure scenario is the most protective, and the residential scenario is used for evaluating whether a site is appropriate for corrective action complete without controls. Although based on current and foreseeable land use, potential exposure to construction workers is not expected at SWMU 02-014, sites being recommended for corrective action complete without controls must not pose an unacceptable risk to construction workers. For some constituents, the construction worker SSL is less than the residential SSL and the residential exposure scenario may not also be protective of construction workers. Therefore, sites posing no potential unacceptable risk under the residential scenario are evaluated to determine whether the residential exposure scenario is also protective of construction workers. If not, the construction worker scenario is evaluated to determine whether the site could be recommended for corrective action complete without controls.

F-4.1 Human Health SSLs and SALs

Human health risk-screening assessments were conducted using SSLs for the industrial and residential scenarios obtained from NMED guidance (NMED 2017, 602273). The NMED SSLs are based on a target hazard quotient (HQ) of 1 and a target cancer risk of 1×10^{-5} (NMED 2017, 602273). Recreational SSLs were obtained from Laboratory guidance (LANL 2017, 602581) and are based on the same target risk levels as the NMED SSLs. Surrogate chemicals were also used for some COPCs without an SSL based on structural similarity or because the COPC is a breakdown product (NMED 2003, 081172). Exposure parameters used to calculate the industrial, recreational, and residential SSLs are presented in Table F-4.1-1.

Radionuclide screening action levels (SALs) were used for comparison with radionuclide COPC EPCs and were derived using the Residual Radioactivity (RESRAD) model, Version 7.0 (LANL 2015, 600929). The SALs are based on a 25-mrem/yr dose as authorized by U.S. Department of Energy (DOE) Order 458.1. Exposure parameters used to calculate the SALs are presented in Tables F-4.1-2, F-4.1-3, and F-4.1-4.

F-4.2 Results of Human Health Screening Evaluation

The EPC of each COPC was compared with the SSLs for the industrial, recreational, and residential scenarios, as appropriate. For carcinogenic chemicals, the EPCs were divided by the SSL and multiplied by 1×10^{-5}. The sum of the carcinogenic risks was compared with the NMED target cancer risk level of 1×10^{-5}. For noncarcinogenic chemicals, an HQ was generated for each COPC by dividing the EPC by the SSL. The HQs were summed to generate a hazard index (HI). The HI was compared with the NMED target HI of 1. The radionuclide EPCs were divided by the SAL and multiplied by 25 mrem/yr. The total doses were compared with the DOE target level of 25 mrem/yr, as authorized by DOE Order 458.1.The results are presented in Tables F-4.2-1 to F-4.2-10 and are described below for SWMU 02-014.

Sites posing no unacceptable risk under the residential scenario may be recommended for corrective action complete without controls if the residential scenario is also protective of construction workers. For SWMU 02-014, the following COPCs have construction worker SSLs less than residential SSLs: aluminum, barium, chromium, manganese, and nickel. The residential EPC for each of these COPCs was compared with the construction worker SSL. The ratio of the residential EPC for SWMU 02-014 to the construction worker SSL (i.e., the maximum HQ) was 0.14 for aluminum, 0.01 for barium, 0.02 for chromium, 0.44 for manganese, and 0.003 for nickel. Thus, manganese is the only COPC that could potentially pose an unacceptable construction worker risk. The construction worker scenario was evaluated to determine whether this site can be recommended for corrective action complete without controls. Because manganese is associated with noncarcinogenic risk, only the construction worker HI was evaluated; the residential scenario is protective of construction worker cancer risk at all sites. Concerning radionuclides, all construction worker SALs are equal to or greater than residential SALs and the residential scenario is protective of construction workers for all sites.

F-4.2.1 SWMU 02-014

The results of the risk-screening assessment for the industrial scenario are presented in Tables F-4.2-1, F-4.2-2, and F-4.2-3. The total excess cancer risk for the industrial scenario is 5×10^{-6}, which is less than the NMED target risk level of 1×10^{-5} (NMED 2017, 602273). The industrial HI is 0.06, which is less than the NMED target HI of 1 (NMED 2017, 602273). The total dose is 0.0009 mrem/yr, which is less than the target dose of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessment for the recreational scenario are presented in Tables F-4.2-4, F-4.2-5, and F-4.2-6. The total excess cancer risk for the recreational scenario is 5 × 10^{-6}, which is less than the NMED target risk level of 1 × 10^{-5} (NMED 2017, 602273). The recreational HI is 0.2, which is less than the NMED target HI of 1 (NMED 2017, 602273). The total dose is 0.0008 mrem/yr, which is less than the target dose of 25 mrem/yr as authorized by DOE Order 458.1.

The results of the risk-screening assessment for the residential scenario are presented in Tables F-4.2-7, F-4.2-8, and F-4.2-9. The total excess cancer risk for the residential scenario is 1 × 10^{-5}, which is equal to the NMED target risk level of 1 × 10^{-5} (NMED 2017, 602273). The residential HI is 0.6, which is less than the NMED target HI of 1 (NMED 2017, 602273). The total dose is 2 mrem/yr, which is less than the target dose of 25 mrem/yr as authorized by DOE Order 458.1.

Manganese is a COPC at SWMU 02-014 and may potentially pose an unacceptable noncarcinogenic risk to the construction worker. Construction worker risk for SWMU 02-014 was evaluated using the EPCs for the residential scenario (Table F-2.3-2) since both residential and construction worker scenarios consider the 0.0-ft to 10.0-ft-bgs interval. The noncarcinogenic risk screening results for the construction worker at SWMU 02-014 are presented in Table F-4.2-10. The construction worker HI is 0.8, which is less than the NMED target of 1 (NMED 2017, 602273). The primary contributor to construction worker noncarcinogenic risk is manganese. The residential scenario is protective of the construction worker for cancer risk and total dose.

F-4.3 Vapor Intrusion Pathway

NMED guidance (NMED 2017, 602273) requires an evaluation of the vapor-intrusion pathway. The vapor intrusion pathway of VOCs into a building was evaluated where appropriate. The evaluation can be qualitative for a potentially complete pathway if the following criteria are met:

- Volatile and toxic compounds are minimally detected,
- Concentrations are below NMED’s vapor-intrusion screening levels for soil-gas and/or groundwater. There is no suspected source(s) for volatile and toxic compounds, and
- Concentrations are decreasing with depth (for soil).

Because only bulk soil data are available for this site, the vapor-intrusion screening levels are not applicable for the evaluation. The vapor-intrusion pathway was qualitatively evaluated as part of the residential scenario. Among the factors considered for the vapor-intrusion pathway to be relevant to human health risk is the current extent of structures and their proximity to the VOC source. One may also consider if construction of buildings is possible or proposed in the reasonably foreseeable future.

F-4.3.1 SWMU 02-014

SWMU 02-014 consists of three former electrical transformer stations (structures 02-31, 02-45, and 02-51) that served buildings in TA-02. This site was not identified as a SWMU or AOC in the 1990 SWMU report. (LANL 1990, 007511). This site was identified during efforts to discover the source of PCB contamination identified during investigation sampling at storm drain AOC 02-011(a)(ii). Historical records, including engineering drawings and photographs, were reviewed and three potential sources of PCBs were identified. Former structure 02-31 was an electrical transformer station located 40 ft behind building 02-1. The transformer station was built in 1944 and was removed in 1950. Former structure 02-45 was built in 1954 to serve building 02-44. The transformer structure consisted of three transformers mounted across two telephone poles approximately 14 ft above the ground. The transformer station was replaced with another transformer station (structure 02-51). Former structure 02-51 was an electrical transformer station located approximately 20 ft southwest of former structure 02-31 and 20 ft southeast of former structure 02-45. Historical records indicated PCB-containing transformer oil had been used at this former transformer station. Structure 02-51 was constructed in 1961 and demolished in 2003. Soil at SWMU 02-014 was remediated in 2018.

One VOC, toluene was minimally detected at this site (one detection in two samples) with a maximum concentration of 0.000465 mg/kg that was less than the nondetected concentration (0.00107 mg/kg) in the second sample. Furthermore, the site description does not indicate that solvents were used, so no sources of VOCs are present and VOCs were only detected minimally. In addition, the structures have been removed, soil has been remediated, and the site is inactive. The vapor-intrusion pathway is therefore potentially complete based on NMED guidance (NMED 2017, 602273) and no additional evaluation is necessary.

F-4.4 Essential Nutrients

NMED has SSLs for evaluation of essential nutrients (NMED 2017, 602273). Magnesium was identified as a COPC at SWMU 02-014 and the maximum detected concentration of magnesium was compared with the appropriate NMED SSL. The results of the comparison found the maximum magnesium concentration to be substantially less than the SSL as presented in Table F-4.4-1. Further evaluation of magnesium at this site is not necessary.

F-4.5 Uncertainty Analysis

F-4.5.1 Data Evaluation and COPC Identification Process

A primary uncertainty associated with the COPC identification process is the possibility that a chemical may be inappropriately identified as a COPC when it is actually not a COPC or that a chemical may not be identified as a COPC when it actually should be identified as a COPC. Inorganic chemicals are appropriately identified as COPCs because only the chemicals detected or that have detection limits above background are retained for further analysis. There are no established BVs for organic chemicals, and all detected organic chemicals are identified as COPCs and are retained for further analysis unless shown to be from a source not related to the site. Other uncertainties may include errors in sampling, laboratory analysis, and data analysis. However, because concentrations used in the risk-screening evaluations include those detected below the estimated quantitation limits and nondetections above BVs, data evaluation uncertainties are expected to have little effect on the risk-screening results.

F-4.5.2 Exposure Evaluation

The current and reasonably foreseeable future land use is industrial. To the degree actual activity patterns are not represented by those activities assumed by the industrial scenario, uncertainties are introduced in the assessment, and the evaluation presented in this assessment overestimates potential risk. An individual may be subject to exposures in a different manner than the exposure assumptions used to derive the industrial SSLs. For the site evaluated, individuals might not be on-site at present or in the future for that frequency and duration. The industrial assumptions for the SSLs are that the potentially exposed individual is outside on-site for 8 hr/day, 225 days/yr, and 25 yr (NMED 2017, 602273). The residential SSLs are based on exposure of 24 hr/day, 350 days/yr, and 30 yr (NMED 2017, 602273). As a result, the industrial and residential scenarios evaluated at SWMU 02-014 likely overestimate the exposure and risk.

A number of assumptions are made relative to exposure pathways, including input parameters, completeness of a given pathway, the contaminated media to which an individual may be exposed, and intake rates for different routes of exposure. In the absence of site-specific data, the exposure assumptions used were consistent with default values (NMED 2017, 602273). When several upper-bound values (as are found in NMED 2017, 602273) are combined to estimate exposure for any one pathway, the resulting risk estimate can exceed the 99th percentile, and therefore, can exceed the range of risk that may be reasonably expected. Also, the assumption that residual concentrations of chemicals in the tuff are available and result in exposure in the same manner as if they were in soil overestimates the potential exposure and risk to receptors.

Uncertainty is introduced in the concentration aggregation of data for estimating the EPCs at a site. Risk from a single location or area with relatively high COPC concentrations may be underestimated by using a representative sitewide value. The use of a UCL is intended to provide a protective upper-bound (i.e., conservative) COPC concentration and is assumed to be representative of the average exposure to a COPC across the entire site. Potential risk and exposure from a single location or area with relatively high COPC concentrations may be overestimated if a representative sitewide value is used. The use of the maximum detected concentration for the EPC overestimates the exposure to contamination because receptors are not consistently exposed to the maximum detected concentration across the site. The use of EPCs similar to BVs will overestimate risk due to site-related contamination since much of the risk will be associated with background concentrations.

SWMU 02-014

The residential total excess cancer risk at SWMU 02-014 was approximately 1×10^{-5}. Aroclor-1260 (9.47×10^{-6}), arsenic (1.13×10^{-6}), and 2,3,7,8-TCDD (1.35×10^{-6}), make up a majority of this risk. The residential EPCs for arsenic (0.798 mg/kg) and 2,3,7,8-TCDD (6.6E-06 mg/kg) are less than their respective SSLs of 7.07 mg/kg and 4.9E-05 mg/kg. The Aroclor-1260 EPC (2.3 mg/kg) is slightly less than the SSL (2.43 mg/kg).

F-4.5.3 Toxicity Evaluation

The primary uncertainty associated with the SSLs is related to the derivation of toxicity values used in their calculation. Toxicity values (reference doses [RfDs] and slope factors [SFs]) were used to derive the SSLs used in this risk-screening evaluation (NMED 2017, 602273). Uncertainties were identified in five areas with respect to the toxicity values: (1) extrapolation from other animals to humans, (2) interindividual variability in the human population, (3) the derivation of RfDs and SFs, (4) the chemical form of the COPC, and (5) the use of surrogate chemicals.

Extrapolation from Animals to Humans. The SFs and RfDs are often determined by extrapolation from animal data to humans, which may result in uncertainties in toxicity values because differences exist in chemical absorption, metabolism, excretion, and toxic responses between animals and humans. Differences in body weight, surface area, and pharmacokinetic relationships between animals and humans are taken into account to address these uncertainties in the dose-response relationship. However, conservatism is usually incorporated in each of these steps, resulting in the overestimation of potential risk.

Individual Variability in the Human Population. For noncarcinogenic effects, the degree of variability in human physical characteristics is important both in determining the risks that can be expected at low exposures and in defining the no observed adverse effect level (NOAEL). The NOAEL uncertainty factor approach incorporates a 10-fold factor to reflect individual variability within the human population that can contribute to uncertainty in the risk evaluation; this factor of 10 is generally considered to result in a conservative estimate of risk to noncarcinogenic COPCs.

Derivation of RfDs and SFs. The RfDs and SFs for different chemicals are derived from experiments conducted by different laboratories that may have different accuracy and precision that could lead to an overestimation or underestimation of the risk. The uncertainty associated with the toxicity factors for noncarcinogens is measured by the uncertainty factor, the modifying factor, and the confidence level. For carcinogens, the weight of evidence classification indicates the likelihood that a contaminant is a human carcinogen. Toxicity values with high uncertainties may change as new information is evaluated.

Chemical Form of the COPC. COPCs may be bound to the environment matrix and not available for absorption into the human body. However, the COPCs are assumed to be bioavailable. This assumption can lead to an overestimation of the total risk.

*Use of Surrogate Chemicals***.** The use of surrogates for chemicals that do not have EPA-approved or provisional toxicity values also contributes to uncertainty in the risk assessment. A surrogate was used to provide an SSL for benzo(g,h,i)perylene based on structural similarity. The overall impact of surrogates on the risk assessment is minimal because these COPCs were detected infrequently and at low concentrations.

F-4.5.4 Additive Approach

For noncarcinogens, the effects of exposure to multiple chemicals are generally unknown, and possible interactions could be synergistic or antagonistic, resulting in either an overestimation or underestimation of the potential risk. Additionally, RfDs used in the risk calculations typically are not based on the same endpoints with respect to severity, effects, or target organs. Therefore, the potential for noncarcinogenic effects may be overestimated for individual COPCs that act by different mechanisms or by different modes of action but are addressed additively.

F-4.6 Interpretation of Human Health Risk Screening Results

F-4.6.1 SWMU 02-014

Industrial Scenario

The total excess cancer risk for the industrial scenario is 5×10^{-6}, which is less than the NMED target risk level of 1×10^{-5} (NMED 2017, 602273). The industrial HI is 0.06, which is less than the NMED target HI of 1 (NMED 2017, 602273). The total dose is 0.0009 mrem/yr, which is less than the target dose of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the industrial scenario is equivalent to a total risk of 4×10^{-9}, based on conversion from dose using RESRAD Version 7.0 (LANL 2015, 600929).

Recreational Scenario

The total excess cancer risk for the recreational scenario is 5×10^{-6}, which is less than the NMED target risk level of 1×10^{-5} (NMED 2017, 602273). The recreational HI is 0.2, which is less than the NMED target HI of 1 (NMED 2017, 602273). The total dose is 0.0008 mrem/yr, which is less than the target dose of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the recreational scenario is equivalent to a total risk of 2×10^{-9}, based on conversion from dose using RESRAD Version 7.0 (LANL 2015, 600929).

Residential Scenario

The total excess cancer risk for the residential scenario is 1 × 10^{-5}, which is equivalent to the NMED target risk level of 1 × 10^{-5} (NMED 2017, 602273). The residential HI is 0.6, which is less than the NMED target HI of 1 (NMED 2017, 602273). The total dose is 2 mrem/yr, which is less than the target dose of 25 mrem/yr as authorized by DOE Order 458.1. The total dose for the residential scenario is equivalent to a total risk of 3 × 10^{-5}, based on conversion from dose using RESRAD Version 7.0 (LANL 2015, 600929).

The residential exposure scenario is also protective of construction workers.

F-5.0 ECOLOGICAL RISK EVALUATION TA-02 CORE AREA

Ecological risk was evaluated collectively for sites within the TA-02 core area, including SWMU 02-014, in the “Phase II Investigation Report for Middle Los Alamos Canyon Aggregate Area, Revision 2” (N3B 2018, 700091). Based on evaluations of the minimum ESLs, HI analyses, potential effects to populations (individuals for threatened and endangered species), lowest observed adverse effect level analyses, the relationship of detected concentrations and screening levels to background concentrations, and results of site-specific ecological risk studies conducted within the TA-02 core area, the Phase II IR concluded that no potential ecological risks exist for the TA-02 core area, which includes SWMU 02-014. Therefore, further evaluation of ecological risk was not performed for this Phase II IR addendum.

F-6.0 CONCLUSIONS

F-6.1 Human Health Risk

The total excess cancer risks were less than the target risk level of 1 × 10^{-5} for the industrial and recreational scenarios at SWMU 02-014. The residential risks at SWMU 02-014 were equivalent to the target risk level of 1 × 10^{-5}.

The HIs were less than the target HI of 1 for the industrial, recreational, and residential scenarios at SWMU 02-014.

The total doses were below the target dose limit of 25 mrem/yr as authorized by DOE Order 458.1 for the industrial, recreational, and residential scenarios at SWMU 02-014. The total doses were equivalent to total risks of 4 × 10^{-9} for the industrial scenario, 2× 10^{-9} for the recreational scenario, and 3 × 10^{-5} for the residential scenario, based on conversion from dose using RESRAD Version 7.0 (LANL 2015, 600929).

There was no potential noncarcinogenic risk to construction workers, and the residential scenario demonstrated protection of construction workers for carcinogenic risk and dose.

SWMU 02-014 in the Middle Los Alamos Canyon Aggregate Area is not accessible by the public and is not planned for release by DOE in the foreseeable future. Therefore, an as low as reasonably achievable (ALARA) evaluation for radiological exposure to the public is not currently required. Should DOE’s plans for releasing this area change, an ALARA evaluation will be conducted at that time.

F-7.0 REFERENCES

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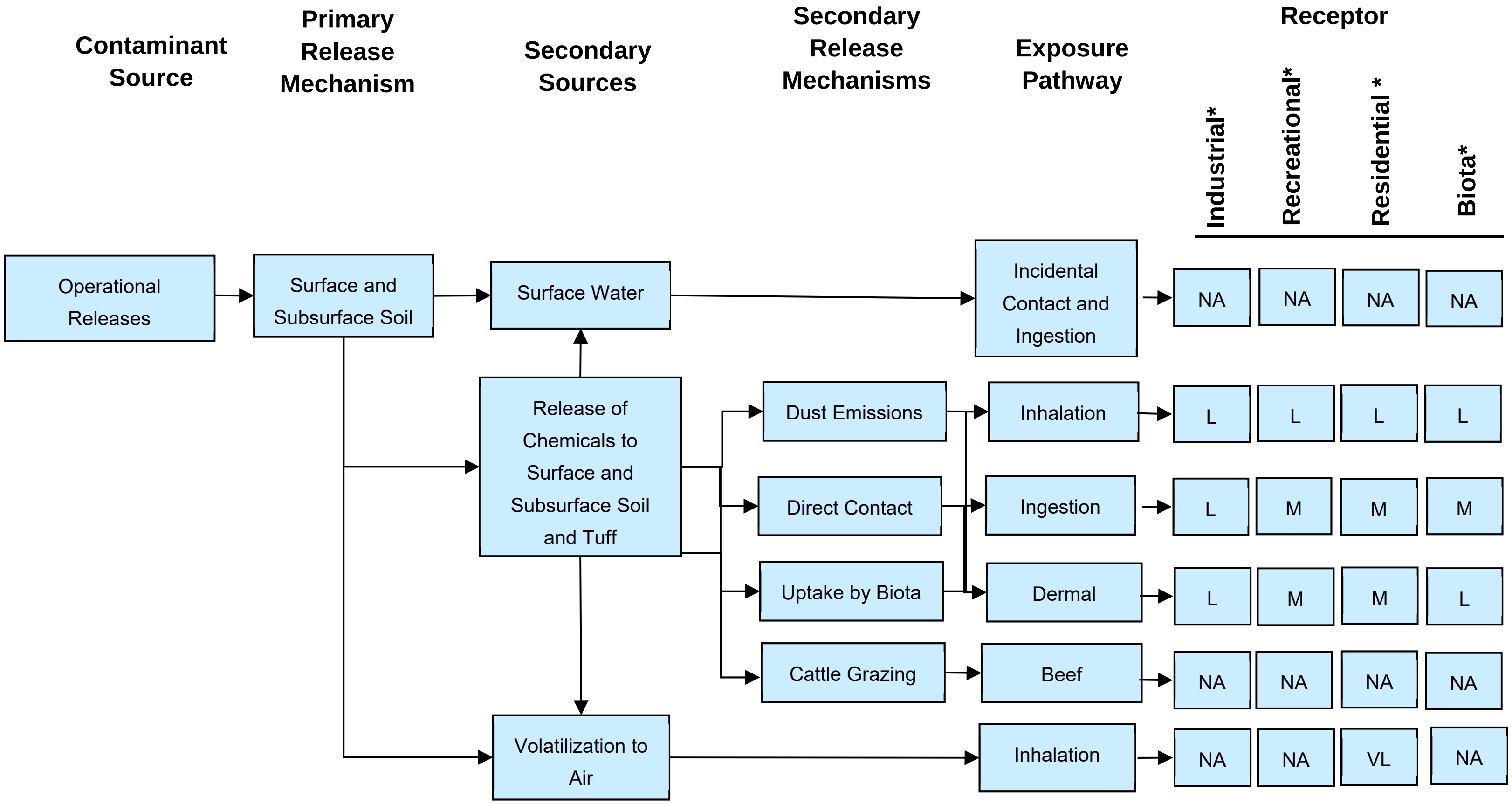


*Notes: Very low (VL), low (L), and moderate (M) designations indicate the pathway is a potentially complete pathway and is evaluated in the risk assessments. Not applicable (NA) indicates the pathway is incomplete and is not evaluated in the risk assessments.

Figure F-3.1-1 Conceptual site model for Solid Waste Management Unit 02-014

Table F-2.3-1
EPCs at SWMU 02-014 for the Industrial and Recreational Scenarios

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Copper	17	16	2.38	47.5	Lognormal	11.7	95% Percentile Bootstrap
Mercury	17	17	0.013	0.538	Lognormal	0.284	95% Chebyshev (Mean, Sd)
Selenium	17	9	0.119	2.5 (U)	Normal	0.66	95% KM (t)
Organic Chemicals (mg/kg)							
Anthracene	1	1	0.00903	0.00903	n/a*	0.00903	Maximum detected concentration
Aroclor-1254	29	6	0.00114 (U)	3.93	Nonparametric	0.787	95% KM (Chebyshev)
Aroclor-1260	29	29	0.016	17.3	Gamma	3.91	95% Adjusted Gamma
Benzo(a)anthracene	1	1	0.0516	0.0516	n/a	0.0516	Maximum detected concentration
Benzo(a)pyrene	1	1	0.0551	0.0551	n/a	0.0551	Maximum detected concentration
Benzo(b)fluoranthene	1	1	0.0702	0.0702	n/a	0.0702	Maximum detected concentration
Benzo(g,h,i)perylene	1	1	0.0271	0.0271	n/a	0.0271	Maximum detected concentration
Benzo(k)fluoranthene	1	1	0.041	0.041	n/a	0.041	Maximum detected concentration
Chrysene	1	1	0.0598	0.0598	n/a	0.0598	Maximum detected concentration
Fluoranthene	1	1	0.0984	0.0984	n/a	0.0984	Maximum detected concentration
Indeno(1,2,3-cd)pyrene	1	1	0.0252	0.0252	n/a	0.0252	Maximum detected concentration
Phenanthrene	1	1	0.0317	0.0317	n/a	0.0317	Maximum detected concentration
Pyrene	1	1	0.0771	0.0771	n/a	0.0771	Maximum detected concentration
TCDD[2,3,7,8-] equivalent	1	1	0.0000066	0.0000066	n/a	0.0000066	Maximum detected concentration
Radionuclides (pCi/g)							
Plutonium-239/240	17	9	0 (U)	0.076	Gamma	0.0414	95% KM Adjusted Gamma

Note: Data qualifiers are defined in Appendix A.

* n/a = Not applicable.

Table F-2.3-2
EPCs at SWMU 02-014 for the Residential Scenario

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Inorganic Chemicals (mg/kg)							
Aluminum	92	92	268	15,000	Nonparametric	5990	95% Chebyshev (Mean, Sd)
Arsenic	92	92	0.321	2.38	Nonparametric	0.799	95% Student's-t
Barium	92	92	14.1	96.1	Nonparametric	36.8	95% Student's-t
Chromium	92	89	1.05 (U)	14.5	Nonparametric	3.32	95% KM (t)
Copper	92	89	1.02	47.5	Nonparametric	5.81	95% KM (Chebyshev)
Iron	92	92	285	12,800	Nonparametric	5300	95% Student's-t
Manganese	92	92	103	305	Normal	204	95% Student's-t
Mercury	92	90	0.003	0.538	Nonparametric	0.0697	95% KM (Chebyshev)
Nickel	92	90	0.774	8.48	Nonparametric	2.39	95% KM (t)
Perchlorate	3	1	0.000813	0.00214 (U)	n/a[a]	0.000813	Maximum detected concentration
Selenium	92	39	0.119	2.5 (U)	Normal	0.459	95% KM (t)
Thallium	92	28	0.027	2.5 (U)	Lognormal	0.0807	95% Percentile Bootstrap
Vanadium	92	92	1.69	19.6	Nonparametric	4.87	95% Student's-t
Organic Chemicals (mg/kg)							
Anthracene	3	2	0.00727	0.0356 (U)	n/a	0.00903	Maximum detected concentration
Aroclor-1254	262	24	0.00112 (U)	7.11	Lognormal	0.132	95% Percentile Bootstrap
Aroclor-1260	262	255	0.00123 (U)	23.9	Nonparametric	2.3	95% KM (Chebyshev)
Benzo(a)anthracene	3	2	0.032	0.0516	n/a	0.0516	Maximum detected concentration
Benzo(a)pyrene	3	2	0.0332	0.0551	n/a	0.0551	Maximum detected concentration
Benzo(b)fluoranthene	3	2	0.0356 (U)	0.0702	n/a	0.0702	Maximum detected concentration
Benzo(g,h,i)perylene	3	2	0.0222	0.0356 (U)	n/a	0.0271	Maximum detected concentration
Benzo(k)fluoranthene	3	2	0.0219	0.041	n/a	0.041	Maximum detected concentration
Chrysene	3	2	0.0356 (U)	0.0598	n/a	0.0598	Maximum detected concentration

Table F-2.3-2 (continued)

COPC	Number of Analyses	Number of Detects	Minimum Concentration	Maximum Concentration	Distribution	EPC	EPC Method
Fluoranthene	3	2	0.0356 (U)	0.0984	n/a	0.0984	Maximum detected concentration
Indeno(1,2,3-cd)pyrene	3	2	0.0184	0.0356 (U)	n/a	0.0252	Maximum detected concentration
Phenanthrene	3	2	0.0212	0.0356 (U)	n/a	0.0317	Maximum detected concentration
Pyrene	3	2	0.0356 (U)	0.0771	n/a	0.0771	Maximum detected concentration
TCDD[2,3,7,8-] equivalent	3	3	0.00000418	0.0000066	n/a	0.0000066	Maximum detected concentration
Toluene	2	1	0.000465	0.00107 (U)	n/a	0.000465	Maximum detected concentration
Radionuclides (pCi/g)							
Cesium-134	90	5	−0.07 (U)	0.171 (U)	n/a	0.066[b]	Maximum detected concentration
Cesium-137	91	8	−0.028 (U)	0.759	n/a	0.759[b]	Maximum detected concentration
Plutonium-238	92	3	−0.00976 (U)	0.019	n/a	0.019	Maximum detected concentration
Plutonium-239/240	92	18	−0.0471 (U)	0.076	n/a	0.076[b]	Maximum detected concentration

Note: Data qualifiers are defined in Appendix A.

[a] n/a = Not applicable.

[b] Value used is the maximum detected concentration because ProUCL recommended value is negative.

Table F-3.2-1
Physical and Chemical Properties of Inorganic COPCs at SWMU 02-014

COPC	K_d[a] (cm^3/g)	Water Solubility[a] (g/L)
Aluminum	1500	Insoluble
Arsenic	29	Insoluble
Barium	41	Insoluble
Chromium	850	Insoluble
Copper	35	Insoluble
Iron	25	Insoluble
Manganese	65	Insoluble
Mercury	52	Insoluble
Nickel	65	Insoluble
Perchlorate	na[b]	245
Selenium	5	Insoluble
Thallium	71	Insoluble
Vanadium	1000	Insoluble

[a] Information from http://rais.ornl.gov/cgi-bin/tools/TOX_search.

[b] na = Not available.

Table F-3.2-2
Physical and Chemical Properties of Organic COPCs at SWMU 02-014

COPC	Water Solubility* (mg/L)	Organic Carbon Coefficient K_{oc}* (L/kg)	Log Octanol-Water Partition Coefficient K_{ow}*	Vapor Pressure* (mm Hg at 25°C)
Anthracene	4.34E-02	1.64E+04	4.45E+00	6.53E-06
Aroclor-1254	4.30E-02	1.30E+05	6.50E+00	7.71E-05
Aroclor-1260	1.44E-02	3.50E+05	7.55E+00	4.05E-05
Benzo(a)anthracene	9.40E-03	1.77E+05	5.76+00	2.1E-07
Benzo(a)pyrene	1.62E-03	5.87E+05	6.13E+00	5.49E-09
Benzo(b)fluoranthene	1.50E-03	5.99E+05	5.78E+00	5.00E-07
Benzo(g,h,i)perylene	2.60E-04	1.95E+06	6.63E+00	1.00E-10
Benzo(k)fluoranthene	8.00E-04	5.87E+05	6.11E+00	9.65E-10
Chrysene	2.00E-03	1.80E+05	5.81E+00	6.23E-09
Fluoranthene	2.60E-01	5.54E+04	5.16E+00	9.22E-06
Indeno(1,2,3-cd)pyrene	1.90E-04	1.95E+06	6.70E+00	1.25E-10
Phenanthrene	1.15E+00	1.67E+04	4.46E+00	1.21E-04
Pyrene	1.35E-01	5.43E+04	4.88E+00	4.50E-06
Tetrachlorodibenzodioxin[2,3,7,8-]	2.00E-04	2.49E+05	6.80E+00	1.50E-09
Toluene	5.26E+02	2.34E+02	2.73E+00	2.84E+01

* Information from http://rais.ornl.gov/cgi-bin/tools/TOX_search, unless noted otherwise.

Table F-3.2-3
Physical and Chemical Properties of Radionuclide COPCs at SWMU 02-014

COPC	Soil-Water Partition Coefficient, K_d[a] (cm^3/g)	Water Solubility[b] (g/L)
Cesium-134	1000	Insoluble
Cesium-137	1000	Insoluble
Plutinium-238	4500	Insoluble
Plutonium-239/240	4500	Insoluble

[a] Information from http://rais.ornl.gov/cgi-bin/tools/TOX_search.

[b] Denotes reference information from http://www.epa.gov/superfund/sites/npl/hrsres/tools/scdm.htm.

Table F-3.3-1
TEFs Used for Calculating TCDD-Equivalent Concentrations

Dioxin and Furan Congeners	TEFs*
TCDD[2,3,7,8-]	1
Pentachlorodibenzodioxin[1,2,3,7,8-]	1
Hexachlorodibenzodioxin[1,2,3,4,7,8-]	0.1
Hexachlorodibenzodioxin[1,2,3,6,7,8-]	0.1
Hexachlorodibenzodioxin[1,2,3,7,8,9-]	0.1
Heptachlorodibenzodioxin[1,2,3,4,6,7,8-]	0.01
Octachlorodibenzodioxin[1,2,3,4,6,7,8,9-]	0.0003
Tetrachlorodibenzofuran[2,3,7,8-]	0.1
Pentachlorodibenzofuran[1,2,3,7,8-]	0.03
Pentachlorodibenzofuran[2,3,4,7,8-]	0.3
Hexachlorodibenzofuran[1,2,3,4,7,8-]	0.1
Hexachlorodibenzofuran[1,2,3,6,7,8-]	0.1
Hexachlorodibenzofuran[1,2,3,7,8,9-]	0.1
Hexachlorodibenzofuran[2,3,4,6,7,8-]	0.1
Heptachlorodibenzofuran[1,2,3,4,6,7,8-]	0.01
Heptachlorodibenzofuran[1,2,3,4,7,8,9-]	0.01
Octachlorodibenzofuran[1,2,3,4,6,7,8,9-]	0.0003

*TEFs from NMED (2017, 602273).

Table F-4.1-1
Exposure Parameters Used to Calculate Chemical SSLs for the Industrial, Recreational, and Residential Scenarios

Parameters	Industrial Values	Recreational Values	Residential Values
Target HQ	1	1	1
Target cancer risk	10^{-5}	10^{-5}	10^{-5}
Averaging time (carcinogen/mutagen)	70 yr × 365 days	70 yr × 365 days	70 yr × 365 days
Averaging time (noncarcinogen)	ED × 365 days	Exposure duration × 365 days	ED × 365 days
Skin absorption factor	SVOC[a] = 0.1	SVOC = 0.1	SVOC = 0.1
	Chemical-specific	Chemical-specific	Chemical-specific
Adherence factor–child	n/a[b]	0.2 mg/cm^2	0.2 mg/cm^2
Body weight–child	n/a	31 kg	15 kg (0–6 yr of age)
Cancer slope factor–oral (chemical-specific)	(mg/kg-day)$^{-1}$	(mg/kg-d)$^{-1}$	(mg/kg-d)$^{-1}$
Inhalation unit risk (chemical-specific)	(µg/m^3)	(µg/m^3)	(µg/m^3)
Exposure frequency	225 days/yr	200 days/yr	350 days/yr
Exposure time	8 hr/day	1 hr/day	24 hr/day
Exposure duration–child	n/a	6 yr (6 to <12 yr of age)	6 yr[c]
Age-adjusted ingestion factor for carcinogens	n/a	n/a	36,750 mg/kg
Age-adjusted ingestion factor for mutagens	n/a	n/a	25,550 mg/kg
Soil ingestion rate–child	n/a	91 mg/d	200 mg/d
Particulate emission factor	6.61×10^9 m^3/kg	6.61×10^9 m^3/kg	6.61×10^9 m^3/kg
Reference dose–oral (chemical-specific)	(mg/kg-day)	(mg/kg-day)	(mg/kg-day)
Reference dose–inhalation (chemical-specific)	(mg/kg-day)	(mg/kg-day)	(mg/kg-day)
Exposed surface area–child	n/a	4030 cm^2	2690 cm^2/day
Age-adjusted skin contact factor for carcinogens	n/a	n/a	112,266 mg/kg
Age-adjusted skin contact factor for mutagens	n/a	n/a	166,833 mg/kg
Volatilization factor for soil (chemical-specific)	(m^3/kg)	(m^3/kg)	(m^3/kg)
Body weight–adult	80 kg	80 kg	80 kg
Exposure duration[d]	25 yr	26 yr (20 yr carcinogens)	30 yr[e]

Table F-4.1-1 (continued)

Parameters	Industrial Values	Recreational Values	Residential Values
Adherence factor–adult	0.12 mg/cm^2	0.07 mg/cm^2	0.07 mg/cm^2
Soil ingestion rate–adult	100 mg/day	30 mg/day	100 mg/day
Exposed surface area–adult	3470 cm^2/day	6032 cm^2	6032 cm^2/day

Note: Parameter values from NMED (2017, 602273) and LANL (2017, 602581).

[a] SVOC = Semivolatile organic compound.

[b] n/a = Not applicable.

[c] The child exposure duration for mutagens is subdivided into 0–2 yr and 2–6 yr.

[d] Exposure duration for lifetime resident is 26 yr. For carcinogens, the exposures are combined for child (6 yr) and adult (20 yr).

[e] The adult exposure duration for mutagens is subdivided into 6–16 yr and 16–30 yr.

Table F-4.1-2
Parameter Values Used to Calculate Radionuclide SALs for the Residential Scenario

Parameter	Residential, Child	Residential, Adult
Inhalation rate (m^3/yr)	4712[a]	7780[b]
Mass loading (g/m^3)	1.5×10^{-7}[c]	1.5×10^{-7}[c]
Outdoor time fraction	0.0926[d]	0.0934[e]
Indoor time fraction	0.8656[f]	0.8648[g]
Soil ingestion (g/yr)	73[h]	36.5[i]

[a] Calculated as 12.9 m^3/day × 365.25 day/yr, where 12.9 m^3/day is the mean upper percentile daily inhalation rate of a child (EPA 2011, 208374, Table 6-1).

[b] Calculated as 21.3 m^3/day × 365.25 day/yr, where 21.3 m^3/day is the mean upper percentile daily inhalation rate of an adult from 21 to less than 61 yr old (EPA 2011, 208374, Table 6-1).

[c] Calculated as ($1/6.6 \times 10^9$ m^3/kg) × 1000 g/kg, where 6.6×10^9 m^3/kg is the particulate emission factor (NMED 2015, 600915).

[d] Calculated as (2.32 hr/day × 350 day/yr)/8766 hr/yr, where 2.32 hr/day (139 min) is the largest amount of time spent outdoors for child age groups between 1 to less than 3 mo and 3 to less than 6 yr (EPA 2011, 208374, Table 16-1) and is comparable with the adult time spent outdoors at a residence.

[e] Calculated as (2.34 hr/day × 350 day/yr)/8766 hr/yr, where 4.68 hr/day is the average total time spent outdoors for adults age 18 to less than 65 yr in all environments (EPA 2011, 208374, Table 16-1); 50% of this value (2.34 hr/day) was applied to time spent outdoors at a residence and is similar to mean time outdoors at a residence for this age group (EPA 2011, 208374, Table 16-22).

[f] Calculated as [(24 hr/day–2.32 hr/day) × 350 day/yr]/8766 hr/yr.

[g] Calculated as [(24 hr/day–2.34 hr/day) × 350 day/yr]/8766 hr/yr.

[h] The soil ingestion rate compensates for the time-based occupancy factor applied by RESRAD (LANL 2015, 600929 in calculating exposure from the soil ingestion pathway. Calculated as [0.2 g/day × 350 day/yr]/[indoor + outdoor time fractions], where 0.2 g/day is the upper percentile site-related daily child soil ingestion rate (NMED 2015, 600915; EPA 2011, 208374, Table 5-1).

[I] The soil ingestion rate compensates for the time-based occupancy factor applied by RESRAD (LANL 2015, 600929 in calculating exposure from the soil ingestion pathway. Calculated as [0.1 g/day × 350 day/yr]/[indoor + outdoor time fractions], where 0.1 g/day is the site-related daily adult soil ingestion rate (NMED 2015, 600915).

Table F-4.1-3
Parameter Values Used to Calculate Radionuclide SALs for the Industrial and Construction Worker Scenarios

Parameter	Industrial, Adult	Construction Worker, Adult
Inhalation rate (m^3/yr)	7780[a]	7780[a]
Mass loading (g/m^3)	1.51×10^{-7}[b]	4.76×10^{-7}[c]
Outdoor time fraction	0.2053[d]	0.2282[e]
Indoor time fraction	0[f]	0
Soil ingestion (g/yr)	109.6[g]	362[h]

[a] Calculated as [21.3 m^3/day × 365.25 day/yr], where 21.3 m^3/day is the upper percentile daily inhalation rate of an adult from 21 to less than 61 yr old (EPA 2011, 208374, Table 6-1).

[b] Calculated as ($1/6.6 \times 10^9$ m^3/kg) x 1000 g/kg, where 6.6×10^9 m^3/kg is the particulate emission factor (NMED 2015, 600915).

[c] Calculated as ($1/2.1 \times 10^6$ m^3/kg) x 1000 g/kg, where 2.1×10^6 m^3/kg is the particulate emission factor (NMED 2015, 600915).

[d] Calculated as (8 hr/day × 225 day/yr)/8766 hr/yr, where 8 hr/day is an estimate of the average length of the workday and 225 day/yr is the exposure frequency (NMED 2015, 600915).

[e] Calculated as (8 hr/day × 250 day/yr)/8766 hr/yr, where 8 hr/day is an estimate of the average length of the workday and 250 day/yr is the exposure frequency (NMED 2015, 600915).

[f] The commercial/industrial worker is defined as someone who "spends most of the work day conducting maintenance or manual labor activities outdoors" (NMED 2015, 600915).

[g] The soil-ingestion rate compensates for the time-based occupancy factor applied by RESRAD (LANL 2015, 600929) in calculating exposure from the soil-ingestion pathway. Calculated as [0.1 g/day × 225 day/yr]/[indoor + outdoor time fractions], where 0.1 g/day is the site-related daily adult soil-ingestion rate (NMED 2015, 600915).

[h] The soil-ingestion rate compensates for the time-based occupancy factor applied by RESRAD (LANL 2015, 600929) in calculating exposure from the soil-ingestion pathway. Calculated as [0.33 g/day × 250 day/yr]/[indoor + outdoor time fractions], where 0.33 g/day is the site-related daily adult soil-ingestion rate (NMED 2015, 600915).

Table F-4.1-4
Parameter Values Used to Calculate Radionuclide SALs for the Recreational Scenario

Parameter	Recreational, Child	Recreational, Adult
Inhalation rate (m^3/yr)	15,250[a]	19,460[b]
Mass loading (g/m^3)	1.5×10^{-7}[c]	1.5×10^{-7}[c]
Outdoor time fraction	0.0228[d]	0.0228[d]
Indoor-time fraction	0	0
Soil ingestion (g/yr)	797[e]	244[f]

[a] Calculated as (0.029 m^3/min × 60 min/hr × 24 hr/day × 365.25 day/yr), where 0.029 m^3/min is the upper percentile child inhalation rate for moderate activity for 6 to <11 yr old (EPA 2011, 208374, Table 6-2).

[b] Calculated as (0.037 m^3/min × 60 min/hr × 24 hr/day × 365.25 day/yr), where 0.037 m^3/min is the age-weighted upper percentile adult inhalation rate for moderate activity (12 to 35 yr) (EPA 2011, 208374, Table 6-2).

[c] Calculated as ($1/6.6 \times 10^9$ m^3/kg) × 1000 g/kg, where 6.6×10^9 m^3/kg is the particulate emission factor used for residential and industrial scenarios (NMED 2015, 600915).

[d] Calculated as (1 hr/day × 200 day/yr)/8766 hr/yr, where 1 hr/day is the exposure time for a recreational adult or child and 200 day/yr is the exposure frequency (LANL 2015, 600929).

[e] The soil ingestion rate is defined to compensate for the time-based occupancy factor applied by RESRAD (LANL 2015, 600929) in calculating exposure from the soil ingestion pathway. One hundred percent of daily soil ingestion is protectively assumed to occur during outdoor activity. Calculated as [(0.2 g/day/2.2 hr/day) × 1 hr/day × 200 day/yr)]/[indoor + outdoor time fractions], where 2.2 hr/day is the mean time spent outdoors per d for a 6 to <11 yr old child (EPA 2011, 208374, Table 16-1), and where 0.2 g/day is the upper-bound child soil ingestion rate (EPA 2011, 208374, Table 5-1; NMED 2015, 600915).

[f] Calculated as [(0.1 g/day/3.6 hr/day) × 1 hr/day × 200 day/yr)]/[indoor + outdoor time fractions], where 3.6 hr/day is the mean time spent outdoors per d for an adult (12 to 35 yr) (EPA 2011, 208374, Table 16-1) and where 0.1 g/day is the adult soil ingestion rate (NMED 2015, 600915).

Table F-4.2-1
Industrial Carcinogenic Screening Evaluation for SWMU 02-014

COPC	EPC (mg/kg)	Industrial SSL* (mg/kg)	Cancer Risk
Aroclor-1254	0.787	11	7.15E-07
Aroclor-1260	3.91	11.1	3.53E-06
Benzo(a)anthracene	0.0516	32.3	1.6E-08
Benzo(a)pyrene	0.0551	23.6	2.33E-08
Benzo(b)fluoranthene	0.0702	32.3	2.17E-08
Benzo(k)fluoranthene	0.041	323	1.27E-09
Chrysene	0.0598	3230	1.85E-10
Indeno(1,2,3-cd)pyrene	0.0252	32.3	7.8E-09
TCDD[2,3,7,8-] equivalent	0.0000066	0.000238	2.77E-07
		Total Excess Cancer Risk	**5E-06**

* SSLs from NMED (2017, 602273).

Table F-4.2-2
Industrial Noncarcinogenic Screening Evaluation for SWMU 02-014

COPC	EPC (mg/kg)	Industrial SSL[a] (mg/kg)	HQ
Copper	11.7	51,900	2.25E-04
Mercury	0.284	389	7.3E-04
Selenium	0.66	6490	1.02E-04
Aroclor-1254	0.787	16.4	4.8E-02
Anthracene	0.00903	253,000	3.57E-08
Benzo(g,h,i)perylene	0.0271	25,300[b]	1.07E-06
Fluoranthene	0.0984	33,700	2.92E-06
Phenanthrene	0.0317	25,300	1.25E-06
Pyrene[b]	0.0771	25,300	3.05E-06
TCDD[2,3,7,8-] equivalent	0.0000066	0.000808	8.17E-03
		HI	**0.06**

[a] SSLs from NMED (2017, 602273).

[b] Pyrene used as a surrogate based on structural similarity.

Table F-4.2-3
Industrial Radionuclide Screening Evaluation for SWMU 02-014

COPC	EPC (pCi/g)	Industrial SAL* (pCi/g)	Dose (mrem/yr)
Plutonium-239/240	0.0414	1200	8.63E-04
		Total Dose	**0.0009**

* SALs from LANL (2015, 600929).

Table F-4.2-4
Recreational Carcinogenic Screening Evaluation for SWMU 02-014

COPC	EPC (mg/kg)	Recreational SSL* (mg/kg)	Cancer Risk
Aroclor-1254	0.787	10	7.87E-07
Aroclor-1260	3.91	10.3	3.8E-06
Benzo(a)anthracene	0.0516	88.8	5.81E-09
Benzo(a)pyrene	0.0551	8.88	6.2E-08
Benzo(b)fluoranthene	0.0702	88.8	7.91E-09
Benzo(k)fluoranthene	0.041	888	4.62E-10
Chrysene	0.0598	8880	6.73E-11
Indeno(1,2,3-cd)pyrene	0.0252	88.8	2.84E-09
TCDD[2,3,7,8-] equivalent	0.0000066	0.000297	2.22E-07
		Total Excess Cancer Risk	**5E-06**

* SSLs from LANL (2017, 602581).

Table F-4.2-5
Recreational Noncarcinogenic Screening Evaluation for SWMU 02-014

COPC	EPC (mg/kg)	Recreational SSL[a] (mg/kg)	HQ
Copper	11.7	24,800	4.72E-04
Mercury	0.284	186	1.49E-03
Selenium	0.66	3100	2.13E-04
Aroclor-1254	0.787	5.53	1.42E-01
Anthracene	0.00903	86,300	1.05E-07
Benzo(a)pyrene	0.0551	86	6.41E-04
Benzo(g,h,i)perylene	0.0271	8630[b]	3.14E-06
Fluoranthene	0.0984	11,500	8.56E-06
Phenanthrene	0.0317	8630	3.67E-06
Pyrene	0.0771	8630	8.93E-06
TCDD[2,3,7,8-] equivalent	0.0000066	0.00034	1.94E-02
		HI	**0.2**

[a] SSLs from LANL (2017, 602581).

[b] Pyrene used as a surrogate based on structural similarity

Table F-4.2-6
Recreational Radionuclide Screening Evaluation for SWMU 02-014

COPC	EPC (pCi/g)	Recreational SAL* (pCi/g)	Dose (mrem/yr)
Plutonium-239/240	0.0414	1300	7.96E-04
		Total Dose	**0.0008**

* SALs from LANL (2015, 600929).

Table F-4.2-7
Residential Carcinogenic Screening Evaluation for SWMU 02-014

COPC	EPC (mg/kg)	Residential SSL* (mg/kg)	Cancer Risk
Arsenic	0.799	7.07	1.13E-06
Chromium	3.32	96.6	3.44E-07
Nickel	2.39	595,000	4.02E-11
Aroclor-1254	0.132	2.43	5.43E-07
Aroclor-1260	2.3	2.43	9.47E-06
Benzo(a)anthracene	0.0516	1.53	3.37E-07
Benzo(a)pyrene	0.0551	1.12	4.92E-07
Benzo(b)fluoranthene	0.0702	1.53	4.59E-07
Benzo(k)fluoranthene	0.041	15.3	2.68E-08
Chrysene	0.0598	153	3.91E-09
Indeno(1,2,3-cd)pyrene	0.0252	1.53	1.65E-07
TCDD[2,3,7,8-] equivalent	0.0000066	0.000049	1.35E-06
		Total Excess Cancer Risk	**1E-05**

* SSLs from NMED (2017, 602273).

Table F-4.2-8
Residential Noncarcinogenic Screening Evaluation for SWMU 02-014

COPC	EPC (mg/kg)	Residential SSL[a] (mg/kg)	HQ
Aluminum	5990	78,000	7.68E-02
Arsenic	0.799	13	6.15E-02
Barium	36.8	15,600	2.36E-03
Chromium	3.32	45,200	7.35E-05
Copper	5.81	3130	1.86E-03
Iron	5300	54,800	9.67E-02
Manganese	204	10,500	1.94E-02
Mercury	0.0697	23.5	2.97E-03
Nickel	2.39	1560	1.53E-03
Perchlorate	0.000813	54.8	1.48E-05
Selenium	0.459	391	1.17E-03
Thallium	0.0807	0.78	1.03E-01
Vanadium	4.87	394	1.24E-02
Aroclor-1254	0.132	1.14	1.16E-01
Anthracene	0.00903	17,400	5.19E-07
Benzo(g,h,i)perylene	0.0271	1740[b]	1.56E-05
Fluoranthene	0.0984	2320	4.24E-05
Phenanthrene	0.0317	1740	1.82E-05
Pyrene	0.0771	1740	4.43E-05
TCDD[2,3,7,8-] equivalent	0.0000066	0.000051	1.3E-01
Toluene	0.000465	5220	8.91E-08
		HI	**0.6**

[a] SSLs from NMED (2017, 602273).

[b] Pyrene used as a surrogate based on structural similarity.

Table F-4.2-9
Residential Radionuclide Screening Evaluation for SWMU 02-014

COPC	EPC (pCi/g)	Residential SAL* (pCi/g)	Dose (mrem/yr)
Cesium-134	0.066	5	3.30E-01
Cesium-137	0.759	12	1.58E+00
Plutonium-238	0.019	84	5.65E-03
Plutonium-239/240	0.076	79	2.41E-02
		Total Dose	**2**

* SALs from LANL (2015, 600929).

Table F-4.2-10
Construction Worker Noncarcinogenic Screening Evaluation for SWMU 02-014

COPC	EPC (mg/kg)	Construction Worker SSL (mg/kg)[a]	HQ
Aluminum	5990	41,400	1.45E-01
Arsenic	0.799	41.2	1.94E-02
Barium	36.8	4390	8.38E-03
Chromium	3.32	134	2.48E-02
Copper	5.81	14,200	4.09E-04
Iron	5300	248,000	2.14E-02
Manganese	204	464	4.40E-01
Mercury	0.0697	77.1	9.03E-04
Nickel	2.39	753	3.17E-03
Perchlorate	0.000813	248	3.28E-06
Selenium	0.459	1750	2.62E-04
Thallium	0.0807	3.54	2.28E-02
Vanadium	4.87	614	7.93E-03
Aroclor-1254	0.132	4.91	2.69E-02
Anthracene	0.00903	75,300	1.20E-07
Benzo(g,h,i)perylene	0.0271	7530[b]	3.60E-06
Fluoranthene	0.0984	10,000	9.84E-06
Phenanthrene	0.0317	7530	4.21E-06
Pyrene	0.0771	7530	1.02E-05
TCDD[2,3,7,8-] equivalent	0.0000066	0.00023	2.87E-02
Toluene	0.000465	14,000	3.32E-08
		HI	**0.8**

[a] SSLs from NMED (2017, 602273).

[b] Pyrene used as a surrogate based on structural similarity.

Table F-4.4-1
Essential Nutrient Screening Assessment

SWMU / AOC	Scenario	COPC	Maximum Concentration (mg/kg)	SSL (mg/kg)*	Ratio
02-014	Residential	Magnesium	1710	20,900,000	8.2E-05

* SSLs from NMED (2017, 602273).

Attachment F-1

Dioxin and Furan Toxicity Equivalency Factor Calculations
(on CD included with this document)

Attachment F-2

ProUCL Files
(on CD included with this document)

Appendix G

Box Plots and Statistical Results

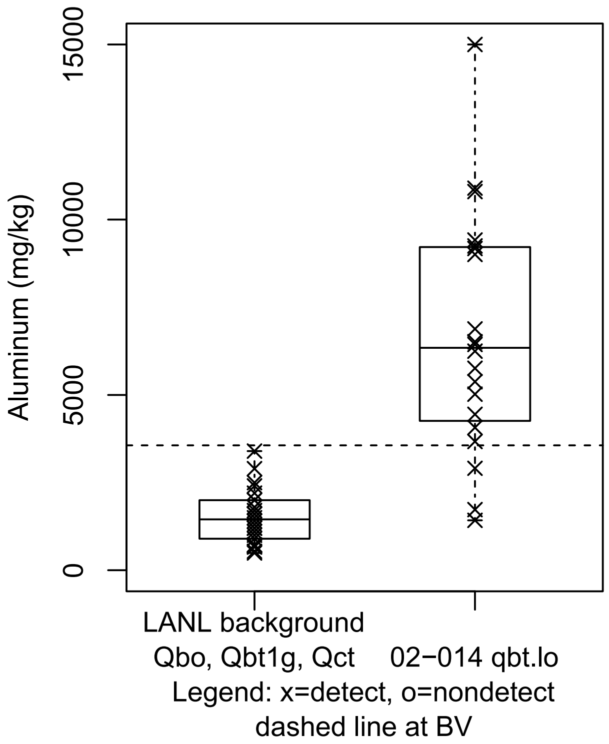


Figure G-1 **Box plot for aluminum in tuff at SWMU 02-014**

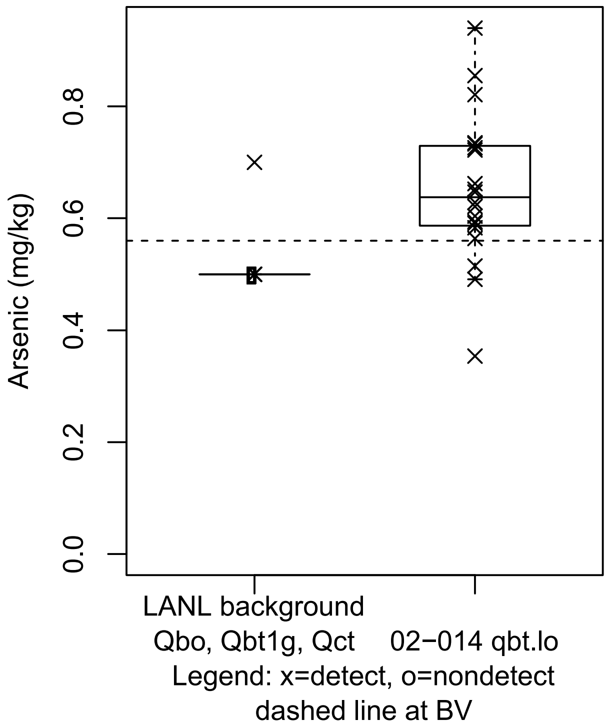


Figure G-2 **Box plot for arsenic in tuff at SWMU 02-014**

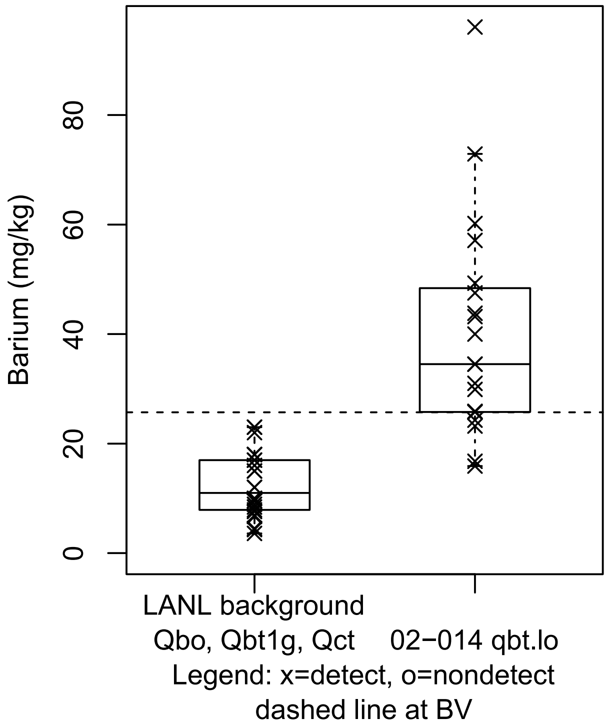


Figure G-3 **Box plot for barium in tuff at SWMU 02-014**

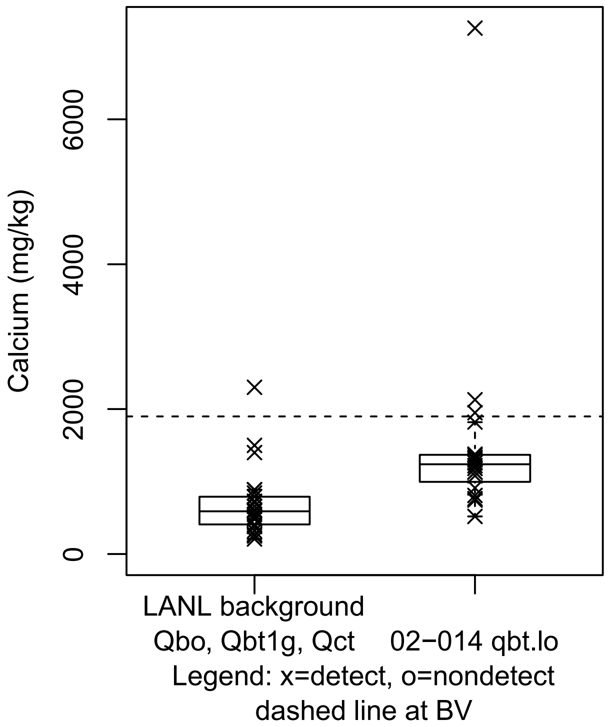


Figure G-4 **Box plot for calcium in tuff at SWMU 02-014**

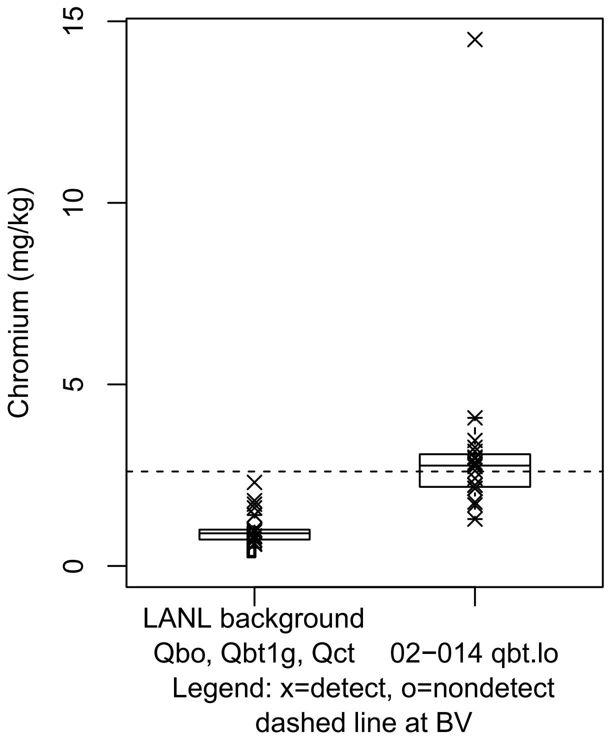


Figure G-5 Box plot for chromium in tuff at SWMU 02-014

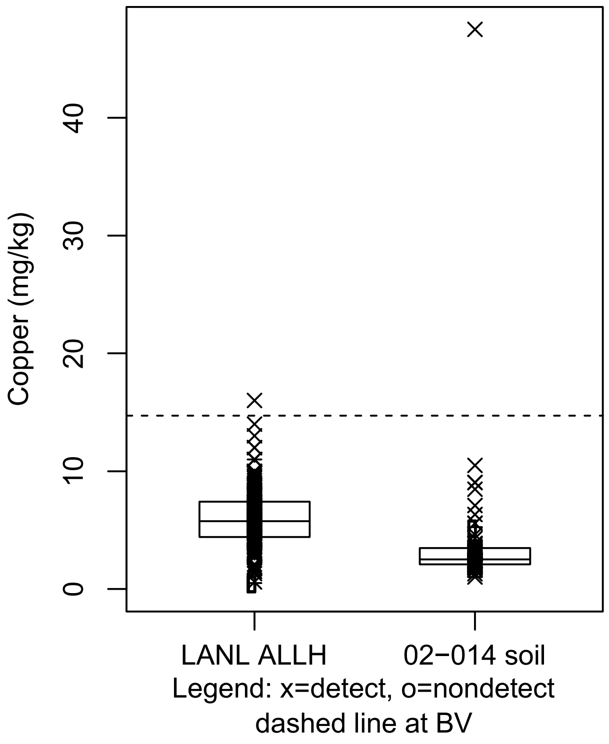


Figure G-6 Box plot for copper in soil at SWMU 02-014

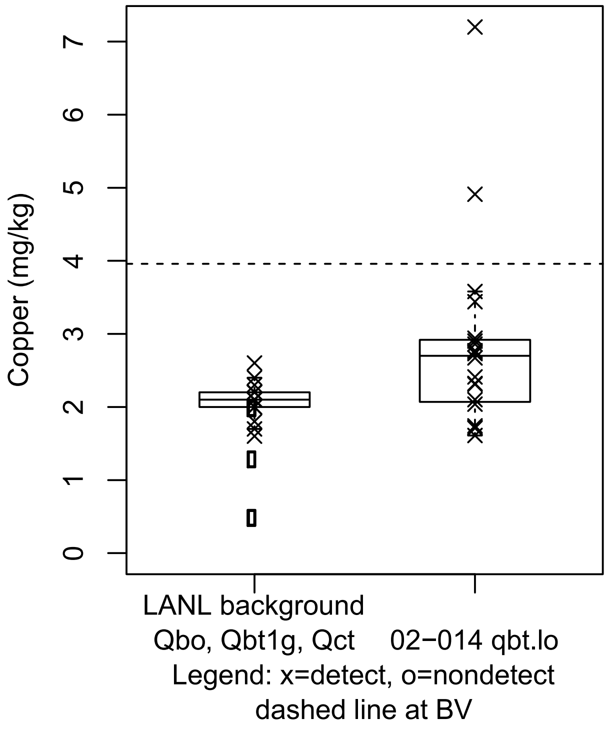


Figure G-7 Box plot for copper in tuff at SWMU 02-014

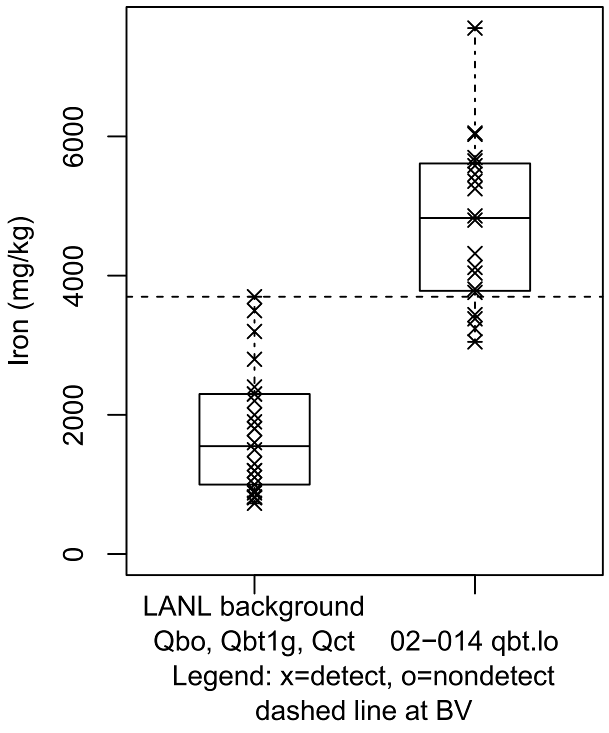


Figure G-8 Box plot for iron in tuff at SWMU 02-014

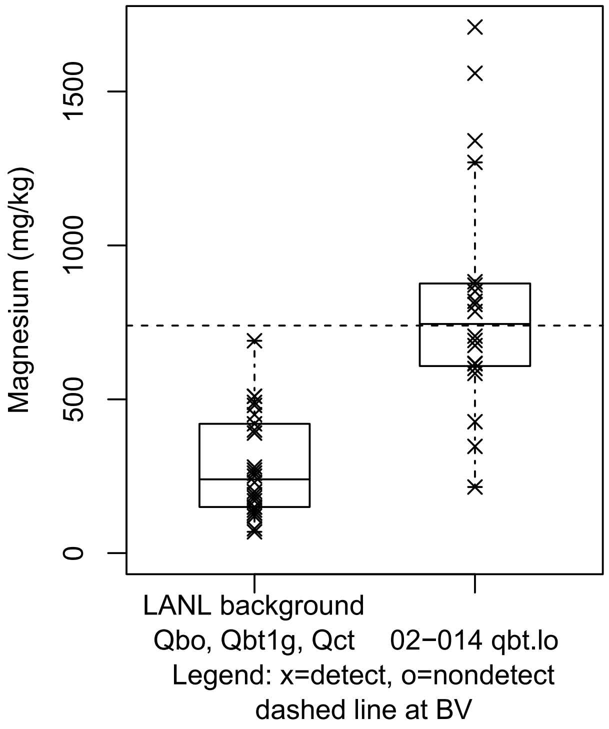


Figure G-9 **Box plot for magnesium in tuff at SWMU 02-014**

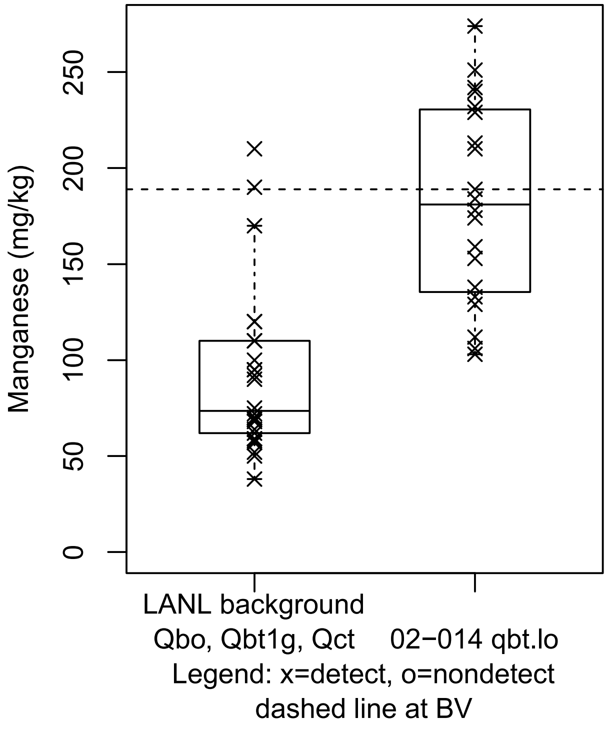


Figure G-10 **Box plot for manganese in tuff at SWMU 02-014**

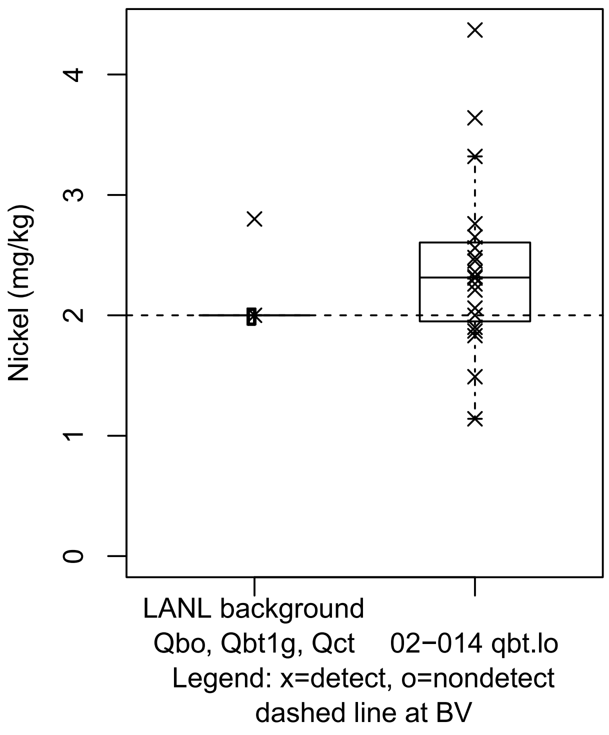


Figure G-11 **Box plot for nickel in tuff at SWMU 02-014**

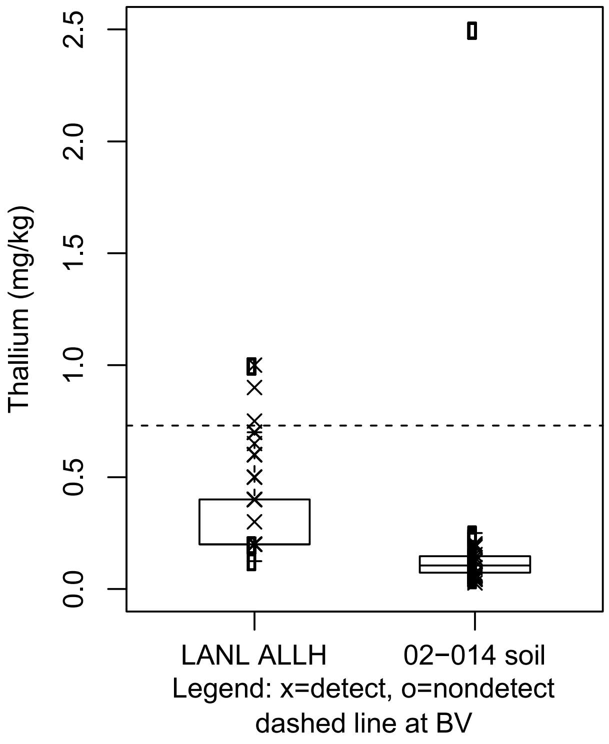


Figure G-12 **Box plot for thallium in soil at SWMU 02-014**

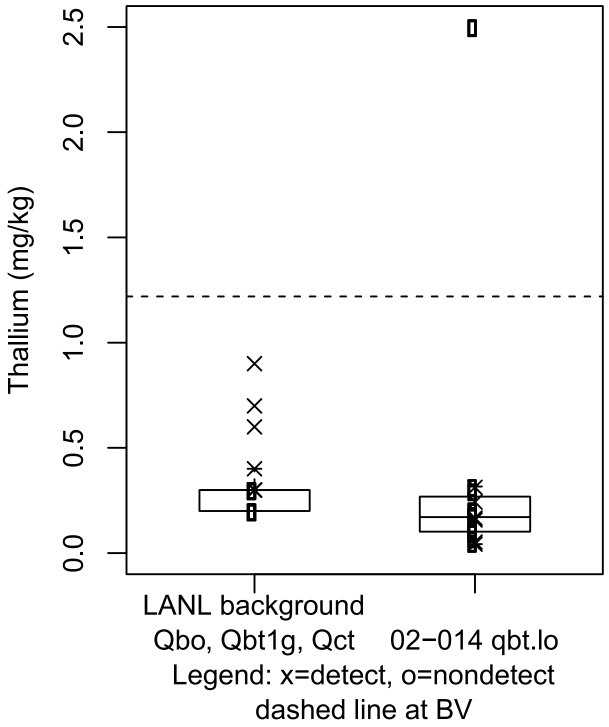


Figure G-13 **Box plot for thallium in tuff at SWMU 02-014**

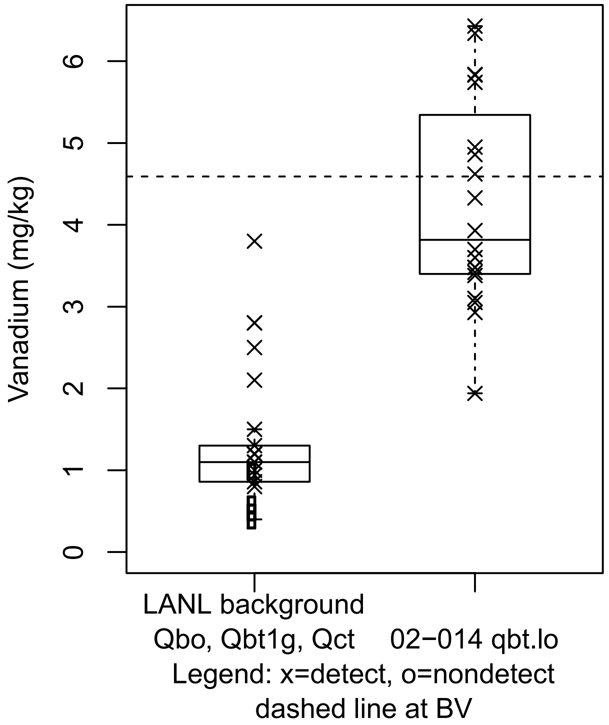


Figure G-14 **Box plot for vanadium in tuff at SWMU 02-014**

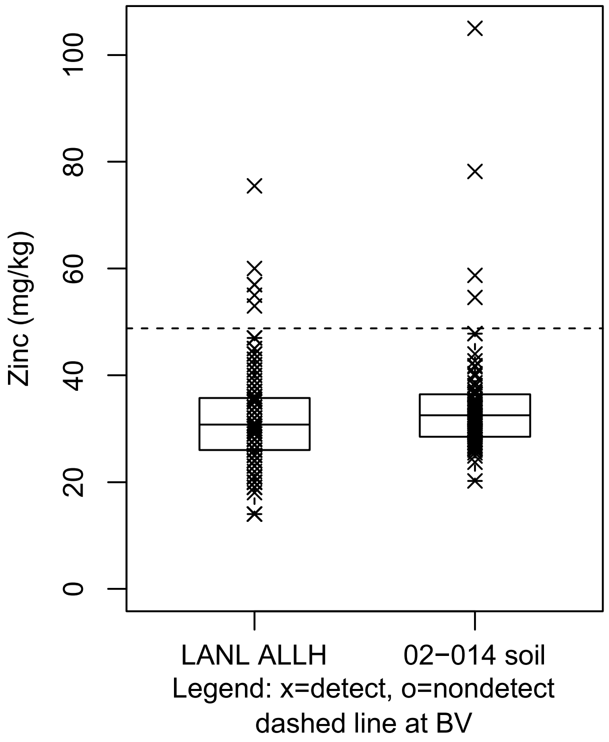


Figure G-15 Box plot for zinc in soil at SWMU 02-014

Table G-1
Results for Statistical Tests for Inorganic Chemicals in Tuff at SWMU 02-014

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-Value	COPC?
Aluminum	<0.001	<0.001	n/a*	Yes
Arsenic	n/a	0.00374	0.00171	Yes
Barium	<0.001	<0.001	n/a	Yes
Calcium	<0.001	0.131	0.444	No
Chromium	<0.001	<0.001	n/a	Yes
Copper	<0.001	<0.001	n/a	Yes
Iron	<0.001	<0.001	n/a	Yes
Magnesium	<0.001	<0.001	n/a	Yes
Manganese	<0.001	<0.001	n/a	Yes
Nickel	n/a	0.00312	0.0751	Yes
Thallium	n/a	1.00	0.184	No
Vanadium	<0.001	<0.001	n/a	Yes

*n/a = Not applicable.

Table G-2
Results for Statistical Tests for Inorganic Chemicals in Soil at SWMU 02-014

Analyte	Gehan Test p-Value	Quantile Test p-Value	Slippage p-Value	COPC?
Copper	1.00	1.00	n/a	No
Thallium	n/a	n/a	0.0239	Yes
Zinc	0.0143	0.212	0.0828	No

*n/a = Not applicable.

Plate 1

Site map of SWMU 02-014

New Mexico State Plane Coordinate System Central Zone (3002)
North American Datum, 1983 (NAD 83)

US Survey Ft

GIS: Ross Casey, rcasey@lanl.gov
Date: 20-February-2019
Last Opened: Monday, April 8, 2019

File: MLA_IR_BaseMap_021919

DISCLAIMER: This map was created for work processes associated with LLCC. All other uses for this map should be confirmed with N3B staff.

■ Sampling location
┼ Former site fencing
🟩 SWMU or AOC
▭ Former structure
▭ Existing structure
▭ Drainline
🟧 Boulder
▭ Concrete flume and debris catcher
▭ Interior excavation boundary
▭ Exterior excavation boundary
— Index contour, 5-ft interval
— Terrain contour, 1-ft interval

Plate 2

Inorganic chemicals detected or detected above BVs at SWMU 02-014

New Mexico State Plane Coordinate System Central Zone (3002)
North American Datum, 1983 (NAD 83)

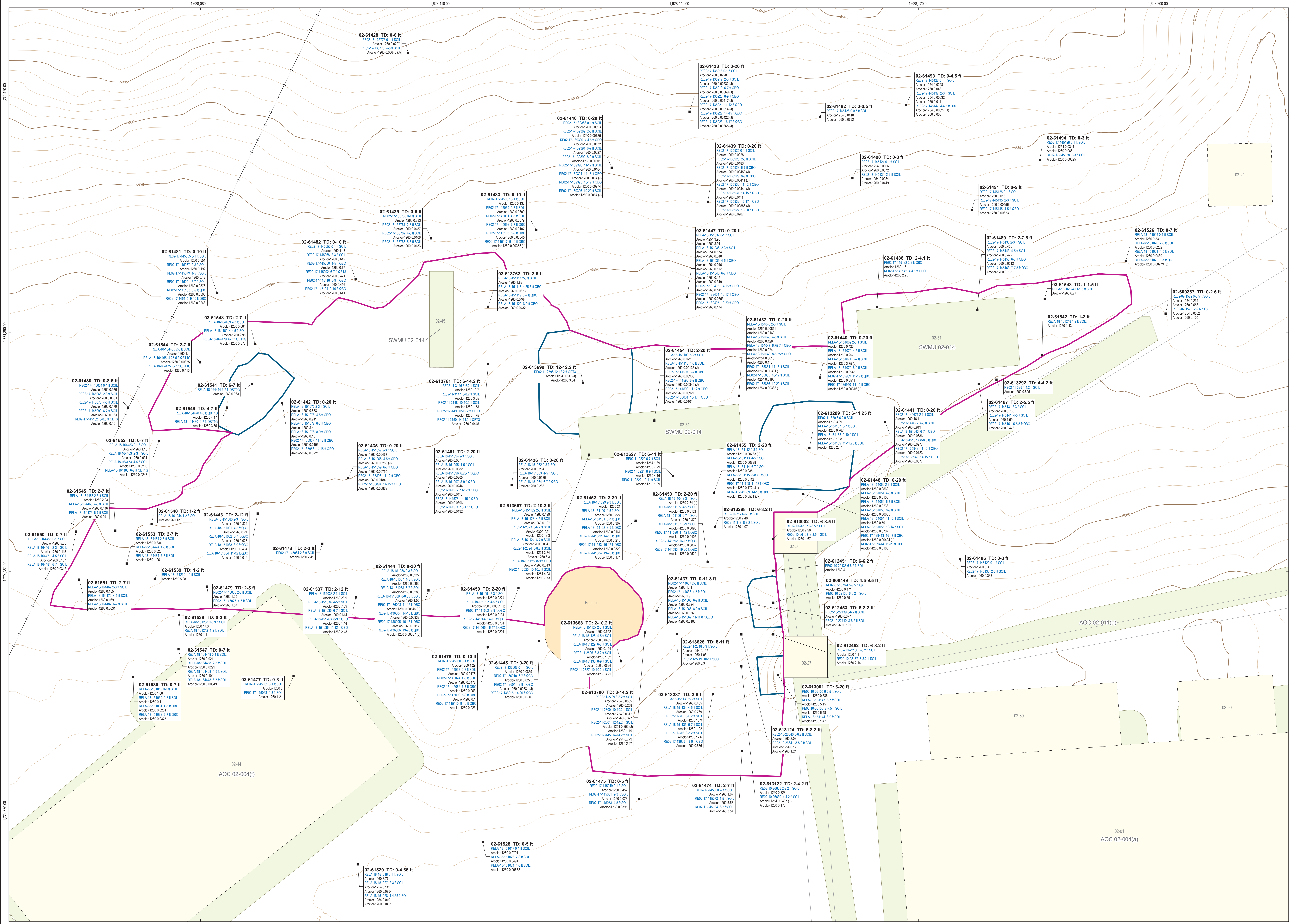
US Survey Ft

GIS: Dave Frank, david.frank@em-la.doe.gov, 551-2945
Created: 15-August-2019
Last Opened: Wednesday, August 21, 2019

File: map_16-0073-36_inorganics_02-14_data_repull

DISCLAIMER: This map was created for work processes associated with the LLCC. All other uses for this map should be confirmed with N3B staff.

All units are in mg/kg



- · Sampling location
- —+— Former site fencing
- 🟩 SWMU or AOC
- ▭ Former structure
- ▭ Existing structure
- ▭ Drainline
- ▭ Boulder
- ▭ Concrete flume and debris catcher
- ▭ Interior excavation boundary
- ▭ Exterior excavation boundary
- — Index contour, 5-ft interval
- — Terrain contour, 1-ft interval

Plate 3

PCBs detected at SWMU 02-014

New Mexico State Plane Coordinate System Central Zone (3002)
North American Datum, 1983 (NAD 83)

US Survey Ft

GIS: Dave Frank, david.frank@em-la.doe.gov, 551-2945
Created: 15-August-2019
Last Opened: Tuesday, August 20, 2019

File: map_16-0073-34_aroclor_excavation_pcb_analyte_data_repull

DISCLAIMER: This map was created for work processes associated with the LLCC. All other uses for this map should be confirmed with N3B staff.

All units are in mg/kg

0 5 10 20
Feet