Response to the Notice of Disapproval for the Remedy Completion Report for Upper Los Alamos Canyon Aggregate Area, Former Technical Area 32, Los Alamos National Laboratory, EPA ID No. NM0890010515, HWB-LANL-10-083, Dated January 25, 2011

INTRODUCTION

To facilitate review of this response, the New Mexico Environment Department's (NMED's) comments are included verbatim. The comments are divided into general and specific categories, as presented in the notice of disapproval. Los Alamos National Laboratory's (LANL's or the Laboratory's) responses follow each NMED comment. This response contains data on radioactive materials, including source, special nuclear, and byproduct material. Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to NMED in accordance with U.S. Department of Energy policy.

GENERAL COMMENTS

NMED Comment

1. *The risk and hazard results have been rounded to one significant figure. Because several of the results are at or slightly above target levels, significant figures showing that results are actually slightly above target levels must be included. Modify tables and text showing risk and hazard estimates to include at least two significant figures.*

LANL Response

1. The Laboratory acknowledges NMED's concern about rounding results that are slightly above target levels, but believes this practice is appropriate and provides the following information to support the practice of rounding risk and hazard results to one significant figure.

   - The Laboratory follows standard risk assessment practice in presenting one significant figure to represent the estimated risk. U.S. Environmental Protection Agency (EPA) guidance (EPA 1989, 008021, section 8.2 and Tables 8-2, 8-3, and 8-4) states that only one significant figure should be used when presenting risk. This is true whether risk results are slightly above the target levels, as cited in NMED's comment, or not.
   - Rounding the calculated results to one significant figure does not reduce the amount of information in the result because the risk assessment calculations do not provide adequate precision to distinguish between results with two significant figures because of the uncertainties in exposure parameters, particularly with screening level assessments.
   - Given the conservative and protective nature of the risk analysis, particularly for a screening level assessment, it is adequate to represent the risk with one significant figure.
   - The target levels are a hazard index (HI) of 1 and a cancer risk of 1×10^{-5}, which are also presented with one significant figure.

   In summary, given the conservative nature of the screening level assessment, representing risk with one significant figure is both appropriate and protective of human health and the environment. It is also consistent with EPA guidance and standard practice. Based on the justification provided above, no revisions have been made to the risk assessment.

NMED Comment

2. *The vapor intrusion pathway was evaluated for residents at sites containing volatile organic compounds (VOCs). This pathway is also complete for the industrial receptors and risks via the vapor intrusion pathway and must be evaluated for an indoor worker at all sites containing VOCs. Revise the risk assessment accordingly.*

   In addition, the construction worker could also be exposed to VOCs volatilized into outdoor air. It is generally accepted that unless there is a trenching scenario where vapors could pond, the indoor air pathway is protective of the outdoor air pathway. However, a qualitative discussion of inhalation of VOCs by the construction worker must still be included in the risk assessment. Revise the risk assessment accordingly.

LANL Response

2. Former Technical Area 32 (TA-32) and the surrounding area is slated for mixed-use development in the future. The vapor-intrusion pathway was only evaluated for the residential scenario because it is the most protective of the two scenarios. The results indicate that a resident would not be adversely affected by this pathway because the residential risks are well below the NMED target risk levels. Because the residential scenario is more protective, the industrial (commercial) worker is also not affected, and no revision to the report is necessary.

   As indicated in NMED's soil screening level (SSL) development document, the SSL for construction workers includes the exposure pathway for inhalation of dusts and volatiles (NMED 2009, 108070, pp. 3, 6–7). Therefore, the risk evaluation for construction workers already considers inhalation of volatile organic compounds (VOCs) volatilized into outdoor air. In addition, a VOC plume is not expected to be present at any of the TA-32 sites that could result in an exposure to a construction worker, based on the low concentrations (low µg/kg range) and infrequent detections (one to five per site) of VOCs. Therefore, an evaluation of the inhalation pathway of VOCs by a construction worker is not necessary, and no revisions to the risk assessment are warranted.

NMED Comment

3. *For sites where the vapor intrusion pathway was evaluated, the calculated risks and hazards from exposure via the vapor intrusion pathway were not added to the calculated risk and hazard estimates from exposure to soil. Cumulative risk/hazard for all potential exposure scenarios must be evaluated when assessing total risk/hazard. Revise cumulative risks/hazard calculations accordingly.*

LANL Response

3. The calculated cancer risk and/or HI for the vapor-intrusion pathway for each site does not affect the total excess cancer risk and HI because the associated risks are several orders of magnitude lower than those for soil. Therefore, the total excess cancer risk and HI for each site are essentially equal to those calculated for soil. Text has been revised in the risk appendix (Appendix F, sections F-4.4.1, F-4.4.2, and F-4.4.3) and main text (sections 4.2.4, 4.3.5, and 4.4.4) to clarify that the vapor-intrusion results do not impact the total excess cancer risk or HI.

NMED Comment

4. *Numerous inconsistencies were noted between exposure point concentrations (EPCs) used in vapor intrusion results and maximum detected concentrations. For example, the EPC in Table F-4.2-13 for methylene chloride (0.00489) is inconsistent with the maximum detected concentration of methylene chloride (0.014) mg/kg) at SWMU 32-002(b) presented in Table 4.2-3. The EPCs presented on Tables F-4.2-23 for methylene chloride (0.00799 mg/kg) are inconsistent with the maximum detected concentrations of methylene chloride (0.016 mg/kg) at AOC 32-003 presented on Table 4.3-3. Resolve the inconsistencies and update the vapor intrusion results utilizing correct maximum detected concentrations.*

LANL Response

4. The exposure point concentrations (EPCs) used in the vapor-intrusion evaluations have been revised to reflect the maximum detected concentrations for each site as indicated in section F-4.1. Tables F-4.2-13 and F-4.2-23 have been revised accordingly.

SPECIFIC COMMENTS

NMED Comment

1. ***Section 4.1.4, Summary of Nature and Extent for SWMU 32-002(a), page 13:***

   Permittee's Statement: *The vertical extent is not defined for:*

   - *aluminum, barium, beryllium, copper, lead, and nickel at location 00-603582;*
   - *aluminum, barium and copper at location 00-603585; and*
   - *chromium and nickel at location 32-06372.*

   NMED's Comment: *Chromium also increased with depth at sample locations 00-603584, 00-603585, 00-603586, 00-603588, 00-603596, 32-06368 and 32-06372. Nickel also increased with depth at sample locations 00-603588, 00-603586 and 00-603596. Revise the text to correctly describe all locations and analytes where the vertical extent is not defined.*

LANL Response

1. The remedy completion report does not evaluate information for locations where no additional data were collected during the 2010 accelerated corrective action at former TA-32 (i.e., locations 00-603584, 00-603586, 00-603588, and 00-603596). This information was presented in the Investigation Report for Upper Los Alamos Canyon Aggregate Area, Revision 1 (LANL 2010, 108528), and has not changed. However, nickel concentrations increase with depth at location 00-603585, and nickel is above the maximum tuff background concentration (7 mg/kg) in the deepest sample at this location, which was sampled in 2010. Section 4.1.4 of the report has been revised to include this information.

   The remedy completion report and the Phase II Investigation Work Plan for Upper Los Alamos Canyon Aggregate Area (LANL 2010, 110860) proposed deeper sampling at three existing locations at Solid Waste Management Unit (SWMU) 32-002(a) to finalize the definition of vertical extent of inorganic chemicals of potential concern (COPCs) as indicated in NMED's comment above. As directed by NMED in their approval with modifications of the Phase II investigation work plan, dated January 19, 2011, “Sampling results from these three locations may be used to define the vertical extent of nickel and chromium at nearby locations” (NMED 2011, 111674). Therefore, chromium analysis will be added to the deeper samples collected from location 00-603582, and chromium and nickel analyses will be added to the deeper samples collected at location 00-603585, as directed by NMED. Section 6.0 of the report has been revised accordingly.

NMED Comment

2. ***Section 4.2.4, Summary of COPCs at SWMU 32-002(b), pages 16-17:***

   According to Table 4.2-2, cadmium was detected above background values (BVs) in three surface soil samples, and five reported non-detects had detection limits above BVs in samples collected at Solid Waste Management Unit (SWMU) 32-002(b). The Permittees did not explain why cadmium was not retained as a constituent of potential concern (COPC) and evaluated in the noncarcinogenic risk screening for SWMU 32-002(b). The Permittees retained thallium and zinc which were determined, by statistical analyses, to be no different from background. Thallium and zinc should not be retained as COPCs. Revise the text to correctly identify COPCs.

LANL Response

2. No additional soil samples were collected at SWMU 32-002(b) during the 2010 accelerated corrective action at former TA-32; therefore, the COPCs for soil did not change from those presented in the investigation report (antimony, chromium, copper, lead, mercury, nitrate, silver, thallium, and zinc) (LANL 2010, 108528).

   Cadmium was not identified as a COPC in soil because none of the results exceeded the maximum background concentration of 2.6 mg/kg (LANL 2010, 108528, Appendix F, p. F-191). Cadmium was not detected above the tuff BV (nor did it have detection limits above the tuff BV) in any samples from SWMU 32-002(b). Therefore, cadmium was not retained as a COPC in soil or tuff at SWMU 32-002(b), and no revision to the remedy completion report is necessary.

   As presented in the investigation report (LANL 2010, 108528), thallium and zinc were identified as COPCs in soil at SWMU 32-002(b). The statistical analysis referenced in NMED’s comment pertains to thallium and zinc in tuff samples. Therefore, thallium and zinc were retained as soil COPCs but eliminated as tuff COPCs, and no revision to the remedy completion report is necessary.

NMED Comment

3. ***Section 4.2.4, Summary of Human Health Risk Screening, page 19:***

   Permittee’s Statement: *The total excess cancer risk for the residential scenario is 2×10^{-5}, slightly above the NMED target risk level of 1×10^{-5}. For the residential scenario, arsenic contributes to the cancer risk (6×10^{-6}). The arsenic exposure point concentration is within the ranges of background concentrations and results in an overestimation of risk. Without arsenic, the total excess cancer risk is approximately 1×10^{-5}, equivalent to the NMED target risk level.*

NMED's Comments: *Arsenic must not be excluded from evaluation in the risk assessment for the following reasons:*

a. Statistical analyses conducted in Appendix E show that site concentrations of arsenic are different from background and are shown to be site-related.

b. It is incorrect to compare Upper Confidence Limits (UCLs) with background comparison values. The background value (i.e., 95% upper tolerance limit) is used for point-to-point comparisons. Because the UCL is not a point estimate, it cannot be used as an estimate of an individual site observation for comparison to background threshold values.

c. Site history indicates that inorganic chemicals (e.g., arsenic) may have been used at SWMU 32-002(b) (Section 2.2.1).

Therefore, arsenic must not be excluded from the residential risk results. Modify the text to include arsenic in the final results and delete the text that states, "the arsenic exposure point concentration is within the ranges of background concentrations and results in an overestimation of risk." Modify the text to state that COPCs at SWMU-32-004(b) may pose unacceptable risks to residents and that further evaluation and/or removal actions are necessary.

Further, the refined ecological risk assessment indicates adverse risk may be present due to mercury. Perform additional analyses to confirm that residual contamination does not pose a threat to the environment.

LANL Response

3. The statistical analyses conducted in Appendix E are used to help identify COPCs. Because the site concentrations of arsenic are statistically different than the background data set, arsenic is identified as a COPC and is included for evaluation in the risk assessment as presented in section 4.2.4 and the risk appendix (Appendix F). This evaluation is done whether arsenic is site related, coming from an unrelated source, or is the result of local background variations. Although section 2.2.1 states that "Inorganic and organic chemicals may have also been used," and arsenic is an inorganic chemical, there is no documented use of arsenic at the site, and arsenic was not noted to be present at elevated levels in sludge samples collected from the SWMU 32-002(b) septic tank (structure 32-08) at the time of removal (LANL 1992, 007668, p. 3-71).

   Because arsenic was identified as a COPC, it is included in the risk screening assessment to derive the total excess cancer risk for the residential scenario, as well as other scenarios. As is standard risk practice, the uncertainty analysis looks at whether the calculated risk is realistic and representative of exposure and site conditions. In this case, the arsenic EPC (2.421 mg/kg for residential and construction worker receptors, and 3.782 mg/kg for industrial and recreational receptors) is indistinguishable from naturally occurring arsenic across the site (soil BV = 8.17 mg/kg, and tuff BV = 2.79 mg/kg). Therefore, the mean exposure across the site is similar to background. Because the calculated risk represents the total excess cancer risk to a receptor above what he/she is typically exposed to, the risk from arsenic is not included in the total estimate as it is not incrementally above the risk that would result from exposure to naturally occurring arsenic. Therefore, the risk is overestimated and the contribution from arsenic should not be included in the total risk estimate.

   If 95% upper confidence limits (UCLs) are calculated for the background data sets, the UCLs are 4.6 mg/kg for soil and 1.1 mg/kg for Qbt 2, 3, 4. This results in potential risks of approximately 3×10^{-6} for Qbt 2, 3, 4 and approximately 1×10^{-5} for soil. The combined data sets yield a UCL of

3.3 mg/kg, which results in a risk of approximately 8 × 10^{-6}. These risk values are comparable to the risk calculated for arsenic at the site (6 × 10^{-6}). Therefore, the risk from arsenic at the site is the same as the risk from background and should not be included in the final risk estimate.

The main text (section 4.2.4) and Appendix F (sections F-4.3.2, F-4.4.1, and F-6.1) have been revised to clarify that the risk from arsenic at the site does not incrementally increase that which would result from exposure to naturally occurring levels of arsenic.

Additional overestimation of the human health risk calculations is a result of using the maximum detected concentrations of benzo(a)pyrene and dibenz(a,h)anthracene as the EPCs (risk contribution of these COPCs is approximately 8 × 10^{-6}). In the case of benzo(a)pyrene, the EPC is the maximum of four detected concentrations, while the dibenz(a,h)anthracene EPC is the only detected concentration. EPA guidance advises against using the maximum concentration as an EPC, so using a calculated value is deemed better than using the maximum (EPA 1989, 008021). EPA points out that the EPC term represents an individual's average exposure from an exposure area during a long period of time; therefore, the EPC term should be estimated using an average value (such as a 95% UCL of the mean) and not the maximum detected concentration. It is unlikely that an individual will visit the location of the maximum detected concentration all of the time, and the use of this value results in a conservative (higher) estimate of the EPC term and associated risk. The maximum detected concentration is therefore not an accurate estimate of the EPC term, and the risk is further overestimated for the residential scenario. Given the additional uncertainty, the total excess cancer risk for the residential scenario likely does not exceed the NMED target level of 1 × 10^{-5}. Text has been added to Appendix F (section F-4.3.2) for clarification.

Although the Laboratory considers the potential ecological risk from mercury to the earthworm is overestimated, mercury concentrations as high as 48 mg/kg were detected in 1996 samples collected at SWMU 32-002(b). These locations will be resampled to confirm the presence of mercury at these elevated levels. Depending upon the results of the resampling, further analysis might be necessary (e.g., testing the soil using the earthworm toxicity and growth test) to determine if a potential ecological impact is present. The main text (executive summary and sections 4.2.5, 5.2, and 6.0) and Appendix F (sections F-5.4.8, F-5.6.1, and F-6.2) have been revised accordingly.

NMED Comment

4. ***Section 4.4.2, Sample Analytical Results, pages 25-26:***

   According to Table 4.4-2, cadmium was detected above BVs in two surface soil samples and six reported non-detects had detection limits above BVs at SWMU 32-004. Retain cadmium as a COPC in risk evaluations or explain why is should not be carried forward.

LANL Response

4. No additional inorganic data were collected at Area of Concern (AOC) 32-004 during the 2010 accelerated corrective action at former TA-32; therefore, the inorganic COPCs did not change from those presented in the investigation report (LANL 2010, 108528). Cadmium was not identified as a COPC at AOC 32-004 because none of the results exceeded the maximum background concentration of 2.6 mg/kg (LANL 2010, 108528, Appendix F, p. F-204). Therefore, no revision to the remedy completion report is necessary.

NMED Comment

5. ***Section 4.4.4, Summary of Human Health Risk Screening, pages 27 and F-80:***

   The Permittees assert that polynuclear aromatic hydrocarbons (PAHs) detected at AOC 32-004 are not site related and that the high concentrations of PAHs detected at sample location 32-06340 are the result of contamination from sources outside of the AOC 32-004 boundary. Thus, the Permittees excluded the PAH results from sample location 32-06340 from the final risk and hazard estimates.

   Results from sample location 32-06340 must not be excluded from the residential risk assessment for the following reasons:

   a. *PAHs were detected at high concentrations in 1996, and additional PAH sampling was conducted in 2010 that confirmed the high concentrations of PAHs at AOC 32-004.*
   b. *PAHs are detected at multiple sampling locations at Area of Concern (AOC) 32-004, indicating that PAHs are pervasive throughout AOC 32-004 and that the removal of the sample location containing the highest concentrations of PAHs is not justified.*
   c. *Exposure to soil at AOC 32-004 via the ingestion, dermal, and inhalation pathways are complete. Human and ecological receptors would be exposed to all soisl at AOC 32-004.*
   d. *After the removal of sample location 32-06340 from the dataset, the residential risk (1.2E-5) still exceeds the target level of 1E-5.*
   e. *After the removal of sample location 32-06340 from the dataset, the residential Hazard Index (HI) of 1.2 also exceeds the target HI of one.*

   Potential unacceptable risks for a resident may exist at AOC 32-004; further evaluation is therefore necessary. Revise the risk assessment at AOC 32-004 accordingly.

LANL Response

5. The Laboratory agrees that polycyclic aromatic hydrocarbons (PAHs) are present at elevated concentrations at AOC 32-004. However, the presence of PAHs is not related to AOC 32-004, which is a drainline and outfall that served a former office building with a vault room that housed a radioactive source. There is no source of PAHs associated with this AOC. Only one radionuclide, americium-241, was detected in one sample, collected near the outfall, at 0.091 pCi/g. Because radionuclides are the primary contaminants expected as a result of releases from the site, the single detection of a radionuclide at a low concentration is a strong indicator that discharges from the drainline were very limited, as would be expected from an office building.

   PAHs are not only pervasive at AOC 32-004, they are pervasive throughout former TA-32 and are pervasive in virtually all urban areas. PAHs in stormwater runoff from asphalt parking lots can result in soil and sediment contamination with total PAH concentrations in the range of 1 to 10 mg/kg (Simon and Sobieraj 2006, 111717). There is ample documentation regarding the ubiquitous presence of PAHs in the environment from sources such as asphalt. One such paper concludes "…the sensibility of conducting soil remediation to remove low concentrations of PAHs from the soil, particularly when the area is going to undergo future redevelopment, possibly with the addition of pavement, warrants serious consideration" (Simon and Sobieraj 2006, 111717). All of the Los Alamos County buildings at former TA-32 were demolished in 2010 to allow for future development, including retail establishments that will require significant areas of paved parking.

There is abundant evidence that PAHs at former TA-32 are the result of relatively recent non-Laboratory activities. In addition to much of the area being paved, loose piles of asphalt were staged and street sweepers were cleaned out by Los Alamos County personnel on a regular basis in this area. Figures 1 and 2 show photographs, taken in March 2008, of the impact to the site from these activities. Personnel from NMED's Hazardous Waste Bureau participated in a site walk at former TA-32 on July 25, 2006, approximately 50 yr after LANL had stopped all operations at former TA-32 and turned the property over to Los Alamos County, which housed their Roads Division and Pavement Management Division at this location up until 2010. Participants on the site walk noted staining, rilling, and other evidence of runoff from the site. Photographs taken at former TA-32 following remediation activities in 1996 indicate that significant impact may have occurred in the past 14 yr (Figure 3).

In addition to sources of PAHs located at former TA-32, there are sources of PAHs and other contaminants located upgradient of AOC 32-004. As presented in the Phase II and Voluntary Corrective Action Report for Potential Release Sites at TA-32 (LANL 1996, 059178) "Several possible sources of contamination located upgradient of TA-32 along Trinity Drive were anticipated to have an impact on the organic and metal concentrations detected in the PRS 32-004 outfall area. These sources include two auto repair shops, a car wash, a paint and body shop, and a gas station. To determine whether the contaminant levels in the outfall arm are associated with PRS 32-004, samples were collected from two locations upgradient from the outfall pipe (locations 32-06339 and 32-06340)." Data from these samples showed that concentrations of organic and inorganic chemicals were "significantly greater" upgradient of the AOC 32-004 outfall, indicating that, with the exception of americium-241, contamination is not coming from AOC 32-004.

Based on this information, it is reasonable to eliminate PAHs from the risk assessment in order to evaluate the risk from AOC 32-004, not non-Laboratory sources. Although it is true that human and ecological receptors will be exposed to soil at AOC 32-004, it is also true that these same receptors are exposed to PAHs in soil (and pavement) throughout former TA-32, the developed portions of Los Alamos County, and virtually any other urban area. It is neither practical nor reasonable to control that exposure in one small area, or to identify as unacceptable risk that is unrelated to Laboratory activities.

For Parts d and e of Specific Comment 5, see response to General Comment 1. In addition, the majority of the remaining cancer risk is still because of PAHs that are unrelated to the AOC. These chemicals are present as a result of the run-on from upgradient sources, as described above, and not the AOC. The HI of 1.2 is due in part to lead (a hazard quotient [HQ] of 0.2) and an elevated detection limit for antimony (HQ = 0.4). The lead HQ can be evaluated separately because of the different mode of action for this inorganic COPC. The lead EPC (79.2 mg/kg) is below the residential SSL of 400 mg/kg and does not present a hazard to a residential child. Without the lead HQ, the HI is equal to 1, which is the NMED target level (see section F-4.3.2, p. F-13). The antimony HQ is overestimated based on a 1996 elevated detection limit (12 mg/kg). More recent data from 2008 have lower detection limits (0.52 mg/kg maximum detection limit), and antimony is not detected above the BV in the 2008 samples. Using 0.52 mg/kg for antimony as the EPC results in an HQ of 0.02, and the HI is further reduced to approximately 0.6, which is below the NMED target level. The main text (section 4.4.4) and Appendix F (sections F-4.3.2 and F-4.4.3) have been revised accordingly.

NMED Comment

6. Recommendations, page 31:

a. NMED agrees that the Permittees may request a certificate of completion for AOC 32-003.

b. NMED does not agree with the Permittee's recommendation that further corrective action is not necessary at SWMU 32-002(b) or AOC 32-004. Revise the recommendations based on comments provided in this NOD.

c. NMED agrees with the Permittee's recommendation for further investigation to define vertical extent of inorganic chemicals at SWMU 32-002(a).

LANL Response

6. a. Comment noted.

b. Additional samples will be collected at SWMU 32-002(b) to verify elevated levels of mercury detected in 1996 samples, as specified in the response to Specific Comment 3.

As presented in the response to Specific Comment 5, the Laboratory has presented a complete evaluation of risks associated with Laboratory operations at AOC 32-004. This evaluation supports the conclusion that no further corrective action is necessary at AOC 32-004.

c. Note that chromium and nickel analyses will be performed on samples collected at SWMU 32-002(a), as specified in the response to Specific Comment 1.

NMED Comment

7. Figure 4.3-2, page 37:

Numerous inconsistencies were noted between the tables and figures. Several detections of inorganic chemicals at concentrations above background values (BVs) were not included in Figure 4.3-2. The missing detections are tabulated below. Revise Figure 4.3-2 to include the missing detections above BVs tabulated below.

Detections of inorganic chemicals above BVs at AOC 32-003 not depicted in Figure 4.3-2

Location ID	Sample ID	Analyte	Concentration detected (mg/kg)
00-603603	RE00-08-15209	lead	24.1
00-603603	RE00-08-15210	lead	12.7
00-603604	RE00-08-15204	magnesium	2230
00-603604	RE00-08-15204	vanadium	21
00-603604	RE00-08-15204	aluminum	14100
00-603604	RE00-08-15204	cobalt	5
00-603604	RE00-08-15204	lead	26.2
00-603604	RE00-08-15204	arsenic	4.5
00-603604	RE00-08-15204	barium	144

Detections of inorganic chemicals above BVs at AOC 32-003 not depicted in Figure 4.3-2			
Location ID	Sample ID	Analyte	Concentration detected (mg/kg)
00-603605	RE00-08-15213	lead	12.7
00-603607	RE00-08-15219	barium	103
00-603607	RE00-08-15218	chromium	18.7
00-603607	RE00-08-15219	chromium	12.3
00-603608	RE00-08-15217	barium	48.5
00-603609	RE32-10-11387	aluminum	8970
00-603609	RE32-10-11387	barium	52.4

LANL Response

7. For consistency with the figures in the investigation report (LANL 2010, 108528), only COPCs are presented in Figure 4.3-2, as indicated in the figure caption. The investigation report was produced before the current practice of showing all detected values above BVs (not just COPCs) in the figures was established. Aluminum, arsenic, barium, cobalt, lead, magnesium, and vanadium were not identified as inorganic COPCs at AOC 32-003. Chromium is a COPC at AOC 32-003; however, the data presented for location 00-603607 in samples RE00-08-15218 and RE00-08-15219 in the table above are qualified as nondetect (U). Therefore, no changes were made to Figure 4.3-2.

NMED Comment

8. Plates 4 and 5:

Numerous inconsistencies were noted between various Tables and Plates. Uranium-235/236 was detected at 0.126 pCi/g, a concentration above background/fallout values (BVs/FVs), in sample ID 0132-96-0607 at location 32-06372. However, the detection is not depicted in Plate 4. Similarly, several detections of inorganic chemicals, at concentrations above BVs, were not included in Plate 5. The missing detections are tabulated below. Revise Plates 4 and 5 to include all detected analytes.

Detections of inorganic chemicals above BV s at AOC 32-002(b) not depicted in Plate 5			
Location ID	Sample ID	Analyte	Concentration detected (mg/kg)
00-603590	RE32-10-11442	sodium	2,840
00-603596	RE00-08-15181	barium	55.1
00-603596	RE00-08-15181	chromium	10.3
00-603596	RE00-08-15181	copper	5.6
00-603596	RE00-08-15181	lead	13.6
00-603596	RE00-08-15181	mercury	0.546
00-603596	RE00-08-15181	nickel	6.9
00-603596	RE00-08-15181	nitrate	0.16
00-603596	RE00-08-15181	selenium	0.34

Detections of inorganic chemicals above BV s at AOC 32-002(b) not depicted in Plate 5			
Location ID	Sample ID	Analyte	Concentration detected (mg/kg)
00-603596	RE00-08-15182	chromium	17.8
00-603596	RE00-08-15182	nickel	9
00-603596	RE00-08-15182	nitrate	0.13
32-06312	0132-96-0325	cadmium	1.9
32-06313	0132-96-0323	cadmium	1
32-06344	0132-96-0801	cadmium	2.1
32-06353	0132-96-0751	calcium	4,700
32-06353	0132-96-0751	manganese	830
32-06365	0132-96-0611	cobalt	3.6
32-06366	0132-96-0612	calcium	2,500
32-06377	0132-96-0614	cobalt	3.6

LANL Response

8. For consistency with the figures in the investigation report (LANL 2010, 108528), only COPCs are presented in Plates 4 and 5, as indicated by the plate captions. The investigation report was produced before the current practice of showing all detected values above BVs (not just COPCs) in the figures was established. Cadmium, calcium, cobalt, manganese, and sodium were not identified as inorganic COPCs at SWMU 32-002(b). Therefore, detected concentrations of these chemicals were not added to Plate 5.

   Uranium-235/236 is a COPC at SWMU 32-002(b). The detected concentration of 0.126 pCi/g in sample 0132-96-0607 at location 32-06372 was added to Plate 4.

   Barium, chromium, copper, lead, mercury, nickel, nitrate, and selenium are COPCs at SWMU 32-002(b). The detected concentrations of these COPCs in samples RE00-08-15181 and RE00-08-15182 at location 00-603596 were added to Plate 5, as applicable.

NMED Comment

9. ***Attachment F-2, Johnson and Ettinger Model Spreadsheets:***

   The only VOCs evaluated for the vapor intrusion pathway are methylene chloride, trichlorofluoromethane, acetone, and tetrachloroethene. Other organic constituents detected at Upper Los Alamos Canyon Aggregate Area, such as anthracene and pyrene, are considered VOCs. The Johnson and Ettinger User's Guide also considers fluoranthene, benzo(g,h,i)perylene, and chrysene to be VOCs. Clarify the criteria that were used to determine the selection of VOCs considered for this pathway and modify the vapor intrusion calculations as necessary.

LANL Response

9. Other than methylene chloride, trichlorofluoromethane, acetone, and tetrachloroethene, the organic chemicals mentioned in the comment are not considered VOCs by EPA and NMED and are therefore not included in the vapor-intrusion pathway evaluation. VOCs are defined by EPA and NMED as chemicals with Henry's law constants greater than 10^{-5} atm-m^3/mol and molecular weights less than 200 g/mol (e.g., NMED 2009, 108070, p. 7). Chrysene, fluoranthene, benzo(g,h,i)perylene, and pyrene have Henry's law constants less than 10^{-5} atm-m^3/mol and molecular weights equal to or greater than 200 g/mol. Anthracene has a Henry's law constant less than 10^{-5} atm-m^3/mol and a molecular weight less than 200 g/mol. For these reasons, chrysene, fluoranthene, benzo(g,h,i)perylene, pyrene, and anthracene are considered semivolatile organic compounds (SVOCs) rather than VOCs. In addition, these PAHs are analyzed by method EPA SW-846:8270C for SVOCs, not method EPA SW-846:8260B for VOCs. Based on this information, no revision to the remedy completion report is necessary.

NMED Comment

10. ***Attachment F-2, Johnson and Ettinger Model Spreadsheets, Tables F-3.3-1, F-3.3-7, and F-3.3-10:***

    95% UCLs were calculated for EPCs for several constituents with datasets containing fewer than 8 samples (i.e., number of analyses). The ProUCL User's Guide advises that, "Datasets with fewer than 8 to 10 observations cannot be considered representative and reliable enough to make important cleanup and remediation decisions." In addition, Section 1.4.2 of the Report specifically states that statistical analyses are not valid if there are fewer than 10 data points. Since fewer than eight samples are included in these datasets, maximum detected concentrations should be used as EPCs at SWMU 32-002(b) (cesium-137), AOCs 32-003 (organics) and 32-004 (inorganics and organics). Consequently, risks and hazards have been underestimated for the industrial and recreational scenarios. Modify Tables F-3.3-1, F-3.3-7, and F-3.3-10 to include maximum detected concentrations as EPCs, and revise all subsequent risk and hazard calculations that would be affected by the use of maximum detected concentrations as EPCs.

LANL Response

10. ProUCL calculates the 95% UCLs with five or more samples if there are at least five detected concentrations in the data set. The results of these calculations are reviewed to determine whether they are representative of the data set and do not exceed the maximum concentration of the data set. If the UCL is representative (i.e., less than the maximum concentration), it is used instead of the maximum detected concentration as the EPC in the risk assessment. EPA guidance advises against using the maximum concentration as an EPC, so using a calculated value is deemed more representative than using the maximum (EPA 1989, 008021).

    EPA points out that the EPC term represents an individual's average exposure from an exposure area during a long period of time; therefore, the EPC term should be estimated using an average value (such as a 95% UCL of the mean) and not the maximum detected concentration. It is unlikely that an individual will visit the location of the maximum detected concentration all of the time, and the use of this value results in an overestimate of the EPC term and associated risk. The objective is to compute an accurate estimate of the EPC term. When a UCL exceeds the maximum detected value, ProUCL displays a warning message. This message was not displayed in any of the instances when fewer than eight samples and five or more detects were used to calculate a UCL. Therefore, the UCL is reasonably representative of the data set and is a much more realistic EPC term (not an underestimate) than the maximum detected concentration. Furthermore, the warnings provided by ProUCL and the ProUCL guidance do not prohibit the use of values calculated with five to seven samples, they simply warn that the values may not be reliable or representative. The Laboratory believes that the approach used not only for the TA-32 report but for many other reports reviewed and approved by NMED is an appropriate and consistent use of the ProUCL program. The potential risk estimated by using these UCLs is also representative and appropriate. No revision to the remedy completion report is necessary.

NMED Comment

11. Attachment F-2, Johnson and Ettinger Model Spreadsheets, Tables F-3.3-4, F-3.3-5, and F.3-6:

The toxicity equivalency factor (TEF) of 0.001 listed for heptachlorodibenzo-dioxin[1,2,3,4,6,7,8-] is inconsistent with the 2005 TEF value of 0.01 listed on http://www.who.int/ipcs/assessment/tef_update/en/index.html. This has resulted in an underestimation of the EPC for 2,3,7,8-TCDD equivalent for the industrial, recreational, ecological, construction worker, and residential scenarios at SWMU 32-002(b). Revise the TEF for heptachlorodibenzo-dioxin[1,2,3,4,6,7,8-] and all subsequent calculations that would be affected.

LANL Response

11. The toxicity equivalency factor for heptachlorodibenzodioxin[1,2,3,4,6,7,8-] in Tables F-3.3-4, F-3.3-5, and F.3.3-6 and all subsequent calculations have been revised. Tables F-4.2-1, F-4.2-4, F-4.2-8, F-4.2-10, F-5.3-2, F-5.3-3, and F-5.4-5 have also been revised accordingly.

NMED Comment

12. F-2, Johnson and Ettinger Model Spreadsheets, Table F-3.3-6:

An EPC of 1.6754E-7 mg/kg is listed for pentachlorodibenzofuran[1,2,3,7,8-]. This is inconsistent with the maximum detected concentration of 2.3E-7 mg/kg listed on Table F-3.3-3. Revise Table F-3.3-6 accordingly and any subsequent calculations that would be affected.

LANL Response

12. The EPC for pentachlorodibenzofuran[1,2,3,7,8-] in Table F-3.3-6 and all subsequent calculations have been revised.

NMED Comment

13. F-2, Johnson and Ettinger Model Spreadsheets, Tables F-4.2-2, F-4.2-11, F-4.2-34, and F-4.2-38:

The residential soil screening level, 15,600 mg/kg, and industrial soil screening level, 227,000 mg/kg, for cyanide are inconsistent with the NMED Soil Screening Levels (SSLs) values of 1,560 mg/kg and 22,700 mg/kg, respectively. Because the screening levels that were used are greater than the values listed in the SSLs, residential and industrial hazards have been underestimated. Modify Tables F-4.2-2, F-4.2-11, F-4.2-34, and F-4.2-38 to include the correct residential and industrial SSLs for cyanide, and modify the hazard quotient (HQ) calculations and resulting hazard indices accordingly.

LANL Response

13. Tables F-4.2-2, F-4.2-11, F-4.2-34, and F-4.2-38 and the calculations have been revised accordingly.

NMED Comment

14. F-2, Johnson and Ettinger Model Spreadsheets, Tables F-4.2-7 and F-4.2-19:

The screening level for aroclor-1260 for the construction worker scenario (7.58 mg/kg) is inconsistent with the SSL value of 7.58. It is noted that the incorrect screening level is more conservative than the SSL value and correction of this value would not affect the results of the risk assessments in Tables F-4.2-7 and F-4.2-19. Modify the tables to include the correct construction worker SSL (75.8 mg/kg) for aroclor-1260.

LANL Response

14. Tables F-4.2-7 and F-4.2-19 have been revised accordingly. The construction worker SSL for Aroclor-1260 has also been revised in Tables 4.1-3, 4.2-3, and 4.3-3 in the main text of the report. In addition, the main text (sections 4.2.4 and 4.3.5) and Appendix F (sections F-4.2.1, F-4.2.2, F-4.4.1, and F-4.4-2) have been revised.

NMED Comment

15. F-2, Johnson and Ettinger Model Spreadsheets, Tables F-4.2-8, F-4.2-19, and F-4.2-30:

Noncarcinogenic hazards for the construction worker scenario were not calculated for SWMU 32-002(b), AOC 32-003 and AOC 32-004 for one or more of the following COPCs: arsenic, bis(2-ethylhexyl)phthalate, methylene chloride, and 2,3,7,8-TCDD. The construction worker SSLs for these constituents are based on noncarcinogenic endpoints and should be evaluated as noncarcinogens and included on Tables F-4.2.8, F-4.2.19, and F-4.2-30 for the construction worker scenario. The hazard indices for the construction worker have been slightly underestimated at SWMU 32-002(b), AOC 32-003 and AOC 32-004, as they currently do not include the evaluation of these constituents. It is noted that the addition of arsenic, bis(2-ethylhexyl)phthalate, methylene chloride, and 2,3,7,8-TCDD to the hazard index calculations would most likely not affect the overall conclusions of the risk assessments. Revise Tables F-4.2.8, F-4.2.19, and F-4.2-30 to include hazard quotients (HQs) for arsenic, bis(2-ethylhexyl)phthalate, methylene chloride, and 2,3,7,8-TCDD for accuracy.

LANL Response

15. Tables F-4.2-7, F-4.2.8, F-4.2.19, F-4.2-20, F-4.2-30, and F-4.2-31 and the calculations have been revised accordingly.

NMED Comment

16. F-2, Johnson and Ettinger Model Spreadsheets, Table F-4.2-20:

The EPC utilized for zinc (43.85 mg/kg) is inconsistent with the EPC of 40.58 mg/kg listed on Table F-3.3-9. It is noted that the overall results of the risk assessment are not affected by this inconsistency since the EPC that was used is greater than the EPC listed on Table F-3.3-9 and *results in a more conservative risk estimate. Modify Table F-4.2-20 to include the correct EPC and modify any calculations that would be affected.*

LANL Response

16. Tables F-4.2-20 and F-4.2-22 and the calculations have been revised accordingly.

NMED Comment

17. F-2, Johnson and Ettinger Model Spreadsheets, Table F-4.2-36:

Supporting Johnson and Ettinger spreadsheets indicate that a reference concentration (RfC) of 0.35 mg/m^3 was used to calculate the risk-based indoor soil concentration for acetone. The currently accepted RfC for acetone, listed in the SSLs, is 31 mg/m^3. It is noted that the RfC of 0.35 mg/m^3 that was utilized in the calculation results in a more conservative risk estimate and would not affect the overall results. Regardless, update the calculation to utilize the appropriate toxicity value (31 mg/m^3) for acetone and include the updated results on Table F-4.2-36.

LANL Response

17. The spreadsheets have been modified to include the updated reference concentration for acetone, and the risk-based value has been recalculated. The results in Table F-4.2-36 and the relevant text have been revised.

REFERENCES

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NMED (New Mexico Environment Department), December 2009. “Technical Background Document for Development of Soil Screening Levels, Revision 5.0,” with revised Table A-1, New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2009, 108070)

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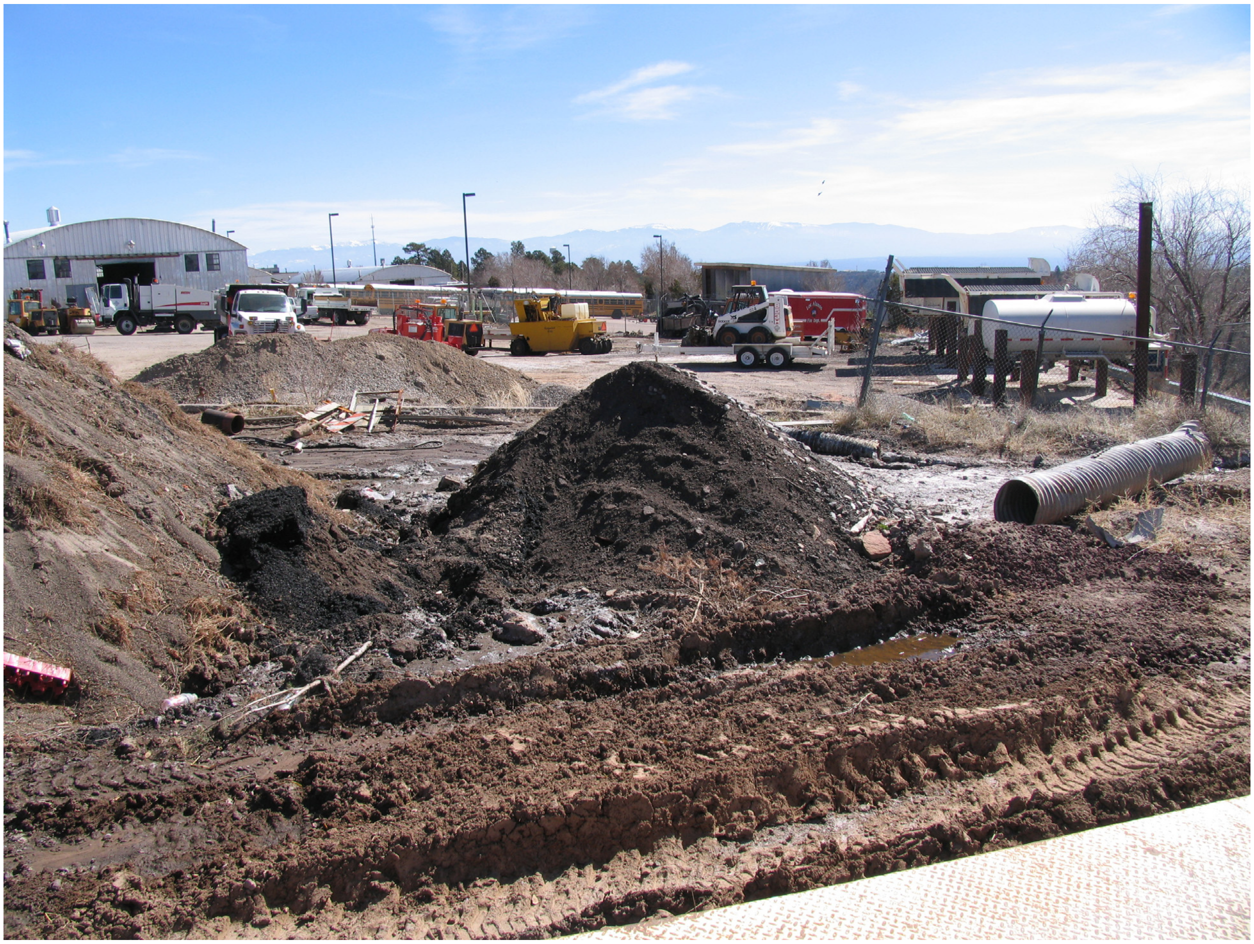

Figure 1 Piles of asphalt and street-sweeper contents in the south-central portion of former TA-32 near the canyon edge (March 2008)

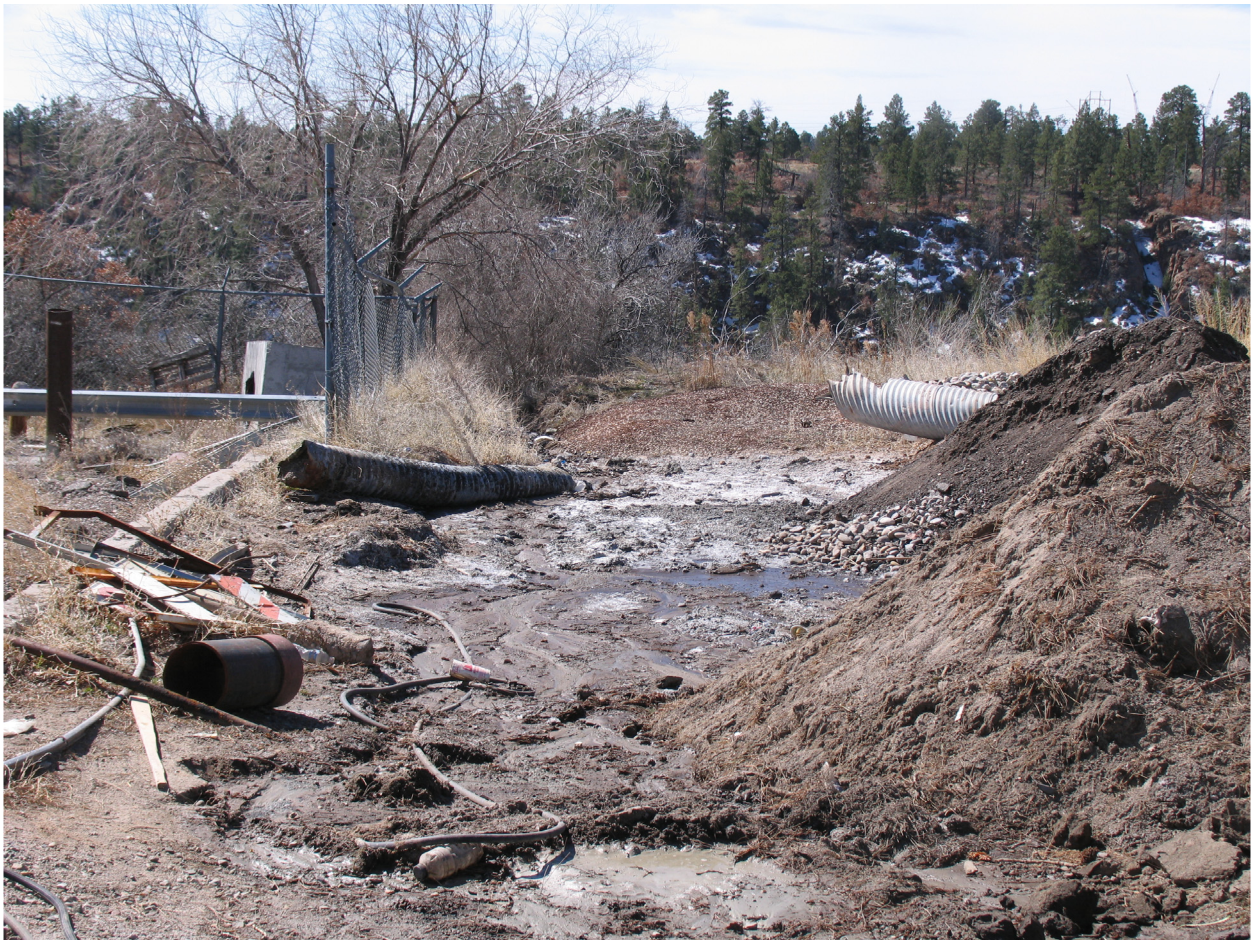

Figure 2 Runoff and debris in the south-central portion of former TA-32 near the canyon edge (March 2008)

Figure 3 **Same area as shown in Figure 2, following remediation in 1996**