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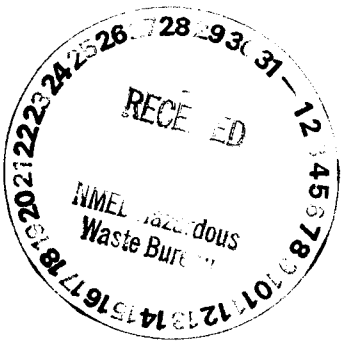
Los Alamos National Laboratory/University of California
Risk Reduction & Environmental Stewardship (RRES)
Remediation Services (RS), MS M992
Los Alamos, New Mexico 87545
(505) 667-0808/FAX (505) 665-4747

National Nuclear Security Administration.
Los Alamos Site Operations, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
(505) 667-7203/FAX (505) 665-4504

Date: August 27, 2003
Refer to: ER2003-0546



Darlene Goering
Project Leader
Permits Management Program
New Mexico Environment Department
Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

SUBJECT: RESPONSE TO YOUR REQUEST FOR SUPPLEMENTAL INFORMATION (RSI) ON THE WORK PLAN FOR SANDIA CANYON AND CAÑADA DEL BUEY

Dear Ms. Goering:

Enclosed is a response to your RSI on the Work Plan for Sandia Canyon and Cañada del Buey. Please consider this a draft response to which changes can potentially be made after you have had a chance to review it. The Los Alamos National Laboratory (LANL) technical team can meet with you to discuss specifics if necessary. After the New Mexico Environment Department approves the content of the RSI response, LANL will incorporate the changes into subsequent work in Sandia Canyon and Cañada del Buey.

This response contains discussions regarding radionuclides, which are regulated under the Atomic Energy Act and specifically excluded from regulation under the Resource Conservation and Recovery Act and the New Mexico Hazardous Waste Act. These discussions are provided in this response for informational purposes only.

Please contact Steven Reneau at (505) 665-3151, or e-mail him at sreneau@lanl.gov if you have any questions.

Sincerely,

David McInroy, Deputy Project Director
Remediation Services
Los Alamos National Laboratory

Sincerely,

David Gregory, Project Manager
Department of Energy
Los Alamos Site Operations

DM/DG/KR/dv

Enclosure 1) Response to Request for Supplemental Information, Work Plan for Sandia Canyon and Cañada del Buey (ER2003-0542)
2) Summary Status of Environmental Restoration Project Investigations in Upper Sandia Canyon (LA-UR-00-777) to Mr. John Young

Cy:(w/enc)
N. Quintana, RRES-RS, MS M992
D. Gregory, LASO, MS A316
J. Kieling, NMED-HWB
V. Maranville, NMED-HWB
M. Leavitt, NMED-SWQB
S. Yanicak, NMED-OB
L. King, EPA Region 6
RRES-RS File, MS M992
CT File #898
IM-5, MS A150
RPF MS M707

Cy:(w/o enclosure)
D. McInroy, RRES-RS, MS M992
B. Ramsey, RRES-DO, MS J591
R. Rich, RRES-RS, MS M992
S. Martin, NMED-HWB
C. Voorhees, NMED-OB

Response to
Request for Supplemental Information, Work Plan for Sandia Canyon and Cañada del Buey, Los Alamos National Laboratory, NM0890010515, HWB-LANL-99-031

INTRODUCTION

Contained below are Los Alamos National Laboratory's (LANL's) responses to the request for supplemental information (RSI) on the "Work Plan for Sandia Canyon and Cañada del Buey" ("the work plan") (LANL 1999, 64617.2), from the New Mexico Environment Department (NMED 2003, 76014.1). To facilitate review of this response, NMED's comments are included verbatim. The comments are divided into general and specific categories as presented in the letter from NMED. LANL's responses follow each NMED comment. In addition, a general comment from LANL precedes the general comments from NMED.

GENERAL COMMENTS

LANL Comment

1. LANL proposes not to physically revise the work plan in response to the NMED comments, but to instead have this response constitute documentation of the correction of errors in the work plan, clarifications, and modifications to the investigation approach. This response is therefore written to indicate where corrections are needed and where modification of the approach will take place, and not where changes will be made to the work plan itself.

NMED Comment

1. *The drilling program at LANL needs to emphasize the importance of identifying perched zones of groundwater. Deep boreholes should be drilled using methods that allow perched zones to be identified. Boreholes that encounter perched groundwater should have wells constructed to allow for monitoring and sampling of the perched zones. Alternately, if a perched zone is identified during the drilling of a regional aquifer well, a separate well, which targets the intermediate zone and is adjacent to the regional well, may be installed.*

LANL Response

1. Methods will be used that are appropriate for the objectives of any specific well. NMED is consulted about drilling methods in a number of forums, including quarterly and annual hydrogeologic work plan meetings, topical meetings dealing with drilling issues, and data quality objective (DQO) meetings to site wells. In addition, NMED reviews sampling and analysis plans (SAPs) that are written for each of the deep wells. The current drilling program incorporates NMED feedback from earlier drilling operations at LANL. Groundwater samples will be collected from perched zones during drilling provided a sufficient volume of water is available for chemical analyses. Groundwater samples will be collected and analyzed for appropriate constituents during characterization and monitoring.

NMED Comment

2. *LANL shall provide a list of all SWMUs and AOCs in Sandia Canyon watershed and Cañada del Buey watershed, along with a list of COPCs at each SWMU and AOC.*

LANL Response

2. A list of potential release sites (PRSs), which includes all SWMUs and AOCs, is provided in Appendix B of the work plan. Chemicals of potential concern (COPCs) are discussed in Chapter 2 for each PRS, and COPCs are summarized by TA in Tables 7.1.1-1 and 7.2.1-1.

NMED Comment

3. LANL shall provide boring logs and monitoring well diagrams for SCO-1, SCO-2, R-12, CDBO-1 through CDBO-9, PM-1, PM-2, PM-3, PM-4, and PM-5. LANL shall provide any logs of soil borings used to determine the conceptual model in Figures A-4 and A-5.

LANL Response

3. Appendix Tables D-1 through D-6 provide all of the well construction and geologic information requested by NMED. These data are synthesized in the site-wide 3D geologic model that was then used to generate control points down the canyons axes (Appendix E). These control points form the basis for constructing the cross sections in Appendix A-4 and A-5.

NMED Comment

4. LANL shall provide all available data, which have been collected from Sandia Canyon and Cañada del Buey in summary tables. LANL shall provide separate tables for each canyon, and for each different medium (soil, sediment, surface water, storm water, springs, alluvial groundwater, and regional groundwater). If the data have already been provided, LANL shall indicate a reference for the document. The requested data shall include the following:

4a. A map with all past or present sampling locations in each canyon and for each medium clearly identified.

4b. Tables in an electronic format (MS Excel) containing the following columns: sampling location, sampling date, matrix, analytical method, fraction (total or dissolved, if applicable), suspended sediment concentration (if applicable), constituent, units, sample depth (if applicable), qualifier as assigned by the analytical laboratory, detection limit or MDA/MDC (for radionuclides), background value (if applicable), constituent, and screening criteria.

LANL Response

4. Summaries of all available data as of 1999, the due date for the plan, are presented in Chapters 2 and 3 in the same format as in previously approved work plans. References to the sources are included. LANL suggests that a request for electronic data, including data that post-date the due date for this work plan, be addressed as a separate request outside the process of reviewing and approving this plan. LANL also suggests that summaries of data that post-date the due date for this plan might more appropriately be requested as an addendum to this plan, to be completed sometime before plan implementation.

NMED Comment

5. LANL shall provide all available aerial photographs of Sandia and Cañada del Buey. LANL shall provide maps showing the historic changes in the topographical features of the canyons. The maps shall delineate the canyon floor, and shall include the locations of any sediment accumulation (the work plan mentioned only one such sediment accumulation area for each canyon). The maps shall also include the location of the disturbed areas in the middle of Sandia Canyon due to road-construction projects, and the locations of any areas impacted by the Cerro Grande Fire in both canyons.

LANL Response

5. (1) Obtaining aerial photographs is a non-routine request, and the reason for this request to LANL is not clear. Vertical aerial photographs have been taken of the Pajarito Plateau in many years since 1935, by many agencies, including various scales and quality, and LANL does not have a complete set of these photographs. LANL also suggests that this item would be most appropriate as a separate request outside the process of approving the work plan. (2) Maps of relevant historical topographical and geomorphic changes in these canyons are not currently available and are normally prepared during implementation of work plans. Such information will be included on geomorphic maps of each investigated reach that are prepared during the reach investigations. (3) The Cerro Grande fire occurred after the work plan was written in 1999, and this request implies that NMED would like the plan updated to include relevant information from the last four years. LANL suggests that preferred alternatives to revising the plan at this point would be to provide an addendum prior to plan implementation that updates Chapters 2 and 3 with relevant information that has become available since summer 1999, or to discuss effects of the fire in the investigation report, in the context of results from the investigation.

NMED Comment

6. The SAP for Sandia Canyon is incomplete and vague. The format of the SAP did not delineate specific phases of the SAP and the information provided is unclear. LANL shall revise the SAP to include the sections listed below:

LANL Response

6. (1) Specific "phases" are equivalent to "tasks" discussed in Section 5.6.3 of the NMED-approved core document (LANL 1997, 55622; LANL 1998, 57666; pp. 5-24 to 5-27). (2) It is not clear what is meant by "incomplete and vague." Note that the work plan is tiered to the core document to minimize repetition of text, and it is intentionally non-specific in many places to retain flexibility as the investigation progresses in order to achieve work plan objectives. LANL proposes to retain both the tiering to the core document and the flexibility contained in this SAP.

NMED Comment

6a. Background of the site. This includes review of the historic data, review of the geologic data, soil information, environmental studies, remote sensing (aircraft or satellite photographs), and the conceptual model of the site. All provided information should be site-specific, canyon-specific, and/or reach-specific.

LANL Response

6a. LANL agrees that the specified information should be included in the work plan. In this work plan, site background is included in Chapters 2 and 3, and LANL considers this information to be sufficiently comprehensive, complete, and site-specific for the purposes of this plan.

NMED Comment

6b. Sampling Objectives. The sampling plan should clearly state the objectives of each sampling event for each medium. The objectives shall outline what the ultimate goal and/or use of the samples will be.

LANL Response

6b. LANL agrees that the objectives and ultimate goals should be included in the work plan. Sampling objectives are discussed on p. 7-1, pp. 7-4 to 7-6, and in subsequent sections. Overall decision rules for the work plan are also discussed on pp. 1-8 to 1-10.

NMED Comment

6c. Rationale behind establishing objectives. In establishing objectives, the SAP should ensure that the samples will provide the required data and that the data meet the DQOs.

LANL Response

6c. LANL agrees that samples to be collected should provide the required data to meet the DQOs and believes that the work plan, in combination with the core document, presents a process sufficient to accomplish this goal.

NMED Comment

6d. Sampling strategies and sampling locations. The appropriate locations, numbers, media, and types of samples to be taken at a particular site depend upon a variety of factors. These factors include: the objectives of the sampling event, the degree of accuracy desired, and the spatial and temporal variability of the media to be sampled. If the sampling is conducted as an initial phase of site characterization, a sufficient number of samples should be collected to meet the site objectives. If LANL intends to apply a phased approach in the investigation of the canyons, a SAP shall be submitted for approval to NMED for each phase with complete reporting of data and analysis of the previous phase of the investigation.

LANL Response

6d. Canyons investigations since 1996 have involved an iterative, or phased, approach with multiple sampling events in each reach and with the results of each sampling event used to help focus subsequent events. This approach has been implemented with the concurrence of NMED. The core document states, "Requirements for additional data will be developed based on the recommendations of the technical team and through frequent dialogue with the regulators" (pp. 5-24 to 5-25). Specifics of sampling events often have been modified based on NMED input (e.g., as part of the 10-day notification process) and without a formal SAP, and LANL believes that this process has been effective in incorporating NMED input into sampling decisions. Preparation of multiple formal SAPs for NMED approval during the investigation of each canyon would add significant costs and delay completion of investigations. LANL therefore requests that approval of this work plan by NMED be considered approval of an iterative approach with multiple sampling events, without the requirement of multiple interim SAPs. However, LANL sees value in providing NMED with brief summary memo reports between sampling phases that document the current status of the investigation, along with electronic versions of analytical data collected in the prior sampling event. Such memo reports would satisfy the objective of keeping NMED current on the results of the investigation and would aid NMED in providing input into subsequent sampling events.

NMED Comment

6e. Sampling methodologies and procedures. A primary objective of any sampling program should be to obtain the most accurate data possible. In order to achieve this, LANL shall use statistically valid sampling strategies so that the appropriate number of samples can be estimated, and the sampling locations can be chosen without a bias. LANL may alternately use non-statistical (judgmental or biased) sampling.

LANL Response

6e. Through the core document and prior work plans, LANL has adopted the alternative given by NMED in the last sentence, to use biased or judgmental sampling. The value of biased sampling has been shown independently by NMED's DOE Oversight Bureau in their work in the South Fork of Acid Canyon (Yanicak et al. 1999, 70670), and LANL believes that such biased sampling is much more effective at locating small areas of elevated contamination than a standard statistically based

approach. Note however that in implementing reach investigations, LANL combines biased sampling with a statistical approach when allocating numbers of samples to different geomorphic units, as discussed in prior reach reports (e.g., Reneau et al. 1998, 59159, p. 2-8).

NMED Comment

6f. Analytical support activities. Include amount of background control samples, amount of QC samples, analytical methods and requirements (DQOs), detection limits, duration and frequency of sampling, reporting requirements, and schedules.

LANL Response

6f. (1) The amount of new background samples required in this investigation is unknown. The core document (pp. 5-24 to 5-25) indicates that more background samples may not be needed, and none are specifically planned in this investigation. However, in some prior reach investigations it has been determined that collection of local background samples is warranted to understand anomalous concentrations of some analytes (e.g., Drakos et al. 2000, 68739.8). (2) The number of QC samples is included by reference to the Quality Assurance Program Plan on p. 7-14. (3) Analytical methods and detection limits are specified in tables in Section 7.1 (beginning on p. 7-17). (4) Duration and frequency of sampling are not relevant for sediments. Surface water and alluvial and deep groundwater sampling are specified as quarterly (pp. 7-28, 7-42, 7-55). (5) Reporting requirements and schedules are discussed in Chapter 7 and Annex I of the core document (see p. 1-3 of the work plan for a crosswalk to the core document).

SPECIFIC COMMENTS

NMED Comment

1. Section 1.4.2.3 Sandia Canyon and Cañada del Buey Decision Rules, pg. 1-9:

a. Paragraph 2:

LANL Statement: "To establish the chemicals of potential concern (COPCs) for each system, analytical results from each reach in Sandia Canyon and Cañada del Buey will be compared to comparable background values and other relevant standards....The weight-of-evidence approach will be used to determine COPCs".

HWB Comment: COPCs should be determined based on a comparison to background levels or to detection/quantitation limits only. LANL shall specify the "other relevant standards" *to which contaminant concentrations will be compared to determine COPCs. LANL shall explain the* "weight-of-evidence" *approach for eliminating COPCs.*

LANL Response

1a. (1) Because there is no background data set currently accepted for comparison to surface water and groundwater data, COPCs for any given site for these media will have to be determined using comparisons to data from applicable baseline sample locations or applicable standards such as those in the New Mexico Water Quality Control Commission (WQCC) regulations and Environmental Protection Agency (EPA) maximum concentration limits (MCLs). LANL will make these comparisons for COPCs in accordance with current NMED guidance or policy. (2) The term "weight-of-evidence" is consistent with the approach laid out for identifying contaminants of potential ecological concern (COPECs) in the NMED guidance document "Guidance for Assessing Ecological Risks Posed by Chemicals: Screening Level Ecological Risk Assessment" (NMED 2000, 70107.1). Section 2.2.1 of NMED (2000, 70107.1) lays out several steps for identifying COPECs, including evaluating detection status (and detection frequency) in Section 2.2.1.2, screening against background concentrations in

Section 2.1.1.3, and an evaluation of fate and transport in Section 2.1.1.4. One aspect of this process is nearly identical to that proposed on p. 1-9 of the work plan, which states that a chemical is to be evaluated as to whether it "is or is not likely to be present at the site." The footnote on p. 28 of NMED (2000, 70107.1) uses site historical information/process knowledge and evaluation of sampling and other relevant information (e.g., degradation or potential for bioaccumulation). As stated on p. 1-9 of the work plan, "The weight-of-evidence will rely heavily on quantitative (statistical and graphical) approaches to evaluate reach data, but will also benefit from known PRS sources and sampling of upstream reaches. This latter 'process knowledge' evidence may lead to adding or subtracting COPCs identified from the quantitative data review." Example applications of these quantitative approaches are contained in prior Canyons reach reports (Reneau et al. 1998, 59159; 1998, 59160; 1998, 59667; Katzman et al. 1999, 63915.1; Drakos et al. 2000, 68739.8).

NMED Comment

1b. Paragraph 4:

LANL Statement: "If the uncertainty in estimated risk values is likely to influence the decision based on the risk assessment..."

HWB Comment: The main goal of a RFI is to present data with precision, accuracy, representativeness, completeness, and comparability quality, data which are useable in further risk evaluation. Premature risk analysis precludes the purpose of a RFI. Risk analysis is only logical and useful if the prerequisite RFI is complete. LANL shall explain what "estimated risk values" means.

LANL Response

1b. Estimated risk values refer to the comparison of data collected during the phased investigations with screening levels for human health and ecological risk. As indicated in the core document (LANL 1997, 55622), which is cited as the basis for the decision rules presented in the work plan, the phased approach to data collection is repeated until data are acceptable for risk assessment. The core document also states that "acceptable" means that data lead to an obvious decision or it is unlikely uncertainties can be reduced by additional sampling. Examples of obvious decisions are that analytical results are clearly greater than or less than risk-based screening levels.

NMED Comment

2. Table 2.2.1-6 Routine Environmental Surveillance Monitoring Stations in Sandia Canyon, pg. 2-10:

HWB Comment: LANL shall add a column indicating the date of installation of the monitoring stations.

LANL Response

2. LANL can provide the requested information. A revised table is included with this response as an attachment. In addition, a revised version of Table 2.2.1-7 is included that provides the same information for Cañada del Buey.

NMED Comment

3 (1). Section 2.4.5.4 MDA L, pg. 2-68, paragraph 2:

LANL Statement: "Radionuclide concentrations in the samples submitted to the contract laboratory are presented in Table 2.4.5.1."

HWB Comment: The table number in the sentence should be 2.4.5.4. In addition, Table 2.4.5.4 is misidentified as applying to MDA J. LANL shall correct these mistakes.

LANL Response

3 (1). LANL agrees that these are mistakes in the document. A revised table is included with this response as an attachment.

NMED Comment

3 (2). Figure 3.4.3-5 Summary of environmental surveillance sampling in Sandia Canyon for metal constituents, pg. 3-47:

HWB Comment: Analytical data from filtered and non-filtered samples were combined together when representing the data using graphs. Analytical data from filtered and non-filtered samples should not be combined. Moreover, filtered data should be screened against the appropriate NMWQCC standards and non-filtered data should be screened against the appropriate NMWQCC standards, or the EPA MCL or health advisories. LANL shall construct separate graphs and tables for filtered and non-filtered samples. The right axis in graph SCS-3 has a different scale from the left axis, which defeats the purpose of the plot. LANL shall correct the scale of the axis and submit a revised plot.

LANL Response

3 (2). (1) Filtered and non-filtered data are separated on graphs using different symbols for each, so the first part of the comment is unclear. LANL sees value in putting both filtered and nonfiltered data on the same graphs to allow direct comparison, specifically to indicate where data in nonfiltered samples are elevated relative to filtered samples. (2) LANL suggests that adding standards to the graphs would make the figures too complicated, and there are only WQCC standards for a small subset of these metals. The plots are intended only to provide an overview of the range of concentrations measured to date for a large number of metals under the Environmental Surveillance Program. (3) LANL agrees that right axis on the graph for SCS-3 is inaccurate and should be the same as the left axis. A revised graph is included with this response as an attachment.

NMED Comment

4. Section 3.5.4.2 Alluvial/Shallow Perched Groundwater in Cañada del Buey, pg. 3-116, paragraph 13:

HWB Comment: The reference, Environmental Protection Group 1995, 50285, p. VII-26, does not contain the preceding citation. LANL shall provide the correct reference.

LANL Response

4. LANL agrees that this is an inaccurate citation. The correct citation is Environmental Protection Group 1994, 45363, p. VII-26.

NMED Comment

5. Section 4.1.2.1 Snowmelt and Stormwater Runoff, pg. 4-3, paragraph 1:

LANL Statement: "However there are plans to install several gaging stations in 1999".

HWB Comment: LANL shall explain if the new stations were installed, provide a map showing their location, and describe how often samples were collected and the sample analyses.

LANL Response

5. LANL currently operates five permanent gaging stations in Sandia Canyon. The stations and locations are consistent with those described in Table 7.1.3-1. An additional station has also been installed just above State Road 4, upstream of the facility boundary, and is named "E125". The

annual surveillance reports present analytical data for samples collected from these stations, as well as a map with their locations. LANL will evaluate these data, as appropriate, in the investigation report.

NMED Comment

6. *Section 4.2.2.1 Snowmelt and Stormwater Runoff, pg. 4-9, paragraph 1:*

LANL Statement: "However, the installation of a new gaging station is planned for 1999".

HWB Comment: LANL shall explain if the new station was installed, provide a map showing its location, and describe how often samples were collected and the sample analyses. This figure may be combined with that from Specific Comment #5.

LANL Response

6. Same as response to comment 5.

NMED Comment

7. *Section 7.1 Sampling and Analysis Plan for Sandia Canyon, pg. 7-1:*

HWB Comment: Although this section bears the title "Sampling and Analysis Plan for Sandia Canyon", *this plan addressed middle Sandia Canyon only. The investigations of groundwater and surface water are restricted to middle Sandia Canyon. The SAP for Upper Sandia Canyon (dated March 1998) included limited sediment and surface water investigations, but did not include any groundwater wells. Similarly, lower Sandia Canyon did not include any groundwater exploratory sampling (cores and wells), and included limited surface water sampling. Since the SAP for Upper Sandia Canyon has not been implemented (to the NMED's knowledge), LANL shall include the total length of Sandia Canyon in this SAP. If some sampling and analysis of the Upper Sandia Canyon was conducted, LANL shall provide a report with the data as an attachment to the RSI response. LANL shall also include any additional sampling that is to be conducted in the Upper Sandia Canyon.*

LANL Response

7. (1) This work plan includes sediment characterization reaches in upper, middle, and lower Sandia Canyons, and upper Sandia Canyon is included by reference. (2) Three alluvial wells (SCAO-1 to -3) were sited in middle Sandia Canyon because information from SCO-1 and SCO-2 indicates that the alluvial groundwater terminates west of these two wells (except when there are very large storm flows). Effluent and stormwater runoff that enters upper Sandia Canyon travels as surface flow where it enters the wetland in reach S-2 and forms a thin saturated zone within thin (estimated at less than 1–2 m) alluvium. The thin, saturated alluvial deposits pinch out at the terminus of the wetland, and alluvial groundwater emerges as surface water. This surface water extends down to middle Sandia Canyon where the canyon floor widens. Surface flow disappears quickly in middle Sandia Canyon, probably primarily due to infiltration into the thickening alluvial deposits and into bedrock units. LANL believes the siting of the three proposed alluvial wells is appropriate to better define the nature and extent of potential contaminants in the alluvial perched water in middle Sandia Canyon and including the delineation of areas where alluvial water is lost into underlying bedrock units. Existing gaging stations can be used to determine the amount of loss from surface flow to underlying alluvium and bedrock units. Alluvial wells are not planned for the lower canyon because of historical termination of groundwater up-canyon of SCO-1 and SCO-2. (3) LANL believes that surface water sampled from the downstream end of the wetland is probably sufficient for characterizing potential alluvial groundwater contamination in upper Sandia Canyon and therefore proposed no alluvial groundwater wells there. However, LANL acknowledges the possibility that water quality could vary between the alluvial groundwater in the wetland and surface water at the proposed sampling point due to mixing. Therefore, LANL will install one alluvial groundwater well in the lower part of the wetland when

implementing this work plan. Given the constraints of drilling in the wetland, appropriate methods of obtaining representative alluvial groundwater samples will be evaluated. (4) Phase 1 sediment investigations and surface water sampling specified in the SAP for upper Sandia Canyon have been completed and have been partially reported in Katzman (2000, 64349.2). This report is included as an attachment to this response. Potential Phase 2 and Phase 3 sampling specified in the SAP will be conducted as part of this work plan if it is determined that significant data gaps remain at the time that the plan is implemented.

NMED Comment

8. Section 7.1.1 Introduction, pg. 7-1, paragraph 5 and Section 7.2.1.5 Overview of Information To Be Collected, pg. 7-70, last paragraph:

LANL Statement: LANL stated that the number of initial samples would be revised in accordance with the strategies discussed in Section 5.3.7 and Section 5.3.8 of the core document. Both of these strategies refer to evaluating the uncertainties including statistical evaluations.

HWB Comment: LANL shall explain how the uncertainties will be evaluated, list the qualitative and quantitative criteria for evaluating uncertainties, the acceptance criteria, the statistical tests to be performed, and references.

LANL Response

8. The core document (LANL 1997, 55622) was prepared to allow tiering of subsequent work plans to it, to reduce the length of such work plans by referencing the core document. As referenced, the general methods for evaluating uncertainties and the acceptance criteria are provided in the core document (LANL 1997, 55622). However, uncertainty evaluation approaches used in Canyons investigations have partially changed since the core document, as follows. Numbers of samples have been modified to reduce uncertainty in contaminant inventory using stratified random sampling formulae (equation 5.10 in Gilbert 1987, 56179). Contaminant inventory at the reach scale has been used as a quantitative measure of the uncertainty in sediment characterization. According to statistical theory, uncertainty in the estimated inventory decreases as the number of samples collected to characterize the population of interest increases (Chapter 5 in Gilbert 1987, 56179). Thus, uncertainty in contaminant inventory should decrease through phases of a sediment investigation. In each investigation phase the planned number of samples is based on initial estimates of the areal coverage, depth, and contaminant concentrations of the identified geomorphic units in the reach. This approach merges the concepts behind statistical sampling for stratified populations with a detailed understanding of contaminant distribution based on geomorphic processes. Although the core document (LANL 1997, 55622) suggests that Monte Carlo approaches may be used to evaluate uncertainties in risk estimates, uncertainties in risk evaluations shall instead be assessed using more qualitative methods as described in Section 1.4.2.3 of the work plan, which are considered to be more appropriate for this investigation.

NMED Comment

9. Section 7.1.2 Sediment Sampling and Analysis Plan, pg. 7-6:

HWB Comment: The SAP for sediments in Sandia Canyon is incomplete for the following reasons:

9a. LANL considered investigating contaminants associated with post-1942[43] sediment deposits. The SAP shall include all contaminated sediments as the mobility of contaminants cannot be disregarded. Sandia Canyon is a "wet" canyon and there is a greater likelihood of subsurface (pre-1942) contamination.

LANL Response

9a. LANL agrees that sampling should occur in all potentially contaminated sediment deposits, including pre-1943 deposits, and that infiltration and alluvial groundwater flow can cause contaminant migration into pre-1943 deposits or other geologic units. Although the work plan specifies that some sampling of pre-1943 sediment deposits may occur, partly "to gage the importance of other sediment transport pathways" (p. 7-7) (e.g., subsurface migration), this could be made clearer and more specific. In implementing the work plan, LANL agrees to include sampling of pre-1943 sediment deposits or other geologic units in wet reaches to evaluate potential migration of contaminants by infiltrating water and/or by groundwater migration.

NMED Comment

9b. LANL considered premature risk evaluation of the present-day risk. The SAP's first objectives should be collecting data with precision, accuracy, representativeness, completeness, and comparability quality, before evaluating risk. The SAP's risk assessment process should include future risk evaluation associated with corrective measures in addition to the present-day risk evaluation.

LANL Response

9b. (1) The issue of "premature risk evaluation" was discussed previously for specific comment 1b. (2) Potential risk associated with potential corrective measures typically is not included in a Resource Conservation and Recovery Act (RCRA) field investigation (RFI), but instead in a corrective measures study (CMS) or a remedial alternatives study. LANL therefore proposes that this topic not be added to this work plan.

NMED Comment

9c. LANL shall revise the SAP to include investigation of the impact of the Cerro Grande Fire and the road construction disturbance.

LANL Response

9c. (1) In part because these watersheds were not heavily impacted by the fire and have had no large post-fire floods, LANL does not believe that the investigation approach should change as a result of the fire. If post-fire sediment deposits occur in a reach, they would be sampled as part of the normal investigation process. LANL therefore proposes that no changes to the proposed work are required to address the impact of the Cerro Grande fire. Findings and discussion of any Cerro Grande effects will be included in the investigation report, as appropriate. (2) Areas of road disturbance in reaches will be mapped when implementing this investigation (see response to general comment 5).

NMED Comment

9d. Field screening methods are not specified in the SAP, except for general radiological field screening. LANL shall include the specific designs of the field screening, like constituent field screening tests (PCB, VOCs/SVOCs, metals, and radionuclides), how the field screening techniques will be implemented, grid size of field screening area (if applicable), exploratory pit methods for vertical field screening, and the rationale behind the field screening methods and locations. The documentation for all field screening (tests, tests results, excavation records, locations of the excavations, co-located samples for identification of reliability) shall be provided with the investigation report.

LANL Response

9d. Based on existing data, contaminant levels of radionuclides are not high enough to allow field-screening methods to be useful in helping to delineate the extent of radionuclide contamination or variations in contaminant levels. Radiological screening will therefore not be conducted. Similarly,

LANL believes that field-screening tests for VOCs, SVOCs, and metals would also not be useful in this setting. However, LANL agrees that field test kits for polychlorinated biphenyls (PCBs), which are a primary COPC in Sandia Canyon and may be present at levels high enough to measure with field kits, may be useful in the investigation. When implementing this investigation, LANL will therefore explore the utility of PCB test kits for screening to guide selection of samples for laboratory analysis in reaches where PCB levels are sufficiently elevated. If used, field screening will occur in all geomorphic units in a reach, at a series of depths, consistent with previous Canyons field investigations. All field-screening activities will be documented in the investigation report. Note that discussion of radionuclides, which are regulated under the Atomic Energy Act (AEA) and specifically excluded from regulation under RCRA and the New Mexico Hazardous Waste Act, are provided in this response for informational purposes only.

NMED Comment

9e. LANL shall design a test for the canyons conceptual model regarding reach and contaminant fate and transport. In addition, questions regarding the appropriateness of judgmental sampling and the use of this strategy for site characterization and risk assessment have arisen. NMED requests that LANL provide documentation supporting the biased sampling approach implemented during canyons investigations and/or conduct a study within a selected "representative" *canyon in which statistical sampling is performed for comparison.*

LANL Response

9e. (1) Tests of the conceptual model are in effect contained in the 1998 reach reports for Los Alamos and Pueblo Canyons (Reneau et al. 1998, 59159; Reneau et al. 1998, 59160; Reneau et al. 1998, 59667), and the nature and potential utility of additional tests (outside those performed as part of normal Canyons characterization) are not obvious. (2) The NMED DOE Oversight Bureau has provided a perfect example of the superiority of biased or judgmental sampling in their work in the South Fork of Acid Canyon (Yanicak et al. 1999, 70670). Despite earlier sediment sampling in the 1970s (e.g., FUSRAP) and ER Project sampling in the 1990s (following an EPA-approved work plan), both of which used random sampling approaches, NMED was able to find much higher levels of contaminants using judgmental sampling following insights gained in prior Canyons investigations. Based on this, LANL believes that further tests involving collection of new analytical data would have limited value and would not be a good use of resources.

NMED Comment

9f. According to Table 7.1.2-1, there are nine reaches to be investigated in Sandia Canyon, and Table 7.1.1-2 states that the initial number of sediment samples is between 45 and 90. Keeping in mind that each reach contains at least four geomorphic units, this gives at most 1 to 2 samples per geomorphic unit. NMED considers this number of initial sediment samples to be insufficient in order to statistically evaluate uncertainties, means, variances, distributions, etc. in each geomorphic unit. LANL shall collect at least two samples per stratum in each identified geomorphic unit (as seen in other reach reports each geomorphic unit may have several strata with respect to the contamination source). This minimum number of samples will allow for the initial variance calculation within each stratum during the initial phase of the investigation.

LANL Response

9f. (1) Two of the reaches in Table 7.1.2-1 have already been sampled as part of the "Sampling and Analysis Plan for Upper Sandia Canyon," so the initial number of reaches to be investigated is seven. (2) The goal of the initial sampling is to identify what COPCs (if any) are present and to provide general information on variations in concentrations between units, not to statistically evaluate uncertainties, etc., in each geomorphic unit. These objectives are addressed in subsequent sampling phases by limited-suite or key-contaminant analyses. In addition, two samples would be insufficient to calculate variances, etc. The 45–90 samples specified are equivalent to 6–13 full-suite samples per

each of 7 reaches, which is considered to be sufficient to meet the goals of phase one of a reach investigation.

NMED Comment

9g. LANL did not address the sampling strategies and methodologies for vertical subsurface sediment/soil sampling. LANL shall address field screening activities, sampling design, and sampling locations in determining the vertical extent of the contamination.

LANL Response

9g. (1) Field screening is discussed in response to specific comment 9d. (2) This aspect of the sampling design is discussed in Section 7.1.2.5.1 (p. 7-14), and criteria for identifying the base of post-1942 sediments is provided on p. 5-22 of the core document. Consistent with previous Canyons investigations, sampling will be concentrated in post-1942 sediment deposits, with some amount of sampling in pre-1943 deposits. Several criteria are typically used to recognize the base of post-1942 sediments, including the depth of burial of pre-1943 trees and associated buried soils, and the depth of exotic material such as quartzite or coal that were imported to the watershed after 1942. Sampling will occur in inferred pre-1943 deposits in part to evaluate the potential subsurface migration of contaminants in wet reaches, as discussed in the response to specific comment 9a.

NMED Comment

9h. LANL stated that the subreaches may be approximately 100m to 500m long. Later on, LANL stated that initially some subreaches may be short (100m to 200m) and may be expanded or eliminated from the investigation, depending on the sediment sampling. NMED disagrees with this approach. The reaches and subreaches shall be as long as approved in this SAP. The field screening tests and surveys, and/or initial sampling may determine a change in the length of the reach, after LANL presents the appropriate basis for that change to NMED.

LANL Response

9h. Prior field investigations in canyons have indicated that, where present, contaminants are distributed throughout post-1942 sediment deposits and that post-1942 sediment deposits are also essentially continuous along stream channels. Therefore, investigation of relatively short reaches is sufficient to determine if contaminants are present and to determine the general level of contamination. For reaches with little or no contamination, it is an inefficient expenditure of time and money to map and characterize a larger area. The proposal to initially restrict some reaches to lengths of only 100–200 m was made to focus the bulk of the field work in reaches where contamination is most likely to be significant and to potentially drive remedial actions. However, subsequent field experience has suggested that 200–250 m is a more realistic minimum reach length, and LANL proposes to revise the minimum reach length to 200–250 m. The reaches as shown on Figure A-1 of the work plan are also approximate and will be refined during the field investigation, as stated on p. 7-11. LANL proposes to retain this general approach. Note that the work plan does not propose that any subreaches "be eliminated from the investigation" following sampling, but instead that sampled reaches be used to "potentially eliminate parts of the watershed from further investigation" based on analytical results (p. 7-11). This is again to focus the investigation on the most significant reaches from the standpoint of potential risk and is believed to adequately address nature and extent.

NMED Comment

9i. LANL shall include DQOs in the SAP for Sandia Canyon.

LANL Response

9i. Sampling objectives are discussed on p. 7-1 and pp. 7-4 to 7-6. It is not certain what additional information NMED would like included, and LANL believes the present text is sufficient for the purpose of this work plan.

NMED Comment

9j. LANL shall extend the eastern end of reach S-3 to include the tributary to the north of Sandia Canyon (into which outfall 03A-114 drained).

LANL Response

9j. The east end of reach S-3 was intentionally placed west of this drainage to allow separation of contaminant levels derived from upstream PRSs in Sandia Canyon from levels derived from outfall 03A-114 and other PRSs to the east. In previous investigations, LANL has found that it is confusing to have reaches spanning confluences and contaminant sources, making it less straightforward to evaluate contaminant sources. Therefore LANL proposes to leave the east end of this reach as shown on Figure A-1. The potential effects of contamination from outfall 03A-114 will be sufficiently addressed in the investigation of reach S-4 West.

NMED Comment

9k. In Section 7.1.2.5.1.2, LANL states that "constituents present at levels that may contribute significantly to present-day risk will be selected as key contaminants." *LANL, shall list these* "levels" *for each contaminant and describe who will determine what is* "significant".

LANL Response

9k. In previous canyons investigations, single analytes that can be directly linked to releases from Laboratory facilities have constituted >50% of the potential human health risk in a canyon and have also been well distributed in post-1942 sediment deposits at levels above background. Such analytes have been chosen as key contaminants (e.g., plutonium-239,240 in Acid and Pueblo Canyons; cesium-137 in DP and Los Alamos Canyons). Similarly, PCBs were chosen as key contaminants in upper Sandia Canyon because PRS investigations had indicated that these were the primary contaminants of concern. These evaluations are made by the technical team following an examination of initial analytical results and comparing these to risk-based levels (e.g., SALs). Analytes that are less widely distributed and/or contribute lesser amounts to potential risk may also be selected, based on the judgment of the technical team.

NMED Comment

9l. In Section 7.1.2.5.1.3, LANL states that "[t]he number of samples will be determined by the technical team based on the complexity of the contamination and will be sufficient to develop a defensible, representative statistic for present-day risk assessment purposes". *The number of samples shall be determined according to statistical procedure or a probabilistic method according to the sampling design and the contamination source in order to be defensible, representative data and be useable in a risk assessment evaluation. LANL shall report the results from the full-suite sampling to NMED before initiating any limited-suite sampling.*

LANL Response

9l. (1) A phased approach has been taken to characterize canyons sediments, as presented in the core document and in other canyon-specific work plans, and the results of these phased investigations have been reported in several reach reports. During these phased investigations, a variety of probability (statistical) and judgmental designs for deciding sample numbers have been applied,

depending on the field situation. One of the probability-based design options previously used in canyons sediment investigations was provided in response to NMED's specific comment 8. However, LANL believes that the option of using professional judgment (instead of solely statistical or probabilistic methods) during sampling design is also valid. This approach is consistent with the most recent guidance from EPA (EPA 2002, 76069), where there is no requirement for statistical or probability-based sampling designs, but where judgmental sampling designs are included as one option. Thus, the approach taken for determining the number of samples in canyon sediment investigations is fully consistent with EPA guidance on this topic. Therefore LANL proposes to make no changes to the approach for determining the number of samples. (2) As discussed in the response to general comment 6d, LANL sees value in providing NMED with brief summary memo reports between sampling phases that document the current status of the investigation, along with electronic versions of analytical data collected in the prior sampling event.

NMED Comment

9m. In Section 7.1.2.5.3, LANL states that "the sediment samples will be homogenized in the field using a stainless steel bowl and spoon before being placed in a container. All samples will be sieved, in either the field or the laboratory, to remove stones and organic matter greater than 2 mm (0.08 in.) in diameter." *Homogenization of discrete samples collected for analyses other than VOCs and SVOCs shall be performed by the analytical laboratory and not in the field unless prior approval is received from NMED. Any samples collected for analyses of VOCs and SVOCs shall not be homogenized. Sieving of samples is not always necessary and can cause bias in the sampling results. LANL shall not sieve samples in the field or in the laboratory.*

LANL Response

9m. (1) Homogenization of samples (except for VOC analyses) is part of the LANL standard operating procedure (SOP) for spade and scoop sampling (ER-SOP-6.09) and is also standard protocol in RCRA sampling guidance. This step is required to provide representative samples and to ensure that the same material is placed in different bottles for different analyses to accurately evaluate potential collocation of contaminants. This step also has been included in prior NMED-approved work plans (e.g., Los Alamos and Pueblo Canyons, Mortandad Canyon) and has been performed by NMED and EPA in their independent sampling events (e.g., South Fork of Acid Canyon). LANL is unsure why NMED wants to change this basic procedure at this time and recommends that no changes be made to this procedure. (2) Sediment samples often contain high (>50%) gravel content and roots and other woody debris, and sieving of samples has been performed to standardize the analyses and eliminate uncertainties associated with incorporation of variable amounts of gravel and large organic material into the samples. Because contaminant concentrations typically increase with decreasing particle size, any biases imparted by sieving would be on the high side and would result in a conservative estimation of potential risk. This step has also been included in prior NMED-approved work plans, and LANL is again unsure why this change in procedure is now being requested and believes it would result in a decrease in overall data quality. Therefore, LANL requests that routine field sieving of samples to remove gravel and large organic matter be approved by NMED in this work plan.

NMED Comment

9n. Even if contamination is not found in subreach S-5 East, this does not preclude the presence of contamination further downstream. LANL shall revise the SAP to include sediment sampling beyond the eastern boundary of the lab in Sandia Canyon (subreaches S-6 West and S-6 East).

LANL Response

9n. In previous investigations, contaminants generally have been shown to decrease downstream and to be prevalent in post-1942 sediment deposits where they are present in a reach. The chances of contaminants being absent in one reach but being deposited at significant levels downstream are considered to be remote in the absence of new contaminant sources. Continuing investigations

downgradient once contaminants are no longer measurable is therefore not believed to be a cost-effective use of resources and would inherently increase the cost and the length of time needed to complete an investigation. LANL therefore proposes that no changes be made to this part of the work plan and that reaches remain uninvestigated if no contaminants are found upstream (analogous to not continuing a groundwater investigation downgradient once the boundaries of a plume have been defined).

NMED Comment

10. Section 7.1.3 Surface Water Sampling and Analysis Plan, pg. 7-21:

HWB Comment: *The SAP for surface water is incomplete for the following reasons:*

10a. LANL states that "[b]efore data can be used in groundwater-flow, contaminant-transport or risk-analysis models, the data must be checked for consistency with the conceptual hydrogeologic model." *NMED does not agree with this statement. The conceptual model is based on the data collected. LANL shall not ignore or disregard data because it doesn't match the model. (p. 7-24)*

LANL Response

10a. LANL agrees that a conceptual model should be subject to revision based on newly collected data and that data should not be ignored or disregarded solely because it is inconsistent with a model. LANL will iteratively revise the conceptual hydrogeologic model based on newly collected data. The revised conceptual model will be used to support evaluation of groundwater flow, contaminant transport, and risk analysis.

NMED Comment

10b. LANL shall provide a map with all surface water sampling points and runoff sampling points in Sandia Canyon. LANL shall provide all available data from sampling points SCS-1, SCS-2, SCS-3, TA-3, and runoffs at SC below Power Plant, SC below wetland, SC near roads and grounds at TA-3, SC truck route, and Sandia Spring in the format described in General Comment #4b, including data for sampling events in 2001.

LANL Response

10b. Maps with sampling points and data from these stations are provided in the annual environmental surveillance reports. LANL suggests that if NMED requires a separate electronic data deliverable from these locations, it be addressed as a separate request and not as part of the process of approving this work plan.

NMED Comment

10c. LANL states that it will determine the extent and nature of contaminants in continuous surface water in Sandia Canyon. LANL shall revise the SAP to also include investigation of all ephemeral surface water.

LANL Response

10c. LANL concurs that the SAP for the surface water investigation should be more thorough but believes that it should focus on persistent surface water in Sandia Canyon. The sampling stations described in Table 7.1.3-1 are operated for monitoring stormwater ("ephemeral surface water"). Stormwater is not considered sufficient for assessments of human health and ecological risk, which are key objectives of the work plan, because stormwater is not persistent enough to provide chronic exposures. LANL

proposes that surface water be collected from the following five sites in Sandia Canyon during implementation of this investigation.

- Surface water collection site in upper reach S-1 South to characterize present-day impacts associated with runoff from TA-3 area.
- Surface water collection site in lower reach S-1 South immediately above the confluence with reach S-1 North to characterize potential water quality impacts from PRSs along reach S-1 South.
- Surface water collection site in lower reach S-1 North immediately above the confluence with reach S-1 South to characterize potential water quality impacts from PRSs in reach S-1 North.
- Surface water collection site at the eastern end (terminus) of the wetland comprising reach S-2 to characterize the role that the wetland environment may have on surface water quality.

NMED Comment

10d. LANL shall include in this section the SAP for surface water in Upper Sandia Canyon. If the SAP has been implemented, LANL shall provide the results from the investigation as part of this SAP and describe if any monitoring of surface water is currently conducted in Upper Sandia Canyon.

LANL Response

10d. A SAP for upper Sandia Canyon (LANL 1998, 62340) has been fully implemented, but is considered a separate investigation from that proposed above in the response to NMED comment 10c. LANL believes that the results of that investigation would be best provided as a separate data deliverable, and not included in this work plan. All relevant data will be included by LANL in the assessments presented in the Sandia Canyon investigation report.

NMED Comment

10e. Table 7.1.3-4 listed the detection limits for beryllium to be 5 µg/L and for thallium to be 2 µg/L. The detection limits for any constituent shall not be equal to or higher than the corresponding EPA MCL, EPA health advisory, NMWQCC standard, or any other standard or screening level. LANL shall revise the table to show lower detection limits and advise the analytical laboratories of the required detection limits.

LANL Response

10e. LANL will use detection limits of 2 µg/L for beryllium and of 1 µg/L for thallium, which are currently achievable and are below applicable regulatory standards. LANL will work with the analytical laboratories to ensure that sufficiently low detection limits are achieved for all constituents using SW-846 analytical methods.

NMED Comment

11. Section 7.1.4 Groundwater Sampling and Analysis Plan

HWB Comment: *The SAP for groundwater is incomplete for the following reasons:*

11a. The extent of the shallow alluvial groundwater body in Sandia Canyon is not fully characterized. Yet, the SAP did not include any exploratory boreholes in the Upper Sandia Canyon, upstream of the Middle Sandia Canyon, and the Lower Sandia Canyon. LANL shall explain how the fundamental questions posed in Section 7.1.4.2.1 for the alluvial system in Sandia Canyon will be answered if all alluvial wells are planned to be installed in the Middle Sandia Canyon.

LANL Response

11a. (1) No exploratory boreholes were planned for upper Sandia Canyon because alluvium is thin there and alluvial groundwater emerges as surface water at the downstream end of the wetlands. LANL

believes that surface water samples from this location are probably adequate for characterizing potential alluvial groundwater contamination in upper Sandia Canyon. In addition, the surface water sampling stations SCS-1 and SCS-2 can be used to estimate water loss in upper Sandia Canyon. However, due to potential differences in water quality between alluvial groundwater and surface water in upper Sandia Canyon, LANL proposes to add one alluvial well in the wetlands (see LANL response to NMED specific comment 7). (2) No exploratory boreholes were planned for lower Sandia Canyon because the conclusion from existing data is that the down-canyon extent of alluvial groundwater is unknown but is somewhere upstream of existing well SCO-1 (i.e., middle canyon). The proposed well locations are considered appropriate for the purpose of defining the downstream extent of alluvial groundwater. Water has not been observed historically in the lower canyon. If contaminants are found at levels exceeding standards or risk-based levels, flow paths and loss from alluvium and flux will be evaluated as appropriate using nested piezometers or other methods.

NMED Comment

11b. LANL shall determine the horizontal and vertical gradient of the alluvial groundwater.

LANL Response

11b. LANL is not clear what is meant by this statement. The investigation described should be adequate to describe gradients at a level of detail sufficient for making risk-based decisions.

NMED Comment

11c. Section 7.1.4.2.3 states that the alluvial wells will be drilled through the alluvium, the Cerro Toledo, and at least 10 ft into the Otowi Member. LANL also stated that the unit thickness (Cerro Toledo) is unknown. LANL shall describe how the field findings will reflect on the final depth of the wells.

LANL Response

11c. The stopping criteria for alluvial wells is 10 ft penetration into the top of the Otowi Member. This unit is easily recognized in wireline core from auger drilling. There were no specific data on the thickness of alluvium and Cerro Toledo deposits at the time the work plan was prepared. However, in the summer of 2002, five boreholes 104–150 ft deep were drilled to the top of the Otowi Member in middle Sandia Canyon as part of site screening for the Advanced Hydrodynamic Test Facility. Data from these boreholes will be used in the planning for installation of alluvial wells in middle Sandia Canyon.

NMED Comment

11d. When drilling the wells in Sandia Canyon, LANL shall focus extra attention on the lithology of the Cerro Toledo interval, or other units or structures that may provide a lateral pathway not coinciding with the orientation of the canyon. The potential presence of buried paleochannels would greatly impact the conceptual model, as the model assumes that buried channels do not coincide with the canyon and, therefore, groundwater and possible contamination do not flow laterally away from the stream channel.

LANL Response

11d. Logging of lithologies penetrated in boreholes is routinely performed during all drilling investigations. LANL will note the features identified by the NMED when logging the Cerro Toledo interval.

NMED Comment

11e. Table 7.1.4-3 did not specify the exact depth of the core samples for the corresponding analytical suite. LANL shall explain how sampling depths will be determined, describe if these samples will be

composite or discrete samples, and describe if any field screening will be conducted when collecting the core samples. Considering the limited information about the alluvium, sediments/soil, and geology of Sandia Canyon, LANL shall collect the samples from the boreholes for full-suite analysis every 10 ft of each borehole. LANL shall propose to modify the sampling intervals based on field observations.

LANL Response

11e. Table 7.1.4-3 provides for samples collected at 10-ft intervals through alluvium and 20-ft intervals through the Cerro Toledo. Based on experience with anion profiles in Mortandad Canyon, these intervals are adequate for vadose-zone contaminant characterization. LANL also believes that full-suite analyses are not required from all samples to provide sufficient data to meet investigation objectives and that the analytical suite should not be changed from what is proposed in the work plan. The questions of contaminant migration can be answered by the tiers of analytical requirements in Table 7.1.4-3. It should be noted that NMED approved the minimal analytical suite (as defined in Table 7.1.4-3 of the work plan) for boreholes with similar DQOs in Mortandad Canyon (NMED 2002, 73830). The request in this RSI for a larger analytical suite in Sandia Canyon is not warranted given the lower levels of Laboratory impacts to Sandia Canyon compared to Mortandad Canyon. However, LANL agrees that it may be appropriate to modify sampling depths in some cases based on field observations of stratigraphy. During implementation of this work plan, exact sampling intervals may therefore be modified based on field observations of stratigraphy penetrated in the cores.

NMED Comment

11f. The analytical data for surface and runoff water from the Upper and Middle Sandia Canyon showed exceedances of lead, aluminum, iron, beryllium, cadmium, mercury, silver, copper, selenium, and gross alpha radiation. The intermediate perched groundwater will be the first to show if the contaminants are being transported to the regional aquifer. LANL shall install one intermediate groundwater well in the vicinity of regional well R-12.

LANL Response

11f. Intermediate perched water is already monitored by two well screens in R-12. Four rounds of characterization sampling took place in R-12 after the well was installed (Longmire 2002, 72800). There were no exceedances of WQCC standards for lead, aluminum, beryllium, cadmium, mercury, silver, copper, selenium, or gross alpha. Iron concentrations exceeded the EPA drinking water secondary standard established for aesthetic properties such as taste, odor, and color. Based on available information, there is no justification for the installation of another well for monitoring intermediate perched water at R-12.

NMED Comment

11g. LANL shall provide all available data for wells PM-1 and PM-3 in the format described in General Comment #4b, including any data from sampling events in 2001.

LANL Response

11g. These data have been published in the annual environmental surveillance reports, which have been submitted to NMED. However, if NMED desires an electronic file with these non-ER data, LANL suggests that it would be most appropriate as a separate data deliverable that is outside the approval process for this work plan.

NMED Comment

11h. In Section 7.1.4.4.2 (pg 7-58) LANL stated that only the first sample from each alluvial and regional aquifer well will be analyzed for full-suite chemicals and radionuclides, and that any non-detected

analyte will be excluded from subsequent analyses. NMED disagrees with this sampling approach. LANL shall monitor all alluvial, intermediate, and regional wells for the full suite of chemicals and radionuclides on a quarterly basis for at least one year. After the data is reported and reviewed by NMED, some constituents may be excluded with NMED's approval.

LANL Response

11h. LANL will analyze groundwater samples for full suite analyses during the first and fourth characterization sampling rounds, as agreed to in discussions with NMED. The first sample collected from each alluvial and regional aquifer well location will undergo analysis for the full suite of organic and inorganic chemicals and radionuclides. If chemicals are identified as COPCs for a particular sampling location in the first sampling round, all subsequent samples from that location will be analyzed for these COPCs. Any analyte reported as not detected in the first sampling round may be excluded from subsequent limited-suite analyses in the second and third characterization rounds. However, full-suite analyses will be obtained from samples collected during the fourth characterization round as confirmation of the results of the first round.

NMED Comment

11i. Table 7.1.4-16 lists the detection limits for beryllium to be 5 µg/L and for thallium to be 2 µg/L. The detection limits for any constituent cannot be equal to or higher than the corresponding EPA MCL, EPA health advisory, NMWQCC standard, or any other standard or screening level. LANL shall revise the table to show lower detection limits and advise the analytical laboratories of the required detection limits.

LANL Response

11i. See response to specific comment 10e.

NMED Comment

12. Section 7.1.6 Biological Sampling and Analysis Plan, pg. 7-65:

HWB Comment: *LANL shall submit a biological SAP as a part of response to this RSI. LANL shall use the SAP created for the Los Alamos/Pueblo Canyon Surface Aggregate as a model.*

LANL Response

12. LANL agrees that a biological SAP will be required for Sandia Canyon and that it is appropriate to model it after the SAP created for Los Alamos and Pueblo Canyons. However, it will not be possible at this time to prepare as detailed a SAP as prepared for Los Alamos and Pueblo Canyons because the latter required an essentially complete set of analytical data from sediments and surface water. Instead, LANL proposes that preparation of a biological SAP be postponed until after at least one phase of sampling has occurred in Sandia Canyon.

NMED Comment

13. Table 7.2.1-1 Chemicals of Potential Concern in Cañada del Buey and Source Areas, pg. 7-67:

HWB Comment: *LANL shall explain why the table does not include TA-51, a potential source of contamination in Cañada del Buey. LANL shall explain why the table does not include VOCs as known COPCs if it is known that there is a VOC plume originating from MDA L. LANL shall include TA-54 as a source of thorium, since this area received all kinds of radioactive waste.*

LANL Response

13. As stated on p. 7-66, this table is based on the summary of analytic data in the Cañada del Buey system that was presented in Chapter 3. TA-51 was not included because no COPCs have been identified there. VOCs were not included because, similarly, they have not been identified as COPCs in surface media away from the mesa top. Thorium was not included because it was not identified as a COPC in sediment sampling along drainages leaving TA-54.

NMED Comment

14. Section 7.2.2 Sediment Sampling and Analysis Plan, pg. 7-71:

HWB Comment: The *SAP for sediments in Cañada del Buey is incomplete for the following reasons. See also the Specific Comment #9 for additional reasons.*

14a. LANL shall include reach CDB-3 West in the investigation instead of labeling it a contingency reach. LANL shall identify and sample an additional reach west of reach CDB-2 Central, based on the alluvial groundwater data from CDBO-6 and CDBO-7.

LANL Response

14a. (1) CDB-3 West is only proposed for no sampling if no contaminants are present in upstream reaches (CDBS-1 East, CDB-2 East). The logic here is the same as discussed for specific comment 9n, and LANL proposes to make no changes here. (2) LANL assumes that NMED means east of CDB-2 Central (not west, as there is no space to the west for another reach). Based on this assumption, LANL proposes that a new reach in the area between CDB-2 Central and CDB-2 East would be required only if levels of contamination in one or both of the reaches indicate the need for potential remediation in this area (as discussed on p. 7-74), and that it should not be added to the planned investigation at this stage.

NMED Comment

14b. LANL shall explain why Table 7.2.2-5 did not include thorium. LANL shall revise the table to include thorium in the analyte list.

LANL Response

14c. Table 7.2.2-5 does not include thorium because analytical data from the watershed has not identified it as a COPC, and it was therefore judged that no additional thorium data collection is required. However, thorium, which is regulated by DOE through the AEA, will be added to the full suite analyte list for completeness.

NMED Comment

14d. Please, correct "Sandia Canyon" *(appearing twice) in the last paragraph on page 7-84 to* "Cañada del Buey" *since this section relates to this canyon.*

LANL Response

14d. LANL agrees that the text should read "Cañada del Buey."

NMED Comment

15. Section 7.2.3 Surface Water Sampling and Analysis Plan, pg. 7-85: The SAP for surface water is incomplete since there is no investigation of surface water proposed. The surface water collected as runoff at SR-4 (White Rock) shows great exceedances of gross alpha and gross beta radiation being

transported beyond the laboratory boundary. The investigation for surface water has to address this contamination by determining the source, and determining how far the contamination extends beyond the laboratory boundary. LANL shall provide a SAP to address any investigations of surface water in Cañada del Buey.

LANL Response

15. LANL agrees that elevated values of gross alpha and gross beta radiation have been detected at the runoff sampling station at SR-4, but does not agree that there have been exceedances of any standard. Because a detailed investigation of sediment deposits in Cañada del Buey upstream from NM 4 found no evidence for the presence of radionuclides above background/fallout levels (Drakos et al. 2000, 68739.8), LANL believes the measured gross alpha and beta radioactivity in stormwater likely results from samples with high sediment load containing naturally occurring radionuclides and not contamination. However, full investigations of all media in reaches in Cañada del Buey is proposed as part of this work plan and will address potential sources of contamination throughout the canyon. In addition, as discussed in the response to NMED's specific comment 10c, LANL believes that this SAP should focus on persistent surface water and not stormwater, and there is no known persistent surface water in Cañada del Buey.

NMED Comment

16. Section 7.2.4 Groundwater Sampling and Analysis Plan, pg. 7-85: The SAP for groundwater is incomplete for the following reasons:

16a. LANL shall provide the boring log and the monitoring well diagram for R-16. LANL shall provide all available data for R-16 in the format specified in General Comment #4b.

LANL Response

16a. NMED recently received the R-16 well completion report (LANL 2003, 76061). It contains all of the available data for this well.

NMED Comment

16b. The source and boundaries of the alluvial saturation in Cañada del Buey has not been determined and is integral to understanding the groundwater pathways in the canyon bottom. LANL shall install three alluvial wells upgradient of CDBO-6 to investigate the source of alluvial saturation. At a minimum, the borings shall be advanced to the depth of the vapor-phase notch. Four alluvial wells shall be installed between wells CDBO-6 and CDBO-7 to identify the boundaries of alluvial saturation. LANL shall install at least one additional alluvial well downgradient of CDBO-7 to determine the extent of the alluvial groundwater. One additional alluvial well shall be installed in Cañada del Buey to investigate potential contamination associated with MDA L. Two additional alluvial wells shall be installed in Cañada del Buey to investigate potential contamination associated with MDA G.

LANL Response

16b. The extent of alluvial/shallow bedrock saturation in Cañada del Buey is well characterized by the nine existing wells and two moisture access boreholes that were installed on the canyon floor between the sanitary wastewater treatment plant (WWTP) at TA-46 and MDA G. Wells CDBO-3 and -4 are located adjacent to and downgradient of MDAs L and G, respectively. Both wells are dry. Furthermore, no saturation was encountered in the alluvium or shallow bedrock when R-21 was drilled on the canyon floor downgradient from MDA L. Therefore, LANL believes that no additional wells are required below MDAs L or G. Shallow groundwater is consistently found in only two wells, CDBO-6 and -7, both of which are located downstream of discharges to the canyon from municipal supply well PM-4, suggesting that PM-4 is a source for this alluvial groundwater. However, because there are no shallow wells located in Cañada del Buey between the outfall for PM-4 and the TA-46

sanitary wastewater treatment plant, LANL agrees that the source of water in CDBO-6 and -7 is not entirely certain. A well upstream of TA-46 is consistently dry. LANL agrees that it would be useful to have an alluvial well between TA-46 and PM-4 to evaluate the potential for alluvial groundwater in this part of the canyon and the quality of any water, if present. This well could also monitor the quality of alluvial groundwater in the event of a release from the TA-46 WWTP. However, given the benign nature of the groundwater in CDBO-6 and -7 (discussed on p. 3-120 of the work plan), additional drilling to define nature and extent downstream from CDBO-6 and -7 appears to lack a regulatory driver and is not needed to make a risk-based decision. LANL therefore proposes that only one new alluvial well be installed in Cañada del Buey.

NMED Comment

16c. When drilling the wells in Sandia Canyon, LANL shall focus extra attention on the lithology of the Cerro Toledo interval, or other units or structures that may provide a lateral pathway not coinciding with the orientation of the canyon. The potential presence of buried paleochannels would greatly impact the conceptual model, as the model assumes that buried channels do not coincide with the canyon, and, therefore, groundwater and possible contamination do not flow laterally away from the stream channel.

LANL Response

16c. (1) LANL assumes NMED means Cañada del Buey and not Sandia Canyon here. (2) See response to comment 11d.

NMED Comment

16d. Section 7.2.4 states that two groundwater wells are planned for this investigation: 1 alluvial well, and 1 regional aquifer well. However, Table 7.2.4-1 does not reflect any newly installed alluvial wells. LANL shall explain this discrepancy.

LANL Response

16d. The reference to an alluvial well in Section 7.2.4 was an error. The remainder of the text in Chapter 7 makes it clear that the intention of the work plan was to collect quarterly samples from existing alluvial wells in Cañada del Buey (CDBO-6, -7, -8, and -9) to determine if there is a contamination problem with the alluvial groundwater. LANL believes that the existing alluvial well network does a sufficient job of defining the extent of alluvial groundwater and evaluating potential contamination. However, as discussed in the response to specific comment 16b, LANL sees value in adding one alluvial well between TA-46 and PM-4. Because of this change, the last sentence in Section 7.2.4, p. 7-85, does not need to be changed. Also, note that there are errors in Table 7.2.4-1, p. 7-90, where CDBO-8 and -9 are incorrectly referred to as SCO-8 and -9.

NMED Comment

16e. The SAP for alluvial groundwater failed to provide a table with the constituents to be analyzed during the investigation. NMED notes that previous sampling of the wells CDBO-6 and CBDO-7 did not include analysis for thorium, which is a COPC in Cañada del Buey due to TA-46. LANL shall revise the SAP to include thorium as well as a table with the description of the suites to be analyzed during the investigation.

LANL Response

16e. (1) Thorium was not included in the original analyte suite because thorium was not identified as a COPC in investigations at TA-46 (p. 3-95) or elsewhere in the Cañada del Buey watershed. However, thorium, which is regulated by the DOE under the AEA, will be added to the analyte suite for completeness. (2) The second to the last sentence in the second to last paragraph in Section

7.2.4.2.2, p. 7-90, states: "The analytes for characterization of groundwater samples are shown in Table 7.1.4.6." So no addition of a new table is required.

NMED Comment

17. Section 7.2.6 Biological Sampling and Analysis Plan

HWB Comment: *LANL shall submit a biological SAP as a part of response to this RSI. LANL shall use the SAP created for the Los Alamos/Pueblo Canyon Surface Aggregate as a model.*

LANL Response

17. See response to specific comment 12.

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ATTACHMENTS

(1) Revised Tables 2.2.1-6 and 2.2.1-7 (response to specific comment 2)

(2) Revised Table 2.4.5-4 (response to specific comment 3[1])

(3) Revised Figure 3.4.3-5 (response to specific comment 3[2])

(4) Katzman, D., February 2000. "Summary Status of Environmental Restoration Project Investigations in Upper Sandia Canyon: Los Alamos National Laboratory document LA-UR-00-777, Los Alamos, New Mexico. (Katzman 2000, 64349.2) (response to specific comment 7)

Table 2.2.1-6
Routine Environmental Surveillance Monitoring Stations in Sandia Canyon

Station Name	Media	Attribute	Period of Record	Location
E121	Surface water	Water quality	1999 to present, intermittent	Upper Sandia Canyon in north tributary of reach S-1
E122	Surface water	Water quality	1999 to present, intermittent	Upper Sandia Canyon in south tributary of reach S-1
E123	Surface water	Flow volume and water quality	1999 to present	Near eastern margin of the wetland area in upper Sandia Canyon
E124	Surface water	Water quality	1999 to present	Middle Sandia Canyon south of TA-53
E125	Surface water	Flow volume and water quality	1994 to present, intermittent	Lower Sandia Canyon west of Laboratory boundary at state road NM4
SCS-1	Surface water	Quality	1969 to present, intermittent	Upper Sandia Canyon wetland east of TA-3
SCS-2	Surface water	Quality	1969 to present, intermittent	Middle Sandia Canyon west of TA-53
SCS-3	Surface water	Quality	1976 to present, intermittent	Middle Sandia Canyon south of TA-53
Sandia Canyon at state road NM4	Runoff, sediment	Quality	1978 to present, intermittent	Intersection of Sandia Canyon and state road NM4
Sandia Spring	Groundwater	Discharge and quality	1959 to present, intermittent	Lower Sandia Canyon approximately 0.5 mi (0.85 km) above point of discharge into the Rio Grande

Table 2.2.1-7
Routine Environmental Surveillance Monitoring Stations in Cañada del Buey

Station	Media	Attribute	Period of Record	Location
E218	Surface water	Runoff volume and water quality	2000 to present	Upper Cañada del Buey north of TA-46
E225	Surface water	Runoff volume and water quality	1993 to present	Lower Cañada del Buey north of MDA G and approximately 1.85 mi (2.9 km) west of the Laboratory boundary
E230	Surface water	Runoff volume and water quality	1991 to present	Lower Cañada del Buey west of state road NM4 at Laboratory boundary
Cañada del Buey	Surface water	Quality	1967 to 2000, intermittent	Upper Cañada del Buey north of TA-46
Cañada del Buey at state road NM4	Sediment	Quality	1978 to present, intermittent	Lower Cañada del Buey west of state road NM4 at Laboratory boundary
MDA G-6	Surface water	Flow volume and water quality	1982 to present, intermittent	Drainage from Mesita del Buey north of MDA G
MDA G-7 through G-9	Sediment	Quality	1982 to present	Toe and confluence of drainages from Mesita del Buey and in Cañada del Buey north of MDA G

Table 2.4.5-4
Radionuclides in Sediment with Concentrations
Greater than Background or No Calculated Background (MDA L Drainage)

Location ID	Sample ID	Am-241 (pCi/g)	Pu-238 (pCi/g)	Po-210 (pCi/g)
54-5143	AAB3134	0.009	**0.006**[a]	1.88
54-5145	AAB3179	0.006	0.003	1.23
54-5147	AAB3149	0.004	**0.005**	1.5
54-5148	AAB3138	0.009	**0.011**	1.43
UTL	n/a[b]	n/a	0.0047	n/a
SAL	n/a	22	27	63

Source: LANL 1996, 54462, p. 59.

[a] Bold = result above UTL values.

[b] n/a = not applicable.

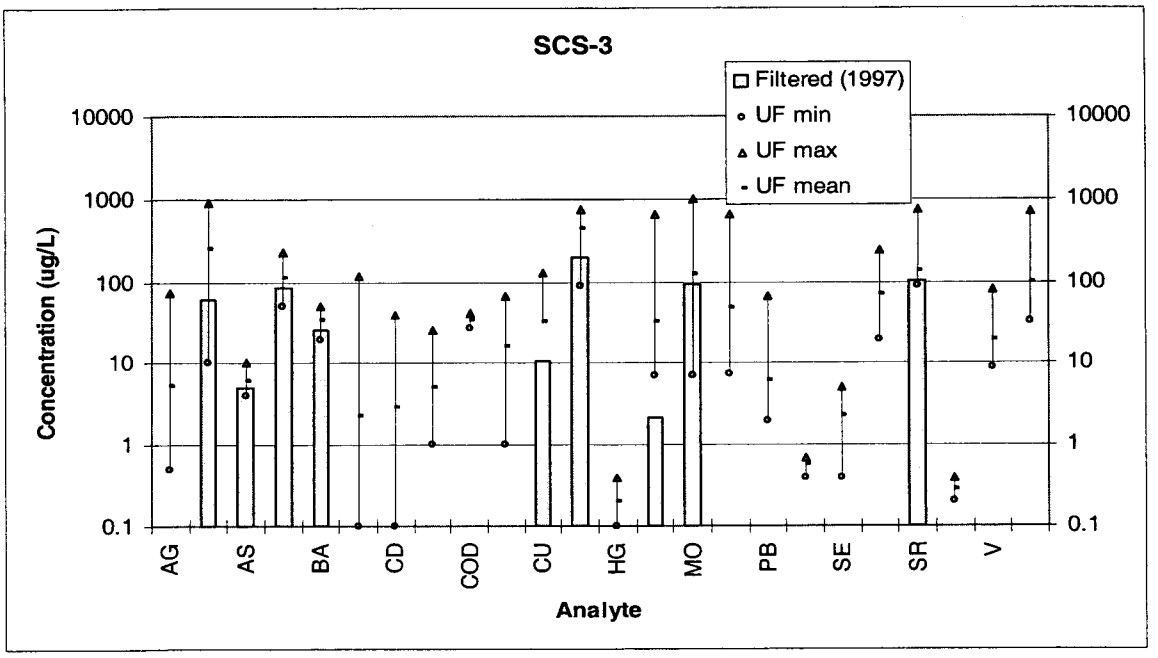

Figure 3.4.3-5. Summary of environmental surveillance sampling of Sandia Canyon surface water for metals constituents