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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 6
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DEC 19 1996

Mr. Benito Garcia, Chief
Hazardous and Radioactive Bureau
New Mexico Environment Department
P.O. Box 26110
Santa Fe, New Mexico 87502

RE: Technical Review of LANL's Environmental Restoration Standard Operating Procedures (SOP)

Dear Mr. Garcia:

The Environmental Protection Agency (EPA) has completed a technical review of LANL's Environmental Restoration SOP's and offer the enclosed comments.

If you have any further questions, please contact Mr. Rich Mayer at (214) 665-7442.

Sincerely yours,

Rich Mayer

for David Neleigh, Section Chief
New Mexico - Federal Facilities

Enclosure

FILE HSWALANL 6/M/6

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TECHNICAL COMMENTS

ENVIRONMENTAL RESTORATION

STANDARD OPERATING PROCEDURES

LOS ALAMOS NATIONAL LABORATORY

GENERAL COMMENTS

The purpose of an SOP is to provide sufficient information for personnel to (1) obtain a basic understanding of the operations that they are asked to perform, and (2) perform the task with minimal assistance. However, most of the SOPs are incomplete and too general. For example, both X-ray diffraction SOPs discuss the term "2π"; however, they neither define the term nor discuss its significance. Other deficiencies include the following:

- ***The SOPs do not incorporate adequate quality assurance and quality control (QA/QC) management tools, such as laboratory blanks, laboratory standards, and standard reference materials. These elements are necessary, because SOPs, if properly followed, should generate reproducible results of known quality. Presently, very few of the SOPs contain, a QA/QC section. SOP-01.05, entitled "Field Quality Control Samples", addresses QA/QC issues that are unique only to analytical sampling, and does not address other QA/QC issues. Consequently, these issues should be addressed in a subsequent revision of the SOPs.***

- ***The SOPs do not include essential information needed to operate some equipment. Instead, the SOPs refer the operator to equipment manufacturer operating manuals for almost all information required for instrument operation. If operating manuals are not available, the operator would be unable to perform necessary calibrations, and may be unable to use the equipment. Therefore, the SOPs should be revised to include: (1) complete instructions for equipment operation, or (2) copies of operating manuals as attachments.***

- ***The SOPs do not adequately address health and safety issues. For example, several SOPs involve the use of hazardous chemicals or potentially dangerous levels of radiation, yet fail to specify procedures for minimizing exposure. Also, several SOPs indicate that, if exposure to hazardous contaminants is possible, field activities should not be performed. Because exposure is a possibility, the SOPs should present sufficient information concerning minimum health and safety precautions for site workers.***

SPECIFIC COMMENTS

General Instructions for Field Investigations, LANL-ER-SOP-01.01, Rev. 0, page 5 of 14, Section 6.1.A. This SOP indicates that the readiness review meetings will be conducted to prepare for field activities. However, this SOP fails to indicate whether the objectives of the RCRA facility investigation will be discussed during this meeting. This discrepancy should be addressed.

General Instructions for Field Investigations, LANL-ER-SOP-01.01, Rev. 0, page 7 of 14, Section 6.2.A.5. The SOP states, "an area designated for analyzing samples may be set up in the support zone. This area will be sheltered from the weather and will contain field analytical instruments." The SOP should explain how analytical instruments can be operated in the outdoors and achieve the necessary accuracy.

General Instructions for Field Investigations, LANL-ER-SOP-01.01, Rev. 0, page 8 of 14, Section 6.4.A. The SOP states, "where an on-site screening area is available, a representative portion of the media collected will be screened." The SOP should reference all appropriate SOPs that discuss field screening.

Sample Container and Preservation, LANL-ER-SOP-01.02, Rev. 0, page 3 of 27, Section 6.0.B. The SOP indicates that sample containers will be selected in accordance with protocols presented in EPA SW-846. The SOP should specify these protocols.

Sample Container and Preservation, LANL-ER-SOP-01.02, Rev. 0, page 4 of 27, Section 6.0, D.1.a. The SOP states that, "based on information in the sampling and analysis plan (SAP), choose a sample container that is nonreactive with the sample and the particular analytical parameter to be tested." Sample containers must be specified in the SAP; this decision should not be left to the discretion of the sampling personnel.

Handling, Packaging, and Shipping of Samples, LANL-ER-01.03, Rev. 1, page 4 of 15, Section 6.0. C. The SOP indicates that sample containers may require decontamination. It should also specify the procedures to be used for the decontamination of these

containers and explain why precleaned containers will not be used.

Handling, Packaging, and Shipping of Samples, LANL-ER-01.03, Rev. 1, page 5 of 15, Section 6.2.1. The SOP indicates that additional training is required for personnel that pack and ship hazardous samples. The SOP should specify the required training.

Sample Control and Field Documentation, LANL-ER-SOP-01.04, Rev. 3, page 3 of 20, Section 6.0, A. This SOP indicates that the sample management office will determine the required sample volumes for analytical samples. However, SOP-01.02 presented required sample volumes. This SOP should be revised to resolve this discrepancy.

Sample Control and Field Documentation, LANL-ER-SOP-01.04, Rev. 3, page 4 of 20, Section 6.0.D. The SOP indicates that field team members must follow SOPs for sample collection. The SOP should specify the procedures applicable to sample collection.

Management of Environmental Restoration Program Radioactive Materials Management Areas, LANL-ER-SOP-01.09, Rev. 0, page 2 of 5, Section 6.1.1. The SOP states that three bulleted criteria are identified as benchmarks to use in determining whether a radioactive materials management area (RMMA) is required within the site. The SOP does not address circumstances under which field screening techniques may not be sensitive enough to use in determining whether an RMMA is required.

Management of Environmental Restoration Program Radioactive Materials Management Areas, LANL-ER-SOP-01.09, Rev. 0, pages 3 and 4 of 5, Sections 6.1.2 and 6.2.2. The SOP states that standard yellow flag and tape barriers, and "Caution" postings, will be used to control radiological areas on private property. It is not clear whether an explicit warning of radiological hazard or the standard radiation symbol will be used to establish warning information at the site boundaries. Also, the criteria for using nonstandard barriers are not clearly defined. If standard radiological hazard postings are not to be used on private property, this deviation should be explained.

Land Surveying Procedures, LANL-ER-SOP-03.01, Rev. 1, page 3 of 8, Section 6.0. ***The SOP indicates that procedures from the Laboratory Survey Manual are included in this section. However, these procedures are either referenced or briefly discussed. If these procedures are important, they should be included in this SOP.***

Petrography, LANL-ER-SOP-03.04, Rev. 0, page 2 of 4, Section 6.0. ***This SOP was identified as presenting procedures for describing the petrographic characteristics of rock specimens. However, this section only references other text. This SOP should be revised to include step-by-step procedures for describing rock specimens.***

Geologic Mapping of Bedrock Units, LANL-ER-SOP-03.09, Rev. 0, page 6 of 10, Section 6.3. ***According to the SOP, "a basic assumption is that individuals applying this procedure are competent, well-trained geologic mappers." The SOP should provide the criteria by which this competence should be evaluated.***

Trenching and Logging, LANL-ER-SOP-03.10, Rev. 0, page 2 of 5, Section 4.0. ***This SOP should include requirements for health and safety precautions for trenching in potentially contaminated areas.***

Coordinating and Evaluating Geodetic Surveys, LANL-ER-SOP-03.11, Rev 0, page 3 of 7, Section 6.1. ***This SOP should include requirements for health and safety training of field personnel.***

Field and Laboratory Notebook Documentation for Environmental Restoration Earth Science Studies, LANL-ER-SOP-03.12, Rev 0, page 3 of 10, Section 3.3. ***This section should define the term "mined muck."***

Field and Laboratory Notebook Documentation for Environmental Restoration Earth Science Studies, LANL-ER-SOP-03.12, Rev 0, page 4 of 10, Section 6.1.1. ***This section and subsequent sections discuss requirements for logbooks used for laboratory work. The SOP should specify the type of laboratory—that is, analytical or geologic.***

Well Development, LANL-ER-SOP-05.02, Rev. 0, page 3 of 8, Section 4.0. ***The SOP indicates that well development settles the filter pack. The filter pack should be settled during well installation, before the bentonite plug and grout are installed. One method that might be used is surging during installation of the filter pack, which will settle the filter pack material and prevent the formation of voids. The SOP should discuss methods of settling the filter pack material and preventing the formation of voids.***

Well Development, LANL-ER-SOP-05.02, Rev. 0, page 3 of 8, Section 4.0.B. ***The SOP indicates that "rawhiding" is a method of well development that reintroduces development water into the well. The SOP should discuss the implications of reintroducing potentially contaminated ground water into a well.***

Well Development, LANL-ER-SOP-05.02, Rev. 0, pages 3 and 4 of 8, Section 4.0.D. ***The SOP indicates that air surging can blow water out of the top of the well. The SOP should explain how this water, which may be contaminated, might be collected.***

Sampling for Volatile Organics, LANL-ER-SOP-06.03, Rev. 0, page 2 of 7, Section 4.0. ***This SOP indicates that "the sensitivity of the analysis and the fragility of the samples require that all volatile samples are collected in duplicate." The wording of the sentence is ambiguous and appears to indicate that a duplicate sample is required of each volatile organic compound (VOC) sample. The SOP should be revised to indicate that a minimum of two containers are required for each VOC sample.***

Hand Auger and Thin-Wall Tube Sampler, LANL-ER-SOP-06.10, Rev. 0, page 2 of 8, Section 6.0.D. ***The SOP presents a procedure for collecting composite samples with a bucket auger. However, if the bucket auger is used for the collection of grab samples, the procedure should be included in this SOP.***

Surface Water Sampling, LANL-ER-SOP-06.13, Rev. 0, page 1 of 9, Section 4.0. ***The SOP indicates that an alternative method of surface water sample collection involves the use of a "breaker." The SOP should correct the term "breaker" and replace it with "beaker."***

Surface Water Sampling, LANL-ER-SOP-06.13, Rev. 0, pages 2 and 3 of 9, Section 6.0.E. ***This section of the SOP discusses collecting ground water samples with a peristaltic pump. The SOP should explain why this procedure is presented with methods for collection of surface water samples.***

Coliwasa Sampler for Liquids and Slurries, LANL-ER-SOP-06.15, Rev. 0, page 2 of 8, Section 6.0. D. ***The SOP indicates that bulging containers require special handling but fails to discuss the specific handling procedures. The SOP should discuss these procedures, or health and safety concerns with handling bulging containers.***

Measurement of Gamma-Ray Fields Using a Sodium Iodide Detector, LANL-ER-SOP-06.23, Rev. 0, page 2 of 4, Section 4.0. ***The SOP describes this technique as quantitative. However, it fails to discuss or control several factors that affect the ability to make quantitative measurements, including (1) the energy distribution of the emitter(s), (2) the techniques used to calibrate the detector for different radioactivity sources, (3) the interdetector variability, and (4) the QA methods used. The survey techniques described should be considered qualitative or semiquantitative.***

Measurement of Gamma-Ray Fields Using a Sodium Iodide Detector, LANL-ER-SOP-06.23, Rev. 0, page 3 of 4, Section 6.0. ***The SOP states that a source check should be performed. However, no criteria are provided for determining that source checks are performed consistently, such as the comparability of data. The SOP should be revised to include such criteria.***

Measurement of Gamma-Ray Fields Using a Sodium Iodide Detector, LANL-ER-SOP-06.23, Rev. 0, page 3 of 4, Section 6.0. ***The SOP states that, for an accurate count rate to be obtained, an instrument reading must be obtained for at least 15 seconds (or the duration indicated in the operations manual for specific models). However, vendor manuals often fail to address the accuracy of the count rate. Fifteen seconds are not always sufficient to minimize the counting error. The SOP should be revised to state that counting time should be established in such a way that the counting error is held to a prespecified coefficient of variation, which may be prespecified for known types of***

detectors. In this way, the count variability is reduced to a small fraction of the interlocation variability.

Measurement of Gamma-Ray Fields Using a Sodium Iodide Detector, LANL-ER-SOP-06.23, Rev. 0, page 4 of 4, Section 6.0. The SOP requires that a scan rate of 1 to 2 inches per second (or the rate indicated in the operations manual for specific models). Many vendor manuals do not specify a scan rate. The SOP should be revised to state that an appropriate scan rate must be developed for specific types of surveys, considering various factors, such as the desired lower limit of detection, overburden, and radionuclide(s).

Measurement of Gamma-Ray Fields Using a Sodium Iodide Detector, LANL-ER-SOP-06.23, Rev. 0, page 4 of 4, Section 6.0. The SOP directs the surveyor to record other relevant data. It should be revised to specify the types of data or provide a reference procedure.

Fluid Level Measurements, LANL-ER-SOP-07.02, Rev. 0, page 2 of 8, Section 4.0. The SOP indicates that a steel tape can be used to obtain depth measurements that are accurate to 0.01 foot. The SOP should explain how this accuracy can be achieved.

Aquifer Pumping Tests, LANL-ER-SOP-07.04, Rev. 0, page 2 of 10, Section 4.0. This SOP discusses conducting a constant rate pumping test. However, if a constant head pumping test were used, certain changes would be required. The SOP should include the procedures necessary for conducting a constant head pumping test.

Thin Section Preparation, LANL-ER-SOP-09.01, Rev. 0, page 2 of 7, Section 6.0. This SOP was identified as presenting the procedures necessary for preparing thin sections. However, the SOP actually refers the reader to other texts for these procedures. The SOP should be revised to include these procedures.

Operation of Siemens X-Ray Diffractometer, LANL-ER-SOP-09.03, Rev. 0, page 1 of 5, Section 4.0. The title of this section is "Background and/or Cautions"; however, little background information is provided. This section should provide the basic operational principles of the X-ray diffractometer, including an exhibit showing the major components of the instrument.

Operation of Siemens X-Ray Diffractometer, LANL-ER-SOP-09.03, Rev. 0, page 2 of 5, Section 6.1. The "Calibration" section references the "Calibration and Alignment" SOP (SOP-09.04) ; however, neither SOP provides the maximum elapsed time between calibrations of the instrument. The SOP should provide this information, and calibration dates should be recorded in the instrument run log (as discussed in SOP-09.04, Section 8.0) so that the operator can verify that the instrument has been properly calibrated.

Operation of Siemens X-Ray Diffractometer, LANL-ER-SOP-09.03, Rev. 0, page 3 of 5, Section 6.2. The "Diffractometer Operation" section recommends that the samples be analyzed without a standard or standard reference material (SRM). EPA recommends that a standard or SRM be analyzed, before analysis of the samples, to verify the proper operation of the diffractometer.

Operation of Siemens X-Ray Diffractometer, LANL-ER-SOP-09.03, Rev. 0, page 3 of 5, Sections 6.4 and 6.5. Each section is too brief and contains information that is insufficient for conducting the system shutdown or data analysis.

Calibration and Alignment of the Siemens Diffractometers, LANL-ER-SOP-09.04, Rev. 0, page 1 of 9, Section 2.2. The discussion in this section is confusing and should be revised to clearly state that, although the diffractometer custodian shall align the instrument, other properly trained personnel may calibrate the instrument.

Calibration and Alignment of the Siemens Diffractometers, LANL-ER-SOP-09.04, Rev. 0, page 3 of 9, Section 6.1. The discussion in this section and section 8.0 suggests that there is a maximum elapsed time between diffractometer calibrations; however, the SOP does not specify the time. The calibration interval should be specified so that the

operator knows whether the instrument requires recalibration.

Calibration and Alignment of the Siemens Diffractometers, LANL-ER-SOP-09.04, Rev. 0, page 3 of 9, Section 6.1. The calibration procedures in this section use a silica standard to set 2π. EPA recommends that a second standard, and a sample having a more complex matrix, be analyzed after the calibration to show that the instrument is operating properly. This same standard and sample would be analyzed each day before the samples are analyzed.

Clay Mineral Separation for X-Ray Diffraction Analysis, LANL-ER-SOP-09.05, Rev. 0, page 2 of 5, Section 6.0. The SOP specifies no QA/QC procedures to be used with the clay mineral separation for X-ray analysis. EPA recommends that a blank, or a clay mineral standard of known clay type and content, be used to verify that the procedure is conducted properly. Although the QA/QC procedures are not needed for each clay separation—they should be conducted at a frequency that will identify problems and minimize the number of sample analyses that are affected.

Clay Mineral Separation for X-Ray Diffraction Analysis, LANL-ER-SOP-09.05, Rev 0, page 4 of 5, Section 6.5.1. This section should specify the approximate amount of clay mineral to be suspended.

Zeolite Purification and Separation, LANL-ER-SOP-09.06, Rev. 0, page 2 of 4, Section 6.0. The SOP specifies no QA/QC procedures to be used in the zeolite purification and separation. EPA recommends that a blank, or a zeolite mineral standard of known zeolite type and content, be used to verify that the procedure is conducted properly. Although the QA/QC procedures are not needed for each zeolite separation, they should be conducted at a frequency that will identify problems and minimize the number of sample analyses that are affected.

Screening of PCBs in Soil, LANL-ER-SOP-10.01, Rev. 0, page 2 of 5, Section 3.0. The detection limit of the polychlorinated biphenyls (PCB) screening procedure—50 milligrams per kilogram—is very high. In addition, the detection technique used in the

screening is prone to false positive identifications. Therefore, a PCB investigation should also include laboratory analyses conducted by using an approved PCB analysis procedure. Generally, 10 to 20 percent of the screened samples are sent for laboratory verification analysis.

Screening of PCBs in Soil, LANL-ER-SOP-10.01, Rev. 0, page 4 of 5, Section 6.0. The indicator discussion states that, "if there is no organic chlorine present then the mercury turns vivid purple with the indicator; if there are no chlorinates present then the mercury is tied up and no color results." Based on this information, it is difficult to determine what constitutes a positive identification. Should the procedure read "if there is organic chlorine present, then the mercury turns vivid purple"?

Fidler Instrument System, LANL-ER-SOP-10.04, Rev. 0, page 6 of 16, Section 6.1.1.8. The SOP presents an equation for calculating the correct channel number for the energy emitted from a check source. The equation presented in the SOP for the case using the 59.4 thousand electron volts (keV) X-ray emitted from Americium-241 is as follows:

59.4 keV * channel # = channel # 152

The correct equation is as follows:

59.4 keV * 1/(0.392 keV/channel) = channel # 152

The SOP should be revised to present this equation.

Fidler Instrument System, LANL-ER-SOP-10.04, Rev. 0, page 8 of 16, Section 6.2. This section states that the Instrument Control Chart is included as Attachment B. It is actually Attachment C. This statement should be revised.

Field Analysis of Total Hydrocarbons Using the Hanby Method, LANL-ER-SOP-10.05, Rev. 0, page 3 of 7, Section 6.3. The extraction procedure recommends that personnel wear appropriate chemical-resistant gloves and safety glasses while working with the

extraction solvent. Based on the toxic properties of carbon tetrachloride, respirators with organic vapor cartridges would protect extraction personnel more effectively. EPA strongly recommends that such respirators be used.

Field Analysis of Total Hydrocarbons Using the Hanby Method, LANL-ER-SOP-10.05, Rev. 0, page 4 of 7, Section 6.3. The extraction procedure recommends that aluminum foil be used to control solvent vapor. EPA recommends that, before the aluminum foil is used, it be rinsed with solvent to remove the residual oils from the manufacturing process. If extracted by solvent contact or vapors, these oils could lead to false positive results.

Field Analysis of Total Hydrocarbons Using the Hanby Method, LANL-ER-SOP-10.05, Rev. 0, page 4 of 7, Section 6.4. The extraction procedure recommends vigorous shaking and periodic venting of the funnel to release pressure in the separatory funnel. Many petroleum products, including automobile fuels, are composed of volatile hydrocarbons that may be lost by following this procedure. EPA recommends that the separatory funnel be agitated gently for a longer time period and occasionally vented.

High Explosives Spot Test, LANL-ER-SOP-10.06, Rev. 0, page 2 of 6, Section 4.0. The last paragraph of this section describes how the spot test works; however, the discussion is vague and difficult to understand.

High Explosives Spot Test, LANL-ER-SOP-10.06, Rev. 0, page 2 of 6, Section 4.0. The SOP should state that reagent 3 (N-1-naphthylethylenediamide) is light-sensitive and is to be stored in a closed box when not in use. The SOP should also specify a period of time during which this reagent can be used or specify that fresh reagent will be used for each testing event.

High Explosives Spot Test, LANL-ER-SOP-10.06, Rev. 0, page 2 of 6, Section 4.0. This section states that personnel must wear chemical-resistant gloves when handling chemicals. EPA recommends using double gloves, including an inner latex glove and an outer chemical-resistant glove, suitable for the chemicals being handled.

Field Monitoring for Surface and Volume Radioactivity Levels, LANL-ER-SOP-10.07, Rev. 0, page 3 of 11, Sections 3.2 and 4.1. The SOP states that the decision amount (DA) is the activity level above which the waste is considered to be radioactive. The SOP provides direction for calculating the DA from a single measurement of background but does not explain how to calculate it for cases in which the background is determined from several samples. For cases with a variable background, insufficient sampling may lead to an elevated DA. The SOP should be revised to describe methods for evaluating local background variability.

Field Monitoring for Surface and Volume Radioactivity Levels, LANL-ER-SOP-10.07, Rev. 0, page 4 of 11, Section 4.1.1. The SOP states that field release of surface contaminated wastes is determined on the basis of whether the instrument has a standard minimum detectable activity (MDA) below the level specified by a particular U. S. Department of Energy (DOE) order. This MDA is based on counting error, because the SOP does not consider the following factors:

- ***A specified margin by which the standard MDA must fall below the level specified by the DOE order***
- ***Error factor associated with each measurement***
  - ***Should be considered and propagated in the MDA and sample activity calculations***
  - ***Should be applied so that the resulting MDA remains conservative***
- ***Measurement for hard-to-detect nuclides, such as tritium***
- ***Effect of surface coverings, moisture, and other possible interferences***
  - ***Should be considered and addressed in the calculation of the MDA***

Field Monitoring for Surface and Volume Radioactivity Levels, LANL-ER-SOP-10.07, Rev. 0, page 4 of 11, Section 4.1.1. The SOP fails to either (1) address the problem of absorption by some materials, or (2) specify the process by which materials will be considered subject only to the surface contamination screening.

Field Monitoring for Surface and Volume Radioactivity Levels, LANL-ER-SOP-10.07, Rev. 0, page 5 of 11, Section 6.1. ***The SOP states that the number of samples required for background determination depends upon the volume of waste or soil to be measured for radioactivity. The SOP does not provide or reference a sampling scheme, and does not consider any other relevant factors related to the production of the waste. It may be necessary to conduct a preliminary trial, before determining the final sample size, to estimate variability between samples. The need for a precise estimate of background radioactivity concentrations must be based on the data quality objectives process described by EPA, and cannot be addressed as simply as stated within this procedure. For example, the need to characterize background depends precisely on the difference between background and some action level or cleanup criteria. Where this difference is large, a small set of background measurements may be acceptable; however, where the cleanup criteria are less than or equal to the mean background, many background measurements may be appropriate. Although Section 3.0 refers generally to the use of statistically sound methods, the SOP does not discuss specific statistical methods; therefore, a review of statistical methods was not possible.***

Field Monitoring for Surface and Volume Radioactivity Levels, LANL-ER-SOP-10.07, Rev. 0, page 6 of 11, Section 6.1.C. ***The SOP states that the MDA is calculated for field screening when an adequate MDA is available, and the DA is calculated when only field screening is performed. The MDA and DA are necessary to describe a measurement process, and both should be routinely reported. The MDA is the a priori value used to describe a measurement result. The DA is the a postiori value used with a report of an analytical result for reporting the actual detection limit or a less than value ("<"). The DA normally represents the one-sided upper tail of the distribution of background, as determined from (1) a single count (in the case of a paired test), or (2) population statistics (in the case of a series of samples that represent background). The MDA normally represents the maximum true activity that could be missed, based on a single count, at a specified confidence interval. The methodology provided within this SOP applies only to single paired count tests,***

or to a comparison of multiple measurements to a single background count. The SOP or site-specific work plans should describe the methodology for calculating MDA and DA in the case in which the background population is described by several samples. The SOP should support the use of only the MDA or the DA.

Field Monitoring for Surface and Volume Radioactivity Levels, LANL-ER-SOP-10.07, Rev. 0, page 6 of 11, Sections 6.2 and 6.3. The SOP provides equations for calculating the MDA and DA. The SOP should provide the method for calculating the MDA and DA when the background counting time is longer than the sample counting time, which is typical. The MDA should be specified as the MDA based only on counting error. If scanning measurements are to be performed, the SOP should provide methods for calculating MDA for scanning measurements. The surveyor usually does not have the option of increasing detector area; however, the background counting time may be increased.

Field Monitoring for Surface and Volume Radioactivity Levels, LANL-ER-SOP-10.07, Rev. 0, page 7 of 11, Section 6.4.A. The SOP states that items may be classified as nonradioactive on the basis of this SOP. The SOP does not address (1) selection of an appropriate instrument for the isotope(s) of concern, (2) sample frequency (100 percent scans of surfaces), (3) handling enclosed or inaccessible surfaces or dismantling equipment, or (4) special detectors for corners that cannot be surveyed with standard detectors. The techniques for calibrating detectors are not available for review. The SOP should be revised to discuss all of these, in addition to factors that could affect the measurement process, such as self-absorption in swipes (for alpha emitters) and backscatter correction.

Operation of the Spectrace 9000 Field-Portable X-Ray Fluorescence Instrument, LANL-ER-SOP-10.08, Rev. 0, page 5 of 10, Section 6.2. This section states that the precision of each element should be determined for one sample in every batch of 20 samples. The precision is determined by repeatedly measuring the element at its action level. The precision objective is 20 percent relative

standard deviation. However, if the action level is near the instrument detection limit, instrument precision will probably not be good, and the precision objective may not be attainable. A more useful indication of precision would be multiple analyses of either an SRM (National Institute of Standards and Technology SRM 2710 or 2711) or a thoroughly characterized sample and an evaluation of the precision of the elements of interest. These precision measurements should be recorded and tracked, because a loss of precision may indicate deterioration of the source.

Radiation Scoping Surveys, LANL-ER-SOP-10.10, Rev. 0, page 3 of 5, Section 4.0.
Before the acceptability of this SOP for its specified purpose can be evaluated, sensitivity of the techniques described for various radioisotopes must be determined and specified.

The SOP states that the absolute value of exposure rates is not important. Exposure rate, which is a defined physical quantity, cannot be measured—with the equipment described—without a calibration; further, if more than one detector is used, measurements will not be directly comparable without calibration data. In addition, the operating mode (energy window) and calibration technique for the Fidler detector should be described by incorporation or reference. The energy range for the sodium iodide (NaI) detector should be specified.

Radiation Scoping Surveys, LANL-ER-SOP-10.10, Rev. 0, page 4 of 5, Section 6.2.
The SOP describes the technique for measuring the background level. It is not clear how the background location is selected to assure that the area selected for background has not been affected by operations. In the case of survey areas covered by artificial surfaces, it is not clear that the measurement techniques will have sufficient sensitivity; this assumption should be tested for the nuclides of concern.

Radiation Scoping Survey, LANL-ER-SOP-10.10, Rev. 0, page 5 of 5, Section 6.2.B. The SOP states that the background level should be redetermined every hour. A combination of time and number of points measured since the last background determination may be more appropriate. Background is normally determined to a higher precision than each individual measurement. Counting time for individual measurements, grid spacing, and internode scanning are not discussed.

Although the SOP states that it provides agreement criteria for a check source, it does not specify frequency and out-of-control actions.

Berthold Low Alpha and Beta Activity Counter Calibration, Quality Control Detection Limit and Use, LANL-ER-SOP-14.01, Rev. 0, pages 2 and 6 of 13, Sections 2.0 and 6.3. The SOP defines the lower level of detection as the minimum radioactivity concentration level necessary to be considered statistically separate from the normal background level. This definition appears to conflict with the definitions provided in other procedures reviewed. Typically, the lower level of detection, MDA, DA, and similar terms refer to detection capability. The DA value—also referred to as the critical level—refers to the minimum value that can be considered different from the background distribution. The form of equation presented in Section 6.4 also implies that the MDA is to be determined from this calculation. However, the written description implies that the equation is used to determine the critical level or DA value.

Berthold Low Alpha and Beta Activity Counter Calibration, Quality Control Detection Limit and Use, LANL-ER-SOP-14.01, Rev. 0, page 7 of 13, Section 6.4. The formula for calculating MDA is incorrect. The MDA or lower level of detection (L_D) is based on the standard deviation of the background count, not the count rate as shown in Appendix A (Table 1; see page 16). The example cited, and other sampling data, make it apparent that, for longer count times, the

MDA expressed as the sum of the background rate and the L_D decreases with increasing count times for a fixed count rate. The SOP should present the correct equation.

<u>Berthold Low Alpha and Beta Activity Counter Calibration, Quality Control Detection Limit and Use, LANL-ER-SOP-14.01, Rev. 0, pages 2 and 7 of 13, Sections 2.0 and 6.5</u>. It is not clear whether (1) this SOP is to be used solely for screening of activity before submittal to a radiochemistry laboratory, or (2) data obtained from implementing this SOP will be used for final determination of release. If this procedure is not considered sufficient for release, the SOP should so state.

TABLE 1
ILLUSTRATION OF DETECTION LIMIT QUANTITIES

Counts	Time (Minutes)	Rate (CPM)	Count Sigma (CPM)	Rate Sigma (CPM)	Count L_D (CPM)	Rate L_D (CPM)	CV (%)	MDA (CPM)
13.8	1	13.80	3.71	3.7	20.0	20.0	26.92	33.78
27.6	2	13.80	5.25	2.6	27.1	13.6	19.03	27.37
276	20	13.80	16.61	0.8	80.0	4.0	6.02	17.80
1380	100	13.80	37.15	0.4	175.4	1.8	2.69	15.55
10	1	10.00	3.16	3.2	17.4	17.4	31.62	27.41
10	2	5.00	3.16	1.6	17.4	8.7	31.62	13.71
10	3	3.33	3.16	1.1	17.4	5.8	31.62	9.14
10	5	2.00	3.16	0.6	17.4	3.5	31.62	5.48
10	10	1.00	3.16	0.3	17.4	1.7	31.62	2.74
100	10	10.00	10.00	1.0	49.2	4.9	10.00	14.92
1,000	100	10.00	31.62	0.3	149.8	1.5	3.16	11.50
10,000	1000	10.00	100.00	0.1	467.7	0.5	1.00	10.47
10,000	100	100.00	100.00	1.0	467.7	4.7	1.00	104.68
10,000	10	1,000.00	100.00	10.0	467.7	46.8	1.00	1,046.77
10,000	5	2,000.00	100.00	20.0	467.7	93.5	1.00	2,093.54
10,000	4	2,500.00	100.00	25.0	467.7	116.9	1.00	2,616.93
10,000	3	3,333.33	100.00	33.3	467.7	155.9	1.00	3,489.24
10,000	2	5,000.00	100.00	50.0	467.7	233.9	1.00	5,233.86
10,000	1	10,000.00	100.00	100.0	467.7	467.7	1.00	10,467.71

Notes:

CPM = Counts per minute
CV = Coefficient of variation
L_D = Lower level of detection
MDA = Minimum detectable activity

Berthold Low Alpha and Beta Activity Counter Calibration, Quality Control Detection Limit and Use, LANL-ER-SOP-14.01, Rev. 0, page 7 of 13, Section 6.5. ***Because use of the provided spillover factor is not clear, the following questions are left unanswered:***

- ***Because this factor will apply to evaluation of detector performance for beta emission measurements, should it be determined as part of the beta calibration?***

- ***Are the "lost counts" added back to the alpha measurement?***

The factor should be calculated by adding the net alpha counts in the alpha window to the net alpha counts in the beta window, and dividing the sum by the product of the alpha source activity and the detector efficiency. The corrected alpha count is calculated by (1) multiplying this factor by the net alpha counts in the alpha window, and (2) dividing the product by the detector efficiency. The SOP should be revised to reflect these changes.