Los Alamos National Laboratory

UNIVERSITY OF CALIFORNIA

Environmental Restoration Project
MS M992
Los Alamos, New Mexico 87545
505-667-0808/FAX 505-665-4747

Date: March 7, 1997
Refer to: EM/ER:97-061

1966 General

Mr. Rich Mayer
EPA, Region 6, 6PD-N
1445 Ross Avenue
Dallas, TX 75202-2733

SUBJECT: RFI REPORT FRAMEWORK

Dear Rich:

Enclosed is the RFI Report Framework that I promised to forward to you in our phone conversation on Wednesday. As I mentioned, our new reporting process to the New Mexico Environment Department will cause modifications to certain sections of the enclosed document. Specifically, our accelerated cleanup approach is being modified; therefore, minor modifications will occur throughout the document to reflect this. Also, because our RFI Reports will recommend final no further action decisions only, Section 5.1.12, *Sampling and Analysis Plan*, will be dropped from Chapter 5, *Specific Results, Conclusions, and Recommendations*. Sampling and analysis plans will be submitted separately.

In addition, the sections pertaining to Ecological Assessment (3.4, *Ecological Assessment* and 5.1.10, *Preliminary Ecological Assessment*) will be updated once we have finalized our ecological approach. Finally, we are in the process of developing a framework for the presentation of water data. Once this mechanism for reporting water data is finalized, the decision criteria, sampling methods, sample preparation, and sample analysis methods portions of Chapter 3, *Approach to Sample Analyses and Data Assessment*, will be updated.

Sincerely,

Tracy Glatzmaier
Environmental Restoration Project

TG/ss

Enclosure: RFI Report Framework

Cy (w/enc.):
RPF, MS M707

Cy (w/o enc.):
EM/ER File, MS M992

RFI Report for Potential Release Sites

XX-001
XX-002(a-c)
XX-003(b, e, g)
XX-008

(located in former Operable Unit XXXX)

Field Unit X

Environmental Restoration Project

Month Year

A Department of Energy Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-YEAR-NUMBER

NOTE: List PRSs on the title page only if there are approximately 8 or fewer (use judgment). To conserve space, list similar numbers together (e.g., XX-003 (b, e, g) or, if applicable, XX-002 (a-c)). If there are too many PRSs to list, title the report as follows: RFI Report X (indicate number of report for this TA) for TA-XX, for example RFI Report 2 for TA-XX.

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EXECUTIVE SUMMARY

Provide a brief description of the PRS(s) or PRS aggregate(s) that is (are) being reported. Include

- **facility operation processes,**
- **facility location, and**
- **operational time frame.**

Briefly describe the sampling event(s) and summarize the data analysis and any significant concerns with the quality of the data.

Explain the objectives of the investigation being reported, including whether this is a first (i.e., Phase I) or continued (i.e., further or Phase II) investigation. If applicable, include a brief summary covering findings of past data (e.g., contaminants previously identified), SALs exceeded, and the main implications of these findings.

Summarize the results of the investigation for each PRS or PRS aggregate.

If this report includes PRSs that have radionuclides as chemicals of potential concern, use the statement: Although radionuclides are regulated by the DOE and are not regulated under RCRA, it is more efficient and cost effective to investigate all types of potential contamination during a single site characterization. Therefore, radiochemical concerns are addressed in this report.

Include Table ES-1 (see example) which lists each PRS and the proposed action resulting from the investigation. This table is critical, even if there is only one PRS, because it provides the reviewer with a quick synopsis of the proposed action (NFA, VCA, EC, further investigation, or CMS). Reference the section in which PRSs are summarized.

TABLE ES-1
SUMMARY OF PROPOSED ACTIONS

			PROPOSED ACTION				
PRS No.	**HSWA[a]**	**Radionuclide Component[b]**	**NFA Criterion***	**Further Action[c]**	**Add to HSWA Module[d]**	**Rationale*** **	**Section No.**
0-001	X	X	5			RCRA and radionuclide contamination are below SALs.	5.x.11
0-002	X		5			RCRA contamination is below SALs.	5.x.11
0-003	X			VCA (date**)		RCRA contamination is above SALs; remedy obvious.	5.x.11
0-004				Further Investigation (date**)	X	Nature and extent of contamination is unknown.	5.x.11
0-005		X		VCA (date**)		Radionuclide contamination is above SALs; remedy obvious.	5.x.11
0-006	X	X		VCA (date**)		RCRA contamination is below SALs; radionuclide contamination is above SALs; remedy obvious.	5.x.11
0-007	X	X		Further Investigation (date**)		RCRA contamination is below SALs. Radionuclide contamination will be addressed in the future.	5.x.11

a. An X in this column indicates that the site is listed on the Hazardous and Solid Waste Amendments (HSWA) Module (Module VIII) of the Laboratory's RCRA operating permit.
b. An X in this column indicates that the site has a radionuclide component.
c. VCA, EC, further investigation, or CMS.
d. An X in this column indicates that hazardous constituents were confirmed at a site not already listed on the HSWA Module. The site requires further action; therefore, the site needs to be added to the Module.
* *Reference the appropriate NFA criterion (see No Further Action Criteria Policy, EM/ER:95-PCT-015, R1, August 30, 1996 [Project Consistency Team, 1210]).*
** *Indicate a best estimate for the start date of a further investigation and for the submittal date of a cleanup plan. For example, September 1997 or first quarter of 1998.*
*** *Clearly indicate if the rationale is for RCRA contamination, radionuclide contamination, or both.*

All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

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RESOURCE CONSERVATION AND RECOVERY ACT
FACILITY INVESTIGATION REPORT

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LANL ER PROJECT

RFI REPORT FRAMEWORK

Revision 1
August 12, 1996

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GENERAL GUIDELINES

1. Follow this format unless special permission to deviate is obtained from the Project Office. It is not the intent of the Project Office to compromise the technical quality of an RFI report by blind adherence to the format specified in the attached document. Rather, it is realized that, in certain unforeseen-to-date or site-specific circumstances, variation from this format will be required. All requests for deviation should be addressed to Linda Nonno (665-0725, lnonno@lanl.gov).

2. The key to the various type faces used in the document is as follows:

   Bold = Required, must follow. However, if a section does not apply to a report, include the section with the words: Section not applicable to this report.

   Italics = Interpretation and guidance. Read, and follow where applicable.

   Underlined = Fill in the underscored portion as applicable to the site(s) being reported.

   Normal = Boilerplate. Use as much as possible, but make changes where necessary, as applied to a report.

   Bold Italics = Required, must follow if it applies to the site(s) being reported (e.g., Section 5.1.9.1).

3. Acronyms have not always been defined in boilerplate sections because it cannot be foreseen if the use in the boilerplate is the first occurrence of the acronym in the document. It is expected that editors will define the acronym when it first occurs. If first occurrence is in a boilerplate section, it is permissible to alter the boilerplate to accommodate defining the acronym.

4. Follow the ER Project Guidelines document for all formatting issues such as headers, footers, references, etc. Ask field unit editors or Marge Boettner for a copy of the document.

5. If a section of this document does not apply, the boilerplate "Section not applicable to this report." should occur at the highest appropriate level. For example,

   correct method: 5.1.12 Sampling and Analysis Plan (SAP) for PRS "X"
   Section not applicable to this report.

   incorrect method: 5.1.12 Sampling and Analysis Plan (SAP) for PRS "X"
   Section not applicable to this report.
   5.1.12.1 Problem Definition
   Section not applicable to this report.
   5.1.12.2 SAP Design
   Section not applicable to this report.
   etc.

6. Follow figure and table numbers as indicated. If additional figures/tables are needed, limit the numbering scheme to three levels. (For example Table 5.1.5-1 is acceptable, but Table 5.1.5.1-1 has four levels and would not be acceptable.)

7. The terms Phase I and Phase II are used throughout this document. Generally, Phase I refers to the initial investigation conducted (typically as a result of the original RFI work plan.) Phase II refers to any detailed further investigation that was/will be performed, for example, to define nature and extent. The Project is moving toward the Accelerated RFI process (see RFI Process Policy, EM/ER:96-PCT-006, April 12, 1996 [Project Consistency Team, 1210]); therefore, a distinction between Phase I and Phase II may not be applicable to the site being reported.

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1.0 INTRODUCTION

This section is intended to be a brief overview of the report. Details will follow in Chapter 5.

1.1 General Site History

Discuss the operational history of the facility or technical area in which the PRS or PRS aggregate is located. Include

- **length of period of operation and associated start/end dates;**
- **types of facility process(es) that could have potentially contaminated the site; and**
- **historical use of chemicals at the site(s)**

NOTE: To avoid confusion, DO NOT use the phrase potential chemicals/constituents of concern or the acronym PCOC. For general discussions of contamination that is believed to be potentially present at the site(s) being reported, use the phrases "potential contamination" or "chemicals potentially present." Technical terms to be used are defined as follows:

- *Chemical. Any naturally occurring or man-made chemical, including radionuclides.*
- *COPC (chemical of potential concern). A chemical identified as a potential human health risk at any point in the screening assessment. The chemical remains a potential concern until it is eliminated in the screening assessment process or in the site-specific human health risk assessment.*
- *COC (chemical of concern). A chemical that is identified as a potential risk as the result of performing a site-specific human health or ecological risk assessment.*

If reporting on an aggregate, present the logic for grouping the PRSs (for example, geographic location, similar contaminants, similar unit types, etc.).

If this report includes PRSs that have radionuclides as chemicals of potential concern, use the statement: Although radionuclides are regulated by the DOE and are not regulated under RCRA, it is more efficient and cost effective to investigate all types of potential contamination during a single site characterization. Therefore, radiochemical concerns are addressed in this report.

Include Figure 1.1-1 (see example). This map shows the location of the TA (highlighted) in which the PRS or PRS aggregate being reported is located with respect to the Laboratory, to New Mexico, and to the United States.

Include Figure 1.1-2 (see example). This map shows the location of the TA (highlighted) in which the PRS or PRS aggregate being reported is located with respect to other Laboratory TAs and surrounding land holdings.

If applicable, include Figure 1.1-3. This map shows the location of the PRSs being reported with respect to the TA and to each other.

1.2 RFI Overview

In most cases this will reference the RFI work plan for Phase I characterization. If this is a Phase II or further investigation report, reference the appropriate sampling and analysis plan for the PRS or aggregate. Include

- **a brief description of the conceptual model and**
- **the objectives of the sampling event(s).**

1.3 Field Activities

Describe the field work, including that information that is common to all field investigations in this report. Limit description to approximately one or two pages unless something extraordinary occurred. Include

- **start and finish dates of field work (some sampling may include one or more seasons);**
- **types of field surveys;**
- **types of field screening, including**
  - **screening conducted to support sampling location bias and**
  - **any screening used to support screening assessment decisions; and**
- **types of sampling performed (e.g., surface sampling, subsurface sampling, auguring, drilling, trenching, monitor well completion, etc.).**

Include boilerplate: All applicable LANL ER SOPs (LANL, 0875) were followed, unless otherwise noted in Chapter 5.

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Figure 1.1-1 Location of TA-XX within Los Alamos National Laboratory, Los Alamos County, New Mexico.

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Figure 1.1-2 Location of TA-XX with respect Laboratory TAs and surrounding land holdings.

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Figure 1.1-3 Location of PRSs/aggregates at TA-XX.

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2.0 ENVIRONMENTAL SETTING

In each section below, briefly describe the environmental setting of the area under discussion (in most cases, summarize the applicable areas of the work plan for the PRSs being reported here). If a section of this chapter does not apply to a specific report, include the section number and title with the following words: Section not applicable to this report.

Modify the following boilerplate, as appropriate, for the area being described.

The environmental setting of the Laboratory is described in Section 2.4 of the Installation Work Plan (IWP) for Environmental Restoration (LANL 1995, 1275). A detailed discussion of the environmental setting for the area described in this report, including climate, geology, hydrology, and a conceptual hydrogeologic model for the area and its surroundings, is presented in the RFI Work Plan for OU ____ (LANL 199_, XXXX). A summary is presented in the following sections.

2.1 Climate

Los Alamos County has a semiarid, temperate, mountain climate. Summers are generally sunny with moderate, warm days and cool nights. High altitude, light winds, clear skies, and dry atmosphere allow summer temperatures to range from __°F to __°F at the area described in this report. During the winter, temperatures typically range from __°F to __°F. The average annual rainfall in the area of the PRSs described in this report is estimated to range from __ to __ in. Of this total, approximately 40% occurs as brief intense thunderstorms during July and August. Stream flow in canyons can occur as a result of these storms. Spring snowmelt runoff may also induce streamflow in the area canyons.

2.2 Geology

2.2.1 Geologic Setting

A detailed discussion of the geology of the entire Los Alamos area can be found in Section 2.5.1 of the IWP (LANL 1995, 1275). A summary of that material, emphasizing conditions expected near the area described in this report, is presented below.

Describe

- **the stratigraphy of the area (including how that information was obtained, i.e., logs of nearby wells) and**
- **depth to the main aquifer.**

If applicable, include Figure 2.2.1-1 (see example) showing the generalized stratigraphy in the area being described.

2.2.2 Soils

A detailed discussion of the soils in the Los Alamos area can be found in Section 2.5.1.3 of the IWP (LANL 1995, 1275). A summary of that material specific to the PRSs described in this report is presented below.

Describe soil type and mode of soil accumulation (this may affect which types of background values are used for comparison in the screening assessment). Include

- **a description of the soils mapped by Nyhan et. al. (1978, 0161) over the aggregate or site area;**
- **the general thickness and variability of soils, including any information regarding the depth to the soil/tuff interface, if applicable;**
- **any documentation of A, B and C horizons;**
- **whether a geomorphological survey was performed to investigate the rate of soil accumulation; and**
- **any features, such as sediment traps or erosion deposits, in which samples were taken.**

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Figure 2.2.1-1 Generalized stratigraphy of TA-XX.

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2.3 Hydrology

The hydrology of the Pajarito Plateau is summarized in Section 2.5.2 of the IWP (LANL 1995, 1275). Site-specific conditions are summarized below.

When available, and if applicable, provide a figure of the geologic formations penetrated, and indicate where the water level was encountered based on a well that was drilled as part of the investigation or a well that is close by. Reference Figure 2.2.1-1 if applicable.

Avoid definitive statements about potential for ground water contamination in the absence of relevant data. For example, "The aquifer is located at a depth of 1000-1200 ft, so there is no need to worry about ground water."

2.3.1 Surface Water

Include a discussion of any drainages, streams, wetlands, etc., in the area. Include Figure 2.3.1-1 (see example) showing the topography of the area described in this report.

2.3.2 Ground Water

Include

- **A discussion of any spring(s) and perched aquifer(s) in the area and**
- **a description of the well inventory in the area and a discussion of how deep the main aquifer is in the area, using the nearest well as a guide.**

2.4 Biological Surveys

Biological resource field surveys have been conducted in the area of the PRSs described in this report for compliance with the Federal Endangered Species Act of 1973; the New Mexico Wildlife Conservation Act; the New Mexico Endangered Species Act; Executive Order 11990, "Protection of Wetlands"; Executive Order 11988, "Floodplain Management"; 10 CFR 1022; Compliance With Floodplain/Wetlands Environmental Review Requirements (DOE 1979, 0633); and DOE Order 5400.1, General Environmental Protection Program (DOE 1988, 0075).

The results of these surveys and the habitat description for the PRS(s) and/or the PRS aggregate(s) described in this report will be included in the ecological RFI report prepared by the Decision Support Council Ecological Risk Assessment Team for the ecological exposure unit(s) in which this (these) PRS(s) and/or the PRS aggregate(s) is (are) located.

2.5 Cultural Surveys

A cultural resource survey has also been conducted in the area of the PRSs described in this report, as required by the National Historic Preservation Act (amended).

Discuss the results of the cultural/archaeological surveys conducted prior to the sampling event. When available, and the level of detail exists, take this information from the work plan. If surveys and reports came after the work plan, use the reports.

Include

- **a discussion of the disturbed and undisturbed environments and**
- **whether any cultural/archaeological sites are in the area.**

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Figure 2.3.1-1 Topography of TA-XX.

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3.0 APPROACH TO SAMPLE ANALYSES AND DATA ASSESSMENT

The approach to data assessment used by the ER Project is described in the policy document Risk-Based Corrective Action Process (Dorries 1996, 1297). The approach includes

- sampling and analysis design,
- field investigation and collection of field and QA samples,
- chemical and radiochemical analyses of samples and reporting of analytical data,
- baseline verification and validation of analytical data,
- organization of field and analytical data into PRS-specific data set(s),
- exploratory data analysis,
- focused validation when necessary to further assess questionable data,
- comparison of validated analytical results with LANL background data,
- comparison of validated analytical results with SALs,
- evaluation of sufficiency of data set(s) to support site decisions, and
- assessment of human health risk.

The following subsections provide overviews of the methods used to complete the steps listed above for the PRSs discussed in this RFI report.

Note any additions and/or deviations from the basic approach.

3.1 Sample Analyses

Samples were collected in accordance with the sampling design specified in the RFI Work Plan for OU XXXX (LANL 199X, XXXX); or the Sampling and Analysis Plan for PRS(s) (LANL 199X, XXXX); or the RFI Report for PRS(s) (LANL 199X, XXXX). All samples requiring chemical and radiochemical analyses and chain-of-custody documentation were submitted to the sample management office (SMO) and/or to the mobile radiological analysis laboratory (MRAL) and/or to an on-site mobile chemical van for analyses.

Note which analytical facilities (fixed lab, rad van, MRAL) were used for the PRSs in this report. Specify any on-site measurements (portable XRF, immunoassay kit, etc.) used in the decision process.

3.1.1 Analytical Methods

The following analytical suites were used for the sample analyses in this RFI report: inorganic chemicals, VOCs, SVOCs, (*etc., as needed*). A list of the target analytes for which analyses were performed for the purpose of this report can be found in Appendix A.

If other than the routine analytical services and methods are used, describe them here, including a description of the performance criteria. Indicate if the performance criteria were met in the appropriate section of Chapter 4. (If a nonroutine analytical method is used only for a particular PRS(s), include a brief description here and refer to the applicable section of Chapter 5, for example, 5.x.5, 5.x.6, or 5.x.7).

All samples were analyzed by contract analytical laboratories using methods specified in ER SMO analytical subcontracts (LANL 1995, 1278). The allowed methods are current EPA SW-846 and Contract Laboratory Program (CLP) methods or equivalent for inorganic chemicals, VOCs, SVOCs, (*etc., as needed*). Prior to analysis for inorganic chemicals, solid samples were digested according to EPA SW-846 method 3050 or equivalent (EPA 1992, 1207). The subcontracts specify LANL-approved methods for radiochemical analyses according to the technologies identified in the subcontract (e.g., americium-241 by alpha spectroscopy, tritium by liquid scintillation, or multiple isotopes by gamma spectroscopy). Analytical method selection is described in Appendix IV of the ER Project Quality Assurance Project Plan Requirements for Sampling and Analysis (QAPP) (LANL 1996, 1292). For each analyte, quantitation or detection limits are specified as contract-required estimated quantitation limits (EQLs) for organic chemicals and radionuclides and estimated detection limits (EDLs) for inorganic chemicals. These limits are included in Appendix III of the ER Project QAPP along with the target analytes for each analytical suite.

3.1.2 Data Validation

Data verification and baseline validation procedures were used to determine whether data packages received from the analytical laboratory were generated according to specifications and

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contain the information necessary to determine data sufficiency for decision-making. For analytical data used for decisions discussed in this RFI report, baseline data validation under the ER protocol was performed as described in the QAPP (LANL 1996, 1292).

This process produced validation reports, with data qualifiers designating potential deficiencies for affected results. Each data qualifier is accompanied by a reason code that provides information about the deficiency which led to qualification of the data. The validation reports were used in the decision-making process and to direct the focused validations required to evaluate the usability of the data for this report.

Data were qualified (i.e., a marker was attached to the data results) for a variety of reasons during the baseline validation process. The baseline validation procedure used for routine analytical services provides information about the reason the qualifier was applied and its potential impact on the affected data. The purpose is not to reject data but rather to ensure that the relative quality of the data is understood so that the data may be used appropriately.

Note if other than the routine process was used. Include a description of what was done and why there was a deviation. This is most likely to occur when nonroutine analyses and services were used or for data produced prior to the implementation of the baseline validation process.

Data qualifiers used in the LANL ER Project baseline validation process are

- A The data required for data review and evaluation are not available.
- U The analyte was not positively identified in the sample, and the associated value is the sample-specific EQL/EDL.
- J The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.
- J+ The analyte was positively identified, and the result is likely to be biased high.
- J- The analyte was positively identified, and the result is likely to be biased low.
- UJ The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific EQL/EDL.
- RPM Without further review of the raw data, the sample results are unusable due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. Presence or absence cannot be verified. NOTE: Any results qualified as RPM must be evaluated for relevance to data use.
- P Professional judgment should be applied to using the data in decision-making.
- PM Professional judgment should be applied to using the data in decision-making. A manual review of raw data is recommended to determine if the defect impacts data use for decision-making.

An example of the implications of the J+ qualifier: data used to determine if a SAL has been exceeded are not impacted from the high recovery when the results are less than the SAL. However, when the results are greater than the SAL, there is the possibility that the high bias indicates a false positive in relation to exceeding the SAL. A false positive could drive an action/decision (e.g., retain as a COPC). To possibly prevent this, a focused validation could evaluate other indicators of bias to support the high bias or to dispel it. If the bias can be quantitated with assurance, it may be possible to justify a determination of "less than the SAL."

An example of the implications of the J-qualifier: if a result is greater than the SAL, the negative bias has no impact on the decision to designate the chemical as a risk-based COPC. If the result is less than the SAL, a false negative may occur that must be evaluated when making a decision whether or not to retain the chemical as a COPC.

A focused data validation may be required as a follow-up to the baseline validation. The purpose of a focused validation is to determine the technical adequacy of measurement data when

- the data are qualified as deficient or as requiring professional judgment during the verification/baseline validation process. For example, when holding times are

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exceeded or interferences are present, a focused validation may be required to assist in determining data adequacy for the intended use.

- the data quality assessment process requires additional information about the
  - variability or uncertainty of the reported data or
  - data quality prior to making a data use decision because of anomalies detected in a data set.

Details of quality assurance/quality control activities are presented in Chapter 4 of this RFI report. Qualifiers resulting from baseline and focused validation are shown in the analytical results tables included in Chapter 5 of this report. Summaries of data quality evaluations and focused validation of analytical data relevant to this report are given in Appendix B. The RPM, P, and PM qualifiers do not appear in Chapter 5 data tables, nor in Appendix B, because they are replaced during focused validation according to the data use.

3.2 Process for the Identification of COPCs

3.2.1 Inorganic Chemicals

Detected inorganic chemicals are compared with natural background distributions to determine if they should be retained as COPCs or eliminated from further consideration. The inorganic background data used in this RFI report are from the following source(s): *(Follow the guidance for background data selection provided in Application of LANL Background Data to ER Project Decision-Making, Part I: Inorganics (Project Consistency Team, 1210 [EM/ER:96-PCT-010]; Ryti et al. 1996, 1298).*

- soil, sediment, and/or tuff samples collected throughout Los Alamos County for which chemical analyses were performed for certain inorganic (metal) chemicals (Longmire et al. 1995, 1142; 1995, 1266). **Briefly state the rationale for selecting the appropriate background data subset. For example, PRS samples were collected from fill material; the all-soil-horizons background data set was used because the soil master horizon cannot be identified in disturbed material.**
- ***background concentrations of data collected at or near the PRS(s) being reported. Briefly state the rationale for collecting local background data.*** *(If you have site-specific background data, use this bullet and include a table of site-specific background screening values.)*

Comparisons between site data and background data are initially performed by comparing each observed concentration datum with a chemical-specific background screening value that is the upper tolerance limit (UTL), or the maximum reported concentration, or the detection limit of a nondetected chemical. These background screening values are derived from LANL-wide soil, sediment, and/or tuff background data, and details on the calculation of these values are presented in Longmire et al. (1995, 1266). Certain inorganic chemicals in certain media have no LANL-wide background data. For these exceptions, PRS sample-specific detection limits are used as nominal background screening values. In this report, chemicals that lack background data include list chemicals.

If other statistical tests are used for background comparisons, specify the test(s) and provide a rationale for using them. Refer to sections of this RFI report in which the comparisons are used. Indicate if background screening or hot measurement comparison and statistical tests are used jointly to produce one list of inorganic chemicals/radionuclides greater than background. Detailed information on selecting statistical tests is presented in the guidance document Application of LANL Background Data to ER Project Decision-Making, Part I: Inorganics (Project Consistency Team, 1210 [EM/ER:96-PCT-010]; Ryti et al. 1996, 1298).

Note any deviation to this process for decisions in this report.

3.2.2 Radionuclides

Comparing reported radiochemical results with minimum detectable activities and background data is necessary to determine the presence of radionuclides and to distinguish concentrations of radionuclides associated with Laboratory operations from those attributable to global fallout and/or to naturally occurring radionuclides.

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The LANL ER Project requires that radiochemical data be reported by a laboratory on the basis of a detection test. Therefore, as part of the data validation/data assessment, reported results must be evaluated to ensure that only those results that represent detections be used to classify a radionuclide as a COPC. This is typically done by comparing the reported value with the associated minimum detectable activity if one is reported. When the minimum detectable activity is not available or does not meet the data quality needs of the ER Project, the reported value will be tested against an estimated minimum detectable activity. This estimated value is based on instrument counting error. The counting error is typically reported as the analytical uncertainty at a value of 1-sigma (i.e., one standard deviation), and the estimated minimum detectable activity is computed as 3-sigma.

Data analysts should be aware that radiological uncertainty in FIMAD is sometimes reported as 1-, 2-, or 3-sigma and that the reported uncertainty may be the total propagated uncertainty, which includes other sources of error in addition to the counting error. Where appropriate to specific radionuclides, other means of evaluating reported results may include half-life, isotopic ratios, and/or parent-daughter relationships. You can also exclude radionuclides, based on process knowledge, e.g., potassium-40.

Detected radionuclides are retained as COPCs or eliminated from further consideration based on a comparison with natural or anthropogenic background distributions. The radionuclide background data used in this RFI report are from the following source(s):

- soil, sediment, and/or tuff samples collected throughout Los Alamos County for which chemical analyses were performed for certain naturally occurring radioactive chemicals (Longmire et al. 1995, 1142; 1995, 1266). **Briefly state the rationale for selecting the appropriate background data subset. For example, PRS samples were collected from Qbt3 and Qbt4; the Qbt3 and Qbt4 background data sets were used because they were identified in borehole logs at depths of 10 to 30 ft and 30 to 50 ft, respectively.**
- ***background concentrations of radioactive chemicals associated with global fallout from atmospheric nuclear testing (e.g., plutonium, cesium, strontium, and tritium) reported in LANL Environmental Surveillance reports (Purtymun et al. 1987, 0211; ESG 1988, 0408; ESG 1989, 0308; Environmental Protection Group 1990, 0497; Environmental Protection Group 1992, 0740).*** *(This bullet applies primarily to surface samples collected from relatively undisturbed sites. The impact of mixing should be considered and the use of fallout-related background justified. If you have no surface samples or if site soils have been disturbed, eliminate this bullet.)*
- ***background concentrations of data collected at or near the PRS(s) being reported. Briefly state the rationale for collecting local background data.*** *(If you have site-specific background data, use this bullet and include a table of site-specific background screening values.)*

Comparisons between site data and background data are initially performed by comparing each observed concentration datum with a radionuclide-specific background screening value that is either the UTL or the maximum reported activity. These background screening values are derived from LANL-wide soil, sediment, and/or tuff background data, and details on the calculation of these values are presented in Longmire et al. (1995, 1266). Certain radionuclides in certain media have no LANL-wide background data. For these exceptions, PRS sample-specific minimum detectable activities are used as nominal background screening values. In this report, radionuclides that lack background data include list radionuclides that were detected but do not have a background screening value.

If other statistical tests are used for background comparisons, specify and provide a rationale for them. Refer to sections of this RFI report in which the comparisons are used. Indicate if background screening or hot measurement comparison and statistical tests are used jointly to produce one list of inorganic chemicals/radionuclides greater than background. Detailed information on selecting statistical tests is presented in the guidance document Application of LANL Background Data to ER Project Decision-Making, Part I: Inorganics (Project Consistency Team, 1210 [EM/ER:96-PCT-010]; Ryti et al. 1996, 1298).

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MDA, the acronym for minimum detectable activity, is already used throughout the project as the acronym for material disposal area. To avoid confusion, always write out the term minimum detectable activity and do not use MDA as an acronym for that term.

Note any deviation to this process for decisions in this report.

3.2.3 Organic Chemicals

Background data are not available for organic chemicals. Organic chemicals positively identified in one or more samples have been carried forward in the screening assessment process for the PRS(s) in this RFI report. Chemicals not detected in any sample have been removed from further consideration.

The elimination as COPCs of nondetected organic chemicals for which the detection limit is greater than the SAL should be addressed in Section 4.3 (Organic Analyses). Organic chemicals that were not detected in any sample are addressed in Chapter 5 only if one or more sample EQLs were significantly elevated due to matrix problems, etc.

Note any deviation to this process for decisions in this report.

3.2.4 Risk-Based Screening Assessment

Inorganic chemicals and radionuclides that exceed background and organic chemicals positively identified in one or more samples require further evaluation if they also exceed SALs. SALs for nonradioactive chemicals are based on EPA Region 9 preliminary remediation goals (PRGs) for residential soil and tap water. Where appropriate, certain EPA Region 9 water PRGs are replaced by Native American Pueblo, state, or federal water quality standards. Soil and water media have separate SALs for each chemical. The decision to identify a chemical as a COPC when a SAL is not available is made on a case-by-case basis, taking into account the availability of process knowledge and toxicological information.

If more than one COPC is present at the site, a multiple chemical evaluation (MCE) is performed to determine if the potentially additive effect of chemicals detected below SALs warrants additional investigation. The method for performing an MCE is summarized in the policy document Risk-Based Corrective Action Process (Dorries 1996, 1297). These comparisons are the last quantitative steps in the screening assessment process for human health concerns. If COPCs remain after this step, then further evaluation is required. If no COPCs remain after this step and the data set is sufficient to support the decision, an NFA recommendation may be proposed based on human health concerns.

If COPCs remain after the screening assessment, several options exist for the PRS. A further site-specific evaluation may lead to eliminating a COPC without going into a formal risk assessment. The site may be proposed for further sampling to more completely characterize the site or for remediation if it is cost effective to proceed without a risk assessment. A risk assessment may be conducted to determine if the remaining COPCs present an unacceptable human health risk.

Note any deviation to this process for decisions in this report.

3.3 Human Health Assessment

3.3.1 Risk Due to Naturally Occurring Inorganic Chemicals in Soils (Background)

Risk is associated with exposure to inorganic chemicals naturally occurring in soil. Calculation of background risks using the same methodology as site risk estimates provides a frame of reference for risk levels calculated at a site. This information provides a basis for determining risk-based remediation goals, which in some circumstances may be set at target risks comparable to background rather than default values, i.e., a cancer risk of 10^{-6} or a hazard index of 1. Background risks can also affect decisions at sites that have chemicals for which there is a toxicity threshold. For some inorganic chemicals, background intakes may be near a toxicity threshold such that incremental intakes associated with contamination may be unacceptable.

Background risk estimates provided in Table 3.3.1-1 were calculated using the same exposure assumptions by which SALs are calculated. SALs are based on health-protective assumptions for a residential scenario (EPA 1995, 1307). For soil exposure, the pathways include incidental soil ingestion, inhalation of resuspended dust, and dermal contact with soil. The background soil data used for these calculations were collected from several soil horizons at geographically diverse locations. Background risks are estimated for two statistics. One statistic is the median, which represents the midpoint in the concentration range (technically, the median is the concentration value that divides the results into two equal groups or where half of the data are above and half are

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below this value). The second statistic represents the upper range on background concentration values, and is either a calculated UTL or a maximum concentration value.[1]

The background risks based on the LANL SAL residential exposure model are provided in Table 3.3.1-1. Risks due to background concentration are presented for both noncarcinogenic and carcinogenic outcomes. The potential for adverse noncarcinogenic health effects is estimated by a hazard quotient. A chemical intake leading to a hazard quotient of up to 1 is not associated with adverse health effects. None of the median background concentrations result in hazard quotients greater than 1. The hazard quotient of the UTL concentration for manganese exceeds 1 (1.9). However, exposure to naturally occurring manganese is not expected to have significant health consequences because of the unlikely occurrence of the UTL concentration over an entire exposure area, the conservative assumptions used in the exposure assessment, and the margin of safety incorporated into the reference dose.

Three of the background inorganic chemicals provided in Table 3.3.1-1 are also carcinogens. Applying the default exposure assumptions used for SALs, the lifetime cancer risks due to residential soil exposure to background concentrations (UTL column) are estimated at approximately 1 excess case of cancer in 100,000 people for beryllium, 2 in 100,000 for arsenic, and 2 in 1,000,000,000 for cadmium (carcinogenic only by inhalation). EPA uses a range of 1 excess case of cancer in 10,000 people to 1 in 1,000,000 as a guidance for an acceptable range of cancer risk (EPA 1990, 0559).

These background risk estimates provide a frame of reference for a risk-based screening assessment and site decisions. If a site-specific risk assessment is necessary to further evaluate risks, background risks can also be calculated using site/scenario-specific assumptions to assist in any remedial action decisions for the site.

Note any deviation to this process for decisions in this report.

TABLE 3.3.1-1
RISK DUE TO BACKGROUND CONCENTRATIONS OF INORGANIC CHEMICALS IN SOIL ASSUMING A RESIDENTIAL SCENARIO[a]

Inorganic Chemical	Background Soil Concentration[b] mg/kg		Hazard Quotient		Lifetime Cancer Risk	
	Median	UTL	Median	UTL	Median	UTL
Aluminum	10 000	38 700	0.1	0.5	NC[c]	NC
Antimony	0.6	1[d]	0.02	0.03	NC	NC
Arsenic	4	7.82	0.2	0.4	1×10^{-5}	2×10^{-5}
Barium	130	315	0.03	0.06	NC	NC
Beryllium	0.895	1.95	0.003	0.006	6×10^{-8}	1×10^{-5}
Cadmium[e]	0.2	2.6[d]	0.005	0.07	1×10^{-10}	2×10^{-9}
Chromium[f]	8.6	19.3	0.00009	0.0002	NC	NC
Cobalt	6	19.2	0.001	0.004	NC	NC
Copper	5.75	15.5	0.002	0.01	NC	NC
Lead[g]	12	23.3	0.03	0.06	NC	NC
Manganese	320	714	0.8	1.9	NC	NC
Mercury	0.05	0.1[d]	0.002	0.004	NC	NC
Nickel	7	15.2	0.005	0.01	NC	NC
Selenium	0.3	1.7[d]	0.0008	0.005	NC	NC
Thallium	0.2	1[d]	0.03	0.2	NC	NC
Uranium	0.9	1.87	0.004	0.008	NC	NC
Vanadium	21	41.9	0.04	0.08	NC	NC
Zinc	30.7	50.8	0.001	0.002	NC	NC

a. Risk estimates are based on reference doses, slope factors, and EPA Region 9 default exposure assumptions effective April 1996.
b. Background concentrations taken from the Longmire et al. all soil horizons data set (1995, 1142).
c. NC = noncarcinogen
d. Maximum detected background value.
e. Cancer risks for cadmium are based solely on inhalation of resuspended dust.
f. Naturally occurring chromium is assumed to exist in a trivalent state.
g. Hazard quotient based on biokinetic uptake model.

[1] UTLs and maximum concentration values are identical to those described in Section 3.2.1 (Inorganic Chemicals).

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3.3.2 Risk Assessment

If a human health risk assessment was performed, use the boilerplate: The human health risk assessment(s) presented in Section 5.x.9 follow(s) the process outlined in the policy document Risk-Based Corrective Action Process (Dorries 1996, 1297) and consists of the following steps:

- identification of COPC concentrations,
- exposure assessment,
- toxicity assessment, and
- risk characterization.

If no human health risk assessments were performed, use the following statement: No human health risk assessments were performed for this PRS or PRS aggregate).

If applicable, indicate if more sampling is proposed to collect more data for a human health risk assessment.

3.4 Ecological Assessment

In cooperation with the New Mexico Environment Department and EPA Region 6, the Laboratory ER Project is developing an approach for ecological risk assessment. Further discussion of ecological risk assessment methodology will be deferred until the ecological exposure unit methodology being developed has been approved.

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4.0 RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

Chapter 4 is similar (although more report-specific) to Chapter 3 in that it provides background for the presentation of results in Chapter 5. Chapter 4 gives the reviewer a preview of the validity of the data presented in Chapter 5. The EPA guidance provided to LANL/DOE in 1994 shows a summary of QA/QC results preceding the analyses presented in Chapter 5.

Because many, if not all, RFI reports must cover volumes of data, the focus of the discussion in this section must be on potential problems associated with the usability of the data. These problems are summarized in the Data Validation table in Appendix B, which must be included for every report (see example in Appendix B). Include only data that have potential problems. If necessary, use more than one table per suite. The table and the text include explanations, where possible, of how qualified data can still be used in Chapter 5.

This section reviews the impact on data usability of QC results reported in Appendix B of this RFI report, as well as QA results associated with laboratory and field QC samples.

NOTE: When using qualified data, especially those impacted by QC deficiencies, a rationale for accepting the data for use must be included in Sections 4.1, 4.2, and/or 4.3, as appropriate.

Each subsection within this chapter must describe the usability of the data. For each subsection, describe any problem associated with

- **surrogates,**
- **matrices,**
- **blanks,**
- **lab and field replicates,**
- **holding times, and**
- **etc. as applicable**

State that the qualifications placed on sample results by data validation are summarized in Appendix B. Reference Table B-1 (B-2, B-3, etc., as needed) and include qualifications in Appendix B.

4.1 Inorganic Analyses

Include the number of field samples collected and the number and type of field QC samples analyzed for the suite of inorganic chemicals.

Describe inorganic QC information that may impact data use. For example, as indicated by matrices, blanks, lab and field replicates, etc. Include a description of the QC samples evaluated. Include any nonroutine services, such as a metal not on the target analyte list. Highlight specifics relative to any focused validation performed. State the reason focused validation was requested, summarize the conclusions, and list PRSs and sections in this report to which the qualified data apply.

Note any deviations from the general data verification/validation process, such as assuming the correctness of analyte identification, and note any deviation to this process for decisions in this report.

If inorganic analyses were not performed, use the following statement: No inorganic analyses were performed at this site.

4.2 Radiochemical Analyses

Include the number of field samples collected and the number and type of field QC samples analyzed for the suite of radionuclides.

Describe pertinent information relative to all the radiochemical data. Describe radiochemical QC information that may impact data use. For example, as indicated by tracers and carriers, matrices, lab and field replicates, etc. Include a description of the QC samples evaluated. Include any nonroutine services, such as a radionuclide not on the routine analytical services target analyte list. Highlight specifics relative to any focused validation performed. State the reason focused validation was requested, summarize the conclusions, and list PRSs and sections in this report to which the qualified data apply.

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Note any deviations from the general data verification/validation process, such as assuming the correctness of analyte identification, and note any deviation to this process for decisions in this report.

If radiochemical analyses were not performed, use the following statement: No radiochemical analyses were performed at this site.

4.3 Organic Analyses

Include the number of field samples collected and the number and type of field QC samples analyzed for the suite of organic chemicals.

Describe organic QC information that may impact data use. For example, as indicated by surrogates, matrices, blanks, lab and field replicates, etc. Include a description of the QC samples evaluated. Include any nonroutine services, such as TPHs or BTEX. Unless one or more EQL values are elevated due to matrix problems, eliminate non-detected organic chemicals for which detection limits exceed SAL values from further evaluation. (See Section 3.2.3, Organic Chemicals). Highlight specifics relative to any focused validation performed. State the reason focused validation was requested, summarize the conclusions, and list PRSs and sections in this report to which the qualified data apply.

Note any deviations from the general data verification/validation process, such as assuming the correctness of analyte identification, and note any deviation to this process for decisions in this report.

If applicable, include HE in Section 4.3.

If organic analyses were not performed, use the following statement: No organic analyses were performed at this site.

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5.0 SPECIFIC RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

Create any necessary subsections if such splitting enhances the organization and clarity of the presentation.

5.1 PRS or Aggregate "X"

Briefly summarize the PRS or PRS aggregate. This should be no more than one or two sentences. Include

- **specific associated building(s) and structure(s);**
- **types of unit(s) (e.g., outfall, septic tank, etc.);**
- **nature of contamination observed; and**
- **recommendations.**

For example, "Septic Tank PRS XX-001 served buildings TA-XX-XX and TA-XX-XY. Organic solvents were detected at concentrations above human health risk-based standards and is, therefore, being recommended for cleanup under a voluntary corrective action. A VCA plan for this PRS is planned for submittal to DOE by date." (Provide the best estimate. For example, by January 1997 or by the second quarter of 1997.) "All specific results, conclusions, and recommendations are (will be) included in the VCA plan."

If applicable, include Figure 5.1-1 (see example) to indicate the PRS (PRS aggregate) location.

5.1.1 History

PRS or Aggregate "X" is discussed in detail in Section(s) XX of the RFI work plan (RFI Work Plan for OU XXXX LANL 199X, XXXX) or other document (e.g., an RFI Report or Sampling Plan).

Include

- **a discussion of any archival data that became available after the RFI work plan (or other document) was submitted;**
- **the process(es) that might have created contamination; and**
- **a discussion of the chemicals used at the site that contributed to the list of COPCs.**

5.1.2 Description

Include specifics for the geology, hydrology, soils, wildlife habitats, etc., that were not detailed in Chapter 2.

5.1.3 Previous Investigation(s)

Include

- **any pre-RFI studies** *(if this information is available in the RFI work plan, summarize the previous investigations and refer the reader to the work plan for more detail)* **and**
- **a summary of any Phase I information if the current report is a Phase II (or further investigation) report** *(if this information is available in an RFI report, summarize the previous investigations and refer the reader to the report for more detail).*

If no previous investigations have been performed, use the following statement: No previous investigations have been performed at this site.

If data from a previous investigation are used to support the risk-based screening assessment (see Section 5.1.8), prepare a table with standard format (see example Tables 5.1.5-1, 5.1.6-1, 5.1.7-1, and 5.1.8-3) to support the discussion. The quality of the data should also be discussed if those data are used in the screening assessment.

5.1.4 Field Investigation

Summarize the specific objectives of the investigation and the supporting conceptual model specific to the PRS (PRS aggregate).

Describe when the investigation took place, and outline what specifically was performed to investigate the PRS (or aggregate); report on the outcome of the activities, including any problems associated with the operation. Include

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Figure 5.1-1 Aggregate "X" PRSs in this RFI Report.

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- all field-screening results except screening for health and safety (table format optional), including results from more than one season, if applicable; type of field-screening instrument(s) used; general frequency and range of levels detected for the chemicals investigated with each type of instrument;
- all information relevant to borehole sampling, such as depths; and
- all information relevant to the actual sampling event(s) (e.g., types of samples collected, etc.).

Report any deviations from an approved sampling plan. Include

- what was supposed to have been done (based on approved sampling and analysis plan);
- a clear description of the deviation;
- why the deviation was necessary; and
- any impact to the success of the field activities experienced because of the deviation.

Include Table 5.1.4-1 (see example) to summarize all sampling. Format as shown in the example. If samples for a particular suite were not collected, do not include that column. Add any nonstandard suite(s) as applicable. If necessary, provide more than one table, breaking out by suite where applicable. Reference Figure 5.1.4-1 (see example) showing all sample locations (use example format provided unless dividing the figure would allow for more detail or would be less confusing). In Figure 5.1.4-1, it is recommended that all surface samples (i.e., 0-5 ft) be indicated using sample ID numbers; all deeper borehole samples be indicated using location ID numbers; and if the sample location has both surface and subsurface samples, the location ID number only should be used. However, if mixing sample and location IDs on a single figure makes that figure confusing, do what makes sense for the PRS being considered.

TABLE 5.1.4-1
SUMMARY OF SAMPLES TAKEN

Location ID	Sample ID	Depth (ft)	Media*	VOCs	SVOCs	PCBs	Inorganic Chemicals	Radionuclides
ta-0001	futa-yr**-1285	0 - 0.5	soil	xxxxx***				
ta-0002	futa-yr-1286	0.5 - 1	soil					
ta-0003	futa-yr-4691	0 - 0.5	soil					
ta-0004	futa-yr-4692	0.5 - 1	soil					
ta-0005	futa-yr-4700	0 - 0.5	soil					
ta-0006	futa-yr-4701	0.5 - 1	soil					
ta-0007	futa-yr-4702	6	Qbt3					
ta-0008	AAA1000	0.5 - 1	fill					

* *Indicate specific soil master horizon or geologic subunit, if appropriate. (Ryti et al. 1996, 1298)*
** *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the sample was taken.*
*** *xxxxx = request number*

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

5.1.5 Evaluation of Inorganic Chemicals

Summarize the COPCs determined as a result of the screening. Follow the example table provided (see Table 5.1.5-1). When the results being reported are for two or more analytes and/or for two or more sample IDs, always use the table format. Otherwise, results may be summarized using text only.

The regulators originally asked for the table format provided in Table 5.1.5-1. To accommodate multiple matrix-based UTLs for data obtained from several soil layers and/or geologic subunits (Ryti et al. 1996, 1298), two format options to this table (see examples) have been provided. Option 1 provides a column for designating soil master horizon and/or geologic subunit. Option 2 is organized by soil master horizon and/or geologic subunit. Use which ever option best suits specific needs. Use of landscape mode and reduced type size to include more analytes is acceptable for all versions of this table. In those instances for which the number of analytes makes using the original table options extremely unwieldy, you may use the alternate format [see Table

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Figure 5.1.4-1 Locations of PRS XX-00X samples.

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5.1.5-1 (alternate format)].

NOTE 1: It is the data user's responsibility to capture or convert data from FIMAD in the appropriate format, including conveying the proper number of significant figures. Improper use of significant figures could indicate to the reader a lack of professionalism and inattention to the data sets being presented thus presenting a poor image of the Laboratory. It is important to document any impact to a decision due to rounding data values. Make sure the data presentation is logical and defensible.

NOTE 2: Table includes the background UTL as well as the SAL. The SAL is included to assist the reviewer in thinking ahead about whether a COPC above its UTL value is also above SAL. In order to better visualize the data, show hits above UTL by outlining the table cell that contains the result and by reversing the text for those hits above SAL (see Table 5.1.5-1 for example). When selecting the outline for a cell, use 1 1/2 pt. double outlining, bold outlining, or an equivalent, dependent upon the software used in creating the table.

NOTE 3: Use U qualifiers rather than a "<" symbol. Do not include chemicals for which all data are U-qualified unless one or more U-qualified values exceed the UTL.

In the table, include qualifiers assigned during the data validation process (not analytical laboratory qualifiers) where applicable. Do not leave any table cell blank, even if a value falls below background UTL. Use this table to provide analysis results even for those analytes for which no UTL is available (see silver for example). Do not include a column for chemicals with no UTL (e.g., mercury) unless there are observations above detection limits.

(option 1) *(option 1)* *(option 1)*

TABLE 5.1.5-1
INORGANIC CHEMICALS WITH CONCENTRATIONS AT OR ABOVE BACKGROUND SCREENING VALUES FOR PRS/AGGREGATE "X"

Sample ID	Depth (ft)	Media**	Mercury (mg/kg)	Silver (mg/kg)	Nickel (mg/kg)	Lead (mg/kg)	Zinc (mg/kg)
SAL	N/A[b]	N/A[b]	23	383	1 500	400	23 000
soil UTL[a]	N/A[b]	N/A[b]	0.1[c]	DL[d]	15.2	23.3	50.8
Qbt3 UTL	N/A[b]	N/A[b]	DL[d]	1.9	2.6	16.2	55.5
futa-yr*-1285	0 - 0.5	soil	10.2	2.4 (U)	19	350	23
futa-yr-1286	0.5 - 1	soil	12.6	26	9.5	11 (J)	276
futa-yr-4691	0 - 0.5	soil	13 (J)	23 (J)	0.8 (U)	15	964
futa-yr-4700	0.5 - 1	soil	10	200	15 (J-)	143	350
futa-yr-4701	0 - 0.5	soil	14 (J)	1 600	26.7	17 (J)	1 208
AAA1004	0.5 - 1	soil	0.08 (U)	400	7 (J-)	45	985
futa-yr-4702	6-7	Qbt3	14	450	1.2	18	125

a. Upper tolerance limit of LANL-wide soil background data from A, B, and C horizons.
b. NA = not analyzed. N/A = not applicable. *(Use as applicable.)*
c. Maximum detected background value.
d. Background data not available; sample-specific detection limits (DLs) used as screening criteria.
* *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the was taken.*
*** *Indicate specific soil master horizon or geologic subunit if appropriate.*

* Qualifiers used in table are defined in Section 3.1.2.

(option 1) *(option 1)* *(option 1)*

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

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(option 2)

TABLE 5.1.5-1
INORGANIC CHEMICALS WITH CONCENTRATIONS AT OR ABOVE BACKGROUND SCREENING VALUES FOR PRS/AGGREGATE "X"

Sample ID	Depth (ft)	Mercury (mg/kg)	Silver (mg/kg)	Nickel (mg/kg)	Lead (mg/kg)	Zinc (mg/kg)
SAL	N/A[b]	23	383	1 500	400	23 000
soil UTL[a,**]	N/A[b]	0.1[c]	DL[d]	15.2	23.3	50.8
futa-yr*-1285	0 - 0.5	10.2	2.4 (U)	19	350	23
futa-yr-1286	0.5 - 1	12.6	26	9.5	11 (J)	276
futa-yr-4691	0 - 0.5	13 (J)	23 (J)	0.8 (U)	15	964
futa-yr-4700	0.5 - 1	10	200	15 (J-)	143	350
futa-yr-4701	0 - 0.5	14 (J)	1 600	26.7	17 (J)	1 208
AAA1004	0.5 - 1	0.08 (U)	400	7 (J-)	45	985
Qbt3 UTL**	N/A[b]	DL[d]	1.9	2.6	16.2	55.5
futa-yr-4702	6-7	14	450	1.2	18	125

a. Upper tolerance limit of LANL-wide soil background data from A, B, and C horizons.
b. NA = not analyzed. N/A = not applicable. *(Use as applicable.)*
c. Maximum detected background value.
d. Background data not available; sample-specific detection limits (DLs) used as screening criteria.
* *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the was taken.*
** *Indicate specific soil master horizon or geologic subunit if appropriate.*

Qualifiers used in table are defined in Section 3.1.2.

(option 2)

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

If, regardless of qualifiers assigned during baseline data validation (i.e., during data validation using generic, not problem-specific, criteria), the data are determined usable for decisions specific to this site, use the following words: The qualifiers shown in the table have been assigned during baseline data validation. However, the data are usable for site-specific decisions, as stated in the rationale below.

Explain why it was determined that the data are usable (e.g., "As discussed in Section 4.1 (Inorganic Analyses), nickel data were qualified because of low surrogate recovery. However, because nickel was identified above its UTL value in two of the samples without qualifiers, nickel is carried forward to SAL comparisons regardless that the qualified values might be above UTL"). NOTE: If the data usability concerns were determined to be independent of PRS-specific decisions, then the rationale should have appeared in Section 4.1.

If data have been rejected by focused validation using decision-specific criteria, then the data should not be used for decision-making purposes.

If other statistical tests are used for background comparisons, specify the test(s). Provide a rationale for using the tests and discuss the decisions you made based upon these tests.

In discussing inorganic chemicals at or above background, reference a detailed figure (see example Figure 5.1.5-1) that shows spatially where chemicals above background are found at the site. If necessary for showing detail, use more than one figure. If numerous chemicals are identified, thus cluttering the figure, chemicals above UTLs not affecting site decisions may be omitted. At the discretion of the authors, depth and concentration may be included in the

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figure to indicate spatial relations if this is important to the conclusions of this report. As appropriate, either location or sample ID number must be specified for each data point included in the figure. If appropriate, the same information should appear or be clearly noted in the corresponding table. If applicable, risk-based COPCs should be identified in this figure or in a separate figure (see Section 5.1.8, Risk-Based Screening Assessment).

NOTE: Chemicals identified above background as a result of screening are now COPCs.

^*^*^*^*^*^* *(alternate format)*^*^*^*^*^*^*^*^(alternate format)*^*^*^*^*^*^*^*^* *(alternate format)*^*^*^*^*^*^

TABLE 5.1.5-1

INORGANIC CHEMICALS WITH CONCENTRATIONS AT OR ABOVE BACKGROUND SCREENING VALUES FOR PRS/AGGREGATE "X"

Analyte (mg/kg)	Sample ID	Sample Value (mg/kg)	SAL (mg/kg)	UTL[a] (mg/kg)	Media**	Depth (ft)
Mercury	futa-yr*-1285	10.2	23	0.1[c]	soil	0 - 0.5
	futa-yr-4700	46			soil	0.5 - 1
	futa-yr-4704	54			soil	0 - 0.5
	futa-yr-4705	24.5			soil	0.5 - 1
Silver	futa-yr-4709	12.6	383	DL[d]	soil	0.5 - 1
Nickel	futa-yr-4691	16	1 534	15.2	soil	0 - 0.5
Lead	futa-yr-4700	725	400	23.3	soil	0.5 - 1
	futa-yr-4701	25			soil	0 - 0.5
	futa-yr-4705	460		16.2	Qbt3	6-7
Uranium	futa-yr-4701	14 (U)	230	5.45	soil	0 - 0.5

a. Upper tolerance limit of LANL-wide soil background data from A, B, and C horizons.
b. NA = not analyzed. N/A = not applicable. *(Use as applicable.)*
c. Maximum detected background value.
d. Background data not available; sample-specific detection limits (DLs) used as screening criteria.
* *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the was taken.*
** *Indicate specific soil master horizon or geologic subunit if appropriate.*

Qualifiers used in table are defined in Section 3.1.2.

^*^*^*^*^*^* *(alternate format)*^*^*^*^*^*^*^*^(alternate format)*^*^*^*^*^*^*^*^* *(alternate format)*^*^*^*^*^*^

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

5.1.6 Evaluation of Radionuclides

Summarize the COPCs determined as a result of the screening. Follow the example table provided (see Table 5.1.6-1). When the results being reported are for two or more analytes and/or for two or more sample IDs, always use the table format. Otherwise, results may be summarized using text only.

Follow the same guidance for table formatting as stated in Section 5.1.5 (Evaluation of Inorganic Chemicals). The guidance in Notes 1, 2 and 3 of Section 5.1.5 also apply to Section 5.1.6.

In the table, include qualifiers assigned during the data validation process (not analytical laboratory qualifiers) where applicable in each table. Do not leave any table cell blank, even if a value falls below background UTL. Use this table to provide analysis results even for those analytes for which no UTL is available

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Figure 5.1.5-1 Locations of analytes that exceed background (UTLs and EQLs) and that exceed SALs at PRS/Aggregate "X".

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TABLE 5.1.6-1
RADIONUCLIDES WITH CONCENTRATIONS AT OR ABOVE BACKGROUND SCREENING VALUES FOR PRS/AGGREGATE "X"

Sample ID	Depth (ft)	Plutonium-239/240 (pCi/g)	Strontium-90 (pCi/g)	Cesium-134 (pCi/g)	Tritium (pCi/g)	Uranium-234 (pCi/g)
UTL[a]	N/A[b]	0.05[c]	1[c]	not available[d]	2.6[e]	1.94[c]
SAL	N/A[b]	24	4.4	1.9	260	13
futa-yr*-1285	0 - 0.5	2 500 (J+)	1.92	0.35	350	74
futa-yr-1286	0.5 - 1	2 400 (J+)	0.303 (UJ-)	0.11	430	27
futa-yr-4691	0 - 0.5	1 200 (J+)	0.704	0.244	290	64
futa-yr-4700	0.5 - 1	980 (J+)	0.252	0.144	1 436	35
futa-yr-4701	0 - 0.5	670 (J+)	0.276	0.177	377	12
AAA1004	0.5 - 1	725 (J+)	0.239	0.459	459	59

a. Upper tolerance limit of LANL-wide soil background data from A, B, and C horizons.
b. NA = not analyzed. N/A = not applicable. *(Use as applicable.)*
c. Maximum detected value from Environmental Surveillance data.
d. Background data not available; sample-specific minimum detectable activities are used as screening criteria.
e. Maximum detected value from Environmental Surveillance data (13 pCi/ml) and maximum soil moisture (25%).
* *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the sample was taken.*

Qualifiers used in table are defined in Section 3.1.2.

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

(see cesium-134, for example). Do not include a column for radionuclides with no UTL unless there are observations above detection limits.

If, regardless of qualifiers assigned during baseline data validation (i.e., during data validation using generic, not problem-specific, criteria), the data are determined usable for decisions specific to this site, use the following words: The qualifiers shown in the table have been assigned during baseline data validation. However, the data are usable for site-specific decisions, as stated in the rationale below.

Explain why it was determined that the data are usable (e.g., "During the data validation process, data were rejected because of the high recovery rate for the plutonium-242 tracer. How-ever, in this case, the plutonium-239/240 sample values are so high that the potential positive bias is insignificant relative to the degree to which the UTL value was exceeded. The data are, therefore, considered usable for the purpose of UTL comparison"). NOTE: This example of data usability differs from the examples provided for inorganic and organic chemicals. In this case, the data usability concerns are related to a PRS-specific decision. If the data usability concerns were determined to be independent of PRS-specific decisions, then the rationale should have appeared in Section 4.2.

If data have been rejected by focused validation using decision-specific criteria, then the data should not be used for decision-making purposes.

If other statistical tests are used for background comparisons, specify the test(s). Provide a rationale for using the tests and discuss the decisions you made based upon these tests.

In discussing radionuclides at or above background, reference back to Figure 5.1.5-1 or generate a new map using the same format as Figure 5.1.5-1.

NOTE: Chemicals identified above background as a result of screening are now COPCs.

5.1.7 Evaluation of Organic Chemicals

EQLs are analyte specific and sample dependent. Organic chemicals that have been positively identified at a site may have been measured at concentrations either above or below their EQLs. All positively identified COPCs must be shown in Table 5.1.7-1 (see example table). It is important to evaluate any positively identified results that are less than the EQL. Estimated values (J-qualified) below the EQL may be important to the risk assessor for multiple chemical evaluation

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(MCE), the statistician, or the project leader who may need to address the presence of the positively detected analyte(s) as an indicator of potential contamination that may need further investigation. If any organic chemical is in this category, the rationale for eliminating it from further consideration as a COPC must be described.

Judgment should be used whether to also reference a map showing where organic chemicals above their EQLs are found at the site. If an organic chemical appears to be a COPC (e.g., not due to blank contamination, etc.), then referring to a map may be appropriate; however, many organic chemicals detected are so far below SAL that reference to a map may be unnecessary. If a map is used, reference back to Fig. 5.1.5-1 or generate a new map using the same format as Fig. 5.1.5-1.

Follow the example table for comparison with estimated quantitation limits (see Table 5.1.7-1).

NOTE 1: In Table 5.1.7-1, use significant figures as per the guidance of Section 5.1.5 Note 1.

NOTE 2: Table includes the EQL as well as the SAL. The SAL is included to assist the reviewer in thinking ahead about whether an identified COPC above its EQL value is also above SAL. In order to better visualize the data, show hits above EQL by outlining the table cell that contains the result and by reversing the text for those hits above SAL (see Tables 5.1.7-1 for example). When selecting the outline for a cell, use 1 1/2 pt. double outlining, bold outlining, or an equivalent, dependent upon the software used in creating the table.

NOTE 3: Use U qualifiers rather than a "<" symbol. Do not include chemicals for which all data are U-qualified.

TABLE 5.1.7-1
DETECTED ORGANIC CHEMICALS FOR PRS/AGGREGATE "X"

Sample ID	Depth (ft)	Aroclor-1254 (mg/kg)	Dibutyl phthalate (mg/kg)	Tetrachloroethylene (mg/kg)
SAL	N/A[a]	1.4	6,500	7.0
EQL	N/A[a]	1.0	0.33	0.013
futa-yr*-1000	0 - 0.5	3.0	0.11 (J)	0.01
futa-yr -1001	0.5 - 1	5.0	0.46	0.008 (J+)
futa-yr -1002	0 - 0.5	2.44	0.73	0.01
futa-yr -1003	0.5 - 1	2.24	0.41	0.013
AAA1004	0 - 0.5	0.7 (U)	0.88	0.010 (J+)
AAA1005	0.5 - 1	0.8 (U)	0.29 (J)	0.01
futa-yr -1006	0 - 0.5	1.56	0.92	0.01

a NA = not analyzed. N/A = not applicable. *(Use as applicable.)*
* *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the sample was taken.*

Qualifiers used in table are defined in Section 3.1.2.

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

Include qualifiers assigned during the data validation process (not analytical laboratory qualifiers) where applicable in table. Do not leave any table cell blank, even if a value falls below EQL.

If, regardless of qualifiers assigned during baseline data validation (i.e., during data validation using generic, not problem-specific, criteria), the data are determined usable for decisions specific to this site, use the following words: The qualifiers shown in the table have been assigned during baseline data validation. However, the data are usable for site-specific decisions, as stated in the rationale below.

Explain why it was determined that the data are usable (e.g., "As discussed in Section 4.3 (Organic Analyses), tetrachloroethylene data were qualified because of high surrogate recovery. However, because no sample values exceeded the sample EQL, tetrachloroethylene is not

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identified as a COPC regardless of the potential positive bias of the sample data"). NOTE: If the data usability concerns were determined to be independent of PRS-specific decisions, then the rationale should have appeared in Section 4.3.

If data have been rejected by focused validation using decision-specific criteria, then the data should not be used for decision-making purposes.

5.1.8 Risk-Based Screening Assessment

This section includes a comparison with SALs and, if applicable, a multiple chemical evaluation (MCE).

Present the results relative to the guidance and standards referenced in Section 3.2.4 (Risk-Based Screening Assessment).

Perform the risk-based screening assessment separately for noncarcinogens, chemical carcinogens, and radionuclides; present three separate tables. Follow the example shown in Table 5.1.8-3. Label the tables 5.1.8-1, 5.1.8-2, 5.1.8-3 for noncarcinogens, carcinogens, and radionuclides, respectively, as applicable to the site being reported.

TABLE 5.1.8-3
PRS/AGGREGATE "X" RADIONUCLIDES
WITH CONCENTRATIONS IN SOIL THAT EXCEED SALs

Sample ID	Location ID	Depth (ft)	Plutonium-238 (pCi/g)	Plutonium-239/240 (pCi/g)	Strontium-90 (pCi/g)	Uranium-234 (pCi/g)
SAL	N/A*	N/A*	27	24	4.4	13
futa-yr**-1000	ta-0001	0 - 0.5	36	2 500	3	18 (J)
AAA1001	ta-0002	0 - 0.5	54	2 400	19	86 (J)
AAA1002	ta-0003	0 - 0.5	498	1 200	113	74 (J)
futa-yr-1003	ta-0004	0 - 0.5	345	670	76	27 (J)
futa-yr-1004	ta-0005	0 - 0.5	112	140	23	64 (J)
futa-yr-1005	ta-0006	0 - 0.5	13	94	11	35 (J)
futa-yr-1006	ta-0007	0 - 0.5	58	23	34	11 (J)
futa-yr-1007	ta-0008	0 - 0.5	168	154	47	59 (J)

* NA = not analyzed. N/A = not applicable. *(Use as applicable.)*
** fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the sample was taken.

Qualifiers used in table are defined in Section 3.1.2.

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

Include qualifiers assigned during the data validation process (not analytical laboratory qualifiers) where applicable in table. Do not leave any table cell blank, even if a value falls below SAL. If no SAL is available, consult a member of the Decision Support Council Risk Assessment team.

If, regardless of qualifiers assigned during baseline data validation (i.e., during data validation using generic, not problem-specific, criteria), the data are determined usable for decisions specific to this site, use the following words: The qualifiers shown in the table have been assigned during baseline data validation. However, the data are usable for site-specific decisions, as stated in the rationale below.

In this case, explain why it was determined that the data are usable (e.g., "Uranium-234 analytical laboratory control sample results deviated from known values by 150%. The associated sample results were validated as estimates (J). Because several uranium 234 sample values exceeded the SAL by substantially more than 150%, the uncertainty in the sample values does not affect identification of uranium-234 as a COPC in the SAL comparison").

If data have been rejected by focused validation using decision-specific criteria, then the data should not be used for decision-making purposes.

If no chemicals were detected at or above SAL, make the statement that no chemicals were detected at or above SAL.

Provide a figure showing the location(s) of risk-based COPCs. (A previous figure such as Figure 5.1.5-1 may be used or a new figure may be generated.) As applicable, include Table 5.1.8-4 (see example) to show the results of MCE

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calculations. Calculate MCE values to one decimal place only. The normalized values should contain the appropriate number of significant figures according to the guidance given in Section 5.1.5, NOTE 1. Note that most SAL values have only two significant figures. Show all COPCs (normalized values equal to or above 0.1) by reversing the text (see normalized values for antimony, lead, and pyrene in Table 5.1.8-4).

TABLE 5.1.8-4

MULTIPLE CHEMICAL EVALUATION FOR SOIL SAMPLES AT PRS/AGGREGATE "X"

Chemical	Location ID	Sample ID	Maximum Sample Value	Soil SAL[a]	Normalized Value
Noncarcinogenic Effects (mg/kg)					
Antimony	ta-0001	futa-yr*-1000	8.9	31	0.3
Cadmium	ta-0002	futa-yr-1001	3.4	38	0.09
Lead	ta-0003	futa-yr-1002	185	400	0.5
Pyrene	ta-0004	AAA1003	780	2 000	0.4
Silver	ta-0005	AAA1004	4.5	380	0.01
				Total[b]:	1
Carcinogenic Effects of Chemicals (mg/kg)					
Aroclor 1260	ta-0007	futa-yr-1005	0.55	1	0.6
Chromium	ta-0008	futa-yr-1006	62(J)	210	0.3
				Total[b]:	0.9
Carcinogenic Effects of Radionuclides (pCi/g)					
Plutonium -238	ta-0009	futa-yr-1007	1.27	27	0.05
Plutonium -239/240	ta-0010	futa-yr-1008	6.36(J)	24	0.3
				Total[b]:	0.4

a. SAL = screening action level.
b. Total may not equal sum of normalized values due to rounding.
* *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the sample was taken.*

Qualifiers used in table are defined in Section 3.1.2.

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

5.1.9 Human Health Risk Assessment

Present the results of a preliminary risk assessment (if performed). Include

- **the land use scenario used to perform the assessment;**
- **a summary of the results in terms of whether an unacceptable risk does or does not exist at the site; and**
- **a discussion of the necessity of further investigation if an unacceptable risk was found.**

All calculations supporting the risk assessment (sufficient for the regulator to reproduce the risk assessment) must be provided in Appendix C.

If no risk assessment was necessary, use the following statement: No human health risk assessment was performed for this PRS (or PRS aggregate). **State the reason why no human health risk assessment was performed.**

A breakout of the following subsections may contribute to the organization and presentation of the material:

5.1.9.1 Review of COPCs and Extent of Contamination

Include a review of the COPCs identified in the previous subsections. In addition, define the nature and extent of contamination for the PRS or aggregate being reported. Also, the investigation, especially if designed to support a screening decision (or to identify COPCs), may not include sufficient data to assess the extent of contamination. In addition, some sites are, by type, exceptions; for instance, the linear and usually shallow nature of contamination typical of outfalls does not lend itself to topographic maps and subsurface cross sections; physical barriers, such as septic tank walls, may also limit need for such a discussion.

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If an analysis is not appropriate, make the statement that extent of contamination is not known or appropriate for the level or type of investigation performed.

For sites where a spatial analysis of extent is appropriate and feasible, prepare a cross section showing vertical definition and a topographic map showing horizontal definition. The boundaries of where extent was defined are shown by a solid line; where it was not defined, a dashed line is used to support the discussion. The screening level to be used to select data for the presentation will vary on a case-by-case basis; in some instances all data above background may be relevant; but, in most cases, the data above SAL or some other level of risk will be considered to be the relevant data. As part of the analysis, discuss the necessity of further sampling if extent of contamination was not fully defined as a result of the investigation.

If a pathway analysis can be performed as a result of the spatial analysis of the data, include it in this section. The results of any modeling of the site that generate information on the spatial distribution of contaminants that have migrated from the site could also be presented in this section.

5.1.9.2 Exposure Assessment

Include, if applicable,

- *description of exposure scenario, receptors, and pathways;*
- *concentration and location of COPCs*
- *environmental fate and transport modeling; and*
- *estimation of COPC intake.*

5.1.9.3 Toxicity Assessment

Include an assessment of

- *general toxicology of COPCs and*
- *derivation of toxicity criteria for COPCs.*

If you have a long list of COPCs, include this information in Appendix C.

5.1.9.4 Risk and Dose Characterization

Risk and dose are characterized with respect to integration of the previous three sections. Risk due to naturally occurring inorganic chemicals in soils (background) may also be characterized with respect to the site-specific exposure assessment, if applicable, and presented here. Nonradionuclides and radionuclides, if both are addressed, may need to be covered in separate subsections.

Include an assessment of uncertainty with regard to

- *land use assumptions,*
- *exposure parameters and models,*
- *environmental fate and transport models, and*
- *toxicity criteria.*

5.1.10 Preliminary Ecological Assessment

In cooperation with the New Mexico Environment Department and EPA Region 6, the Laboratory ER Project is developing an approach for ecological risk assessment. Further ecological risk assessment at this (these) site(s) will be deferred until the site(s) can be assessed as part of the ecological exposure unit methodology currently being developed.

5.1.11 Conclusions and Recommendations

Use the results of Sections 5.1.3 through 5.1.10 to justify conclusions and recommendations. Develop conclusions to provide a comprehensive and logical rationale for the recommendations. If a risk assessment was not performed, the rationale supporting the decisions should put the quantitative screening results (UTL, EQL, and SAL comparisons) into a logical framework that interprets the results from the perspective of the conceptual model describing contaminant distribution and potential human exposure at the site.

Possible factors to be addressed in the rationale may include

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- *Analytical Issues. Is the analyte list complete? If data are sufficient for evaluation, do bias and/or precision problems impact site recommendations?*
- *Spatial Characterization(s) Has (have) the location(s) of the PRS(s) being reported been positively identified? Are the number, location, and depth of soil samples sufficient? (Consider patterns observed in the data, possible contaminant redistribution since the time the site was active, release mechanisms, volume of release, etc.) Should additional media be sampled? Are the data biased?*
- *Environmental Fate and Transport. (Related to spatial characterization.) Could chemical or biological degradation and/or re-speciation impact decisions? Could chemical adsorption, precipitation, dissolution, etc., impact redistribution in the environment? How could site-specific hydrologic and geologic conditions impact contaminant transport and hence site decisions?*
- *Exposure and Toxicity(s) How do site location, accessibility, and potential use affect site decisions? How do assumptions concerning exposure mechanisms and model parameters impact site decisions? How does uncertainty in contaminant toxicity impact site decisions?*

If any of these factors were addressed in previous sections of this report (in particular if a risk assessment was performed), a brief summary of these evaluations and how they support the final recommendations is sufficient. Try to minimize the introduction of new information. This section should primarily interpret information from previous sections and connect it into a logical explanation to support the conclusions derived and the recommendations proposed.

In general, NFA recommendations based on Phase I data require the most substantial defense because a site decision is often made when sample data are limited. In this case, the rationale may involve a subjective cost/benefit evaluation based on the likelihood of new data affecting the site decision. If a Phase II investigation is proposed, the rationale for taking this action should support the problem definition and goals stated in Section 5.1.12.1 (SAP Problem Definition).

Clearly state the recommendation(s) for proposed actions.

If NFA is the proposed action, reference the appropriate NFA criterion *(See No Further Action Criteria Policy, EM/ER:95-PCT-015, R1, August 30, 1996 [Project Consistency Team, 1210])* **and include the following statement:** This (these) site(s) is (are) proposed for NFA, based on NFA Criterion provide number. A Class III permit modification will be requested to remove this site from the Hazardous and Solid Waste Amendments Module of the Laboratory's Resource Conservation and Recovery Act operating permit.

If the site is not on the HSWA Module, and no further action is necessary, include the following statement: Based on NFA Criterion provide number, this PRS will not be added to the HSWA Module of the Laboratory RCRA operating permit and is proposed for removal from the ER Project list of PRSs.

If Phase II (or any further investigation) is the proposed action, summarize when the additional sampling is necessary and include the sampling and analysis plan in Section 5.1.12.

If accelerated cleanup is proposed, state the reason for recommending the proposed cleanup and reference the accelerated cleanup plan to be submitted by a specified date.

If a corrective measures study is proposed, state the reason for recommending the study and reference the corrective measures study plan to be submitted by a specified date.

If the site is proposed to be deferred to the decommissioning program, state the reason and indicate a time (however tentative) by which the decommissioning will occur.

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5.1.12 Sampling and Analysis Plan (SAP) for PRS or Aggregate "X."

DO NOT SUBMIT AN RFI REPORT WITHOUT AN ADEQUATE SAMPLING AND ANALYSIS PLAN (SAP). IF YOU ARE UNABLE TO DESIGN AN ADEQUATE SAP BY THE RFI DEADLINE, YOU SHOULD REQUEST AN EXTENSION OF THE DEADLINE AT LEAST ONE MONTH PRIOR TO THAT DEADLINE.

SAPs should be clear and specific enough that a second party given the plan could execute it with essentially the same results as those of the author of the plan. The plan should explicitly state the objectives and rationale for every set of samples (i.e., stream sediment samples, surface samples, subsurface samples, etc.). The following information is to be included.

5.1.12.1 Problem Definition

Question(s) to be answered by the data

- *Questions to be answered by the data collected must be concrete and specific, not open-ended.*

Purpose for which this information is needed

- *What decisions depend on the answers to these questions?*

Include only as much of the following types of information as is necessary to clarify the questions and purposes of the proposed investigation or help the reader to understand the site.

Site description
If this is part of a larger report in which the site has already been adequately described (e.g., an RFI report), reference the appropriate section(s).

- *Include a figure showing the salient site features and indicating the areas of interest.*
- *Summarize physical features and site history pertinent to this SAP.*

Historical data
Reference earlier sections of an RFI report, an attachment, or another report, for detailed information and lengthy data tables. Reference sources of historical data, directly or indirectly.

- *Summarize the most pertinent existing data; a short table may be appropriate.*

Regulatory drivers

- *Identify pertinent legislation, permits, guidance, etc.*

5.1.12.2 SAP Design

Present an overview of "what" and "why." The details of "how" belong in Section 5.1.12.3 (SAP Implementation).

Overview of information to be collected

- ***Identify locations and media to be sampled, and frequency if more than once.***
- ***Identify target analytes.***
- ***List all measurements (both field and analytical laboratory) to be reported.***
  - *Explain, if appropriate, how selection of samples for analytical laboratory analysis will be based on results of field tests, surveys, sampling grids, or statistics.*
  - *As appropriate, include figure(s) identifying sampling locations, and table(s) listing sample matrices, locations, depths, and proposed analyses.*
  - *Describe contingency plans, if any.*

How will these data be used to answer the questions?

- ***Specify the summary statistics to be calculated.***
- ***Specify target levels with which summary statistics will be compared.***
  - *Identify sources of other information for statistical or other comparisons, as appropriate, such as background data sets, previously collected baseline data, or data from an upgradient well.*

Assumptions underlying the design

- *For example,*
  - *expectations about the spatial distribution and levels of contamination,*
  - *assumptions about the availability of auxiliary information for biasing or stratifying samples,*
  - *expectations concerning the performance of field kits,*
  - *the anticipated bias and precision of individual measurements, and*
  - *physical and temporal constraints affecting the design.*

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Requirements for data quality implied by intended data use

- *Specify the critical range of concentrations (e.g., within an order of magnitude of the preliminary remediation goal or waste acceptance criterion). Determine acceptable levels of precision and bias for summary statistics within this critical range.*
- *Consider foreseeable problems that could render the data unusable for its intended purpose.*

Measurements to verify assumptions and requirements

- ***Identify data quality assessment information to be collected to verify critical assumptions.***
  - *In particular, identify measurements or observations that will be used to trigger implementation of any contingency plan.*
- ***Describe data acceptance criteria that will be used for review, verification, and validation of the data.***

5.1.12.3 SAP Implementation

Provide a level of detail that makes the design outlined in Subsection 5.1.12.2 (SAP Design) "third-party implementable." Cite SOPs when available and appropriate. (Develop or modify SOPs if necessary.) Provide details not included in the SOPs.

Field methods

- ***Include all methods for surveying and sampling that will affect data to answer question.***
  - *Describe surveying and permanent marking of survey and sample locations.*
  - *Describe site preparation for surveys and sampling.*
  - *Describe sampling methods to be used. Include any special field sample preparation not covered in SOPs.*
  - *Specify when and how to collect QC samples, calibrate field instruments, etc.*
  - *Identify all sampling information that must be recorded on the sampling logs, in logbooks, and/or in the field database.*
  - *Describe any temporal information that may affect data collection.*

Measurement methods

- ***Include field, mobile laboratory, and off-site laboratory methods.***
  - *Cite SOPs wherever possible. Exclude measurements for H&S, DOT, etc.*
  - *Identify screening instruments to be used. Supplement SOPs with sufficient QC/calibration/testing to meet requirements.*
  - *Describe use of field test kits. Supplement SOPs or manufacturer's instructions with sufficient QC/calibration/testing to meet requirements.*
  - *Describe auxiliary field measurements to be made, e.g., dry sieving to determine particle size fractions, soil type characterization.*
  - *Describe mobile van analyses*
  - *Describe off-site analytical methods to be used. Specify any special requirements such as rapid turnaround, sample cleanup expectations.*

Field decisions

- *Provide clear instructions on the use of field measurements to select samples for further analysis. Specify what information is to be recorded both for these locations/samples and for other candidate locations/samples.*
- *Provide criteria (i.e., Reconsidering and/or Stopping Work on Accelerated Cleanups, EM/ER:96-PCT-004, April 12, 1996 [Project Consistency Team, 1210]) to be used by field team to determine when a contingency plan should be invoked.*

Sample handling

- *Describe how samples are to be preserved, packaged, shipped, and tracked. Cite SOPs where applicable.*
- *Describe any special arrangements such as archiving samples or their derivatives, if applicable.*

Data tracking

- *Specify which field measurements must be recorded in sampling logs, logbooks, and/or the field database.*
- *Describe how field information will be prepared for and transmitted to a central data management system.*

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- *Describe how mobile laboratory data will be reported to field crews and how it will be uploaded to the central data management system.*
- *Describe forms of data (electronic, hard copy) expected from off-site laboratories, and how those data will be uploaded to the central data management system. Cite SOPs/SOWs where applicable.*

Schedule
- *Anticipate the length of time each activity will require. Include time for analysis of samples, data assessment, and preparation of reports.*
- *If contingency plans need to be invoked, how will that modify the schedule?*

5.1.12.4 Data Assessment
Describe the process by which the usability of all data for its intended purpose will be evaluated vis-a-vis the assumptions and requirements specified in Section 5.1.12.2 (SAP Design).

Verification and baseline data validation
- *Discuss data verification and baseline validation process. SOPs/SOWs/QAPP may be cited if available and appropriate.*
- *Describe how results will be communicated to data users; for example, by application of standard qualifiers to results. Standard procedures may be cited if available and appropriate.*
- *Describe how field data will be reviewed and verified.*

Data quality assessment
- *Describe activities planned to complete reconciliation of results with data quality objectives, such as*
  - *focused validation of analytical data packages,*
  - *comparison of achieved bias and precision with levels originally prescribed, and*
  - *evaluation of validity of the assumptions that were made for planning purposes.*

5.1.12.5 Administration
Summarize the nontechnical aspects of the SAP essential to maintain quality and to achieve third-party implementability. If more than one SAP is to be submitted in the same report and the information for this section is identical, you need to include this section only for the first SAP and then refer back to this section for subsequent SAPs.

Project task organization
- *Describe functional roles and responsibilities. Include those for which names, phone numbers, and addresses will need to be supplied before SAP is executed.*
- *Provide an organizational chart.*
- *Identify any special personnel needed to meet task objective.*

Training
- *Identify special training needed for this investigation, such as use of field kits, nonstandard field sample preparation, or special field documentation requirements, etc.*

Records
- *Include what they are [e.g., handwritten field records (sample logs, logbooks), electronic data files, and formal reports] and who is to receive them.*

Oversight
- *Indicate what is planned, e.g., readiness review, peer reviews, field audits. Mention special concerns, if any, such as completion of SOPs or SOWs.*

Inspection/acceptance policies
- *Cite SOPs if available and appropriate.*
- *Identify person(s) responsible and criteria for inspection/acceptance of supplies and consumables.*

Reports to management
- *Identify reports to be provided to management, including expected frequency and content.*

5.2 PRS or Aggregate "Y"

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APPENDIX A ANALYTICAL SUITES

Results of analyses can be found in FIMAD. Hard copies of supporting information will be provided upon request.

Chemicals that are reported by analytical laboratories as nondetects have not been included in the tables of this RFI report. Nonetheless, nondetected chemicals are often part of the decision-making process, and it is important to note that analyses for these chemicals were performed. This appendix provides a list of the target analytes in each analytical suite for which samples were taken (see Table 5.x.4.1, Summary of Samples Taken).

The lists provided below are standard analytical suites. The lists may need to be modified to suit the needs of specific RFI reports. Target analytes in several suites have changed with subsequent contract laboratory statements of work. For example, the inorganic suite changed from 11 to 21 analytes in mid-1994.. When in doubt, check the target analyte list in one of the data packets.

As appropriate, include the following lists for all suites for which samples were taken. The lists should be consistent with Table 5.x.4.1. Delete any suite NOT used in a specific RFI report. Add any nonstandard suite (such as water quality analyses) as applicable. Modify target analytes in each suite, as applicable.

Inorganic Suite

Aluminum	Calcium	Lead	Selenium
Antimony	Chromium	Magnesium	Silver
Arsenic	Cobalt	Manganese	Sodium
Barium	Copper	Mercury	Thallium
Beryllium	Cyanide	Nickel	Vanadium
Cadmium	Iron	Potassium	Zinc

Volatile Organic Suite

Acetone	Chloroform	1,2-Dichloropropane	1,1,2-Trichloroethane
Benzene	Chloromethane	1,3-Dichloropropane	1,1,1,2-Tetrachloroethane
Bromobenzene	2-Chlorotoluene	2,2-Dichloropropane	1,1,2,2,-Tetrachloroethane
Bromochloromethane	4-Chlorotoluene	1,1-Dichloropropene	Tetrachloroethene
Bromodichloromethane	1,2-Dibromo-3-chloropropane	c-1,3-Dichloropropene	Toluene
Bromoform	1,2-Dibromoethane	t-1,3-Dichloropropene	Trichlorotrifluoroethane
Bromomethane	Dibromomethane	Ethylbenzene	Trichloroethene
2-Butanone	1,2-Dichlorobenzene	2-Hexanone	Trichlorofluoromethane
n-Butylbenzene	1,3-Dichlorobenzene	Iodomethane	1,2,3-Trichloropropane
sec-Butylbenzene	1,4-Dichlorobenzene	Isopropylbenzene	1,2,4-Trimethylbenzene
tert-Butylbenzene	Dichlorodifluoromethane	p-Isopropyltoluene	1,3,5-Trimethylbenzene
Carbon disulfide	1,1-Dichloroethane	4-Methyl-2-pentanone	Vinyl chloride
Carbon tetrachloride	1,2-Dichloroethane	Methylene chloride	o,m,p-Xylene (mixed)
Chlorobenzene	1,1-Dichloroethene	n-Propylbenzene	
Chlorodibromomethane	c-1,2-Dichloroethene	Styrene	
Chloroethane	t-1,2-Dichloroethene	1,1,1-Trichloroethane	

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Semivolatile Organic Suite

Acenaphthene
Acenaphthylene
Aniline
Anthracene
Azobenzene
Benzo(a)anthracene
Benzoic acid
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(g,h,i)perylene
Benzo(a)pyrene
Benzyl alcohol
Bis(2-chloroethoxy)methane
Bis(2-chloroethyl)ether
4-Bromophenylphenyl ether
Butylbenzylphthalate
4-Chloroaniline
4-Chloro-3-methylphenol
2-Chloronaphthalene
2-Chlorophenol
4-Chlorophenylphenyl ether
Chrysene
Dibenzo(a,h)anthracene
Dibenzofuran
1,2-Dichlorobenzene
1,3-Dichlorobenzene
1,4-Dichlorobenzene
3,3'-Dichlorobenzidine
2,4-Dichlorophenol
Diethylphthalate
Dimethyl phthalate
2,4-Dimethylphenol
2,4-Dinitrophenol
Di-n-butylphthalate
4,6-Dinitro-2-methylphenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene
Di-n-octylphthalate
Bis(2-ethylhexyl)phthalate
Fluoranthene
Fluorene
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclopentadiene
Hexachloroethane
Indeno(1,2,3-cd)pyrene
Isophorone
2-Methylnaphthalene
2-Methylphenol
4-Methylphenol
Naphthalene
2-Nitroaniline
3-Nitroaniline
4-Nitroaniline
Nitrobenzene
2-Nitrophenol
4-Nitrophenol
N-Nitrosodimethylamine
N-Nitrosodiphenylamine
N-Nitroso-di-n-propylamine
2,2'-oxybis(1-Chloropropane)
Pentachlorophenol
Phenanthrene
Phenol
Pyrene
1,2,4-Trichlorobenzene
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol

Pesticide and Polychlorinated Biphenyl Suite

Aldrin
alpha-BHC
beta-BHC
delta-BHC
gamma-BHC (Lindane)
alpha-Chlordane
gamma-Chlordane
4,4'-DDD
4,4'-DDE
4,4'-DDT
Dieldrin
Endosulfan I
Endosulfan II
Endosulfan sulfate
Endrin
Endrin aldehyde
Endrin keytone
Heptachlor
Heptachlor epoxide
Methoxychlor
Toxaphene
Aroclor-1016
Aroclor-1221
Aroclor-1232
Aroclor-1242
Aroclor-1248
Aroclor-1254
Aroclor-1260

High Explosive Suite

2-Amino-4,6-dinitrotoluene (2-AM-DNT)
4-Amino-2,6-dinitrotoluene (4-Am-DNT)
1,3-Dinitrobenzene (1,3-DNB)
2,4-Dinitrotoluene (2,4-DNT)
2,6-Dinitrotoluene (2,6-DNT)
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)
Nitrobenzene (NB)
Nitrocelluose
Nitroguanidine
Nitroglycerine (NG)
2-Nitrotoluene (2-NT)
3-Nitrotoluene (3-NT)
4-Nitrotoluene (4-NT)
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)
Pentaerythritol tetranitrate (PETN)
Tetrazene
1,3,5-Trinitrobenzene (1,3,5-TNB)
2,4,6-Trinitrotoluene (2,4,6-TNT)

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Radiochemical Suite

Gross alpha/beta	Cesium-137	Plutonium-238	Sodium-22
Gross gamma	Cobalt-57	Plutonium-239/240	Strontium-85
Actinium-228	Cobalt-60	Potassium-40	Strontium-90
Americium-241	Europium-152	Protactinium-231	Thallium-208
Annihilation radiation	Iodine-129	Protactinium-233	Thorium-227
Barium-140	Lanthanum-140	Protactinium-214m	Thorium-228, 230, & 232
Bismuth-211	Lead-210	Radium-223	Thorium-234
Bismuth-212	Lead-211	Radium-224	Tin-113
Bismuth-214	Lead-212	Radium-226	Tritium
Cadmium-109	Lead-214	Radium-228	Uranium-234, 235, & 238
Cerium-139	Manganese-54	Radon-219	Yttrium-88
Cerium-144	Mercury-203	Ruthenium-106	Zinc-65
Cesium-134	Neptunium-237	Selenium-75	

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APPENDIX B DATA VALIDATION

Appendix B summarizes any potential problems associated with the usability of the data. The qualifiers in Appendix B can be the product of a focused validation and often result in changes to the qualifier appropriate to data use. If a focused validation is not performed, the qualifiers in Appendix B are a product of the validation report. This appendix is reserved for any supporting data validation tables.

If no supporting data validation tables are necessary, provide boilerplate: No data validation tables are necessary for PRS(s) being reported because....

If necessary, provide more than one data validation table, breaking out by suite where applicable.

TABLE B-1
DATA VALIDATION TABLE FOR TA-XX SAMPLES

Request Number	Sample ID	Suite*	Comments
12345	futa-yr** -1000	SVOCs	Phthalate contamination of method blank caused by laboratory contamination. QC results within allowable limits; all data are valid
12346	futa-yr -1001	PCBs	Equipment rinsate missed holding time, but no PCBs were detected in samples. Therefore, this does not affect usability of data; all data are valid
12346	futa-yr -1002	Inorganic chemicals	Cadmium values low by 25% in QC samples. Sample values also low (0.4-0.6 mg/kg). Does not affect usability of data; all data are valid
12345	futa-yr -1003	SVOCs	Phthalate contamination of method blank caused by laboratory contamination. QC results within allowable limits; all data are valid
12347	futa-yr -1009	SVOCs	SVOCs expected, but not detected. % recovery of surrogates less than 10%, indicating strong potential for false negatives. Data were rejected by validator.

* *NOTE: Suites may include VOCs, SVOCs, pesticides, herbicides, HE, inorganic chemicals, and radionuclides.*
** *fu = field unit number; ta = technical area number; yr = last 2 digits of the year in which the sample was taken.*

NOTE: All information included in this table is example data only. Table footnotes designated by asterisks are guidance only.

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APPENDIX C RISK ASSESSMENT CALCULATIONS

This appendix is reserved for any supporting risk assessment calculations.

Include all supporting calculations (sufficient for the regulator to reproduce the risk assessment).

If no supporting calculations are necessary, provide boilerplate: No quantitative risk assessment was performed on PRS(s) being reported.

If more than one risk assessment calculation is necessary, break this appendix into several sections.

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