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Date: September 30, 1997
Refer to: EM/ER:97-395

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Steve/Terri
need to do fatal flaw review on these documents & then remand to LANL/DOE or assign to appropriate staff. Please let me know by mon. your result of fatal flaw review — Benito 10/3/97

Mr. Benito Garcia
NMED-HRMB
P.O. Box 26110
Santa Fe, NM 87502

SUBJECT: SUBMITTAL OF RFI REPORTs FOR PRSs IN TAs 0, 1, 3, 11, 13, 15, 16, 19, 33, 36, AND 73

Dear Mr. Garcia:

Enclosed are two copies of each of the Los Alamos National Laboratory's Resource Conservation and Recovery Act Facility Investigation Reports for Potential Release Sites in Technical Areas 0, 1, 3, 10, 11, 13, 15, 16, 19, 33, 36, and 73. One copy of each report is for your information and the second copy of each should go to your technical branch. The list of reports submitted is itemized on the following page.

If you have any questions, please contact Dave McInroy at (505) 667-0819 or Joe Mose at (505) 667-5808.

Sincerely,

Jorg Jansen, Program Manager
LANL/ER Project

Sincerely,

Theodore J. Taylor, Program Manager
DOE/LAAO

JJ/TT/ss

Enclosures (1) RFI Reports for PRSs in TAs 0, 1, 3, 10, 11, 13, 15, 16, 19, 33, 36, and 73
(2) Certifications

TV

3405

Reports
RFI RPT TA 0: PRS 0-003, 0-012
NFA RPT TAs 0, 73: PRS 0-034(a,b), 73-001(b), 73-004(c,d)
RFI RPT TA 1: PRS 1-001(s,u), 1-007(l)
RFI RPT TA 3: PRS 3-004(c,d),3-007, 3-014(o), 3-049(b), 3-052(b), 3-056(k), C-03-014, 3-014(k,l,m)
RFI RPT TA 3, PRS 3-054(e), C-3-006, CMR
[redacted]08
Addendum RFI RPT TA 15: PRS C-15-001, C-15-007
RFI RPT TA 19: 19-001, 19-003, C-19-001
Addendum RFI RPT TA 36: PRS 36-005
RFI RPT TA 16: 16-024(c,d,f,g,k,m,o,p-s) 16-025(b2,d,g,h,j,k,m,n,o,y), 16-034(c,d,e,f,l,m), C-16-005, C-16-017
RFI RPT TAs 11, 13, 16: PRSs 11-012(a,b), 13-003(a), 16-006(c,d), 16-010(a), 16-021(a), 16-026(c,d,v), 16-028(a), 16-030(g)
RFI RPT TA 33: PRSs 33-002(b,c), 33-003(b), 33-004(k), 33-006(a), 33-008(a,b), 33-011(d), 33-013, 33-017

Cy (w/ encs.):
G. Allen, CST-7, MS E525
M. Gilgosch, LAAO, MS A316
G. Gould, EES-15, MS J495
D. Griswold, AL-ERD, MS A906
J. Harry, EES-5, MS M992
B. Koch, LAAO, MS A316
D. Krier, EES-1, MS D462
R. Michelotti, CST-7, MS E525
J. Mose, LAAO, MS A316
D. Neleigh, EPA, R.6, 6PD-N
C. Rodriguez, CIO/ER, MS M769
T. Taylor, LAAO, MS A316
J. White, ESH-19, MS K490
S. Dinwiddie, NMED-HRMB
M. Leavitt, NMED-GWQB
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D. McInroy, EM/ER, MS M992
J. Plum, LAAO, MS A316
S. Rae, ESH-18, MS K497
G. Rael, AL-ERD, MS A906
J. Vozella, LAAO, MS A316
EM/ER File, MS M992

CERTIFICATION

I certify under penalty of law that these documents and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violation.

Document Title: [redacted]

Name: _____ Date: 9-30-97

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Environmental Restoration Project
Los Alamos National Laboratory

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Joseph Vozella,
Acting Assistant Area Manager of
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Theodore J. Taylor, Program Manager
Environmental Restoration Program
DOE-Los Alamos Area Office

RFI Report for
Potential Release Site

10-008

OCT 1 1997

Field Unit 1

Environmental Restoration Project

September 1997

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-97-3771

LANL
1 / 1079 / 10

EXECUTIVE SUMMARY

This report presents the results of the Phase I Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) conducted at former Technical Area (TA) 10, Potential Release Site (PRS) 10-008 at Los Alamos National Laboratory (LANL). A separate investigation was not conducted at PRS 10-008. Samples collected during the 1994 RFI at PRSs 10-001(a–d) were used to evaluate PRS 10-008. Included in this report are the data assessment and analysis approach used in this investigation, and the site-specific results, conclusions, and recommendations regarding RCRA constituents for the PRSs listed above. Although radionuclides are regulated by the Department of Energy (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.

PRS 10-008 is a former satellite firing site located approximately 1 400 ft northwest of the primary firing sites (PRSs 10-001[a–d]) in Bayo Canyon. This PRS was identified during 1994 interim action activities to address shrapnel in Bayo Canyon. During the interim action, shrapnel was found embedded in the northwestern sides of trees in this area, opposite the known primary firing sites. This suggested the existence of an additional firing site. Archival research indicates that this firing site was used for nonradioactive shots during the 1940s. The primary firing pads were active from the 1943 to 1961. Site-wide decommissioning of the firing sites, the radiochemistry laboratory, and associated structures at TA-10 was completed in 1963. TA-10 was released to Los Alamos County in 1967.

The objectives of the Phase I RFI at PRS 10-001(a–d) were the same as the objectives for PRS 10-008. These objectives were to determine whether residual RCRA chemicals (particularly barium, beryllium, or lead) existed in surficial deposits in the vicinity of the firing sites and to confirm that radiological constituents identified at these sites during previous investigations did not pose an unacceptable risk to human health. Thirteen samples were collected in the vicinity of PRS 10-008. These samples were submitted to a fixed laboratory for analysis of target analyte list (TAL) metals, high explosives, strontium-90, uranium, and gamma spectroscopy.

Background comparison and screening assessment of the fixed laboratory analytical results indicated that no chemicals are present at the site at levels that pose an unacceptable risk to human health. Therefore, PRS 10-008 is proposed for no further action (NFA) based on NFA Criterion 5 (see Table ES-1).

TABLE ES-1

SUMMARY OF PROPOSED ACTIONS

			PROPOSED ACTION				
PRS NUMBER	HSWA[a]	RADIONUCLIDE COMPONENT[b]	NFA CRITERION	FURTHER ACTION[c]	ADD TO HSWA MODULE[d]	RATIONALE	SECTION NUMBER
10-008	X	X	5			RCRA and radionuclide contamination are below SALs.	5.1

[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.

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1.0 INTRODUCTION

This report presents results of the Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) at former Technical Area (TA) 10, Potential Release Site (PRS) 10-008 at Los Alamos National Laboratory (LANL). A separate investigation was not conducted at PRS 10-008. Samples collected during the 1994 RFI at PRSs 10-001(a–d) were used to evaluate PRS 10-008. Included in this report are the data assessment and analysis approach used in this investigation, and the site-specific results, conclusions, and recommendations regarding RCRA constituents for the PRS listed above. Although radionuclides are regulated by the Department of Energy (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.

1.1 General Site History

TA-10, also referred to as Bayo Site, was located in Bayo Canyon between Kwage Mesa to the south and Otowi Mesa to the north (Figs. 1.1-1 and 1.1-2). TA-10 was used from 1943 to 1961 as a firing site to conduct experiments using high explosives (HE) in conjunction with nuclear weapons research. The site consisted of firing pads, control buildings, battery buildings, a radiochemistry laboratory, subsurface disposal systems, and other associated structures.

TA-10 was constructed to test assemblies containing conventional HE and components made from depleted or natural uranium. The assemblies were loaded with a lanthanum-140 source of several hundred to several thousand curies for blast diagnostics. The lanthanum-140 (40.3 hour half-life) was contaminated with a small amount of strontium-90 (28.8 year half-life). The detonations at TA-10 resulted in dispersion of radioactive materials, including uranium, lanthanum-140, and strontium-90, in the forms of aerosols and solid debris.

PRS 10-008 is a former satellite firing site located approximately 1 400 ft northwest of the primary firing sites (PRSs 10-001[a–d]) in Bayo Canyon. This PRS was identified during 1994 interim action activities to address shrapnel in Bayo Canyon. During the interim action, shrapnel was found embedded in the northwestern sides of trees in this area, opposite the known primary firing sites. This suggested the existence of an additional firing site. Archival research indicates that this firing site was used for nonradioactive shots during the 1940s. The primary firing pads were active from the 1943 to 1961.

Decontamination and decommissioning activities at TA-10 started in 1960 with demolition and burning of several buildings. Explosives testing ceased in 1961. Site-wide decommissioning of the firing sites, the radiochemistry laboratory, and associated structures was completed in 1963. TA-10 was released to Los Alamos County in 1967.

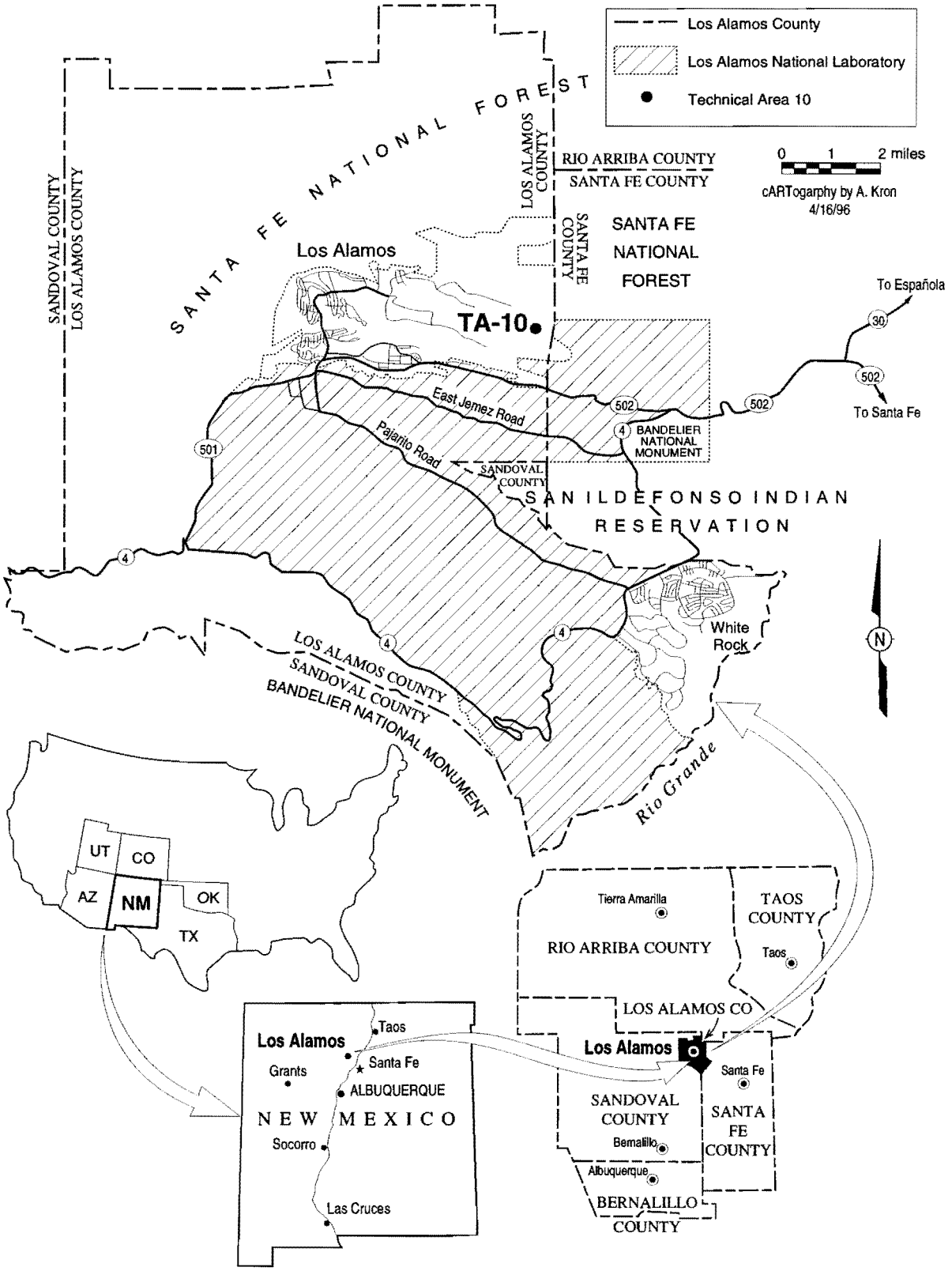

Figure 1.1-1 Location of TA-10 within Los Alamos National Laboratory, Los Alamos County, New Mexico.

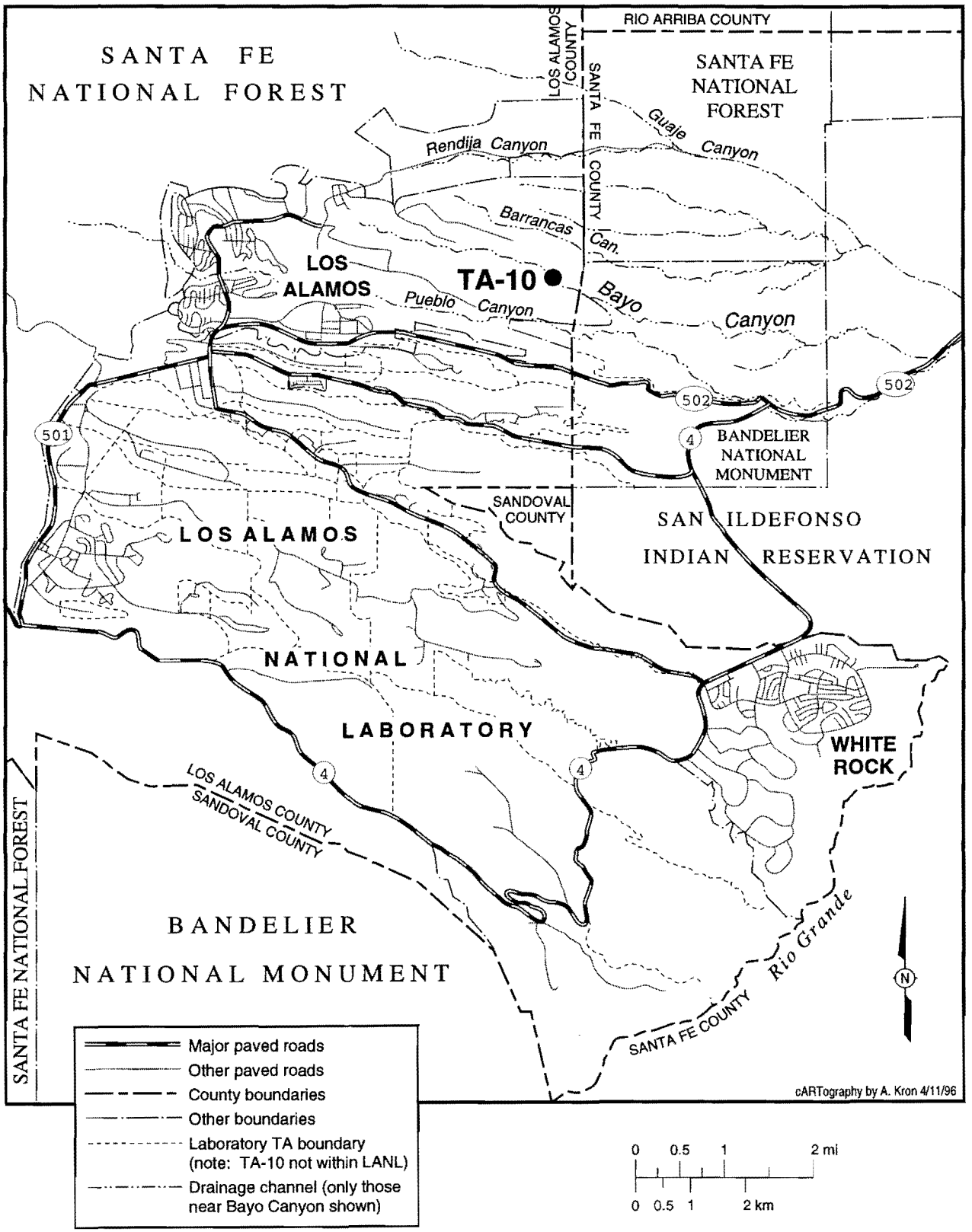

Figure 1.1-2 Location of TA-10 with respect to Laboratory TAs and surrounding holdings.

1.2 RFI Overview

A Phase I RFI was conducted for PRSs 10-001(a–d) in 1994. The sampling grid used in this investigation included the area within an approximate radius of 2 500 ft from the primary firing pads. This area included PRS 10-008. PRS 10-008 was identified during the 1994 interim action in Bayo Canyon, the EPA was informed, and a request was made to add the new PRS to the permit. The objectives of the RFI for PRSs 10-001(a–d) were the same as the objectives for PRS 10-008. Therefore, rather than writing a separate sampling and analysis plan for PRS 10-008, data from the 1994 investigation that applied to the area of PRS 10-008 were used to evaluate this site.

The objectives of the Phase I RFI at PRS 10-008 were to determine whether residual RCRA chemicals (particularly barium, beryllium, or lead) existed in surficial deposits in the vicinity of the firing sites and to confirm that radiological constituents identified at these sites during previous investigations did not pose an unacceptable risk to human health. Surface soil investigations conducted in 1977 for the Atomic Energy Commission (AEC) Formerly Utilized Site Remedial Action Program (FUSRAP) indicated that strontium-90 and uranium were the only residual radiological constituents remaining at the site (Mayfield et al. 1979, 0818). These investigations suggested that there were no unacceptable health risks from this radiological contamination (LANL 1992, 0783).

The conceptual exposure model for PRS 10-008 is also the same as the model used for PRSs 10-001(a–d). This model assumes that the primary receptors are visitors and potential future residents, and the primary exposure pathways are ingestion, inhalation, and dermal contact with soil. This model is described in detail in Section 2.3 of the RFI Work Plan for Operable Unit (OU) 1079 (LANL 1992, 0783).

1.3 Field Activities

Field activities were not specifically conducted for PRS 10-008. During the 1994 RFI for PRSs 10-001(a–d), surface soil samples were collected according to a statistically based grid pattern to address residual contamination dispersed from the firing sites. The samples collected during this investigation were used to evaluate PRS 10-008. Field activities were conducted in accordance with the RFI Work Plan for OU 1079 (LANL 1992, 0783), DOE and LANL directives and policies, and LANL Environmental Restoration (ER) Project Standard Operating Procedures (SOPs) (LANL, 0875).

A detailed discussion of the field activities conducted at PRSs 10-001(a–d) is included in the RFI Report for Solid Waste Management Units (SWMUs)10-001(a–d) (LANL 1995, 06-0130).

The investigation included a geodetic survey, field screening for beta and gamma radiation, and collection of surface samples. The details of these activities as applicable to PRS 10-008 are included in Section 5.1.4 of this report.

2.0 ENVIRONMENTAL SETTING

The environmental setting of the Laboratory is described in Section 2.4 of Revision 5 the Installation Work Plan (IWP) for Environmental Restoration (LANL 1995, 1275). A detailed discussion of the environmental setting for the TA-10 Bayo Canyon area, including climate, geology, hydrology, and a conceptual hydrogeologic model for the area and its surroundings, is presented in the RFI Work Plan for OU 1079 (LANL 1992, 0783). 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 50°F to 90°F in Bayo Canyon. During the winter, temperatures typically range from 15°F to 50°F. The average annual rainfall in the area of TA-10 averages about 18 in. Of this total, approximately 40% occurs as brief intense thunderstorms during July and August. Stream flow in the canyon can occur as a result of these storms. Spring snowmelt runoff may also induce stream flow in the canyon.

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 Revision 5 of the IWP (LANL 1995, 1275). A summary of that material, emphasizing conditions expected near PRS 10-008, is presented below.

PRS 10-008 is located in Bayo Canyon at an elevation of about 6 600 to 6 740 ft and between Kwage Mesa to the south and Otowi Mesa to the north. Adjacent mesa tops range from about 7 000 ft to slightly over 7 100 ft. The upper portions of the canyon walls are vertical or near-vertical cliffs which are cut into the Tshirege Member of the Bandelier Tuff. From the base of the cliffs, steep slopes ranging from 10° to 30° lead downward to wide, gentle slopes, and then to a relatively flat canyon floor.

2.2.2 Soils

The slopes and canyon floor are mainly cut into the (lower) Otowi Member of the Bandelier Tuff. The slopes are overlain by talus and colluvium derived from the cliffs above. The canyon floor consists of broad, low-angle side slopes covered with colluvium that ranges in thickness from less than 1 ft to more than 6 ft. The canyon floor also includes stream terraces and an ephemeral, braided stream channel with banks from 1.5 ft to 6 ft high. Between 20 ft to 26 ft of Quaternary stream alluvium underlie the canyon floor.

2.3 Hydrology

The hydrology of the Pajarito Plateau is summarized in Section 2.5.2 of Revision 5 of the IWP (LANL 1995,1275). Site specific conditions are summarized below.

2.3.1 Surface Water

Surface water flow on the canyon slopes and bottom is mostly sheet flow generated during intense rainfall. Shallow tributary channels leading to the main channel collect water that flows over the cliffs and across the ground surface. The only sediment sampling station in Bayo Canyon is located at the intersection with Los Alamos Canyon, about two miles to the east.

The ephemeral stream in Bayo Canyon carries water only during intense thunderstorm activity. Individual flooding events may cause realignment of the main channel.

2.3.2 Ground Water

The elevation of the main aquifer is about 6 000 ft above sea level, approximately 600 ft below the level of Bayo Canyon at the former site of TA-10. No perched or alluvial aquifers were suspected to be present in Bayo Canyon, and none were encountered during subsurface investigations conducted at the site. Ninety-five holes were drilled in Bayo Canyon to depths of approximately 50 ft as a part of the TA-10 subsurface characterization. The data for these boreholes are presented in the RFI Report for PRSs 10-002(a–b), 10-003(a–o), 10-004(a–b), 10-005, and 10-007 (LANL 1996, 06-0131). The holes encountered only damp alluvium and Bandelier Tuff. Two holes were deepened and cased to the contact between the Bandelier Tuff and the underlying Puyé Formation at a depth of approximately 70 ft below the floor of Bayo Canyon. Because of uncertainty regarding whether a saturated zone might potentially (either permanently or seasonally) overlie the contact, one hole was completed as a groundwater monitoring well and the second was equipped with a suction lysimeter to measure formation pore water in unsaturated rock. To date, no saturated conditions have been observed.

2.4 Biological Surveys

Biological resource field surveys have been conducted in the area of PRS 10-008 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).

2.5 Cultural Surveys

A cultural resource survey has been conducted in the area of PRS 10-008 as required by the National Historic Preservation Act (amended). Twenty-eight archaeological sites are located within the area of OU 1079. All sites located in the survey area were avoided and were not impacted by sampling activities.

3.0 APPROACH TO DATA ASSESSMENT AND ANALYSIS

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 quality assurance (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 sets,
- 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 screening action levels (SALs),

- evaluation of sufficiency of data sets 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.

3.1 Sample Analysis

Samples were collected in accordance with the sampling design specified in the RFI Work Plan for OU 1079 (LANL 1992, 0783). Samples were submitted to the Mobile Radiochemical Analytical Laboratory (MRAL) and to the sample management office (SMO).

3.1.1 Analytical Methods

The following analytical suites were used for the sample analyses in this RFI report: target analyte list (TAL) metals, HE, gamma spectroscopy, total uranium, and strontium-90. A list of the target analytes for which analyses were performed for the purpose of this report can be found in Appendix A.

All samples were analyzed by contract analytical laboratories using methods specified in ER SMO analytical subcontracts (LANL 1995, 1278). The allowed methods are current Environmental Protection Agency (EPA) SW-846 and Contract Laboratory Program (CLP) methods or equivalent for TAL metals, high explosives, gamma spectroscopy, total uranium, and strontium-90. 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 gamma-emitting 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), which is included as Chapter 4 of Revision 6 of the LANL IWP (LANL 1996, 1379). 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 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, 1379).

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.

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

- "A" signifies that the data required for data review and evaluation are not available.
- "U" signifies that the analyte was not positively identified in the sample, and the associated value is the sample-specific EQL/EDL.
- "J" signifies that 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+" signifies that the analyte was positively identified, and the result is likely to be biased high.
- "J-" signifies that the analyte was positively identified, and the result is likely to be biased low.
- "UJ" signifies that the analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific EQL/EDL.

- "RPM" signifies that 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. Any results qualified as RPM must be evaluated for relevance to data use.

- "P" signifies that professional judgment should be applied to using the data in decision-making.

- "PM" signifies that 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.

- "R" signifies that the data are rejected as a result of major problems with quality assurance/quality control (QA/QC) parameters.

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 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 (1) the variability or uncertainty of the reported data, or (2) data quality prior to making a data-use decision because of anomalies detected in a data set.

Details of QA/QC 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.

Laboratory contaminants are sometimes found in method blanks used by the analytical laboratories during organic analyses. When this occurs, there is a potential for samples to also be contaminated. To account for method blank contamination in samples, the "10 times" and

"5 times" rules are applied as described in the EPA document "Contract Laboratory Program National Functional Guidelines for Organic Data Review" (EPA 1994, 1205). The "10 times" rule states that when a common laboratory contaminant is found in the method blank, any values of that analyte detected in the samples at levels less than 10 times the method blank concentration should be considered nondetected and a "U" qualifier should be added to the data. Common laboratory contaminants for volatile organic compound (VOC) analysis include acetone, methylene chloride, and 2-butanone; common laboratory contaminants for semivolatile organic compound (SVOC) analysis include the common phthalates. The "5 times" rule states that when an analyte that is not a common laboratory contaminant is found in the method blank, any values of that analyte detected in the samples at levels less than 5 times the method blank concentration should be considered nondetected and a "U" qualifier should be added to the data. These rules were used in addressing the data for PRS 10-008 as discussed in Section 4.0 of this report.

3.2 Background Comparisons

3.2.1 Inorganic Chemicals

Detected inorganic chemicals are compared with natural background distributions to determine whether they should be retained as chemicals of potential concern (COPCs) or eliminated from further consideration. The inorganic background data used in this RFI report are from the following source:

- soil samples collected throughout Los Alamos County for which chemical analyses were performed for certain inorganic (metal) chemicals (Longmire et al. 1995, 1142; Longmire et al. 1995, 1266).

The RFI data considered in this report were collected from soil. The ER Project procedure is to make comparisons of PRS data to the most geologically relevant subset of the LANL-wide background data. 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), the maximum reported concentration, or, in the case of nondetected chemicals, the detection limit. These background screening values are derived from LANL-wide soil 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, silver is the only chemical that lacks background data.

Further statistical tests are used for background comparisons when sufficient data are available. When site data contain several nondetects and/or do not appear to satisfy normality assumptions, nonparametric tests are used for further background comparisons. The Gehan modification to the Wilcoxon Rank Sum test and the Quantile test, both of which account for nondetects, are used for these evaluations. The Gehan test is best suited for assessing complete shifts in distribution in a statistically robust manner, whereas the Quantile test is better suited for assessing shifts of a subset of the data. Between the two tests, most types of differences between distributions can be captured. 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," EM/ER:96-PCT-010 (Project Consistency Team, 1210; Ryti et al. 1996, 1298). Observed significance levels (p-values) for these tests are presented in Section 5.1.5 of this report. If a p-value is less than a specified probability, typically 0.05 or 5%, then there is some reason to suspect that there is a difference between the background and site distributions; otherwise, no difference is indicated. The results of these statistical tests, when available, are used in addition to the results of the comparison with background screening values to determine whether a chemical is considered greater than background.

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.

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.

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 sources:

- soil samples collected throughout Los Alamos County for which chemical analyses were performed for certain naturally occurring radioactive chemicals (Longmire et al. 1995, 1142; Longmire et al. 1995, 1266).
- 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).

These two sources apply only to surface data where the depth ranges from 0–2 ft. 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.

3.2.3 Organic Chemicals

Background data are not available for organic chemicals. Organic chemicals positively identified in one or more samples are carried forward in the screening assessment process. Chemicals not detected in any sample are removed from further consideration.

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. 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 whether 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 are sufficient to support the decision, a no further action (NFA) recommendation may be proposed based on human health concerns.

If COPCs remain after the screening assessment, several options exist for the PRS. 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.

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

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.

3.3.2 Risk Assessment

No human health risk assessment was performed for PRS 10-008.

3.4 Ecological Assessment

In cooperation with the New Mexico Environment Department and EPA Region 6, the LANL 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.

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}	1×10^{-5}
Barium	130	315	0.03	0.06	NC	NC
Beryllium	0.895	1.95	0.003	0.006	6×10^{-5}	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	9.0×10^{-5}	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.

4.0 RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

4.1 Inorganic Analyses

There was a general problem with the inorganics analysis for PRS 10-008. Samples were not analyzed until four to seven months after collection due to difficulties at the LANL SMO. This caused all of the samples to miss the recommended holding times for mercury (28 days) and cyanide (14 days). Cyanide was only analyzed in request 19518. A number of the sample analyses also exceeded the recommended holding time for TAL metals (six months). However, based on LANL and EPA SW846 guidelines, the following facts should be considered:

(1) These holding times are based on unpreserved water samples, and all of the samples were solid samples collected in the top six inches of soil;

(2) Soil samples are less likely to undergo the biotransformation from elemental mercury to organomercury compounds (the volatile compounds responsible for the 28-day holding time for mercury) than water samples because of the nature of the soil samples;

(3) The site was decommissioned over 30 years ago, so any metals released in the area have been exposed to the environment for over 30 years and would have already undergone any chemical transformations to which they might be susceptible in a sample collection jar.

(4) Additionally, mercury and cyanide are not on the COPC list because they were not associated with Laboratory activities at the firing sites. However, mercury and cyanide were analyzed as part of the TAL metals list. This was because the COPCs lead, beryllium, and barium are included in the TAL metals list, and it is more cost-effective to analyze the entire TAL metals list than to analyze a few specific analytes.

Based on this information and on the LANL data validation guidelines, it is reasonable to conclude that the missed holding times do not have a substantial effect on the data. Because cyanide and mercury holding times were greatly exceeded, all cyanide and mercury data are qualified J or UJ. None of the other metals are qualified for the missed holding times because the holding times were not grossly exceeded.

Four samples were analyzed for TAL metals in requests 19785 (two samples) and 19792 (two samples). All QC parameters were met for these requests except for the missed holding times

described above. All TAL metals data for these requests are valid and usable as qualified for the reasons discussed above.

Five samples were analyzed for TAL metals in request 19518. All QC parameters were met for this request with one exception. There were low recoveries in two blind QC samples for arsenic (70% and 67%) and chromium (66% and 63%). Blind QC samples are used as indicators of the analytical laboratory's ability to produce similar results to the "accepted" concentrations produced by the QC laboratory. A low percent recovery in the blind QC sample may indicate incomplete recovery from the digestion or extraction process or problems with the analysis. There is also the possibility of heterogeneity in the QC sample itself. As required in the LANL data validation guidelines, the data for arsenic and chromium are qualified J or UJ to account for the possible low bias. All TAL metals data for request 19518 are valid and usable as qualified because the possible low bias is considered in the screening process (see Sections 5.1.5 and 5.1.8).

Two samples were analyzed for TAL metals in request 19759. All QC parameters were met for this request with one exception. There was a high recovery of lead (244%) and a low recovery of chromium (69%) in the blind QC sample. As discussed above, a low percent recovery in the blind QC sample may indicate incomplete recovery from the digestion or extraction process, problems with the analysis, or possibly heterogeneity in the QC sample itself. A high percent recovery may result from more efficient extraction and digestion of the sample at the analytical laboratory, or possibly heterogeneity in the QC sample. As required in the LANL data validation guidelines, the data for lead and chromium are qualified J or UJ to account for the possible high and low bias. All TAL metals data for request 19759 are valid and usable as qualified because the possible high and low biases are considered in the screening process (see Sections 5.1.5 and 5.1.8).

4.2 Organic Analyses

Two samples were analyzed for HE in requests 17913 and 17916. All QC parameters were met for these requests with one exception. The recommended holding time of 14 days was exceeded by two days. However, based on LANL and EPA SW846 guidelines, the following facts should be considered:

(1) The holding time is only recommended (not required) because it is based on unpreserved water samples, and all of the samples were solid samples collected in the top six inches of soil;

(2) The site was decommissioned over 30 years ago, so any HE released in the area have been exposed to the environment for over 30 years and would have already undergone any chemical transformations to which they might be susceptible in a sample collection jar preserved in a freezer.

Based on this information and the LANL data validation guidelines, it is reasonable to conclude that the missed holding times do not have a substantial effect on the data. Therefore, all data are considered valid and usable and no qualifiers were added.

4.3 Radiochemistry Analyses

One sample was analyzed for gamma activity using gamma spectroscopy in request 19706. All QC parameters were within allowed limits for this analysis. All data are valid and usable without added qualifiers.

Eleven samples were analyzed for total uranium and strontium-90 in requests 19705, 19762, 19765, and 19768. In request 19765, all QC parameters were within allowed limits for these analyses and all data are valid and usable without added qualifiers.

In requests 19705, 19762, and 19768, all QC parameters were met with the following exception. There were high and low recoveries in the blind QC samples. In request 19705, there were high recoveries for strontium-90 (121%) and uranium (122% and 123%). In request 19762, there was a low recovery for uranium (78%). In request 19768, there was high recovery for uranium (130%). As discussed above, a low percent recovery in the blind QC sample may indicate incomplete recovery from the digestion or extraction process, problems with the analysis, or possibly heterogeneity in the QC sample itself. A high percent recovery may result from more efficient extraction and digestion of the sample at the analytical laboratory, or possibly heterogeneity in the QC sample. As required in the LANL data validation guidelines, the data for these analytes in these requests are qualified J to address the possible high or low bias. All radiochemistry data for these requests are valid and usable as qualified because the possible high and low biases are considered in the screening process (see Sections 5.1.7 and 5.1.8).

5.0 RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 PRS 10-008

PRS 10-008 is a former satellite firing site located approximately 1 400 ft northwest of the primary firing sites (PRSs 10-001[a–d]) in Bayo Canyon. Samples collected during the 1994 RFI of PRSs 10-001(a–d) were used to evaluate this site because PRS 10-008 is located within the area characterized during the 1994 investigation. Based on the results of these samples, no chemicals are retained as COPCs for PRS 10-008. Therefore, this site is recommended for NFA.

5.1.1 History

PRS 10-008 is a former satellite firing site located approximately 1 400 ft northwest of the primary firing sites (PRSs 10-001[a–d]) in Bayo Canyon. This PRS was identified during 1994 interim action activities to address shrapnel in Bayo Canyon. During the interim action, shrapnel was found embedded in the northwestern sides of trees in this area, opposite the known primary firing sites. This suggested the existence of an additional firing site. Archival research indicates that this firing site was used for nonradioactive shots during the 1940s. These shots used the same assemblies as the primary firing pads without the radioactive component. The primary firing pads were active from the 1943 to 1961.

Decontamination and decommissioning activities at TA-10 started in 1960 with demolition and burning of several buildings. Explosives testing ceased in 1961. Site-wide decommissioning of the firing sites, the radiochemistry laboratory, and associated structures was completed in 1963. TA-10 was released to Los Alamos County in 1967. Portions of Bayo Canyon are currently open to the public for recreational use. The area including PRS 10-008 is currently fenced and is not open to the public.

5.1.2 Description

PRS 10-008 is located on the floor of Bayo Canyon. As discussed in the RFI Work Plan for OU 1079, the canyon floor area was heavily disturbed during the 1963 remediation of the Bayo Canyon firing pads and surrounding area (LANL 1992, 0783). For further descriptive information about this site, refer to Section 2.0 of this report.

5.1.3 Previous Investigations

Several investigations and studies have been conducted over the years at TA-10 and the surrounding area. The results of these investigations are summarized in the RFI Work Plan for

OU 1079. (LANL 1992, 0783). These investigations included test hole drilling, soil sampling, and a radiological survey conducted under the DOE FUSRAP.

The 1977 FUSRAP resurvey program was designed to provide a basis for estimating potential exposure scenarios under conditions of continued recreational use, light construction, and as an occupied residential area. The FUSRAP exposure estimates included data from soil and sediment sampling, air sampling, and dosimetry measurements.

In addition, an extensive interim action was conducted in 1994 and 1995 to remove shrapnel from Bayo Canyon (LANL 1995, 06-0134; LANL 1995, 06-0133). This interim action included complete enumeration of metallic anomalies in 3-in. depth intervals within selected 100-ft^2 subunits, as well as removal of visible surface shrapnel or shrapnel present in the 0- to 2-in. depth interval from adjacent 10 000 ft^2 areas. The interim action focused on the area surrounding the primary firing pads, including the location of PRS 10-008. The spatial distribution of shrapnel provided an excellent indicator of the location and magnitude of possible chemical releases associated with test detonations.

5.1.4 Field Investigation

The 1994 RFI for PRSs 10-001(a–d) began with a geodetic survey to establish the locations of former structures associated with former TA-10 operations and the surface sample grid. Surface soil sample locations were established in a 17 000 000 ft^2 grid with a 500-ft grid interval. Sample locations corresponded to grid nodes. If a grid node fell on bedrock, it was relocated to the nearest soil outcrop and surveyed. The grid consisted of 68 surface sample locations plus ten random samples.

Thirteen of these 68 samples were collected in the vicinity of PRS 10-008 (Fig 5.1.4-1). Location 10-1014 was located near the center of PRS 10-008, and locations 10-1006, 10-1007, 10-1008, 10-1013, 10-1015, 10-1022, 10-1023, 10-1623, and 10-1024 were located adjacent to location 10-1014. Two samples were collected at locations 10-1022, 10-1023, and 10-1623, and one sample was collected at the remaining seven locations. A summary of the samples collected and analyses performed is included in Table 5.1.4-1.

Samples were collected on grid nodes from the surface soil on the canyon bottom, talus on the mesa slope, and soil/crushed tuff on the mesa tops to a depth of 6 in. Samples were screened in the field for beta and gamma radiation using a Ludlum™ Model 2221 with a shielded Geiger-Mueller™ (GM) probe. Samples were collected, analyzed for gross alpha, beta, and gamma radiation by the MRAL, and shipped to fixed laboratories for analysis of TAL metals, HE, gamma spectroscopy, total uranium, and strontium-90.

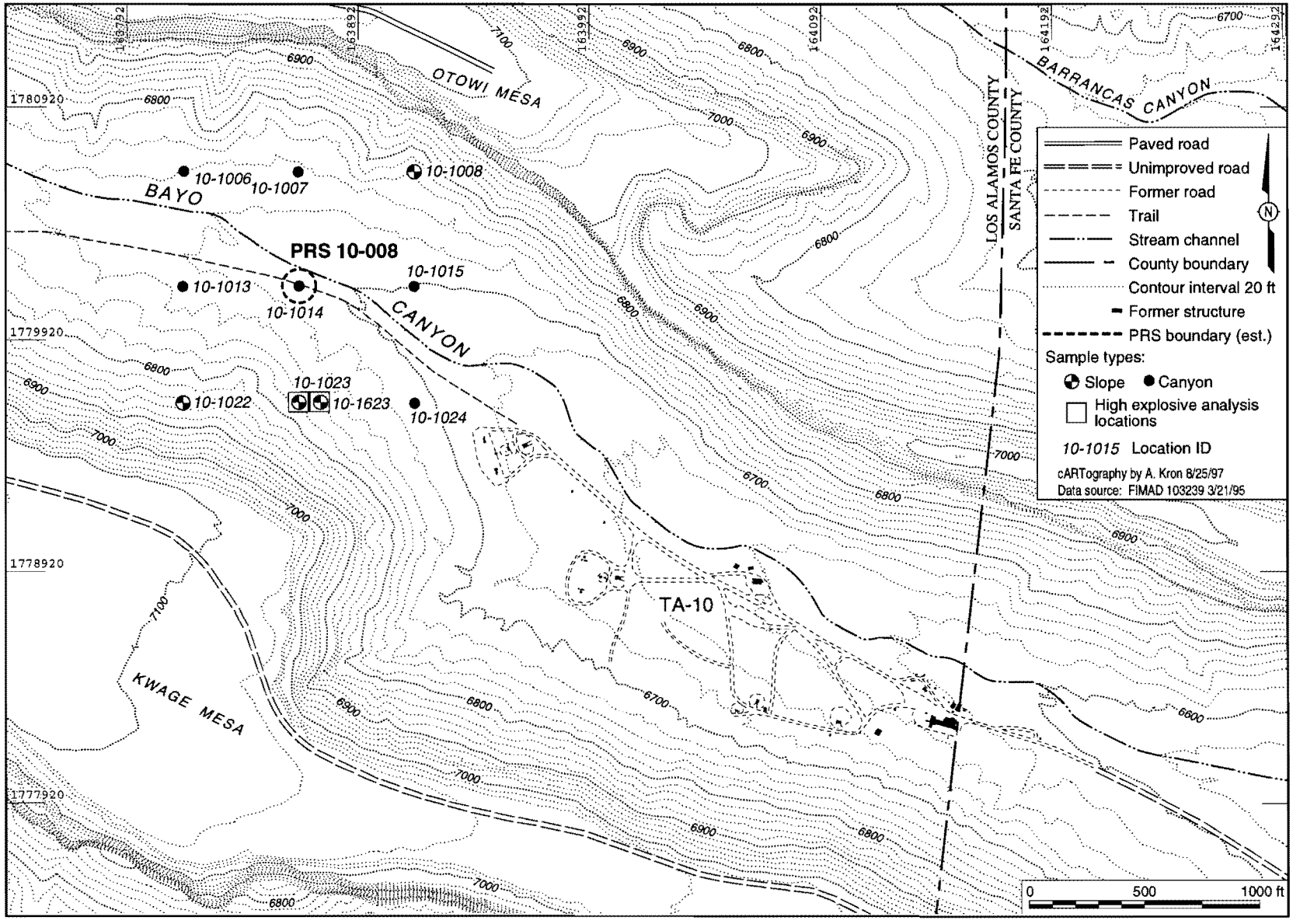

Fig. 5.1.4-1 Locations of samples collected during the 1994 RFI at PRSs 10-001(a–d) that apply to PRS 10-008.

TABLE 5.1.4-1

SUMMARY OF SAMPLES COLLECTED AT PRS 10-008

LOCATION ID	SAMPLE ID	DEPTH (in.)	MEDIA	TAL METALS[a]	HIGH EXPLOSIVES	STRONTIUM-90 & URANIUM	GAMMA SPEC[b]
10-1006	AAB5513	0–4	Soil	19785	—	19705	—
10-1007	AAB5515	0–4	Soil	19785	—	19705	—
10-1008	AAB5460	0–4	Soil	19518	—	19768	—
10-1013	AAB5469	0–4	Soil	19518	—	19768	—
10-1014	AAB5467	0–4	Soil	19518	—	19768	—
10-1015	AAB5451	0–5	Soil	19792	—	19765	—
10-1022	AAB5461	0–4	Soil	19759	—	19762	—
10-1022	AAB5485	0–4	Soil	19759	—	19762	—
10-1023	AAB5462	2–4	Soil	19518	—	19768	—
10-1023	AAB5608	0–4	Soil		17916	—	19706
10-1024	AAB5456	0–4	Soil	19792	—	19765	—
10-1623	AAB5527	0–2	Soil		17913	—	—
10-1623	AAB5465	0–4	Soil	19518	—	19768	—

[a] TAL metals = Target analyte list metals.
[a] Gamma spec = Gamma spectroscopy.

5.1.5 Evaluation of Inorganic Chemicals

Eleven samples collected from the area of PRS 10-008 were analyzed for TAL metals and uranium. Three inorganics (lead, mercury, and uranium) were detected at concentrations exceeding their background screening values. The concentrations of these analytes for each sample that has at least one value above the background screening values are presented in Table 5.1.5-1. The locations where these analytes were detected at levels exceeding background screening values are shown in Fig. 5.1.5-1.

The qualifiers shown in the table were assigned during baseline validation as discussed in Section 4.0 of this report. The mercury data are qualified J because the sample holding time was exceeded, indicating a possible low bias. The uranium and lead data were qualified J because of high recoveries in the blind QC sample, indicating a possible high bias.

Lead, mercury, and uranium will be carried forward to the screening assessment.

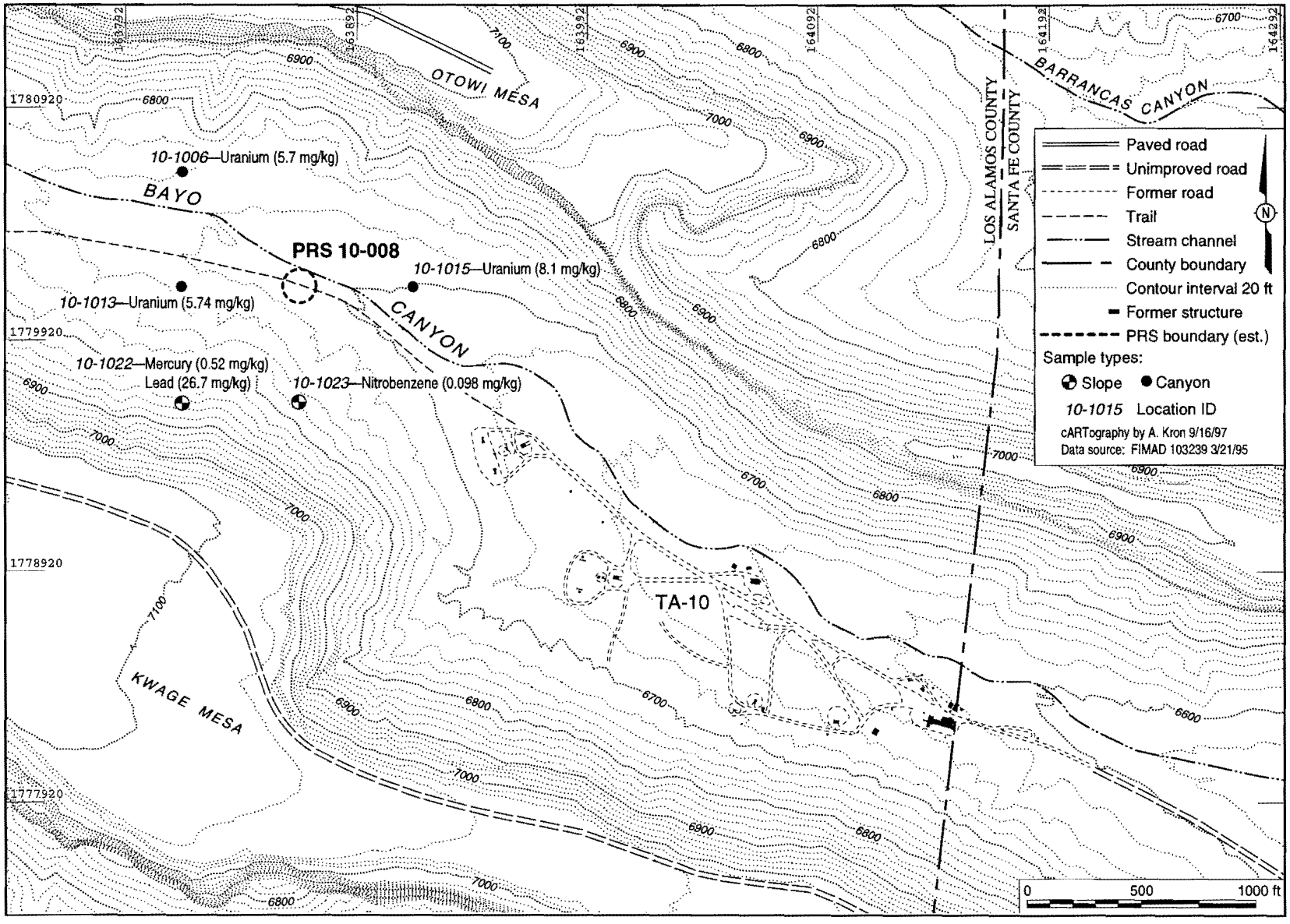

Fig. 5.1.5-1 **Locations of detected organic analytes and inorganic analytes and radionuclides detected at levels exceeding background screening values at PRS 10-008.**

TABLE 5.1.5-1

INORGANICS WITH CONCENTRATIONS EXCEEDING BACKGROUND SCREENING VALUES AT PRS 10-008[a]

CHEMICAL	LOCATION ID	SAMPLE ID	SAMPLE VALUE (mg/kg)	UTL (mg/kg)	SAL (mg/kg)	DEPTH (in.)
Uranium	10-1006	AAB5513	5.7 J	5.45	29	0–4
	10-1013	AAB5469	5.74 J	5.45	29	0–4
	10-1015	AAB5451	8.1	5.45	29	0–5
Lead	10-1022	AAB5485	26.7 J	23.3	400	0–4
Mercury	10-1022	AAB5485	0.52 J	0.1[b]	23	0–4

[a] Data collected during the Phase I RFI for PRS 10-001(a–d) were used to evaluate PRS 10-008.
[b] There were insufficient samples to calculate the UTL for mercury. Therefore, the maximum value in the background range was used as a background screening value (Longmire et al. 1995, 1142).

5.1.6 Evaluation of Radionuclides

Eleven samples collected from the area of PRS 10-008 were analyzed for strontium-90 and uranium, and one sample was analyzed for gamma emitting radionuclides by gamma spectroscopy. Uranium was the only radionuclide detected at levels exceeding the background screening value. As discussed in Section 5.1.5, uranium is carried forward to the screening assessment.

5.1.7 Evaluation of Organic Chemicals

Two samples collected from the area of PRS 10-008 were analyzed for HE. One organic chemical, nitrobenzene, was detected. The concentrations of nitrobenzene detected at PRS 10-008 are presented in Table 5.1.7-1. The location where this analyte was detected is shown on Fig. 5.1.5-1.

There were no data validation qualifiers associated with nitrobenzene. Nitrobenzene will be carried forward to the screening assessment.

TABLE 5.1.7-1

ORGANICS WITH CONCENTRATIONS EXCEEDING BACKGROUND SCREENING VALUES AT PRS 10-008[a]

CHEMICAL	LOCATION ID	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL (mg/kg)	DEPTH (in.)
Nitrobenzene	10-1023	AAB5608	0.098	18	0–4

[a] Data collected during the Phase I RFI for PRS 10-001(a–d) were used to evaluate PRS 10-008.

5.1.8 Human Health Screening Assessment

This subsection discusses the comparison with SALs for COPCs carried forward from the background comparison. Four COPCs were carried forward from the background screening: lead, mercury, nitrobenzene, and uranium.

Greater than SAL. No COPCs were detected at concentrations greater than their SALs.

No SAL. All of the COPCs had SALs.

Below SAL. Lead, mercury, nitrobenzene, and uranium were detected at concentrations below their SALs. These COPCs are addressed in a multiple chemical evaluation.

To evaluate multiple chemical effects for this data set, COPCs detected at levels below their SALs were divided into three classes: noncarcinogens, carcinogens, and radionuclides. SALs for all chemicals were normalized and summed as described in "Risk-Based Corrective Action Process" (Dorries 1996, 1297).

Lead, mercury, nitrobenzene, and uranium are all noncarcinogens. Uranium, a radionuclide, is evaluated for its radiocarcinogenicity as well as its noncarcinogenic toxicity. The result of the multiple chemical evaluation is 0.1, as shown in Table 5.1.8-1. This result is considerably less than one, indicating that adverse health effects are not associated with these COPC concentrations.

As discussed in Section 4.0 of this report, the mercury data included in the multiple constituent evaluation may be biased low. However, the mercury value is nearly two orders of magnitude below the SAL, and the data for uranium and lead included in the evaluation may be biased high. Therefore, a low bias in the mercury data would not affect the conclusion of the multiple chemical evaluation.

Only one radionuclide, uranium, was detected at a level below the SAL for radiological risk (29 mg/kg assuming it is natural uranium). Because uranium is the only radionuclide present above the background screening value and it is present at a concentration 0.3 times its radiological SAL, it is not associated with an unacceptable risk level.

TABLE 5.1.8-1

MULTIPLE CHEMICAL EVALUATION FOR NONCARCINOGENIC EFFECTS AT PRS 10-008

CHEMICAL	LOCATION ID	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL (mg/kg)	RATIO OF CONCENTRATION TO SAL
Uranium	10-1015	AAB5451	8.1	230	0.04
Lead	10-1022	AAB5485	26.7	400	0.07
Mercury	10-1022	AAB5485	0.52	23	0.02
Nitrobenzene	10-1023	AAB5608	0.098	18	0.005
RATIO SUM					0.1

5.1.9 Human Health Risk Assessment

No human health risk assessment was performed for PRS 10-008 because no chemicals were retained as COPCs in the screening assessment for this site.

5.1.10 Preliminary Ecological Assessment

In consultation 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 PRS 10-008 will be deferred until the site can be assessed as part of the ecological exposure unit methodology currently being developed.

5.1.11 Conclusions and Recommendations

Based on the results of the evaluations of inorganic chemicals, radionuclides, and organic chemicals and the risk-based screening assessment, no analytes are retained as COPCs at PRS 10-008. PRS 10-008 is proposed for NFA based on NFA Criterion 5. This criterion states that the PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants of concern are either not present or are present in concentrations that would pose an acceptable level of risk under the projected future land use.

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APPENDIX A APPENDIX A ANALYTICAL RESULTS

Analytical results for Potential Release Site 10-008 can be found in the Facility for Information Management, Analysis, and Display (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 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 collected.

The complete data used for the evaluations in this report are included in Tables A-1 through A-3.

Inorganic Suite (Metals)

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

High Explosives

2-Amino-4,6-dinitrotoluene (2-AM-DNT)

4-Amino2,6-dinitrotoluene 4-Am-DNT)

2,3-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-ttrinitrophenylnitramine (Tetryl)

Nitrobenzene (NB)

Nitrocelluose

Nitroguanidine

Nitroglycerine (NG)

2-Nitrotoluene (2-NT)

3-Nitrotoluene (3-NT)

4-Nitrotoluene (4-NT)

Octahydro-2,3,5,7-tetranitro-2,3,5,7-tetrazocine (HMX)

Pentaerythritol tetranitrate (PETN)

Tetrazene

1,3,5-Trinitrobenzene (1,3,5-TNB)

2,4,6-Trinitrotoluene (2,4,6-TNT)

Radiochemical Suite

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

TABLE A-1

ANALYTICAL RESULTS FOR INORGANIC ANALYTES DETECTED AT PRS 10-008

LOCATION ID	SAMPLE ID	DEPTH (in.)	ALUMINIUM	ARSENIC	BARIUM	BERYLLIUM	CADMIUM	CALCIUM	CHROMIUM	COBALT	COPPER	IRON	LEAD
		UTL											
		SAL											
10-1014	AAB5467		5 310	<1.4	62.1	<0.7	<0.42	1 800	4	<2.4	8	5 790	17
10-1006	AAB5513		3 510	<0.58	55.4	<0.6	<0.4	<933	<1.6	<0.83	<3	4 090	7.8
10-1007	AAB5515		1 950	<0.55	<21.9	<0.53	<0.42	<887	<1.1	<0.7	<2.2	4 770	6.6
10-1008	AAB5460		1 420	<0.54	<12.7	<0.33	<0.34	<632	<1.1	<0.7	<1.1	3 340	6.8
10-1013	AAB5469		5 600	<1.3	61.2	<0.69	<0.36	2 290	3.2	<2.5	<4.4	5 980	20
10-1015	AAB5451		2 420	<0.38	<21.2	<0.53	<0.04	<861	<0.93	<0.78	<0.96	2 720	5.7
10-1022	AAB5461		4 580	<1.8	53.7	<0.64	<0.64	2 110	3.7	<2.3	5.2	6 640	4.5
10-1022	AAB5485		5 220	<1.8	54.8	<0.72	1.1	2 060	4.6	<2.7	5.7	7 080	27
10-1023	AAB5462		6 890	<1	62.4	<0.88	<0.37	2 380	4.2	<2.2	<4	5 850	14
10-1023	AAB5462R		—	—	—	—	—	—	—	—	—	—	—
10-1023	AAB5608		—	—	—	—	—	—	—	—	—	—	—
10-1024	AAB5456		8 040	2.6	107	<0.98	<0.49	2 410	6.9	<5.1	6.4	11 600	13
10-1623	AAB5465		5 330	2.6	49.3	<0.69	<0.35	1 470	3.4	<2	<4.2	4 720	11

TABLE A-2

ANALYTICAL RESULTS FOR RADIONUCLIDES DETECTED AT PRS 10-008

LOCATION ID	SAMPLE ID	DEPTH (in.)	AMERICIUM-241	CESIUM-137	STRONTIUM-90
		UTL			
		SAL			
10-1014	AAB5467		—	—	-0.13
10-1006	AAB5513		—	—	0.62
10-1007	AAB5515		—	—	-0.01
10-1008	AAB5460		—	—	-0.16
10-1013	AAB5469		—	—	0.61
10-1015	AAB5451		—	—	0.28
10-1022	AAB5461		—	—	0.43
10-1022	AAB5485		—	—	0.47
10-1023	AAB5462		—	—	-0.03
10-1023	AAB5462R		—	—	-0.2
10-1023	AAB5608		0.025	0.619	—
10-1024	AAB5456		—	—	0.35
10-1623	AAB5465		—	—	-0.36

TABLE A-3

ANALYTICAL RESULTS FOR HIGH EXPLOSIVE ANALYTES DETECTED AT PRS 10-008

LOCATION ID	SAMPLE ID	DEPTH (in.)	AMINO-2,6-DINITROTOLUENE [4-]	DINITROTOLUENE [2,6-]	HMX	NITROBENZENE	NITROTOLUENE [M-]	NITROTOLUENE [O-]	NITROTOLUENE [P-]
		UTL							
10-1014	AAB5467		—	—	—	—	—	—	—
10-1006	AAB5513		—	—	—	—	—	—	—
10-1007	AAB5515		—	—	—	—	—	—	—
10-1008	AAB5460		—	—	—	—	—	—	—
10-1013	AAB5469		—	—	—	—	—	—	—
10-1015	AAB5451		—	—	—	—	—	—	—
10-1022	AAB5461		—	—	—	—	—	—	—
10-1022	AAB5485		—	—	—	—	—	—	—
10-1023	AAB5462		—	—	—	—	—	—	—
10-1023	AAB5462R		—	—	—	—	—	—	—
10-1023	AAB5608		<0.092	<0.094	<0.168	0.098	<0.163	<0.141	<0.189
10-1024	AAB5456		—	—	—	—	—	—	—
10-1623	AAB5465		<0.09	<0.092	<0.164	<0.075	<0.16	<0.138	<0.185

APPENDIX B DATA VALIDATION

TABLE B-1

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR TA-10 SURFACE SAMPLES

LOCATION ID	SAMPLE ID	MATRIX	ANALYTE SUITE	REQUEST NUMBER	QUALITY CONTROL (QC) COMMENTS
10-1023	AAB5608	Soil	Gamma spectroscopy	19706	All data are valid and usable. No qualifiers were added.
10-1623	AAB5527	Soil	High explosives	17913	Samples missed holding times, but no qualifiers needed to be added to the data. All data are valid and usable.
10-1023	AAB5608	Soil	High explosives	17916	Samples missed holding times, but no qualifiers needed to be added to the data. All data are valid and usable.
10-1008	AAB5460	Soil	TAL metals	19518	Mercury and cyanide data are qualified J or UJ for missed holding times. Arsenic and chromium data are qualified J or UJ because there were low recoveries for these analytes in two blind QC samples. All data are valid and usable as qualified.
10-1023	AAB5462	Soil	TAL metals	19518	Mercury and cyanide data are qualified J or UJ for missed holding times. Arsenic and chromium data are qualified J or UJ because there were low recoveries for these analytes in two blind QC samples. All data are valid and usable as qualified.
10-1623	AAB5465	Soil	TAL metals	19518	Mercury and cyanide data are qualified J or UJ for missed holding times. Arsenic and chromium data are qualified J or UJ because there were low recoveries for these analytes in two blind QC samples. All data are valid and usable as qualified.
10-1014	AAB5467	Soil	TAL metals	19518	Mercury and cyanide data are qualified J or UJ for missed holding times. Arsenic and chromium data are qualified J or UJ because there were low recoveries for these analytes in two blind QC samples. All data are valid and usable as qualified.
10-1013	AAB5469	Soil	TAL metals	19518	Mercury and cyanide data are qualified J or UJ for missed holding times. Arsenic and chromium data are qualified J or UJ because there were low recoveries for these analytes in two blind QC samples. All data are valid and usable as qualified.
10-1022	AAB5461	Soil	TAL metals	19759	Mercury data are qualified J or UJ because the holding time was grossly exceeded. Lead and chromium data are qualified J or UJ because there were recoveries for these analytes in the blind QC sample that were outside acceptable limits. All data are valid and usable as qualified.
10-1022	AAB5485	Soil	TAL metals	19759	Mercury data are qualified J or UJ because the holding time was grossly exceeded. Lead and chromium data are qualified J or UJ because there were recoveries for these analytes in the blind QC sample that were outside acceptable limits. All data are valid and usable as qualified.
10-1006	AAB5513	Soil	TAL metals	19785	Mercury data are qualified J or UJ because the holding time was grossly exceeded. All data are valid and usable as qualified.
10-1007	AAB5515	Soil	TAL metals	19785	Mercury data are qualified J or UJ because the holding time was grossly exceeded. All data are valid and usable as qualified.
10-1015	AAB5451	Soil	TAL metals	19792	Mercury data are qualified J or UJ because the holding time was grossly exceeded. Aluminum and chromium were outside the allowed limits in one of two blind QC sample. There is up to 20% uncertainty in QC value, so qualifiers did not need to be added for these analytes. All data are valid and usable as qualified.

TABLE B-1 (continued)

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR TA-10 SURFACE SAMPLES

LOCATION ID	SAMPLE ID	MATRIX	ANALYTE SUITE	REQUEST NUMBER	QUALITY CONTROL (QC) COMMENTS
10-1024	AAB5456	Soil	TAL metals	19792	Mercury data are qualified J or UJ because the holding time was grossly exceeded. Aluminum and chromium were outside the allowed limits in one of two blind QC sample. There is up to 20% uncertainty in QC value, so qualifiers did not need to be added for these analytes. All data are valid and usable as qualified.
10-1006	AAB5513	Soil	Total uranium, strontium-90	19705	Strontium-90 and uranium data were qualified J for high recoveries in the blind QC samples. All data are valid and usable as qualified.
10-1007	AAB5515	Soil	Total uranium, strontium-90	19705	Strontium-90 and uranium data were qualified J for high recoveries in the blind QC samples. All data are valid and usable as qualified.
10-1022	AAB5461	Soil	Total uranium, strontium-90	19762	Uranium data were qualified J because of a low recovery in the blind QC sample . All data are valid and usable as qualified.
10-1022	AAB5485	Soil	Total uranium, strontium-90	19762	Uranium data were qualified J because of a low recovery in the blind QC sample . All data are valid and usable as qualified.
10-1015	AAB5451	Soil	Total uranium, strontium-90	19765	All data are valid and usable. No qualifiers were added.
10-1024	AAB5456	Soil	Total uranium, strontium-90	19765	All data are valid and usable. No qualifiers were added.
10-1008	AAB5460	Soil	Total uranium, strontium-90	19768	Uranium data were qualified J because of a high recovery in the blind QC sample. All data are valid and usable as qualified.
10-1023	AAB5462	Soil	Total uranium, strontium-90	19768	Uranium data were qualified J because of a high recovery in the blind QC sample. All data are valid and usable as qualified.
10-1623	AAB5465	Soil	Total uranium, strontium-90	19768	Uranium data were qualified J because of a high recovery in the blind QC sample. All data are valid and usable as qualified.
10-1014	AAB5467	Soil	Total uranium, strontium-90	19768	Uranium data were qualified J because of a high recovery in the blind QC sample. All data are valid and usable as qualified.
10-1013	AAB5469	Soil	Total uranium, strontium-90	19768	Uranium data were qualified J because of a high recovery in the blind QC sample. All data are valid and usable as qualified.

APPENDIX C RISK ASSESSMENT CALCULATIONS

No risk assessment was conducted for PRS 10-008.

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BONNIE KOCH,9/18/97 9:37 PM,Comments on RFI Report for 10-008

Date: Thu, 18 Sep 1997 14:37:13 -0700
From: BONNIE KOCH <BKOCH@doe.lanl.gov>
To: ccrosby@lanl.gov
Cc: dbradbury@lanl.gov
Subject: Comments on RFI Report for 10-008

Christina,

Here are comments:

1. The table format is very user friendly. Would like to see it more often. Tables 5.1.5-1, etc. (No change to document required).

2. Section 1.0: Should the permit status be mentioned? This is an optional comment that the regulatory experts may want to consider. The unit was a new SWMU which the AA said to add to the permit. It was not added. It could be that it is better to leave this undiscussed. (Optional).

3. Section 1.2 or Section 5.1.3: Defense of the grid spacing is likely to be an issue for this report since it is an unresolved issue for 10-001(a-d). Would it not be advisable to also put the defense that has been prepared for 10-001(a-d) into this report? The reg experts should perhaps be consulted on this question. (optional).