Los Alamos National Laboratory

ENVIRONMENTAL RESTORATION

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

U. S. Department of Energy
Los Alamos Area Office, MS A316
Los Alamos, New Mexico 87544
505-665-7203
FAX 505-665-4504

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Date: May 20, 1996
Refer to: EM/ER:96-278

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

SUBJECT: SUBMITTAL OF THE RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION (RFI) REPORT FOR POTENTIAL RELEASE SITES (PRSs) IN TECHNICAL AREA (TA) 15

Dear Mr. Garcia:

Enclosed is a copy of the Los Alamos National Laboratory's RFI Report concerning several PRSs in TA-15. The report documents the field work performed as detailed in the approved RFI Work Plan for Operable Unit 1086 and the results of the sampling. This RFI Report is due to your office on May 22, 1996.

Please ask your office to contact Gene Gould at (505) 667-0402 or Everett Trollinger at (505) 667-5801, if you have any questions.

Sincerely,

Jorg Jansen, Program Manager
Environmental Restoration

Sincerely,

Theodore J. Taylor, Program Manager
Los Alamos Area Office

JJ/TT/el

Enclosures: RFI Report for PRSs at TA-15
Certification

3924

Cy: (w/encs.)
S. Anderson, NMED-AIP, MS J993
G. Gould, ESA-4, MS G787
D. Griswold, ERD, AL, MS A906
J. Harry, EM/ER, MS M992
B. Hoditschek, NMED-HRMB
R. Kern, NMED-HRMB
N. Naraine, EM-453, DOE-HQ
D. Neleigh, EPA, R.6, 6PD-N (2 copies)
M. Shaner, CIO, MS A117 (5 copies)
T. Taylor, LAAO, MS A316
Everett Trollinger, LAAO, MS A316
N. Weber, NMED-AIP, MS J993
J. White, ESH-19, MS K498
S. Yanicak, NMED-AIP, MS J993
RPF, MS M707

Cy: (w/o encs.)
T. Baca, EM, MS J591
D. Bradbury, EM/ER, MS M992
T. Glatzmaier, DDEES/ER, MS M992
D. McInroy, EM/ER, MS M992
G. Rael, ERD, AL, MS A906
W. Spurgeon, EM-453, DOE-HQ
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: Submittal of the Resource Conservation and Recovery Act Facility Investigation Report for Potential Release Sites in Technical Area 15

Name: _____ Date: 5-21-96

Jorg Jansen, Program Manager
Environmental Restoration Project
Los Alamos National Laboratory

or

Tom Baca, Program Director
Environmental Management
Los Alamos National Laboratory

Name: _____ Date: 5/21/96

Joseph Vozella,
Acting Assistant Area Manager of
Environment Projects
Environment, Safety, and Health Branch
DOE-Los Alamos Area Office

or

Theodore J. Taylor
Program Manager
Environment Restoration Program
DOE-Los Alamos Area Office

RFI Report for Potential Release Sites at TA-15

15-001, 15-002, 15-004(g,h), 15-005(b,c)
15-006(c,d), 15-007(a), 15-008(c,g),
15-009(a,f,i,k), 15-010(a-c), 15-011(a-c)
15-012(a), 15-014(a,b,d,e,g-l), C-15-001,
C-15-005, C-15-006, C-15-007,
C-15-010, and C-15-011

(located in former
Operable Unit 1086)

Field Unit 2

Environmental Restoration Project

May 1996

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-95-1685

RFI Report for Potential Release Sites in TA-15

(located in former Operable Unit 1086)

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MAY 23 1996

Field Unit 2

Environmental Restoration Project

May 22, 1996

A Department of Energy
Environmental Cleanup Program

EXECUTIVE SUMMARY

The former Operable Unit (OU) 1086, located in the northwestern quadrant of the Los Alamos National Laboratory in Los Alamos New Mexico, consists of one active technical area, TA-15.

TA-15, also known as R-Site, occupies a roughly rectangular area about 1.3 mi wide by 1.5 mi long. Established in 1944, the site has been used for explosives development and testing, including tests involving radioactive materials. Currently, TA-15 is used for on-going explosion research.

Chemicals of potential concern (COPC) at TA-15 include spent high explosives (HE) and their known residual products, as well as other chemicals associated with firing site activities. Radionuclide COPCs include uranium and its daughter products.

The overall objectives of this Phase I investigation were:

- if any releases occurred at the PRSs, and, if so, the nature and extent of any contamination;
- the risks posed by any contamination to workers and the public; and
- the need for corrective action.

Field activities at the former OU 1086 began in June 1995 and were completed in March 1996. The data received from the analytical laboratory underwent a quality assurance/quality control assessment, which indicated that nearly 100% of the data were acceptable and defensible.

Two PRSs — PRS 15-011(a) and PRS 15-014(k) — were not sampled during this investigation because upon investigation the PRSs were found to be concrete and contained no sampling media. However, both sites drain into PRS-15-011(c), which was sampled. Four PRSs and one AOC — PRS-15-001, PRS 15-009(i), PRS 15-004(h), PRS 15-009(a), and C-15-007— are still active and their investigation will be deferred until decommissioning. One AOC — C-15-001 — is recommended for a continuation of Phase I sampling to determine whether uranium present in the soil is natural or depleted. A geophysical survey is currently being conducted at PRS 15-007(a) in order to determine appropriate further action. In addition, three PRSs — PRS 15-004(g), PRS 15-008(c) and PRS 15-006(c) — will be addressed in separate interim action (IA) or expedited cleanup (EC) reports. One PRS and one AOC — PRS 15-010(a) and AOC C-15-010 — are proposed for Phase II investigations; proposed sampling plans for each of these sites are included in Chapter 5 of this report. Finally, twenty-six PRSs are recommended for no further action (NFA) using the criteria presented in the Project Consistency Team Policy Number 015, "No Further Action Criteria" (PCT 1210). Of these twenty-six sites, five PRSs — PRS 15-010(c), PRS 15-014(e), PRS 15-014(l), and PRS 15-012(a) — were previously proposed for NFA and are recommended for NFA again in this report.

Table ES-1 presents all the PRSs considered here and the proposed action for each.

TABLE ES-1
SUMMARY OF PROPOSED ACTIONS

PRS	HSWA	NFA Criteria*	Further Action	Rationale	Section
Storage Area					
15-001	-	-	Deferred	Active site	5.2
Pit					
15-002	X	5	NFA for Human health	Site has been characterized and no COPCs are present	5.12
Inactive Firing Sites					
15-004(g)	-	-	IA	Surface contaminants	5.1
15-004(h)	-	-	Deferred	Within active site radius of PHERMEX	5.6
15-006(c)	X	-	EC in 1997	Contaminants present above PRGs	5.35
15-006(d)	X	5	NFA for Human health	Site has been characterized and no COPCs are present	5.36
Container Storage Area					
15-005(b)	-	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.30
15-005(c)	-	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.31
Landfill					
15-007(a)	X	-	To be determined	Geophysical survey currently under way	5.13
Surface Disposals					
15-008(c)	X	-	IA	Surface contaminants	5.3
15-008(g)	-	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.37
Active Septic Systems					
15-009(a)	X	-	Deferred	Active site	5.16
15-009(f)	X	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.28
15-009(i)	X	-	Deferred	Active site	5.4
15-009(k)	X	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.29
Inactive Septic Systems					
15-010(a)	X	-	Phase II	Extent of contamination not defined	5.32
15-010(b)	X	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.33
15-010(c)	X	2	NFA for Human health and ecology	Site has never been used for RCRA waste management	5.8
Sump					
15-011(a)	X	1	NFA for Human health and ecology	Site cannot be located or does not exist	5.17
15-011(b)	X	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.18

TABLE ES-1
SUMMARY OF PROPOSED ACTIONS
(continued)

15-011(c)	X	5	NFA for Human health	Site has been characterized and no COPCs are present	5.19
Operational Release					
15-012(a)	X	1	NFA	Site cannot be located or does not exist	5.38
Outfalls					
15-014(a)	X	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.26
15-014(b)	X	1	NFA for Human health and ecology	Site cannot be located or does not exist	5.27
15-014(d)	-	2	NFA for Human health and ecology	Site has never been used for RCRA waste management	5.9
15-014(e)	-	2	NFA for Human health and ecology	Site has never been used for RCRA waste management	5.10
15-014(g)	-	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.22
15-014(h)	-	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.34
15-014(i)	X	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.20
15-014(j)	X	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.21
15-014(k)	X	1	NFA for Human health and ecology	Site cannot be located or does not exist	5.23
15-014(l)	X	2	NFA for Human health and ecology	Site has never been used for RCRA waste management	5.11
Areas of Concern					
C-15-001	-	-	Phase I, cont.	Isotopic uranium measurement necessary	5.5
C-15-005	-	5	NFA	Site has been characterized and no COPCs are present	5.14
C-15-006	-	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.15
C-15-007	-	-	Deferred until 1997	Temporary building on top of site	5.24
C-15-010	-	-	Phase II	Nature and extent of any contamination not defined	5.25
C-15-011	-	5	NFA for Human health and ecology	Site has been characterized and no COPCs are present	5.7

* See Project Consistency Team Policy Number 015 "No Further Action Criteria" (PCT, 1210)

RESOURCE CONSERVATION AND RECOVERY ACT
FACILITY INVESTIGATION REPORT

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1.0 INTRODUCTION

1.1 General Site History

Technical Area (TA) 15, part of Field Unit (FU) 2, was formerly designated as Operable Unit (OU) 1086 at Los Alamos National Laboratory (the Laboratory) in Los Alamos, New Mexico (NM) (Figure 1.1-1). TA-15 is located in the northwestern quadrant of the Laboratory and south of the Los Alamos townsite. The TA occupies a roughly rectangular area, about 1.3 mi wide by 1.5 mi long (Figure 1.1-2).

The northern boundary is formed by the stream channels in Pajarito and Three-Mile canyons along TAs-46, 66, and 67. The area is bounded on the west by TA-14 and the stream channel of Cañon de Valle along TA-16 and TA-37. TA-49, located on the southern margin of Water Canyon, forms the southern boundary, and TA-36 forms the eastern boundary.

The relatively flat surface of Three-Mile Mesa on Pajarito Mesa encompasses most of TA-15, but steep-walled Water Canyon traverses the southern site boundary and Potrillo Canyon intersects the main portion of Three-Mile Mesa, dividing the Mesa into two firing site areas on PHERMEX Mesa and Mesita del Potrillo.

TA-15, also known as R-Site, has been used for explosives development and testing since 1944, including tests involving radioactive materials. TA-15 is an active technical area of the Laboratory used for on-going explosion research.

Chemicals of potential concern (COPCs) at TA-15 include spent high explosives (HE) and their known residual products. Radionuclides possibly present include uranium, and analyses were conducted for this analyte and its daughter products, depending on the site history. A number of other chemicals associated with firing sites and their activities were included in the COPCs at each site. Inorganic constituents possibly present included barium, beryllium, cadmium, chromium, cyanide, lead, and silver. Additional organic COPCs could have resulted from product leaks or spills; analyses were conducted for both volatile (VOC) and semivolatile (SVOC) organic compounds, depending on site histories.

1.2 RFI Overview

The overall objectives of the Phase I field investigations at TA-15, as outlined in the RCRA Facility Investigation (RFI) Work Plan (LANL 1993, 1087), were to determine:

- if any releases occurred at the PRSs, and, if so, the nature and extent of any contamination;
- the risks posed by any contamination to workers and the public; and
- the need for corrective action.

These investigations also satisfy the site-specific regulatory requirements contained in the Laboratory's RCRA operating permit, specifically in Module VIII, which contains the HSWA corrective action requirements (LANL 1995, 1275). The Laboratory sites that are reported on herein include Solid Waste Management Units (SWMUs) and areas of concern (AOCs). AOCs are sites that contain potentially hazardous substances, such as radionuclides, not regulated under RCRA. Collectively SWMUs and AOCs are called potential release sites (PRSs).

The RFI Work Plan, which governed the investigations, was submitted to the U. S. Environmental Protection Agency (EPA) in July 1993 (LANL 1993, 1087), was amended to correct deficiencies noted by the EPA, and then re-submitted to the EPA on August 24, 1994 and November 29, 1994. Final approval was given on January 9, 1995.

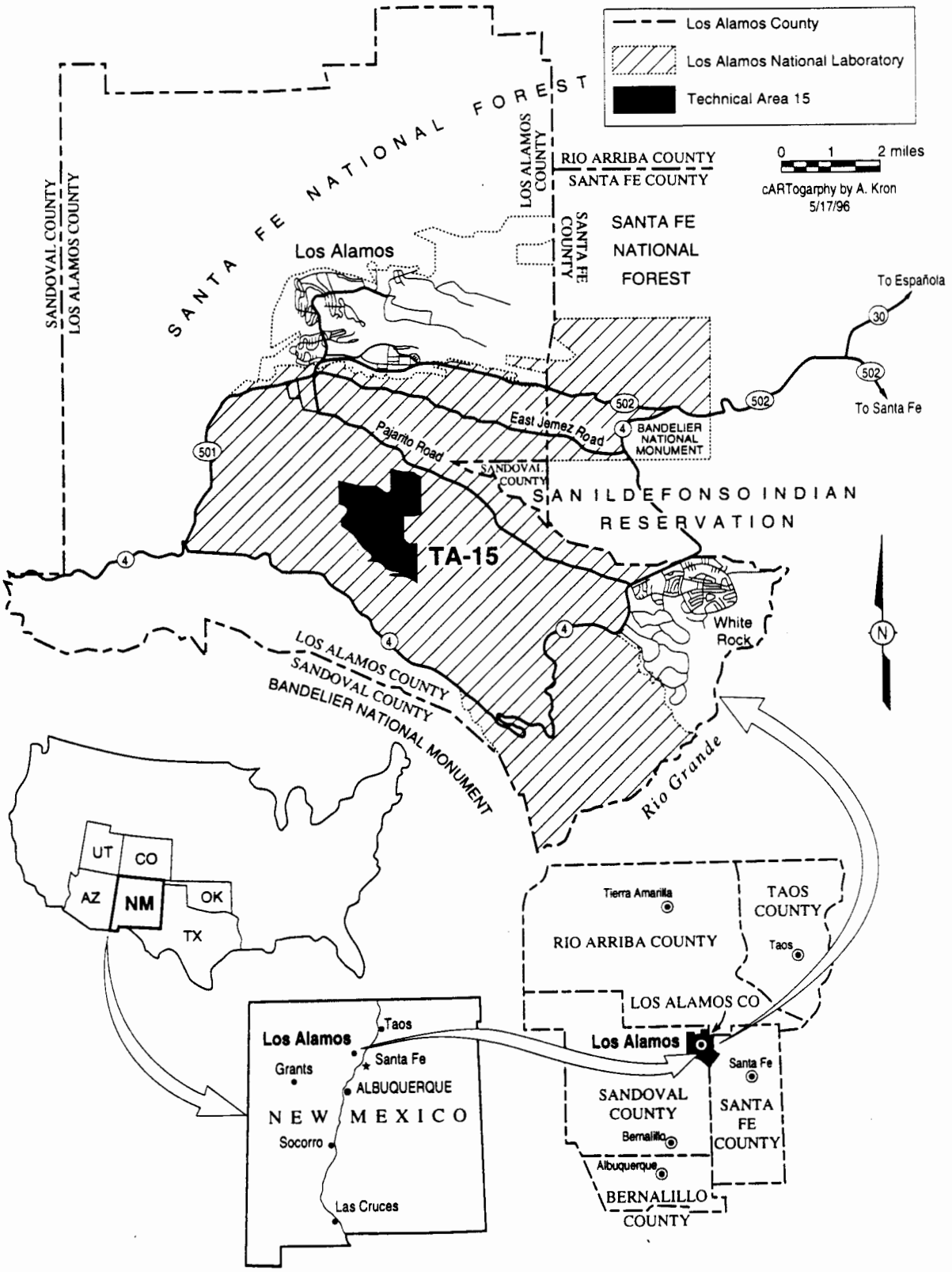


Figure 1.1-1 Location of TA-15 within Los Alamos National Laboratory, Los Alamos County, New Mexico

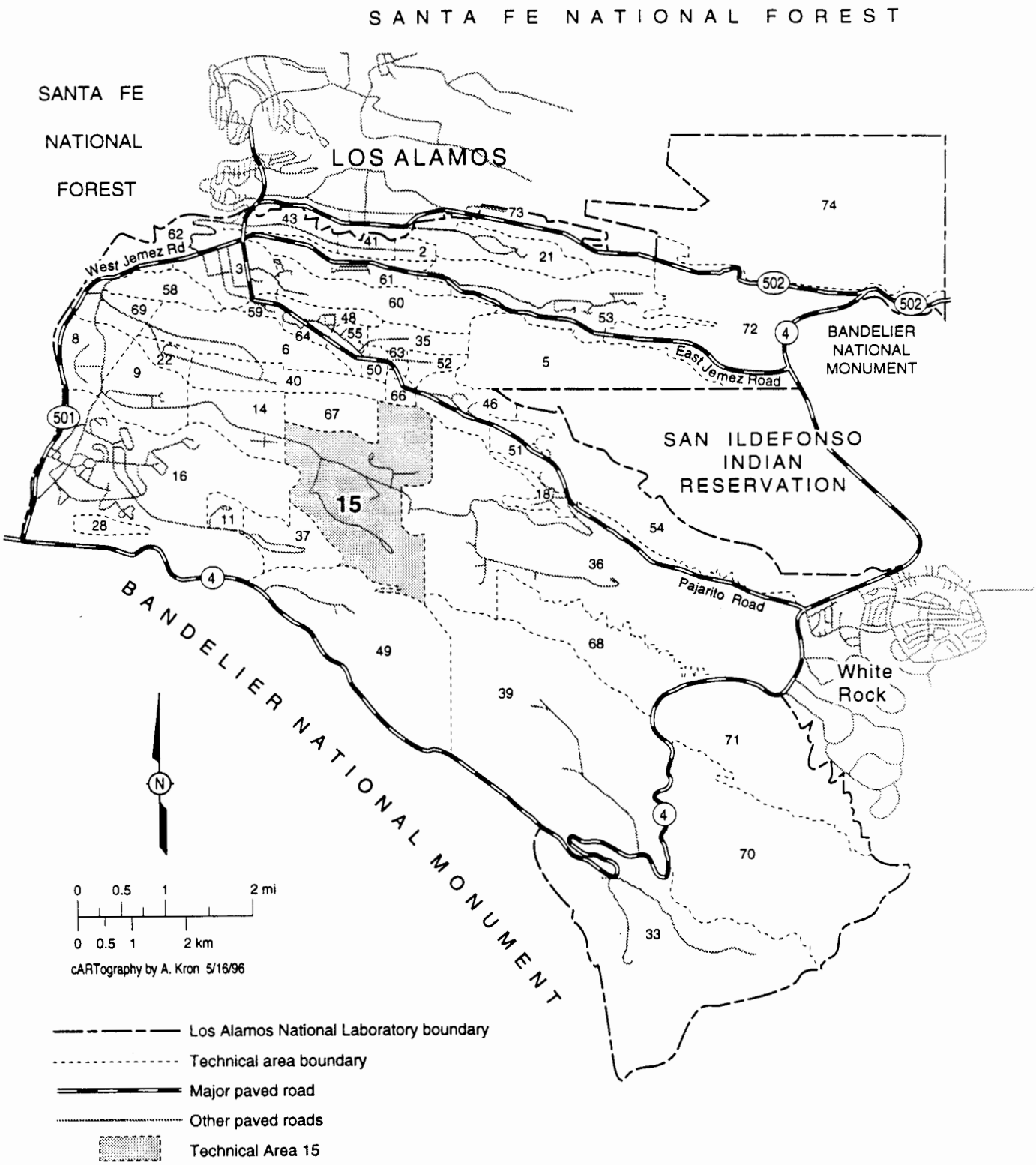


Figure 1.1-2 Location of TA-15 with respect to Laboratory TAs and surrounding landholdings

The conceptual model developed for the RFI Work Plan identified sources of contaminants, release mechanisms, and exposure routes. The elements for this model are presented in Table 4-1 of the RFI Work Plan (LANL 1993, 1087). This information was used to develop a conceptual model for each PRS and to make decisions regarding the sampling and analyses required to adequately characterize a site. The majority of sites discussed in this report had dispersion, runoff, and either infiltration or radiological decay as potential release mechanisms; direct contact, inhalation, and ingestion were noted as potential exposure routes.

Two PRSs — PRS 15-011(a) and PRS 15-014(k) — were not sampled during this investigation because upon investigation the PRSs were found to be open concrete drain lines and contained no sampling media. These PRSs connect to PRS 15-011(c), however, which was sampled. These sites are among those recommended for no further action (NFA).

Four PRSs and one AOC — PRS 15-001, PRS 15-009(i), PRS 15-004(h), PRS 15-009(a), and C-15-007 — are still active. Action on these sites will be deferred until decommissioning.

AOC C-15-001 is recommended for further Phase I sampling. Two samples will be collected and analyzed for isotopic uranium to determine whether the uranium detected at the site through Phase I sampling is depleted or natural.

In addition, the following three PRSs will not be addressed in this report, but in interim action (IA) or expedited cleanup (EC) plans.

- PRS 15-004(g), Former Firing Site
- PRS 15-008(c), Surface Disposal
- PRS 15-006(c) [includes 15-008(b), as described in the November 1994 report (LANL, ER-94-J351)], Former Firing Site

The following PRS and AOC will be proposed for Phase II investigations, and the related sampling plans are included in this report:

- PRS 15-010(a)
- AOC C-15-010

A second geophysical survey is being conducted for PRS 15-007(a). The results of this survey will assist in determining the appropriate action for this PRS.

Twenty-six sites discussed in this report, including PRS 15-011(a) and 15-014(k), have been proposed for no further action (NFA). A site can be proposed for NFA if it meets one of the five criteria presented in Environmental Restoration (ER) Project Consistency Team Policy Number 015, "No Further Action Criteria" (PCT 1996, 1210). Figure 1.2-1 presents each PRS and the criterion under which it is proposed for NFA.

Five sites — PRS 15-010(c), PRS 15-014(d), PRS 15-014(e), PRS 15-014(l), and PRS 15-012(a) — were previously recommended for NFA in the Work Plan and/or the (NOD) responses. No response has been received to date; therefore, they are again recommended for NFA in this report.

Figure 1.2-1
PRSs Slated for NFA and Criterion

Criterion 1: The site cannot be located or has been found not to exist, is a duplicate PRS, or is located within, and therefore, investigated as part of another PRS.

PRS 15-011(a) PRS 15-014(b) PRS 15-014(k)

Criterion 2: The site has never been used for the management (that is, generation, treatment, storage, or disposal) of RCRA solid or hazardous wastes and/or constituents, or other CERCLA hazardous substances.

PRS 15-010(c) PRS 15-012(a) PRS 15-014(d) PRS 15-014(e)
PRS 15-014(l)

Criterion 3: No release to the environment has occurred.

Criterion 4: There was a release, but the site was characterized and/or remediated under another authority which adequately addresses corrective action, and documentation, such as closure letter, is available.

Criterion 5: 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 future land use.

C-15-005	C-15-006	C-15-011	PRS 15-002
PRS 15-005(b)	PRS 15-005(c)	PRS 15-006(d)	PRS 15-008(g)
PRS 15-009(f)	PRS 15-009(k)	PRS 15-010(b)	PRS 15-011(b)
PRS 15-011(c)	PRS 15-014(a)	PRS 15-014(g)	PRS 15-014(h)
PRS 15-014(i)	PRS 15-014(j)		

1.3 Field Activities

Field activities for this Phase I field investigation, as outlined in the RFI Work Plan, consisted of field surveys and screening and sampling. Field activities commenced in June 1995 and were completed by March 1996.

Radiological surveys were used for PRSs where radionuclides were suspected to be present in order to establish areas of potential contamination for biased sampling. Land surveys were performed at all the sites to set grid points and sample locations using established survey monuments and coordinates published in the LANL Survey Monument Network Manual (LANL 1994). A Sokkia Set IIIB Total Station with SDR Data Collector was used to conduct the surveys.

Field screening was performed at each sample location and on the collected sample material to determine potential hazards and to protect the health and safety of on-site workers. Portable radiation detection instruments included a Ludlum Model 2221 scaler/ratemeter with a 44-10 2x2 scintillator and an Eberline ESP-1 survey meter with an HP260 detector. A photoionization detector (PID) was used to measure organic vapors.

A high explosives (HE) spot test kit was used to screen every sample location prior to the start of any intrusive activities. The kit, designed by the Laboratory High Explosives - Science and Technology Group, tests for common HE such as Composition B, cyclonite (RDX), octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX), nitroglycerine, nitrocellulose, trinitrotoluene (TNT), and tetryl (methyl-2,4,6-trinitrophyenylnitramine) (TETRYL). These HE analytes can be detected to a concentration of 100 ppm. Perataerythritol tetranitrate (PETN) can be detected to 500 ppm; triaminotrinitrobenzene (TATB) can be detected, but its lower limit has not yet been established. The test was not used to attempt to quantify the content of HE in any particular sample; its purpose was to indicate the presence of HE that could create special packaging and shipping requirements.

X-ray fluorescence (XRF) was used to screen all soil samples for lead and uranium content. These data, along with the radiological data, were then used to determine which samples, based upon the highest results, would be sent to the fixed analytical laboratory for analysis. (See Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.) Whenever beryllium was a suspected COPC, Laser Induced Breakdown Spectroscopy (LIBS) was used to screen for beryllium content. Soil samples at PRS 15-006(c), PRS 15-006(d), and PRS 15-008(g) were screened using LIBS.

Sample matrices collected were principally soil, both surface and subsurface; three water/sludge samples were collected from septic tanks. All applicable Los Alamos National Laboratory Environmental Restoration (ER) Standard Operating Procedures (LANL-ER-SOP) were followed, unless otherwise noted in Chapter 5.

2.0 ENVIRONMENTAL SETTING

The environmental, geologic, and hydrologic setting of the Laboratory are described in Sections 2.4 and 2.5 of the Installation Work Plan (IWP) for Environmental Restoration (LANL 1995, 1164). A detailed discussion of the environmental setting for TA-15, including climate, geology, hydrology, and a conceptual hydrogeologic model for the area, is presented in the RFI Work Plan for OU 1086 (LANL 1993, 1087). A summary is presented in the following sections.

2.1 Climate

Los Alamos County, including the Laboratory, has a semiarid, temperate mountain climate. Summers are generally sunny, with moderate, warm days and cool nights. The high altitude, light winds, clear skies, and dry atmosphere allow summer temperatures to range from 45° F to 95°F. During the winter, temperatures typically range from 15° to 50°F. Average annual precipitation is 16 in., but there is a large east-to-west gradient in precipitation across the area. July and August storms account for 40% of the precipitation. Streamflow in the canyons result from summer storms and spring snowmelt (Environmental Protection Group, 1994, 1179).

2.2 Geology

2.2.1 Geologic Setting

TA-15 occupies a roughly rectangular area about 1.3 mi wide by 1.5 mi long. The topography is rugged, characterized by relatively narrow mesa tops separated by elongated canyons; the predominant axis of both mesas and canyons is west-northwest to east-southeast. The maximum elevation of TA-15 is 7329 ft on the mesa west of building TA-15-40, and the minimum elevation is 6719 ft in Water Canyon. Mesa tops are generally flat and gently slope to the east-southeast. Canyon walls are steep to nearly vertical, ending in large piles of talus at the canyon wall/canyon bottom junction. Canyon bottoms are generally narrow, with steep stream channel gradients.

Both the mesa tops and the canyon bottoms of TA-15 are situated within the Bandelier Tuff, a thick sequence of volcanic ash flows and ash falls on the Pajarito Plateau. In the absence of additional structures, such as faults and fractures, the horizontal uniformity in rock type implies relative uniformity in surface hydrologic and geologic properties throughout the area. The generalized stratigraphy of OU 1086 is shown in Figure 2.2.1-1.

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, 1164).

2.2.2 Soils

TA-15 contains at least 8 different kinds of soils, mainly surface deposits of colluvium and alluvium, each of which is described and mapped by Nyhan (Nyhan et al. 1978, 0161). Coverage is highly variable over TA-15; the progression from north to south is as follows:

The extreme northern portion of TA-15 starts at the bottom of Pajarito Canyon and consists primarily of rock outcrops. The surface of Pajarito Mesa is covered with Frijoles very fine sandy loam. The southern part of this mesa shows exposures of Hackroy rock outcrop complex.

Three-Mile Canyon has steep rocky walls with some gravely sandy loam (Totavi) in the bottom of the canyon. The eastern tip of Three-Mile Mesa exposes Hackroy rock outcrop complex, grading westward

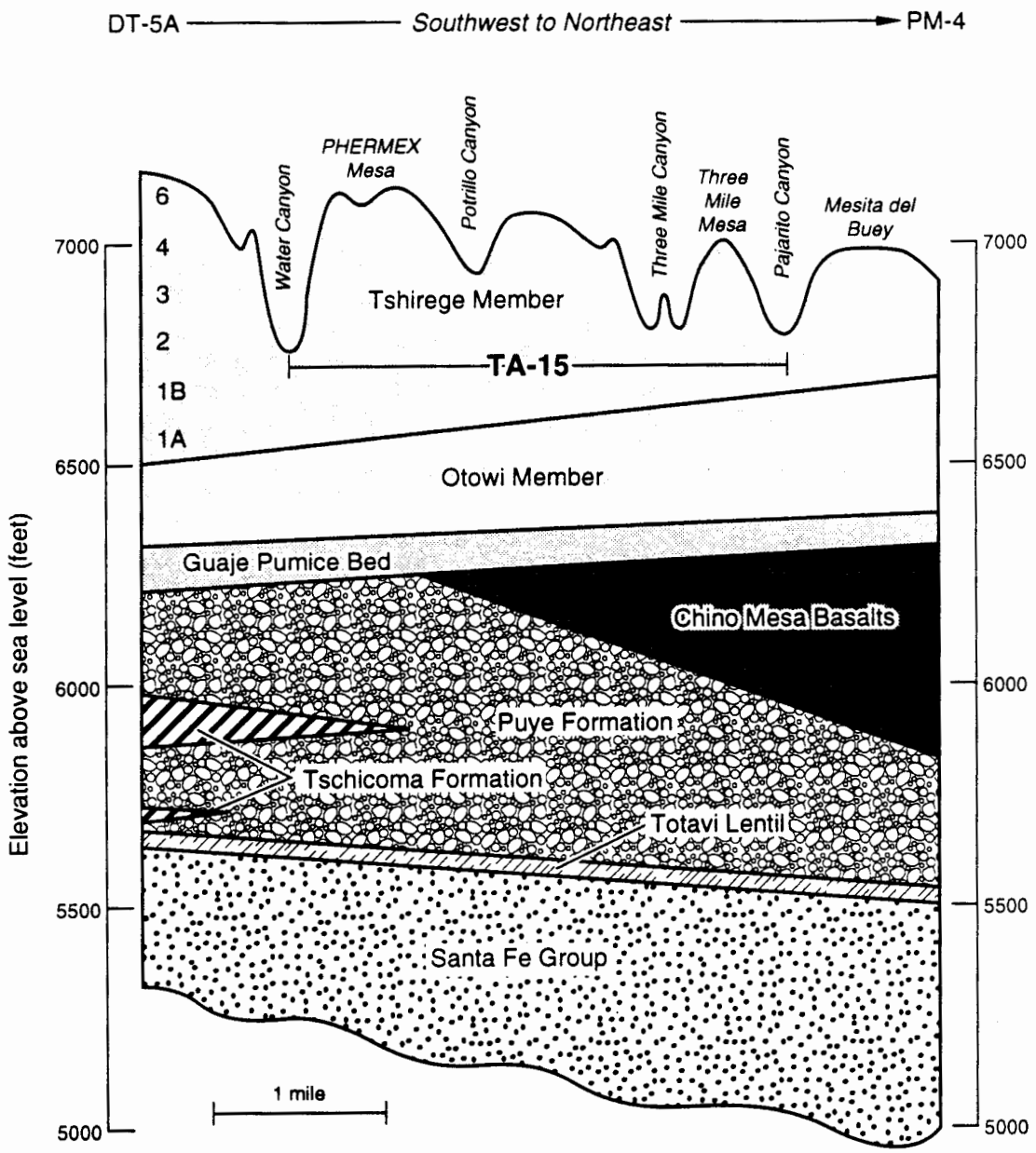


Figure 2.2.1-1 Generalized stratigraphy of OU 1086

into Carjo loam and Pogna sandy loam. Still further to the west lie Seaby loam and the continuation of Carjo loam, which is generally central to the Mesa throughout its length.

The eastern portion of Mesita del Potrillo, which joins Three-Mile Mesa, is covered with Hackroy rock outcrop complex at the extreme eastern edge, grading into Carjo loam. This persists to the western edge of TA-15, where it is joined on the eastern margin of Cañon de Valle by Pogna loam. The northeastern rim of Mesita del Potrillo is covered with Hackroy sandy loam.

The sequence of soils on the land bridge connecting Mesita del Potrillo with PHERMEX Mesa has the following progression from west to east: Pogna loam, a pod of Frijoles loam, Seaby loam, and Carjo loam, with typic eutroboralfs at the head of Potrillo Canyon. Grading west to east into Potrillo Canyon is Tocal loam and, in the bottom of the canyon, Totavi sandy loam.

The center of PHERMEX Mesa is covered with Nyjack loam. This grades to the north to Seaby loam and Hackroy loam on the northeast rim of Potrillo Canyon. Seaby loam grades to the west and east of PHERMEX site, with a small pod of Nyjack loam located on the extreme eastern edge of TA-15 on this mesa. The northern rim of Water Canyon shows Pogna loam on the west and Hackroy loam on the east. A pod of Seaby loam is located in the bottom of Water Canyon at the eastern edge of TA-15.

2.2.3 Sedimentation and Erosion

Sediment deposition and erosion by surface water occurs at TA-15 in response to snowmelt and storm-water runoff events. Periods of runoff can produce erosion, sediment transport, and deposition. At the firing sites, where the natural soil surface has been disturbed through use, erosion is generally accelerated (Graf 1975, 13-009; Nyhan & Lane 1986, 0159). Active erosional processes on the Pajarito Plateau are addressed in Section 2.5.1.6 of the IWP (LANL 1995, 1164).

Sediment accumulations in excess of 3 ft from a single event have been measured in the active channel in Potrillo Canyon east of TA-15. There is preferential accumulation of the smaller particulates in the stream bank deposits, point bars, and alluvial fans. Therefore, these geomorphologic deposits may accumulate uranium and other possible contaminant metals, such as mercury, lead, and possibly beryllium. Uranium, a heavy metal used in dynamic weapons testing at TA-15, was found to accumulate in particular geomorphologic deposits in Potrillo Canyon (Becker and Hoopes, 1993, in preparation).

2.3 Hydrology

2.3.1 Surface Water

Four separate watersheds, each with an established stream-channel drainage network, are present within TA-15 (Figure 2.3.1-1). These watersheds are Three-Mile Canyon, Potrillo Canyon, Water Canyon, and Cañon de Valle. For locations and boundaries of these watersheds, see Appendix A of the RFI Work Plan for OU 1086 (LANL 1993, 1087). All surface water transport of contaminants at TA-15 ultimately will flow into one of these four canyons. A fifth watershed, Pajarito Canyon, receives runoff from a small, undeveloped area within TA-15. Because this watershed is not expected to receive any contaminants from TA-15, it is excluded from further discussion.

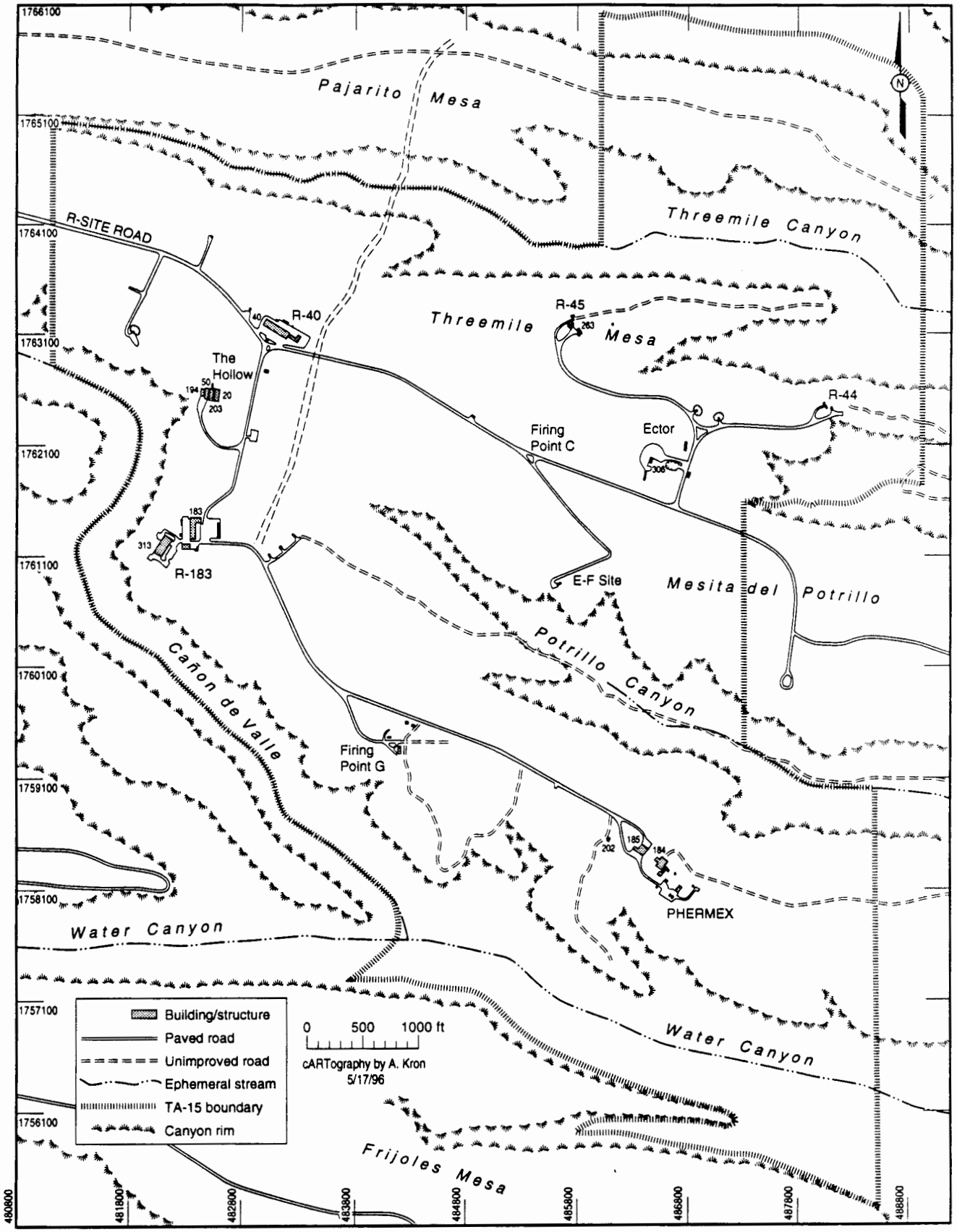


Figure 2.3.1-1 Topography of OU 1086

Stream flow in Three-Mile and Potrillo canyons is ephemeral, occurring in response to rainfall and snowmelt events. Flow in Cañon de Valle in the vicinity of TA-15 may occur at times from permitted wastewater discharge and from snowmelt and storm-water runoff. Water Canyon receives flow from springs upstream from West Jemez Road, from permitted wastewater discharge at TAs-11, 15, and 16, and from snowmelt and storm-water runoff. In years of heavy snow pack, all these channels may transport continuous flow during the spring; intermittent flow in response to heavy rainfall occurs during the spring, summer, and fall.

2.3.2 Groundwater

The depth to the main aquifer varies from 875 to 1100 ft below ground surface in the vicinity of TA-15 (Purtymun and Stoker 1988, 0205). The water in the main aquifer generally moves eastward across the plateau toward the Rio Grande, with some discharge into the Rio Grande through seeps and springs (Purtymun 1984, 0196).

2.4 Biological Survey

Biological resource field surveys have been conducted at TA-15 in compliance with the Federal Endangered Species Act of 1973; the New Mexico Wildlife Conservation Act (NM Game and Fish Dept. 1978); the New Mexico Endangered Plant 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).

Biological resources were extensively surveyed in the summer of 1992. Several threatened and endangered species were identified for which TA-15 has a suitable ecology, however, none were determined to have significant potential of occurrence in the area (Dunham 1995). Within TA-15, 91 species of plants, 51 species of nesting birds, 24 species of wintering birds, 34 species of mammals, and 10 species of reptiles and amphibians have been identified. TA-15 serves as an overwintering area for deer and elk. Other species that are known to occur on the site include a variety of small mammals (such as mice and coyotes).

Each PRS was also evaluated to determine the potential for ecological receptors to be exposed to any COPCs associated with the site. The assessment assigns scores that indicate overall landscape conditions at the site and site-specific conditions that influence the accessibility of any COPCs to ecological receptors. Results of the evaluation are provided in Table 2.4-1.

2.5 Cultural Survey

A cultural resources survey was conducted at various areas within TA-15, as required by the National Historic Preservation Act (amended). Over 80 sites of cultural interest were located. For a summary of the results, see Appendix E of the RFI Work Plan for OU 1086 (LANL 1993, 1087). None of these sites were disturbed by the RFI.

TABLE 2.4-1
SUMMARY OF HABITAT SCREENING ASSESSMENT

PRS #	Description	Landscape Condition [a]	Receptor Access [b]
15-001	boneyard; northeast of building	2	2
C-15-001	soil pile	2	2
C-15-011	underground fuel tank; removed	2	0
15-002	burn pit	2	3
15-007(a)	landfill	2	2
C-15-005	building site; structures removed	2	2
C-15-006	building site; structures removed	2	2
15-009(a)	septic tank; flows to seepage pit	2	3
15-011(b)	drainline	2	3
15-011(c)	acid waste dump	2	3
15-014(i)	seepage pit	2	2
15-014(j)	drain line discharge	2	3
15-014(g)	outfall in canyon	2	3
C-15-010	underground fuel tank; removed	2	2
15-014(a)	outfall; edge of mesa	2	3
15-014(b)	outfall; edge of mesa	2	3
15-009(f)	septic tank	2	0
15-009(k)	septic tank	2	0
15-005(b)	container storage area	2	2
15-005(c)	container storage area	2	2
15-010(a)	septic tank; tank removed; regraded	2	2
15-010(b)	septic tank; in line to outfall	2	3
15-014(h)	outfall into canyon	2	3
15-006(d)	firing site	2	2
15-008(g)	sandbags at firing site	2	2

[a] 1 = heavily disturbed/developed, 2 = moderately disturbed, 3 = lightly disturbed or not disturbed

[b] 0 = no potential for receptor access to COPCs or for COPC transport, 1 = low potential for access or transport, 2 = moderate potential for access or transport, 3 = high potential for access or transport

3.0 APPROACH TO DATA ASSESSMENT AND ANALYSES

The decision approach used for data assessment and analysis involves a series of quantitative steps that occur after the field investigation, chemical analysis, and data reporting are complete. These steps begin with routine data validation and continue with more focused data validation, if necessary. Routine validation involves validating each data item against specific targets and adding qualifier flags to the data signifying a potential deficiency. Focused validation consists of analyzing quality assurance/quality control (QA/QC) data for their potential impact on the succeeding data assessment steps (i.e., comparing site data with background concentration data, verifying the identities of detected organic chemicals, comparing site data with screening action levels (SAL) for human health impacts, and performing human health or ecological risk assessments, when necessary). The following subsections provide overviews of the methods used to complete these quantitative steps.

3.1 Sample Analyses

All samples requiring chemical and radiological analysis and chain-of-custody documentation were submitted to the fixed analytic laboratory. Each soil sample was screened for radionuclides and analyzed by XRF and screened for radioactivity with a Ludlum model 2221 scaler/ratemeter with a 44-10 2X2 scintillator. Analyses were conducted using the methods indicated in Appendix G of this report.

3.1.1 Analytical Methods

All samples were analyzed using EPA SW-846 methods or equivalent and/or radiological methods as described in Quality Control Data Use (document in preparation), unless otherwise noted.

3.1.2 Data Validation

Data verification and validation procedures are used to determine whether data packages have been generated according to specifications, are of known quality, and contain the information necessary to determine data sufficiency for decision making.

Data verification is a check of data deliverables against a set of stated requirements to ensure that what has been ordered has been delivered, thus indicating that the laboratories can be paid. All analytical data generated in support of the ER Project is verified.

Data validation is the process of determining whether individual results can be reliably used to support the decision-making process. During the process, validators determine whether data should be qualified or used with caution because of the potential impact of noted flaws or the failure to achieve precision or bias constraints.

Routine data validation is the comparison of quality indicators (such as surrogate recovery, measurements of method blanks, holding times, differences between replicate measurements) with clearly defined limits to determine whether limitations may need to be placed on the use of the data. Routine validation is most suitable for routine analyses and for those nonroutine analyses for which clearly defined limits have been established.

The focused data validation process addresses those characteristics of the data (e.g., precision and bias) that directly affect the decision(s) to be based on the data. The same data set may undergo different focused validations for different decisions.

3.2 Background Comparisons

Once the data validation process is complete and the site data are finalized, the next step in the process is to compare site data with available background data. The results of a focused data validation should exclude from consideration for background comparison any contaminant that is identified as an artifact of analytical laboratory or field contamination, analytical interference, or improper analyte identification or quantitation. The purpose of this decision step is to determine whether chemicals that have natural or anthropogenic background distributions should be retained as COPCs or eliminated from further consideration. Background data are available from two sources: 1) soil samples collected throughout Los Alamos County for which chemical analyses were performed for certain inorganic (metal) chemicals and naturally occurring radioactive chemicals (Longmire et al. 1995, 1142 and 1266); and 2) background concentrations of radioactive chemicals associated with global fallout from atmospheric nuclear testing (e.g., plutonium, cesium, strontium, and tritium) reported in Laboratory environmental surveillance reports (most recently Environmental Protection Group 1994, 1179).

Comparisons between site data and background data are initially performed by comparing each observed concentration datum with an upper tolerance limit (UTL) estimated from background data. Further statistical comparisons are performed for the analytes that exceed their UTLs to determine whether statistically significant differences exist between the observed site and background data sets. The Gehan/Wilcoxon Rank Sum test (Gehan 1965, 1296), the Quantile test (Gilbert and Simpson 1992, 0974), and the Slippage test (Gilbert and Simpson 1990, 0972) are used for these evaluations (see Gilbert). The Gehan modification of the Wilcoxon Rank Sum test is best suited for assessing complete shifts in distribution, whereas the Quantile test is better suited for assessing partial shifts. The Slippage test determines the probability of the observed number of site concentrations being greater than the maximum background concentration, given that the site data originate from the same distribution as the background data. Among the three tests, most types of differences between distributions can be determined. Observed significance levels (p-values) are reported for the tests. The p-value is the probability of observing data at least as different from the typical background data as the actual, observed site data if the site concentration distribution is the same as background. If a p-value is less than 0.05, then there is reason to suspect that there is a difference between the background and site distributions; otherwise, no difference is indicated and the site concentrations are not statistically different than background. These tests are only performed for PRSs that have at least four samples, and only for the analytes that have adequate background datasets. For example, mercury data is not subjected to these tests because the background dataset is almost entirely composed of non-detected data. The p-values for any analytes that are shown not to be statistically different from background are included in Chapter 5 where comparisons to background are discussed. Histograms, smoothed density images, and box plots for all analytes subjected to these analyses are presented in Appendix E. Details of statistical methods used to generate UTLs from the background data sets and suggestions for statistical methods of comparing site and background data sets and concentration distributions are presented in the guidance document, Statistical Comparisons to Background, Part I (ER Project Assessments Council 1995, 1218).

If a chemical has a reported concentration that exceeds its UTL or fails other statistical background comparison tests (i.e., the site data are statistically greater than background data), then that chemical is carried forward to the screening assessment process. If a chemical does not have a reported concentration that exceeds the UTL, then that chemical is removed from further consideration.

The ER Project has developed UTLs for the most commonly sampled chemicals and the most commonly analyzed media. For chemicals and/or media not included in the Longmire data (or in other Laboratory databases), UTLs will be developed by the Decision Support Council as needed.

In general, some of the inorganics analyzed as part of the analytical suite were not subjected to the data comparison because they were not considered to be COPCs at any PRS investigated. These inorganics, which include aluminum, calcium, iron, magnesium, potassium, and sodium, occur naturally in soil.

3.3 Evaluation of Radionuclide Data

The analytical results for radionuclides are reported as activity concentrations in either pCi/g or pCi/L. The values are determined from the measurement of the radioactivity in the sample using a radiation detection instrument (e.g., an alpha particle spectrophotometer or a gamma ray spectrophotometer). Because the radioactive decay process is random and governed by statistical probabilities, the measured value is not constant, but will vary with each measurement of the sample. The variance or sample uncertainty is reported along with the analytical result for each sample as a ± value called "sigma" (σ), which is the standard deviation of the result. The ER Program has established 3σ (± 3 times the standard deviation) as a screening tool. The 3σ value provides 99% certainty that the true value of the sample is within this range. Any reported value less than or equal to 3σ is considered to be non-detect for that analyte; values greater than 3σ are considered to be detected values.

If no background UTL is available for a radionuclide of concern the reported concentration was compared with that for a radionuclide with which (under natural conditions) it would be in secular equilibrium. If the radionuclide of concern was found to be in secular equilibrium with its associated radionuclide, the radionuclide of concern was considered to be naturally occurring and not present as a result of Laboratory-related activities. Secular equilibrium is assumed for the following specific isotopes: thorium-232~thorium-228~radium-228; uranium-238~thorium-234; and uranium-234~thorium-230~ radium-226.

Radionuclide data received from the analytical laboratory were evaluated for the presence of DOE-introduced radionuclides. The evaluation process examines each reported radionuclide based on its origin (i.e., whether it is naturally occurring or man-made). The natural radionuclides of cosmic or primordial origin (e.g., potassium-40) are identified first and are usually eliminated.

Isotopes in the three existing natural radioactive decay series (uranium, thorium, and actinium) are compared with background and can be screened out unless their activity levels or isotopic ratios are significantly different from those found in naturally occurring radionuclides.

The environmental legacy of former global atmospheric nuclear weapons testing include the following man-made radionuclides: tritium, cobalt-60, and isotopes of uranium, neptunium, plutonium, and americium. Depleted uranium (DU), which is 99.75% uranium-238, is also considered man-made, in that it has been depleted of most of its uranium-234 and uranium-235 in the gaseous diffusion process. In natural uranium, the activity ratio of uranium-238 to uranium-234 is ~1:1; for DU, the ratio is ~10:1 for the oldest DU (~50 years old), and ~100:1 for DU that is ~3 years old. Thus, using the measured isotopic activities, the presence of natural or depleted uranium can be ascertained. Natural and DU have been used in a variety of experiments at the Laboratory and are expected contaminants at the firing sites in former OU 1086.

3.4 Evaluation of Organic Constituents

Background data are not available for organic chemicals. This preliminary evaluation of organic chemicals considers detected chemicals and chemicals that were analyzed for but not detected in any sample. The purpose of this decision step is to determine whether organic chemicals should be retained as COPCs or eliminated from further consideration based on detection status. Detection status is determined by the analytical laboratory on a sample-by-sample, analyte-by-analyte basis. Estimated quantitation limits (EQL) have been established for each analyte as reporting limits when the analyte is not detected. It should be noted that the EQLs reported for individual samples are dependent on a number of factors and can vary from sample to sample and from analysis to analysis. Therefore, the sample-specific EQL for a chemical must be used in this comparison.

If an organic chemical is reported as detected, then that chemical is generally carried forward through the screening assessment process. If a chemical is not reported as detected in any sample analyses, then

that chemical is generally removed from further consideration. Exceptions to these general rules may be made if site-specific process knowledge so indicates. A chemical that is detected may be removed from further consideration if it can be determined that its presence is not a result of laboratory operations, and a chemical that is not detected in any sample may be carried through the decision process if the chemical can be expected to be present at the site based on historical operations.

3.5 Human Health Assessment

3.5.1 Screening Assessment

The screening assessment consists of sequential decisions that are used to determine whether chemicals have been released to the environment as a result of historical Laboratory operations at levels that may be hazardous to human health or the environment. The decisions include the following:

- Can reported concentrations be attributed solely to positive analytical laboratory or field bias?
- Are site data greater than background?
- Is the maximum site concentration greater than the SAL?

The purpose of this decision step is to determine whether chemicals should be retained as COPCs or eliminated from further consideration based on comparisons with SALs. This is the last step in the screening assessment process for human health concerns. If COPCs remain after this step, then further action may be proposed. If no COPCs remain after this step, then NFA may be proposed based on human health concerns. SALs are medium-specific concentrations that are calculated using chemical-specific toxicity information and conservative, default exposure assumptions. A complete description of the methods used to generate SALs is provided in "Risk-Based Corrective Action Process" (LANL/SNL 1996, 1277). For those chemicals for which SALs are available, each observed concentration datum is compared with the chemical's SAL. If a chemical has a reported concentration greater than its SAL, then that chemical is retained as a COPC pending further analysis. If a chemical does not have a reported concentration greater than its SAL, then that chemical is generally removed from further consideration. If more than one chemical is present at the site, this decision is deferred pending the results of the multiple chemical evaluation (described below). The decision to retain 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.

It is possible that COPCs should be retained because of the combined adverse health effects of several chemicals. This possibility is evaluated in the multiple chemical evaluation (MCE), in which the reported concentration for each chemical is divided by its respective SAL, and the resulting normalized values are incorporated into a simple additive model. If the sum of the normalized values (i.e., the total normalized value) is less than 1, then the chemicals are removed from further consideration. If the total normalized value is greater than 1, then chemicals having an individual normalized value greater than or equal to 0.1 are retained as COPCs pending further evaluation.

Only those chemicals that exceed background concentration thresholds (certain inorganics and radionuclides) or are detected (organics) in at least one sample are included in the MCE. These chemicals are divided into three classes: noncarcinogens, chemical carcinogens, and radionuclides. Additive effects are assumed within each class, but each class is evaluated separately. For further information on the calculation of MCEs see "Risk-Based Corrective Action Process" (LANL/SNL 1996, 1277).

The screening assessment described in "Technical Approach to RFI Reports" (LANL in preparation, 1281) was followed.

3.5.2 Risk Assessment

The human health risk assessments presented in Chapter 5 follow the guidance document "Risk-Based Corrective Action Process" (LANL/SNL 1996, 1277). The human health risk assessment process consists of the following four steps:

- identification of chemicals of potential concern,
- exposure assessment,
- toxicity assessment, and
- risk characterization.

No baseline or quantitative human health risk assessments were performed for any of the PRSs in this report. However, preliminary remediation goals (PRGs) were calculated for some analytes using risk assessment methodology (Appendix C).

3.6 Ecological Assessment

An ecological risk assessment will be conducted when an approach has been approved by our regulators. Threatened and endangered species and sensitive habitats have been identified based on field surveys (Section 2.4). A qualitative habitat screening model was applied to each PRS to evaluate the potential for exposure to ecological receptors, and the results are given in Table 2.4-1. The model evaluates potential ecological risk by ranking general landscape condition (development and disturbance) and the potential for receptors to access ecological COPCs, as described in the draft policy paper "Risk-Based Corrective Action Process" (LANL/SNL 1996, 1277).

4.0 RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

Samples were collected, processed, and analyzed in accordance with the Environmental Restoration Quality Assurance/Quality Control (QA/QC) program documented in the Site-Specific Quality Assurance Project Plan (QAPjP), Annex II of the RFI Work Plan for OU 1086 (LANL 1993, 1087). The QA objectives for measured data are based on the Laboratory Quality Program Plan for ER Activities (LANL 1991, 0840).

A variety of QA/QC samples are used to determine the usability of the data generated from the various analyses. These samples included field and laboratory duplicates, laboratory blanks, spikes, surrogates, and laboratory control samples. The assessment of the QA/QC samples and the potential effect these results may have on data usability were evaluated for all samples presented in this report.

The QA/QC data associated with this investigation indicated that of the approximately 14,000 pieces of analytical data, 99.6 percent (13,960 results) are acceptable and defensible. All of the radiochemistry results are considered usable; however, isotopic values that are less than 3σ counting uncertainty are considered useable as nondetects only. Similarly, less than 1% of the inorganic and organic data are affected because of blank contamination, but they are still useable as nondetects. Only 22% of the later data set is qualified as undetected estimated (UJ) or estimated (J). The volatile organic data for one sample are considered unusable for screening assessment purposes because of matrix interference problems. Neither the unusable data nor the qualification of the data due to QA/QC problems did not affect the sufficiency of the data for decision-making purposes because 99.6 percent are acceptable and defensible. The QA/QC mechanisms were effective in ensuring the reliability of measured data within expected limits of sampling and analytical error.

The QA/QC problems are presented in Table B-1 in Appendix B according to analytical suite and batch number, respectively.

4.1 Analyses for AOC C-15-011

4.1.1 Inorganic Analyses

AOC C-15-011 was not analyzed for inorganics.

4.1.2 Organic Analyses

Two samples were analyzed for semivolatile organics (SVOCs). 4-Nitrophenol was qualified as UJ because the laboratory control sample (LCS) recovery was below the established limits (75% to 125%). The data are useable because the recovery was >50%, so the analyte would be detected and quantified if present. All other SVOC data are considered useable as reported.

Two samples were analyzed for volatile organics (VOCs). Acetone, 2-butanone, meta- and para-xylenes, methylene chloride, trichloroethylene, and toluene are qualified as J because the sample results were below the estimated quantitation limits (EQLs) and the minimum detection limits (MDLs). The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified.

Acetone was detected in the laboratory blank. The sample concentration in one sample was less than 10 times the blank concentration. The value is considered useable as a nondetect due to

blank contamination. In addition, acetone was detected in one subsurface soil sample above the EQL and at a concentration greater than ten times the blank value. Because this analyte was detected in the laboratory blank, is not expected to be present as a result of site activities, and is also a common laboratory contaminant, the detected value of acetone is considered a nondetect and is useable as such. All other VOC data are considered useable as reported.

4.1.3 Radiochemistry Analyses

AOC C-15-011 was not analyzed for radionuclides.

4.2 Analyses for PRS 15-002

4.2.1 Inorganic Analyses

Four samples were analyzed for inorganics. Antimony in three samples, cadmium in two samples, and mercury in one sample are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified.

Arsenic, barium, cadmium, chromium, lead, manganese, mercury, and nickel were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.2.2 Organic Analyses

Four samples were analyzed for SVOCs. Pentachlorophenol and phenol in all samples were qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the recoveries were <2% below the limit, so the analytes would be detected and quantified if present. All other SVOC data are considered useable as reported.

Two samples were analyzed for VOCs. Methylene chloride in both samples is qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified.

Acetone and bis(2-chloroisopropyl)ether were detected in the laboratory blank. The sample concentrations of acetone were less than 10 times the blank concentration and sample concentrations of bis(2-chloroisopropyl)ether were less than 5 times the blank concentration. The values are not qualified and are useable in the screening assessment as nondetects due to blank contamination. All other VOC data are considered useable as reported.

4.2.3 Radiochemistry Analyses

Four samples were analyzed for uranium; all uranium data are considered useable as reported.

4.3 Analyses for PRS 15-007(a)

4.3.1 Inorganic Analyses

Thirteen samples, including one field duplicate, were analyzed for inorganics. Antimony in ten samples, cadmium in eleven samples, selenium and thallium in eight samples, mercury in four samples, and beryllium in one sample are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Mercury in six samples is qualified as J, because the LCS recoveries were above the established limits (80% to 120%). The results affected by the LCS recovery were useable because they were biased high. Arsenic, barium, lead, nickel, vanadium, and zinc in one sample are qualified as J because the matrix spike/matrix spike duplicate (MS/MSD) recoveries were below the established limits for each analyte (MS limits 88.4% to 96.1%; MSD limits 93.4% to 98.1%). The results affected by the matrix spike/matrix spike duplicate recoveries are useable because the analytes are detected below background UTLs, so the bias does not affect the data comparison.

Arsenic, barium, beryllium, chromium, copper, manganese, nickel, and zinc were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.3.2 Organic Analyses

Thirteen samples, including one field duplicate, were analyzed for SVOCs. Phenol, 4-nitrophenol, and 2-chlorophenol in all the samples are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because recoveries were >50%, so the analytes would be detected and quantified if present. All of the SVOCs in one sample were incorrectly qualified as UJ because the matrix spike recoveries were assumed to be outside the established limits. The data should not be qualified and are useable because the matrix spike recoveries were within the laboratory established control limits. All other SVOC data are considered useable as reported.

Eight samples were analyzed for VOCs. Acetone, benzene, carbon tetrachloride, chloroform, dichlorobromomethane, ethylbenzene, methylene chloride, toluene, trichloroethylene, 1,2-trans-dichloroethylene, 1,2-cis-dichloroethylene,1,1-dichloropropene, 1,1-dichloroethane, 1,1,1,-trichloroethane, cis-1,3-dichloropropylene in one sample are qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. All VOCs in one sample are qualified as UJ or J because the surrogate recoveries for bromofluorobenzene and dibromofluoromethane were above the established limits (74% to 121% and 80% to 120%, respectively). The data are useable because the results are biased high.

2-Butanone was detected in the laboratory blank and the sample concentrations were less than 10 times the blank concentration. The values are not qualified and are useable in the screening assessment as nondetects due to blank contamination. In addition, acetone was detected in several subsurface soil samples slightly above the EQL. Because this analyte is not expected to be present as a result of site activities and is also a common laboratory contaminant, the detected value of acetone is considered a nondetect and is useable as such. All other VOC data are considered useable as reported.

4.3.3 Radiochemistry Analyses

Thirteen samples, including one field duplicate, were analyzed for radionuclides; all radionuclide data are considered useable as reported.

4.4 Analyses for AOC C-15-005

4.4.1 Inorganic Analyses

Three samples were analyzed for inorganics. Antimony and cadmium in all the samples, beryllium, mercury, and thallium in one sample each are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Antimony and barium are qualified as J because the LCS recoveries were outside the established limits (80% to 120%). The data are useable because the recovery for antimony was <1% below the limit, so the analyte would be detected if present and the results for barium are biased high. Arsenic, chromium, cobalt, lead, nickel, selenium, silver, thallium, and vanadium in one sample are qualified as UJ or J because the matrix spike/matrix spike duplicate recoveries were below the established limits for each analyte (MS limits 92.2% to 96.1%; MDS limits 94.2% to 98.1%). The data are useable because the analytes that were detected are either well below background UTLs or, in the case of lead, well below the SAL so the bias did not affect the data comparison. The undetected analytes were also not affected by the bias because recoveries were 5% or less below the limits so they would be detected and quantified if present.

Barium, beryllium, chromium, manganese, mercury, nickel, selenium, and zinc were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.4.2 Organic Analyses

Three samples were analyzed for SVOCs. Pentachlorophenol, 4-nitrophenol, and N-nitrosodipropylamine in all the samples are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the recoveries were >50%, so the analytes would be detected and quantified if present. All of the SVOCs in one sample were incorrectly qualified as UJ because the matrix spike recoveries were assumed to be outside the established limits. The data should not be qualified and are useable because recoveries were within the laboratory established control limits. All other SVOC data are considered useable as reported.

Two samples were analyzed for VOCs. Acetone in one sample is qualified as J because the sample result was below the EQL and the MDL. The value has a high degree of uncertainty because it is near or within the instrument "noise" range. The datum is useable as an estimated value, but should be used with caution because it cannot be accurately quantified.

Acetone, 2-butanone, and bis(2-chloroisopropyl)ether were detected in the laboratory blank. The sample concentrations of acetone and 2-butanone were less than 10 times the blank concentration and sample concentrations of bis(2-chloroisopropyl)ether were less than 5 times the blank concentration. The values are not qualified and are useable in the screening assessment as nondetects due to blank contamination. All other VOC data are considered useable as reported.

4.4.3 Radiochemistry Analyses

Three samples were analyzed for radionuclides. Thorium-230 was detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank value and the results are valid. The data are not qualified and are useable in the screening assessment as detected values. All other radionuclide data are considered useable as reported.

4.5 Analyses for AOC C-15-006

4.5.1 Inorganic Analyses

One sample was analyzed for inorganics. Antimony, cadmium, and mercury are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Antimony and barium are qualified as J because the LCS recoveries were outside the established limits (80% to 120%). The data are useable because the recovery for antimony was <1% below the limit, therefore it would be detected and quantified if present and the results for barium are biased high.

Barium, beryllium, chromium, manganese, mercury, nickel, selenium, and zinc were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.5.2 Organic Analyses

One sample was analyzed for SVOCs. Pentachlorophenol, 4-nitrophenol, and N-nitrosodipropylamine in all the samples are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the recoveries were >50%, therefore the analytes would be detected and quantified if present. All other SVOC data are considered useable as reported.

4.5.3 Radiochemistry Analyses

One sample was analyzed for radionuclides. Thorium-230 was detected in the laboratory blank at or below the MDLs. The sample value is greater than 5 times the blank value and the result is valid. The datum is not qualified and is useable in the screening assessment as a detected value. All other radionuclide data are considered useable as reported.

4.6 Analyses for PRS 15-011(b)

4.6.1 Inorganic Analyses

Two samples were analyzed for inorganics. Antimony, beryllium, and selenium in both samples and silver in one sample are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Thallium data are qualified as J because the LCS recovery is above the established limits (80% to 120%). The data are useable because the results are biased high.

Antimony was detected in the laboratory blank at or below the MDL. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.6.2 Organics Analyses

Two samples were analyzed for SVOCs. All of the SVOCs in both samples are qualified as UJ because the surrogate recoveries were zero. The data are useable because the surrogate spike levels were too low to compensate for the sample dilution so percent recovery could not be determined. 1,4-Dichlorobenzene, 2-chlorophenol, pentachlorophenol, and phenol in both samples are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the recoveries were between 58% and 74.6% so the analytes would be detected and quantified if present. All other SVOC data are considered useable as reported.

One sample was analyzed for VOCs. Methylene chloride, dichlorodifluoromethane, and toluene are qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified.

Acetone was detected in several subsurface soil samples slightly above the EQL. Because this analyte is not expected to be present as a result of site activities, and is also a common laboratory contaminant, the detected value of acetone is considered a nondetect and is useable as such. All other VOC data are considered useable as reported.

Two samples were analyzed for HE; all HE data are considered useable as reported.

4.6.3 Radiochemistry Analyses

Two samples were analyzed for uranium; all uranium data are considered useable as reported.

4.7 Analyses for PRS 15-011(c)

4.7.1 Inorganic Analyses

Four samples were analyzed for inorganics. Antimony and cadmium in all the samples, beryllium, cobalt, and mercury in two samples each are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified.

Arsenic, beryllium, barium, cadmium, chromium, lead, manganese, nickel, and zinc were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.7.2 Organic Analyses

Four samples were analyzed for SVOCs. Phenol in all the samples was qualified as UJ because the LCS recovery was below the established limits (75% to 125%). The data are useable because

the recovery was <3% below the limit, so the analyte would be detected and quantified if present. All other SVOC data are considered useable as reported.

Two samples were analyzed for VOCs. Acetone, 2-butanone, methylene chloride, and trifluorochloromethane in one sample each are qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified.

Acetone, 2-butanone, and bis(2-chloroisopropyl)ether were detected in the laboratory blank. The sample concentrations of acetone and 2-butanone were less than 10 times the blank concentration and sample concentrations of bis(2-chloroisopropyl)ether were less than 5 times the blank concentration. The values are not qualified and are useable in the screening assessment as nondetects due to blank contamination. All of the VOCs in one sample are qualified as UJ or J because the 14-day holding time was exceeded by 3 days. The sample results are useable because the sample was properly stored (cooled at 4° C and preserved to a pH of 2) and the holding time was not grossly exceeded (more than two times the holding time). All other VOC data are considered useable as reported.

4.7.3 Radiochemistry Analyses

Four samples were analyzed for uranium; all uranium data are considered useable as reported.

4.8 Analyses for PRS 15-014(l)

4.8.1 Inorganic Analyses

Two samples were analyzed for inorganics. The laboratory duplicates for antimony and arsenic in one sample, beryllium in both samples, and mercury in one sample are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Antimony and thallium in one sample are qualified as J and UJ, respectively, because the matrix spike/matrix spike duplicate recoveries were below the established limits for each analyte (81.8%/78.3% and 94%/95.9%, respectively). The low bias does not affect usability of the antimony data, because the analyte was detected above its background UTL and is an order of magnitude below its SAL. The usability of the thallium data is also not affected because the recoveries were >85%, so the analyte would be detected and quantified if present. The thallium data for both samples are also qualified UJ because the LCS recovery was above the established limits (80% to 120%). The data are useable because the results are biased high.

Antimony was detected in the laboratory blank at or below the MDL. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.8.2 Organic Analyses

Two samples were analyzed for SVOCs. All of the SVOCs in both samples and 1,4-dichlorobenzene, 2,4-dinitrotoluene, 2-chlorophenol, 4-chloro-3-methyl phenol, 4-nitrophenol, N-nitrosodipropylamine, phenol, and pyrene in one sample are qualified as UJ because the surrogate recoveries and the matrix spike recoveries, respectively, were zero. The data are useable because the spike levels used for the surrogates and the matrix spikes were too low to

compensate for the sample dilution so percent recoveries could not be determined. 1,4-dichlorobenzene, 2-chlorophenol, pentachlorophenol, and phenol in both samples are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the recoveries were between 58% and 74.6% so the analytes would be detected and quantified if present. All other SVOC data are considered useable as reported.

One sample was analyzed for VOCs. Acetone, methylene chloride, and trichloroethylene are qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. In addition, acetone was detected in several subsurface soil samples slightly above the EQL. Because this analyte was detected in the laboratory blank, is not expected to be present as a result of site activities, and is also a common laboratory contaminant, the detected value of acetone is considered a nondetect and is useable as such. All other VOC data are considered useable as reported.

Two samples were analyzed for HE; all HE data are considered useable as reported.

4.8.3 Radiochemistry Analyses

Two samples were analyzed for uranium; all uranium data are useable as reported.

4.9 Analyses for PRS 15-014(j)

4.9.1 Inorganic Analyses

Five samples were analyzed for inorganics. Cadmium in all the samples, cobalt, in four samples, beryllium in three samples, antimony, mercury, and selenium in one sample each are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Antimony, copper, manganese, and mercury are qualified as UJ or J because the matrix spike/matrix spike duplicate recoveries were below the established limits for each analyte (MS limits 81.8% to 125.5%; MSD limits 78.3% to 118.5%). The data are useable because the spike levels for copper and manganese were less than the concentrations present in the samples so that recoveries could not be determined. The antimony and mercury data are usable because the recoveries were <5% below the respective limits, so antimony would be detected and quantified if present and mercury was detected well below SAL. Therefore, the bias did not affect the data comparison of these analytes.

Arsenic, barium, cadmium, chromium, lead, manganese, mercury, and nickel were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.9.2 Organic Analyses

Five samples were analyzed for SVOCs. N-nitrosodipropylamine in all the samples was qualified as UJ because the LCS recovery was below the established limits (75% to 125%). The data are useable because the recovery was <3% below the limit, so the analyte would be detected and quantified if present. All of the SVOCs in two samples were qualified as UJ because the surrogate recoveries were zero. The data are useable because the spike levels were too low to compensate

for the sample dilution so percent recovery could not be determined. All other SVOC data are considered useable as reported.

Two samples were analyzed for VOCs. Methylene chloride in both samples, benzene, dichlorobromomethane, carbon tetrachloride, ethylbenzene, 1,4-dichlorobenzene, 1,1-dichloropropene, tetrachloroethylene, 1,1,1-trichloroethane, trichloroethylene, toluene, meta-, ortho-, and para-xylenes in one sample are qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified.

All the VOC laboratory duplicates for one sample are qualified as UJ because the 14-day holding time was exceeded by one day. The sample results are useable because the sample was properly stored (cooled at 4° C and preserved to a pH of 2) and the holding time was not grossly exceeded (more than two times the holding time).

Acetone and bis(2-chloroisopropyl)ether were detected in the laboratory blank. The sample concentrations of acetone were less than 10 times the blank concentration and sample concentrations of bis(2-chloroisopropyl)ether were less than 5 times the blank concentration. The values are not qualified and are useable in the screening assessment as nondetects due to blank contamination. In addition, acetone and 2-butanane were detected in the subsurface soil at concentrations slightly above the EQL. Because acetone was detected in the laboratory blank, neither chemical is expected to be present as a result of site activities, and because both are common laboratory contaminants, the detected values are considered nondetects and are useable as such. All other VOC data are considered useable as reported.

4.9.3 Radiochemistry Analyses

Five samples were analyzed for uranium; all uranium data are considered useable as reported.

4.10 Analyses for PRS 15-014(g)

4.10.1 Inorganic Analyses

One sample was analyzed for inorganics; all inorganic data are considered useable as reported.

4.10.2 Organic Analyses

One sample was analyzed for SVOCs and HE; all SVOC and HE data are considered useable as reported.

4.10.3 Radiochemistry Analyses

One sample was analyzed for uranium; all uranium data are considered useable as reported.

4.11 Analyses for AOC C-15-010

4.11.1 Inorganic Analyses

Two samples were analyzed for inorganics. Cadmium and mercury in both samples, antimony, beryllium, cobalt, and thallium in one sample each are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or

within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified.

Arsenic, barium, cadmium, chromium, lead, manganese, mercury, and nickel were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.11.2 Organic Analyses

Two samples were analyzed for SVOCs. Acenaphthene, anthracene, dibenzo(a,h)anthracene, flourene, and naphthalene are qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Pentachlorophenol and phenol in both samples are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the recoveries were between 68% and 74%, so both analytes would be detected and quantified if present. All other SVOC data are considered useable as reported.

Two samples were analyzed for VOCs. Methylene chloride and 1,1,1-trichloroethane are qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. All the VOCs in one sample are qualified as UJ or J because the 14-day holding time was exceeded by 8 days. The sample results are useable because the sample was properly stored (cooled at 4° C and preserved to a pH of 2) and the holding time was not grossly exceeded (more than two times the holding time).

Acetone and bis(2-chloroisopropyl)ether were detected in the laboratory blank. The sample concentrations of acetone were less than 10 times the blank concentration and sample concentrations of bis(2-chloroisopropyl)ether were less than 5 times the blank concentration. The values are not qualified and are useable in the screening assessment as nondetects due to blank contamination. All other VOC data are considered useable as reported.

4.11.3 Radiochemistry Analyses

Two samples were analyzed for uranium; all uranium data are considered useable as reported.

4.12 Analyses for PRS 15-014(a)

4.12.1 Inorganic Analyses

Seven samples were analyzed for inorganics. Cadmium in all the samples, mercury in five samples, antimony in three samples, beryllium in two samples, and selenium, silver, and thallium in one sample each are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Mercury in all the samples was qualified as J because the LCS recovery was above the established limits (80% to 120%). The data are useable because the results are biased high. Antimony, barium, manganese, silver, and zinc are qualified as UJ or J because the matrix spike/matrix spike duplicates were below the established limits for each analyte (MS limits 81.8% to 93.2%; MSD limits 78.3% to 99.6%). The data are useable because the matrix

spike/matrix spike duplicate recoveries, except for antimony and manganese, were <1% below the limits. Barium, silver, and zinc were detected and are more than a factor of 2 below their background UTLs or SALs so the bias did not affect the data comparison. The manganese data are useable because the sample value was 4 times higher than the spike value so percent recovery could not be determined. The antimony datum usability is compromised for this sample because the recovery is too low (<30%) and should not be used in the screening assessment.

Barium, beryllium, manganese, and zinc were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.12.2 Organic Analyses

Seven samples were analyzed for SVOCs. 4-Chloro-3-methyl phenol, 2-chlorophenol, and 2,4-dinitrotoluene are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the recoveries were <3% below the limits so the analytes would be detected and quantified if present. All of the SVOCs for two samples are qualified as UJ because the surrogate recoveries were zero. The data are useable because the spike levels were too low to compensate for the sample dilution so percent recovery could not be determined. All other SVOC data are considered useable as reported.

Three samples were analyzed for VOCs. Methylene chloride and meta- and para-xylenes in two samples, 1,3-dichlorobenzene and toluene in one sample each are qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified.

All VOCs in one sample are qualified as UJ or J, but should be re-qualified as R4 because the surrogate recoveries were 0%. The R4 qualifier indicates that recoveries were affected by matrix interference so that the results cannot be accurately quantified. Although these data are not used in the screening assessment at this PRS, the remaining three samples are sufficient to characterize the site for VOCs.

Bromoform, 4-methyl-2-pentanone, 1,2-,1,3-,1,4-dichlorobenzenes, bis(2-chloroisopropyl) ether, ethylbenzene, methylene chloride, and toluene were detected in the laboratory blank. Sample concentrations were less than 10 times the blank concentrations for methylene chloride and toluene, and less than 5 times the blank concentrations for the other contaminants. The values are not qualified and are useable in the screening assessment as nondetects due to blank contamination. In addition, acetone was detected at concentrations slightly greater than the EQL. Because this analyte is not expected to be present as a result of site activities, and is a common laboratory contaminant, the detected value of the acetone is considered a nondetect and is useable as such. All other VOC data are considered useable as reported.

4.12.3 Radiochemistry Analyses

PRS 15-014(a) was not analyzed for radionuclides.

4.13 Analyses for PRS 15-014(b)

4.13.1 Inorganic Analyses

Thirteen samples, including one field duplicate, were analyzed for inorganics. Antimony and mercury in ten samples each, cadmium in nine samples, beryllium in three samples, and selenium in one sample are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Arsenic, barium, beryllium, chromium, cobalt, copper, lead, nickel, selenium, silver, thallium, and vanadium in one sample are qualified as UJ or J because the matrix spike/matrix spike duplicates were below the established limits for each analyte (MS limits 88.4% to 97.6%; MSD limits 93.4% to 99.6%). The data are useable because the analytes were detected either well below background UTLs or SALs so the bias did not affect the data comparisons.

Arsenic, barium, beryllium, cadmium, chromium, lead, manganese, nickel, and zinc were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.13.2 Organic Analyses

Thirteen samples, including one field duplicate, were analyzed for SVOCs. Chrysene in four samples, benzo(b)fluoranthene and benzo(a)pyrene in three samples, phenanthrene in two samples, and acenaphthene, anthracene, and indeno(1,2,3-cd)pyrene in one sample each are qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Phenol in all the samples is qualified as UJ because the LCS recovery was below the established limits (75% to 125%). The data are useable because the recovery is <3% below the limit, so the analyte would be detected and quantified if present. All of the SVOCs in one sample were incorrectly qualified as UJ because the matrix spike recoveries were assumed to be outside the established limits. The data should not be qualified and are useable because the matrix spike recoveries were within the laboratory established control limits. All other SVOC data are considered useable as reported.

Six samples were analyzed for VOCs. Acetone and methylene chloride in one sample each are qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. All of the VOCs in one sample are qualified as UJ because the surrogate recoveries for toluene-d8, bromofluorobenzene, and dibromofluoromethane were above the established limits (117%, 121%, and 120%, respectively). The data are useable because the results are biased high. All of the VOCs in two samples were qualified as UJ because the 14-day holding time was exceeded by 3 days. The sample results are useable because the sample was properly stored (cooled at 4° C and preserved to a pH of 2) and the holding time was not grossly exceeded (more than two times the holding time).

Acetone, 2-butanone, and bis(2-chloroisopropyl)ether were detected in the laboratory blank. Sample concentrations were less than 10 times the blank concentration for acetone in four samples, and less than 10 times the blank concentration for 2-butanone and less than 5 times the blank value for bis(2-chloroisopropyl)ether in all the samples. The values are not qualified and are

useable in the screening assessment as nondetects due to blank contamination. The other two acetone values were greater than 10 times the blank concentration. However, because acetone was detected in the laboratory blank, is not expected to be present as a result of site activities, and is a common laboratory contaminant, the detected values of the acetone are considered nondetects and are useable as such. These data are not qualified and are useable in the screening assessment as detected values. All other VOC data are considered useable as reported.

4.13.3 Radiochemistry Analyses

PRS 15-014(b) was not analyzed for radionuclides.

4.14 Analyses for PRS 15-009(f)

4.14.1 Inorganic Analyses

One sample was analyzed for inorganics. Arsenic, beryllium, cadmium, chromium, cobalt, copper, lead, mercury, selenium, and vanadium are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified.

Antimony, barium, cadmium, and thallium were detected in the laboratory blank at or below the MDLs. Cadmium and thallium sample concentrations were less than 5 times the blank concentrations. The values are not qualified and are useable in the screening assessment as nondetects due to blank contamination. Antimony and barium sample concentrations were greater than 5 times the blank concentrations and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.14.2 Organic Analyses

One sample was analyzed for SVOCs. Acenaphthene, 4-chloro-3-methyl phenol, 4-nitrophenol, 2-chlorophenol, 2,4-dinitrotoluene, pyrene, phenol, pentachlorophenol, and N-nitrosodipropylamine are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the surrogate recoveries were acceptable so that the analytes would be detected and quantified if present. All of the SVOCs were incorrectly qualified as UJ because the matrix spike recoveries were assumed to be below the established limits. The data should not be qualified and are useable because the matrix spike recoveries were within the laboratory established control limits.

One sample was analyzed for VOCs. Methylene chloride is qualified as J because the sample result is below the EQL and the MDL. The value has a high degree of uncertainty because it is near or within the instrument "noise" range. The datum is useable as an estimated value, but should be used with caution because it cannot be accurately quantified. All other VOC data are considered useable as reported.

One sample was analyzed for HE. 4-amino-2,6-dinitrotoluene, 2,6-dinitrotoluene, m-dinitrobenzene, meta-,ortho-,para-nitrotoluenes, sym-trinitrobenzene, TETRYL, RDX, and nitrobenzene are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the recoveries were >50%, so the analytes would be detected and quantified if present. All other HE data are considered useable as reported.

4.14.3 Radiochemistry Analyses

One sample was analyzed for uranium; all uranium data are considered useable as reported.

4.15 Analyses for PRS 15-009(k)

4.15.1 Inorganic Analyses

One sample was analyzed for inorganics. Arsenic, beryllium, cobalt, mercury, and vanadium as well as the laboratory duplicates of barium, nickel, and zinc are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Selenium is qualified as UJ because the matrix spike/matrix duplicate recoveries are below the established limits. The data are useable because the recoveries were > 50% and the LCS recoveries were acceptable, so the analyte would be detected and quantified if present.

Arsenic, beryllium, and lead were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.15.2 Organic Analyses

One sample was analyzed for SVOCs. Acenaphthene, 4-chloro-3-methyl phenol, 4-nitrophenol, 2-chlorophenol, 2,4-dinitrotoluene, pyrene, phenol, pentachlorophenol, and N-nitrosodipropylamine are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the surrogate recoveries were acceptable so that the analytes would be detected and quantified if present. All other SVOC data are considered useable as reported.

One sample was analyzed for VOCs. Methylene chloride is qualified as J because the sample result is below the EQL and the MDL. The value has a high degree of uncertainty because it is near or within the instrument "noise" range. The datum is useable as an estimated value, but should be used with caution because it cannot be accurately quantified. All other VOC data are considered useable as reported.

One sample was analyzed for HE. 4-Amino-2,6-dinitrotoluene, 2,6-dinitrotoluene, m-dinitrobenzene, meta-,ortho-,para-nitrotoluenes, sym-trinitrobenzene, TETRYL, RDX, and nitrobenzene are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the recoveries were >50%, so the analytes would be detected and quantified if present. All other HE data are considered useable as reported.

4.15.3 Radiochemistry Analyses

One sample was analyzed for uranium; all uranium data are considered useable as reported.

4.16 Analyses for PRS 15-005(b)

4.16.1 Inorganic Analyses

Four samples were analyzed for inorganics. Antimony in all samples, cadmium in two samples, and beryllium and mercury in one sample each are qualified as J because the sample results were

below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Mercury in all samples is qualified as J because the LCS recovery is above the established limits (80% to 120%). The data are useable because the results are biased high.

Barium, beryllium, manganese, and zinc were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.16.2 Organic Analyses

PRS 15-005(b) was not analyzed for organics.

4.16.3 Radiochemistry Analyses

Four samples were analyzed for uranium; all uranium data are considered useable as reported.

4.17 Analyses for PRS 15-005(c)

4.17.1 Inorganic Analyses

Two samples were analyzed for inorganics. Cadmium and mercury in both samples, and antimony and thallium in one sample are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified.

Arsenic, barium, cadmium, chromium, manganese, mercury, and nickel were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.17.2 Organic Analyses

PRS 15-005(c) was not analyzed for organics.

4.17.3 Radiochemistry Analyses

Two samples were analyzed for uranium; all uranium data are considered useable as reported.

4.18 Analyses for PRS 15-010(a)

4.18.1 Inorganic Analyses

Two samples were analyzed for inorganics. Antimony in both samples and selenium in one sample are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Chromium in both samples is qualified as J because the LCS recovery is above the established limits (80% to 120%). The data are useable because the results are biased high.

Barium, beryllium, cadmium, chromium, copper, manganese, mercury, nickel, vanadium, and zinc were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.18.2 Organic Analyses

Two samples were analyzed for SVOCs. 4-nitrophenol, 2-chlorophenol, and phenol are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the recoveries were >50%, so the analytes would have been detected and quantified if present. All of the SVOCs in both samples are qualified as UJ because the surrogate recoveries for 2-fluorobiphenyl, p-terphenyl-d14, and 2,4,6-tribromophenol were above the established limits (115%, 137%, and 122%, respectively). The data are useable because the results are biased high.

Two samples were analyzed for VOCs. Carbon tetrachloride is qualified as J because the sample result is below the EQL and the MDL. The value has a high degree of uncertainty because it is near or within the instrument "noise" range. The datum is useable as an estimated value, but should be used with caution because it cannot be accurately quantified. All of the VOC data are qualified as UJ or J because the surrogate recovery for bromofluorobenzene was above the established limit (121%). The data are useable because the results are biased high. All of the VOCs in one sample were also incorrectly qualified as UJ because the matrix spike recoveries were assumed to be outside the established limits. The data should not be qualified and are useable because the matrix spike recoveries were within the laboratory established control limits.

In addition, acetone was detected in one subsurface soil sample above the EQL. Because this analyte is not expected to be present as a result of site activities and is also a common laboratory contaminant, the detected value of the acetone is considered a nondetect and is useable as such.

Two samples were analyzed for HE; all HE data are considered useable as reported.

4.18.3 Radiochemistry Analyses

Two samples were analyzed for radionuclides; all radionuclide data are considered useable as reported.

4.19 Analyses for PRS 15-010(b)

4.19.1 Inorganic Analyses

PRS 15-010(b) was not analyzed for inorganics.

4.19.2 Organic Analyses

Four samples (one sludge, three soil) were analyzed for HE. 2-Amino-2,4-dinitrotoluene detected in one soil sample is qualified as J because the sample result is below the MDL. The value has a high degree of uncertainty because it is near or within the instrument "noise" range. The datum is useable as an estimated value, but should be used with caution because it cannot be accurately quantified. 4-amino-2,6-dinitrotoluene, 2,6-dinitrotoluene, m-dinitrobenzene, meta-,ortho-,para-nitrotoluenes, sym-trinitrobenzene, TETRYL, RDX, and nitrobenzene detected in the sludge sample are qualified as UJ because the LCS recoveries were below the established

limits (75% to 125%). The data are useable because the recoveries were >50%, so the analytes would be detected and quantified if present. All other HE data are considered useable as reported.

4.19.3 Radiochemistry Analyses

PRS 15-010(b) was not analyzed for radionuclides.

4.20 Analyses for PRS 15-014(h)

4.20.1 Inorganic Analyses

Four samples were analyzed for inorganics. Antimony and cadmium in two samples each, and beryllium, silver, and thallium in one sample each are qualified as J because the sample results were below the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. In one sample, antimony and barium, in another sample copper, lead, manganese, and zinc are qualified as UJ or J because the matrix spike/matrix spike duplicate recoveries were outside the established limits for each analyte (MS limits 81.8% to 95.6%, MSD limits 78.3% to 99.6%). The data for barium, manganese, and zinc are useable because the spike levels were too low and the percent recoveries could not be determined. The data for lead and copper are useable because results are biased high. The antimony data are useable because recovery was sufficient to detect and quantify the analyte if present.

Arsenic, barium, cadmium, chromium, lead, manganese, mercury, and nickel were detected in the laboratory blank at or below the MDLs. The sample values are greater than 5 times the blank values and are valid results. These data are not qualified and are useable in the screening assessment as detected values. All other inorganic data are considered useable as reported.

4.20.2 Organic Analyses

Four samples were analyzed for SVOCs. Benzo(b)fluoranthene, fluoranthene, and pyrene are qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified. Phenol in all the samples, pentachlorophenol in three samples, and 2-chlorophenol, 4-nitrophenol, and N-nitrosodipropylamine in one sample are qualified as UJ because the LCS recoveries were below the established limits (75% to 125%). The data are useable because the recoveries were between 62% and 74% which were sufficient to detect and quantify the analytes if present. All of the SVOCs in one sample are incorrectly qualified as UJ because the matrix spike recoveries were assumed to be below the established limits. The data should not be qualified and are useable because the matrix spike recoveries were within the laboratory established control limits. All other SVOC data are considered useable as reported.

Two samples were analyzed for VOCs. Acetone in one sample and methylene chloride in both samples are qualified as J because the sample results were below the EQLs and the MDLs. The values have a high degree of uncertainty because they are near or within the instrument "noise" range. The data are useable as estimated values, but should be used with caution because they cannot be accurately quantified.

Methylene chloride was detected in the laboratory blank and the sample concentrations were less than 10 times the blank concentration. The values are not qualified and are useable in the

screening assessment as nondetects due to blank contamination. In addition, acetone was detected in one subsurface soil sample at a concentration slightly above the EQL. Because this analyte is not expected to be present as a result of site activities and is also a common laboratory contaminant, the detected value of the acetone is considered a nondetect and is useable as such. All other VOC data are considered useable as reported.

4.20.3 Radiochemistry Analyses

PRS 15-014(h) was not analyzed for radionuclides.

4.21 Analyses for PRS 15-006(d)

4.21.1 Inorganic Analyses

Twenty-four samples, including one field duplicate, were analyzed for inorganics; all inorganics data are considered useable as reported.

4.21.2 Organic Analyses

Twenty-four samples, including one field duplicate, were analyzed for HE; all HE data are considered useable as reported.

4.21.3 Radiochemistry Analyses

Twenty-four samples, including one field duplicate, were analyzed for uranium; all uranium data are considered useable as reported.

4.22 Analyses for PRS 15-008(g)

4.22.1 Inorganic Analyses

One sample was analyzed for inorganics; all inorganics data are considered useable as reported.

4.22.2 Organic Analyses

One sample was analyzed for HE; all HE data are considered useable as reported.

4.22.3 Radiochemistry Analyses

One sample was analyzed for uranium; all uranium data are considered useable as reported.

5.0 SPECIFIC RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 PRS 15-004(g)

PRS 15-004(g) is the area known as Firing Site G and is located in the southern half of TA-15. Based on the sample results and screening assessment, uranium was retained as a COPC. This analyte was detected at concentrations greater than its screening action level (SAL) and preliminary remediation goals (PRG). An Interim Action (IA) to remove any visible pieces of surface uranium is recommended for this site. An Interim Action Plan will be submitted to the Department of Energy (DOE) in 1997. All specific results, conclusions, and recommendations will be included in the plan. This site will then be evaluated for further action.

5.2 PRS 15-001

PRS 15-001, also called the Boneyard, is an active site to the north and east of Building TA-15-233 that is being used to store equipment, steel, experimental vessels, and construction debris from Dual Axis Radiographic Hydro Test Facility (DARHT) and Pulsed High Energy Radiographic Machine Emitting X-rays (PHERMEX). It is deferred from further action until decommissioning.

5.3 PRS 15-008(c)

PRS 15-008(c) consists of several small areas near TA-15-233, west of TA-15-233, and south of the road. Based on the sample results and screening assessment, uranium was retained as a COPC. This analyte was detected at concentrations greater than its SAL and PRG. This PRS is recommended for Interim Action (IA) to remove any visible pieces of surface uranium. An Interim Action Plan will be submitted to the Department of Energy (DOE) in 1997. All specific results, conclusions, and recommendations will be included in the plan. The site will then be evaluated for further action.

5.4 PRS 15-009(i)

PRS 15-009(i) is an active septic tank located southeast of TA-15-233 that accepts sanitary waste from building TA-15-233. The site is deferred from further action until decommissioning.

5.5 AOC C-15-001

AOC C-15-001 is a soil pile in the area of Firing Site G, and is considered part of the Firing Site [PRS 15-004(g)]. We recommend the continuation of Phase I activities for the purpose of obtaining two additional isotopic uranium samples from the same locations sampled in 1995 to determine whether detected uranium in samples collected in the Phase I investigation is depleted or natural. Results of this sampling will be provided as an addendum to this RFI report in the fall of 1996. All specific results, conclusions, and recommendations will be included in the addendum.

5.6 PRS 15-004(h)

PRS 15-004(h) is an inactive Firing Site located within the active PHERMEX hazard area. Due to its close proximity to PHERMEX (within 300 ft), action will be deferred until the decommissioning of PHERMEX. Figure 5.6-1 shows the location of the PRS in relation to PHERMEX.

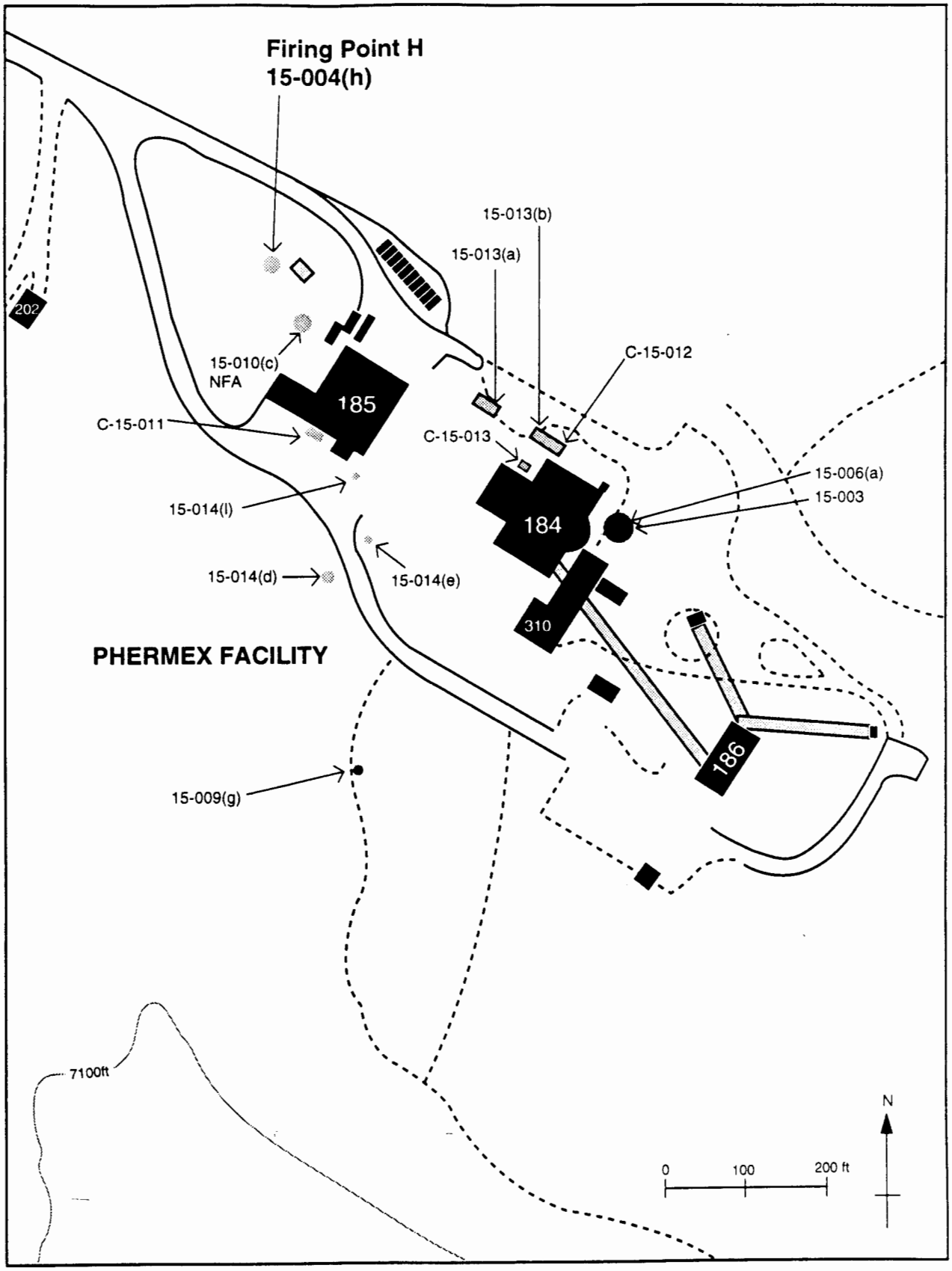


Figure 5.6-1. Location of PRS 15-004(h) in relation to PHERMEX.

5.7 AOC C-15-011

AOC C-15-011 is the site of a former underground fuel storage tank (TA-15-274) located immediately south of Building TA-15-185. Two subsurface soil samples were collected and analyzed; no COPCs were retained. Based on NFA Criterion 5, AOC C-15-011 will not be added to the HWSA module of the Laboratory RCRA operating permit and is proposed for removal from the ER Project List of PRSs.

5.7.1 History

Section 8.6.4 of the OU 1086 RFI Work Plan describes this underground storage tank. The 218-gallon tank was installed in 1973 and removed in 1987 (Francis 1992, 10-0002). The tank was constructed of 14 gause galvanized steel and had a 2½ in. vent.

5.7.2 Description

The asphalt parking lot was cut, and drilling was conducted at two depths: the bottom of the previously removed tank (6 ft) and 3 ft below that. The location of the former tank was determined with the help of personnel who had removed the tank and reported it had been 6 ft deep. The COPCs for the site were VOCs and SVOCs.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.7.3 Previous Investigations

No previous investigations occurred at this AOC.

5.7.4 Field Investigation

5.7.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the AOC and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.7.4.2 Results of Field Screening

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

5.7.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at AOC C-15-011 was to determine whether contamination was present that could be associated with site activities. Figure 5.7.4.3-1 shows the sample locations, and Table 5.7.4.3-1 summarizes the sampling conducted at this AOC.

The two samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan. The samples were analyzed for VOCs and SVOCs within prescribed holding times.

AOC C-15-011

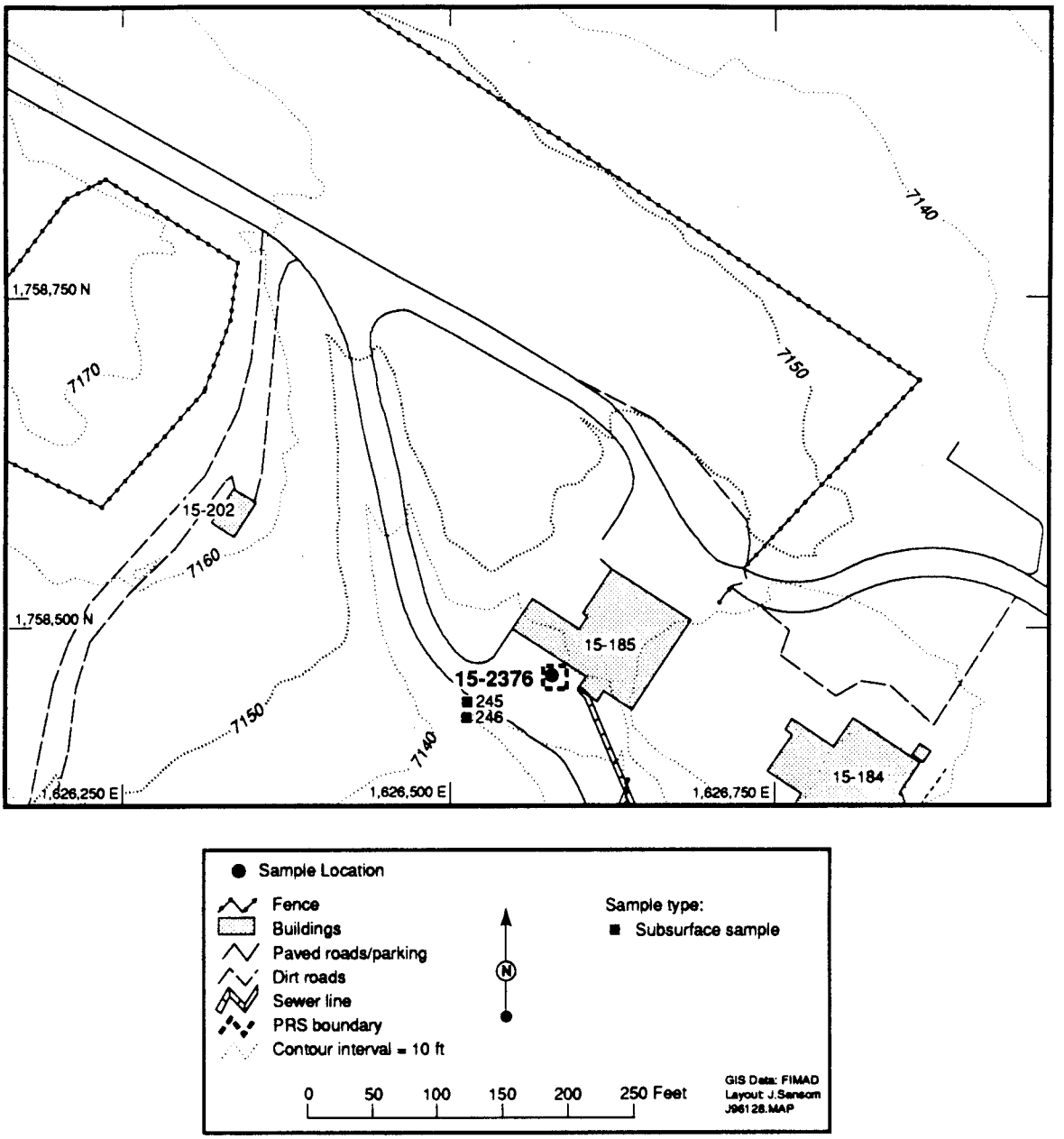


Figure 5.7.4.3-1 Location of AOC C-15-011 samples

TABLE 5.7.4.3-1
SUMMARY OF SAMPLES TAKEN - AOC C-15-011

Location ID	Sample ID	Depth (in)	Matrix	VOCs*	SVOCs*
15-2376	0215-95-0245	72-78	Soil	68411	68345
15-2376	0215-95-0246	120-126	Soil	68411	68345

* Batch numbers

5.7.5 Background Comparisons

Inorganics

Inorganic compounds were not analyzed for this site.

Radionuclides

Radionuclide compounds were not analyzed for this site.

5.7.6 Evaluation of Organic Constituents

Acetone was detected in one subsurface soil sample above the EQL (0.01 mg/kg) at a concentration of 0.016 mg/kg but was not carried forward to the SAL comparison stage because it is a common laboratory contaminant. The data usability of the detected value of acetone and the other reported organics detected below the EQLs and MDLs are addressed in Section 4.1.2.

Organics that were undetected are not retained as COPCs.

5.7.7 Human Health Assessment

5.7.7.1 Screening Assessment

No organic compounds were considered to be detected above the EQL, so screening assessment was unnecessary.

5.7.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this AOC.

5.7.8 Ecological Assessment

The general landscape condition around AOC C-15-011 is moderately developed and disturbed, but the AOC is paved and there is essentially no potential for receptors to come in contact with acetone detected below the surface (Table 2.4-1). No further ecological evaluation of this site is required.

5.7.9 Extent of Contamination

No COPCs were retained; therefore, this section is not applicable.

5.7.10 Conclusions and Recommendations

Based upon NFA Criterion 5, AOC C-15-011 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.

5.8 PRS 15-010(c)

PRS 15-010(c) is a drain line that carried only rainwater. In the Notice of Deficiency (NOD) response dated August 12, 1994, it was recommended for NFA (ER 94-J351). Because no response was received from the EPA, this site is recommended for NFA based on NFA Criterion 2.

5.9 PRS 15-014(d)

PRS 15-014(d) is an outfall/drainage. In the OU 1086 RFI Work Plan (LANL 1993, 1087), it was recommended for NFA. Because no response was received from the EPA, this site is recommended for NFA based on NFA Criterion 2.

5.10 PRS 15-014(e)

PRS 15-014(e) is an outfall and drain line that was recommended for NFA in the OU 1086 RFI Work Plan (LANL 1993, 1087). The EPA inquired as to whether any additives were added to the cooling water, and LANL responded that no additives were added. Because no response was received from the EPA, this site is recommended for NFA based on NFA Criterion 2.

5.11 PRS 15-014(l)

PRS 15-014(l) is an outfall that was recommended for NFA in the OU 1086 RFI Work Plan (LANL 1993, 1087). The EPA asked whether the cooling towers received any heavy metals. LANL responded that sodium molybdate is added to the cooling water for anti-corrosion purposes, and the total concentration is less than 200 ppm. Because no response was received from the EPA, this site is recommended for NFA based on NFA Criterion 2.

5.12 PRS 15-002

PRS 15-002 is a bermed area approximately 600 ft from Building TA-15-20 and due east of a north-south fire road. Four samples were collected from two locations. Based on the sample results and the screening assessment, we recommend NFA for this site under NFA Policy Criterion 5.

5.12.1 History

During the 1986 Comprehensive Environmental Assessment and Response Program (CEARP) field survey (DOE 1987, 0264), one former employee recalled two occasions when oil/uranium mixtures were burned 100 to 150 yd west of the site. Also, in 1992, a different employee recalled that an HE burn area was located across the road from TA-15-20. He could not recall the exact location.

Initial construction at TA-15 (R-site) was completed in 1944 (LASL 1944, 10-0044). Engineering drawing ENG-C 15208 (1956, 10-0028) shows a trash-burning area about 900 ft southwest of the TA-15-7 control room and across the road from TA-15-20.

PRS 15-002 is discussed in detail in Section 8.7 of the OU 1086 RFI Work Plan (LANL 1993, 1087).

5.12.2 Description

A berm, about 3 ft high and 10 ft in diameter, surrounds the pit on three sides. A seldom used dirt road, overgrown with vegetation, is visible leading to the burn pit. Because the activities at this PRS were undocumented, metals, VOCs, SVOCs, and uranium were analyzed.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.12.3 Previous Investigations

An aerial radiological survey was conducted in 1982 by EG&G/Energy Measurements (Fritzsche 1989, 10-0033). This survey did not detect radionuclides at levels above background.

5.12.4 Field Investigation

5.12.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.12.4.2 Results of Field Screening

HE spot tests were carried out at these sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.12.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-002 was to determine whether contamination was present that could be associated with site activities. Figure 5.12.4.3-1 shows the two sample locations, and Table 5.12.4.3-1 summarizes the sampling conducted at this PRS.

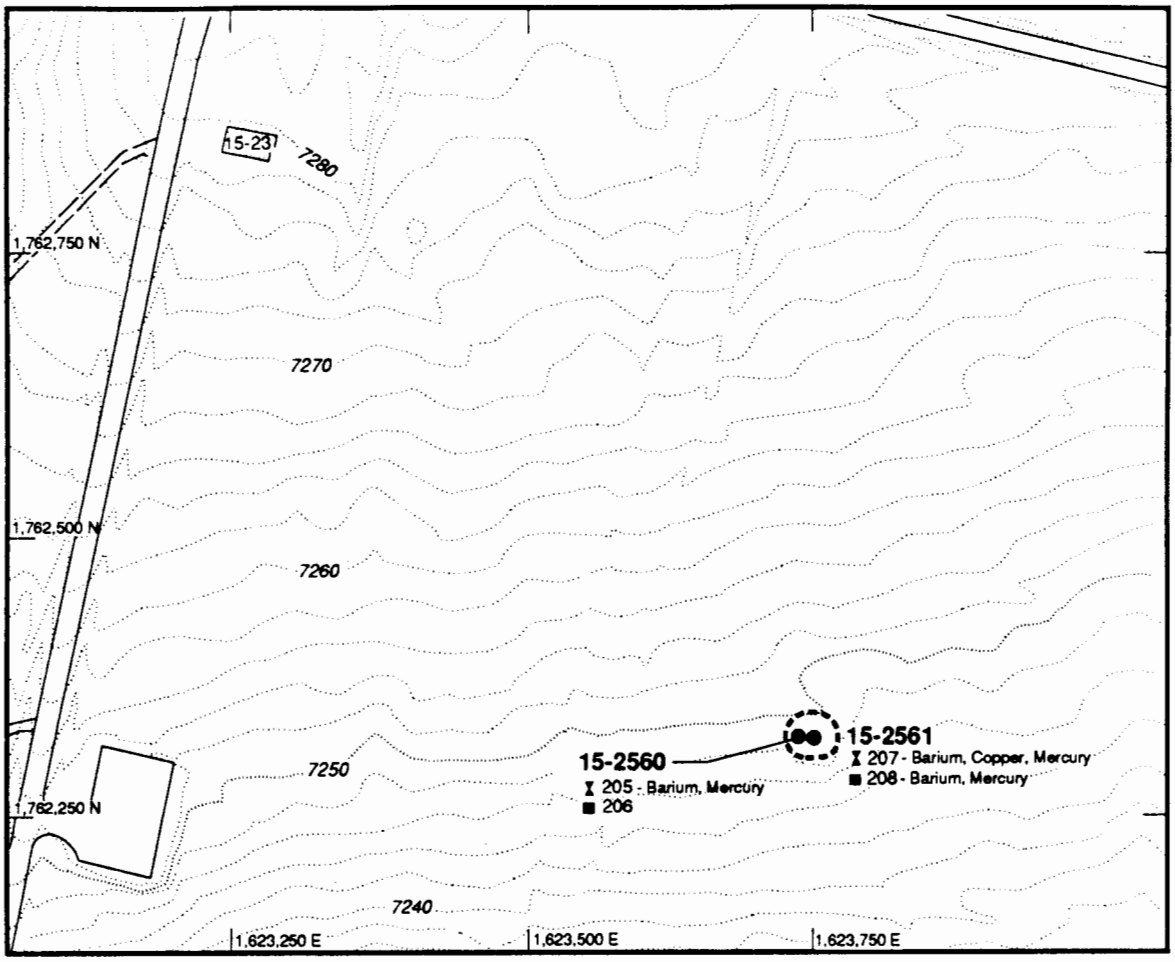
All four samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The samples were analyzed for total uranium, TAL metals, VOCs, and SVOCs within prescribed holding times.

5.12.5 Background Comparisons

Inorganics

Barium, copper, mercury, and uranium were detected in the surface and subsurface soils above their background UTLs. Further analysis of the inorganic data showed that the distribution of the uranium site concentrations was not statistically different from background (uranium: Gehan test p-value = 0.8532, Quantile test p-value = 0.5967, Slippage test p-value = 1.0000. See Section 3.2 for a discussion of these tests). As a result, uranium is not retained as a COPC.

PRS 15-002



● Sample Location—analytes listed are above background

Buildings
Paved roads/parking
Dirt roads
PRS boundary
Contour interval = 10 ft

N

Sample type:
Surface sample
Subsurface sample

0 50 100 150 200 250 Feet

GIS Data: FIMAD
Layout: J.Sansom
J96118.MAP

Figure 5.12.4.3-1 Location of PRS 15-002 samples

TABLE 5.12.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-002

Location ID	Sample ID	Depth (in)	Matrix	Total * Uranium	TAL Metals*	VOCs*	SVOCs*
15-2560	0215-95-0205	0-6	Soil	70725	71206, 71524	NA	71478
15-2560	0215-95-0206	18-24	Soil	70725	71206, 71524	71436	71478
15-2561	0215-95-0207	0-6	Soil	70725	71206, 71524	NA	71478
15-2562	0215-95-0208	18-24	Soil	70725	71206, 71524	71436	71478

* Batch numbers NA = not analyzed

The inorganics that are greater than the background UTLs are presented in Table 5.12.5-1 and were carried forward to the SAL comparison stage. The inorganics that were undetected or less than the background UTLs are not retained as COPCs.

The locations of samples with inorganics exceeding background UTLs are presented in Figure 5.12.4.3-1.

TABLE 5.12.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR PRS 15-002

Sample ID	Depth (in.)	Barium (mg/kg)	Copper (mg/kg)	Mercury (mg/kg)
LANL UTL	N/A	315	15.5	0.1
SAL	N/A	5300	2800	23
0215-95-0205	0-6	162	7.22	0.25
0215-95-0207	0-6	845	17.5	0.59
0215-95-0208	18-24	2170	9.53	0.52

N/A = not applicable

Radionuclides

Uranium, the only radionuclide analyzed for at this site, was detected above its background UTL, but its frequency distribution was not statistically different from background (see Inorganics). Therefore, uranium was not retained as a radionuclide COPC.

5.12.6 Evaluation of Organic Constituents

No organics were detected above the EQL. The reported organics detected below the EQLs and MDLs are addressed in Section 4.2.2.

5.12.7 Human Health Assessment

5.12.7.1 Screening Assessment

Barium, copper, and mercury were detected at concentrations below their respective SALs and were submitted to an MCE.

Multiple Chemical Evaluation

The MCE included three analytes in the noncarcinogenic effects category (Table 5.12.7.1-1). The sum of the maximum normalized concentrations was 0.4413, which is below the target value of 1.0. Therefore, these analytes were not retained as COPCs.

TABLE 5.12.7.1-1
MULTIPLE CHEMICAL EVALUATION - PRS 15-002

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
SOIL-NONCARCINOGENIC	
Barium	0.4094
Copper	0.0062
Mercury	0.0257
TOTAL	0.4413

5.12.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.12.8 Ecological Assessment

The general landscape condition around PRS 15-002 is a moderately disturbed grassland, and there is high potential for receptors to come in contact with ecological COPCs (barium, copper, and mercury) associated with the site (Table 2.4-1). Therefore, this PRS will be included as an ecological COPC source in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by our regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.12.9 Extent of Contamination

No human health COPCs were retained; therefore, this section is not applicable.

5.12.10 Conclusions and Recommendations

Based upon NFA Criterion 5, PRS 15-002 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.

5.13 PRS 15-007(a)

PRS 15-007(a) is designated as a material disposal area, MDA-N. Based on the laboratory sample results and further discussions with site personnel, we believe the original Phase I sampling may not have been conducted in areas of the contaminated fill. Therefore, a Phase II Plan will be prepared and submitted as an addendum to this report, if appropriate. At the time of this writing, a more precise Phase I geophysical survey is being carried out to further delineate the landfill characteristics. When this survey is completed, an addendum to this RFI report will be prepared.

5.13.1 History

PRS 15-007(a) is described in Section 9.1 in the OU 1086 RFI Work Plan (LANL 1993, 1087) The 1990 SWMU Report (LANL 1990, 0145) describes this PRS as a pit containing remnants of

several structures from R-Site that had been exposed to explosives or chemical contamination. MDA-N was opened in 1962 and covered by 1965.

5.13.2 Description

MDA-N is under an open field at the intersection of two roads. The MDA is believed to be approximately 300 ft long and 100 ft wide. Pieces of metal and rebar are visible at the surface which is mounded from the original grade of the land.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.13.3 Previous Investigations

No previous investigations were performed at this PRS.

5.13.4 Field Investigation

A geophysical survey was conducted in 1995 which was inconclusive as to the location of the MDA. Survey results indicated possible subsurface metallic objects in several locations, but did not record the boundaries of the landfill. Soil samples were collected at seven locations based on geophysics rather than the locations proposed in the RFI Work Plan (LANL 1993, 1087); however, we believe these sample locations did not fully characterize the site based on analytical results.

5.13.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.13.4.2 Results of Field Screening

HE spot tests were carried out at these sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled to assist in determining which samples would be submitted for offsite analysis on the basis of metals content. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling to assist in determining which samples would be submitted for offsite analysis on the basis of metals content. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.13.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-007(a) was to determine whether contamination was present that could be associated with site activities. Figure 5.13.4.3-1 shows the sample locations, and Table 5.13.4.3-1 summarizes the sampling conducted at this PRS.

Of the 22 samples collected, 13 were submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The samples were analyzed for isotopic thorium, total uranium, TAL metals, VOCs, and SVOCs within prescribed holding times.

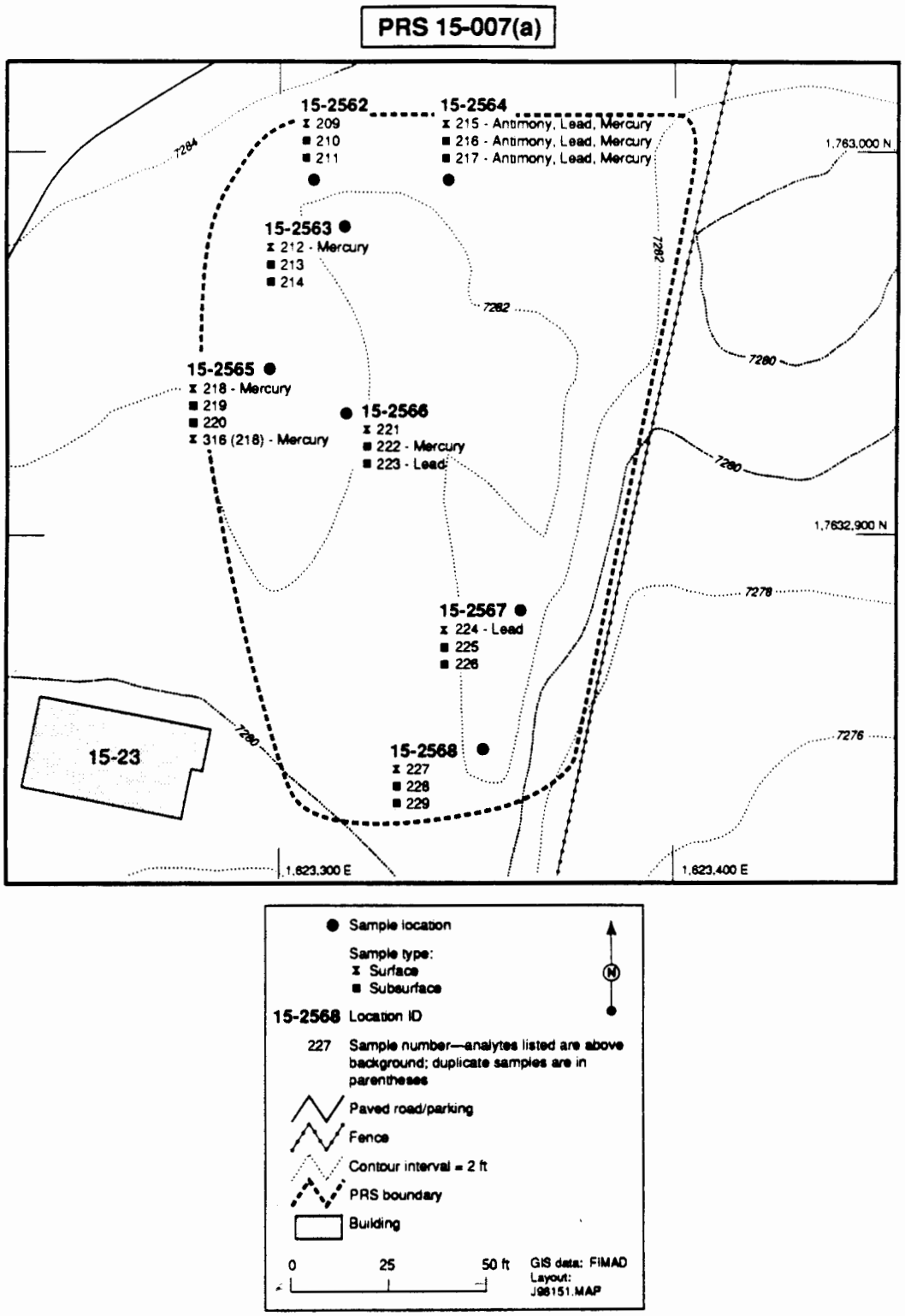


Figure 5.13.4.3-1 Location of PRS 15-007(a) samples

TABLE 5.13.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-007(a)

Location ID	Sample ID	Depth (in)	Matrix	Isotopic* Thorium	Total* Uranium	TAL* Metals	VOCs*	SVOCs*
15-2562	0215-95-0209	0-6	Soil	Not submitted for analysis, in accordance with Work Plan				
15-2562	0215-95-0210	18-24	Soil	Not submitted for analysis, in accordance with Work Plan				
15-2562	0215-95-0211	40-46	Soil	70177	70066	70468, 70268	70563	70324
15-2563	0215-95-0212	0-6	Soil	70177	70066	70468, 70268	NA	70324
15-2563	0215-95-0213	18-24	Soil	70177	70066	70468, 70268	70563	70324
15-2563	0215-95-0214	50-56	Soil	Not submitted for analysis, in accordance with Work Plan				
15-2564	0215-95-0215	0-6	Soil	70177	70066	70468, 70268	NA	70324
15-2564	0215-95-0216	18-24	Soil	70177	70066	70468, 70268	70563	70324
15-2564	0215-95-0217	33-39	Soil	70177	70066	70468, 70268	70563	70324
15-2565	0215-95-0218	0-6	Soil	70177	70066	70468, 70756	NA	70324
15-2565	0215-95-0219	18-24	Soil	Not submitted for analysis, in accordance with Work Plan				
15-2565	0215-95-0220	26-32	Soil	Not submitted for analysis, in accordance with Work Plan				
15-2566	0215-95-0221	0-6	Soil	Not submitted for analysis, in accordance with Work Plan				
15-2566	0215-95-0222	18-24	Soil	70177	70066	70468, 70756	70563	70324
15-2566	0215-95-0223	29-35	Soil	70177	70066	70468, 70756	70563	70324
15-2567	0215-95-0224	0-6	Soil	70177	70066	70468, 70756	NA	70324
15-2567	0215-95-0225	18-24	Soil	Not submitted for analysis, in accordance with Work Plan				
15-2567	0215-95-0226	48-54	Soil	Not submitted for analysis, in accordance with Work Plan				
15-2568	0215-95-0227	0-6	Soil	Not submitted for analysis, in accordance with Work Plan				
15-2568	0215-95-0228	18-24	Soil	70177	70066	70468, 70756	70563	70324
15-2568	0215-95-0229	30-36	Soil	70177	70066	70468, 70756	70563	70324
15-2565	0215-95-316	0-6	Soil	70177	70066	70468, 70756	NA	NA

* Batch numbers
NA = Not Analyzed

5.13.5 Background Comparisons

Inorganics

Antimony, copper, lead, mercury, uranium, and zinc were detected in the surface and subsurface soils at concentrations above their background UTLs. Further analyses of the inorganic data showed that the distributions of the copper, uranium, and zinc site concentrations were not statistically different from background (copper: Gehan test p-value = 0.1694, Quantile test p-value = 0.4397, Slippage test p-value = 0.0645; uranium: Gehan test p-value = 1.0000, Quantile test p-value = 0.9356, Slippage test p-value = 1.0000; zinc: Gehan test p-value = 0.7202, Quantile test p-value = 0.4476, Slippage test p-value = 0.0652. See Section 3.2 for a discussion of these tests.). As a result, copper, uranium, and zinc are not retained as COPCs.

The inorganics that are greater than the background UTLs are presented in Table 5.13.5-1 and were carried forward to the SAL comparison stage. The inorganics that were undetected or less than background UTLs are not retained as COPCs.

The locations of samples with inorganics exceeding background UTLs are presented in Figure 5.13.4.3-1.

TABLE 5.13.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR PRS 15-007(a)

Sample ID	Depth (in.)	Antimony (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)
LANL UTL	N/A	1.0	23.3	0.1
SAL	N/A	31	400	23
0215-95-0212	0-6	0.21(J)[1]	11.4	0.23
0215-95-0215	0-6	2.06	25.8	0.76
0215-95-0216	18-24	3.34	33.2	1.63
0215-95-0217	33-39	3.35	106	0.82
0215-95-0218	0-6	0.4(J)[1]	14.4	0.58
0215-95-0222	18-24	0.22(J)[1]	13.2	0.4
0215-95-0223	29-35	0.18(J)[1]	26	0.082
0215-95-0224	0-6	0.23(J)[1]	198	0.006(J)[1]
0215-95-0316	0-6	0.25(J)[1]	15.7	0.57

N/A = not applicable
[1] Sample values are below the method detection limits (Section 4.3.1). J = estimated, U = undetected.

Radionuclides

Uranium was detected at a concentration above its background UTL, but was not found to be statistically different from background (see Inorganics). Therefore, uranium is not retained as a radionuclide COPC. The other radionuclides that were undetected or less than background UTLs were not retained as COPCs.

5.13.6 Evaluation of Organic Constituents

Acetone was detected in subsurface soils at concentrations (0.012 - 0.03 mg/kg) above the EQL (0.01 mg/kg) but was not carried forward to the SAL comparison stage because it is a common laboratory contaminant. The data usability of these acetone values and reported organics detected below the EQLs and MDLs are addressed in Section 4.3.2.

Organics that were undetected or detected below the EQLs are not retained as COPCs.

5.13.7 Human Health Assessment

5.13.7.1 Screening Assessment

Antimony, lead, and mercury were below their respective SALs and were submitted to an MCE.

Multiple Chemical Evaluation

The MCE included three analytes in the noncarcinogenic effects category (Table 5.13.7.1-1). The sum of the maximum normalized concentrations was 0.6740, which is below the target value of 1.0. Therefore, these analytes were not retained as COPCs.

TABLE 5.13.7.1-1
MULTIPLE CHEMICAL EVALUATION - PRS 15-007(a)

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
SOIL-NONCARCINOGENIC	
Antimony	0.1081
Lead	0.4950
Mercury	0.0709
TOTAL	0.6740

5.13.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.13.8 Ecological Assessment

The general landscape condition around PRS 15-007(a) is moderately developed and disturbed, and there is moderate potential for receptors to come in contact with ecological COPCs (antimony, lead, mercury, uranium, and acetone) associated with the site (Table 2.4-1). Therefore, this PRS will be included as an ecological COPC source in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by our regulators.

Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.13.9 Extent of Contamination

No human health COPCs were retained; therefore, this section is not applicable.

5.13.10 Conclusions and Recommendations

Though the samples collected during Phase I sampling indicated that no COPCs were present, further characterization of the landfill is warranted. A second geophysical survey using new geophysical methods, currently being conducted, may help establish additional sampling locations that will delineate the boundaries of the site. Based on the geophysical survey, a decision will be made regarding further action at this PRS, which will be reported in an addendum to this RFI report.

5.14 AOC C-15-005

AOC C-15-005 is the site of former Building TA-15-1. Four soil samples were collected from the location of the former building. Based on the sample results and screening assessment, we are recommending NFA for this site under NFA Policy Criterion 5.

5.14.1 History

The building had been removed by 1962. This building may have been the original laboratory and shop for R-Site. Little is known about activities in the building that may have involved hazardous materials. COPCs described in the Work Plan (LANL 1993, 1087) included metals, HE, and VOCs.

5.14.2 Description

AOC C-15-005 is described in detail in Section 9.1 of the OU 1086 RFI Work Plan (LANL 1993, 1087). The site of the former building is in a field adjacent to R-Site Road.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.14.3 Previous Investigations

Prior to 1965, thorium contamination was found in Building TA-15-1 and was cleaned up (Buckland 1965, 10-0032).

5.14.4 Field Investigation

5.14.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the AOC and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.14.4.2 Results of Field Screening

HE spot tests were carried out at these sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled to assist in determining which samples would be submitted for offsite analysis on the basis of metals content. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling to assist in determining which samples would be submitted for offsite analysis on the basis of metals content. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.14.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at AOC C-15-005 was to determine whether contamination was present that could be associated with site activities. Figure 5.14.4.3-1 shows the sample locations, and Table 5.14.4.3-1 summarizes the sampling conducted at this AOC.

Three of the four samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The samples were analyzed for TAL metals, isotopic thorium and total uranium, VOCs, and SVOCs within prescribed holding times.

TABLE 5.14.4.3-1
SUMMARY OF SAMPLES TAKEN - AOC C-15-005

Location ID	Sample ID	Depth (in)	Matrix	TAL* Metals	Isotopic Thorium & Total Uranium*	VOCs*	SVOCs*
15-2569	0215-95-0230	0-6	Soil	69704, 70012	69788, 70390	NA	70234
15-2569	0215-95-0231	18-24	Soil	69704, 70012	69788, 70390	70369	70234
15-2570	0215-95-0232	0-6	Soil	Not submitted for analysis, in accordance with Work Plan			
15-2570	0215-95-0233	18-24	Soil	69704, 70012	69788, 70390	70369	70234

* Batch numbers NA = not analyzed

5.14.5 Background Comparisons

Inorganics

Inorganics detected at concentrations above their background UTLs are presented in Table 5.14.5-1 and were carried forward to the SAL comparison stage. The inorganics that were undetected or less than the background UTLs were not retained as COPCs.

The locations of samples with inorganics exceeding background UTLs are presented in Figure 5.14.4.3-1.

Radionuclides

Uranium was detected in the surface soil at a concentration of 13.6 mg/kg, which is above its background UTL of 5.45 mg/kg (Table 5.14.5-1) and was carried forward to the SAL comparison stage. The radionuclides that were undetected or less than background UTLs were not retained as COPCs.

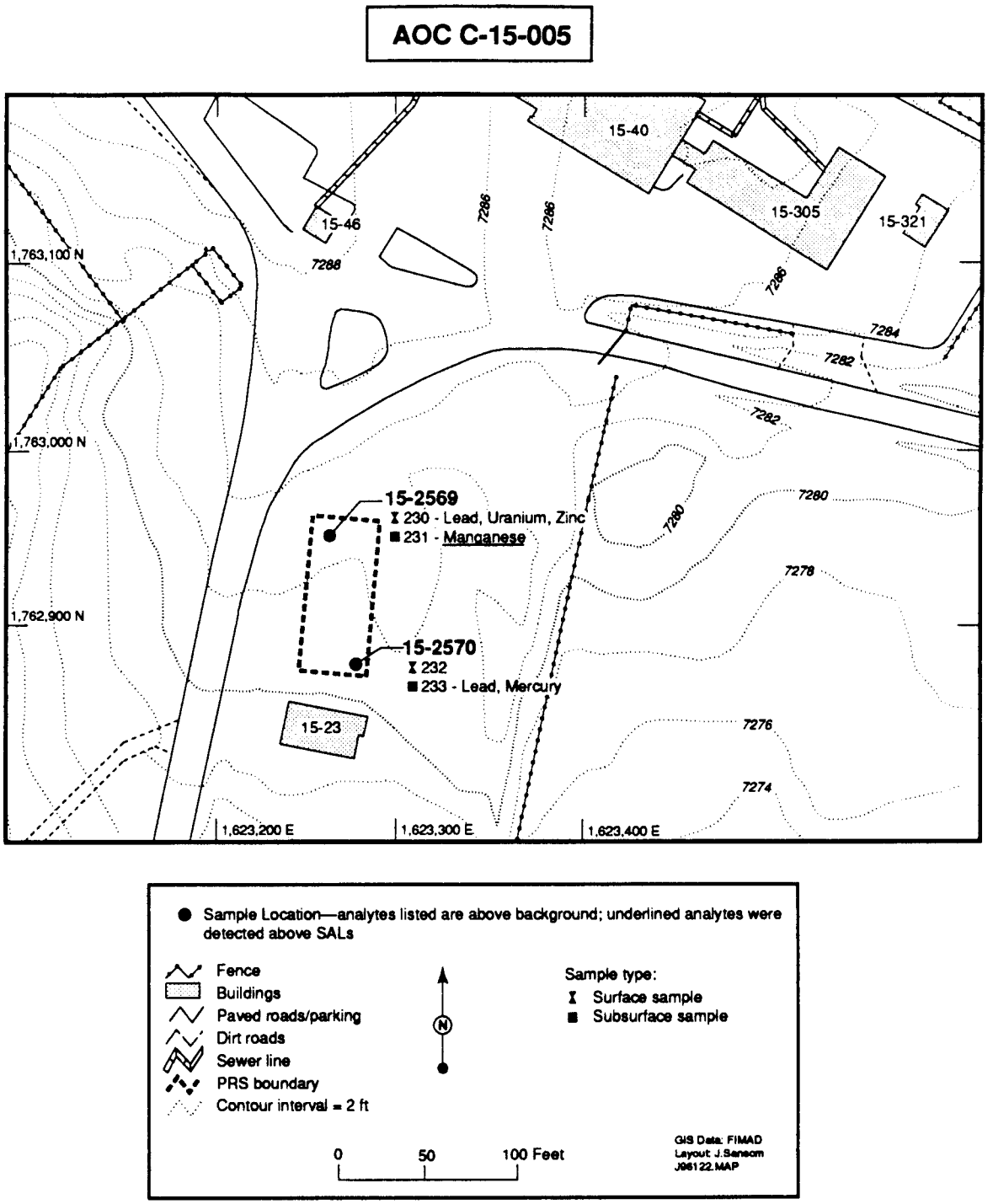


Figure 5.14.4.3-1 Location of AOC C-15-005 samples

TABLE 5.14.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR C-15-005

Sample ID	Depth (in.)	Lead (mg/kg)	Manganese (mg/kg)	Mercury (mg/kg)	Uranium (mg/kg)	Zinc (mg/kg)
LANL UTL	N/A	23.3	714	0.1	5.45	50.8
SAL	N/A	400	Not Available	23	230/29*	23000
0215-95-0230	0-6	28.4(J)	195	0.018(J)[1]	13.6	156
0215-95-0231	18-24	15.2	724	0.082	2.9	27.6
0215-95-0233	18-24	29.5	161	0.22	1.29	38.1

N/A = not applicable
* Uranium SAL of 230 mg/kg is based on systemic effects; natural uranium SAL of 29 mg/kg is based on radiation dose.
[1] Sample value is below the method detection limit (Section 4.4.1).
J = estimated, U = undetected.

The locations of samples with uranium exceeding its background UTL are presented in Figure 5.14.4.3-1.

5.14.6 Evaluation of Organic Constituents

No organics were detected above the EQL. The reported organics detected below the EQLs and MDLs are addressed in Section 4.4.2.

5.14.7 Human Health Assessment

5.14.7.1 Screening Assessment

Lead, mercury, uranium, and zinc were detected at concentrations below their respective SALs and were submitted to an MCE.

Because manganese was detected in one subsurface soil sample at a concentration above its background UTL of 714 mg/kg (Table 5.14.5-1) and because it has no SAL, it was retained as a COPC.

Samples were not analyzed for isotopic uranium; therefore, using the ratio of uranium-234 to uranium-238 to determine whether the uranium was natural or depleted could not be done. Because the RFI Work Plan indicates that both natural and depleted uranium may have been used at TA-15, the more conservative of the two SALs of radionuclide uranium, i.e., natural uranium, was used in the screening assessment. Uranium was detected below its natural uranium SAL of 29 mg/kg and was not retained as a radionuclide COPC. It was not submitted to an MCE because it was the only radionuclide above background.

Multiple Chemical Evaluation

The MCE included four analytes in the noncarcinogenic effects category (Table 5.14.7.1-1). The sum of the maximum normalized concentrations was 0.1493, which is below the target value of 1.0. Therefore, these analytes are not retained as COPCs.

TABLE 5.14.7.1-1
MULTIPLE CHEMICAL EVALUATION - C-15-005

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
SOIL-NONCARCINOGENIC	
Lead	0.0738
Mercury	0.0096
Uranium	0.0591
Zinc	0.0068
TOTAL	0.1493

5.14.7.2 Risk Assessment

The site-specific preliminary remediation goal (PRG) for manganese was calculated to determine if the detected concentration above the background UTL warranted corrective action. Calculation of the PRG was based on an intrusive industrial exposure scenario because it was detected at a depth of 18 to 24 in. (Appendix C). The PRG for manganese was calculated to be 2030 mg/kg, which is markedly greater than the maximum concentration detected in the soil (724 mg/kg). Therefore, manganese was not retained as a COPC because it was below the cleanup level.

5.14.8 Ecological Assessment

The general landscape condition around AOC C-15-005 is moderately developed and disturbed, and there is moderate potential for receptors to come in contact with ecological COPCs (lead, mercury, uranium, and zinc) associated with the site (Table 2.4-1). Therefore, this AOC will be included as an ecological COPC source in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by our regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.14.9 Extent of Contamination

No human health COPCs were retained; therefore, this section is not applicable.

5.14.10 Conclusions and Recommendations

Based upon NFA Criterion 5, AOC C-15-005 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.

5.15 AOC C-15-006

AOC C-15-006 is the site of former Building TA-15-7. Two soil samples were collected from the location of the former building. Based on the sample results and screening assessment, we are recommending NFA for this site under NFA Policy Criterion 5.

5.15.1 History

The building had been removed by 1962. This building may have been used as a darkroom, but little is known about activities in the building that may have involved hazardous materials. COPCs described in the Work Plan (LANL 1993, 1087) included metals, HE, and VOCs.

5.15.2 Description

AOC C-15-006 is described in detail in Section 9.1 of the OU 1086 RFI Work Plan (LANL 1993, 1087). The site of the former building is in a field at the intersection of the road to Firing Site E-F and the road to R-183.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.15.3 Previous Investigations

Prior to 1953, a mercury spill occurred in Building TA-15-7 and was cleaned up (H Division 1953, 0624).

5.15.4 Field Investigation

5.15.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the AOC and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.15.4.2 Results of Field Screening

An HE spot test was carried out at this sample location before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling to assist in determining which samples would be submitted for offsite analysis on the basis of metals content. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.15.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at AOC C-15-006 was to determine whether contamination was present that could be associated with site activities. Figure 5.15.4.3-1 shows the sample locations, and Table 5.15.4.3-1 summarizes the sampling conducted at this AOC.

One of the two samples collected was submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The sample was analyzed for TAL metals, isotopic thorium and total uranium, and SVOCs within prescribed holding times.

5.15.5 Background Comparisons

Inorganics

No inorganic compounds were detected at concentrations above the background UTLs; therefore, they were not retained as COPCs.

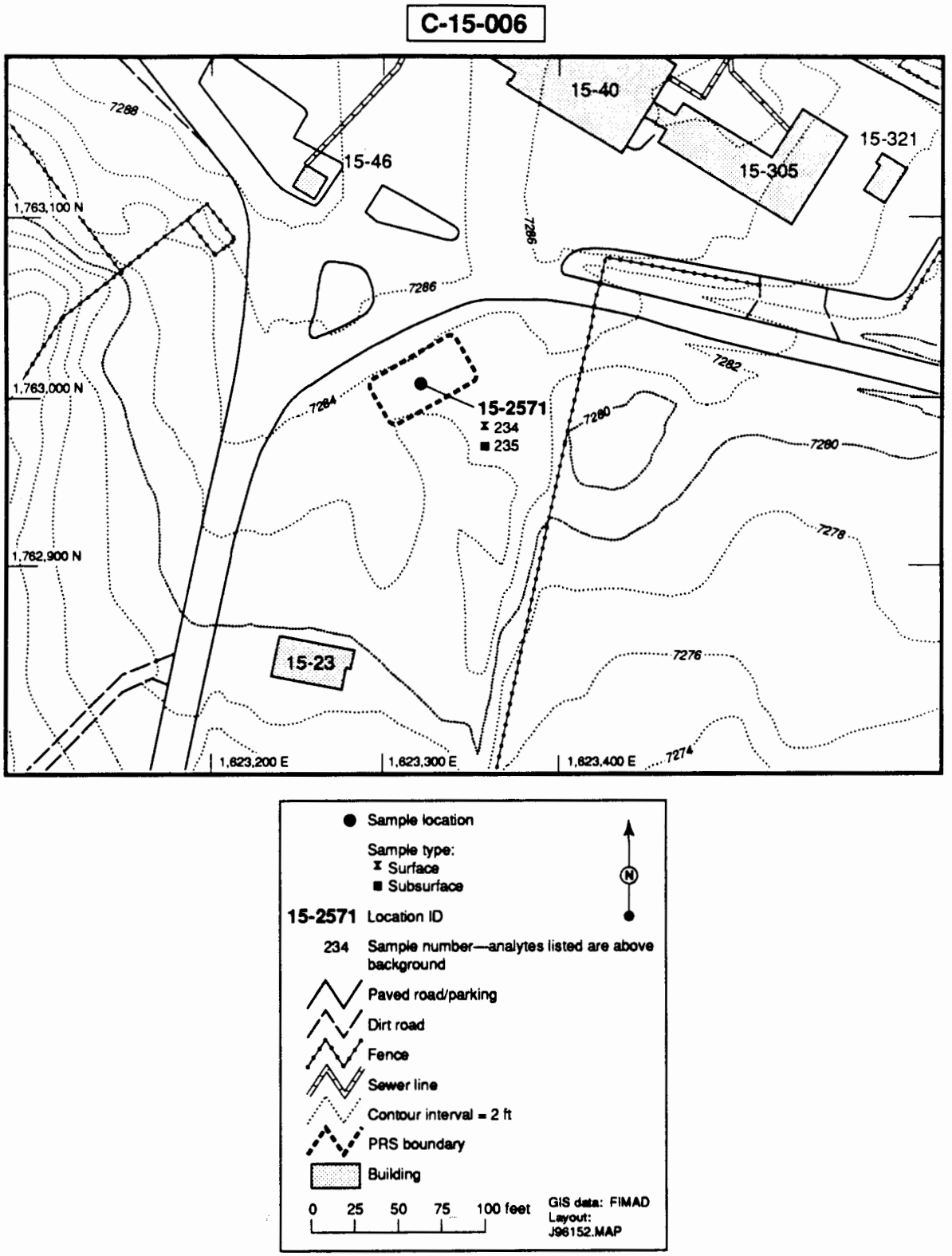


Figure 5.15.4.3-1 Location of AOC C-15-006 samples

TABLE 5.15.4.3-1
SUMMARY OF SAMPLES TAKEN - AOC C-15-006

Location ID	Sample ID	Depth (in)	Matrix	TAL Metals*	Isotopic Thorium & Total Uranium*	SVOCs*
15-2571	0215-95-0234	0-6	Soil	69704, 70012	69788, 70390	70234
15-2571	0215-95-0235	18-24	Soil	Not submitted for analysis, in accordance with the Work Plan		

* Batch numbers

Radionuclides

No radionuclide compounds were detected at concentrations above the background UTLs; therefore, they were not retained as COPCs.

5.15.6 Evaluation of Organic Constituents

No organics were detected; therefore, they were not retained as COPCs.

5.15.7 Human Health Assessment

5.15.7.1 Screening Assessment

No inorganics or radionuclides were detected above background UTLs, and no organics were detected. Therefore, a screening assessment was not conducted.

5.15.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable risk to human health exists at this site.

5.15.8 Ecological Assessment

No inorganics were detected above their background UTLs and no organics were detected, so these constituents were eliminated as contaminant sources for ecological risk. Therefore, no further ecological evaluation of this site is required.

5.15.9 Extent of Contamination

No COPCs were retained; therefore, this section is not applicable.

5.15.10 Conclusions and Recommendations

Based upon NFA Criterion 5, AOC C-15-006 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.

5.16 PRS 15-009(a)

PRS 15-009(a) is an active septic tank located 8 ft 6 in. south of the southwest corner of building TA-15-50. It is deferred from further action until decommissioning.

5.17 PRS 15-011(a)

PRS 15-011(a) is described in the OU 1086 RFI Work Plan in Section 10.1.5.2 as a sump connected to trench drains from Building TA-15-20, that in turn drained to an outfall at the edge of Water Canyon [PRS 15-011(c)] (LANL 1993, 1087).

Upon investigation, it was found that PRS 15-011(a) is not a sump, but a group of concrete trench drains that contain no sampling media. No visible cracks were observed in the drains. The outfall eventually drains to PRS 15-011(c), which was sampled (see Section 5.19). Any transported contaminants would have been detected in the investigation of PRS 15-011(c). Based on NFA Policy Criterion 1, we are recommending NFA for this PRS.

5.18 PRS 15-011(b)

PRS 15-011(b) is described in the RFI Work Plan as a drain line serving Building TA-15-194 and a drywell. In the NOD response (ER 95-J351), PRS 15-011(b) is described as a sump. The drainline leading to the canyon edge was sampled.

5.18.1 History

PRS 15-011(b) is described in detail in Section 10.1 of the RFI Work Plan (LANL 1993, 1087). The site may have received degreasers, solutions containing sulfuric acid, chromates, and/or hydrochloric acid or radioactivity.

5.18.2 Description

This PRS is a dirt drainage ditch leading to PRS 15-011(c).

A description of the geology, hydrology, soils, and wildlife habitats is presented in Chapter 2.

5.18.3 Previous Investigation(s)

No previous investigations were performed at this PRS.

5.18.4 Field Investigation

5.18.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.18.4.2 Results of Field Screening

An HE spot test was carried out at this sample location before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample location consisted of screening the actual soil being samples. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

5.18.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-011(b) was to determine whether contamination was present that could be associated with site activities. Figure 5.18.4.3-1 shows the sample locations, and Table 5.18.4.3-1 summarizes the sampling conducted at this PRS.

Both samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The samples were analyzed for HE, total uranium, TAL metals, and SVOCs within prescribed holding times. The subsurface sample was also analyzed for VOCs.

TABLE 5.18.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-011(b)

Location ID	Sample ID	Depth (in)	Matrix	HE*	TAL Metals*	Total Uranium*	VOCs*	SVOCs*
15-2388	0215-95-0704	0-6	Soil	82462	82469, 82886	82461	NA	82474
15-2388	0215-95-0705	10-16	Soil	82462	82469, 82886	82461	82481	82474

* Batch numbers NA= not analyzed

5.18.5 Background Comparisons

Inorganics

Inorganics detected at concentrations above their background UTLs are presented in Table 5.18.5-1 and were carried forward to the SAL comparison stage. The inorganics that were undetected or less than the background UTLs are not retained as COPCs.

The locations of samples with inorganics exceeding the background UTLs are presented in Figure 5.18.4.3-1.

TABLE 5.18.5-1
INORGANICS WITH CONCENTRATIONS GREATEER THAN BACKGROUND UTLs FOR PRS 15-011(b)

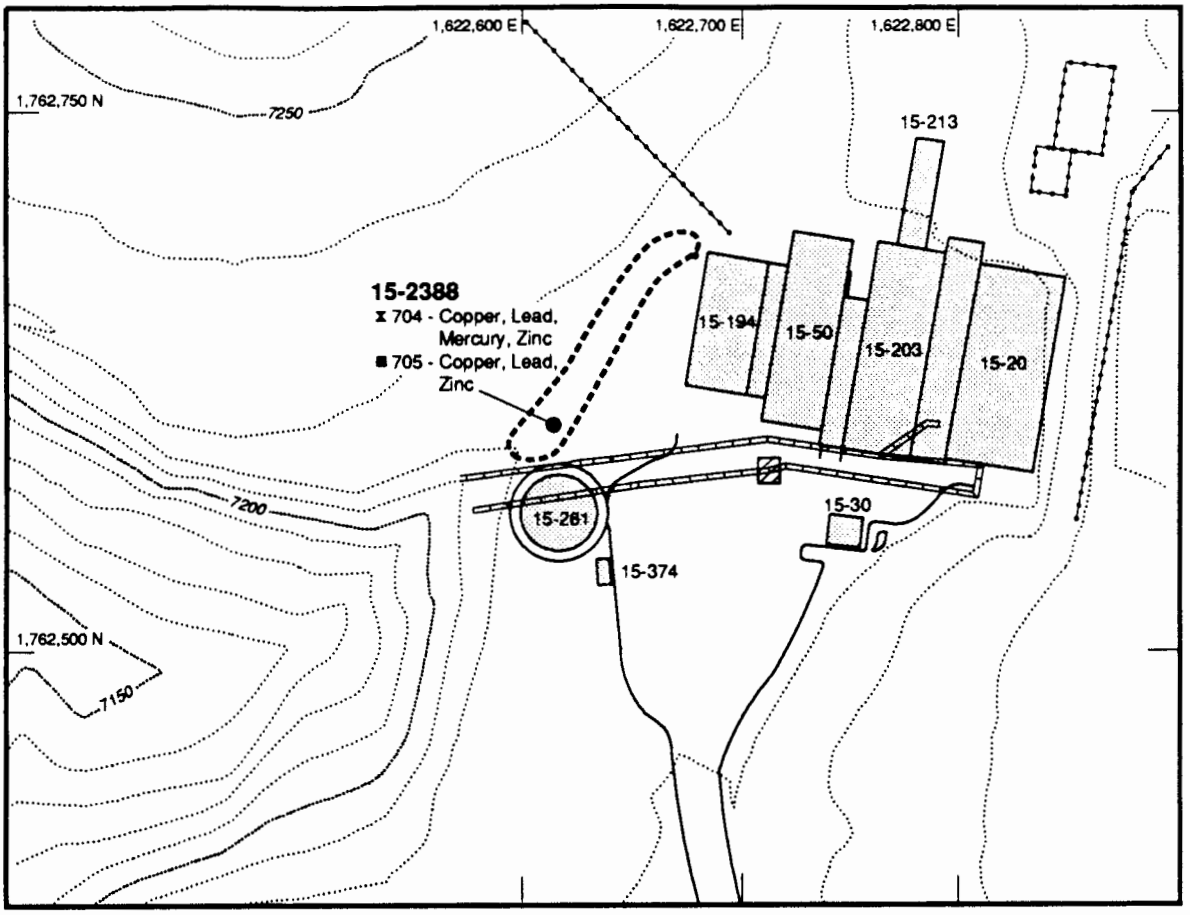
Sample ID	Depth (in)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Zinc (mg/kg)
LANL UTL	N/A	15.5	23.3	0.1	50.8
SAL	N/A	2800	400	23	23000
0215-96-0704	0-6	117.4	197	0.15	116.3
0215-96-0705	10-16	94	63.7	0.071	107.3

N/A = not applicable

Radionuclides

Uranium, the only radionuclide analyzed for at this site, was detected at concentrations below its background UTL and was not retained as a COPC.

PRS 15-011(b)



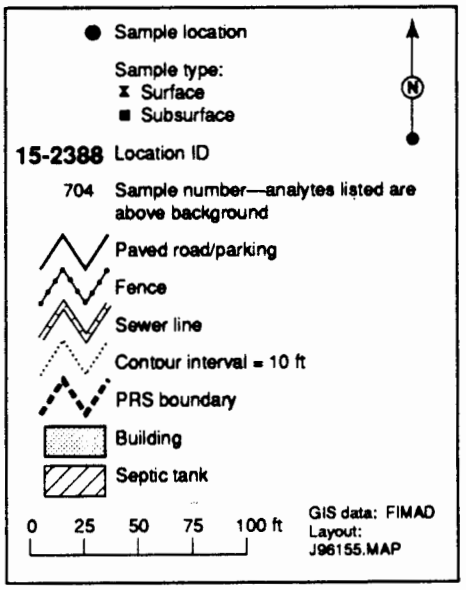


Figure 5.18.4.3-1 Location of PRS 15-011(b) samples

5.18.6 Evaluation of Organic Constituents

Acetone was reported in the subsurface sample at a concentration of 0.0103 mg/kg above the EQL (0.01 mg/kg) but was not carried forward to the SAL comparison stage because it is a common laboratory contaminant. The data usability of the acetone and the reported organics detected below the EQLs and MDLs are addressed in Section 4.6.2.

Organics that were undetected or detected below the EQLs were not retained as COPCs.

5.18.7 Human Health Assessment

5.18.7.1 Screening Assessment

Copper, lead, mercury, and zinc were detected at concentrations below their respective SALs and were submitted to an MCE.

Multiple Chemical Evaluation

The MCE included four analytes in the noncarcinogenic effects category (Table 5.18.7.1-1). The sum of the maximum normalized concentrations is 0.5459, which is less than the target value of 1.0. Therefore, these analytes were not retained as COPCs.

TABLE 5.18.7.1-1
MULTIPLE CHEMICAL EVALUATION - PRS 15-011(b)

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
SOIL-NONCARCINOGENIC	
Copper	0.0418
Lead	0.4925
Mercury	0.0065
Zinc	0.0051
TOTAL	0.5459

5.18.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.18.8 Ecological Assessment

General landscape condition around 15-011(b) is moderately developed and disturbed and there is high potential for receptors to come in contact with ecological COPCs (copper, lead, mercury, and zinc) associated with the site (Table 2.4-1). Therefore, this PRS will be included as an ecological COPC source in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by our regulators. Threatened and endangered species and /or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.18.9 Extent of Contamination

No human health COPCs were retained; therefore, this section is not applicable.

5.18.10 Conclusions and Recommendations

Based upon NFA Criterion 5, PRS 15-011(b) will not be added to the HSWA module of the Laboratory RCRA operation permit and is proposed for removal from the ER Project List of PRSs.

5.19 PRS 15-011(c)

PRS 15-011(c) is located at the edge of the mesa top where all the outfalls from operations within the buildings in The Hollow combine to flow into Cañon de Valle. Four soil samples were collected along the drainages. Based on the sample results and screening assessment, we recommend NFA for this site under NFA Policy Criterion 5.

5.19.1 History

This drainage serves the outfalls from buildings within The Hollow (bowl-like depression area within TA-15) that have had various uses as assembly buildings, laboratories, and shops. The buildings, and also the drainage, are still in use by the Laboratory's Hydrodynamics Groups.

5.19.2 Description

PRS 15-011(c) is described in detail in Section 10.1.2 in the OU 1086 RFI Work Plan (LANL 1993, 1087). The intersection of the drainages is located approximately 100 ft below the elevation of the buildings. Samples from location 15-2594 were collected at the intersection of the drainages, while samples from location 15-2558 were the background samples discussed in the NOD response on August 24, 1994 (ER 94-J315). COPCs for this site include uranium, beryllium, lead, chromium, VOCs, and SVOCs.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.19.3 Previous Investigations

No previous investigations were performed at this PRS.

5.19.4 Field Investigation

5.19.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.19.4.2 Results of Field Screening

HE spot tests were carried out at these sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.19.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-011(c) was to determine whether contamination was present that could be associated with site activities. Figure 5.19.4.3-1 shows the sample locations and Table 5.19.4.3-1 summarizes the sampling conducted at this PRS.

The samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The samples were analyzed for TAL metals, uranium, VOCs, and SVOCs. All analyses with the exception of one sample for VOCs were analyzed within prescribed holding times. The holding time for VOC analysis was exceeded by 3 days, and the delay did not affect data usability (see Section 4.7.2 for usability assessment).

TABLE 5.19.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-011(c)

Location ID	Sample ID	Depth (in)	Matrix	TAL Metals*	Total Uranium*	VOCs*	SVOCs*
15-2594	0215-95-0147	0-6	Soil	70317, 70015	69761	NA	70235
15-2594	0215-95-0148	30-36	Soil	70317, 70015	69761	70446	70235
15-2558	0215-95-0149	0-6	Soil	70317, 70015	69761	NA	70235
15-2558	0215-95-0150	18-24	Soil	70317, 70015	69761	70446	70235

*Batch number NA= not analyzed

5.19.5 Background Comparisons

Inorganics

Mercury and uranium were detected in the surface and subsurface soils, respectively, above their background UTLs. Further analysis of the inorganic data showed that the distribution of the uranium site concentrations was not statistically different from background (uranium: Gehan test p-value = 0.9612, Quantile test p-value = 0.5967, Slippage test p-value = 1.0000. See Chapter 3 for a discussion of these tests.). As a result, uranium is not retained as a COPC.

Mercury was detected at a concentration of 0.18 mg/kg above its background UTL of 0.1 mg/kg and was carried forward to the SAL comparison stage. The inorganics that were undetected or less than the background UTLs are not retained as COPCs.

The location of the sample with inorganics exceeding background UTLs is presented in Figure 5.19.4.3-1.

Radionuclides

Uranium, the only radionuclide analyzed for at this site, was detected in the surface soil at a concentration above its background UTL, but was not found to be statistically different from background (see Inorganics). Therefore, uranium was not retained as a radionuclide COPC.

15-011(c)

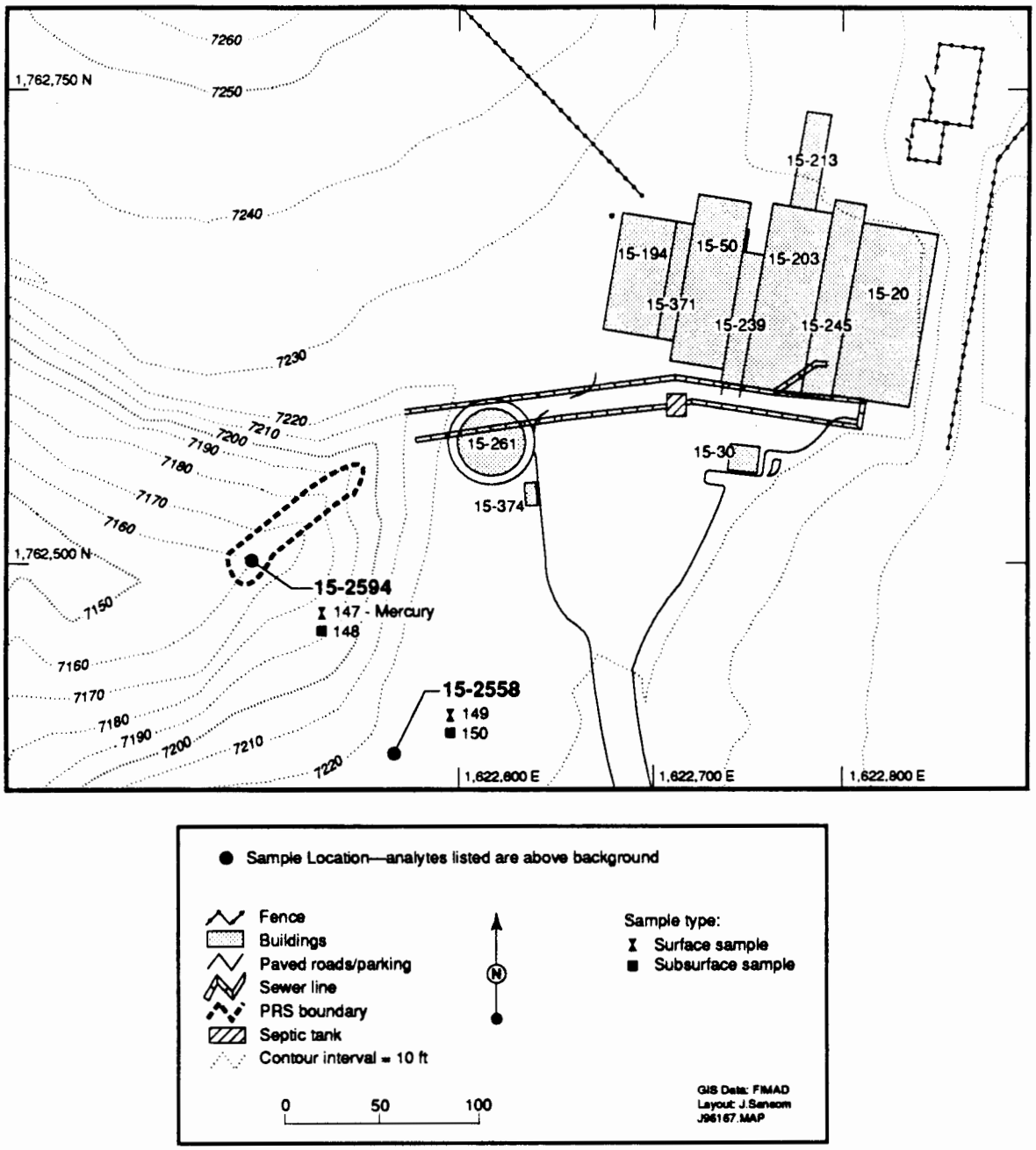


Figure 5.19.4.3-1 Location of PRS 15-011(c) samples

5.19.6 Evaluation of Organic Constituents

No organics were detected above the EQL. The reported organics detected below the EQLs and MDLs are addressed in Section 4.7.2.

Organics that were undetected or less than the EQLs were not retained as COPCs.

5.19.7 Human Health Assessment

5.19.7.1 Screening Assessment

Mercury was detected at a concentration below its SAL of 23 mg/kg and was not retained as a COPC. It was not submitted to an MCE because it was the only analyte detected above background.

5.19.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable risk to human health exists at this site.

5.19.8 Ecological Assessment

The general landscape condition around PRS 15-011(c) is moderately developed and disturbed, and there is high potential for receptors to come in contact with ecological COPCs (mercury) associated with the site (Table 2.4-1). Therefore, this PRS will be included as an ecological COPC source in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by our regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.19.9 Extent of Contamination

No human health COPCs were retained; therefore, this section is not applicable.

5.19.10 Conclusions and Recommendations

Based upon NFA Criterion 5, PRS 15-011(c) 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.

5.20 PRS 15-014(i)

PRS 15-014(i) is a drainage from the top of Building TA-15-194.

5.20.1 History

Section 10.1.2 of the OU 1086 RFI Work Plan (LANL 1993, 1087) and the NOD response describe PRS 15-014(i) in detail. The buildings in the Hollow have had various uses as assembly building, laboratories, and shops. They are still in use by the Laboratory's Hydrodynamics Groups.

5.20.2 Description

The PRS serves as drainage from the roof of Building TA-15-194 and the roof of the shelter between Buildings TA-15-194 and TA-15-50. The COPCs for this site include uranium, beryllium, lead, chromium, VOCs, and SVOCs.

5.20.3 Previous Investigations

No previous investigations were performed at this PRS.

5.20.4 Field Investigation

5.20.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.20.4.2 Results of Field Screening

An HE spot test was carried out at this sample location before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

5.20.4.3 Sample Collection and Submittal for Analyses

The objective of sampling at PRS 15-014(i) was to determine whether contamination was present that could be associated with site activities. Figure 5.20.4.3-1 shows the sample location, and Table 5.20.4.3-1 summarizes the sampling conducted at this PRS.

The samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan. The samples were analyzed for TAL metals, total uranium, HE, SVOCs, and VOCs within the prescribed holding times.

TABLE 5.20.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-014(I)

Location ID	Sample ID	Depth (in)	Matrix	TAL Metals*	Total Uranium*	HE*	SVOCs*	VOCs*
15-2387	0215-96-0702	0-6	Soil	82469, 82885, 82497	82461	8246 2	82474	NA
15-2387	0215-96-0703	12-18	Soil	82469, 82885, 82497	82461	8246 2	82474	82481

*Batch number NA= not analyzed

5.20.5 Background Comparisons

Inorganics

Inorganics detected at concentrations above their background UTLs are presented in Table 5.20.5-1 and were carried forward to the SAL comparison stage. The inorganics that were undetected or less than the background UTLs are not retained as COPCs.

PRS 15-014(i)

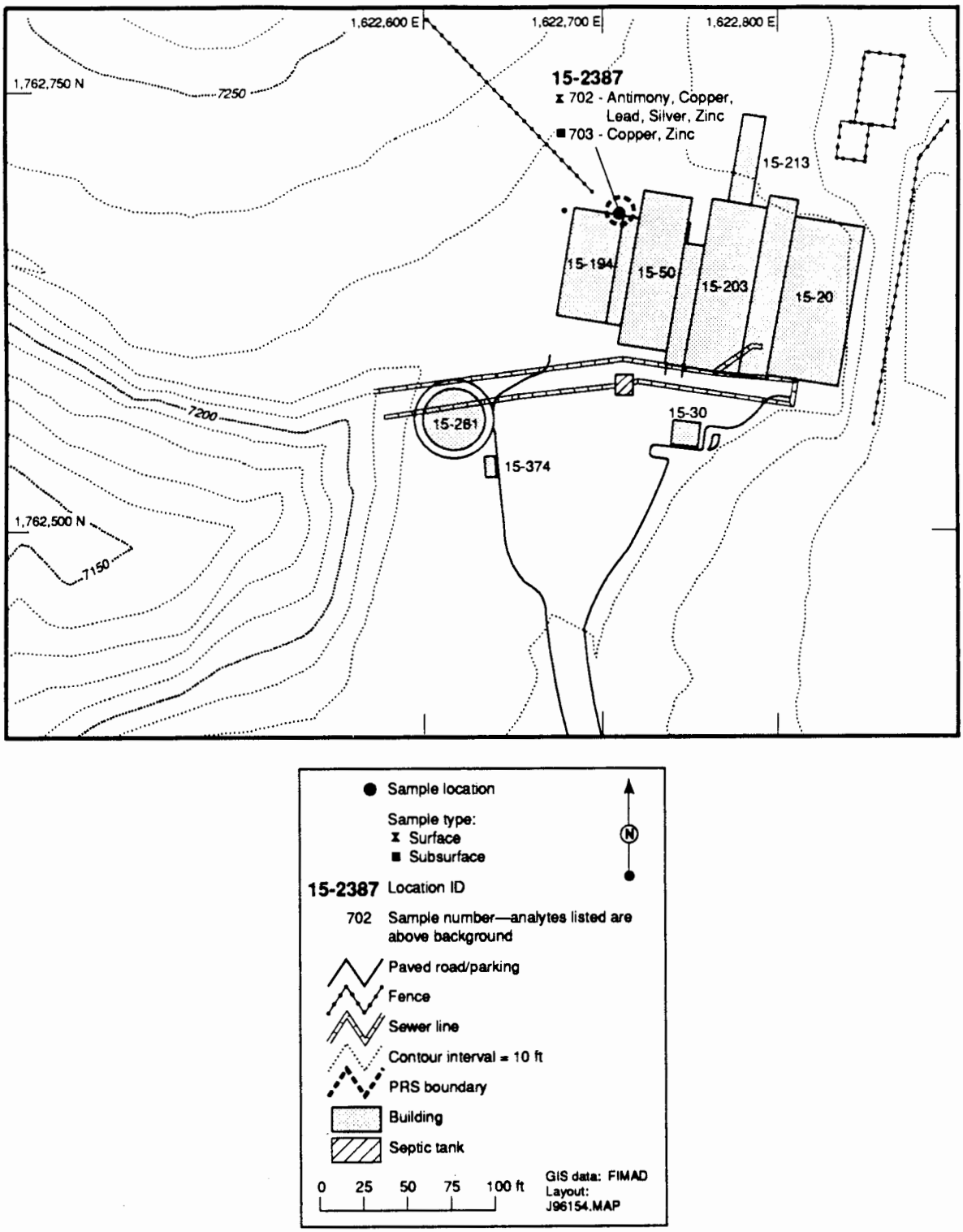


Figure 5.20.4.3-1 Location of PRS 15-014(i) samples

The locations of samples with inorganics exceeding the background UTLs are presented in Figure 5.20.4.3-1.

TABLE 5.20.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR PRS 15-014(I)

Sample ID	Depth (in.)	Antimony (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)
LANL UTL	N/A	1.0	15.5	23.3	Not Available	50.8
SAL	N/A	31	2800	400	380	23000
0215-96-0702	0-6	2.1	97.8	38.3	2.5	79.2
0215-96-0703	12-18	ND	53.5	9.1	ND	57

N/A = not applicable ND = not detected

Radionuclides

Uranium, the only radionuclide analyzed for at this site, was detected at concentrations below its background UTL and was not retained as a COPC.

5.20.6 Evaluation of Organic Constituents

No organics were detected above the EQLs. The reported organics detected below the EQLs and MDLs are addressed in Section 4.8.2.

Organics that were undetected below the EQLs were not retained as COPCs.

5.20.7 Human Health Assessment

5.20.7.1 Screening Assessment

Antimony, copper, lead, silver, and zinc were detected at concentrations below their respective SALs and were submitted to an MCE.

Multiple Chemical Evaluation

The MCE included five analytes in the noncarcinogenic effects category (Table 5.20.7.1-1). The sum of the maximum normalized concentrations is 0.2084, which is less than the target value of 1.0. Therefore, these analytes were not retained as COPCs.

TABLE 5.20.7.1-1
MULTIPLE CHEMICAL ANALYSIS - PRS 15-014(I)

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
SOIL-NONCARCINOGENIC	
Antimony	0.0677
Copper	0.0349
Lead	0.0958
Silver	0.0066
Zinc	0.0034
TOTAL	0.2084

5.20.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.20.8 Ecological Assessment

General landscape condition around 15-014(i) is moderately developed and disturbed and there is a moderate potential for receptors to come in contact with ecological COPCs (antimony, copper, lead, silver, and zinc) associated with the site (Table 2.4-1). Therefore, this PRS will be included as an ecological COPC source in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by our regulators. Threatened and endangered species and /or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.20.9 Extent of Contamination

No human health COPCs were retained; therefore, this section is not applicable.

5.20.10 Conclusions and Recommendations

Based upon NFA Criterion 5, PRS 15-014(i) 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.

5.21 PRS 15-014(j)

PRS 15-014(j) consisted of three outfalls from Building TA-15-50. Five soil samples were collected along the drainage. Based on the sample results and screening assessment, we are recommending NFA for this site under NFA Policy Criterion 5.

5.21.1 History

Section 10.1.2 of the OU 1086 RFI Work Plan (LANL 1993, 1087) and the NOD response (ER 94-J315) describe PRS 15-014(j) in detail. Building TA-15-50 has had various uses as assembly building, laboratories, and shops. It is still in use by the Laboratory's Hydrodynamics Groups.

5.21.2 Description

This PRS consists of a drainage channel which was partially asphalt, just below the outfall, leading towards the canyon. COPCs for this site include uranium, beryllium, lead, chromium, VOCs, and SVOCs.

5.21.3 Previous Investigations

No previous investigations were performed at this PRS.

5.21.4 Field Investigations

5.21.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for onsite workers. No elevated readings were reported from these radiological surveys.

5.21.4.2 Results of Field Screening

HE spot tests were carried out at these sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.21.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-014(j) was to determine whether contamination was present that could be associated with site activities. Figure 5.21.4.3-1 shows the sample locations and Table 5.21.4.3-1 summarizes the sampling conducted at this PRS.

The samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The samples were analyzed for TAL metals, uranium, VOCs, and SVOCs. All analyses with the exception of the VOC laboratory duplicate were analyzed within prescribed holding times. The holding time for the VOC duplicate was exceeded by one day, and the delay did not affect data usability. (See Section 4.9.2 for usability assessment.)

TABLE 5.21.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-014(j)

Location ID	Sample ID	Depth (in.)	Matrix	TAL Metals*	Total Uranium*	VOCs*	SVOC*
15-2554	0215-95-0141	0-6	Soil	71206, 71524	70725	NA	71076
15-2554	0215-95-0142	16-20	Soil	71206, 71524	70725	71435	71076
15-2555	0215-95-0143	0-1	Soil	71206, 71524	70725	NA	71076
15-2556	0215-95-0145	0-6	Soil	71206, 71524	70725	NA	71076
15-2556	0215-95-0146	30-36	Soil	71206, 71524	70725	71436	71076

*Batch numbers NA = not analyzed

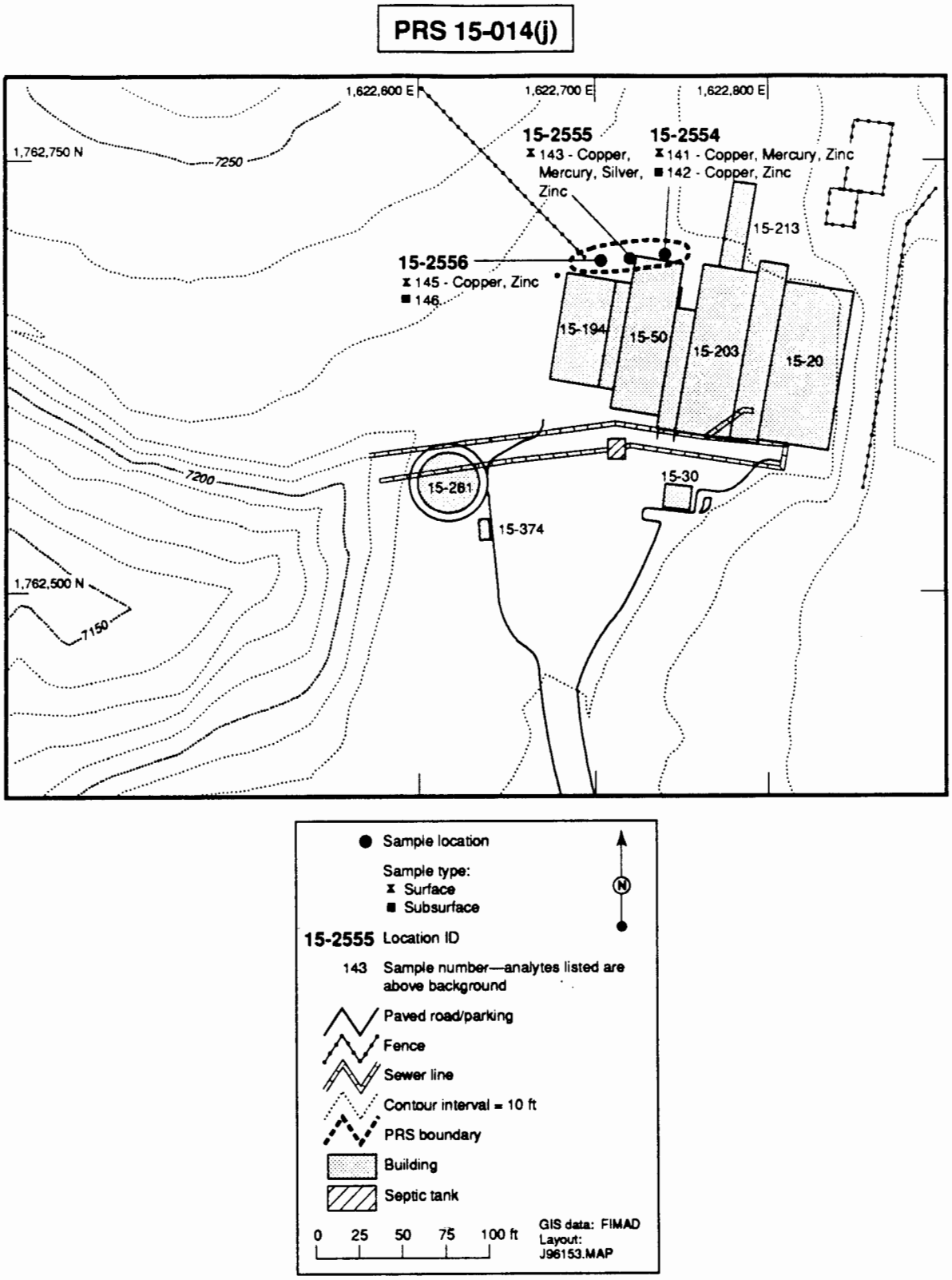


Figure 5.21.4.3-1 Location of PRS 15-014(j) samples

5.21.5 Background Comparisons

Inorganics

Copper, lead, mercury, silver, and zinc were detected in the surface and subsurface soils above their background UTLs. Further analysis of the inorganic data showed that the distribution of the lead site concentrations was not statistically different from background (lead: Gehan test p-value = 0.1036, Quantile test p-value = 0.2546, Slippage test p-value = 0.0281. See Section 3.2 for a discussion of these tests.). As a result, lead was not retained as a COPC.

The inorganics that are greater than the background UTLs, or that were deleted but without a background UTL, are presented in Table 5.21.5-1 and were carried forward to the SAL comparison stage. The inorganics that were undetected or less than background UTL were not retained as COPCs.

The locations of samples with inorganics exceeding background UTLs are presented in Figure 5.21.4.3-1.

TABLE 5.21.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR PRS 15-014(j)

Sample ID	Depth (in.)	Copper (mg/kg)	Mercury (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)
LANL UTL	N/A	15.5	0.1	Not Available	50.8
SAL	N/A	2800	23	380	23000
0215-95-0141	0-6	30.2	0.31	ND	103
0215-95-0142	16-20	21.5	0.04	ND	69.3
0215-95-0143	0-1	155	3.0	1.89	1640
0215-95-0145	0-6	149	0.06	ND	100

N/A = not applicable ND = not detected

Radionuclides

Uranium, the only radionuclide analyzed for at this site, was detected below its background UTL and was not retained as a COPC.

5.21.6 Evaluation of Organic Constituents

Acetone and 2-butanone were detected in the subsurface soil above the EQL (0.01 mg/kg) at concentrations of 0.05 mg/kg and 0.013(J) mg/kg, respectively, but were not carried forward to the SAL comparison stage because of their presence in the laboratory blank. The data usability of the acetone and 2-butanone values and the reported organics detected below the EQLs and MDLs are addressed in Section 4.9.2.

Organics that were undetected or less than the EQLs are not retained as COPCs.

5.21.7 Human Health Assessment

5.21.7.1 Screening Assessment

Copper, mercury, silver, and zinc were detected at concentrations below their respective SALs and were submitted to an MCE.

Multiple Chemical Evaluation

The MCE included four analytes in the noncarcinogenic effects category (Table 5.21.7.1-1). The sum of the maximum normalized concentrations is 0.2621, which is below the target value of 1.0. Therefore, these analytes were not retained as COPCs.

TABLE 5.21.7.1-1
MULTIPLE CHEMICAL EVALUATION - PRS 15-014(j)

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
SOIL-NONCARCINOGENIC	
Copper	0.0554
Mercury	0.1304
Silver	0.0050
Zinc	0.0713
TOTAL	0.2621

5.21.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs are retained as a result of the screening assessment and no unacceptable risk to human health exists at this site.

5.21.8 Ecological Assessment

The general landscape condition around PRS 15-014(j) is moderately developed and disturbed, and there is high potential for receptors to come in contact with ecological COPCs (copper, mercury, silver and zinc) associated with the site (Table 2.4-1). Therefore, this PRS will be included as an ecological COPC source in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by our regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.21.9 Extent of Contamination

No human health COPCs were retained; therefore, this section is not applicable.

5.21.10 Conclusions and Recommendations

Based upon NFA Criterion 5, PRS 15-014(j) 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.

5.22 PRS 15-014(g)

PRS 15-014(g) is an outfall located 11 ft east of the northwest corner of Building TA-15-203. Two samples were collected at the outfall. Based on the sample results and screening assessment, we recommend NFA for this site under NFA Policy Criterion 5.

5.22.1 History

This PRS is a drain that was used for once-through cooling water to an air compressor. The water drained to a ditch emptying into Cañon de Valle.

5.22.2 Description

This PRS consists of a drainage channel that was partially asphalt. PRS 15-014(g) is described in detail in the OU 1086 RFI Work Plan in Section 5.3.1.2 (LANL 1993, 1087), which was moved to Section 10.1.2 with the NOD response (ER 94-J315). The COPCs associated with this site are uranium, beryllium, lead, chromium, VOCs, and SVOCs.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.22.3 Previous Investigations

No previous investigations were performed at this PRS.

5.22.4 Field Investigation

5.22.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.22.4.2 Results of Field Screening

HE spot tests were carried out at this sample location before the start of any intrusive activities. Positive results were obtained with the spot test. DX-2 results showed no detectable HE; therefore, the spot tests are interpreted to have been false positives.

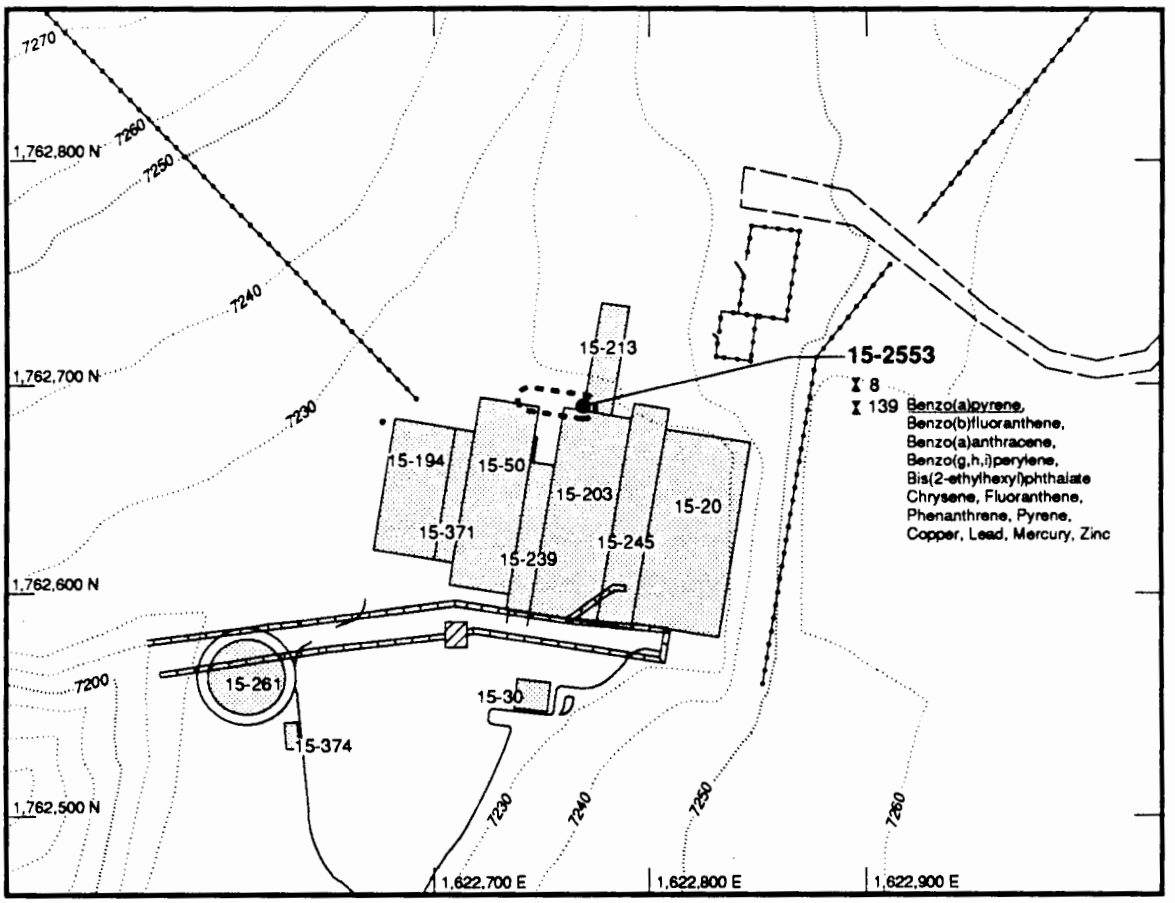
Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling to assist in determining which samples would be submitted for offsite analysis on the basis of metals content. The results of the field screening and of PE sample analysis by XRF, LIBS, are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.22.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-014(g) was to determine whether contamination was present that could be associated with site activities. Figure 5.22.4.3-1 shows the sample locations, and Table 5.22.4.3-1 summarizes the sampling conducted at this PRS.

15-014(g)



● Sample Location—analytes listed are above background; underlined analytes were detected above SALs

Fence
Buildings
Paved roads/parking
Dirt roads
Sewer line
PRS boundary
Septic tank
Contour interval = 10 ft

N

Sample type:
Surface sample

0 50 100

GIS Data: FIMAD
Layout: J.Sanson
J96168.MAP

Figure 5.22.4.3-1 Location of PRS 15-014(g) samples

TABLE 5.22.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-014(g)

Location ID	Sample ID	Depth (in)	Matrix	HE*	TAL Metals*	VOCs*	Total Uranium*
15-2553	0215-95-0008	0-6	Soil	6528913	NA	NA	NA
15-2553	0215-95-0139	0-6	Soil	DX-2	6528783	6528723	6528402

*Batch numbers NA = not analyzed DX-2 = Analyzed by Laboratory DX-2 Division

The samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). One sample was analyzed for HE only, while the other sample was analyzed for TAL metals, VOCs, and total uranium, within prescribed holding times.

5.22.5 Background Comparisons

Inorganics

Inorganics detected in the surface soil at concentrations above their background UTLs are presented in Table 5.22.5-1 and were carried forward to the SAL comparison stage. The inorganics that were undetected or less than background UTLs were not retained as COPCs.

The locations of samples with inorganics exceeding background UTLs are presented in Figure 5.22.4.3-1.

TABLE 5.22.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR PRS 15-014(g)

Sample ID	Depth (in.)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Zinc (mg/kg)
LANL UTL	N/A	15.5	23.3	0.1	50.8
SAL	N/A	2800	400	23	23000
0215-95-0139	0-6	24.5	60.1	0.26	127

N/A = not applicable

Radionuclides

Uranium, the only radionuclide analyzed for at this site, was detected at a concentration below its background UTL and was not retained as a COPC.

5.22.6 Evaluation of Organic Constituents

Nine organics, eight of which are polynuclear aromatic hydrocarbons (PAHs), were detected in the surface soil above the EQLs (Table 5.22.6-1) and were carried forward to the SAL comparison stage. The organics that were undetected were not retained as COPCs.

The sampling location at this PRS receives surface runoff from several areas that are probable sources of the PAHs. These include an asphalt walkway, the asphalt roof of the adjacent building, and some creosote covered electrical poles. The PAHs detected are assumed the result of non-site related activities because the runoff from these sources would collect in the area sampled and

TABLE 5.22.6-1
SOIL CONCENTRATIONS FOR ORGANIC ANALYTES WITH VALUES GREATER THAN THE EQL - PRS 15-014(g)

Sample ID	Depth (in.)	Benzo(a)anthracene (mg/kg)	Benzo(a)pyrene (mg/kg)	Benzo(b)fluoranthene (mg/kg)	Benzo(g,h,i)perylene
SAL	N/A	0.61	0.061	0.61	No SAL
EQL	N/A	0.33	0.33	0.33	0.33
0215-95-0139	0-6	0.46	0.47	0.6	0.38

Sample ID	Depth (in.)	Bis(2-ethylhexyl)phthalate (mg/kg)	Chrysene (mg/kg)	Fluoranthene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
SAL	N/A	32	24	2600	No SAL	2000
EQL	N/A	0.33	0.33	0.33	0.33	0.33
0215-95-0139	0-6	0.59	0.51	0.98	0.73	0.9

N/A = not applicable

5.22.7 Human Health Assessment

5.22.7.1 Screening Assessment

Copper, lead, mercury, and zinc were detected at concentrations below their respective SALs and were submitted to an MCE.

Bis(2-ethylhexyl)phthalate was detected below its SAL of 32 mg/kg (Table 5.22.6-1) and was not retained as a COPC. ALL PAHs were not retained as COPCs because they were not related to site activities.

Multiple Chemical Evaluation

The MCE included four analytes in the noncarcinogenic effects category (Table 5.22.7.1-1). The sum of the maximum normalized concentrations is 0.1759, which is below the target value of 1.0. These analytes were not retained as COPCs.

TABLE 5.22.7.1-1
MULTIPLE CHEMICAL EVALUATION - PRS 15-014(g)

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
SOIL-NONCARCINOGENIC	
Copper	0.0088
Lead	0.1503
Mercury	0.0113
Zinc	0.0055
TOTAL	0.1759

5.22.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable risk to human health exists at this site.

5.22.8 Ecological Assessment

The general landscape condition around PRS 15-014(g) is moderately developed and disturbed and there is high potential for receptors to come in contact with ecological COPCs (copper, lead, mercury, and zinc) associated with the site (Table 2.4-1). Therefore, this PRS will be included as an ecological COPC source in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by our regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.22.9 Extent of Contamination

No human health COPCs were retained; therefore, this section is not applicable.

5.22.10 Conclusions and Recommendations

Based upon NFA Criterion 5, PRS 15-014(g) 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.

5.23 PRS 15-014(k)

PRS 15-014(k) is described in the OU 1086 RFI Work Plan in Section 10.1.5.2 (LANL 1993, 1087) as trench drains from Building TA-15-20 which drained to a sump, which, in turn, drained to an outfall at the edge of Water Canyon.

Upon investigation, it was found that the open trench drains are concrete, containing no sampling medium, so sampling was not possible. The drain lines did not contain any visible evidence of cracks. The outfall eventually drains to PRS 15-011(c), which was sampled (see Section 5.19). Any contaminants transported from the site would have been detected in the PRS 15-011(c) investigation but none were found. We recommend NFA for this site under NFA Policy Criterion 1.

5.24 AOC C-15-007

AOC C-15-007 is reported to be an oil stain under a temporary building presently in place in the Hollow. It is proposed for deferred action until the temporary building is removed.

5.25 AOC C-15-010

AOC C-15-010 is an area that contained an underground fuel storage tank until its removal in 1989. Based on the sample results and screening assessment, we recommend Phase II for this site.

5.25.1 History

AOC C-15-010 is described in detail in Section 10.1.5.2 of the OU 1086 RFI Work Plan (LANL 1993, 1087). Located 15 ft south of the southeast corner of Building TA-15-20, the area contained an underground diesel fuel storage tank until its removal in 1989.

5.25.2 Description

Part of the area that contained the fuel storage tank is now covered by a transportainer. The tank was approximately 15 ft to 20 ft long and 7 ft wide. The COPCs associated with this site include uranium, beryllium, lead, chromium, VOCs, and SVOCs.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.25.3 Previous Investigations

No previous investigations were performed in this area.

5.25.4 Field Investigation

5.25.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the AOC and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.25.4.2 Results of Field Screening

HE spot tests were carried out at these sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.25.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at AOC C-15-010 was to determine whether contamination was present that could be associated with site activities. Figure 5.25.4.3-1 shows the sample locations, and Table 5.25.4.3-1 summarizes the sampling conducted at this AOC.

The samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan. The samples were analyzed for TAL metals, VOCs, SVOCs, and uranium. All analyses except for one VOC were analyzed within prescribed holding times. The holding time for the VOC in this sample was exceeded by 8 days, and the delay did not affect data usability (see Section 4.11.2 for usability assessment).

TABLE 5.25.4.3-1
SUMMARY OF SAMPLES TAKEN - AOC C-15-010

Location ID	Sample ID	Depth (in)	Matrix	TAL Metals*	VOCs*	SVOCs*	Uranium*
15-2551	0215-95-0137	18-24	Soil	71206, 71524	71436	71478	70725
15-2552	0215-95-0138	18-24	Soil	71206, 71524	71436	71478	70725

*Batch numbers

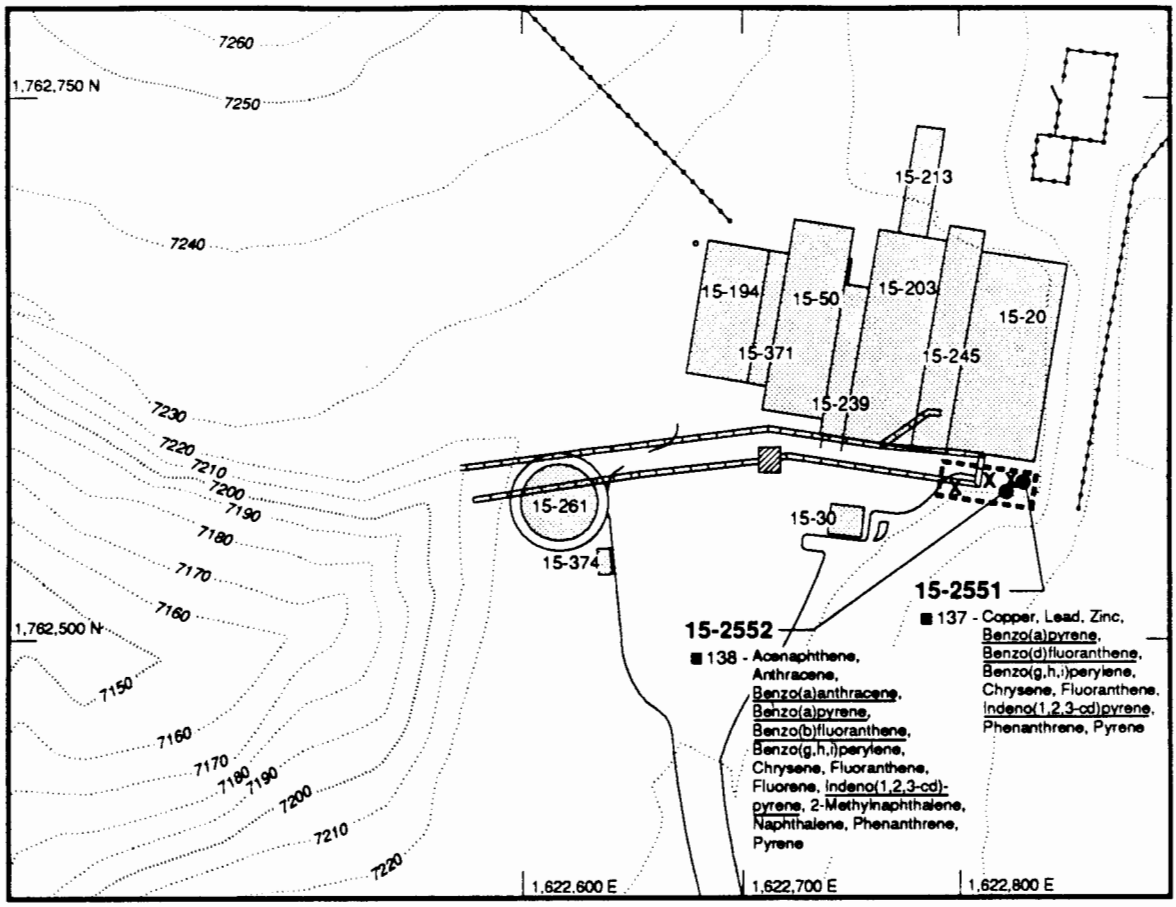
5.25.5 Background Comparisons

Inorganics

Inorganics detected in the subsurface soil above their background UTLs are presented in Table 5.25.5-1 and were carried forward to the SAL comparison stage. The inorganics that were undetected or less than the background UTLs were not retained as COPCs.

The locations of samples with inorganics exceeding background UTLs are presented in Figure 5.25.4.3-1.

C-15-010



● Sample Location—analytes listed are above background; underlined analytes were detected above SALs

X Proposed subsurface sampling location

Fence
Buildings
Paved roads/parking
Sewer line
PRS boundary
Septic tank
Contour interval = 10 ft

N

Sample type:
■ Subsurface sample

0 50 100 Feet

GIS Data: FIMAD
Layout: J.Sansom
J96160.MAP

Figure 5.25.4.3-1 Location of AOC C-15-010 samples and proposed sampling locations

TABLE 5.25.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR AOC C-15-010

Sample ID	Depth (in.)	Copper (mg/kg)	Lead (mg/kg)	Zinc (mg/kg)
LANL UTL	N/A	15.5	23.3	50.8
SAL	N/A	2800	400	23000
0215-95-0137	18-24	21.7	23.4	54.7

N/A = not applicable

Radionuclides

Uranium, the only radionuclide analyzed for at this site, was detected below its background UTL and was not retained as a COPC.

5.25.6 Evaluation of Organic Constituents

Fourteen organic compounds were detected in the subsurface soils above the EQLs (Table 5.25.6-1) and were carried forward to the SAL comparison stage. The other reported organics detected below the EQLs and MDLs are addressed in Section 4.11.2.

Organics that were undetected or less than the EQLs are not retained as COPCs.

The locations of samples with detected organics are presented in Figure 5.25.4.3-1.

5.25.7 Human Health Assessment

5.25.7.1 Screening Assessment

Copper, lead, and zinc were detected below their respective SALs and were submitted to an MCE.

Seven organics, acenaphthene, anthracene, chrysene, fluoranthene, fluorene, naphthalene, and pyrene, were detected below their respective SALs and were submitted to an MCE.

Four organics, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene, were detected above their SALs and retained as COPCs (Table 5.25.7.1-1). Three other organics, benzo(g,h,i)perylene, 2-methylnaphthalene, and phenanthrene, were detected Table 5.25.7.1-2) but do not have SALs, and were retained as COPCs.

TABLE 5.25.6-1
SOIL CONCENTRATIONS FOR ORGANIC ANALYTES WITH VALUES GREATER THAN THE EQL - AOC C-15-010

Sample ID	Depth (in.)	Acenaphthene (mg/kg)	Anthracene (mg/kg)	Benzo(a) anthracene (mg/kg)	Benzo(a) pyrene (mg/kg)	Benzo(b) fluoranthene (mg/kg)
SAL	N/A	360	19	0.61	0.061	0.61
EQL	N/A	0.33	0.33	0.33	0.33	0.33
0215-95-0137	18-24	0.26(J)[1]	0.3(J)[1]	ND	0.82	1.28
0215-95-0138	18-24	0.88	1.79	1.79	1.83	2.92

Sample ID	Depth (in.)	Benzo(g,h,i)perylene (mg/kg)	Chrysene (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)
SAL	N/A	N/A	24	2600	300
EQL	N/A	0.33	0.33	0.33	0.33
0215-95-0137	18-24	0.45	0.96	1.77	0.22(J)[1]
0215-95-0138	18-24	0.85	1.73	3.86	0.86

Sample ID	Depth (in.)	Indeno(1,2,3-cd)pyrene (mg/kg)	2-Methyl-naphthalene (mg/kg)	Naphthalene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
SAL	N/A	0.61	N/A	800	N/A	2000
EQL	N/A	0.33	0.33	0.33	0.33	0.33
0215-95-0137	18-24	0.47	ND	0.21(J)[1]	1.5	1.84
0215-95-0138	18-24	0.88	0.35	1.0	3.01	3.24

[1] Sample values are below the EQLs and the method detection limits (Section 4.11.2). J = estimated U = undetected

TABLE 5.25.7.1-1
CARCINOGEN ORGANICS WITH CONCENTRATIONS IN SOIL THAT EXCEED SALs - AOC C-15-010

Sample ID	Location ID	Depth (in.)	Benzo(a)anthracene (mg/kg)	Benzo(a)pyrene (mg/kg)
SAL	N/A	N/A	0.61	0.061
0215-95-0137	15-2551	18-24	ND	0.82
0215-95-0138	15-2552	18-24	1.79	1.83

Sample ID	Location ID	Depth (in.)	Benzo(b)fluoranthene (mg/kg)	Indeno(1,2,3-cd)pyrene (mg/kg)
SAL	N/A	N/A	0.61	0.61
0215-95-0137	15-2551	18-24	1.28	0.47
0215-95-0138	15-2552	18-24	2.92	0.88

N/A = not applicable ND = not detected

TABLE 5.25.7.1-2
NONCARCINOGEN ORGANICS WITH CONCENTRATIONS IN SOIL THAT EXCEED SALs - AOC C-15-010

Sample ID	Location ID	Depth (in.)	Benzo(g,h,i) perylene (mg/kg)	2-Methyl-naphthalene (mg/kg)	Phenanthrene (mg/kg)
N/A	N/A	N/A	No SAL	No SAL	No SAL
0215-95-0137	15-2551	18-24	0.45	ND	1.5
0215-95-0138	15-2552	18-24	0.85	0.35	3.01

N/A = not applicable ND = not detected

Multiple Chemical Evaluation

The MCE included nine analytes in the noncarcinogenic effects category (Table 5.25.7.1-3). The sum of the maximum normalized concentrations is 0.1726, which is below the target value of 1.0. Therefore, these analytes were not retained as COPCs.

An MCE with chrysene was not performed because it was the only carcinogen detected below its SAL. Therefore, this analyte was not retained as a COPC.

TABLE 5.25.7.1-3
MULTIPLE CHEMICAL EVALUATION - AOC C-15-010

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
SOIL-NONCARCINOGENIC	
Acenaphthene	0.0024
Anthracene	0.0942
Copper	0.0078
Fluoranthene	0.0015
Fluorene	0.0029
Lead	0.0585
Naphthalene	0.0013
Pyrene	0.0016
Zinc	0.0024
TOTAL	0.1726

5.25.7.2 Risk Assessment

The site-specific preliminary remediation goals (PRGs) for the COPCs retained by the screening assessment were calculated to determine if the detected concentrations warranted corrective action. Calculation of the PRGs were based on an intrusive industrial exposure scenario (samples were taken at 18-24 in.) and a risk factor of 10^{-6} (Appendix C). The PRGs were calculated to be 50 mg/kg for benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene, and 5.0 mg/kg for benzo(a)pyrene. In addition, the cumulative risk was calculated by adding together the fractional contribution of each chemical to determine if a hazard may exist (Appendix C). The multiple chemical PRG analysis resulted in a hazard index of 0.45, which is below the target value of 1.0. The detected concentrations of these COPCs were, therefore, below the PRGs and less than a hazard index of 1.0.

5.25.8 Ecological Assessment

The general landscape condition around AOC C-15-010 is moderately developed and disturbed, and there is moderate potential for receptors to come in contact with ecological COPCs (copper, zinc, and 14 organics) associated with the site (Table 2.4-1). Therefore, this AOC will be included as an ecological COPC source in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by our regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.25.9 Extent of Contamination

The Phase I sampling conducted at this AOC in accordance with the Work Plan indicated that there may be some contamination from the fuel tank previously buried at this site. However, the sampling was not sufficient to determine the nature and extent of any contamination. As a result, Phase II sampling is recommended for this site.

5.25.10 Conclusions and Recommendations

Phase II sampling will be conducted at this site to determine the nature and extent of the contamination.

5.25.11 Sampling and Analysis Plan for AOC C-15-010

5.25.11.1 Problem Definition

The OU 1086 RFI Work Plan (LANL 1993, 1087) describes the underground fuel tank that was located at this site. Before the tank was removed in 1989, it contained diesel fuel. During the initial investigation of this site, a portable transportainer was situated directly over the prior location of the fuel tank. Two samples were taken next to the container at depths of 18-24 inches in accordance with the Work Plan. However, the samples that were collected did not include the former tank depth. Phase II sampling is required to fully characterize the nature and extent of any potential contamination associated with this fuel tank.

5.25.11.2 Chemicals of Potential Concern

Phase I sampling detected several PAHs. TPH, BTEX, and other organic constituents associated with diesel fuel are also considered COPCs for this site.

5.25.11.3 Sampling and Analysis Design

The tank was situated 3 ft below the ground surface and was approximately 7 ft in diameter. The bottom of the tank, therefore, was about 10 ft below surface level. When the tank was removed, the area was backfilled. Proposed Phase II sampling includes three boreholes. Samples will be taken from each borehole at depths of 0 to 6 in, 30 to 36 in (the approximate depth the top of the tank occupied); at the soil/tuff interface (which is expected to occur where the backfill ends at approximately 10 ft); and, finally, at a depth 3 ft below the soil/tuff interface.

The three boreholes will be evenly spaced along the length of the previous location of the tank. The tank was 15 to 20 ft in length, and the samples will be spaced at 7 ft intervals along the center line of the tank, as shown in Figure 5.25.11.3-1.

5.25.11.4 Analyses

All surface and subsurface samples will be analyzed for SVOCs by EPA SW-846 Method 8270 and TPH by EPA Method 8015. Subsurface samples will also be analyzed for VOCs by EPA Method 8240. See Table 5.25.11.4-1. Appropriate Laboratory QA/QC procedures will be followed.

TABLE 5.25.11.4-1
PROPOSED PHASE II SAMPLING AND ANALYSIS PLAN FOR AOC C-15-010(a)

PRS 15-010(a) Sample Depth (in.)	Field Screening			Laboratory Analysis		
	Alpha, Beta, Gamma	HEs	SVOCs	SVOCs	VOCs	TPH
0-6	3	3	3	3	3	3
30-36	3	3	3	3	3	3
Soil/tuff	3	3	3	3	3	3
3' below soil/tuff	3	3	3	3	3	3
Total	12	12	12	12	12	12

5.25.11.5 Sampling Plan Implementation

A land survey will be conducted for the sample locations using established survey monuments and coordinates published in the LANL Survey Monument Network Manual (LANL 1994). A Sokkia Set IIIB Total Station with SDR Data Collector will be used. Prior to sampling, all sample locations will be field screened for radioactivity and HEs in accordance with the SSHASP. Appropriate health and safety precautions will be undertaken according to the Laboratory's ER Program SOPs (LANL 1993, 0875) based on this screening. Sampling will be conducted using drilling techniques according to LANL-ER-SOP-04.01, R0. Sample collection will be conducted according to LANL ER-SOP-06.09. All samples will be screened by photoionization dectection (PID) for SVOCs.

If the PID reading on the final sample from any borehole is greater than twice the background reading, another sample will be taken from an interval twice the distance of the previous interval. That is, if the final sample taken at 3 ft below soil/tuff interface gives a high PID reading, another

sample will be taken from six ft deeper down in the same borehole. Obvious odor of petroleum products in a sample will also require further sampling in the same manner.

All samples will be sent to a fixed laboratory for analysis. This Phase II investigation will be submitted to the DOE for inclusion in the 1997 budget.

Field screening will be conducted by portable radiation detection instruments and by LIBS.

All appropriate SOPs will be followed.

Three surface samples (0-6 in.), spaced 7 ft apart, will be collected from along the center line of the tank.

At each sample location, boreholes will be drilled. The split spoon auger will contain the soil from 33-36 in. depth. Analytical samples for VOCs, SVOCs, and TPH will be collected. Sample depths of the soil/tuff interface and 3 ft below the soil/tuff interface will be collected and analyzed for the same COPCs as above.

5.25.11.6 Sample Handling

Samples will be handled, packaged, and shipped in accordance with the latest revisions of the applicable Laboratory ER SOPs. Samples will be submitted to offsite contract analytical laboratories by direct shipping from the field or through the Laboratory Sample Management Office.

Field data will be collected and documented in the field notebooks and field sample collection logs. Additionally, required field data will be entered in the ER 4-D™ electronic field data base. This electronic record will be uploaded to the Facility for Information Management, Analysis, and Display (FIMAD) at the conclusion of the sampling season. Data verification and baseline validation will be consistent with the EP Project QAPP.

5.26 PRS 15-014(a)

PRS 15-014(a) is an outfall from drains located in Building TA-15-183 that have been in use since 1961. Seven soil samples were collected from the outfalls and the drainage. Based on the sample results and the screening assessment, we recommend NFA for this site under NFA Policy Criterion 5.

5.26.1 History

This outfall is permitted under EPA Non Pollutant Discharge Elimination System (NPDES) permit number 06A 123. Prior to being permitted, its effluent included photographic wastes, making silver and organics the potentially hazardous materials at this location. A new drain was installed in 1987 which has the same path as the old drain.

5.26.2 Description

PRS 15-014(a) is described in Section 10.2.2 of the OU 1086 RFI Work Plan (LANL 1993, 1087). The PRS is an outfall from drains in Building TA-15-183 in use since 1961. Since sampling, this PRS has been disturbed. The soil has been inadvertently removed to make room for construction; some of the soil has been redistributed over the site and some may have been removed. COPCs associated with this site include silver, VOCs, and SVOCs.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.26.3 Previous Investigations

No previous investigations were performed at this PRS.

5.26.4 Field Investigation

5.26.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.26.4.2 Results of Field Screening

HE spot tests were carried out at these sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.26.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-014(a) was to determine whether contamination was present that could be associated with site activities. Figure 5.26.4.3-1 shows the sample locations, and Table 5.26.4.3-1 summarizes the sampling conducted at this PRS.

The samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan. The samples were analyzed for TAL metals, VOCs, and SVOCs within prescribed holding times.

TABLE 5.26.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-014(a)

Location ID	Sample ID	Depth (in)	Matrix	TAL Metals*	VOCs*	SVOCs*
15-2531	0215-95-0159	0-6	Soil	71387, 70756	NA	70384
15-2531	0215-95-0160	26-32	Soil	71387, 70756	70809	70384
15-2532	0215-95-0161	0-6	Soil	71387, 70756	NA	70384
15-2532	0215-95-0162	20-26	Soil	71387, 70756	70809	70384
15-2533	0215-95-0163	0-6	Soil	71387, 70756	NA	70384
15-2533	0215-95-0164	6-10	Soil	71387, 70756	70809	70384
15-2534	0215-95-0165	0-6	Soil	71387, 70756	NA	70384

*Batch numbers NA = not analyzed

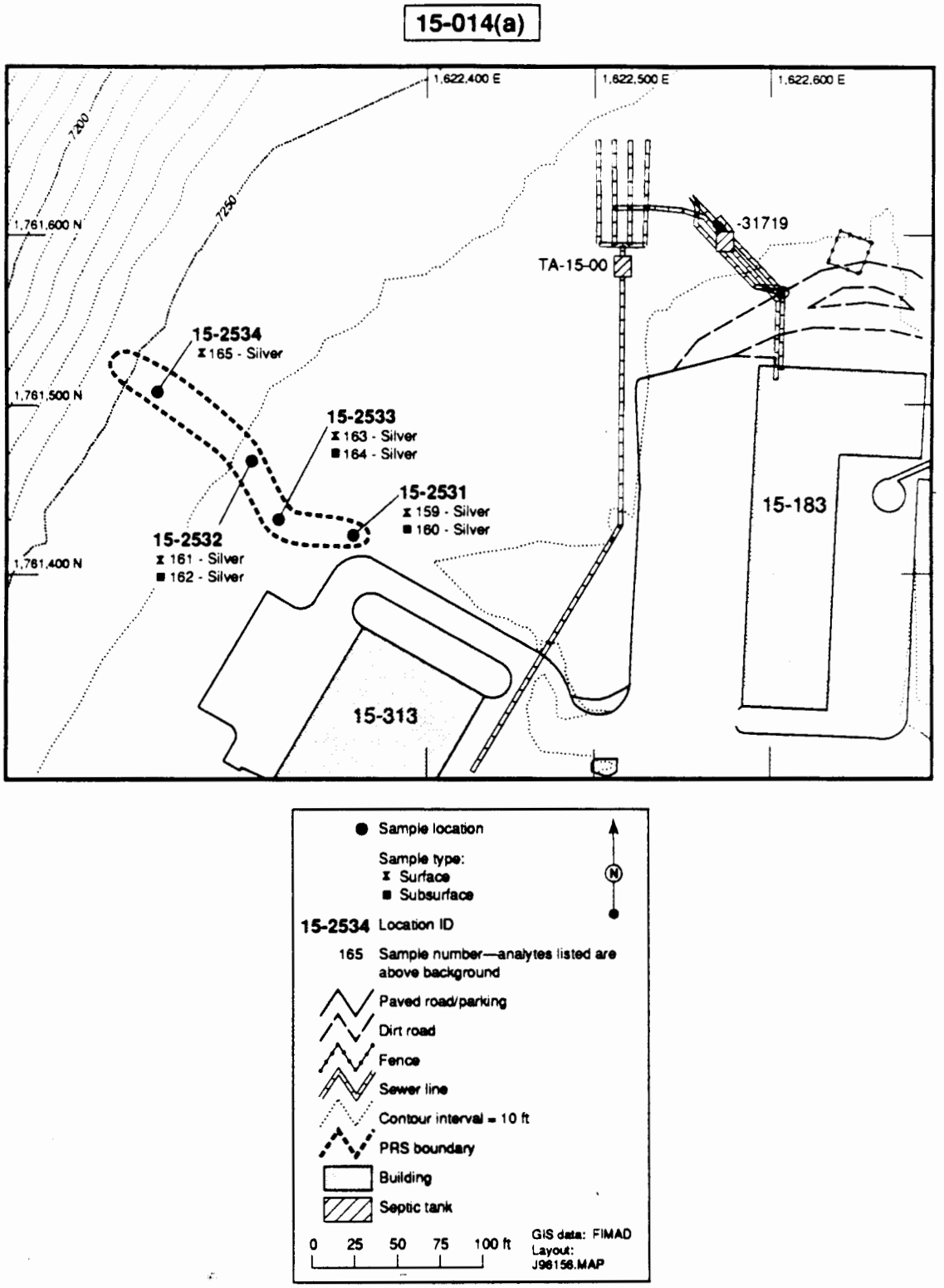


Figure 5.26.4.3-1 Location of PRS 15-014(a) samples

5.26.5 Background Comparisons

Inorganics

Copper was detected in the surface and subsurface soils above its background UTL. Silver was detected in surface and subsurface soils but there is no background UTL available. Further analysis of the inorganic data showed that the distribution of the copper site concentrations was not statistically different from background (copper: Gehan test p-value = 0.9944, Quantile test p-value = 0.7944, Slippage test p-value = 0.0387. See Section 3.2 for a discussion of these tests.). As a result, copper was not retained as COPC.

Silver, which does not have a background UTL, is presented in Table 5.26.5-1 and was carried forward to the SAL comparison stage. The inorganics that were undetected or less than background UTLs were not retained as COPCs.

The locations of samples with detected silver concentrations are presented in Figure 5.26.4.3-1.

TABLE 5.26.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR PRS 15-014(a)

Sample ID	Depth (in.)	Silver (mg/kg)
LANL UTL	N/A	Not Available
SAL	N/A	380
0215-95-0159	0-6	1.14
0215-95-0160	26-32	3.67
0215-95-0161	0-6	107(J)
0215-95-0162	20-26	3.56
0215-95-0163	0-6	6.2
0215-95-0164	6-10	1.1
0215-95-0165	0-6	0.4(J)[1]

N/A = not applicable J = estimated U = undetected
[1] Sample value is below the method detection limit (Section 4.12.1).

Radionuclides

No radionuclide compounds were analyzed for at this PRS.

5.26.6 Evaluation of Organic Constituents

Acetone was detected in two subsurface soil samples above the EQL (0.01 mg/kg) at concentrations of 0.019 mg/kg and 0.013 mg/kg but was not carried forward to the SAL comparison stage because it is a common laboratory contaminant. The data usability of the acetone values and the reported organics detected below the EQLs and MDLs are addressed in Section 4.12.2.

The organics that were undetected or detected below EQLs were not retained as COPCs.

5.26.7 Human Health Assessment

5.26.7.1 Screening Assessment

Silver was detected at concentrations below its SAL, but was not submitted to an MCE because it was the only analyte detected. Therefore, it was not retained as a COPC.

5.26.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.26.8 Ecological Assessment

The general landscape condition around the PRS is moderately disturbed and developed, and a potential exists for ecological receptors to come in contact with ecological COPCs associated with the site. However, removal of the PRS (see Section 5.26.2) precludes an evaluation of whether ecological COPC sources exist for this site.

5.26.9 Extent of Contamination

No human health COPCs were retained; therefore, this section is not applicable.

5.26.10 Conclusions and Recommendations

Based upon NFA Criterion 5, PRS 15-014(a) 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.

5.27 PRS 15-014(b)

PRS 15-014(b) consists of two separate outfalls from drains from Building TA-15-183. Thirteen samples were collected from the drainages. Based on the sample results and the screening assessment, we recommend NFA for this site under NFA Policy Criterion 5.

5.27.1 History

The effluent from Building TA-15-183 included photographic wastes, making silver and organics the potentially hazardous materials at this location.

5.27.2 Description

PRS 15-014(b) is described in Section 10.2.2 of the OU 1086 RFI Work Plan (LANL 1993, 1087). Since sampling, this PRS has been disturbed. Some soil has been inadvertently removed to make room for construction; in addition, some soil has been redistributed over the site. The COPCs associated with this site include silver, VOCs, and SVOCs.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.27.3 Previous Investigations

No previous investigations were performed at this PRS.

5.27.4 Field Investigation

5.27.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.27.4.2 Results of Field Screening

HE spot tests were carried out at these sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.27.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-014(b) was to verify whether contamination is present that could be associated with site activities. Figure 5.27.4.3-1 shows the sample locations, and Table 5.27.4.3-1 summarizes the sampling conducted at this PRS.

The samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The samples were analyzed for TAL metals, VOCs, and SVOCs. All analyses except for two VOC samples were analyzed within prescribed holding times. The holding time for both VOC samples was exceeded by 3 days, and this delay did not affect data usability. (See Section 4.13.2 for usability assessment.)

5.27.5 Background Comparisons

Inorganics

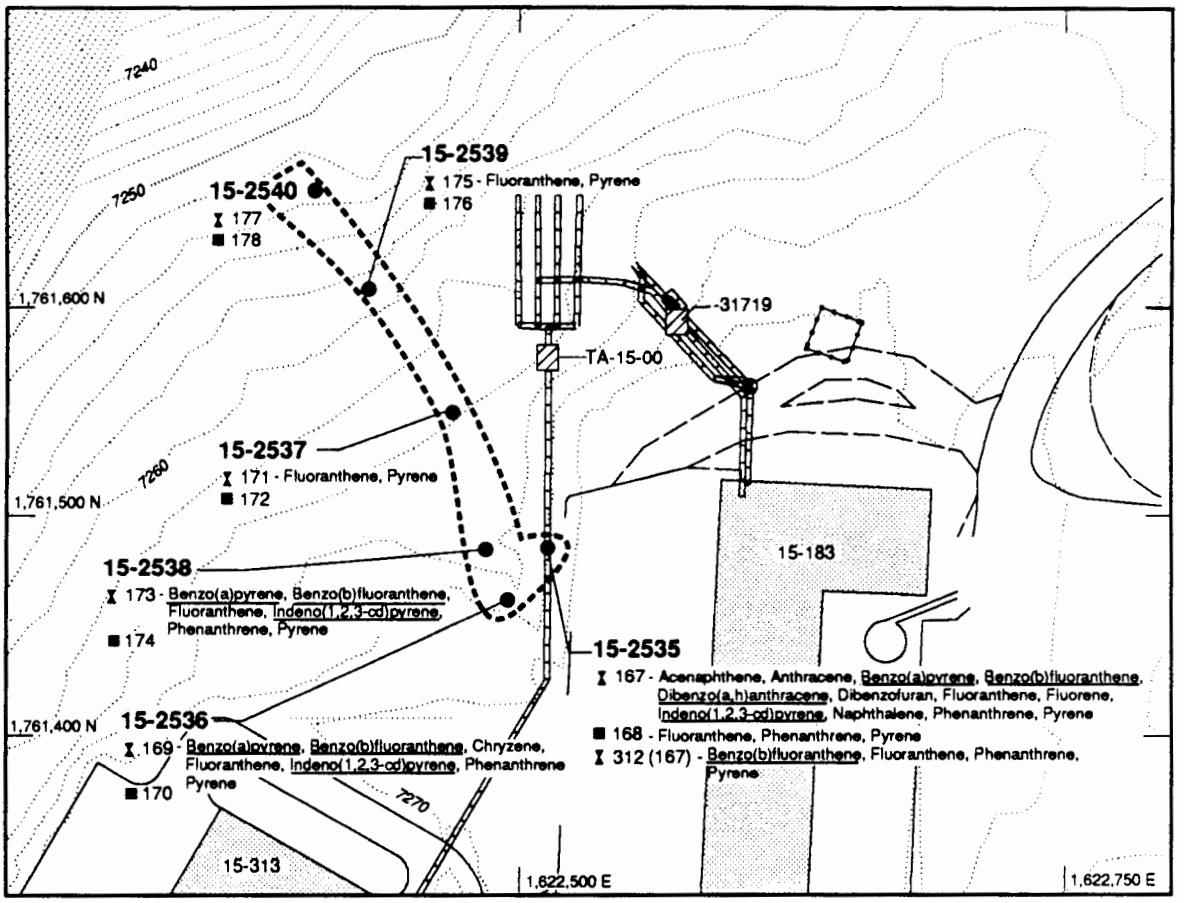
Zinc was detected in three surface soil samples at concentrations above the background UTL of 50.8 mg/kg. Further analysis of the inorganic data showed that the distribution of the zinc site concentrations was not statistically different from background (zinc: Gehan test p-value = 0.8536, Quantile test p-value = 0.4476, Slippage test p-value = 0.0039. See Section 3.2 for a discussion of these tests.). As a result, zinc was not retained as a COPC.

The other inorganics that were undetected or less than the background UTLs were not retained as COPCs.

Radionuclides

Radionuclide compounds were not analyzed for this site.

15-014(b)



● Sample Location—analytes listed are above background; underlined analytes were detected above SALs; duplicate samples are shown in parentheses

Fence
Buildings
Paved roads/parking
Dirt roads
Sewer line
PRS boundary
Septic tank
Contour interval = 10 ft

N

Sample type:
Surface sample
Subsurface sample

0 50 100 150 200 250 Feet

GIS Data: FIMAD
Layout: J.Sansom
J96134.MAP

Figure 5.27.4.3-1 Location of PRS 15-014(b) samples

TABLE 5.27.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-014(b)

Location ID	Sample ID	Depth (in)	Matrix	TAL Metals*	VOCs*	SVOCs*
15-2535	0215-95-0167	0-6	Soil	70317, 70015	NA	70235
15-2535	0215-95-0312	0-6	Soil	70317, 70015	NA	70235
15-2535	0215-95-0168	30-36	Soil	70317, 70015	70446	70235
15-2536	0215-95-0169	0-6	Soil	70317, 70015	NA	70235
15-2536	0215-95-0170	30-36	Soil	70317, 70015	70446	70235
15-2537	0215-95-0171	0-4	Soil	70317, 70015	NA	70235
15-2537	0215-95-0172	9-15	Soil	70317, 70015	70446	70235
15-2538	0215-95-0173	0-6	Soil	70317, 70015	NA	70235
15-2538	0215-95-0174	30-36	Soil	70317, 70015	70446	70235
15-2539	0215-95-0175	0-5	Soil	70317, 70015	NA	70235
15-2539	0215-95-0176	10-15	Soil	70317, 70015	70446	70235
15-2540	0215-95-0177	0-6	Soil	70317, 70015	NA	70235
15-2540	0215-95-0178	22-25	Soil	70317, 70015	70446	70235

* Batch numbers NA = not analyzed

5.27.6 Evaluation of Organic Constituents

Thirteen organic compounds were detected in the surface and subsurface soils above the EQLs (Table 5.27.6-1) and were carried forward to the SAL comparison stage. The reported organics detected below the EQLs and MDLs are addressed in Section 4.13.2.

The organics that were undetected are also not retained as COPCs.

The locations of samples with detected or less than the EQL organics are presented in Figure 5.27.4.3-1.

5.27.7 Human Health Assessment

5.27.7.1 Screening Assessment

Eight organic analytes [acenaphthene, anthracene, chrysene, dibenzofuran, fluoranthene, fluorene, naphthalene, and pyrene] were detected below their respective SALs, and all but chrysene, the only carcinogen, were submitted to an MCE (Table 5.27.7.1-1).

Four organic analytes [benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene] were detected above their SALs and retained as COPCs (Table

TABLE 5.27.6-1
SOIL CONCENTRATIONS FOR ORGANIC ANALYTES WITH VALUES GREATER THAN THE EQL - PRS 15-014(b)

Sample ID	Depth (in.)	Acenaphthene (mg/kg)	Anthracene (mg/kg)	Benzo(a)pyrene (mg/kg)	Benzo(b)fluoranthene (mg/kg)
SAL	N/A	360	19	0.061	0.61
EQL[1]	N/A	0.33	0.33	0.33	0.33
0215-95-0167	0-6	8.74	18.3	27.3	55.4
0215-95-0312[2]	0-6	ND	ND	0.85(J)[3]	1.54
0215-95-0168	30-36	ND	ND	0.68(J)[3]	0.85(J)[3]
0215-95-0169	0-6	2.05(J)[3]	3.17(J)[3]	8.43	12.3
0215-95-0171	0-4	ND	ND	0.2(J)[3]	0.33(J)[3]
0215-95-0172	9-15	ND	ND	ND	ND
0215-95-0173	0-6	ND	ND	0.52	1.0
0215-95-0175	0-5	ND	ND	ND	0.32(J)[3]
0215-95-0176	10-15	ND	ND	ND	ND

Sample ID	Depth (in.)	Chrysene (mg/kg)	Dibenzo(a,h)-anthracene (mg/kg)	Dibenzofuran (mg/kg)	Fluoranthene (mg/kg)	Fluorene (mg/kg)
SAL	N/A	24	0.061	260	2600	300
EQL[1]	N/A	0.33	0.33	0.33	0.33	0.33
0215-95-0167	0-6	ND	5.44	5.3	76	8.74
0215-95-0312[2]	0-6	1.23(J)[3]	ND	ND	2.49	ND
0215-95-0168	30-36	0.97(J)[3]	ND	ND	2.21	ND
0215-95-0169	0-6	11.7	ND	ND	20.8	ND
0215-95-0171	0-4	0.29(J)[3]	ND	ND	0.43	ND
0215-95-0172	9-15	ND	ND	ND	ND	ND
0215-95-0173	0-6	ND	ND	ND	1.05	ND
0215-95-0175	0-5	0.22(J)[3]	ND	ND	0.47	ND
0215-95-0176	10-15	ND	ND	ND	ND	ND

N/A = not applicable ND = not detected J = estimated U = undetected
[1] Samples 0215-95-0167 and 0169 were diluted 10X and samples 0215-95-0168 and 0312 were diluted 4X so that the EQLs are increased accordingly.
[2] Sample 0215-95-0312 is a field duplicate of sample 0215-95-0167.
[3] Sample values are below method detection limits and the EQLs (Section 4.13.2).

TABLE 5.27.6-1
SOIL CONCENTRATIONS FOR ORGANIC ANALYTES WITH VALUES GREATER THAN THE EQL - PRS 15-014(b) (Continued)

Sample ID	Depth (in.)	Indeno(1,2,3-cd)pyrene (mg/kg)	Naphthalene (mg/kg)	Phenanthrene (mg/kg)	Pyrene (mg/kg)
SAL	N/A	0.61	800	No SAL	2000
EQL[1]	N/A	0.33	0.33	0.33	0.33
0215-95-0167	0-6	17.5	5.01	63.1	64.2
0215-95-0312[2]	0-6	ND	ND	1.61	2.14
0215-95-0168	30-36	ND	ND	1.75	1.7
0215-95-0169	0-6	5.72	ND	16	18.3
0215-95-0171	0-4	0.17(J)[3]	ND	0.21(J)[3]	0.38
0215-95-0172	9-15	ND	ND	ND	ND
0215-95-0173	0-6	0.39	ND	0.53	1.02
0215-95-0175	0-5	ND	ND	0.24(J)[3]	0.4
0215-95-0176	10-15	ND	ND	ND	ND

N/A = not applicable ND = not detected J = estimated U = undetected
[1] Samples 0215-95-0167 and 0169 were diluted 10X and samples 0215-95-0168 and 0312 were diluted 4X so that the EQLs are increased accordingly.
[2] Sample 0215-95-0312 is a field duplicate of sample 0215-95-0167.
[3] Sample values are below method detection limits and the EQLs (Section 4.13.2).

TABLE 5.27.7.1-2
CARCINOGENS WITH CONCENTRATIONS IN SOIL THAT EXCEED SALs - PRS 15-014(b)

Sample ID	Location ID	Depth (in.)	Benzo(a)pyrene (mg/kg)	Benzo(b) fluoranthene (mg/kg)	Dibenzo(a,h) anthracene (mg/kg)	Indeno(1,2,3-cd) pyrene (mg/kg)
SAL	N/A	N/A	0.061	0.61	0.061	0.61
0215-95-0167	15-2535	0-6	27.3	55.4	5.44	17.5
0215-95-0312[1]	15-2535	0-6	0.85(J)[2]	1.54	ND	ND
0215-95-0169	15-2536	0-6	8.43	12.3	ND	5.72
0215-95-0173	15-2538	0-6	0.52	1.0	ND	0.39

N/A = not applicable ND = not detected J = estimated U = undetected
[1] Sample 0215-95-0312 is a field duplicate of sample 0215-95-0167.
[2] Sample value is below the method detection limit and the EQL (Section 4.13.2).

5.27.7.1-2). Phenanthrene was also detected in several soil samples (Table 5.27.6-1) and is retained as a COPC because it does not have a SAL.

Multiple Chemical Evaluation

The MCE included seven analytes in the noncarcinogenic effects category (Table 5.27.7.1-1). The sum of the maximum normalized concentrations for sample 0215-95-0167 (the sample with the maximum normalized sum) is 1.1046, which is above the target value of 1.0. Anthracene was the only analyte retained as a COPC because it contributed more than 0.1 to the sum. The other organic analytes were not retained as COPCs.

An MCE for carcinogens was not performed because only one carcinogen, chrysene, was detected below its SAL. Therefore, chrysene was not retained as a COPC.

TABLE 5.27.7.1-1
MULTIPLE CHEMICAL EVALUATION - PRS 15-014(b)

Analytes	Maximum Normalized Concentrations
SOIL-NONCARCINOGENIC	Maximum Sample 0215-95-0167
Acenaphthene	0.0243
Anthracene	0.9632
Dibenzofuran	0.0204
Fluoranthene	0.0292
Fluorene	0.0291
Naphthalene	0.0063
Pyrene	0.0321
TOTAL	1.1046

The RFI Work Plan for OU 1086 (LANL 1993, 1087) indicates that the outfalls at PRS 15-014(b) drained some of the floors, sinks, and asphalt roof (which is probably the source of the PAHs). In 1992, the drains from the building were connected to the Sanitary Waste Collection System (SWCS) and thus, they no longer drain into the PRS. However, the area sampled, which includes the outfalls, have been inadvertently disturbed to accommodate a new building. This has resulted in soil removal and redistribution, the result of which is that the PRS no longer exists at its former location. Because the area sampled no longer exists and the outfalls do not receive any drainage or PAHs, and the site cannot now be located, we recommend NFA for this PRS under NFA Policy Criterion 1.

5.27.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.27.8 Ecological Assessment

The general landscape condition around the PRS is moderately disturbed and developed, and a potential exists for ecological receptors to come in contact with ecological COPCs associated with the site. However, removal of the PRS (see Section 5.27.2) precludes an evaluation of whether ecological COPC sources exist for this site.

5.27.9 Extent of Contamination

The highest concentrations of PAHs were detected at the outfalls of PRS 15-014(b) (Sample IDs 0215-95-0167 and 0215-95-0169) (Figure 5.27.4.3-1). There was a rapid decrease in PAH concentrations as the two outfalls merged (Sample ID 0215-95-0173) and subsequently continue on as one drainage until no PAHs were detected (Sample IDs 0215-95-0171, 0215-95-0175, and 0215-95-0177). Therefore, the extent of the runoff from the asphalt roof has been clearly defined.

5.27.10 Conclusions and Recommendations

Based upon NFA Criterion 1, PRS 15-014(b) 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.

5.28 PRS 15-009(f)

PRS 15-009(f) is a septic tank located northwest of TA-15-183. One sludge sample was collected from the septic tank. Based on the sample results and the screening assessment, we recommend NFA for this site under NFA Policy Criterion 5.

5.28.1 History

According to the OU 1086 work plan (LANL 1993, 1087) this tank accepted sanitary waste from Laboratory buildings. It was registered with NMED as an unpermitted individual liquid waste system. The septic tank is no longer active.

5.28.2 Description

PRS 15-009(f) is described in detail in Section 10.2.3.1 of the OU 1086 RFI Work Plan (LANL 1993, 1087) . The tank is made of reinforced concrete. COPCs associated with this site include uranium, silver, beryllium, lead, VOCs, SVOCs, and HE.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.28.3 Previous Investigations

No previous investigations were performed at this PRS.

5.28.4 Field Investigation

5.28.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.28.4.2 Results of Field Screening

Field screening at this PRS consisted of monitoring for organic vapors with a PID. No elevated readings were encountered.

The sludge was submitted to the Laboratory Mobile Radiological Van for radiological screening. No elevated readings were reported from this screening.

5.28.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-009(f) was to determine whether contamination was present that could be associated with site activities. Figure 5.28.4.3-1 shows the sample locations, and Table 5.28.4.3-1 summarizes the sampling conducted at this PRS.

Although the RFI Work Plan called for the collection of two samples, only one sample was collected because the contents were assumed to be homogeneous. The sample collected was submitted to an offsite laboratory and was analyzed for HE, TAL metals, VOCs, SVOCs, and total uranium within prescribed holding times.

TABLE 5.28.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-009(f)

Location ID	Sample ID	Depth (in)	Matrix	HE*	TAL Metals*	VOCs*	SVOCs*	Total Uranium*
15-2541	0215-95-0155	N/A	Sludge	71042	71501, 71175	71522	71377	70999

* Batch numbers N/A = not applicable

5.28.5 Background Comparisons

Inorganics

Inorganics detected in the septic tank are presented in Table 5.28.5-1 and were carried forward to the SAL comparison stage. The inorganics that were undetected were not retained as COPCs.

The location of the sample with detected inorganics is presented in Figure 5.28.4.3-1.

Radionuclides

Uranium, the only radionuclide analyzed for, was detected in the septic tank at a concentration of 0.92 µg/L. It was carried forward to the SAL comparison stage.

The location of the sample with detected uranium is presented in Figure 5.28.4.3-1.

5.28.6 Evaluation of Organic Constituents

No organics were detected above the EQL. The reported organics detected below the EQLs and MDLs are addressed in Section 4.14.2.

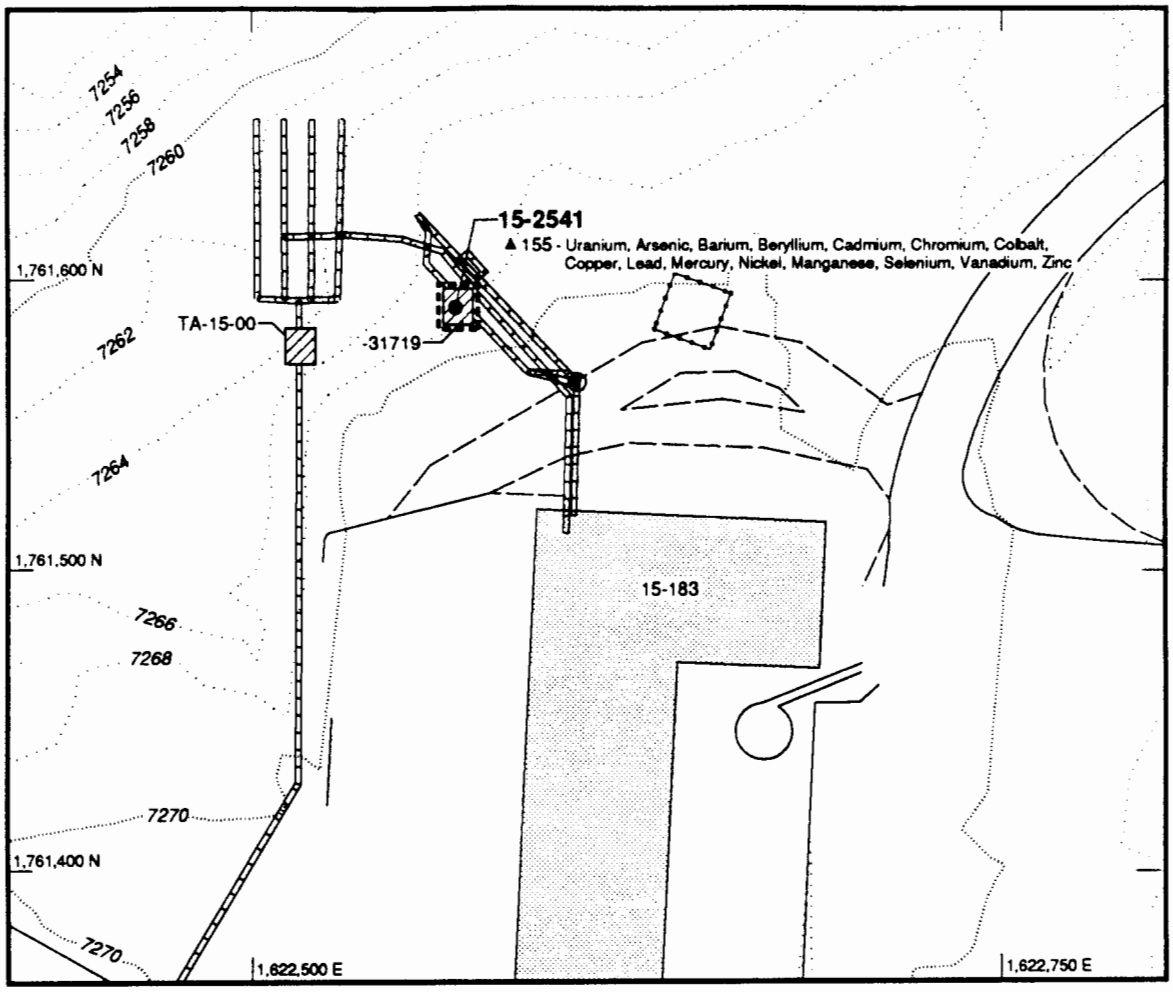
Organics that were undetected or less than the EQLs are not retained as COPCs.

5.28.7 Human Health Assessment

5.28.7.1 Screening Assessment

Fourteen inorganics were detected below their respective SALs in the septic tank (Table 5.28.5-1). Fourteen of the inorganics were submitted to an MCE. The the remaining inorganic, cadmium, was not submitted because it is considered to be a nondetect due to blank contamination (see Section 4.14.1).

PRS 15-009(f)



● Sample Location—analytes listed are above background

Fence
Buildings
Paved roads/parking
Dirt roads
Sewer line
PRS boundary
Septic tank
Contour interval = 2 ft

Sample type:
▲ Sludge Sample

N

0 50 100 150 Feet

GIS Data: FIMAD
Layout: J.Sansom
J96126.MAP

Figure 5.28.4.3-1 Location of PRS 15-009(f) sample

TABLE 5.28.5-1
INORGANICS WITH DETECTED CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR PRS 15-009(f)

Sample ID	Depth (in.)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cadmium (µg/L)	Chromium (µg/L)
LANL UTL	N/A	Not available	Not available	Not available	Not available	Not available
SAL	N/A	50	1000	4	5	180
0215-95-0155	N/A	4.5(J)[1]	92.8	0.14(J)[1]	0.17(J)[1,2]	1.48(J)[1]

Sample ID	Depth (in.)	Cobalt (µg/L)	Copper (µg/L)	Lead (µg/L)	Mercury (µg/L)	Nickel (µg/L)
LANL UTL	N/A	Not available	Not available	Not available	Not available	Not available
SAL	N/A	2200	1300	50	2	100
0215-95-0155	N/A	5.01(J)[1]	3.51(J)[1]	2(J)[1]	0.16(J)[1]	15.5

Sample ID	Depth (in.)	Manganese (µg/L)	Selenium (µg/L)	Vanadium (µg/L)	Uranium (µg/L)	Zinc (µg/L)
LANL UTL	N/A	Not available	Not available	N`ot available	Not available	Not available
SAL	N/A	180	6	260	20	11000
0215-95-0155	N/A	70.2	1.44(J)[1]	3.6(J)[1]	0.92	29.8

N/A = not applicable J = estimated U = undetected
[1] Sample values are below the method detection limits (Section 4.14.1).
[2] Sample value is considered a nondetect because of blank contamination (Section 4.14.1).

Uranium was below its water SAL of 20 µg/L and is not retained as a radionuclide COPC because it is the only radionuclide detected.

Multiple Chemical Evaluation

The MCE included fourteen analytes in the noncarcinogenic effects category (Table 5.28.7.1-1). The sum of the maximum normalized concentrations is 1.1985, which is greater than the target value of 1.0. This would indicate possible additive effects for the inorganics detected in the septic tank. However, nine of the analytes submitted to the MCE were detected below the MDLs and are J qualified. These data have a high degree of uncertainty, and should be used with caution in the data comparison (Section 4.14.1). In addition, the exposure pathway for the septic tank contents is ingestion of the water, which is extremely conservative and unlikely under any circumstance. As a result of these factors, the inorganics detected in the septic tank are not retained as COPCs.

5.28.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.28.8 Ecological Assessment

General landscape condition around 15-009(f) is moderately developed and disturbed, but there is essentially no potential for ecological receptors to come in contact with COPCs in the area sampled. Therefore, no further ecological evaluation of this site is required.

5.28.9 Extent of Contamination

No COPCs were retained; therefore, this section is not applicable.

TABLE 5.28.7.1-1
MULTIPLE CHEMICAL EVALUATION - PRS 15-009(f)

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
WATER-NONCARCINOGENIC	
Arsenic	0.0900
Barium	0.0928
Beryllium	0.0350
Chromium	0.0082
Cobalt	0.0023
Copper	0.0027
Lead	0.0400
Manganese	0.0800
Mercury	0.1550
Nickel	0.3900
Selenium	0.2400
Vanadium	0.0138
Uranium	0.0460
Zinc	0.0027
TOTAL	1.1985

5.28.10 Conclusions and Recommendations

Based upon NFA Criterion 5, PRS 15-009(f) 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.

5.29 PRS 15-009(k)

PRS 15-009(k) is a septic tank located northwest of building TA-15-183. One sludge sample was collected from the septic tank. Based on the sample results and the screening assessment, we recommend NFA for this site under NFA Policy Criterion 5.

5.29.1 History

According to the OU 1086 RFI Work Plan (LANL 1993, 1087) this inactive tank accepted sanitary waste from Laboratory buildings. It was registered as active with NMED as an unpermitted individual liquid waste system.

5.29.2 Description

PRS 15-009(k) is described in detail in Section 10.2.3.1 of the OU 1086 RFI Work Plan (LANL 1993, 1087). The tank is made of reinforced concrete. COPCs specified in the Work Plan as associated with this septic tank include uranium, silver, beryllium, lead, VOCs, SVOCs, and HE.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.29.3 Previous Investigations

No previous investigations were performed at this PRS.

5.29.4 Field Investigation

5.29.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.29.4.2 Results of Field Screening

Field screening at this PRS consisted of monitoring for organic vapors with a PID. No elevated readings were encountered.

The sludge was submitted to the Laboratory Mobile Radiological Van for radiological screening. No elevated readings were reported from this screening.

5.29.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-009(k) was to determine whether contamination was present that could be associated with site activities. Figure 5.29.4.3-1 shows the sample location, and Table 5.29.4.3-1 summarizes the sampling conducted at this PRS.

Although the 1086 RFI Work Plan called for two samples to be collected, only one sample was collected as the waste was expected to be homogeneous. The sample collected was submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The sample was analyzed for HE, VOCs, SVOCs, TAL metals, and total uranium within prescribed holding times. Due to an oversight, the aliquot intended for metals analysis was not sent. Subsequently, another sample was collected and submitted to an offsite laboratory in accordance with the RFI Work Plan. The sample was analyzed for TAL metals within prescribed holding times.

TABLE 5.29.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-009(k)

Location ID	Sample ID	Depth (in)	Matrix	HE*	VOCs*	SVOCs*	Total Uranium*	TAL Metals*
15-2542	0215-95-0157	N/A	Sludge	71042	71522	71377	70999	NA
15-2542	0215-96-0706	N/A	Sludge	NA	NA	NA	NA	82509, 82538

*Batch numbers N/A = not applicable NA = not analyzed

5.29.5 Background Comparisons

Inorganics

Inorganics detected in the septic tank are presented in Table 5.20.5-1 and were carried forward to the SAL comparison stage. The inorganics that were undetected were not retained as COPCs.

The location of the sample with detected inorganics is presented in Figure 5.29.4.3-1.

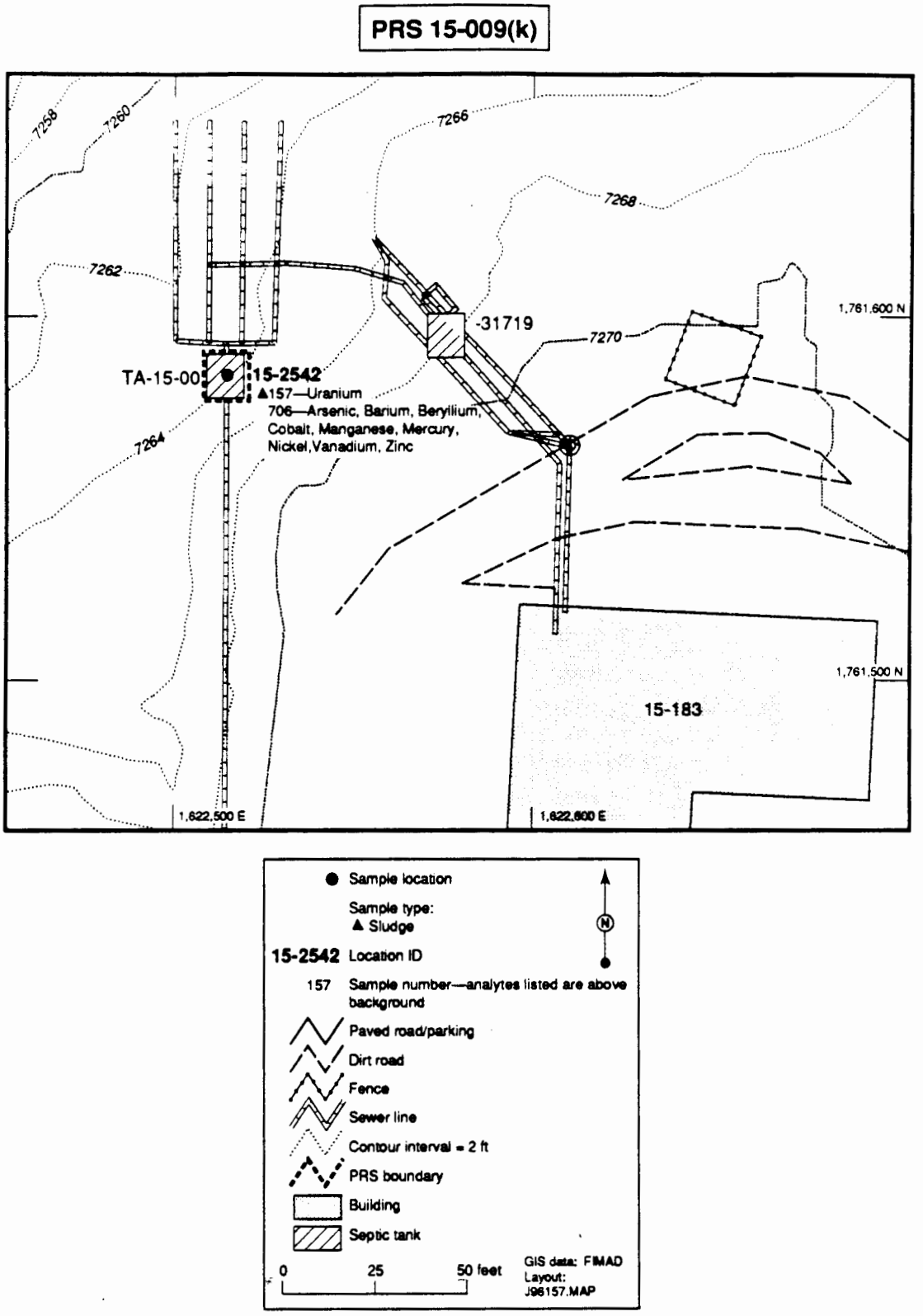


Figure 5.29.4.3-1 Location of PRS 15-009(k) samples

Radionuclides

Uranium was the only radionuclide analyzed for at this site and was detected at a concentration of 0.91 µg/L. It was carried forward to the SAL comparison stage.

The location of the sample with detected uranium is presented in Figure 5.29.4.3-1.

TABLE 5.29.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR PRS 15-009(k)

Sample ID	Depth (in.)	Arsenic (µg/L)	Barium (µg/L)	Beryllium (µg/L)	Cobalt (µg/L)	Manganese (µg/L)
LANL UTL	N/A	Not available	Not available	Not available	Not available	Not available
SAL	N/A	50	1000	4	2200	180
0215-95-0157	N/A	NA	NA	NA	NA	NA
0215-96-0706	N/A	5.79 (J)[1]	16.5 (J)[1]	0.16 (J)[1]	7.75 (J)[1]	88.2

Sample ID	Depth (in.)	Mercury (µg/L)	Nickel (µg/L)	Uranium (µg/L)	Vanadium (µg/L)	Zinc (µg/L)
LANL UTL	N/A	Not available	Not available	Not available	Not available	Not available
SAL	N/A	2	100	20	260	11000
0215-95-0157	N/A	NA	NA	0.91	NA	NA
0215-96-0706	N/A	0.097 (J)[1]	20.1 (J)[1]	NA	1.74 (J)[1]	88.5 (J)[1]

N/A = not applicable NA = not analyzed
[1] Sample values are below the method detection limits (Section 4.15.1).

5.29.6 Evaluation of Organic Constituents

No organics were detected above the EQL in the septic tank. The reported organics detected below the EQLs and MDLs are addressed in Section 4.15.2. The organics that were undetected or below the EQLs were not retained as COPCs.

5.29.7 Human Health Assessments

5.29.7.1 Screening Assessment

Arsenic, barium, beryllium, cobalt, manganese, mercury, nickel, uranium, vanadium, and zinc were detected below their respective water SALs and were submitted to an MCE.

Uranium was below its water SAL of 20 µg/L and was not retained as a radionuclide COPC because it was the only radionuclide detected.

Multiple Chemical Evaluation

The MCE included ten analytes in the noncarcinogenic effects category (Table 5.29.7.1-1). The sum of the maximum normalized concentrations is 0.9753, which is less than the target value of 1.0. Therefore, the inorganics detected in the septic tank are not retained as COPCs.

5.29.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

TABLE 5.29.7.1-1
MULTIPLE CHEMICAL EVALUATION - PRS 15-009(k)

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
WATER-NONCARCINOGENIC	
Arsenic	0.1158
Barium	0.0165
Beryllium	0.0400
Cobalt	0.0035
Manganese	0.4900
Mercury	0.0485
Nickel	0.2010
Vanadium	0.0455
Uranium	0.0067
Zinc	0.0078
TOTAL	0.9753

5.29.8 Ecological Assessment

The general landscape condition around 15-009(k) is moderately developed and disturbed, but there is essentially no potential for ecological receptors to come in contact with COPCs in the area sampled because it is an enclosed septic tank. Therefore, no further ecological evaluation of this site is required.

5.29.9 Extent of Contamination

No COPCs were retained; therefore, this section is not applicable.

5.29.10 Conclusions and Recommendations

Based upon NFA Criterion 5, PRS 15-009(k) 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.

5.30 PRS 15-005(b)

PRS 15-005(b) is an active container storage area for HE. Based on NFA Policy Criterion 5, this PRS will not be added to the HSWA module of the Laboratory's RCRA operating permit, and it is proposed for removal from the ER Project List of PRSs.

5.30.1 History

Section 10.2.3.2 of the RFI Work Plan states that this container storage area is currently regulated under 40 CFR Part 262, Standards Applicable to Generators of Hazardous Wastes.

5.30.2 Description

Three storage areas are located near PRS 15-005(b). The RFI Work Plan calls for collecting two samples from the outside of the building. A grassy field is on one side of the building, and a paved road is on the other side.

5.30.3 Previous Investigations

No previous investigations were performed at this PRS.

5.30.4 Field Investigation

5.30.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No readings significantly above background were reported from these radiological surveys.

5.30.4.2 Results of Field Screening

HE spot tests were carried out at these sample locations before the start of any intrusive activities. One location,15-2544, yielded a positive result. Another test was conducted 2 in. away, with a negative result. Surface sample 0215-95-0181 was collected from the location of the negative result. No further positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.30.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-005(b) was to determine whether contamination was present that could be associated with site activities. Figure 5.30.4.3-1 shows the sample locations, and Table 5.30.4.3-1 summarizes the sampling conducted at this PRS.

All five samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan. The samples were analyzed for total uranium and TAL metals within prescribed holding times.

TABLE 5.30.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-005(b)

Location ID	Sample ID	Depth (in)	Matrix	Total Uranium*	TAL Metals*
15-2543	0215-95-0179	0-6	Soil	70274	71387/70756
15-2543	0215-95-0314	0-6	Soil	70274	71387/70756
15-2543	0215-95-0180	18-24	Soil	70274	71387/70756
15-2544	0215-95-0181	0-6	Soil	70274	71387/70756
15-2544	0215-95-0182	18-24	Soil	70274	71387/70756

*Batch numbers

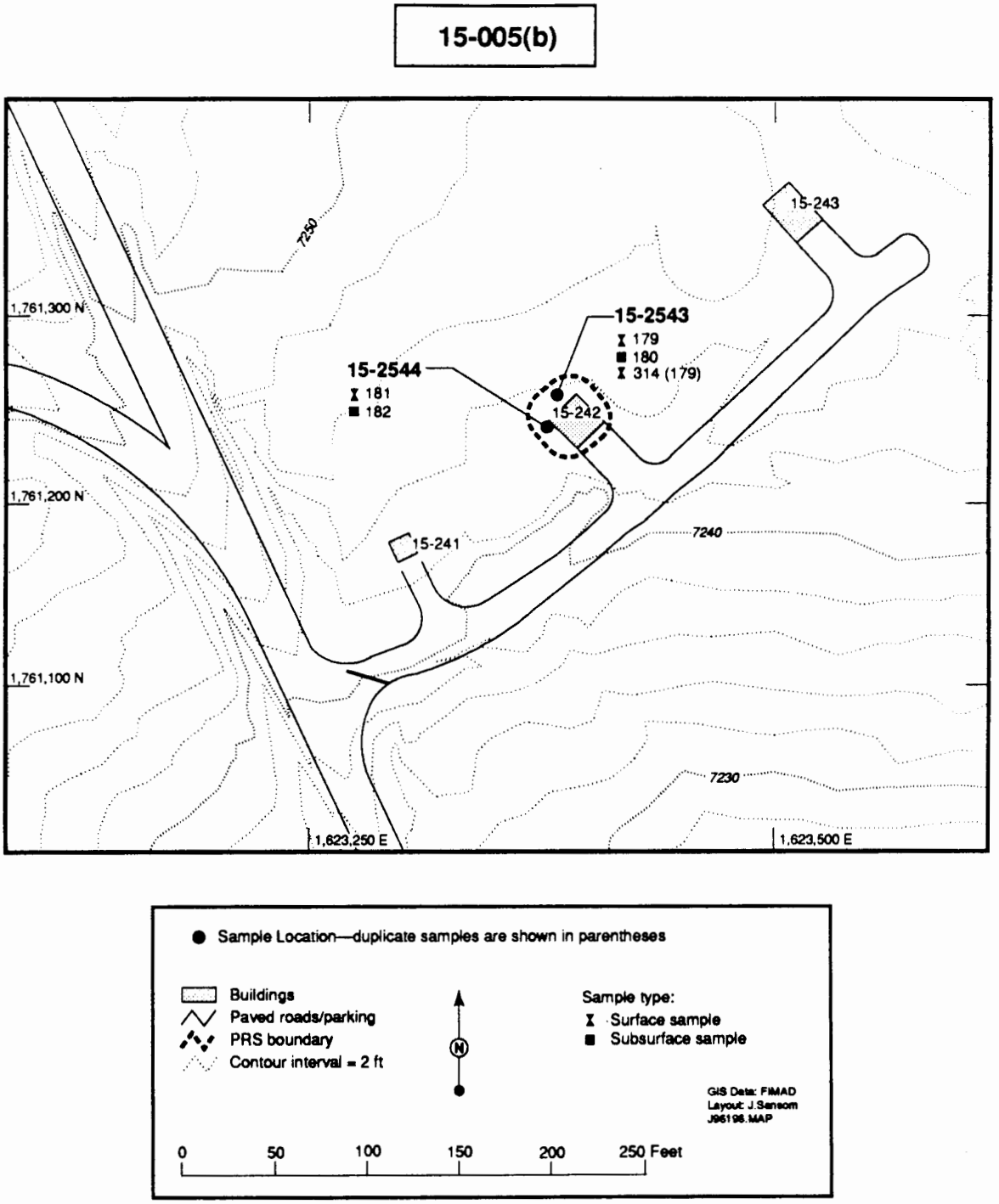


Figure 5.30.4.3-1 Location of PRS 15-005(b) samples

5.30.5 Background Comparisons

Inorganics

No inorganic compounds were detected at concentrations above the background UTLs; therefore, they were not retained as COPCs.

Radionuclides

No radionuclide compounds were detected at concentrations above the background UTLs; therefore, they were not retained as COPCs.

5.30.6 Evaluation of Organic Constituents

Organic compounds were not analyzed for this PRS, in accordance with the RFT Work Plan (LANL 1993,1087).

5.30.7 Human Health Assessment

5.30.7.1 Screening Assessment

No inorganics or radionuclides were detected above background UTLs and no organics were analyzed for at this site. Therefore, a screening assessment was not conducted.

5.30.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs are retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.30.8 Ecological Assessment

No inorganics were detected above background UTLs and no organics were detected, so these constituents are eliminated as contaminant sources for ecological risk. Therefore, no further ecological evaluation of this site is required.

5.30.9 Extent of Contamination

No COPCs are retained; therefore, this section is not applicable.

5.30.10 Conclusions and Recommendations

Based upon NFA Criterion 5, PRS 15-005(b) 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.

5.31 PRS 15-005(c)

PRS 15-005(c) is an active container storage area for HE that is currently regulated under 40 CFR Part 262, Standards Applicable to Generators of Hazardous Wastes. Based on NFA Policy Criterion 5, this PRS will not be added to the HSWA Module of the Laboratory's RCRA Operating Permit, and is proposed for removal from the ER Project List of PRSs.

5.31.1 History

In Section 10.2.3.2, the RFI Work Plan states that this container storage area is currently regulated under 40 CFR Part 262, Standards Applicable to Generators of Hazardous Wastes.

5.31.2 Description

PRS 15-005(c) is located next to a road very near to former Firing Site C.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.31.3 Previous Investigations

No previous investigations were performed at this PRS.

5.31.4 Field Investigation

5.31.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No readings significantly above background were reported from these radiological surveys.

5.31.4.2 Results of Field Screening

HE spot tests were carried out at these sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF and Laboratory Results.

5.31.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-005(c) was to determine whether contamination was present that could be associated with site activities. Figure 5.31.4.3-1 shows the sample locations, and Table 5.31.4.3-1 summarizes the sampling conducted at this PRS.

All samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan. The samples were analyzed for total uranium and TAL metals within prescribed holding times.

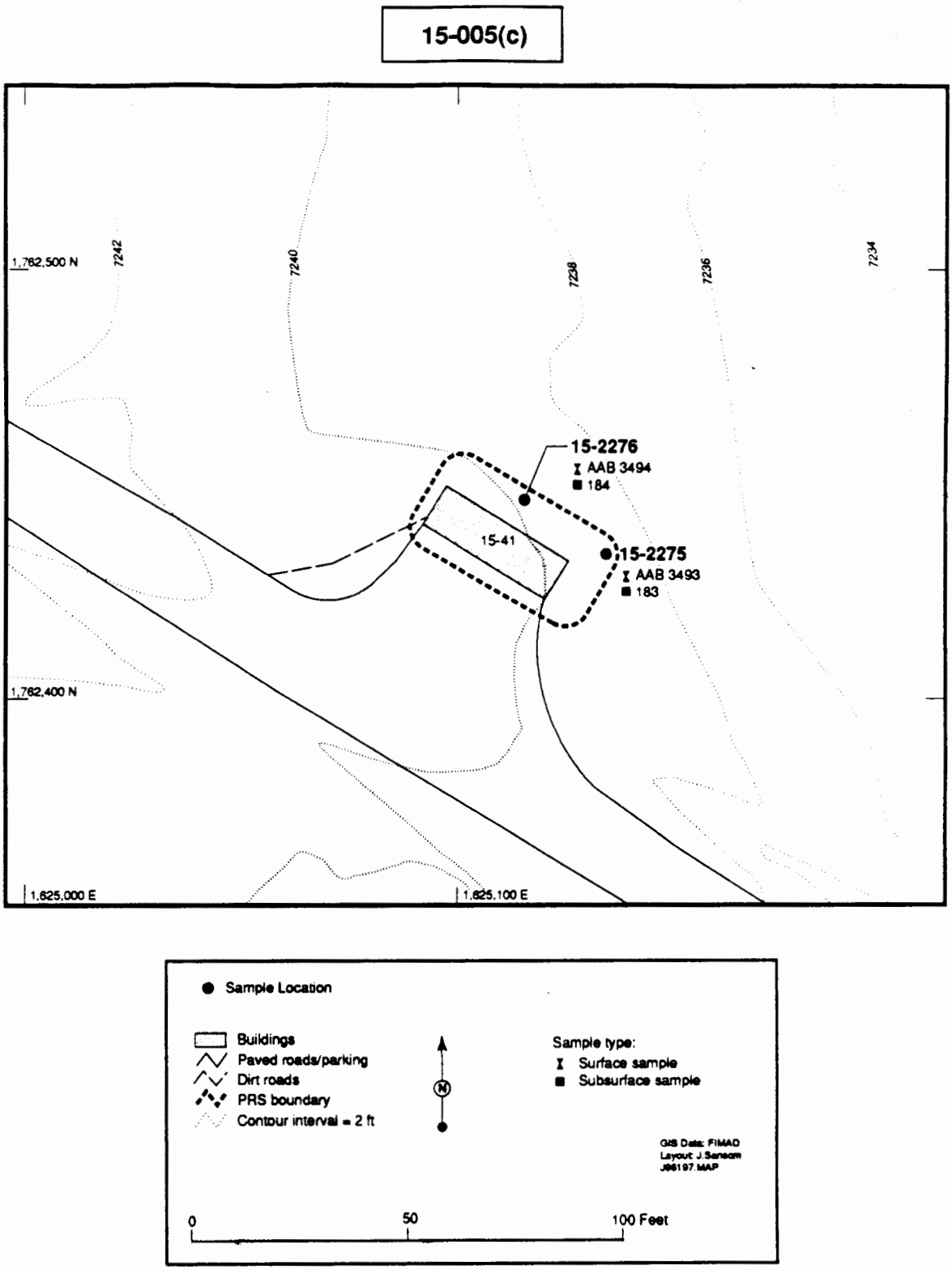


Figure 5.31.4.3-1 Location of PRS 15-005(c) samples

TABLE 5.31.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-005(c)

Location ID	Sample ID	Depth (in)	Matrix	Total Uranium*	TAL Metals*
15-2275	AAB 3493	0-4	Soil	18166	18164
15-2275	0215-95-0183	18-24	Soil	70275	71206/71524
15-2276	AAB 3494	0-6	Soil	18166	18164
15-2276	0215-95-0184	18-24	Soil	70275	71206/71524

*Batch numbers

5.31.5 Background Comparisons

Inorganics

No inorganic compounds were detected at concentrations above the background UTLs; therefore, they were not retained as COPCs.

Radionuclides

No radionuclide compounds were detected at concentrations above the background UTLs; therefore, they were not retained as COPCs.

5.31.6 Evaluation of Organic Constituents

No organics compounds were analyzed for at this PRS in accordance with the RFI Work Plan (LANL 1993, 1087).

5.31.7 Human Health Assessment

5.31.7.1 Screening Assessment

No inorganics or radionuclides were detected above background UTLs and no organics were analyzed for at this site. Therefore, a screening assessment was not conducted.

5.31.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs are retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.31.8 Ecological Assessment

No inorganics were detected above background UTLs and no organics were detected, so these constituents are eliminated as contaminant sources for ecological risk. Therefore, no further ecological evaluation of this site is required.

5.31.9 Extent of Contamination

No COPCs were retained; therefore, this section is not applicable.

5.31.10 Conclusions and Recommendations

Based upon NFA Criterion 5, PRS 15-005(c) 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.

5.32 PRS 15-010(a)

PRS 15-010(a) is a septic tank built in 1944 and connected to building TA-15-1. It was later connected to relocated building TA-15-23. Because we believe that Phase I sampling did not adequately characterize the site, this PRS is recommended for Phase II sampling.

5.32.1 History

PRS 15-010(a) is described in detail in the OU 1086 RFI Work Plan for on 1086 (LANL 1993, 1087) in Section 5.3.3.2, which was moved to Section 10.3.3 with the NOD response (ER 94-J315).

Engineering drawing R 5110, 1983; lists the building TA-15-1 as having been removed in 1962, and this septic tank abandoned in 1961. Conversations with former personnel revealed that the septic tank was connected to Buildings TA-15-23 and TA-15-1 and may also have been connected to the photography lab in Building TA-15-7.

5.32.2 Description

Field investigations found that the tank, measuring approximately 5 ft wide by 8 ft long by 3 ft deep, had not been removed, but was left in place and backfilled with sand. The tank was found by using a backhoe. The top of the tank was broken and in pieces within the tank. The tank is approximately 4 ft below grade.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.32.3 Previous Investigations

In 1965 this septic tank was surveyed and found to be free of HE and radioactive contamination (Courtright 1965, 10-0034) and was reported to have been removed and disposed of in 1967.

5.32.4 Field Investigation

5.32.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.32.4.2 Results of Field Screening

Field screening at this PRS consisted of monitoring for organic vapors with a PID. No elevated readings were encountered.

Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.32.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-010(a) was to determine whether contamination was present that could be associated with site activities. Figure 5.32.4.3-1 shows the sample location, and Table 5.32.4.3-1 summarizes the sampling conducted at this PRS.

The samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The samples were analyzed for TAL metals, VOCs, SVOCs, HE, and by gamma scan within prescribed holding times.

TABLE 5.32.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-010(a)

Location ID	Sample ID	Depth (in)	Matrix	TAL Metals*	VOCs*	SVOCs*	HE*	Gamma Scan*
15-2572	0215-95-0131	83	Soil	69184, 69437	69364	69207	69881	69318
15-2572	0215-95-0132	81	Soil	69184, 69437	69364	69207	69881	69318

*Batch numbers

5.32.5 Background Comparisons

Inorganics

Inorganics detected in the soil from the tank above their background UTLs are presented in Table 5.32.5-1 and were carried forward to the SAL comparison stage. The inorganics that were undetected or less than the background UTLs were not retained as COPCs.

The location of samples with inorganics exceeding background UTLs are presented in Figure 5.32.4.3-1.

TABLE 5.32.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR PRS 15-010(a)

Sample ID	Depth (in.)	Chromium (mg/kg)	Copper (mg/kg)	Lead (mg/kg)	Mercury (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)
LANL UTL	N/A	19.3	15.5	23.3	0.1	Not Available	50.8
SAL	N/A	210	2800	400	23	380	23000
0215-95-0131	83	78.9(J)	50.2	133	182	37.6	266
0215-95-0132	81	15.7(J)	28.8	53.3	53.7	2.37	90.9

N/A = not applicable J = estimated U = undetected

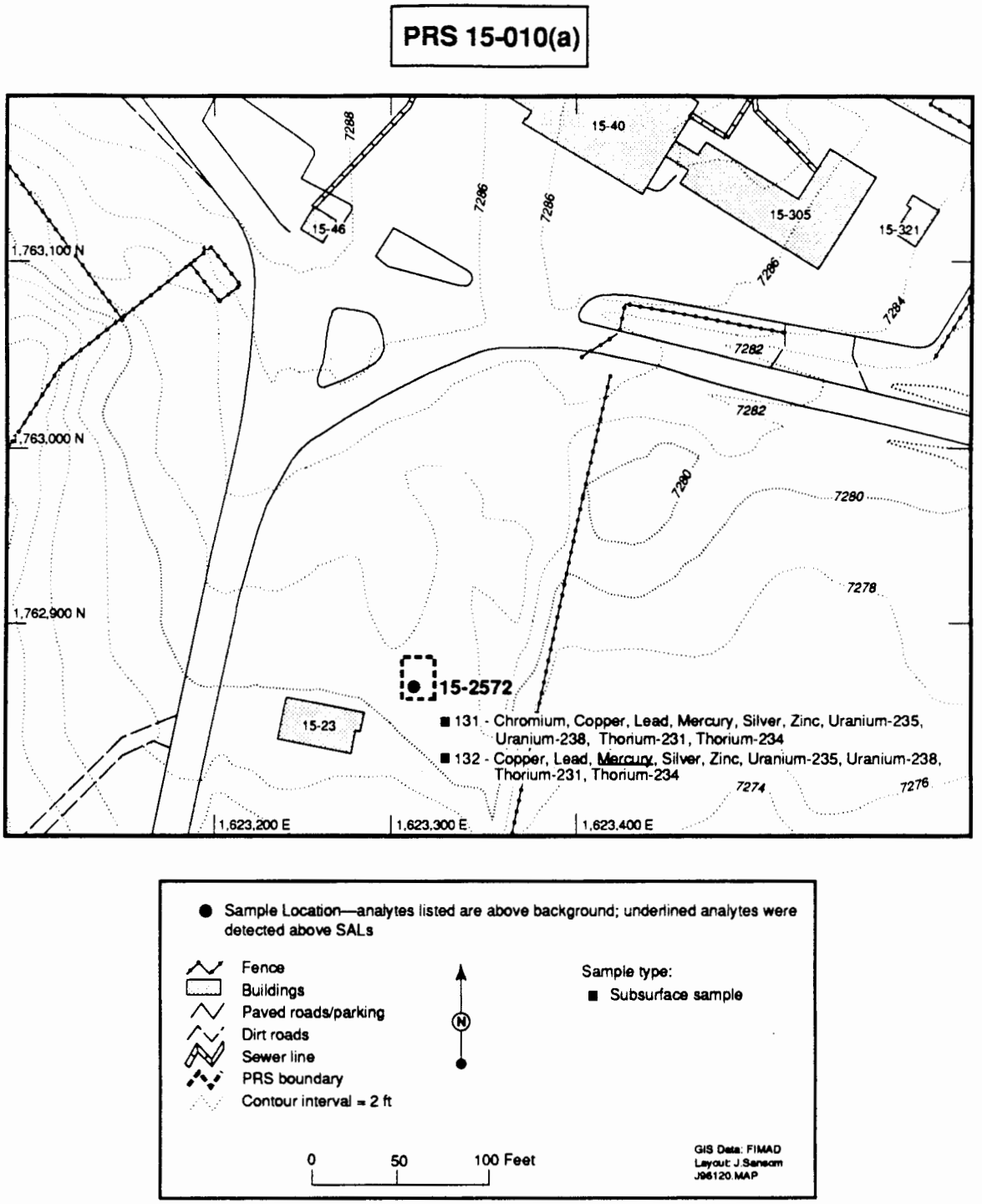


Figure 5.32.4.3-1 Location of PRS 15-010(a) samples

Radionuclides

Radionuclides detected in the subsurface soil above their background UTLs and detected, but without a background UTL, are presented in Table 5.32.5-2. These radionuclides are carried forward to the SAL comparison stage, while radionuclides that were undetected or less than the background UTLs were not retained as COPCs.

The locations of samples with radionuclides exceeding background UTLs are presented in Figure 5.32.4.3-1.

TABLE 5.32.5-2
RADIONUCLIDES WITH CONCENTRATIONS GREATER THAN BACKGROUND CONCENTRATIONS FOR PRS 15-010(a)

Sample ID	Depth (in.)	Thorium-231 (pCi/g)	Thorium-234 (pCi/g)	Uranium-235 (pCi/g)	Uranium-238 (pCi/g)
LANL UTL	N/A	Not Available	1.82	0.084	1.82
SAL	N/A	No SAL	No SAL	10	67
0215-95-0131	83	0.99	4.47	0.261 (U)	3.46
0215-95-0132	81	0.82	5.39	0.254 (U)	4.2

N/A = not applicable J = estimated U = undetected

5.32.6 Evaluation of Organic Constituents

Acetone was detected in one subsurface soil sample above the EQL (0.01 mg/kg) at a concentration of 0.044(J) mg/kg but was not carried forward to the SAL comparison stage because it is a common laboratory contaminant. The data usability of the detected acetone value and the reported organics detected below the EQLs and MDLs are addressed in Section 4.18.2. The organics that were undetected or detected below the EQLs were not retained as COPCs.

5.32.7 Human Health Assessment

5.32.7.1 Screening Assessment

Chromium, copper, lead, silver, and zinc were detected below their respective SALs and were submitted to an MCE. Mercury was detected above its SAL (23 mg/kg) and was retained as a COPC (Table 5.32.5-1).

Thorium-231 and thorium-234, which were detected in two subsurface soil samples, are the daughter products of naturally occurring uranium-235 and uranium-238, respectively. Because the uranium radionuclides were detected below their respective SALs and the thorium daughter radionuclides are included in the SAL calculations for uranium-235 and uranium-238, thorium-231 and thorium-234 are not considered to be at levels of concern and are not retained as COPCs at this PRS.

Uranium-235 and uranium-238 were detected at concentrations below their SALs and were submitted to an MCE.

Multiple Chemical Evaluation

The MCE included five analytes in the noncarcinogenic effects category (Table 5.32.7.1.-1). The sum of the maximum normalized concentrations is 0.8366, which is less than the target value of 1.0. Therefore, these analytes are not retained as COPCs.

The MCE included two analytes in the radionuclide effects category (Table 5.32.7.1-1). The sum of the maximum normalized concentrations is 0.0888, which is less than the target value of 1.0. Therefore, these analytes are not retained as COPCs.

TABLE 5.32.7.1-1
MULTIPLE CHEMICAL EVALUATION - PRS 15-010(a)

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
SOIL-NONCARCINOGENIC	
Chromium	0.3757
Copper	0.0179
Lead	0.3325
Silver	0.0989
Zinc	0.0116
TOTAL	0.8366
SOIL-RADIONUCLIDE	
Uranium-235	0.0261
Uranium-238	0.0627
TOTAL	0.0888

5.32.7.2 Risk Assessment

The screening assessment indicated that mercury was a COPC at this site. It is impossible to determine whether the mercury found in the tank resulted from the fill, or if it was present in the tank when it was abandoned. In addition, it was not possible to determine if any contaminants had leaked from the tank. However, the number of samples was not sufficient to adequately characterize the site. Therefore, Phase II sampling will be conducted to provide more information about the site.

5.32.8 Ecological Assessment

General landscape condition around 15-010(a) is moderately developed and disturbed and there is moderate potential for receptors to come in contact with ecological COPCs (chromium, copper, lead, mercury, silver, zinc, uranium, and thorium) associated with the site (Table 2.4-1). Therefore, this PRS will be included as an ecological COPC source in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by our regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.32.9 Extent of Contamination

The extent of contamination was not determined by the Phase I investigation and is of concern since mercury was detected above its PRG. The Phase II sampling will be conducted to better define the extent and nature of the contamination.

5.32.10 Conclusions and Recommendations

Phase II sampling will be conducted at this PRS.

5.32.11 Sampling and Analysis Plan for PRS 15-010(a)

5.32.11.1 Problem Definition

Although the OU 1086 RFI Work Plan (LANL 1993, 1087) stated that the septic tank had been removed, initial investigation of the septic tank area with a backhoe encountered the tank. The top of the septic tank was found to be no longer intact. The two samples that were collected at this PRS were located close to the bottom of the tank in material that is either fill or was left in the tank when it was abandoned. These two samples from inside the tank did not adequately characterize this PRS in terms of any releases that may occur.

Phase II sampling around and in the tank will sufficiently characterize any potential contamination associated with the septic tank.

5.32.11.2 Chemicals of Potential Concern

The COPC identified from the Phase I sampling is mercury, but samples will also be analyzed for TAL metals, total uranium, HE, and SVOCs, to be consistent with the Phase I RFI Work Plan (LANL 1993, 1087).

5.32.11.3 Sampling and Analysis Design

Four samples are proposed for collection from this PRS with the use of a backhoe to expose soil, followed by hand collection. One sample will be collected where the drainline exits the tank. Two additional samples will be collected from the outside of the tank, while one sample will be collected from the interior of the tank at the opposite end from the two previous samples. In addition, if excavation of the soil surrounding the tank shows signs of obvious staining, the soil will be sampled and analyzed as described. Figure 5.32.11.3-1 shows the proposed sampling locations.

5.32.11.4 Analyses

All four subsurface soil samples will be analyzed for TAL metals, total uranium, HE, and SVOCs (Table 5.32.11.4-1).

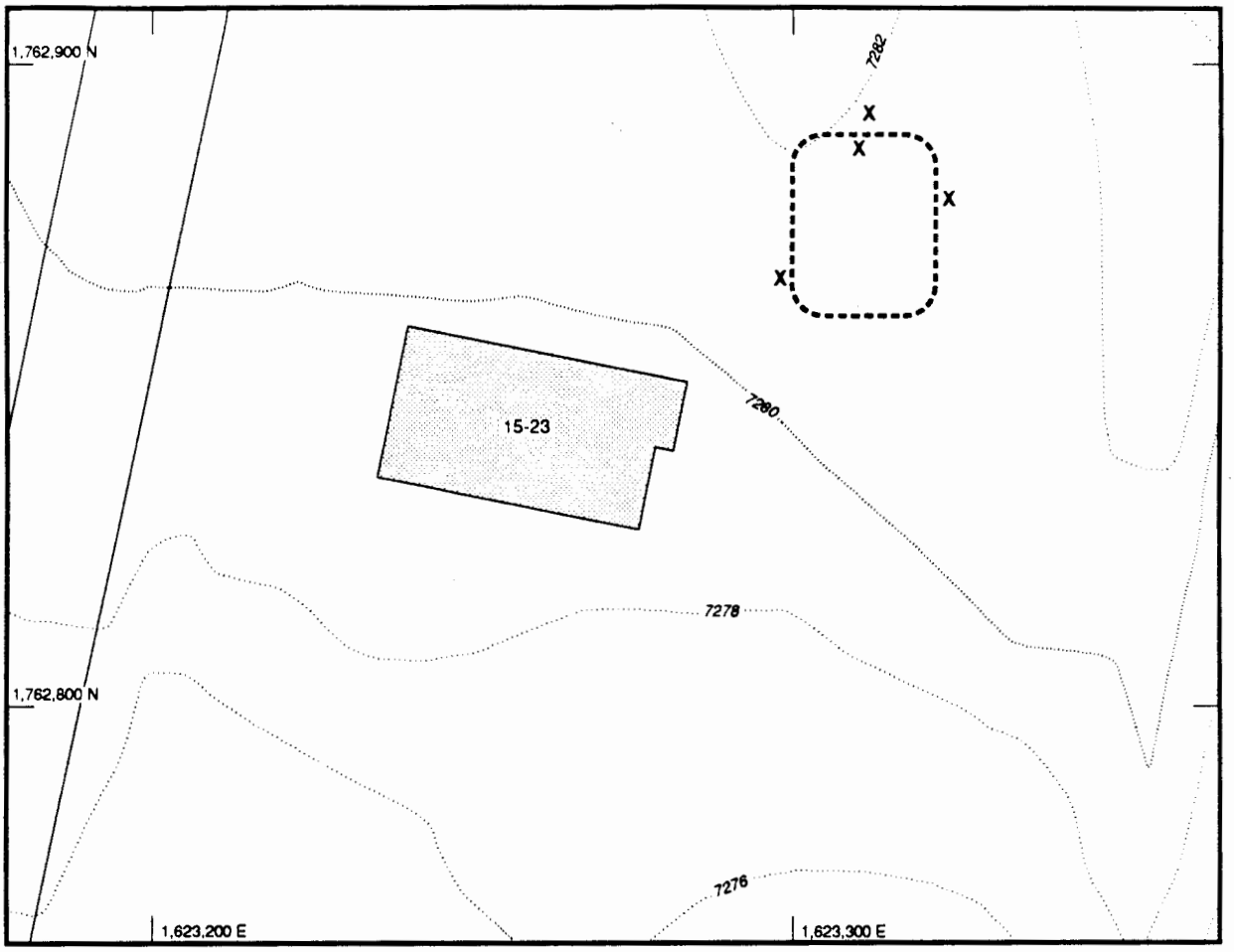
All analytical samples will be analyzed for inorganics by EPA SW-846 Method 6010 in accordance with current ER contract requirements. Analytical samples will be analyzed for SVOCs by EPA SW-846 Method 8270, for total uranium by ICPMS, and for HE by USATHMA high-performance liquid chromatography (HPLC). Appropriate Laboratory QA/QC procedures will be followed.

5.32.11.5 Sampling Plan Implementation

A land survey will be conducted for the sample locations using established survey monuments and coordinates published in the LANL Survey Monument Network Manual (LANL 1994). A Sokkia Set IIIB Total Station with SDR Data Collector will be used for the survey.

Prior to sampling, all sample locations will be field screened for radioactivity and HEs in accordance with the Site-Specific Health and Safety Plan (SSHASP). Appropriate health and safety precautions will be undertaken according to the Laboratory's ER Program SOPs (LANL 1993, 0875) based on this screening. A backhoe will be used to expose the sides of the tank and the drainline leading into the tank. The samples will be collected from dirt brought up in the backhoe according to LANL ER-DOP-06-09. All samples will be submitted to a fixed lab for analysis.

15-010(a)
Proposed Subsurface Sampling Locations



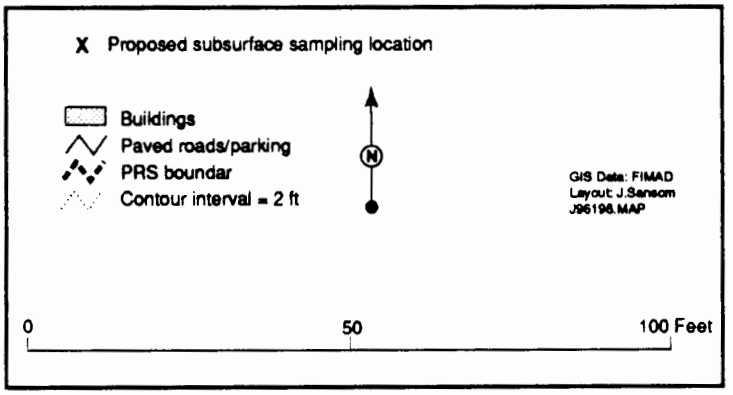


Figure 5.32.11.3-1 Location of proposed sampling for PRS 15-010(a)

TABLE 5.32.11.4-1
PROPOSED PHASE II SAMPLING AND ANALYSIS PLAN FOR PRS 15-010(a)

PRS 15-010(a) Samples	Field Screening						Laboratory Analysis			
	Alpha, Beta, Gamma	Uranium	Beryllium	Lead	HEs	SVOCs	Total Uranium	TAL Metals	HEs	SVOCs
Drainline Sample at 8 ft	1	1	1	1	1	1	1	1	1	1
Tank Exterior at 10 ft	2	2	2	2	2	2	2	2	2	2
Tank Interior at 7 ft	1	1	1	1	1	1	1	1	1	1
Total	4	4	4	4	4	4	4	4	4	4

Field screening will be conducted by portable radiation detection instruments and by LIBS.

All appropriate SOPs will be followed.

A backhoe will be used to excavate the soil above the tank and beside the tank near the drainline. The backhoe will bring up material from the north end of the tank, and this soil will be sampled for total uranium TAL metals, HEs, and SVOCs.

From below the drainline/tank connection, the backhoe will excavate soil which will be sampled for the above COPCs.

The final two samples will be collected from approximately 10 ft below grade next to the tank exterior following the procedures described above. These samples will determine if contamination is migrating from the tank.

5.32.11.6 Sample Handling

Samples will be handled, packaged, and shipped in accordance with the latest revisions of the applicable Laboratory ER Program SOPs. Samples will be submitted to offsite contract analytical laboratories by direct sample shipping from the field or by the Sample Management Office.

Field data will be collected and documented in the field notebooks and field sample collection logs. Additionally, required field data will be entered in the ER 4-D™ electronic field data base. This electronic record will be uploaded to FIMAD at the conclusion of the sampling season. Data verification and baseline validation will be consistent with the EP Project QAPP.

5.33 PRS 15-010(b)

PRS 15-010(b) is an inactive septic tank which served Building TA-15-8. Based on the sample results and the screening assessment, we recommend NFA for this site under NFA Policy Criterion 5.

5.33.1 History

PRS 15-010(b) is discussed in detail in Section 10.3.2 in the OU 1086 RFI Work Plan (LANL 1993, 1087).

This tank is a concrete cube that was part of a drainline from Building TA-15-8 which drained to an outfall at the edge of Three-Mile Canyon. Because HE was machined in the building with water cooling, HE is the only COPC associated with this site.

5.33.2 Description

This septic tank is described as a 5 by 5 by 5 ft concrete cube which was used for clean-out or settling of HE. The bottom of the tank is located 5 ft below grade.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.33.3 Previous Investigations

No previous investigations were performed at this PRS.

5.33.4 Field Investigation

5.33.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.33.4.2 Results of Field Screening

Field screening at this PRS consisted of monitoring for organic vapors with a PID. No elevated readings were encountered.

HE spot tests were carried out at the soil sample locations before the start of any intrusive activities. No positive results were obtained. Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

The sludge sample was screened for radioactivity by the Laboratory Mobile Radiological Van. No elevated readings were encountered from this screening.

5.33.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-010(b) was to determine whether contamination was present that could be associated with site activities. Figure 5.33.4.3-1 shows the sample locations, and Table 5.33.4.3-1 summarizes the sampling conducted at this PRS.

Although the OU 1086 RFI Work Plan called for two samples to be collected from the septic tank, only one sample was collected, as the waste was expected to be homogeneous. Three soil

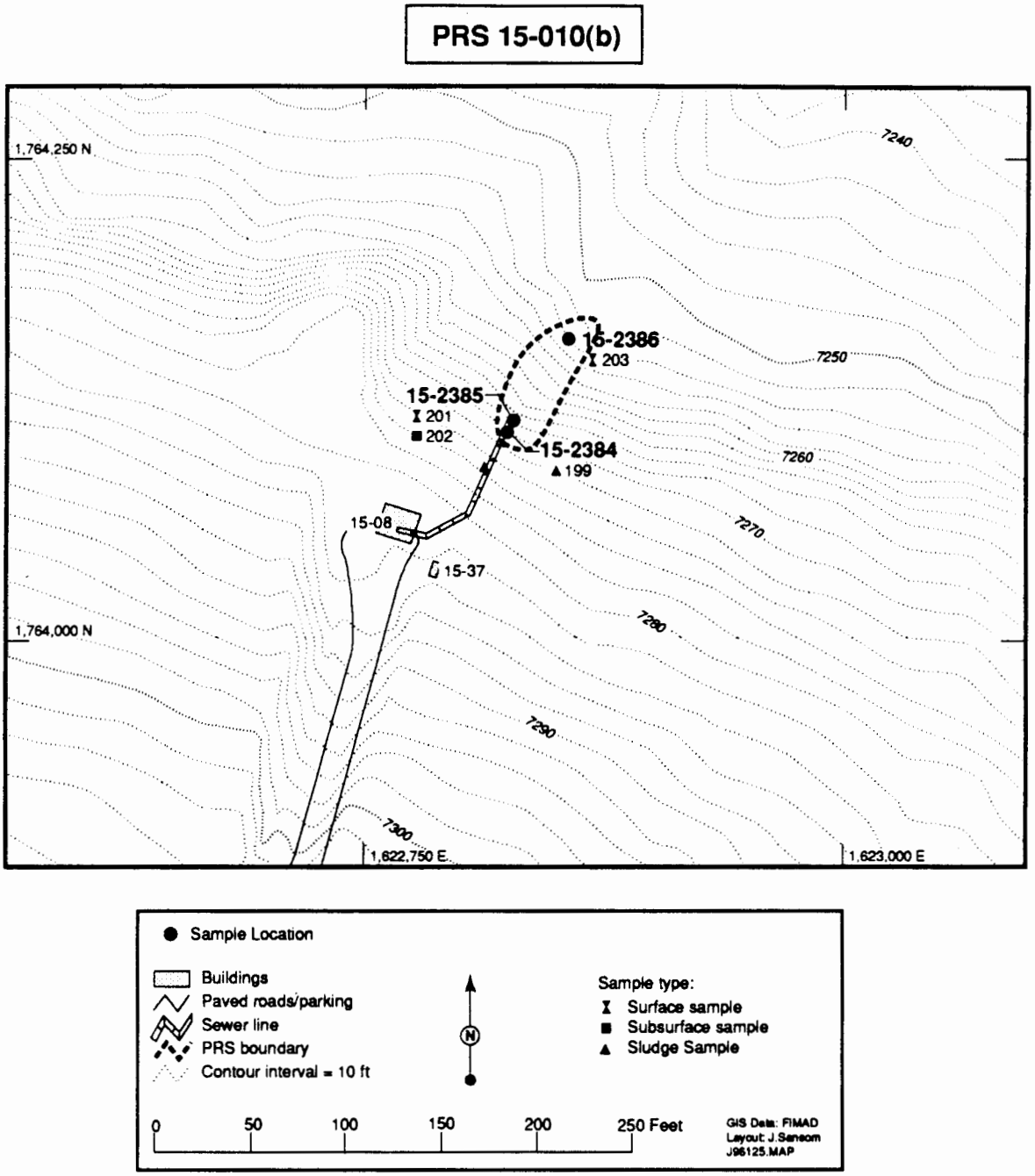


Figure 5.33.4.3-1 Location of PRS 15-010(b) samples

samples were collected instead of the four required by the RFI Work Plan because tuff was reached at 4 in. in one auger hole and deeper sampling was prohibited. The samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The samples were analyzed for HE within prescribed holding times.

TABLE 5.33.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-010(b)

Location ID	Sample ID	Depth (in)	Matrix	HE*
15-2384	0215-95-0199	N/A	Sludge	71042
15-2385	0215-95-0201	0-6	Soil	71116
15-2385	0215-95-0202	20-24	Soil	71116
15-2386	0215-95-0203	0-6	Soil	71116

*Batch numbers N/A = not applicable

5.33.5 Background Comparisons

Inorganics

Inorganic compounds were not analyzed for this PRS.

Radionuclides

Radionuclide compounds were not analyzed for this PRS.

5.33.6 Evaluation of Organic Constituents

No HE compounds were detected; therefore, they were not retained as COPCs.

5.33.7 Human Health Assessment

5.33.7.1 Screening Assessment

No organics were detected; therefore, a screening assessment was not conducted.

5.33.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable health risk exists at this site.

5.33.8 Ecological Assessment

No inorganics were detected above background UTLs and no organics were detected, so these constituents were eliminated as contaminant sources for ecological risk. Therefore, no further ecological evaluation of this site is required.

5.33.9 Extent of Contamination

No COPCs were retained because none were detected; therefore, this section is not applicable.

5.33.10 Conclusions and Recommendations

No COPCs were retained at this PRS; therefore, based on NFA Criterion 5, PRS 15-010(b) 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.

5.34 PRS 15-014(h)

PRS 15-014(h) consists of three outfalls on the northeast side of building TA-15-40 from which noncontact cooling water is emptied. Based on the sample results and screening assessment, we recommend this site for NFA under NFA Policy Criterion 5.

5.34.1 History

PRS 15-014(h) is discussed in detail in Section 10.3 in the OU 1086 RFI Work Plan (LANL 1993, 1087).

5.34.2 Description

Of the three outfalls, the first is permitted (EPA 04A 013). The first outfall was from a photographic laboratory and was believed to be contaminated with silver and organic compounds. The second outfall, from building TA-15-40, is also permitted (EPA 04A 102), and the discharge water is derived from noncontact cooling water, roof drains, and floor drains. . The COPCs associated with the first to drain at this site include silver, VOCs, and SVOCs.

The third outfall is a storm drain that connects a yard drain north and east of building TA-15-40. This third drain was recommended for NFA in the RFI Work Plan and approved by EPA, and Therefore, was not sampled. The site was recommended for NFA because it is a storm drain that connects a yard drain north and east of Building TA-15-40 to an outfall, and there is no evidence that any hazardous materials were put in the drain

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.34.3 Previous Investigations

No previous investigations were performed at this PRS.

5.34.4 Field Investigation

5.34.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.34.4.2 Results of Field Screening

HE spot tests were carried out at these sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling to assist in determining which samples would be submitted for offsite analysis on the basis of metals content. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.34.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-014(h) was to determine whether contamination was present that could be associated with site activities. Figure 5.34.4.3-1 shows the sample locations, and Table 5.34.4.3-1 summarizes the sampling conducted at this PRS.

The samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan. The samples were analyzed for TAL metals, VOCs, and SVOCs within prescribed holding times.

TABLE 5.34.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-014(h)

Location ID	Sample ID	Depth (in)	Matrix	TAL Metals*	VOCs*	SVOCs*
15-2380	0215-95-0191	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-2380	0215-95-0192	30-36	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-2381	0215-95-0193	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-2381	0215-95-0194	18-24	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-2382	0215-95-0195	0-6	Soil	71206, 71524	NA	71478
15-2382	0215-95-0196	30-36	Soil	71206, 71524	71599	71478
15-2383	0215-95-0197	0-6	Soil	71206, 71524	NA	71478
15-2383	0215-95-0198	16-22	Soil	71206, 71524	71599	71550
15-2380	0215-95-0318	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		

*Batch numbers NA = not analyzed

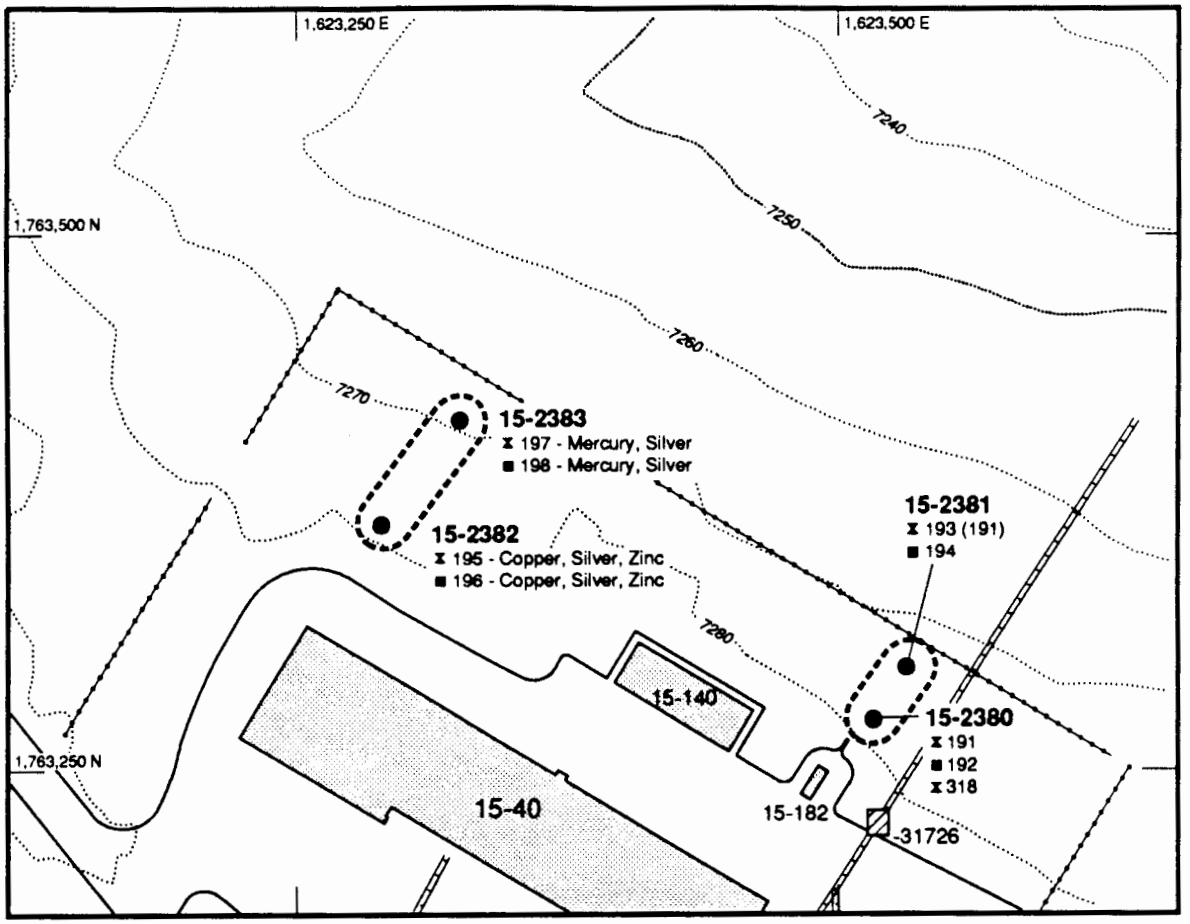
5.34.5 Background Comparisons

Inorganics

Copper, lead, mercury, silver, and zinc were detected above their background UTLs or detected, but with no background UTL. Further analysis of lead data showed that the distribution of site data concentrations was not statistically different from background (lead: Gehan test p-value = 0.3591, Quantile test p-value = 0.5893, Slippage test p-value = 0.0226. See Section 3.2 for a discussion of these tests.). As a result, lead was not retained as a COPC.

The inorganics that were greater than background UTLs, or without a background UTL are presented in Table 5.34.5-1 and were carried forward to the SAL comparison stage. The inorganics that were undetected or less than background UTLs were not retained as COPCs.

PRS 15-014(h)



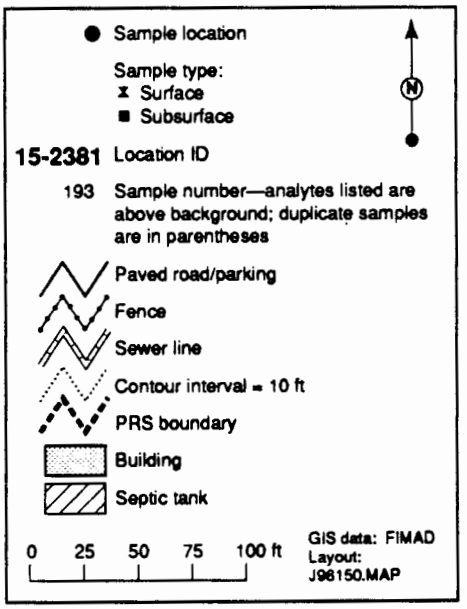


Figure 5.34.4.3-1 Location of PRS 15-014(h) samples

The locations of samples with inorganics exceeding background UTLs are presented in Figure 5.34.4.3-1.

TABLE 5.34.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR PRS 15-014(h)

Sample ID	Depth (in.)	Copper (mg/kg)	Mercury (mg/kg)	Silver (mg/kg)	Zinc (mg/kg)
LANL UTL	N/A	15.5	0.1	Not Available	50.8
SAL	N/A	2800	23	380	23000
0215-95-0195	0-6	18.3	0.09	1.57	197(J)
0215-95-0196	30-36	21.8	0.07	5.54	81.4
0215-95-0197	0-6	14.9	0.72	6.49	35.4
0215-95-0198	16-22	3.72	0.36	0.38(J)[1]	24.7

N/A = not applicable ND = not detected J = estimated U = undetected
[1] Sample value is below the method detection limit (Section 4.20.1).

Radionuclides

Radionuclides were not analyzed for this PRS.

5.34.6 Evaluation of Organic Constituents

Acetone was detected in one subsurface soil sample above the EQL (0.01 mg/kg) at a concentration of 0.015(J) mg/kg but was not carried forward to the SAL comparison stage because it is a common laboratory containment and not expected to persist at this PRS. The data usability of the detected acetone value and the reported organics detected below the EQLs and MDLs are addressed in Section 4.20.2.

The organics that were undetected or less than the EQLs were not retained as COPCs.

5.34.7 Human Health Assessment

5.34.7.1 Screening Assessment

Copper, mercury, silver, and zinc were detected below their respective SALs and were submitted to an MCE.

Multiple Chemical Evaluation

The MCE included four analytes in the noncarcinogenic effects category (Table 5.34.7.1-1). The sum of the maximum normalized concentrations is 0.0648, which is below the target value of 1.0. Therefore, these analytes were not retained as COPCs.

5.34.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable health risk exists at this site.

TABLE 5.34.7.1-1
MULTIPLE CHEMICAL EVALUATION - PRS 15-014(h)

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
SOIL-NONCARCINOGENIC	
Copper	0.0078
Mercury	0.0313
Silver	0.0171
Zinc	0.0086
TOTAL	0.0648

5.34.8 Ecological Assessment

The general landscape condition around PRS 15-014(h) is moderately developed and disturbed, and there is high potential for receptors to come in contact with ecological COPCs (copper, mercury, silver, and zinc) associated with the outfall (Table 2.4-1). Therefore, this PRS will be included as an ecological COPC source in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by our regulators. Threatened and endangered species and/or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.34.9 Extent of Contamination

No human health COPCs were retained; therefore, this section is not applicable.

5.34.10 Conclusions and Recommendations

Based on NFA Criterion 5, PRS 15-014(h) 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.

5.35 PRS 15-006(c)

PRS 15-006(c), also known as R-44, is a former firing site built in 1951 and used until 1992. Based on the sample results and screening assessment, concentrations of uranium, beryllium, lead, arsenic, and RDX were detected above their PRGs and retained as COPCs. Consequently, an expedited cleanup (EC) is recommended for PRS 15-006(c) and PRS 15-008(b) (an associated surface material disposal area). An EC plan will be submitted to the DOE in 1997. [The results of the sampling at PRS 15-008(b) were reported in the OU 1086 RFI Report that was submitted to the EPA on November 1, 1995.] All specific results, conclusions, and recommendations will be included in the plan.

5.36 PRS 15-006(d)

PRS 15-006(d), also known as R-45, is a former firing site built in 1951 and used until 1992. Sixty-seven soil samples were collected and twenty-four submitted for analysis. Based on the sample results and screening assessment, we recommend NFA for this site under NFA Policy Criterion 5.

5.36.1 History

PRS 15-006(d) is described in Section 6.3 of the OU 1086 RFI Work Plan (LANL 1993, 1087) and in the sampling and analysis plan that was submitted to the EPA in May 1995. Built in 1951, the firing site was used only for small quantities of explosives.

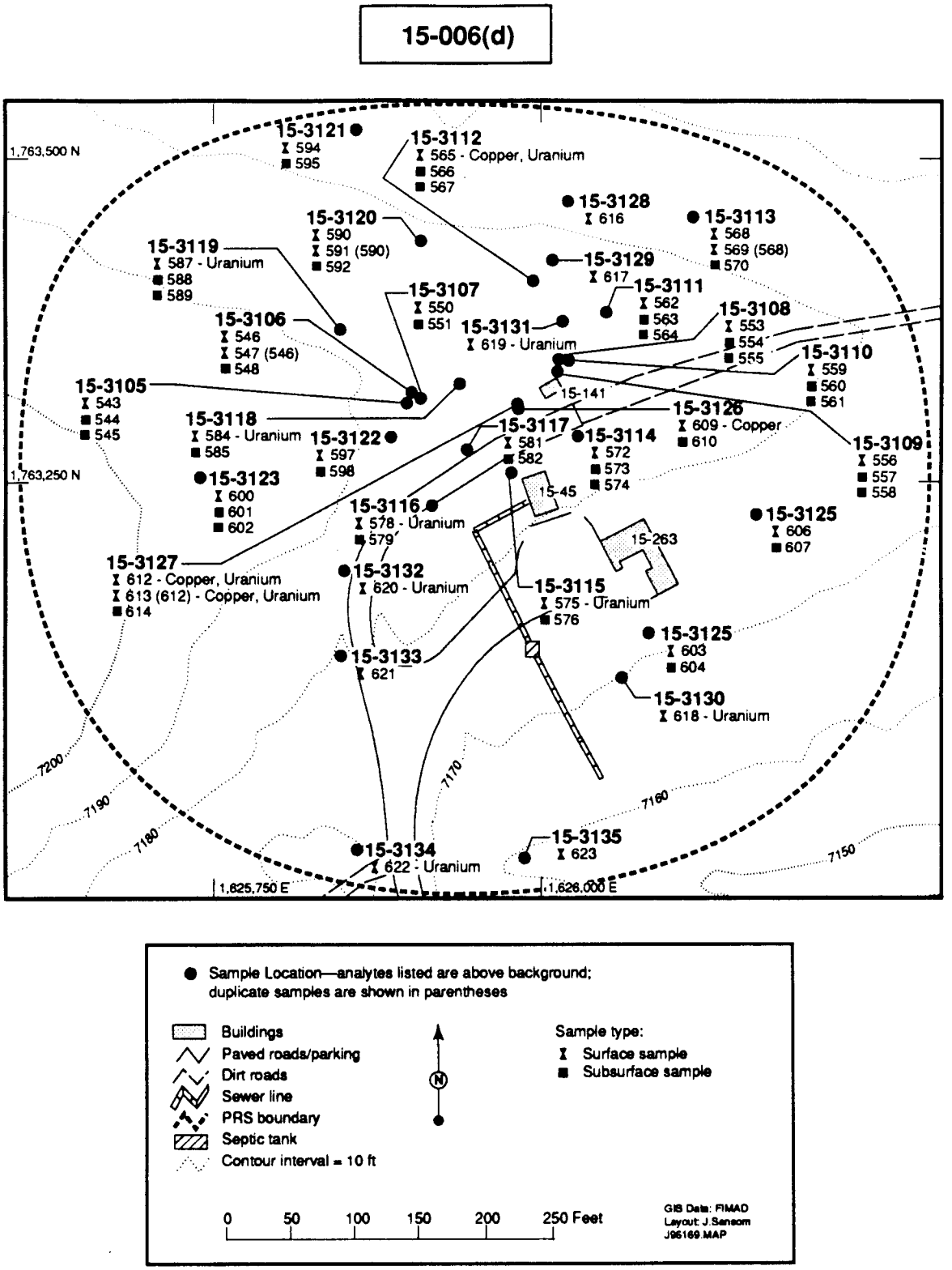


Figure 5.36.4.3-1 Location of PRS 15-006(d) samples

5.36.2 Description

PRS 15-006(d) was used purely for science experiments. Two firing sites were active here; both were used for small shots to test shock wave phenomena. Optical diagnostic shots were conducted at one site. COPCs associated with this site include beryllium, lead, uranium, and HE.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.36.3 Previous Investigations

The radiological survey of 1991 (Schlapper 1991, 10-0009) found exposure rates up to 10 mR/h at the surface of the camera building closest to the firing range. A recent aerial radiological survey (Fritzsche 1989, 10-0033) did not detect any gamma radioactivity above background at Firing Site R-45.

5.36.4 Field Investigation

5.36.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.36.4.2 Results of Field Screening

HE spot tests were carried out at the sample locations before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample locations consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling to assist in determining which samples would be submitted for offsite analysis on the basis of metals content. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.36.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-006(d) was to determine whether contamination was present that could be associated with site activities. Figure 5.36.4.3-1 shows the sample locations, and Table 5.36.4.3-1 summarizes the sampling conducted at this PRS.

The samples collected were submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The samples were analyzed for uranium, TAL metals, and HE within prescribed holding times.

5.36.5 Background Comparisons

Inorganics

Copper, lead, and uranium were detected in the surface soil above their background UTLs. Further analysis of lead data showed that the distribution of site data concentrations was not

TABLE 5.36.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-006(d)
(Continued)

Location ID	Sample ID	Depth (in)	Matrix	Total Uranium*	TAL Metals*	HE*
15-3111	0215-95-0563	18-24	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3111	0215-95-0564	51-57	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3112	0215-95-0565	0-6	Soil	6527736	6528148, 6528263, 6528261, 6528167, 6528264, 6528265	6528219
15-3112	0215-95-0566	18-24	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3112	0215-95-0567	33-39	Soil	6527736	6528148, 6528263, 6528261, 6528167, 6528264, 6528265	6528219
15-3113	0215-95-0568	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3113	0215-95-0569	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3113	0215-95-0570	8-14	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3114	0215-95-0572	0-6	Soil	6527736	6528148, 6528263, 6528261, 6528167, 6528264, 6528265	6528219
15-3114	0215-95-0573	18-24	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3114	0215-95-0574	30-40	Soil	6527736	6528148, 6528263, 6528261, 6528167, 6528264, 6528265	6528219
15-3115	0215-95-0575	0-6	Soil	6527736	6528148, 6528263, 6528261, 6528167, 6528264, 6528265	6528157
15-3115	0215-95-0576	15-21	Soil	6527736	6528148, 6528263, 6528261, 6528167, 6528264, 6528265	6528157

*Batch numbers

TABLE 5.36.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-006(d)

Location ID	Sample ID	Depth (in)	Matrix	Total Uranium*	TAL Metals*	HE*
15-3105	0215-95-0543	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3105	0215-95-0544	18-24	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3105	0215-95-0545	88-94	Soil	6527728	6528156, 6528111, 6528110, 6528136, 6528112, 6528113	6528219
15-3106	0215-95-0546	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3106	0215-95-0547	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3106	0215-95-0548	18-24	Soil	6527728	6528156, 6528111, 6528110, 6528136, 6528112, 6528113	6528219
15-3107	0215-95-0550	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3107	0215-95-0551	9-15	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3108	0215-95-0553	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3108	0215-95-0554	18-24	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3108	0215-95-0555	35-41	Soil	6527736	6528148, 6528263, 6528261, 6528167, 6528264, 6528265	6528219
15-3109	0215-95-0556	0-6	Soil	6527736	6528148, 6528263, 6528261, 6528167, 6528264, 6528265	6528219
15-3109	0215-95-0557	18-24	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3109	0215-95-0558	41-47	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3110	0215-95-0559	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3110	0215-95-0560	18-24	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3110	0215-95-0561	38-44	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3111	0215-95-0562	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		

*Batch numbers

TABLE 5.36.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-006(d)
(Continued)

Location ID	Sample ID	Depth (in)	Matrix	Total Uranium*	TAL Metals*	HE*
15-3116	0215-95-0578	0-6	Soil	6527736	6528148, 6528263, 6528261, 6528167, 6528264, 6528265	6528157
15-3116	0215-95-0579	11-17	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3117	0215-95-0581	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3117	0215-95-0582	8-14	Soil	6527728	6528156, 6528111, 6528110, 6528113, 6528112, 6528136	6528219
15-3118	0215-95-0584	0-6	Soil	6527728	6528156, 6528111, 6528110, 6528113, 6528112, 6528136	6528219
15-3118	0215-95-0585	8-14	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3119	0215-95-0587	0-6	Soil	6527736	6528148, 6528263, 6528261, 6528167, 6528264, 6528265	6528157
15-3119	0215-95-0588	18-24	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3119	0215-95-0589	30-36	Soil	6527736	6528148, 6528263, 6528261, 6528167, 6528264, 6528265	6528157
15-3120	0215-95-0590	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3120	0215-95-0591	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3120	0215-95-0592	12-18	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3121	0215-95-0594	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3121	0215-95-0595	10-16	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3122	0215-95-0597	0-6	Soil	Not submitted for analysis, in accordance with the Work Plan		
15-3122	0215-95-0598	6-10	Soil	Not submitted for analysis, in accordance with the Work Plan		

*Batch numbers

TABLE 5.36.5-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UTLs FOR PRS 15-006(d)

Sample ID	Depth (in.)	Copper (mg/kg)	Uranium (mg/kg)
LANL UTL	N/A	15.5	5.45
SAL	N/A	2800	230/29*
0215-95-0565	0-6	19.6	17
0215-95-0575	0-6	ND	5.7
0215-95-0578	0-6	7.4	7.2
0215-95-0584	0-6	12.1	17
0215-95-0587	0-6	6	29
0215-95-0609	0-6	157	4.7
0215-95-0612	0-6	277	25
0215-95-0613	0-6	23.4	8.4
0215-95-0618	0-4	4.7	9.2
0215-95-0619	0-6	7	8.4
0215-95-0620	0-6	5.2	14
0215-95-0622	0-6	7.7	18

N/A = not applicable ND = not detected

* Uranium SAL of 230 mg/kg is based on systemic effects; the natural uranium SAL of 29 is based on radiation dose.

5.36.6 Evaluation of Organic Constituents

No organics were detected; therefore, they were not retained as COPCs.

5.36.7 Human Health Assessment

5.36.7.1 Screening Assessment

Copper and uranium were detected below their SALs and were submitted to an MCE.

Because samples were not analyzed for isotopic uranium, the source of the uranium, whether it was natural or depleted, could not be determined. Because the RFI Work Plan indicates that both natural and depleted uranium were used at TA-15, the more conservative of the two SALs of radionuclide uranium, i.e., natural uranium, was used in the screening assessment. Uranium was detected at concentrations equal to or below its natural uranium SAL of 29 mg/kg (based on radioactive properties) and was not retained as a COPC. It was not submitted to an MCE because it was the only radioactive COPC.

Multiple Chemical Evaluation

The MCE included two analytes in the noncarcinogenic effects category (Table 5.36.7.1-1). The sum of the maximum normalized concentrations is 0.2250, which is below the target value of 1.0. Therefore, these analytes were not retained as COPCs.

5.36.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs were retained as a result of the screening assessment and no unacceptable health risk exists at this site.

TABLE 5.36.7.1-1
MULTIPLE CHEMICAL EVALUATION - PRS 15-006(d)

ANALYTE	MAXIMUM NORMALIZED CONCENTRATIONS
SOIL-NONCARCINOGENIC	
Copper	0.0989
Uranium	0.1261
Total	0.2250

5.36.8 Ecological Assessment

The general landscape condition around 15-006(d) is moderately developed and disturbed, and there is moderate potential for receptors to come in contact with ecological COPCs with the site (Table 2.4-1). Therefore, this PRS will be included as an ecological COPC source in the ecological risk assessment. An ecological risk assessment will be conducted when that approach has been approved by our regulators. Threatened and endangered species and /or sensitive habitat listed in Chapter 2 will be evaluated in the ecological risk assessment.

5.36.9 Extent of Contamination

No human health COPCs were retained; therefore, this section is not applicable.

5.36.10 Conclusions and Recommendations

Based on NFA Criterion 5, PRS 15-006(d) 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.

5.37 PRS 15-008(g)

PRS 15-008(g) is the location designated by sandbags at R-45. Based on NFA Policy Criterion 5, this PRS will not be added to the HSWA module of the Laboratory's RCRA operating permit, and it is proposed for removal from the ER Project List of PRSs.

5.37.1 History

PRS 15-008(g) is described in Section 6.3 of the OU 1086 RFI Work Plan (LANL 1993, 1087) and in the sampling plan submitted to the EPA in May 1995.

The sandbags may have been used as shielding during explosions carried out at R-45 Firing Site and may have received fragments from the explosives. Therefore, COPCs will include metals, uranium, and HE.

5.37.2 Description

PRS 15-008(g) is a pile of broken up sandbags.

A description of the geology, hydrogeology, soils, and wildlife habitats is presented in Chapter 2.

5.37.3 Previous Investigations

No records of previous investigations have been found.

5.37.4 Field Investigation

5.37.4.1 Results of Field Surveys

Radiological surveys were conducted immediately before sampling to help characterize the PRS and to help establish health and safety conditions for on-site workers. No elevated readings were reported from these radiological surveys.

5.37.4.2 Results of Field Screening

An HE spot test was carried out at the sample location before the start of any intrusive activities. No positive results were obtained.

Radiological screening at the sample location consisted of screening the actual soil being sampled. No readings were encountered that would have entailed special labeling or packaging of samples being sent offsite for analysis.

XRF analysis was carried out at the field office after sampling. The results of the field screening and of PE sample analysis by XRF are presented in Appendix D, Correlation Between the Field XRF, LIBS, and Laboratory Results.

5.37.4.3 Sample Collection and Submittal for Analysis

The objective of sampling at PRS 15-008(g) was to determine whether contamination was present that could be associated with site activities. Figure 5.37.4.3-1 shows the sample location, and Table 5.37.4.3-1 summarizes the sampling conducted at this PRS.

The sample collected was submitted to an offsite laboratory in accordance with the RFI Work Plan (LANL 1993, 1087). The sample was analyzed for total uranium, TAL metals, and HE within prescribed holding times.

TABLE 5.37.4.3-1
SUMMARY OF SAMPLES TAKEN - PRS 15-008(g)

Location ID	Sample ID	Depth (in)	Matrix	Total Uranium*	TAL Metals*	HE*
15-3136	0215-95-0624	0-6	Soil	6527728	6528156, 6528111, 6528110, 6528136, 6528113, 6528112	6528219

*Batch numbers

5.37.5 Background Comparisons

Inorganics

No inorganic compounds were detected above background UTLs and were therefore not retained as COPCs.

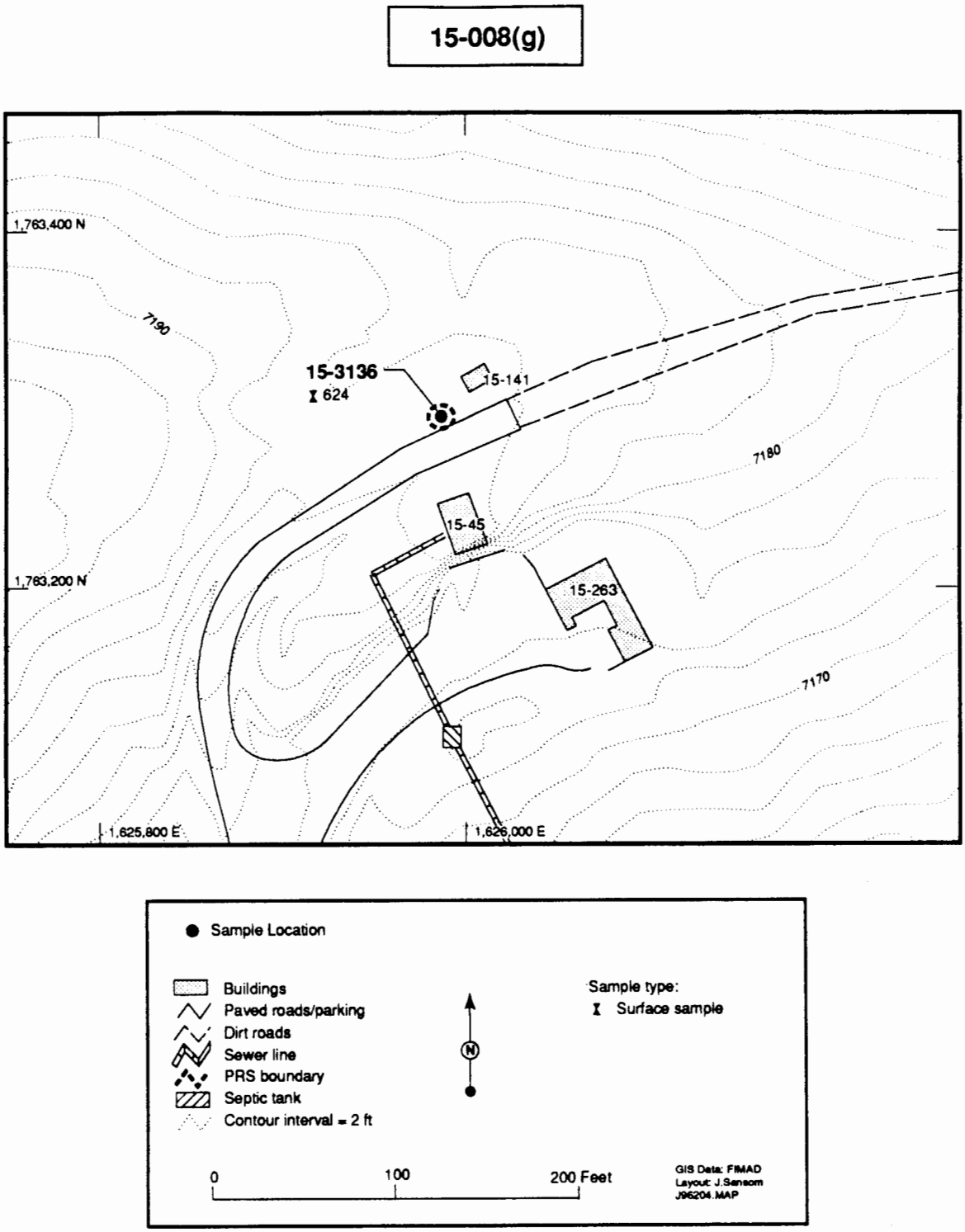


Figure 5.37.4.3-1 Location of PRS 15-008(g) samples

Radionuclides

No radionuclide compounds were detected above background UTLs and were therefore not retained as COPCs.

5.37.6 Evaluation of Organics Constituents

No HE compounds were detected and were therefore not retained as COPCs.

5.37.7 Human Health Assessment

5.37.7.1 Screening Assessment

No inorganics or radionuclides were detected above background UTLs, and no organics were detected; therefore, a screening assessment was not conducted.

5.37.7.2 Risk Assessment

No human health risk assessment was performed because no COPCs are retained as a result of the screening assessment and no unacceptable human health risk exists at this PRS.

5.37.8 Ecological Assessment

No inorganics were detected above background UTLs and no organics were detected, so these constituents are eliminated as contaminant sources for ecological risk. Therefore, no further ecological evaluation of this site is required.

5.37.9 Extent of Contamination

No COPCs were retained; therefore, this section is not applicable.

5.37.10 Conclusions and Recommendations

Based upon NFA Criterion 5, PRS 15-008(g) 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.

5.38 PRS 15-012(a)

PRS 15-012(a) is a surface disposal site that was recommended for NFA in the OU 1086 RFI Work Plan (LANL 1993, 1087) because its location is unknown. EPA asked the volume of oil used in this unit. LANL responded that there is no documentation of the volume of oil, which had been disposed of. The Laboratory further said that this PRS was listed in the 1990 DOE report as not having a CEARP identification, and the location is unknown. The Laboratory provided a copy of Site Database Task 24 TA-15 (LANL 1989, 0863) as additional evidence that the location of PRS 15-012(a) has never been identified. Because guidance was not received from the EPA, it is again being recommended for NFA based on NFA Criterion 1.

APPENDIX D

DISTRIBUTIONAL COMPARISONS WITH BACKGROUND

APPENDIX D

FIELD SCREENING AND CORRELATION BETWEEN FIELD AND LABORATORY METHODS FOR LEAD, URANIUM, AND BERYLLIUM

Field screening methods were used during the field sampling program to help determine which samples would be sent to the laboratory for analyses; this process is also referred to as biased sampling. Samples from the field were processed in a portable trailer using X-ray fluorescence (XRF) techniques to detect lead and uranium. Selected samples were processed at the Laboratory using a Laser-Induced Breakdown Spectroscopy (LIBS) to detect whenever beryllium was a suspected COPC. LIBS was used because XRF cannot detect beryllium. As described in the OU 1086 RFI Work Plan (LANL 1993, 1087), the intent was to bias the fixed lab analyses toward high concentrations. Samples with high field screening values were sent for fixed lab analyses.

The screening analyses performed by XRF and LIBS are surface techniques that measure the elements of interest in only the outermost few mm of the soil grains. The fixed laboratory analysis methods, in contrast, utilize a strong acid leaching procedure followed by either atomic absorption/emission or inductively coupled plasma emission. The fixed laboratory analysis measures what may be described as more of a bulk concentration of an analyte than do the screening methods. The comparison between the two analytical techniques are presented here to demonstrate the utility of the portable methods for qualitative field screening. The use of field instruments are justified as a cost savings technique and because they yield real-time results. In addition, when the supplementary field screening measurements correlate well with the fixed lab analyses, the field information from samples not submitted to the lab can be used in a qualitative manner to characterize the extent of contamination over a site.

The attached scatter plots of the Field screening measurements relative to the analytical lab results show the correlations between the two measurement methods. The plots show the results of positive (non-zero or negative) instrument readings. A single plot is shown for all the combined results from all the Potential Release Sites (PRSs) for lead, uranium, and beryllium (Figures D-1, D-2, and D-3, respectively). The values used to produce the plots are presented in Table D-1.

For lead, one extremely high value of 132,000 ppm measured by the laboratory and 2314 ppm measured by XRF has been eliminated from the data set at an outlier . For uranium, the same is true for the value of 45,000 ppm (laboratory) and 734 ppm (XRF).

The results show a positive correlation between the measurement techniques. There is a large amount of scatter about the points, due to the differences in the nature of the analytical techniques, matrix effects, inhomogeneties in the samples, etc. However, these results give confidence that the higher concentrations of metals in samples picked for fixed lab analysis were confirmed. This result, in turn, lends credence to the use of field screening for biasing the samples sent for fixed lab analysis.

In addition to the correlations between Field and Fixed Laboratory Analysis illustrated in the figures, a performance evaluation (PE) sample of certified reference material was analyzed repeatedly during the field sampling season to determine the accuracy of the field analysis equipment. Table D-2 presents the results. For lead, 28 measurements of the USGS soil reference material yielded a mean of 592 ppm and a standard deviation of 30 ppm. The certified value was 690 ppm, standard deviation 60 ppm. For uranium, 28 measurements yielded a mean of 7.3 ppm, standard deviation 7.2 ppm, while the certified value was 2.9 ppm, standard deviation 0.06 ppm.

From these results, the XRF measurements for lead appear to be precise (Relative Standard Deviation 5.1%) but low by approximately 100 ppm. A statistical T-test using the certified reference value as the "accepted value" reveals that there is a determinate (low) error with the XRF for lead.

For lead, Figure D-1 shows a good correlation ($r = 0.83$, $n = 55$) between field and laboratory results suggesting that the XRF is appropriate for field screening of Pb in soil.

Reference to the uranium correlation figure (Figure D-2) shows a good correlation above 10 ppm uranium, suggesting that the XRF is appropriate for field screening of uranium in soil. For uranium, the negative values for some PE sample analyses suggest that the PE sample concentration was at the lower limit of the useful analytical range of the XRF instrument, and no quantitative conclusions can be drawn.

For beryllium, accuracy relative to two different soil reference standards appears to be quite good (Table D-3).

The correlation between the field and laboratory measurements of bulk soil (Figure D-1) shows scattter on the linear plot, which is undoubtedly related to the differences in the analytical methods. The correlation between field and fixed lab methods was 0.73 for 60 measurements, which is still good. As was the case for the XRF, the results lend credence to the use of LIBS for beryllium screening in the field.

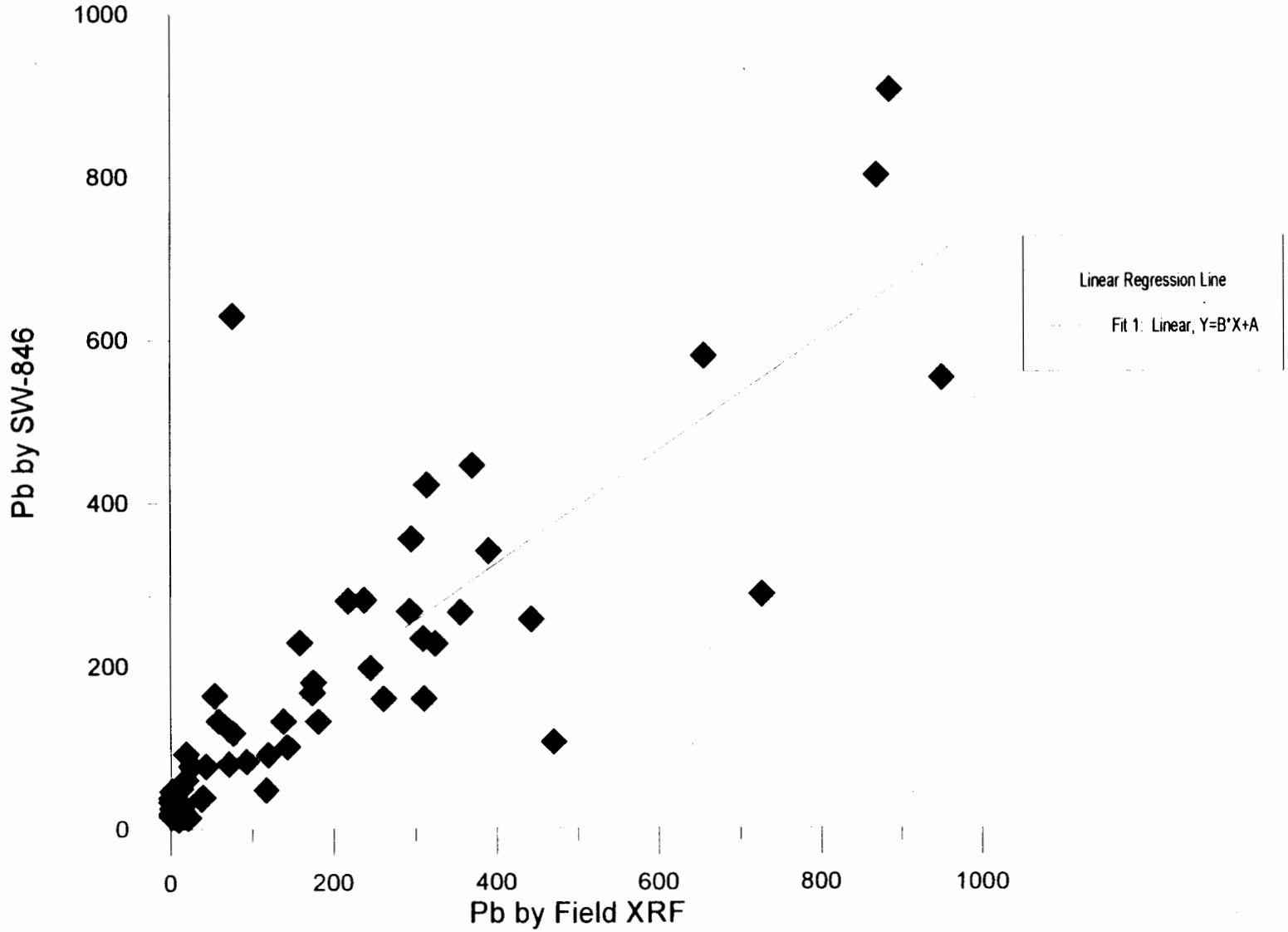


Figure D-1. Correlation between Field and Laboratory Measured Lead (ppm)

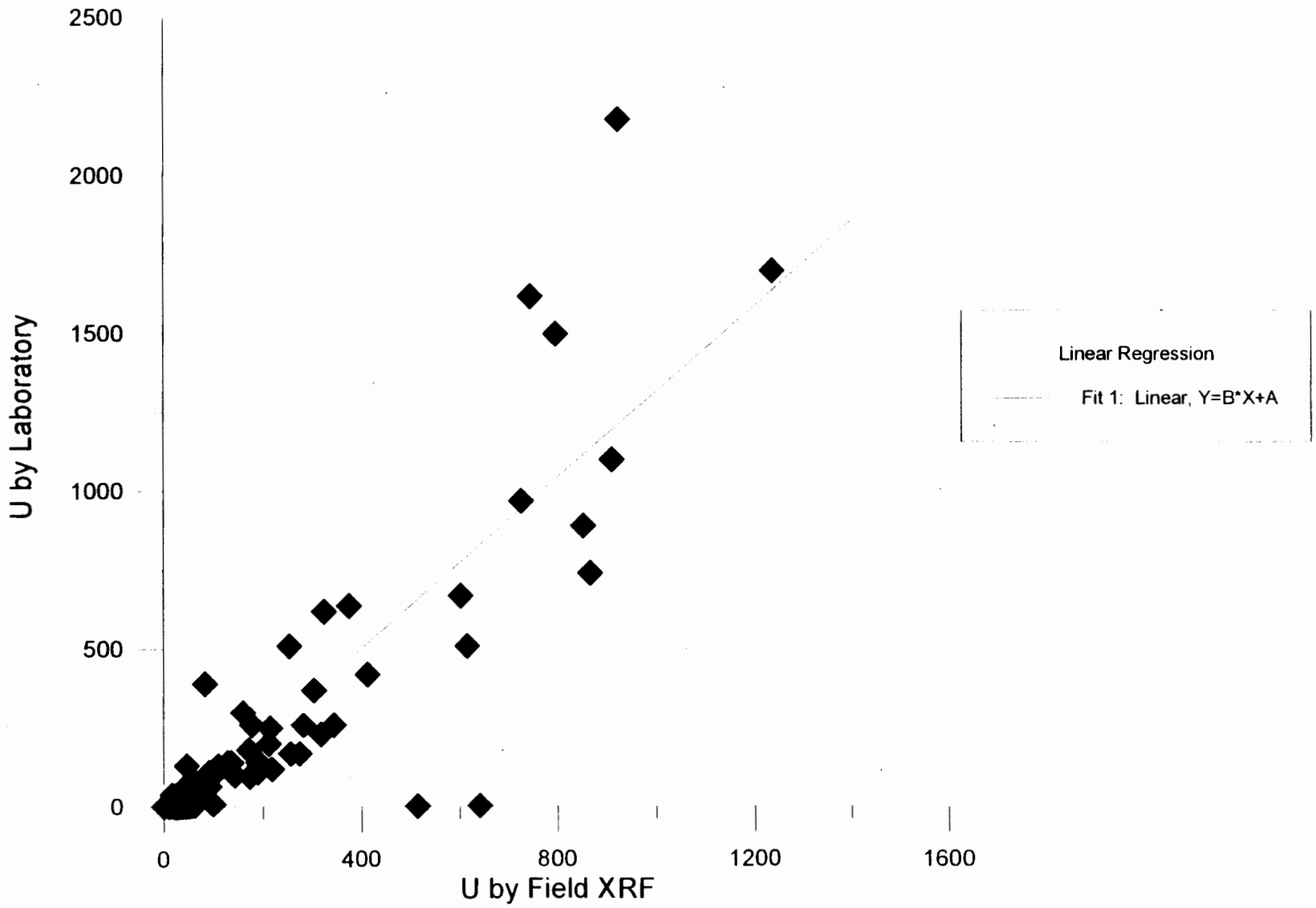


Figure D-2. Correlation between Field and Laboratory Measured Uranium (ppm).

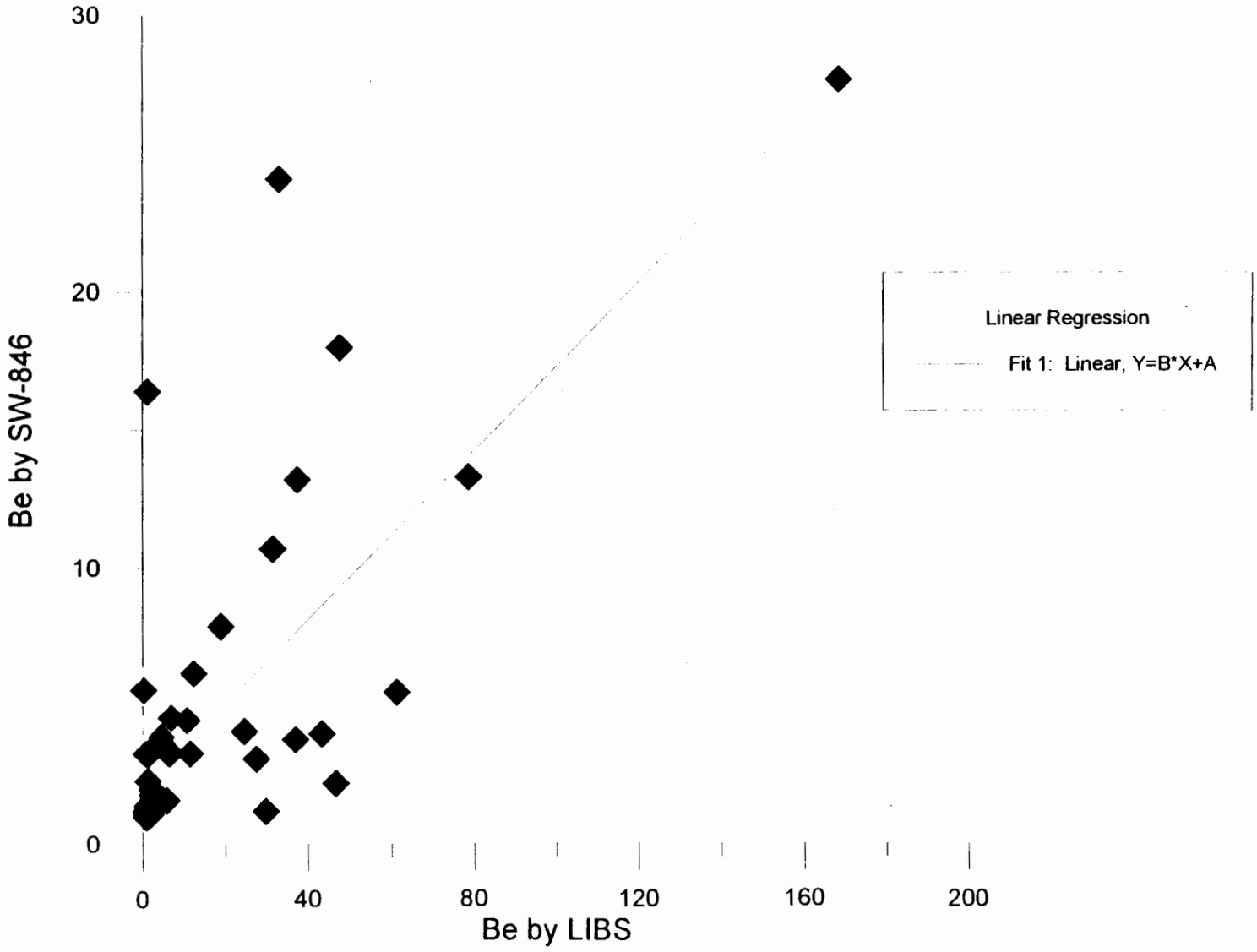


Figure D-3. Correlation between Field and Laboratory Measured Be (ppm).

TABLE D-1

Screening and Analytical Data for TA-15

PRS or AOC	Sample #	Depth (inches)	XRF Data Pb (ppm)	XRF Data U (ppm)	LIBS Be (ppm)	Ludlum 2210 Rad Data (cpm)	Analytical Data Pb (ppm)	Analytical Data U (ppm)	Analytical Data Be (ppm)
15-010(a)	0215-95-0131	83 - 83	59	11.5	NA	2697	133.00	*	0.565
15-010(a)	0215-95-0132	81 - 81	-20	19	NA	2774	53.30	*	0.664
C-15-010	0215-95-0137	18 - 24	13	39	NA	2473	23.40	2.61	0.471
C-15-010	0215-95-0138	18 - 24	-24	58	NA	2504	5.01	4.47	0.167
15-006(c)	0215-95-0139	0 - 6	18	11	NA	2436	60.1	2	1.1
15-014(j)	0215-95-0141	0 - 6	1.0	41	NA	2207	15.40	2.51	0.964
15-014(j)	0215-95-0142	16 - 20	-38	44	NA	1778	13.90	2.15	0.803
15-014(j)	0215-95-0143	0 - 1	144	16	NA	2314	101.00	3.44	0.365
15-014(j)	0215-95-0145	0 - 6	-17	43	NA	2283	18.60	2.39	0.363
15-014(j)	0215-95-0146	30 - 36	-24	22	NA	2417	7.71	2	0.403
15-011(c)	0215-95-0147	0 - 6	-29	45	NA	3378	6.84	1.03	0.400
15-011(c)	0215-95-0148	30 - 36	-25	36	NA	3274	6.69	1.62	0.383
15-011(c)	0215-95-0149	0 - 6	-41	24	NA	2509	15.30	5.51	0.783
15-011(c)	0215-95-0150	18 - 24	-62	25	NA	2516	10.60	0.66	0.876
15-014(a)	0215-95-0159	0 - 6	-11	39	NA	2375	3.47	*	0.241
15-014(a)	0215-95-0160	26 - 32	-21	44	NA	2491	6.10	*	0.264
15-014(a)	0215-95-0161	0 - 6	-28	23	NA	2292	8.46	*	0.214
15-014(a)	0215-95-0162	20 - 26	-45	19.1	NA	2279	4.70	*	0.207
15-014(a)	0215-95-0163	0 - 6	-15	36	NA	2002	7.56	*	0.231
15-014(a)	0215-95-0164	6 - 10	-40	35	NA	2065	3.66	*	0.255
15-014(a)	0215-95-0165	0 - 6	-26	24	NA	2467	10.70	*	0.284
15-014(b)	0215-95-0167	0 - 6	-14	-26	NA	2164	12.60	*	0.783
15-014(b)	0215-95-0168	30 - 36	-35	21	NA	2304	12.60	*	0.878
15-014(b)	0215-95-0169	0 - 6	-47	32	NA	2123	9.51	*	0.328
15-014(b)	0215-95-0170	30 - 36	-43	27	NA	2053	9.88	*	1.090
15-014(b)	0215-95-0171	0 - 4	-46	27	NA	2079	3.69	*	0.830
15-014(b)	0215-95-0172	9 - 15	-44	19	NA	2358	3.90	*	0.607

TABLE D-1

Screening and Analytical Data for TA-15 (continued)

PRS or AOC	Sample #	Depth (inches)	XRF Data Pb (ppm)	XRF Data U (ppm)	LIBS Be (ppm)	Ludlum 2210 Rad Data (cpm)	Analytical Data Pb (ppm)	Analytical Data U (ppm)	Analytical Data Be (ppm)
15-014(b)	0215-95-0173	0 - 6	-18	19	NA	2010	13.90	*	0.649
15-014(b)	0215-95-0174	30 - 36	-45	19	NA	2051	13.40	*	0.893
15-014(b)	0215-95-0175	0 - 5	-48	15	NA	2152	11.50	*	0.587
15-014(b)	0215-95-0176	10 - 15	-39	33	NA	2076	16.00	*	1.720
15-014(b)	0215-95-0177	0 - 6	-56	18	NA	2319	7.99	*	0.378
15-014(b)	0215-95-0178	22 - 25	-68	35	NA	2401	4.49	*	0.314
15-005(b)	0215-95-0179	0 - 6	-22	28	NA	2856	12.80	4.67	0.742
15-005(b)	0215-95-0180	18 - 24	-33	20	NA	2765	9.53	2.59	0.645
15-005(b)	0215-95-0181	0 - 6	-40	27	NA	2749	12.20	3.65	0.713
15-005(b)	0215-95-0182	18 - 24	-54	22	NA	2506	11.90	3.51	1.030
15-005(c)	0215-95-0183	18 - 24	-21	31	NA	2563	10.80	2.46	0.987
15-005(c)	0215-95-0184	18 - 24	-41	29	NA	2719	10.70	3.71	0.889
15-014(h)	0215-95-0191	0 - 6	-9.3	13	NA	2480	Not Submitted for Analysis		
15-014(h)	0215-95-0192	30 - 36	-32	25.4	NA	2297	Not Submitted for Analysis		
15-014(h)	0215-95-0193	0 - 6	16	13	NA	2453	Not Submitted for Analysis		
15-014(h)	0215-95-0194	18 - 24	-20	12	NA	2542	Not Submitted for Analysis		
15-014(h)	0215-95-0195	0 - 6	37	20	NA	2930	37.20	*	0.435
15-014(h)	0215-95-0196	30 - 36	-29	31	NA	2543	8.72	*	0.958
15-014(h)	0215-95-0197	0 - 6	-47	15	NA	2568	16.60	*	0.657
15-014(h)	0215-95-0198	16 - 22	-25	39	NA	2565	9.07	*	0.561
15-010(b)	0215-95-0201	0 - 6	2.0	27	NA	2291	Not Submitted for Analysis		
15-010(b)	0215-95-0202	20 - 24	-18	19	NA	2519	Not Submitted for Analysis		
15-010(b)	0215-95-0203	0 - 6	-50	28	NA	2882	Not Submitted for Analysis		
15-002	0215-95-0205	0 - 6	-21	20	NA	2667	14.20	2.24	0.849
15-002	0215-95-0206	18 - 24	-25	9.9	NA	2487	12.90	3.15	0.856
15-002	0215-95-0207	0 - 6	-7.9	29	NA	2399	22.10	5.94	0.692
15-002	0215-95-0208	18 - 24	-18	17	NA	2685	12.40	3.18	0.838

TABLE D-1

Screening and Analytical Data for TA-15 (continued)

PRS or AOC	Sample #	Depth (inches)	XRF Data Pb (ppm)	XRF Data U (ppm)	LIBS Be (ppm)	Ludlum 2210 Rad Data (cpm)	Analytical Data Pb (ppm)	Analytical Data U (ppm)	Analytical Data Be (ppm)
15-007(a)	0215-95-0209	0 - 6	-28	13	NA	2426	Not Submitted for Analysis		
15-007(a)	0215-95-0210	18 - 24	-44	8.2	NA	2292	Not Submitted for Analysis		
15-007(a)	0215-95-0211	40 - 46	-30	35	NA	2401	9.19	1.78	0.947
15-007(a)	0215-95-0212	0 - 6	-36	25	NA	2480	11.40	2.61	0.386
15-007(a)	0215-95-0213	18 - 24	-52	28	NA	2263	12.70	2.06	0.973
15-007(a)	0215-95-0214	50 - 56	-39	19.4	NA	2419	Not Submitted for Analysis		
15-007(a)	0215-95-0215	0 - 6	1.7	28	NA	2308	25.80	3.32	0.742
15-007(a)	0215-95-0216	18 - 24	0.4	26	NA	2378	33.20	2.77	0.612
15-007(a)	0215-95-0217	33 - 39	470	22.3	NA	2406	106.00	1.9	0.634
15-007(a)	0215-95-0218	0 - 6	6.2	22	NA	2541	14.40	2.79	0.711
15-007(a)	0215-95-0219	18 - 24	-16	18	NA	2358	Not Submitted for Analysis		
15-007(a)	0215-95-0220	26 - 32	-49	21.4	NA	2263	Not Submitted for Analysis		
15-007(a)	0215-95-0221	0 - 6	-28	0.6	NA	2060	Not Submitted for Analysis		
15-007(a)	0215-95-0222	18 - 24	-26	35	NA	2048	13.20	5.84	0.578
15-007(a)	0215-95-0223	29 - 35	4.0	21.9	NA	2110	26.00	2.96	0.705
15-007(a)	0215-95-0224	0 - 6	245	28	NA	2424	198.00	2.73	0.622
15-007(a)	0215-95-0225	18 - 24	-38	26	NA	2350	Not Submitted for Analysis		
15-007(a)	0215-95-0226	48 - 54	-34	19.6	NA	2375	Not Submitted for Analysis		
15-007(a)	0215-95-0227	0 - 6	-15	14	NA	2221	Not Submitted for Analysis		
15-007(a)	0215-95-0228	18 - 24	9.5	29	NA	2277	11.50	2.09	0.709
15-007(a)	0215-95-0229	30 - 36	-33	26	NA	2593	15.00	1.85	0.686
C-15-005	0215-95-0230	0 - 6	-18	18	NA	2088	28.40	13.6	0.328
C-15-005	0215-95-0231	18 - 24	-28	13	NA	2041	15.20	2.9	0.920
C-15-005	0215-95-0232	0 - 6	-34	16	NA	2020	Not Submitted for Analysis		
C-15-005	0215-95-0233	18 - 24	-16	19	NA	2296	29.50	1.29	0.795
C-15-006	0215-95-0234	0 - 6	-10	23	NA	2183	13.90	2.87	0.670
C-15-006	0215-95-0235	18 - 24	-31	-0.08	NA	2133	Not Submitted for Analysis		

TABLE D-1

Screening and Analytical Data for TA-15 (continued)

PRS or AOC	Sample #	Depth (inches)	XRF Data Pb (ppm)	XRF Data U (ppm)	LIBS Be (ppm)	Ludlum 2210 Rad Data (cpm)	Analytical Data Pb (ppm)	Analytical Data U (ppm)	Analytical Data Be (ppm)
C-15-011	0215-95-0245	72-78	-32	12.8	NA	2288	Not Submitted for Analysis		
C-15-011	0215-95-0246	120-126	NA	NA	NA	2381	Not Submitted for Analysis		
15-001	0215-95-0247	0 - 3	-13	12	NA	1762	6.20	4.88	0.447
15-001	0215-95-0248	0 - 6	-18	12	NA	1637	5.01	6.37	0.276
15-001	0215-95-0249	0 - 4	-54	19.9	NA	1927	4.77	3.26	0.417
15-004(g)	0215-95-0250	0 - 6	-55	17	NA	2743	10.90	6.52	0.720
15-004(g)	0215-95-0251	18 - 24	-37	34	NA	2763	9.20	2.94	0.884
15-004(g)	0215-95-0252	0 - 6	-20	23	NA	2640	Not Submitted for Analysis		
15-004(g)	0215-95-0253	18 - 24	-32	9.0	NA	2708	9.48	2.79	1.010
15-004(g)	0215-95-0254	0 - 6	-14	51	NA	2620	Not Submitted for Analysis		
15-004(g)	0215-95-0255	0 - 6	-37	42	NA	2671	13.50	61.8	0.726
15-004(g)	0215-95-0256	18 - 24	-38	31	NA	2386	10.90	2.32	0.929
15-004(g)	0215-95-0257	0 - 6	-15	28	NA	2406	Not Submitted for Analysis		
15-004(g)	0215-95-0258	18 - 24	-28	9.8	NA	2371	Not Submitted for Analysis		
15-004(g)	0215-95-0259	0 - 6	13	160	NA	2448	27.60	298	0.524
15-004(g)	0215-95-0260	0 - 6	-5.9	65	NA	2516	Not Submitted for Analysis		
15-004(g)	0215-95-0261	18 - 20	-14	374	NA	3050	15.40	637	0.381
15-004(g)	0215-95-0262	0 - 6	-40	44	NA	1829	Not Submitted for Analysis		
15-004(g)	0215-95-0263	0 - 6	-8.4	20	NA	2003	Not Submitted for Analysis		
15-004(g)	0215-95-0264	18 - 24	-38	27	NA	1979	Not Submitted for Analysis		
15-004(g)	0215-95-0265	0 - 6	-49	17	NA	2561	Not Submitted for Analysis		
15-004(g)	0215-95-0266	18 - 24	-39	20	NA	2407	Not Submitted for Analysis		
15-004(g)	0215-95-0267	0 - 6	21	17	NA	2421	13.70	38.3	0.808
15-004(g)	0215-95-0268	0 - 6	-24	43	NA	2328	Not Submitted for Analysis		
15-004(g)	0215-95-0269	0 - 6	-32	35	NA	2062	Not Submitted for Analysis		
15-004(g)	0215-95-0270	18 - 24	-23	23	NA	2155	Not Submitted for Analysis		
15-004(g)	0215-95-0271	0 - 6	-37	9.4	NA	1837	Not Submitted for Analysis		

TABLE D-1

Screening and Analytical Data for TA-15 (continued)

PRS or AOC	Sample #	Depth (inches)	XRF Data Pb (ppm)	XRF Data U (ppm)	LIBS Be (ppm)	Ludlum 2210 Rad Data (cpm)	Analytical Data Pb (ppm)	Analytical Data U (ppm)	Analytical Data Be (ppm)
15-004(g)	0215-95-0272	18 - 24	-28	19	NA	1729	Not Submitted for Analysis		
15-008(c)	0215-95-0273	0 - 6	1.8	922	NA	3449	46.40	2180	33.400
15-008(c)	0215-95-0274	0 - 5	-32	744	NA	3557	43.90	1620	260.000
C-15-001	0215-95-0275	0 - 3	-43	46	NA	2675	23.20	55	0.825
C-15-001	0215-95-0276	0 - 6	-19	39	NA	2374	20.00	14.2	0.884
15-004(h)	0215-95-0277	0 - 6	-10	29	NA	2819	191.10	33	0.673
15-004(h)	0215-95-0278	18 - 24	-31	22	NA	2469	6.08	2.8	0.627
15-004(h)	0215-95-0279	0 - 6	-16	17.8	NA	2357	11.40	5.07	0.615
15-004(h)	0215-95-0280	18 - 24	-1.9	2.5	NA	2144	7.83	3.86	0.716
15-004(h)	0215-95-0281	0 - 2	-42	54	NA	2616	21.40	29.9	0.457
15-004(h)	0215-95-0282	0 - 6	-23	30	NA	2219	15.80	24.7	1.060
15-004(h)	0215-95-0283	18 - 24	-25	26	NA	2445	7.85	4.57	0.708
15-004(h)	0215-95-0284	0 - 6	-13	26.7	NA	2336	12.80	33	0.358
15-004(h)	0215-95-0285	18 - 24	-21	25	NA	2380	13.20	3.24	0.881
15-004(h)	0215-95-0286	0 - 5	-45	25	NA	2783	7.50	4.12	0.319
15-004(h)	0215-95-0287	18 - 24	-25	19	NA	2518	8.84	3.89	0.714
15-004(h)	0215-95-0288	0 - 6	-61	34.2	NA	2868	9.11	22.9	0.238
15-004(h)	0215-95-0289	0 - 6	93	253	NA	2716	82.70	510	0.350
15-004(h)	0215-95-0290	18 - 24	139	46	NA	2513	132.00	131	0.253
15-004(h)	0215-95-0291	0 - 4	-50	23.1	NA	1863	Not Submitted for Analysis		
15-004(h)	0215-95-0292	12 - 16	-34	-0.5	NA	1942	Not Submitted for Analysis		
15-004(h)	0215-95-0293	0 - 6	-20	19	NA	2730	Not Submitted for Analysis		
15-004(h)	0215-95-0294	18 - 22	-25	24	NA	2687	Not Submitted for Analysis		
15-004(h)	0215-95-0295	0 - 6	-22	22	NA	2947	Not Submitted for Analysis		
15-004(h)	0215-95-0296	18 - 24	-38	23	NA	2911	Not Submitted for Analysis		
15-004(h)	0215-95-0297	0 - 6	-35	22	NA	2861	Not Submitted for Analysis		
15-004(h)	0215-95-0298	18 - 24	2.3	16.4	NA	2935	Not Submitted for Analysis		

TABLE D-1

Screening and Analytical Data for TA-15 (continued)

PRS or AOC	Sample #	Depth (inches)	XRF Data Pb (ppm)	XRF Data U (ppm)	LIBS Be (ppm)	Ludlum 2210 Rad Data (cpm)	Analytical Data Pb (ppm)	Analytical Data U (ppm)	Analytical Data Be (ppm)
15-004(h)	0215-95-0299	0 - 4	39	55	NA	2432	38.90	35.3	0.643
15-004(h)	0215-95-0300	0 - 6	-4.5	29	NA	2672	Not Submitted for Analysis		
15-004(h)	0215-95-0301	0 - 4	-4.1	13	NA	2856	Not Submitted for Analysis		
15-004(h)	0215-95-0302	0 - 6	-28	33.4	NA	2702	3.91	11.7	0.707
15-004(h)	0215-95-0303	18 - 24	-47	10	NA	2982	Not Submitted for Analysis		
15-004(h)	0215-95-0304	0 - 6	-18	63	NA	2306	13.90	75.9	1.100
15-004(h)	0215-95-0305	13 - 19	-28	36	NA	2414	6.91	6.79	0.626
15-004(h)	0215-95-0308	0 - 6	2.1	16	NA	2947	Not Submitted for Analysis		
15-004(h)	0215-95-0309	18 - 24	-24	15	NA	2911	Not Submitted for Analysis		
15-014(b)	0215-95-0312	0-6	-14	-26	NA	2167	15.00		0.878
15-005(b)	0215-95-0314	0 - 6	-22	28	NA	2856	12.90	4.5	0.630
15-007(a)	0215-95-0316	0 - 6	6.2	22	NA	2541	15.70	4.32	0.668
15-014(h)	0215-95-0318	0 - 6	-9.3	13	NA	2480	Not Submitted for Analysis		
15-006(c)	0215-95-0400	0 - 6	-47	49	<1	3100	Not Submitted for Analysis		
15-006(c)	0215-95-0403	0 - 8	-37	47	<1	2989	Not Submitted for Analysis		
15-006(c)	0215-95-0406	0 - 6	1.0	67	<1	3046	Not Submitted for Analysis		
15-006(c)	0215-95-0407	13 - 19	-40	49	<1	3065	Not Submitted for Analysis		
15-006(c)	0215-95-0409	0 - 6	4.3	61	<1	2858	Not Submitted for Analysis		
15-006(c)	0215-95-0412	0 - 5	76	129	NA	5024	118	140	4
15-006(c)	0215-95-0413	5 - 9	-32	109	NA	3175	Not Submitted for Analysis		
15-006(c)	0215-95-0415	0 - 5	261	256	NA	3560	160	170	3.6
15-006(c)	0215-95-0416	7 - 13	-3.1	51	NA	3196	Not Submitted for Analysis		
15-006(c)	0215-95-0418	0 - 6	870	866	NA	3346	802	740	22.6
15-006(c)	0215-95-0419	0 - 6	886	852	NA	3346	907	890	15.6
15-006(c)	0215-95-0420	6 - 8	120	303	NA	3341	91.3	370	1.2
15-006(c)	0215-95-0422	0 - 6	390	282	36.86	3260	341	260	3.8
15-006(c)	0215-95-0423	12 - 18	6.6	123	<1	3220			

TABLE D-1

Screening and Analytical Data for TA-15 (continued)

PRS or AOC	Sample #	Depth (inches)	XRF Data Pb (ppm)	XRF Data U (ppm)	LIBS Be (ppm)	Ludlum 2210 Rad Data (cpm)	Analytical Data Pb (ppm)	Analytical Data U (ppm)	Analytical Data Be (ppm)
15-006(c)	0215-95-0425	0 - 6	324	178	61.2	3303	228	260	5.5
15-006(c)	0215-95-0426	12 - 18	9.8	86	<1	2957	Not Submitted for Analysis		
15-006(c)	0215-95-0428	0 - 6	76.3	171	46.53	3676	630	180	2.2
15-006(c)	0215-95-0429	18 - 24	54	909	24.53	3901	164	1100	4.1
15-006(c)	0215-95-0430	26 - 32	13	796	3.2	3561	29.7	1500	3.6
15-006(c)	0215-95-0431	0 - 6	237	1237	168.45	4051	281	1700	27.7
15-006(c)	0215-95-0432	18 - 24	117	734	43.18	3547	47.7	45000	4
15-006(c)	0215-95-0433	24 - 30	19	317	6.46	3543	92	230	3.3
15-006(c)	0215-95-0434	0 - 6	-1.9	184	<1	3691	Not Submitted for Analysis		
15-006(c)	0215-95-0435	12 - 18	-13	130	<1	3570	Not Submitted for Analysis		
15-006(c)	0215-95-0437	0 - 6	74	117	<1	2960	Not Submitted for Analysis		
15-006(c)	0215-95-0438	6 - 12	-6.1	64	<1	2842	Not Submitted for Analysis		
15-006(c)	0215-95-0440	0 - 6	22	55	<1	3105	Not Submitted for Analysis		
15-006(c)	0215-95-0441	0 - 6	19	79	<1	3105	Not Submitted for Analysis		
15-006(c)	0215-95-0442	6 - 12	-24	65	<1	3019	Not Submitted for Analysis		
15-006(c)	0215-95-0444	0 - 6	148	116	0.77	2842	Not Submitted for Analysis		
15-006(c)	0215-95-0445	8 - 14	32	52	<1	2754	Not Submitted for Analysis		
15-006(c)	0215-95-0447	0 - 6	-25	27	<1	2689	Not Submitted for Analysis		
15-006(c)	0215-95-0448	15 - 21	-29	25	<1	2685	Not Submitted for Analysis		
15-006(c)	0215-95-0450	0 - 6	-23	92	0.74	2773	84.2	64	3.3
15-006(c)	0215-95-0451	12 - 18	-7.3	44	<1	2687	Not Submitted for Analysis		
15-006(c)	0215-95-0453	0 - 6	295	725	78.52	3235	356	970	13.3
15-006(c)	0215-95-0454	15 - 21	71	411	27.45	3130	79.7	420	3.1
15-006(c)	0215-95-0456	0 - 6	950	343	47.57	2658	553	260	18
15-006(c)	0215-95-0457	7 - 13	8.9	64	0.26	2776	Not Submitted for Analysis		
15-006(c)	0215-95-0459	0 - 6	726	324	31.5	2971	287	620	10.7
15-006(c)	0215-95-0460	6 - 12	273	145	8.69	2977	Not Submitted for Analysis		

TABLE D-1

Screening and Analytical Data for TA-15 (continued)

PRS or AOC	Sample #	Depth (Inches)	XRF Data Pb (ppm)	XRF Data U (ppm)	LIBS Be (ppm)	Ludlum 2210 Rad Data (cpm)	Analytical Data Pb (ppm)	Analytical Data U (ppm)	Analytical Data Be (ppm)
15-006(c)	0215-95-0462	0 - 6	191	317	29.8	2939	Not Submitted for Analysis		
15-006(c)	0215-95-0463	0 - 6	133	234	24.2	2939	Not Submitted for Analysis		
15-006(c)	0215-95-0464	16 - 22	-42	82	20.2	2947	Not Submitted for Analysis		
15-006(c)	0215-95-0466	0 - 6	-26	37	<0.2	2506	Not Submitted for Analysis		
15-006(c)	0215-95-0467	8 - 14	-77	43	<0.2	2922	Not Submitted for Analysis		
15-006(c)	0215-95-0469	0 - 6	-33	9.5	<0.2	2584	Not Submitted for Analysis		
15-006(c)	0215-95-0470	18 - 24	-2.9	38	<1	2587	Not Submitted for Analysis		
15-006(c)	0215-95-0471	34 - 40	-11	39	<0.2	2505	Not Submitted for Analysis		
15-006(c)	0215-95-0472	0 - 6	-16	11	<0.2	2539	Not Submitted for Analysis		
15-006(c)	0215-95-0473	15 - 21	-49	27	<0.2	2481	Not Submitted for Analysis		
15-006(c)	0215-95-0475	0 - 6	95	292	20.9	4447	Not Submitted for Analysis		
15-006(c)	0215-95-0476	18 - 24	309	274	<0.2	4032	234	170	1.4
15-006(c)	0215-95-0477	26 - 32	43	189	2.13	4145	77.1	110	2
15-006(c)	0215-95-0478	0 - 6	41	708	6.2	3988	Not Submitted for Analysis		
15-006(c)	0215-95-0479	9 - 15	-2.3	86	<0.2	4196	Not Submitted for Analysis		
15-006(c)	0215-95-0481	0 - 6	-39	133	0.60	3617	Not Submitted for Analysis		
15-006(c)	0215-95-0482	6 - 12	-37	218	<0.2	3654	18.1	120	1.2
15-006(c)	0215-95-0484	0 - 6	181	602	37.3	3685	132	670	13.2
15-006(c)	0215-95-0485	0 - 6	175	615	33.0	3685	180	510	24.1
15-006(c)	0215-95-0488	0 - 6	189	178	13.1	3434	Not Submitted for Analysis		
15-006(c)	0215-95-0491	0 - 6	190	346	12.3	3303	Not Submitted for Analysis		
15-006(c)	0215-95-0492	6 - 12	17	92	2.01	3576	Not Submitted for Analysis		
15-006(c)	0215-95-0494	0 - 6	3.4	67	0.29	3598	Not Submitted for Analysis		
15-006(c)	0215-95-0495	9 - 15	-41	33	<0.2	3371	Not Submitted for Analysis		
15-006(c)	0215-95-0497	0 - 6	-39	56	1.18	3155	Not Submitted for Analysis		
15-006(c)	0215-95-0498	0 - 6	-38	66	29.71	3262	8.7	41	1.2
15-006(c)	0215-95-0499	0 - 6	-31	46	22.36	3266	Not Submitted for Analysis		

TABLE D-1

Screening and Analytical Data for TA-15 (continued)

PRS or AOC	Sample #	Depth (inches)	XRF Data Pb (ppm)	XRF Data U (ppm)	LIBS Be (ppm)	Ludlum 2210 Rad Data (cpm)	Analytical Data Pb (ppm)	Analytical Data U (ppm)	Analytical Data Be (ppm)
15-006(c)	0215-95-0500	0 - 3	-59	34	0.96	3127	Not Submitted for Analysis		
15-006(c)	0215-95-0501	0 - 6	-25	34	0.88	3216	Not Submitted for Analysis		
15-006(c)	0215-95-0502	0 - 6	-50	54	1.15	3122	Not Submitted for Analysis		
15-006(c)	0215-95-0503	0 - 3	-57	57	1.25	3320	17.7	11	16.4
15-006(c)	0215-95-0504	0 - 2	-11	91	2.17	3455	21.4	110	1.8
15-006(c)	0215-95-0505	0 - 4	-33	37	0.88	3493	Not Submitted for Analysis		
15-006(c)	0215-95-0506	0 - 6	11	110	5.72	3287	49.5	130	1.6
15-006(c)	0215-95-0507	0 - 6	218	641	11.4	3169	280	3.3	3.3
15-006(c)	0215-95-0508	0 - 6	174	514	10.63	3169	167	1.1	4.5
15-006(c)	0215-95-0509	0 - 6	655	100	2.84	6632	580	8.5	1.5
15-006(c)	0215-95-0510	0 - 6	-11	65	1.58	3018	18.4	23	1.2
15-006(c)	0215-95-0511	0 - 6	-12	58	1.19	3053	Not Submitted for Analysis		
15-006(c)	0215-95-0512	0 - 6	-38	56	1.07	3392	Not Submitted for Analysis		
15-006(c)	0215-95-0513	0 - 6	-27	79	1.89	3080	10.9	49	1.1
15-006(c)	0215-95-0514	0 - 6	0.4	173	1.49	3652	18.8	96	1.2
15-006(c)	0215-95-0515	0 - 6	-56	63	1.24	3026	6.8	4.8	1.1
15-006(c)	0215-95-0516	0 - 6	-56	45	1.26	3117	Not Submitted for Analysis		
15-006(c)	0215-95-0517	0 - 6	-38	31	<1	3517	Not Submitted for Analysis		
15-006(c)	0215-95-0518	0 - 4	-30	47	<1	4027	9.5	3.9	1
15-006(c)	0215-95-0519	0 - 6	-35	22.6	<1	3297	Not Submitted for Analysis		
15-006(c)	0215-95-0520	0 - 6	-73	43	<0.2	2815	Not Submitted for Analysis		
15-006(c)	0215-95-0522	0 - 6	279	72	<0.2	2833	Not Submitted for Analysis		
15-006(c)	0215-95-0525	0 - 7	-15	112	<0.2	3212	Not Submitted for Analysis		
15-006(c)	0215-95-0526	0 - 6	9.4	93	<0.2	2758	Not Submitted for Analysis		
15-006(c)	0215-95-0527	0 - 6	30	88	<0.2	2758	Not Submitted for Analysis		
15-006(c)	0215-95-0528	14 - 20	-41	35	<0.2	2912	Not Submitted for Analysis		
15-006(c)	0215-95-0529	0 - 4	370	214	0.2	3022	446	250	5.6

TABLE D-1

Screening and Analytical Data for TA-15 (continued)

PRS or AOC	Sample #	Depth (inches)	XRF Data Pb (ppm)	XRF Data U (ppm)	LIBS Be (ppm)	Ludlum 2210 Rad Data (cpm)	Analytical Data Pb (ppm)	Analytical Data U (ppm)	Analytical Data Be (ppm)
15-006(c)	0215-95-0531	0 - 6	442	191	12.3	3005	257	140	6.2
15-006(c)	0215-95-0532	7 - 13	355	136	5.73	2861	266	140	3.5
15-006(c)	0215-95-0533	0 - 1	346	84	1.04	2724	Not Submitted for Analysis		
15-006(c)	0215-95-0535	0 - 6	2314	143	4.49	2764	132000	100	3.9
15-006(c)	0215-95-0536	6 - 12	159	77	<0.2	2800	229	37	1.5
15-006(c)	0215-95-0537	0 - 3	293	211	18.9	2769	267	200	7.9
15-006(c)	0215-95-0539	0 - 6	314	105	1.23	2626	422	110	2.3
15-006(c)	0215-95-0541	0 - 6	310	84	6.85	2114	160	390	4.6
15-006(c)	0215-95-0542	6 - 12	0.3	58	1.37	2229	38.1	30	3.3
15-006(d)	0215-95-0543	0 - 6	-22	25	0.84	2606	Not Submitted for Analysis		
15-006(d)	0215-95-0544	18 - 24	-38	42	1.60	2357	Not Submitted for Analysis		
15-006(d)	0215-95-0545	88 - 94	-52	39	1.57	2350	6.1	2.6	1.5
15-006(d)	0215-95-0546	0 - 6	-24	4.3	1.24	2328	Not Submitted for Analysis		
15-006(d)	0215-95-0547	0 - 6	-19	16.4	0.94	2328	Not Submitted for Analysis		
15-006(d)	0215-95-0548	18 - 24	-37	51	1.65	2255	7.7	2.4	1.1
15-006(d)	0215-95-0550	0 - 6	-45	10.0	1.04	2408	Not Submitted for Analysis		
15-006(d)	0215-95-0551	9 - 15	-64	41	1.82	2291	Not Submitted for Analysis		
15-006(d)	0215-95-0553	0 - 6	-34	10	1.24	1871	Not Submitted for Analysis		
15-006(d)	0215-95-0554	18 - 24	-50	23	1.22	1784	Not Submitted for Analysis		
15-006(d)	0215-95-0555	35 - 41	-40	29	1.10	1810	8.8	2.5	1.2
15-006(d)	0215-95-0556	0 - 6	25	25	0.75	1745	77	5.4	1
15-006(d)	0215-95-0557	18 - 24	-35	30	0.94	1608	Not Submitted for Analysis		
15-006(d)	0215-95-0558	41 - 47	-4.7	19	NA	1746	Not Submitted for Analysis		
15-006(d)	0215-95-0559	0 - 6	-38	11	0.86	1722	Not Submitted for Analysis		
15-006(d)	0215-95-0560	18 - 24	-20	41	0.80	1661	Not Submitted for Analysis		
15-006(d)	0215-95-0561	38 - 44	-71	17	1.23	1677	Not Submitted for Analysis		
15-006(d)	0215-95-0562	0 - 6	-32	28	1.08	2258			

TABLE D-1

Screening and Analytical Data for TA-15 (continued)

PRS or AOC	Sample #	Depth (inches)	XRF Data Pb (ppm)	XRF Data U (ppm)	LIBS Be (ppm)	Ludlum 2210 Rad Data (cpm)	Analytical Data Pb (ppm)	Analytical Data U (ppm)	Analytical Data Be (ppm)
15-006(d)	0215-95-0563	18 - 24	-1.2	11	1.16	2304	Not Submitted for Analysis		
15-006(d)	0215-95-0564	51 - 57	-42	16	0.76	2112	Not Submitted for Analysis		
15-006(d)	0215-95-0565	0 - 6	-48	34	0.91	2569	14	17	1.2
15-006(d)	0215-95-0566	18 - 24	-20	13	0.78	2372	Not Submitted for Analysis		
15-006(d)	0215-95-0567	33 - 39	-39	29	1.16	2499	9.1	1.8	1.1
15-006(d)	0215-95-0568	0 - 6	-30	26	0.91	2340	Not Submitted for Analysis		
15-006(d)	0215-95-0569	0 - 6	-30	35	0.97	2340	Not Submitted for Analysis		
15-006(d)	0215-95-0570	8 - 14	-38	24	0.98	2573	Not Submitted for Analysis		
15-006(d)	0215-95-0572	0 - 6	-28	46	1.19	2340	9.8	4.6	1.1
15-006(d)	0215-95-0573	18 - 24	-23	20	0.94	2287	Not Submitted for Analysis		
15-006(d)	0215-95-0574	30 - 40	-16	27	0.62	2330	17	2.1	1.2
15-006(d)	0215-95-0575	0 - 6	-71	40	1.40	2655	7.8	5.7	1.2
15-006(d)	0215-95-0576	15 - 21	-47	49	1.51	2869	6.6	2.4	1.2
15-006(d)	0215-95-0578	0 - 6	-38	24	1.21	2398	8.8	7.2	1.1
15-006(d)	0215-95-0579	11 - 17	-19	42	1.03	2615	Not Submitted for Analysis		
15-006(d)	0215-95-0581	0 - 6	-17	22	0.71	2149	Not Submitted for Analysis		
15-006(d)	0215-95-0582	8 - 14	-48	43	1.33	2100	7.3	2.6	1.2
15-006(d)	0215-95-0584	0 - 6	-48	51	1.14	2206	14	17	1.2
15-006(d)	0215-95-0585	8 - 14	-83	41	1.50	2414	Not Submitted for Analysis		
15-006(d)	0215-95-0587	0 - 6	-17	42	1.06	2382	13	29	1.1
15-006(d)	0215-95-0588	18 - 24	-7.7	21	1.35	2700	Not Submitted for Analysis		
15-006(d)	0215-95-0589	30 - 36	-47	32	1.01	2643	12	2.7	1.1
15-006(d)	0215-95-0590	0 - 6	-31	33	0.91	2486	Not Submitted for Analysis		
15-006(d)	0215-95-0591	0 - 6	-6.5	21	0.98	2486	Not Submitted for Analysis		
15-006(d)	0215-95-0592	12 - 18	-37	31	1.11	2496	Not Submitted for Analysis		
15-006(d)	0215-95-0594	0 - 6	-43	19	1.06	2689	Not Submitted for Analysis		
15-006(d)	0215-95-0595	10 - 16	-23	26	0.70	2471	Not Submitted for Analysis		

TABLE D-1

Screening and Analytical Data for TA-15 (continued)

PRS or AOC	Sample #	Depth (inches)	XRF Data Pb (ppm)	XRF Data U (ppm)	LIBS Be (ppm)	Ludlum 2210 Rad Data (cpm)	Analytical Data Pb (ppm)	Analytical Data U (ppm)	Analytical Data Be (ppm)
15-006(d)	0215-95-0597	0 - 6	-4.2	33	0.85	2524	Not Submitted for Analysis		
15-006(d)	0215-95-0598	6 - 10	-27	29	1.41	2473	Not Submitted for Analysis		
15-006(d)	0215-95-0600	0 - 6	-20	25	1.60	2376	Not Submitted for Analysis		
15-006(d)	0215-95-0601	18 - 24	-46	9.9	0.90	2629	Not Submitted for Analysis		
15-006(d)	0215-95-0602	28 - 34	-2.4	26	0.79	2540	Not Submitted for Analysis		
15-006(d)	0215-95-0603	0 - 6	-36	31	0.92	2616	Not Submitted for Analysis		
15-006(d)	0215-95-0604	6 - 12	-39	39	0.31	2720	Not Submitted for Analysis		
15-006(d)	0215-95-0606	0 - 6	-27	23	1.21	2448	Not Submitted for Analysis		
15-006(d)	0215-95-0607	11 - 17	-35	36	0.75	2418	Not Submitted for Analysis		
15-006(d)	0215-95-0609	0 - 6	-0.5	26	1.19	2146	44.7	4.7	1.1
15-006(d)	0215-95-0610	12 - 18	-49	50	1.80	2132	5.6	3.5	1.2
15-006(d)	0215-95-0612	0 - 6	-27	39	NA	2248	22	25	1.1
15-006(d)	0215-95-0613	0 - 6	-2.4	24	0.85	2248	13	8.4	1.1
15-006(d)	0215-95-0614	14 - 20	-28	49	1.94	2094	7.9	3.7	1.2
15-006(d)	0215-95-0616	0 - 6	-45	28	1.26	2484	Not Submitted for Analysis		
15-006(d)	0215-95-0617	0 - 6	-25	33	0.83	2380	Not Submitted for Analysis		
15-006(d)	0215-95-0618	0 - 4	-28	33	1.44	2660	8.8	9.2	1.1
15-006(d)	0215-95-0619	0 - 6	-23	25	1.02	2317	31	8.4	1.1
15-006(d)	0215-95-0620	0 - 6	-40	35	0.93	2720	9.7	14	1.1
15-006(d)	0215-95-0621	0 - 6	-52	50	1.41	2922	Not Submitted for Analysis		
15-006(d)	0215-95-0622	0 - 6	-41	40	0.94	2521	14	18	1.4
15-006(d)	0215-95-0623	0 - 6	-16	28	1.82	2894	Not Submitted for Analysis		
15-008(g)	0215-95-0624	0 - 6	-32	0.04	0.95	2082	3.3	0.88	1

* Not Submitted for Total Uranium Analysis

TABLE D-2

Accuracy Determination for Field XRF, 1995 TA 15		
Date of Analysis	Pb (ppm)	U (ppm)
6/22/95	652	13.4
6/27/95	620	17
6/27/95	588	14
6/28/95	559	-8
6/30/95	594	-0.5
7/12/95	569	-2.3
7/13/95	568	14
7/20/95	546	6.0
7/21/95	619	13
7/24/95	635	8.5
7/25/95	577	6.7
7/26/95	596	6.2
7/26/95	620	14.6
7/27/95	573	5.8
7/27/95	585	4.6
8/2/95	609	14
8/4/95	586	17
8/7/95	521	17
8/8/95	639	13
8/9/95	619	13.3
8/9/95	600	2.3
8/10/95	593	7.0
8/18/95	599	4.5
8/21/95	597	4.8
8/25/95	609	0.8
8/25/95	572	-2.2
8/29/95	545	-7.5
8/29/95	588	8.6
Experimental Mean	**592**	**7.3**
Experimental Standard Devation	**30**	**7.2**
Certified Value *	**690**	**2.9**
Certified Standard Deviation	**60**	**0.06**
* USGS Reference Material GXR-2, Soil, Park City, Utah		

TABLE D-3

Be Replicate Analysis of Certified Samples

Sample Number	Proposed Value (ppm)	LIBS Average Value (ppm)
GXR -3 (USGS)	26	33.3 ± 5.2 (15.6%)*
SY-2 (CCRMP)	22	17.9 ± 0.8 (4.3%)*

* n = 10

APPENDIX E

GRAPHS FOR STATISTICAL BACKGROUND COMPARISON

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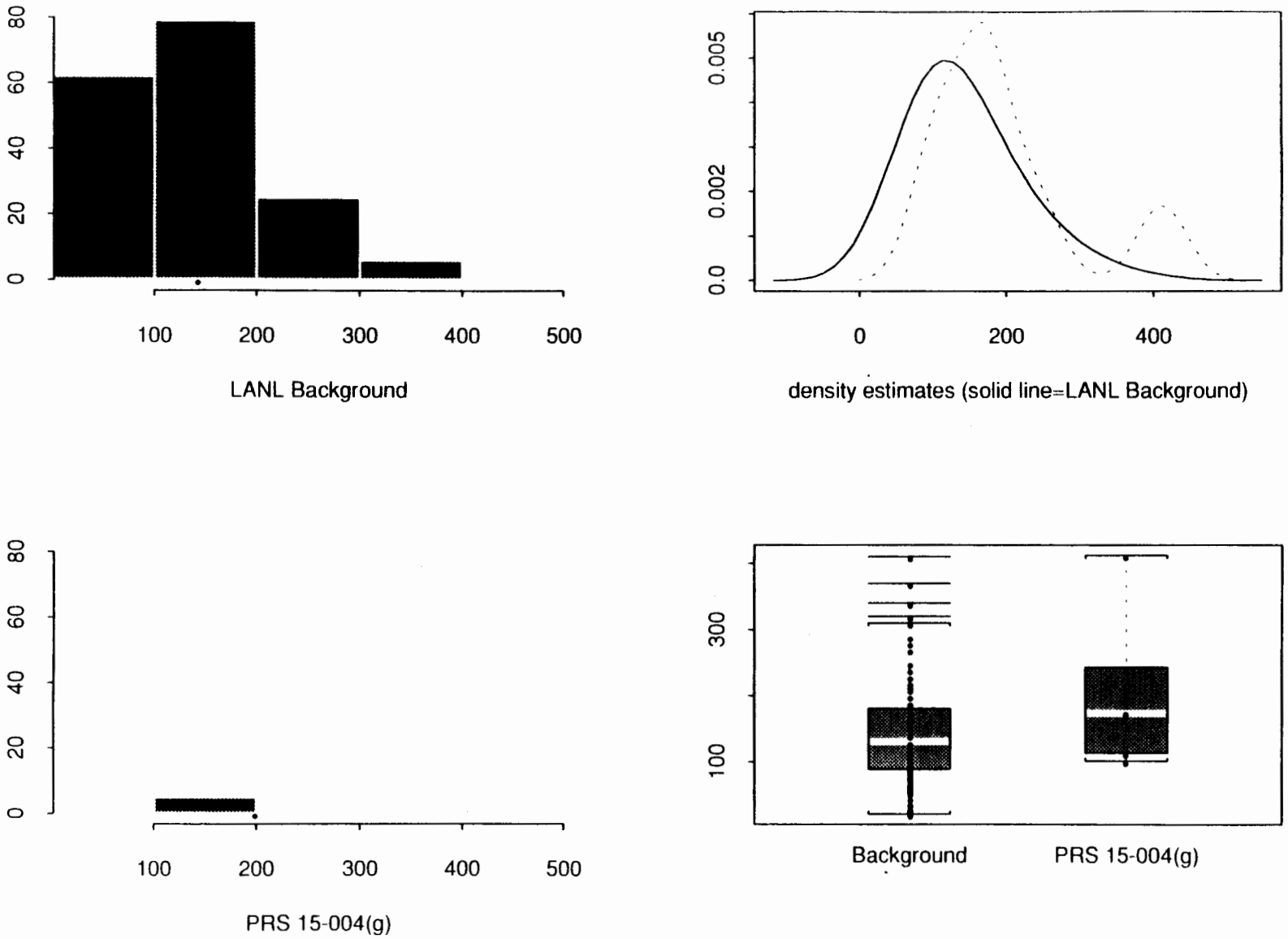

Figure E-1 Comparision of Barium at PRS 15-004(g) to LANL Background

APPENDIX E

GRAPHS FOR STATISTICAL BACKGROUND COMPARISON

This appendix includes graphical representations of the distributions of data for each analyte that has an exceedence of its Laboratory background upper tolerance limit (UTL), by PRS. The four displays on each page are:

- In the upper left corner — the histogram of the Laboratory background data is presented for the analyte being considered. The horizontal axis gives the observed concentrations in mg/kg, while the vertical axis gives the number of observations in each concentration class.
- In the lower left corner — the histogram of the site data for the analyte being considered. The axes are the same as for the Laboratory background data histogram.
- In the upper right corner — density functions of both the Laboratory background data and the site data for the analyte being considered. The density functions are smoothed, normalized "histograms" where the horizontal axis is again concentrations in mg/kg. The vertical axis is essentially equivalent to the probability of observing any particular concentration. Because these are continuous distributions, the probabilities are actually the areas under the curve within some interval of concentrations.
- In the lower right corner — box plots of both the Laboratory background data and the site data for the analyte being considered. The white line in the middle of each plot shows the median of the data set. The dark areas of these plots are the regions between the 25th percentiles and the 75th percentiles. The square brackets give an interval outside of which data may be considered to be significantly different from the rest of the data set. The vertical axis is concentrations of the observed data in mg/kg.

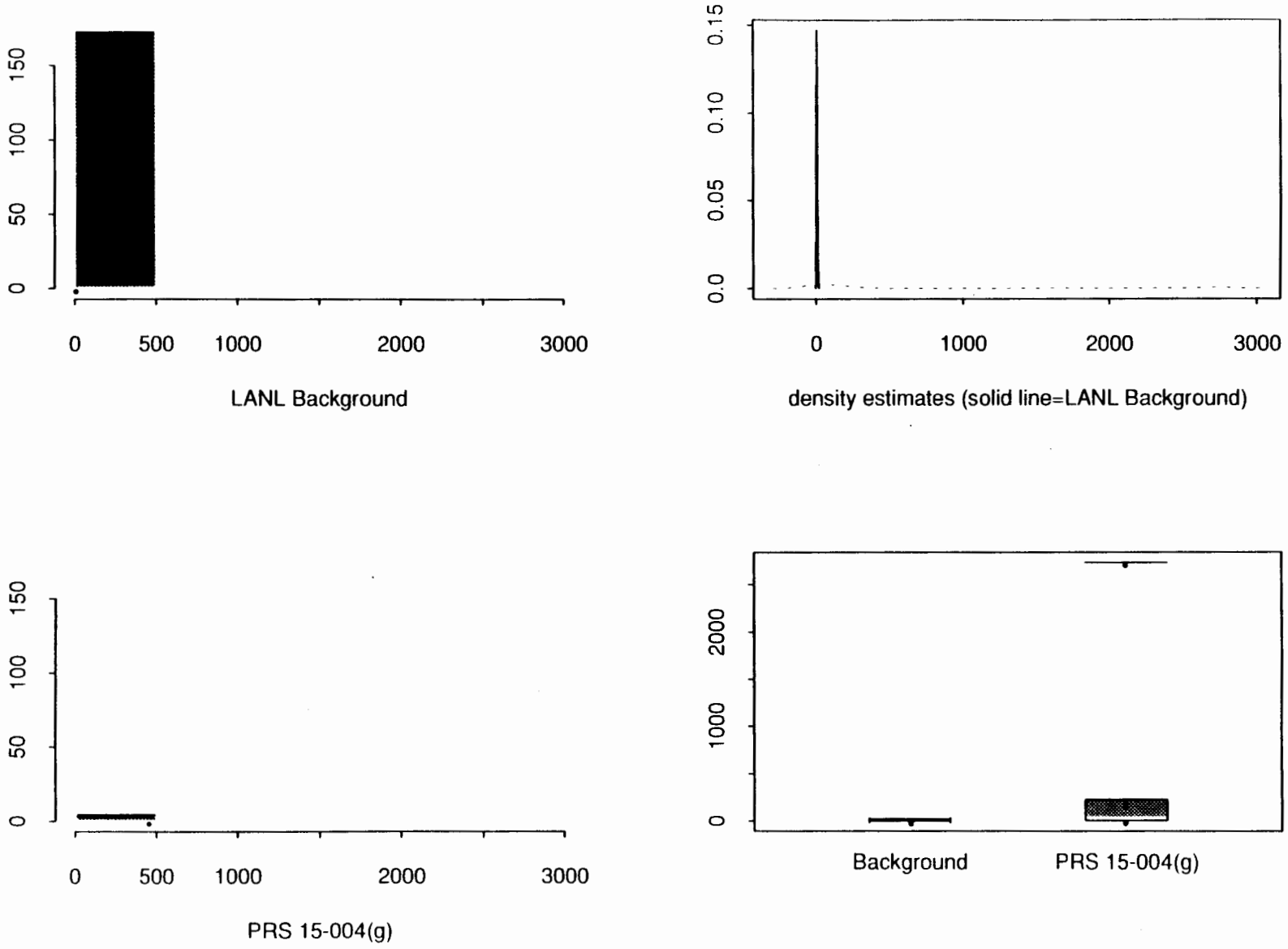

Figure E-2 Comparision of Copper at PRS 15-004(g) to LANL Background

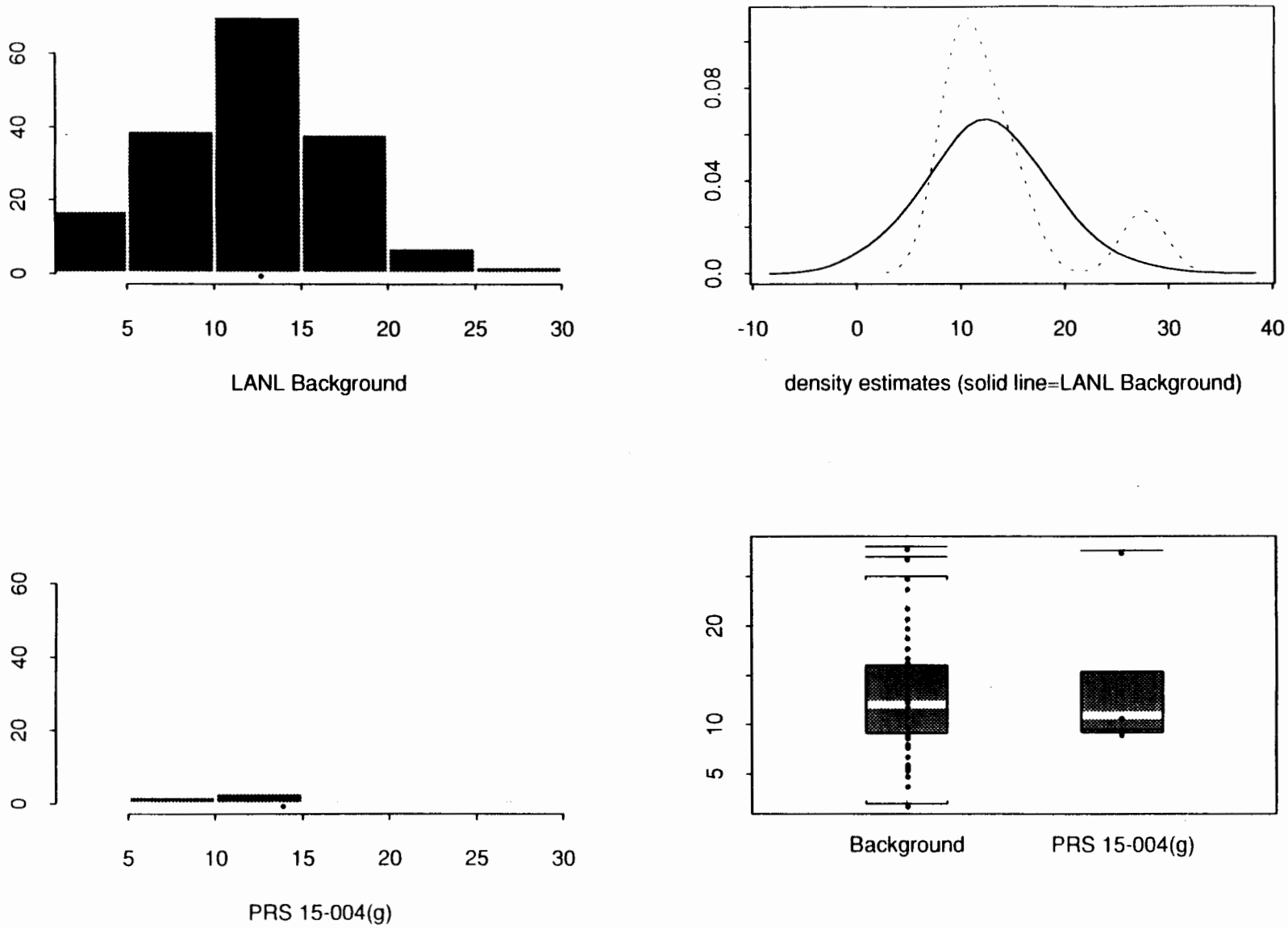

Figure E-3 Comparision of Lead at PRS 15-004(g) to LANL Background

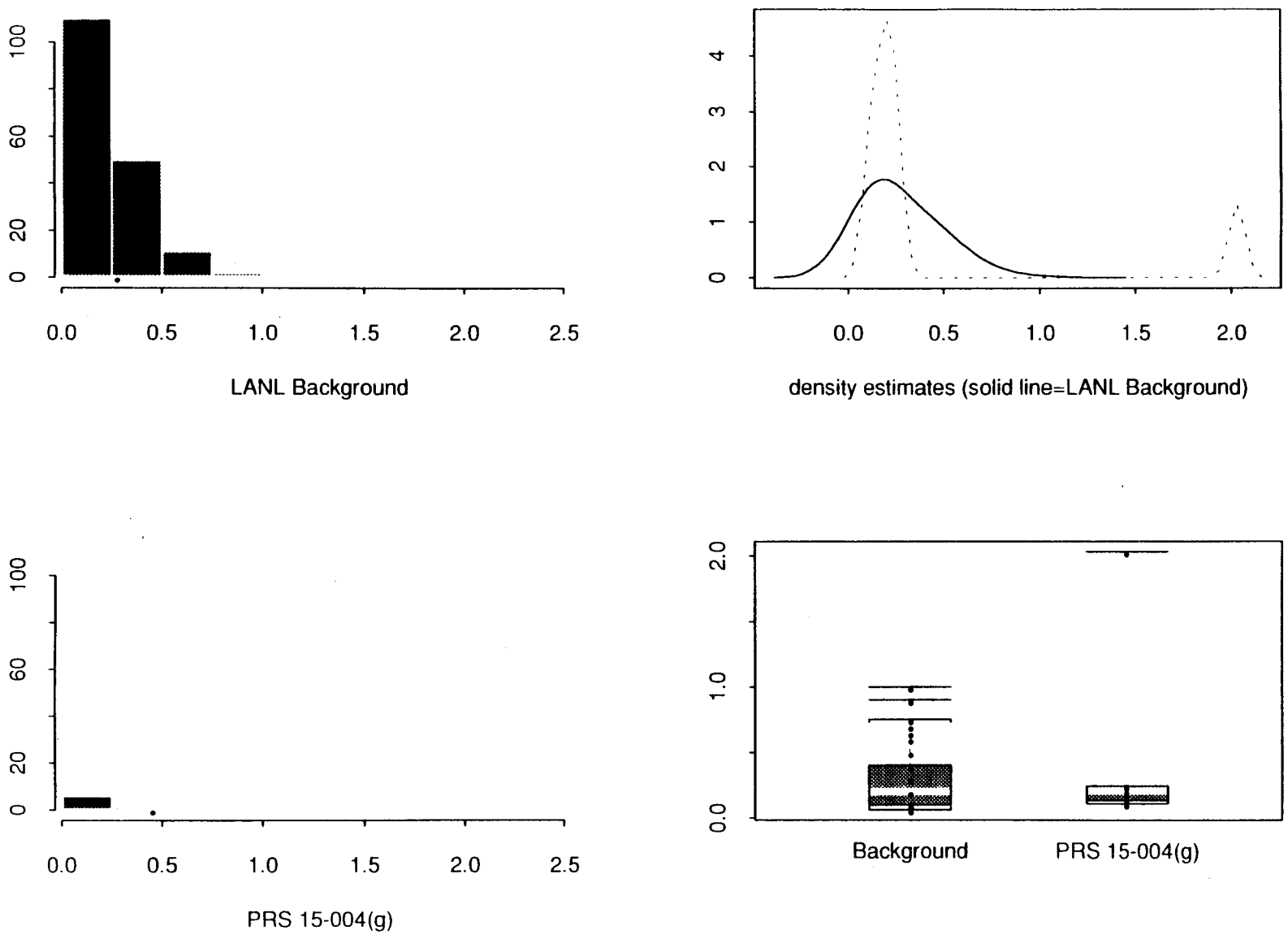

Figure E-4 Comparision of Thallium at PRS 15-004(g) to LANL Background

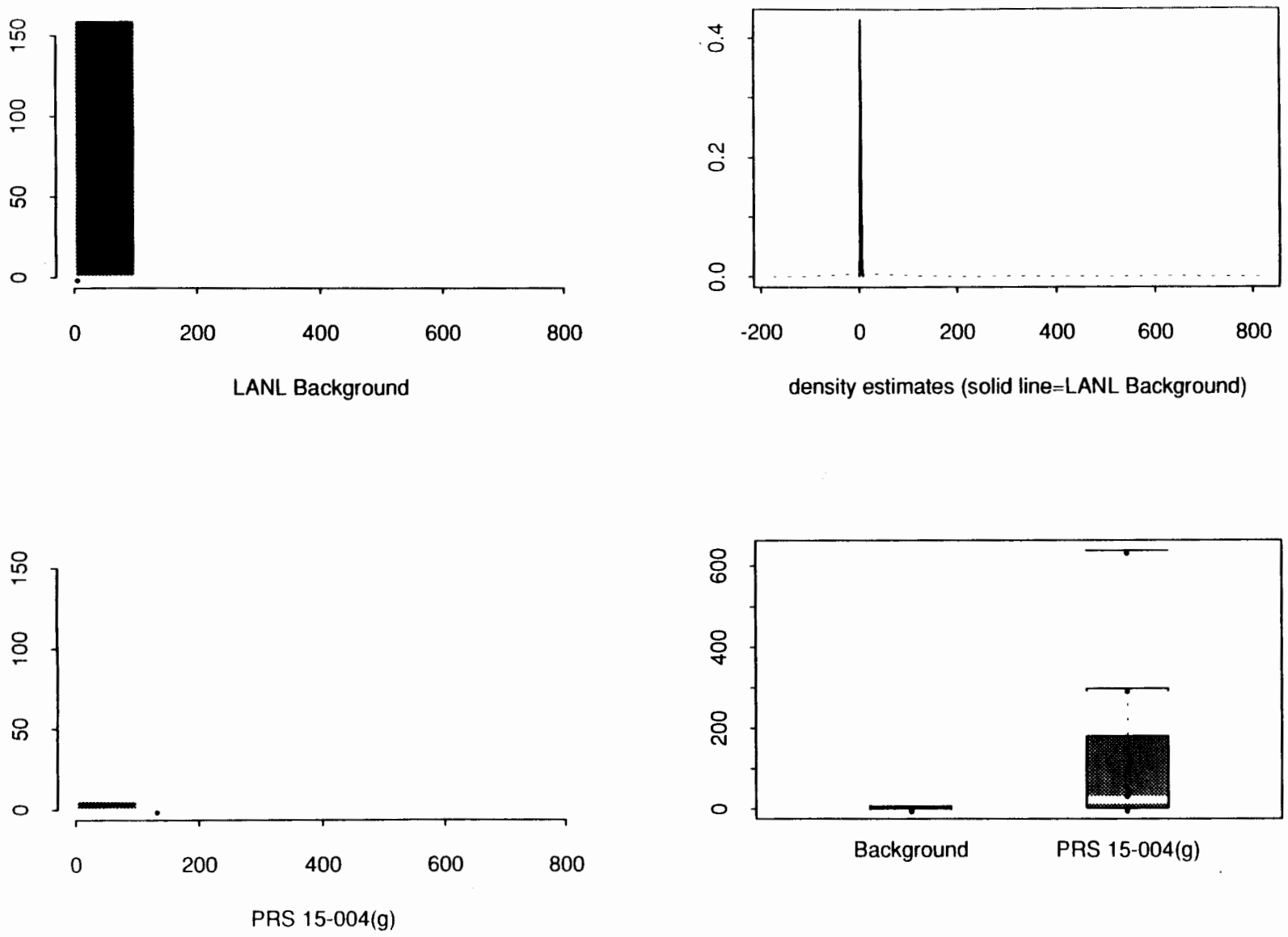

Figure E-5 Comparision of Uranium at PRS 15-004(g) to LANL Background

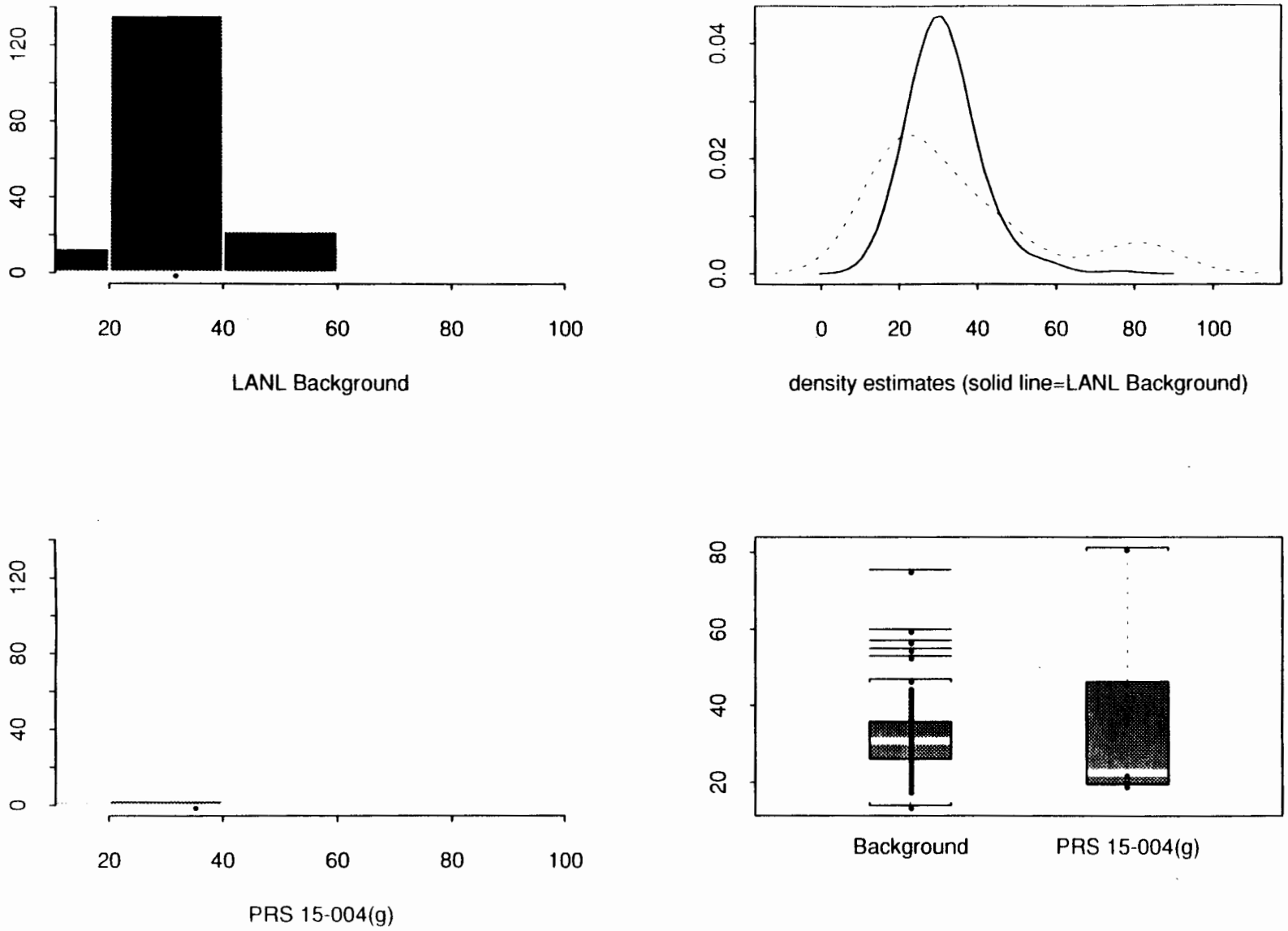

Figure E-6 Comparision of Zinc at PRS 15-004(g) to LANL Background

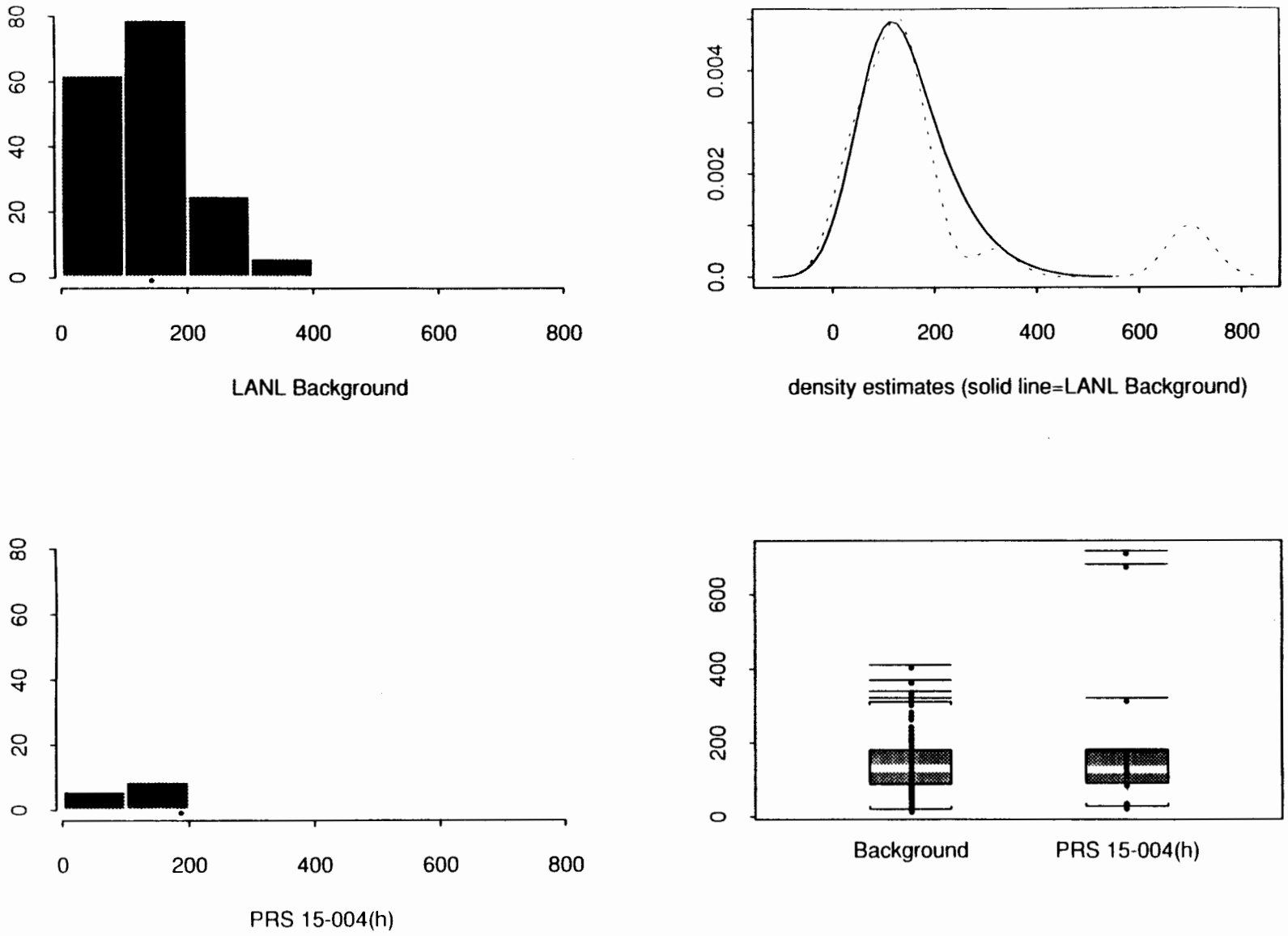

Figure E-7 Comparision of Barium at PRS 15-004(h) to LANL Background

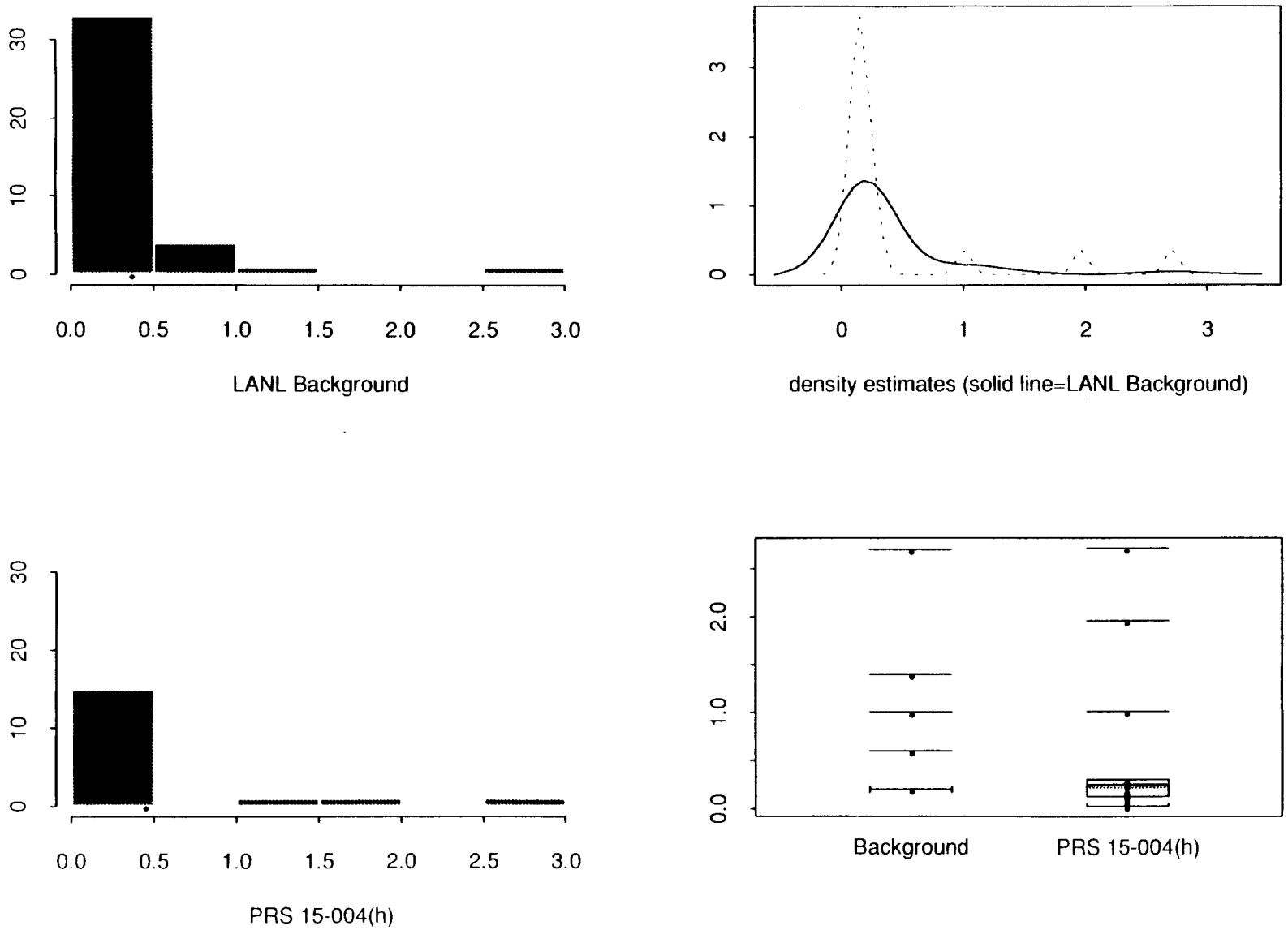

Figure E-8 Comparision of Cadmium at PRS 15-004(h) to LANL Background

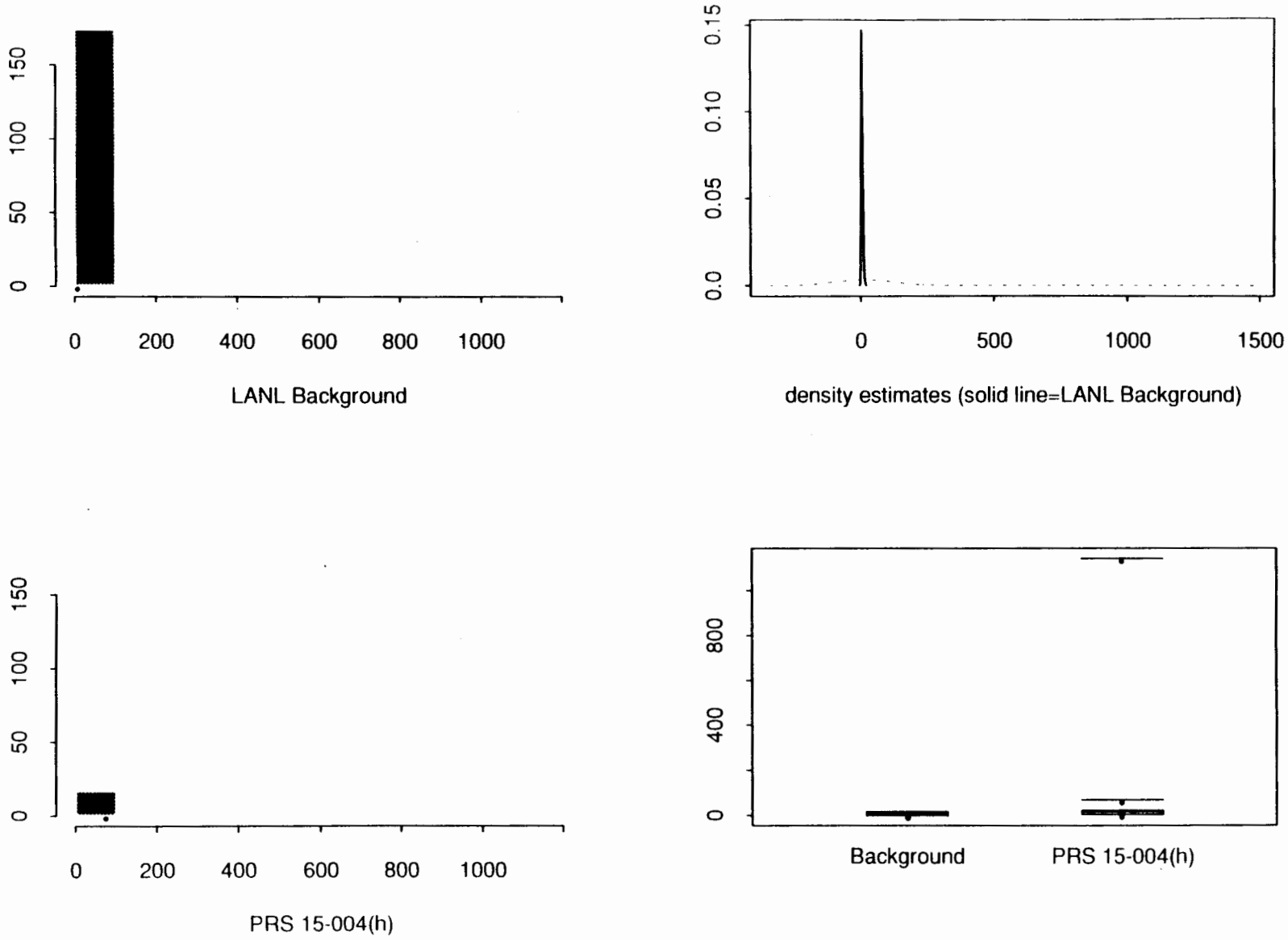

Figure E-9 Comparision of Copper at PRS 15-004(h) to LANL Background

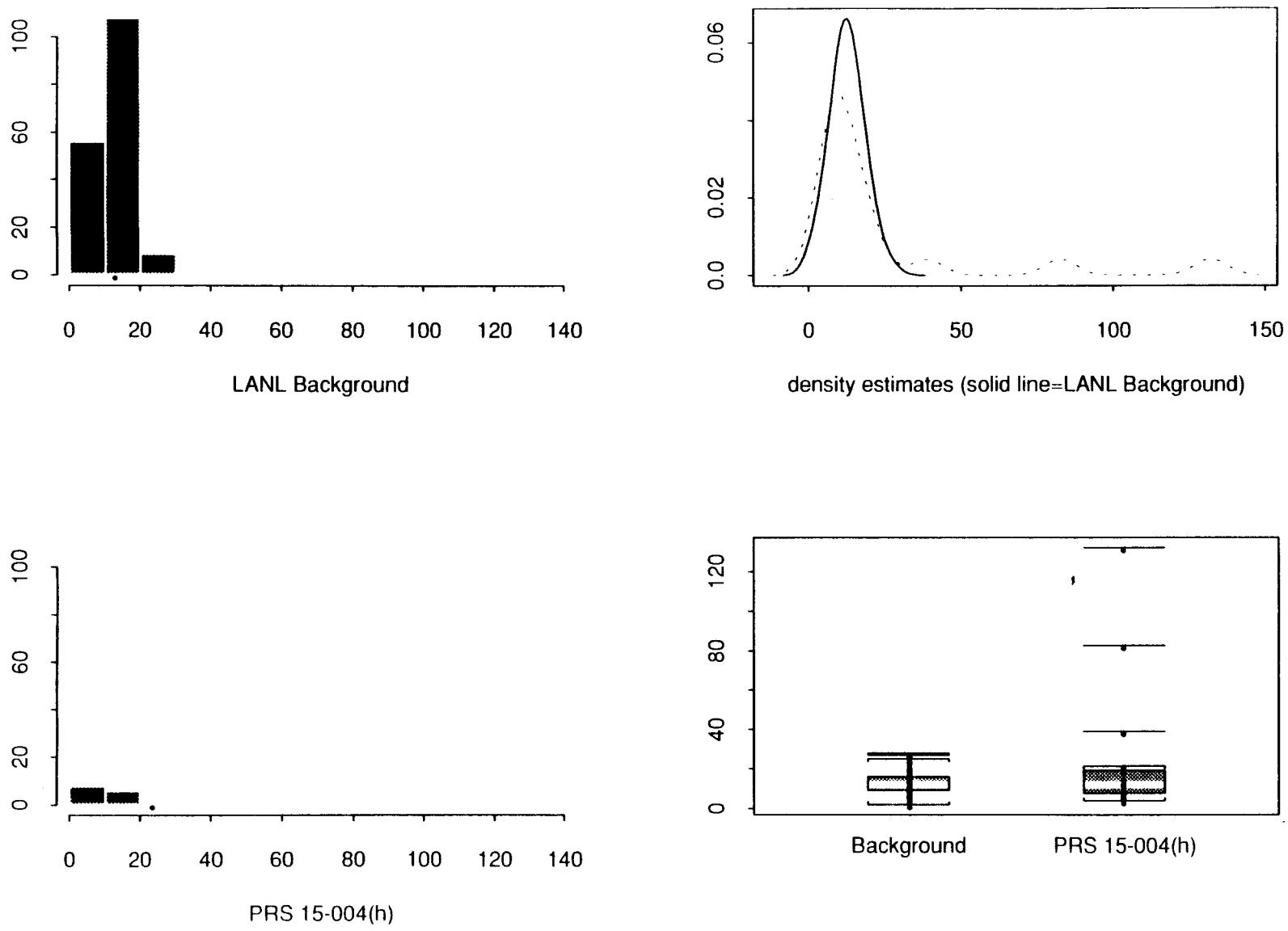

Figure E-10 Comparision of Lead at PRS 15-004(h) to LANL Background

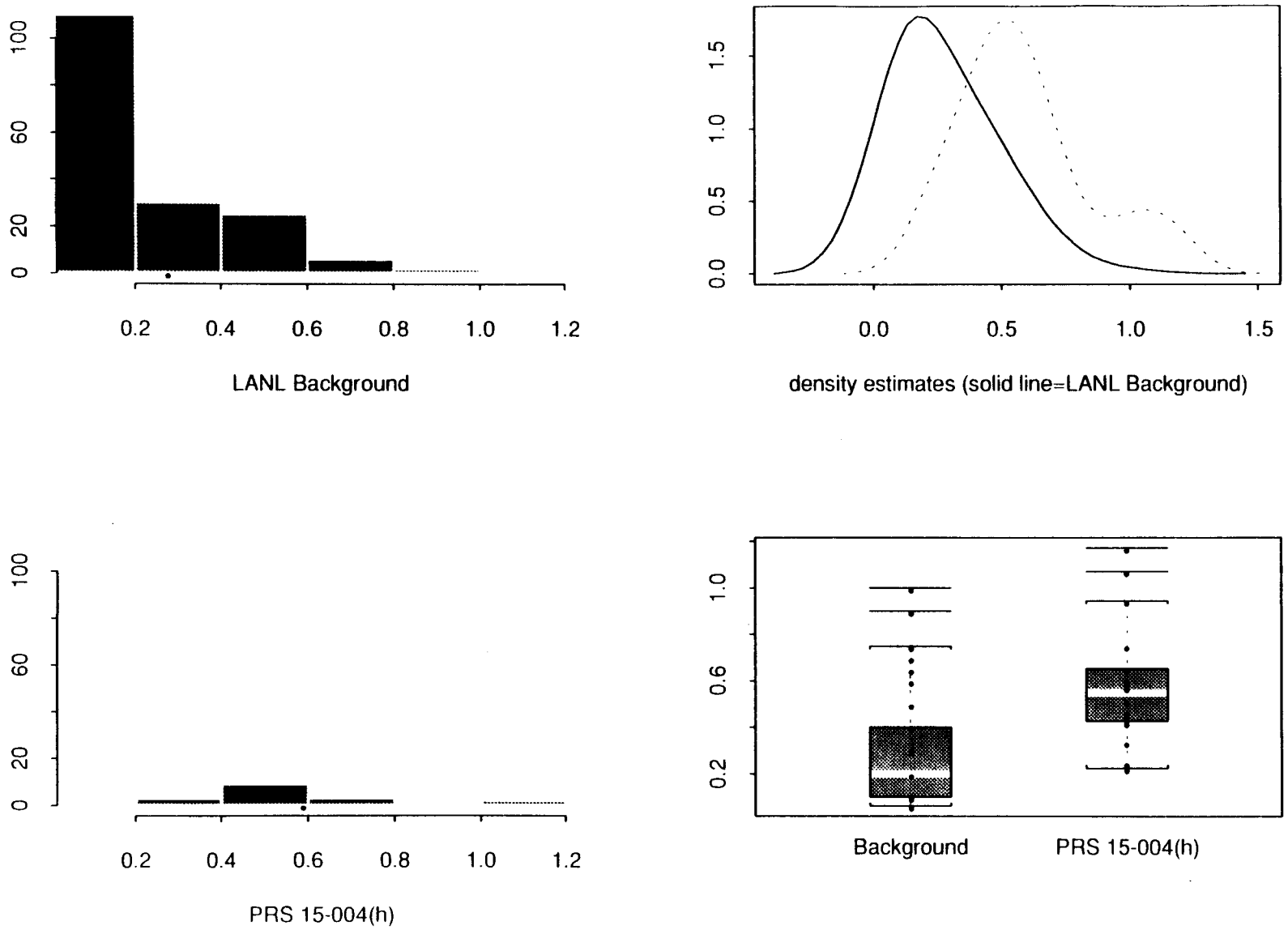

Figure E-11 Comparision of Thallium at PRS 15-004(h) to LANL Background

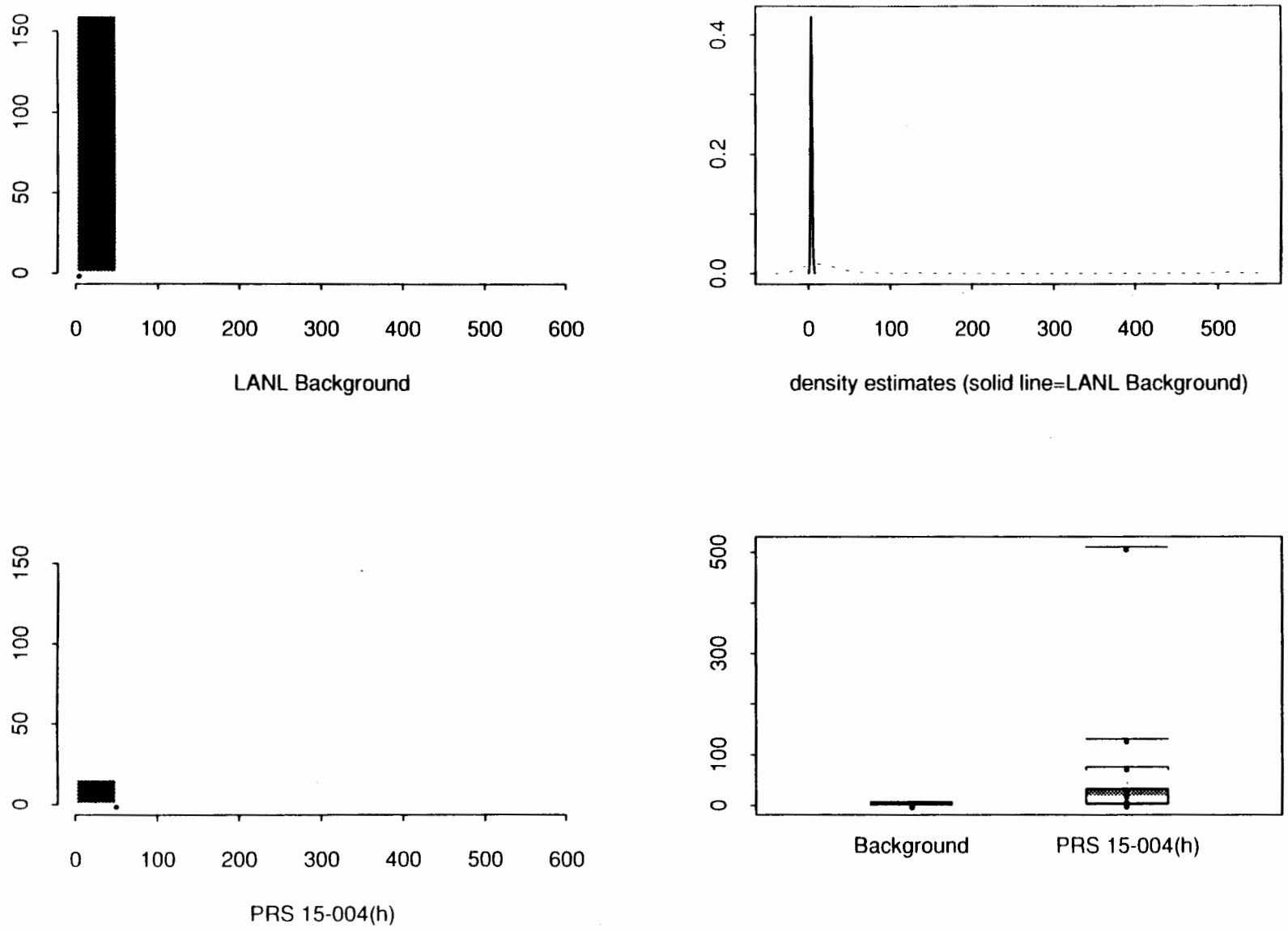

Figure E-12 Comparision of Uranium at PRS 15-004(h) to LANL Background

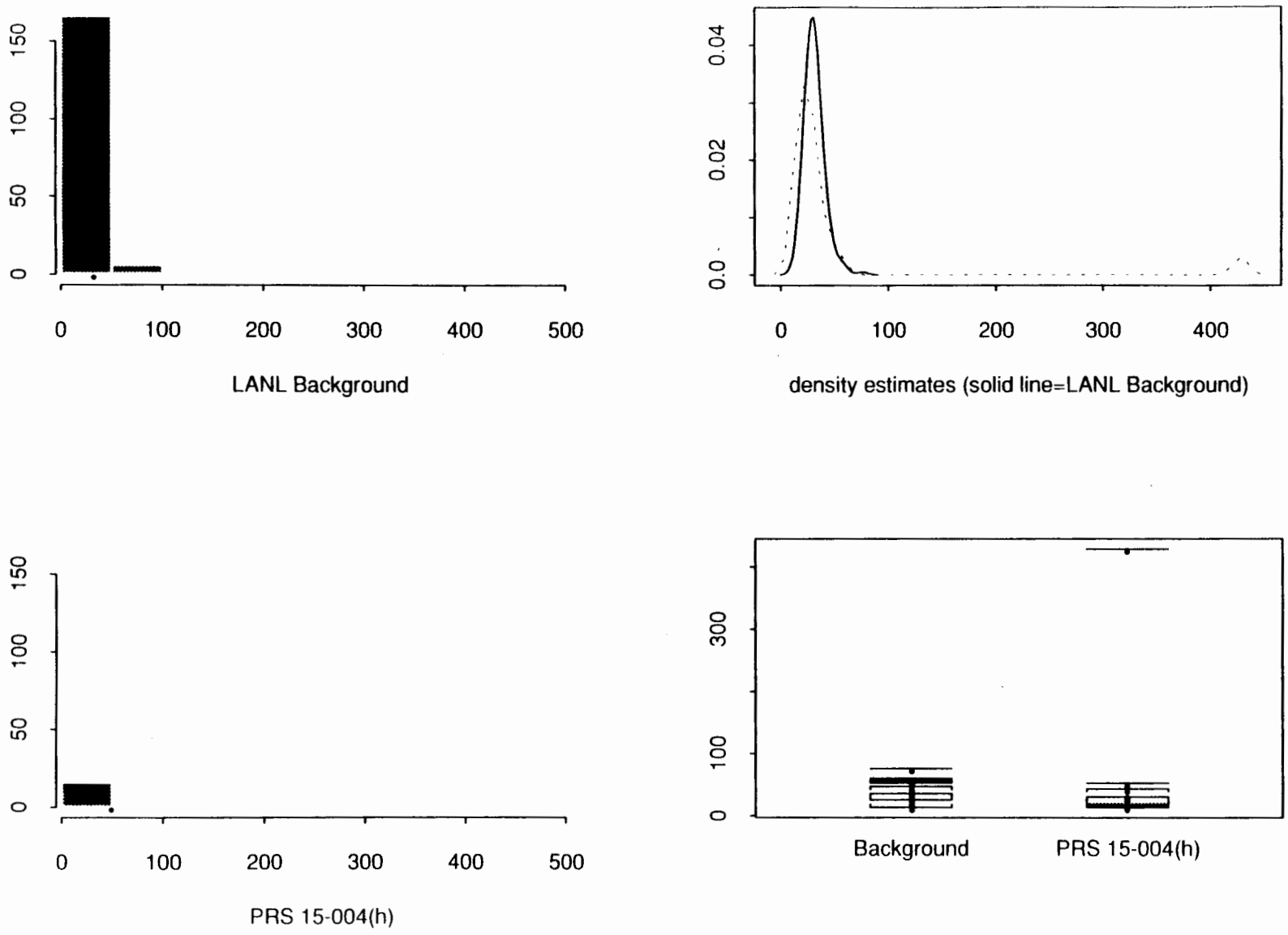

Figure E-13 Comparision of Zinc at PRS 15-004(h) to LANL Background

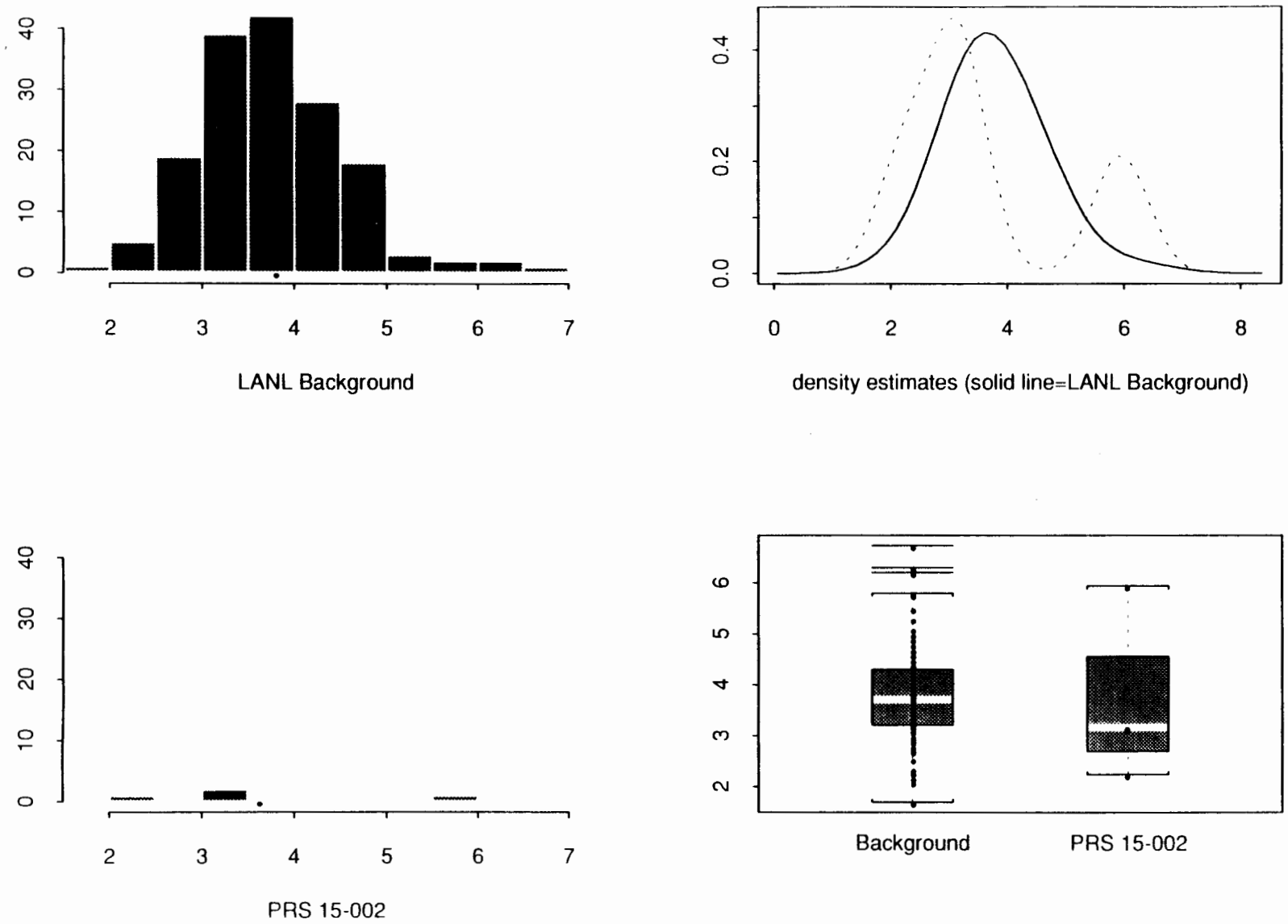

Figure E-14 Comparision of Uranium at PRS 15-002 to LANL Background

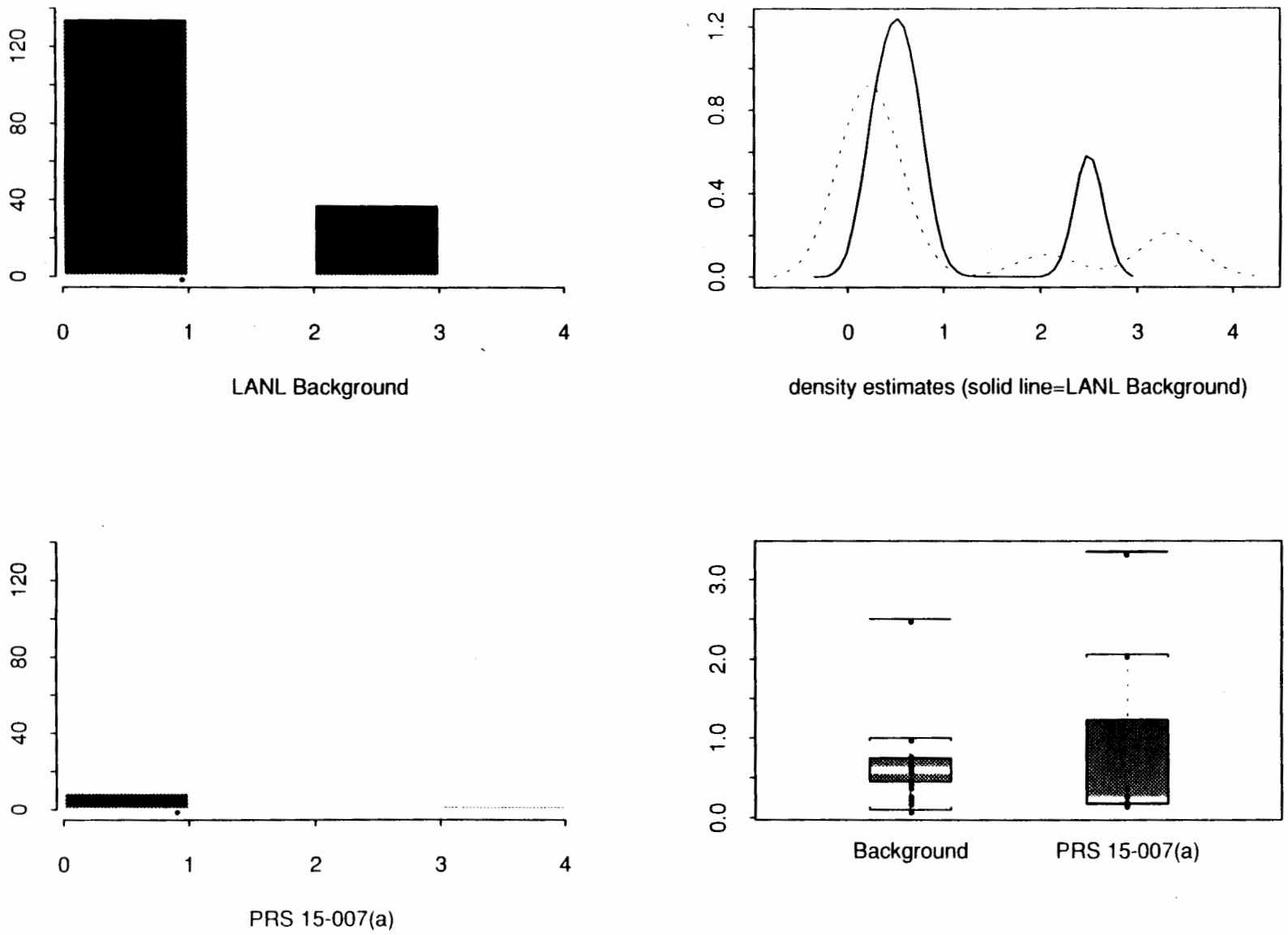

Figure E-15 Comparision of Antimony at PRS 15-007(a) to LANL Background

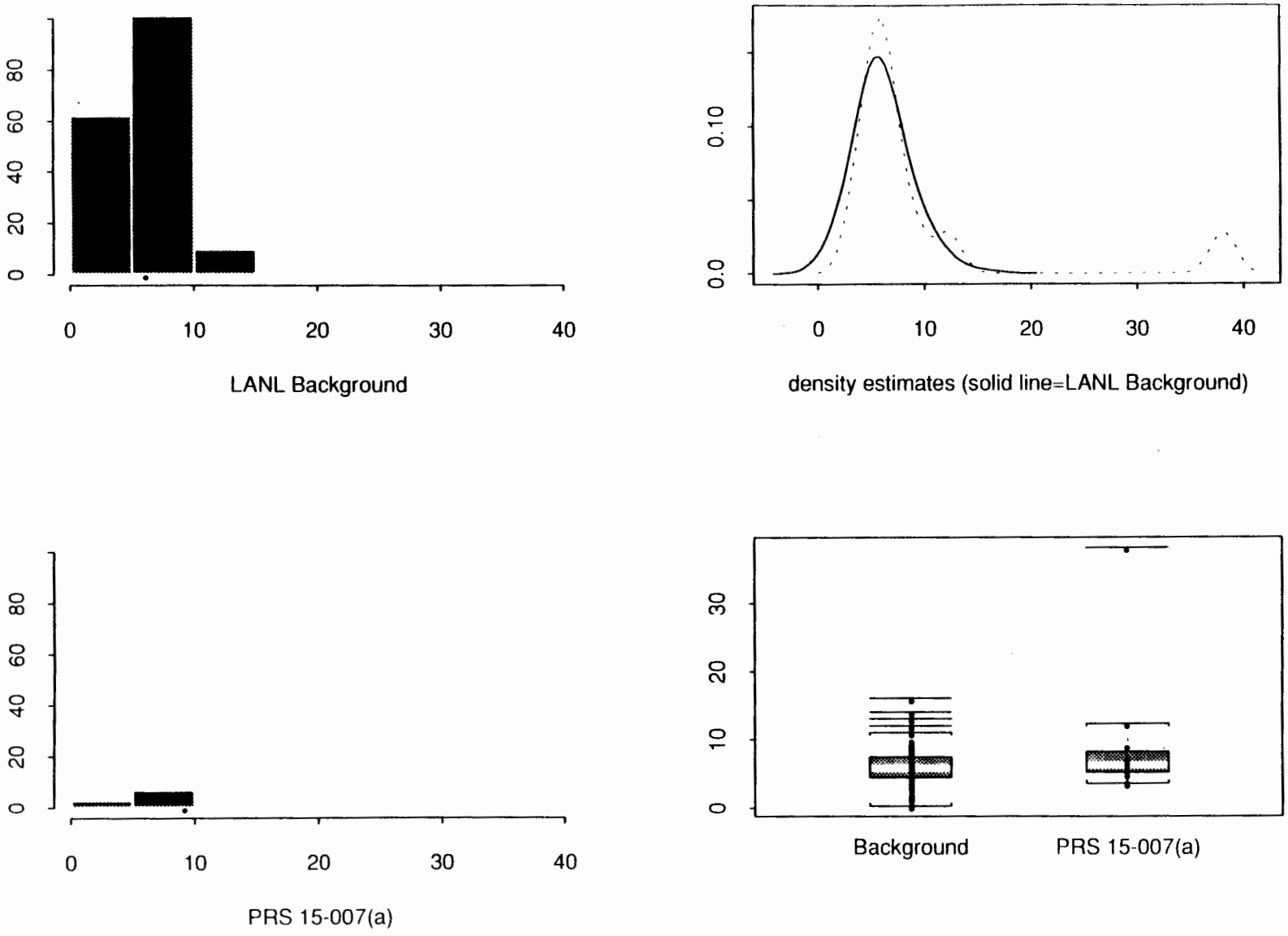

Figure E-16 Comparision of Copper at PRS 15-007(a) to LANL Background

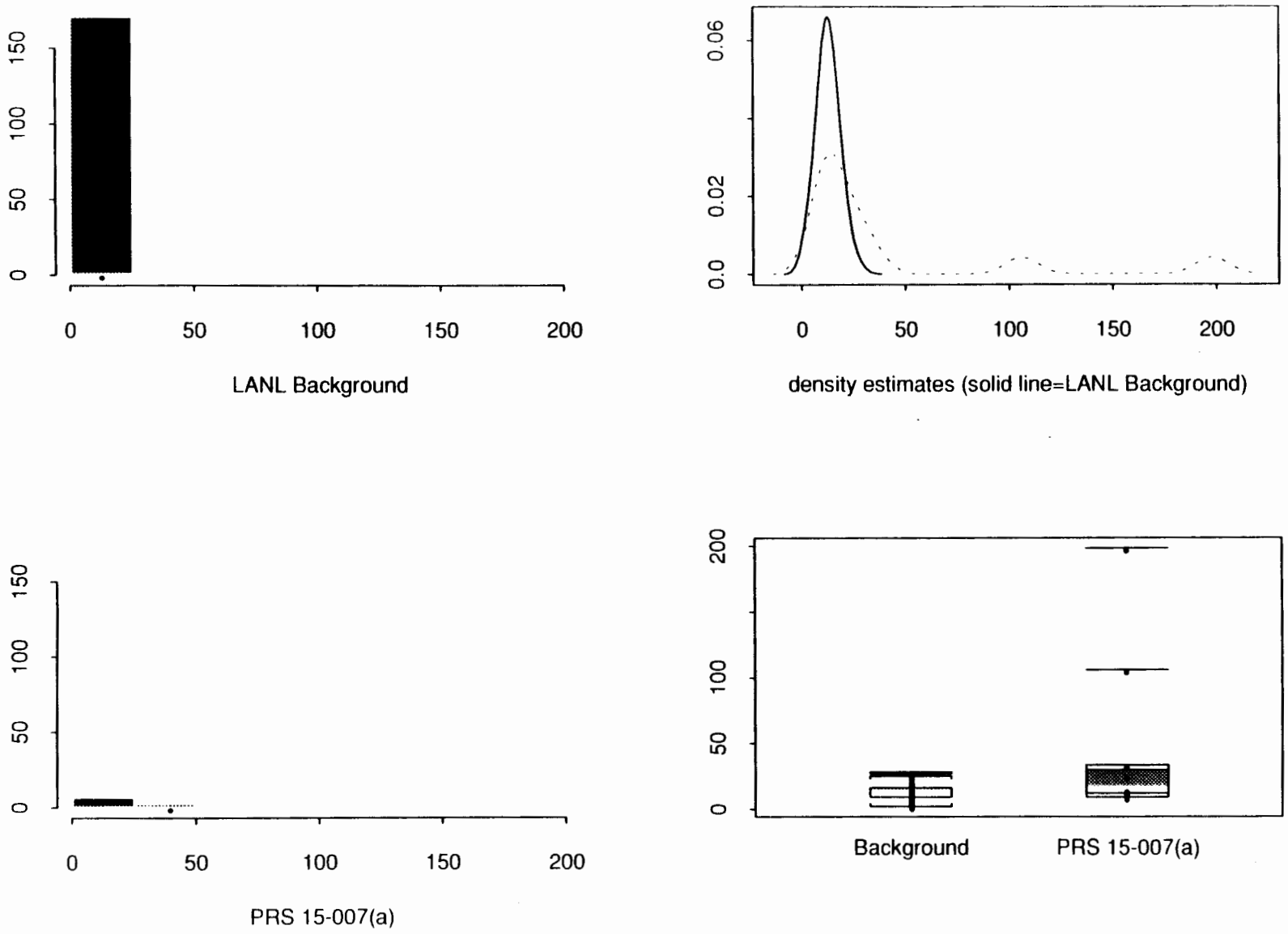

Figure E-17 Comparision of Lead at PRS 15-007(a) to LANL Background

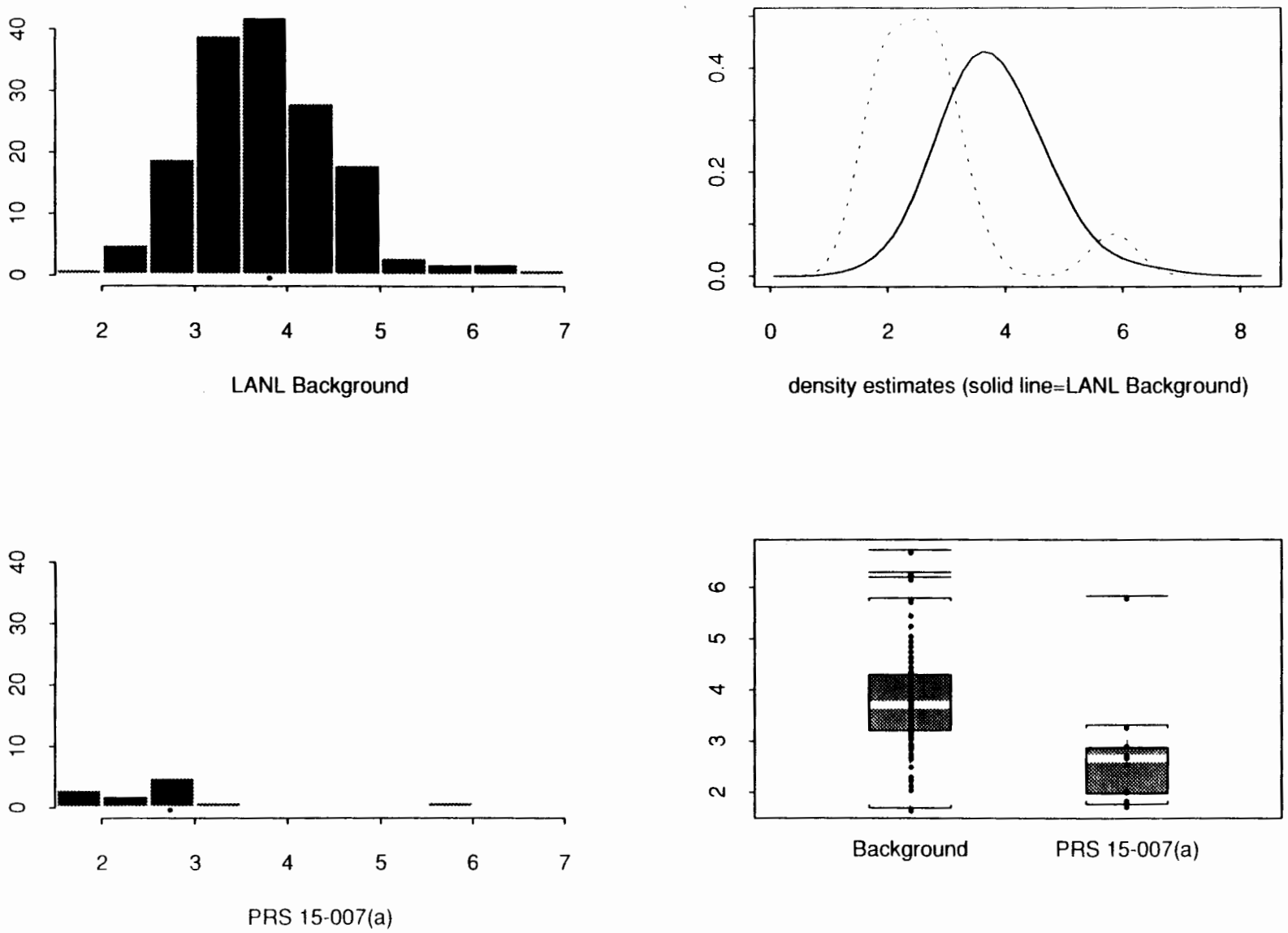

Figure E-18 Comparision of Uranium at PRS 15-007(a) to LANL Background

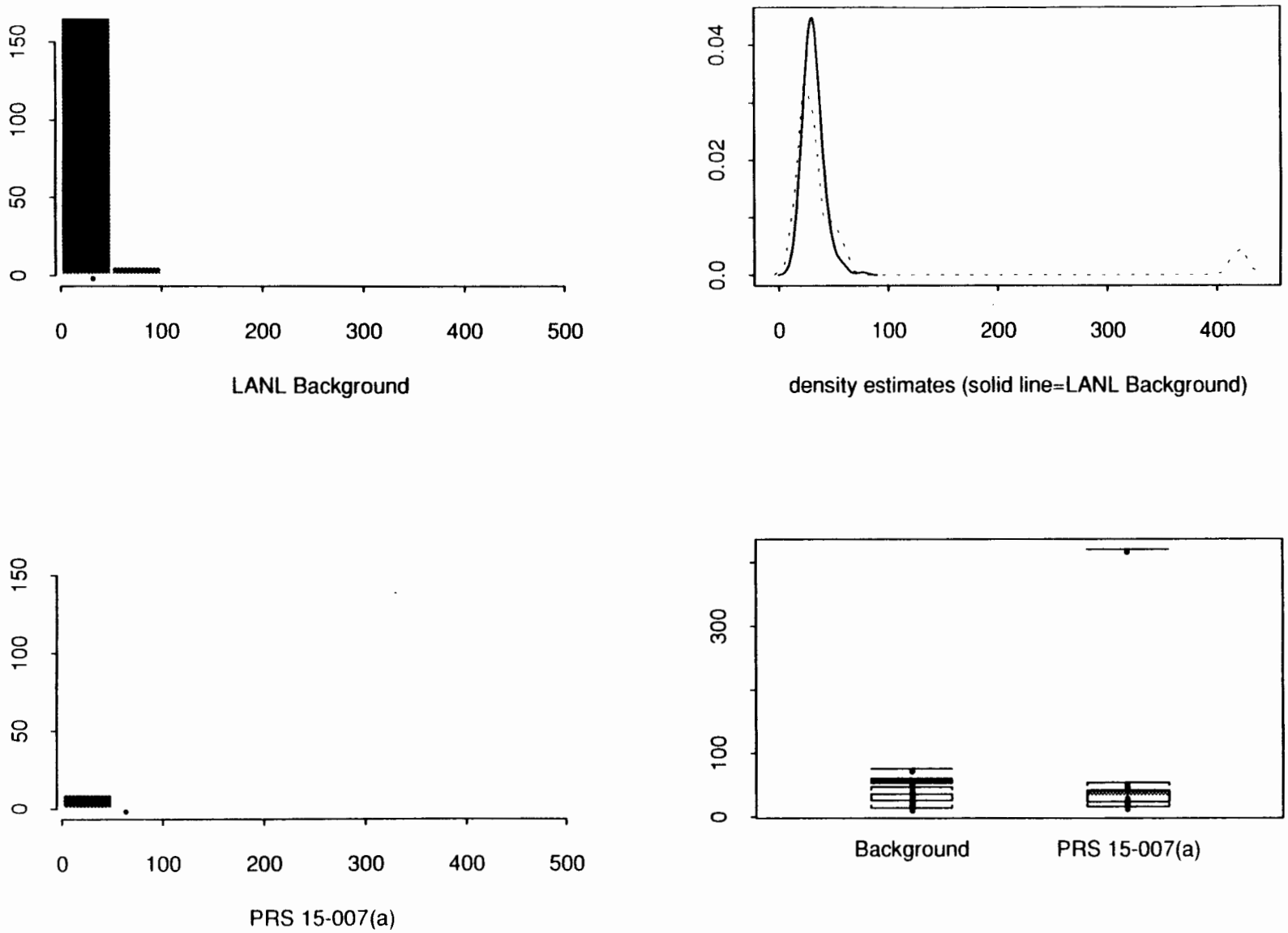

Figure E-19 Comparision of Zinc at PRS 15-007(a) to LANL Background

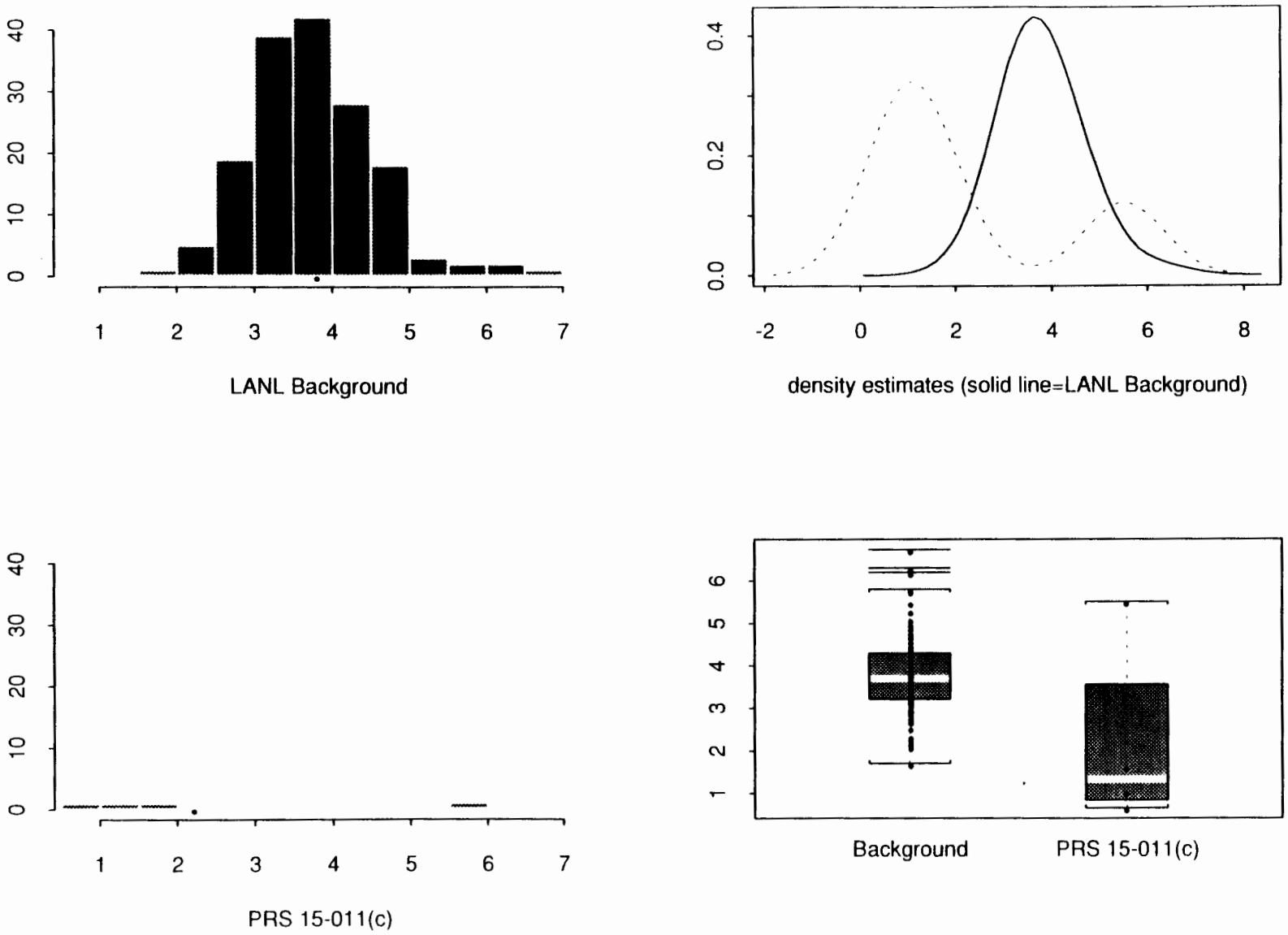

Figure E-20 Comparision of Uranium at PRS 15-011(c) to LANL Background

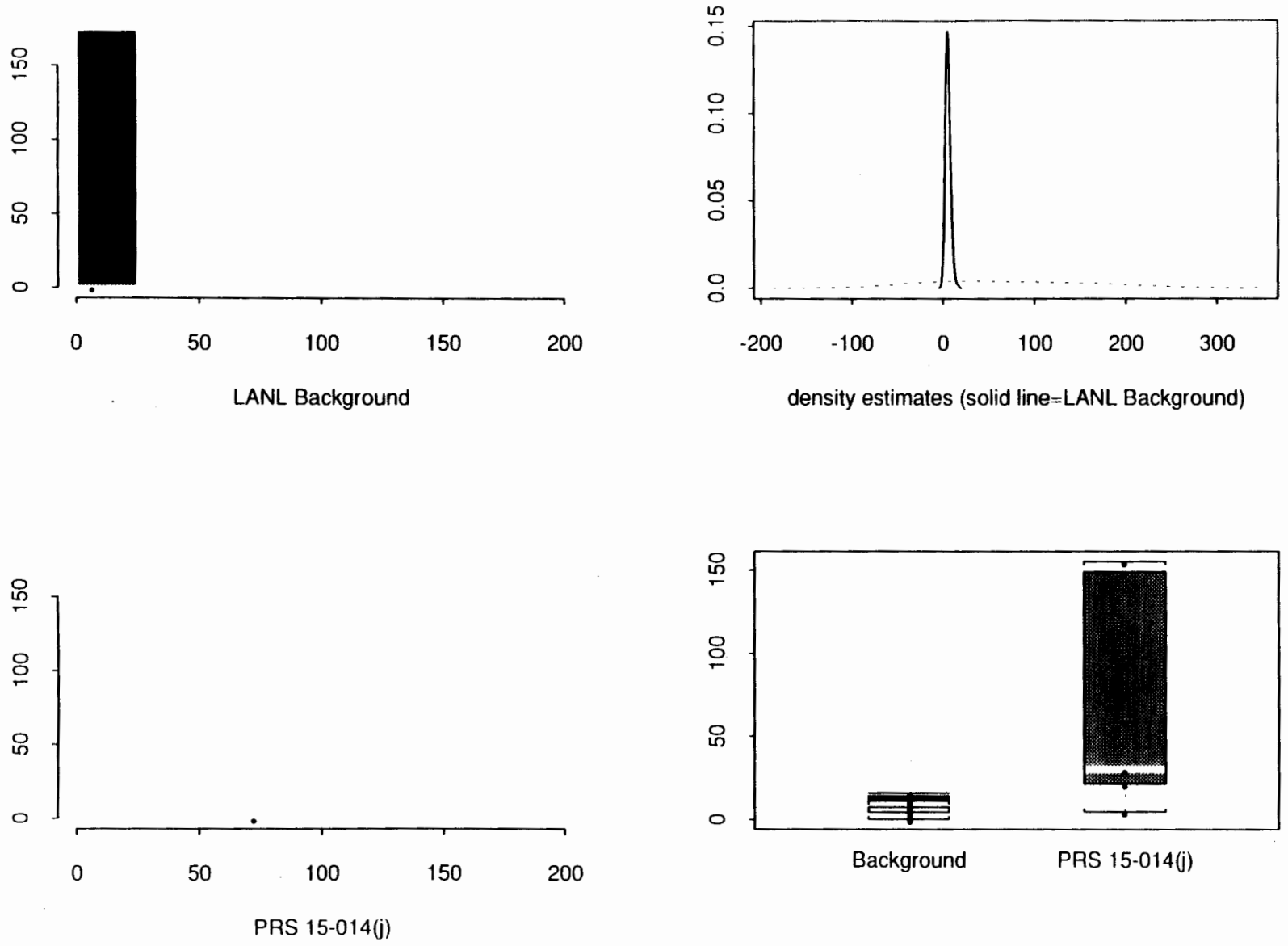

Figure E-21 Comparision of Copper at PRS 15-014(j) to LANL Background

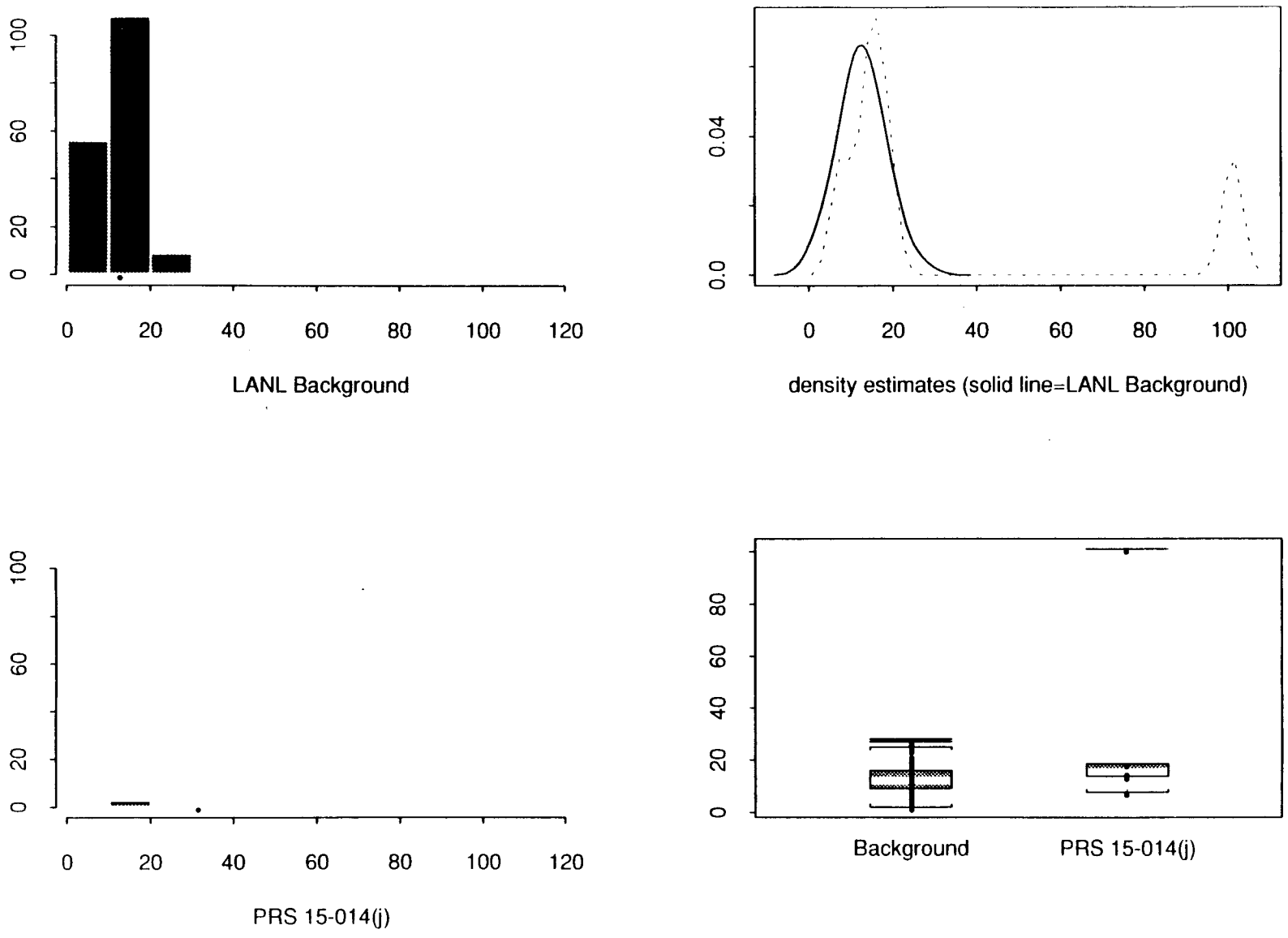

Figure E-22 Comparision of Lead at PRS 15-014(j) to LANL Background

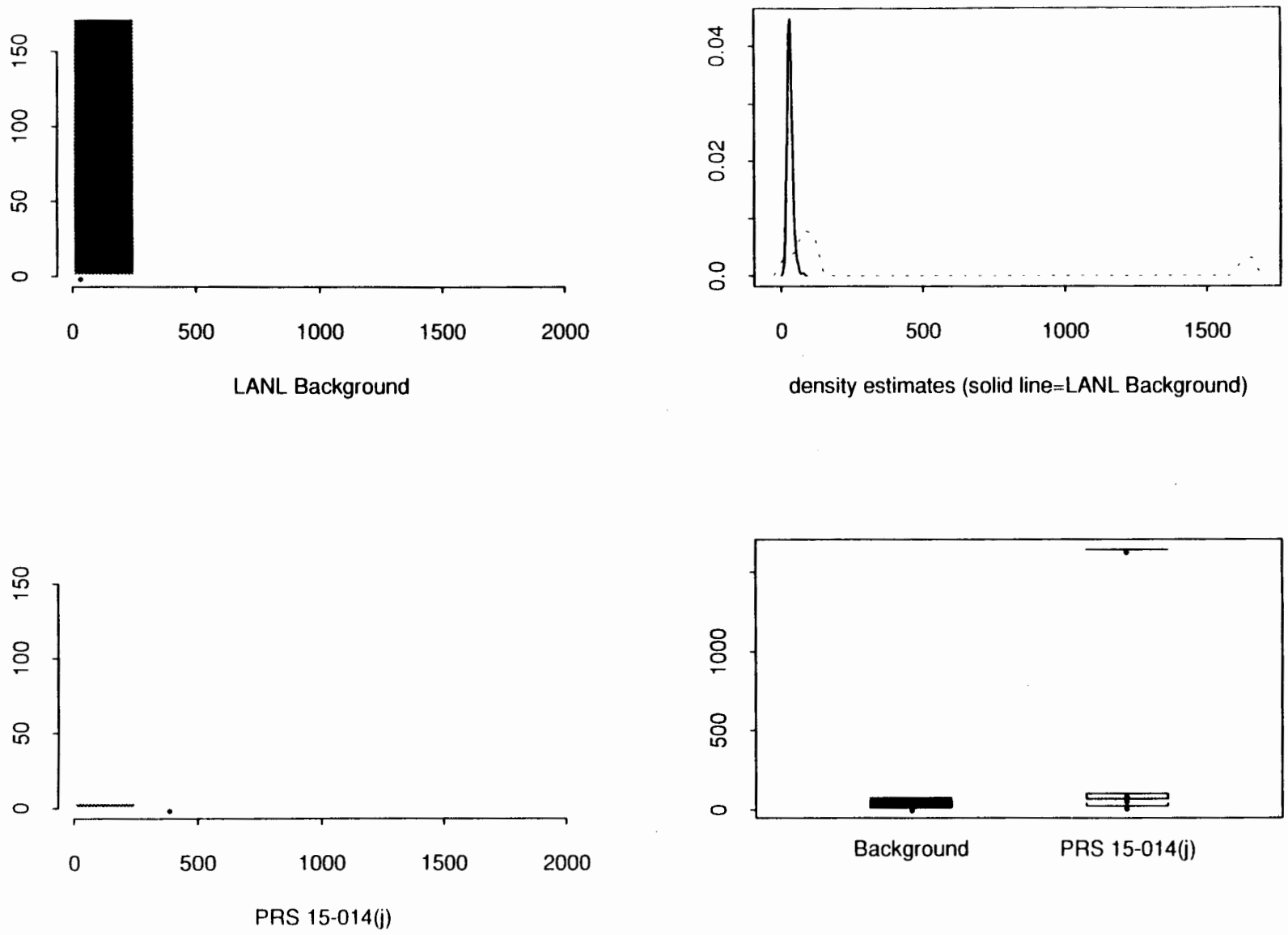

Figure E-23 Comparision of Zinc at PRS 15-014(j) to LANL Background

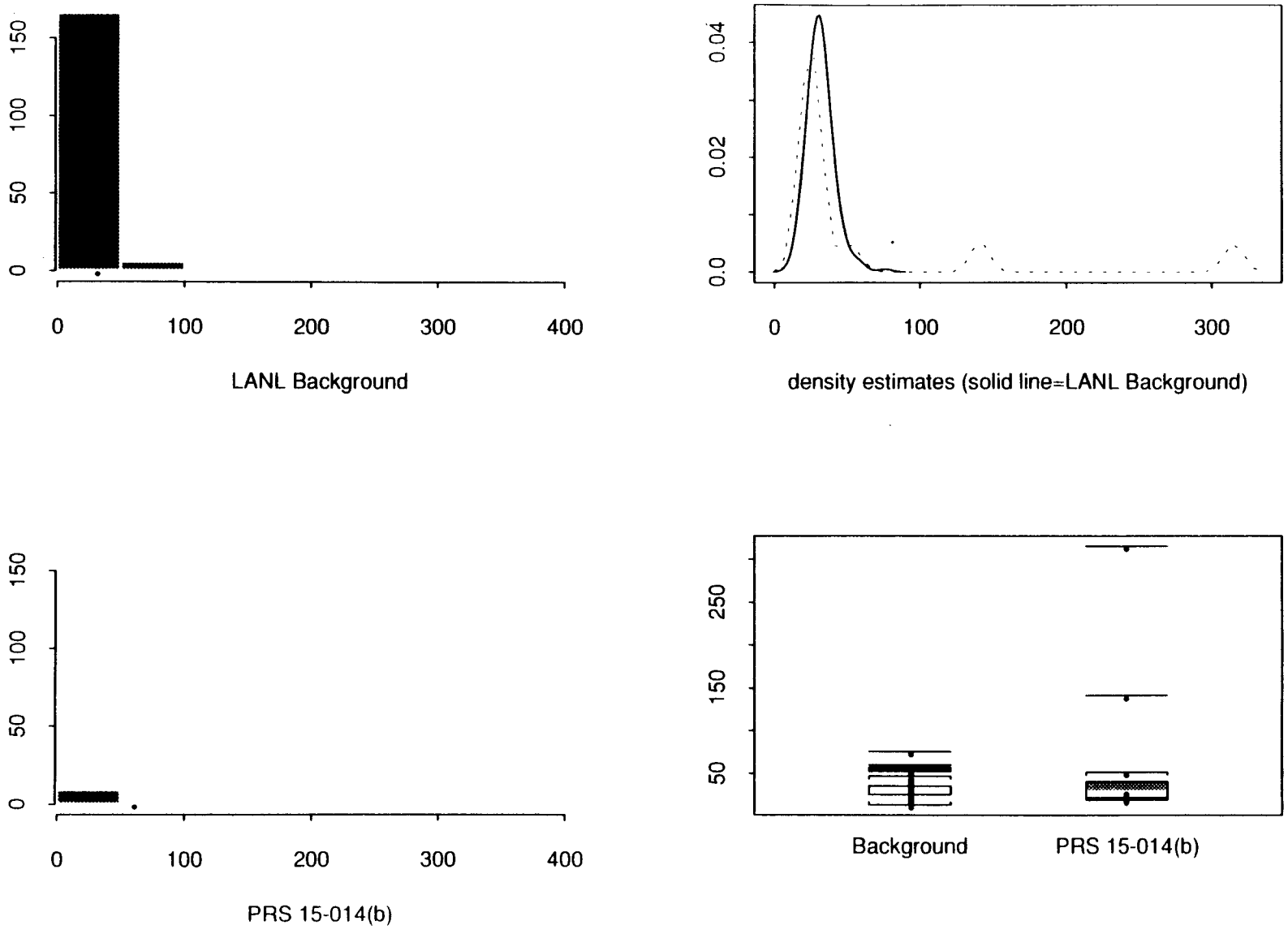

Figure E-25 Comparision of Zinc at PRS 15-014(b) to LANL Background

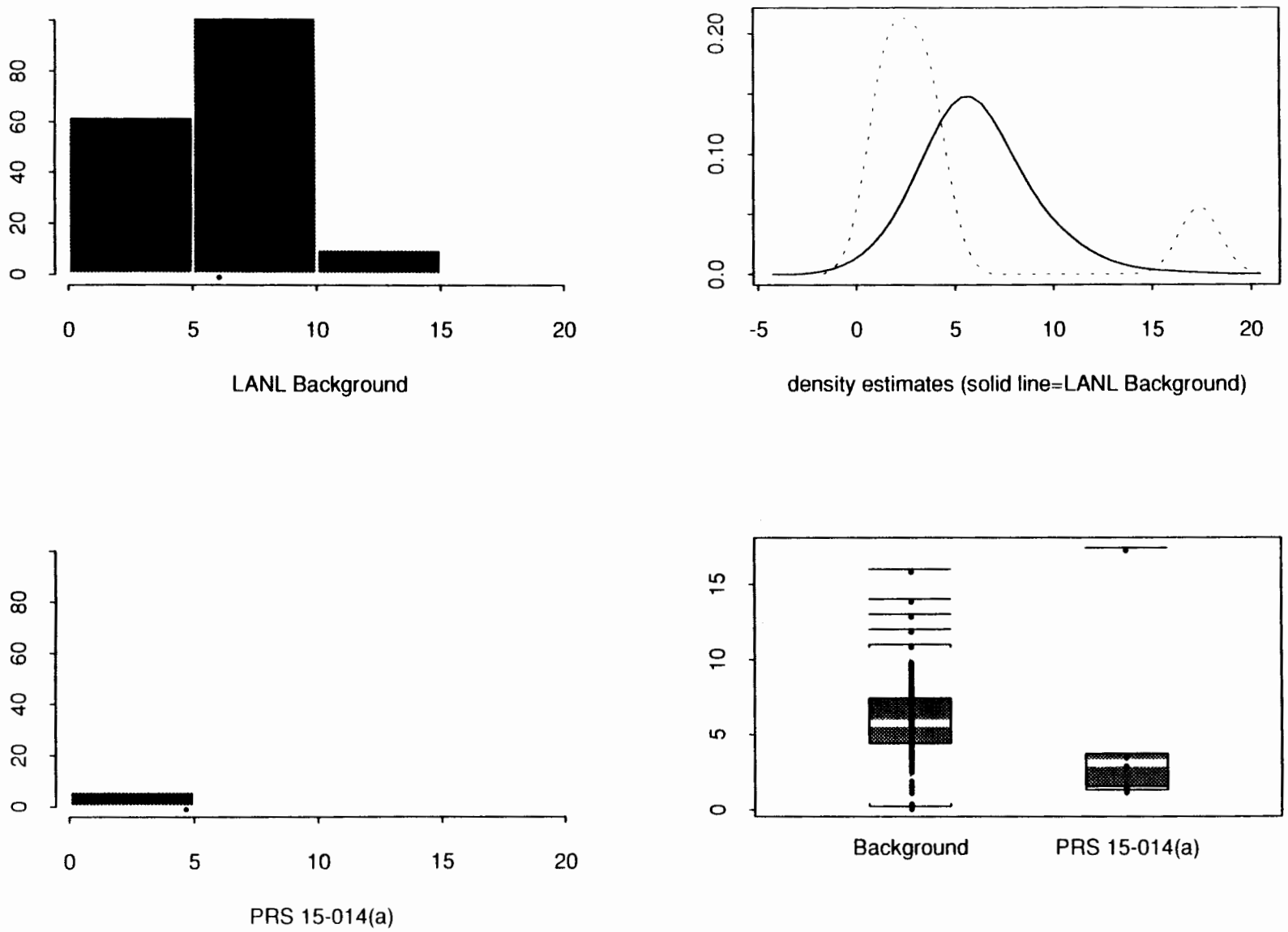

Figure E-24 Comparision of Copper at PRS 15-014(a) to LANL Background

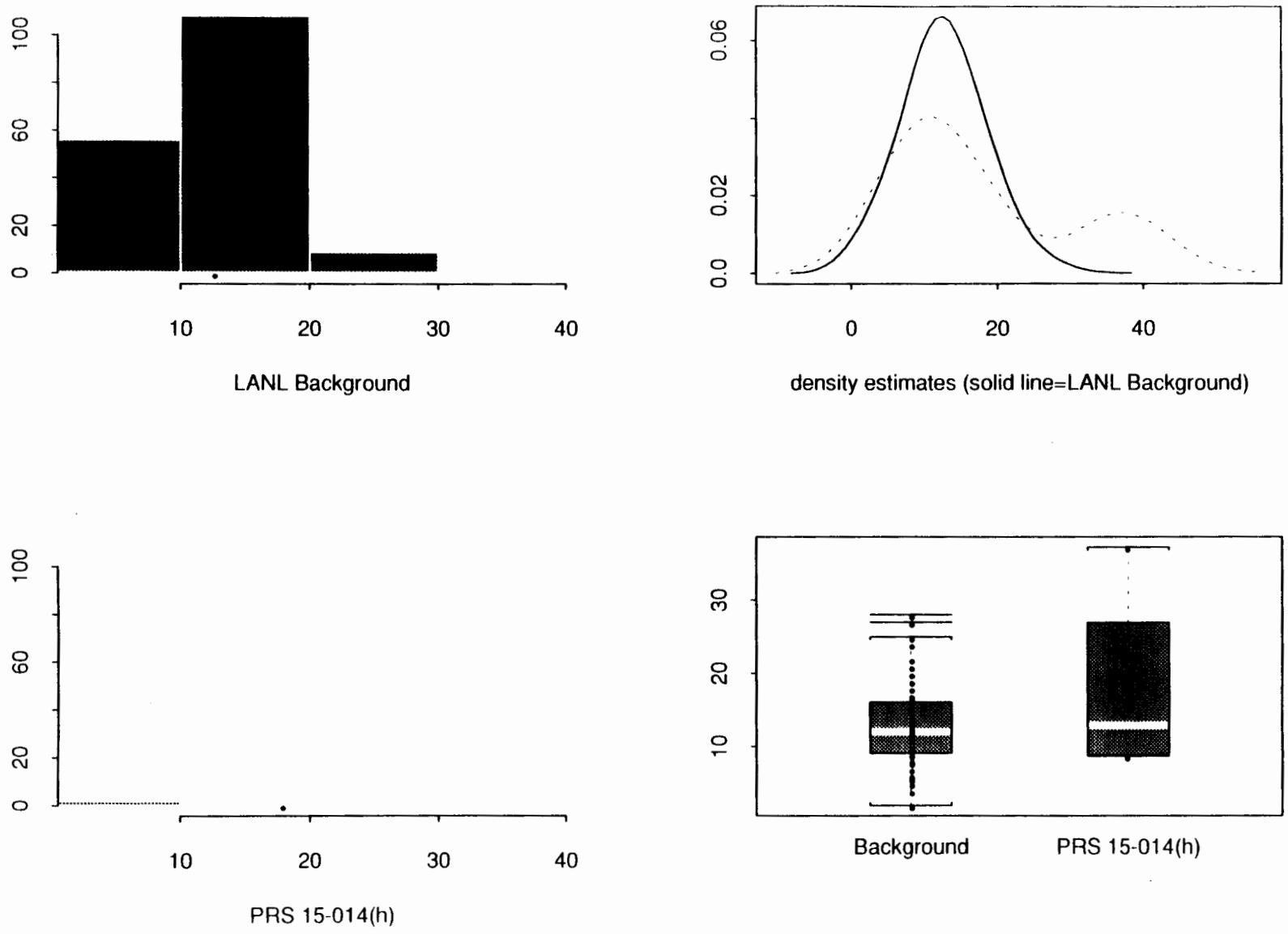

Figure E-27 Comparision of Lead at PRS 15-014(h) to LANL Background

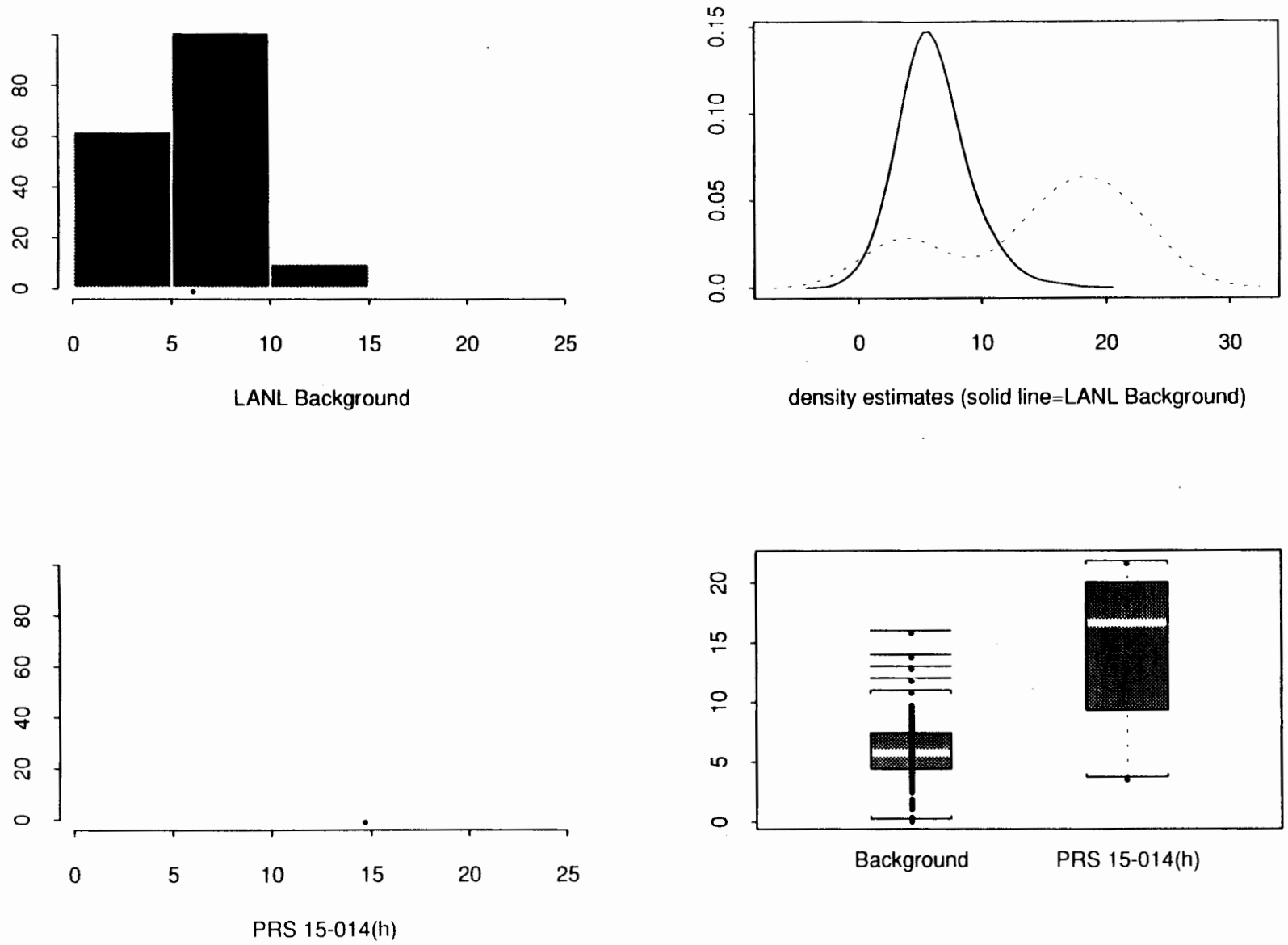

Figure E-26 Comparision of Copper at PRS 15-014(h) to LANL Background

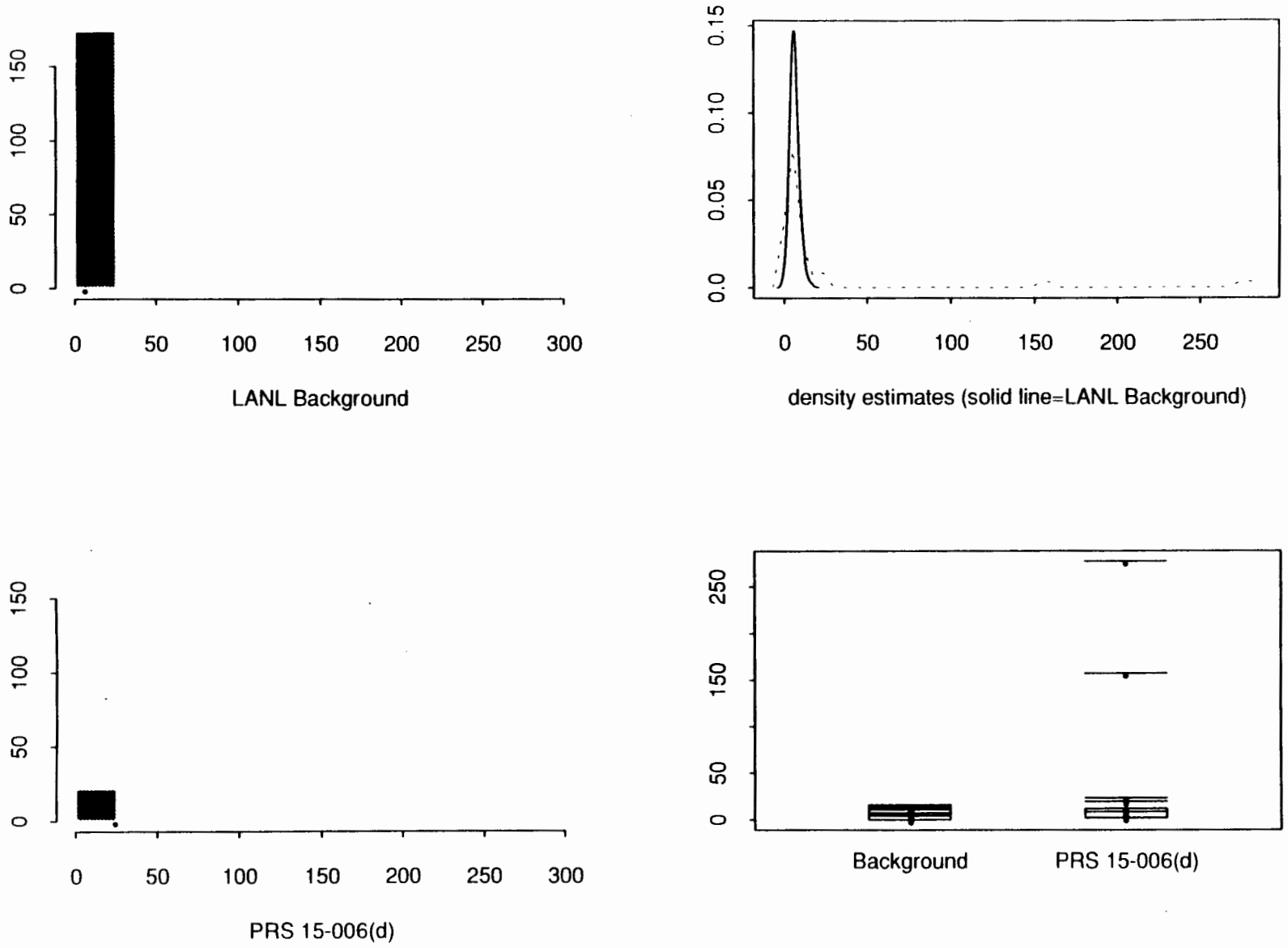

Figure E-29 Comparision of Copper at PRS 15-0006(d) to LANL Background

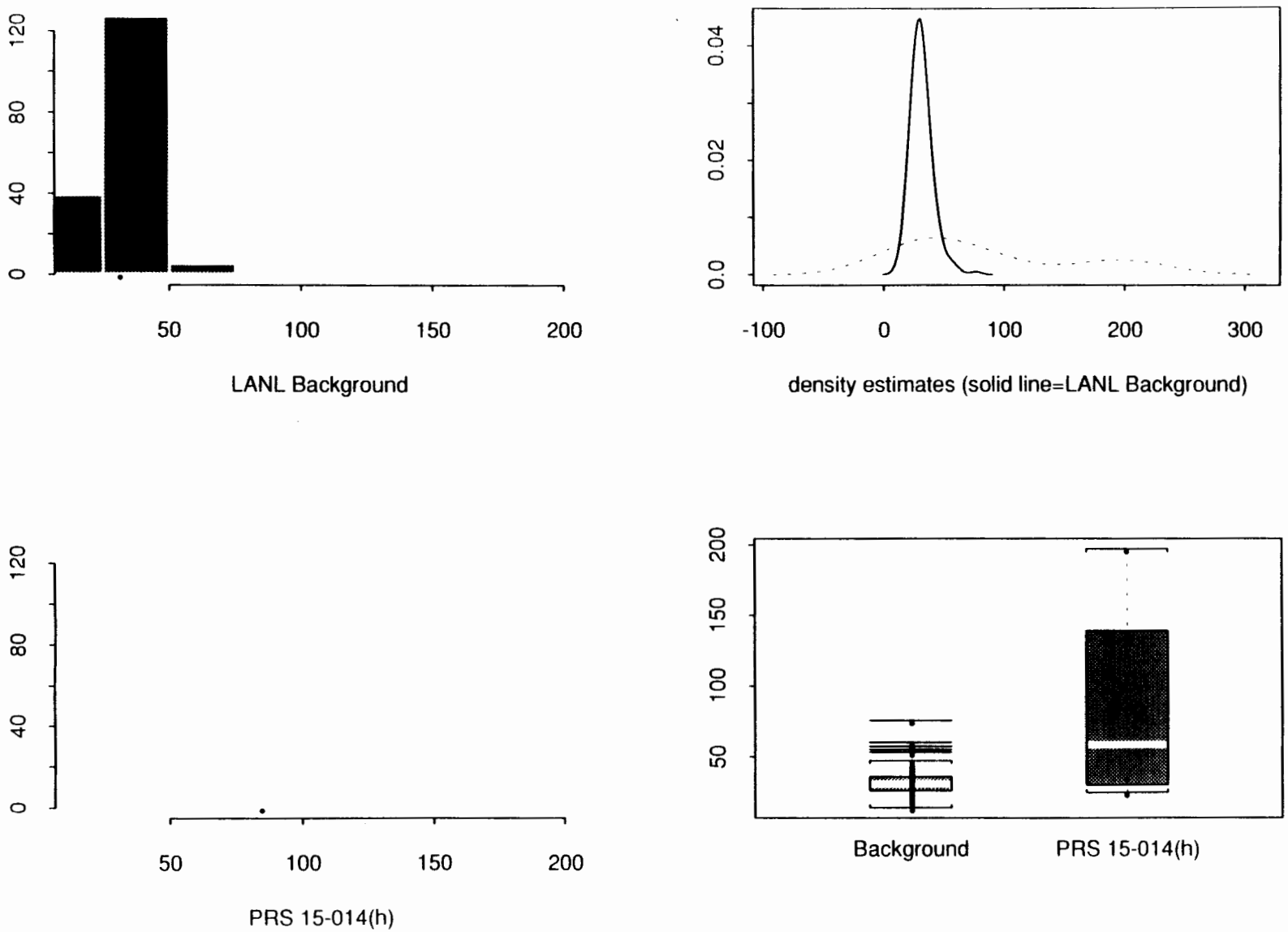

Figure E-28 Comparision of Zinc at PRS 15-014(h) to LANL Background

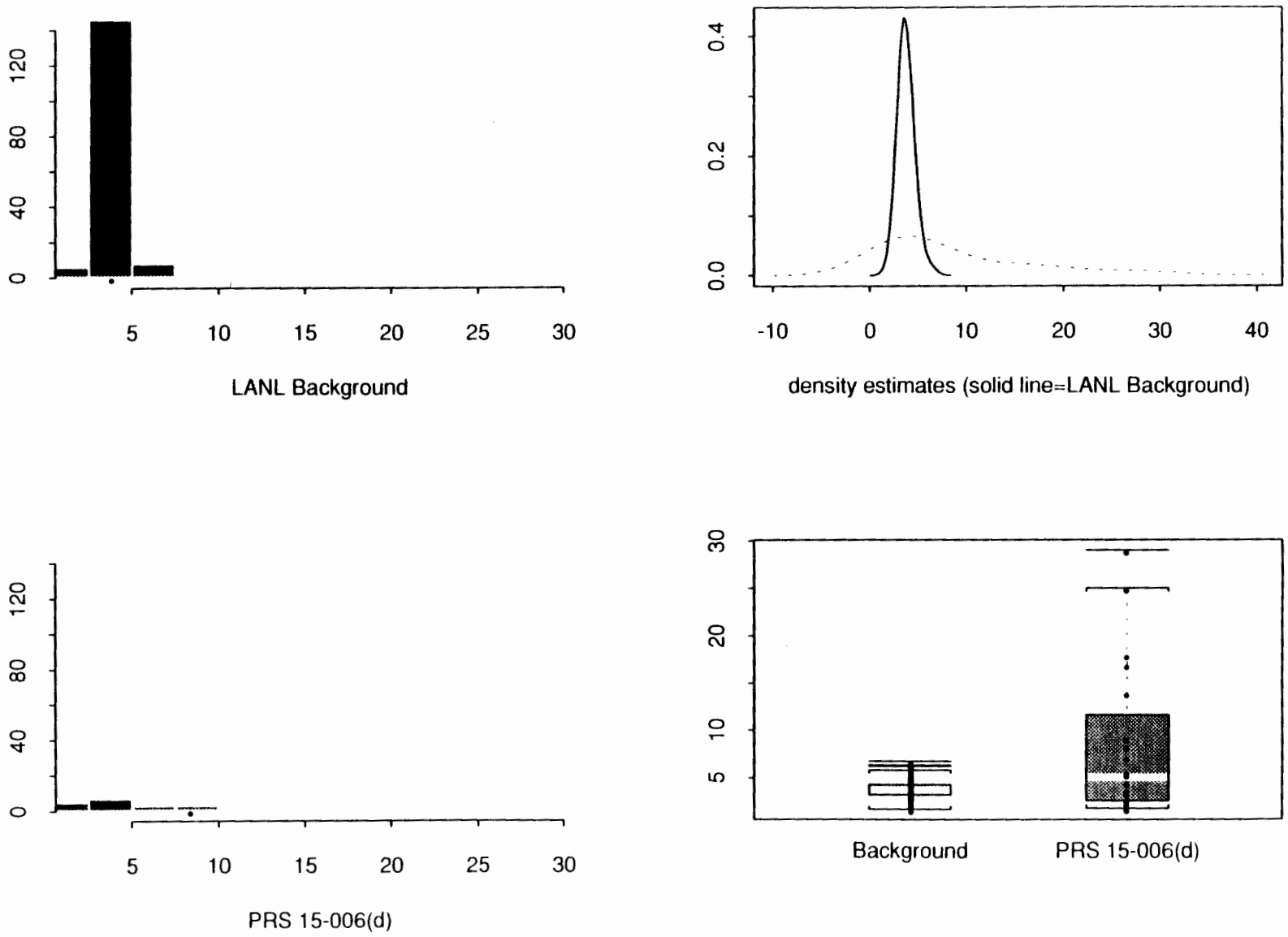

Figure E-31 Comparision of Uranium at PRS 15-006(d) to LANL Background

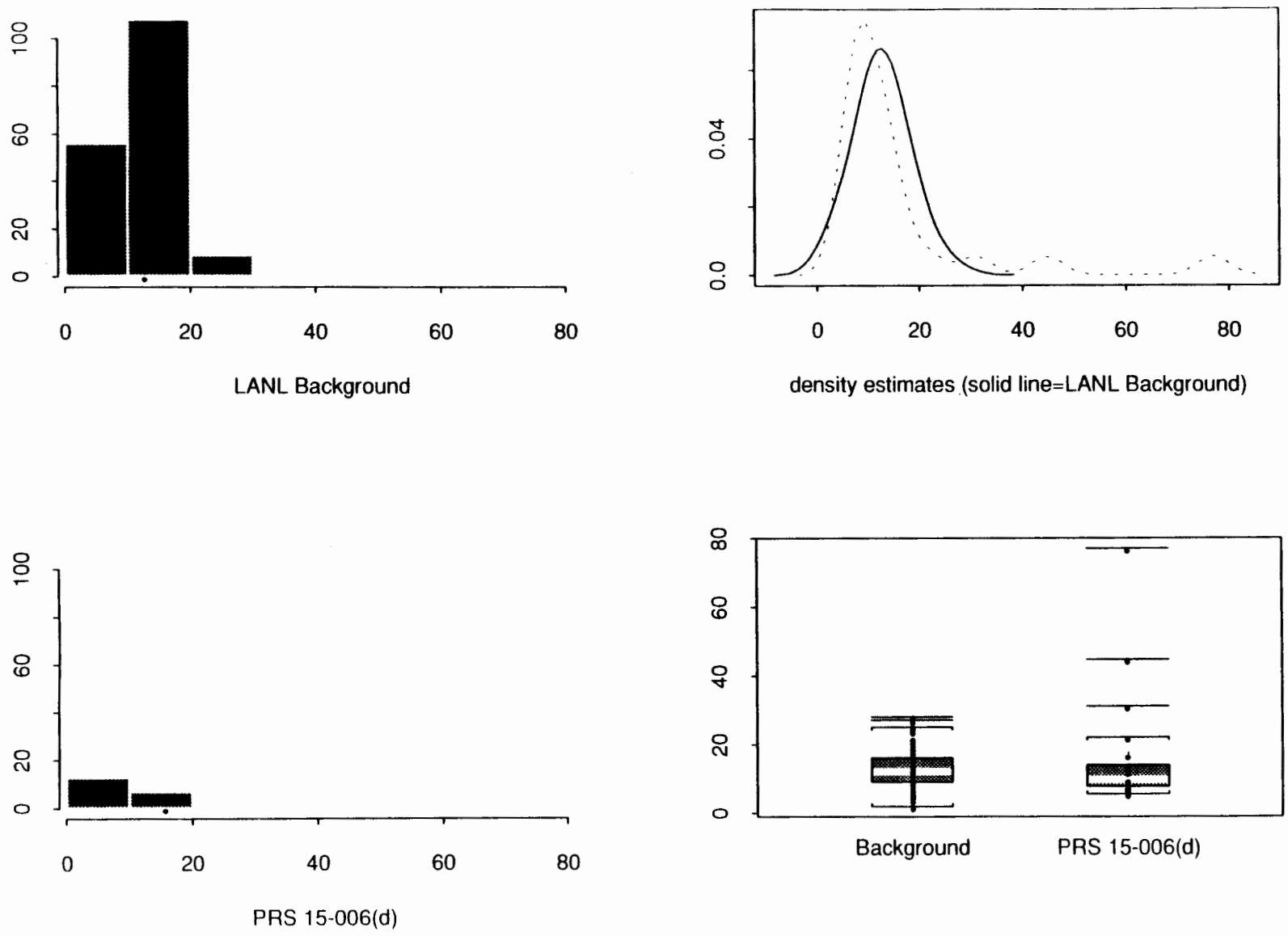

Figure E-30 Comparision of Lead at PRS 15-006(d) to LANL Background

APPENDIX F

GEOPHYSICAL INVESTIGATION OF MATERIAL DISPOSAL AREA N (MDA-N) SWMU 15-007(A), TECHNICAL AREA 15 (TA-15)

GEOPHYSICAL INVESTIGATION OF MATERIAL DISPOSAL AREA N (MDA-N) SWMU 15-007(a), TECHNICAL AREA 15 (TA-15), LOS ALAMOS NATIONAL LABORATORY

Prepared for:

Los Alamos National Laboratory
Los Alamos, New Mexico

Prepared by:

ICF Kaiser Engineers, Inc.

August 1995

Martin J. Miele
Registered Geophysicist, R.Gp. 941, R.G. 6088

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GEOPHYSICAL INVESTIGATION OF MATERIAL DISPOSAL AREA N (MDA-N)
SWMU 15-007(a), TECHNICAL AREA 15 (TA-15)
LOS ALAMOS NATIONAL LABORATORY

1.0 INTRODUCTION

This report presents the results of an electromagnetic induction (EM) and time-domain metal detection investigation performed by ICF Kaiser Engineers at Material Disposal Area N (MDA-N) within Technical Area 15 (TA-15) at the Los Alamos National Laboratory (LANL), Los Alamos, New Mexico. The field survey was performed during the period May 2 through 4, 1995.

1.1 Background

Solid Waste Management Unit 15-007(a) (SWMU 15-007(a)) was used as a material disposal area (MDA-N). Remnants of several structures from R-Site which had been exposed to explosives or chemical contamination were disposed of there.

1.2 Objectives

The objective of the geophysical investigation at MDA-N was to identify and assess the location of geophysical anomalies that are caused by buried metallic and non-metallic objects. This information may indicate the location and lateral extent of buried pits or trenches at SWMU 15-007(a). The anomalous areas will be investigated with subsequent soil sampling or trenching. The electromagnetic induction (EM) and time-domain metal detection methods were used to meet the objective.

2.0 METHODOLOGY AND INSTRUMENTATION

2.1 Electromagnetic Induction (EM)

The electromagnetic induction (EM) method consists of a system of two coils. One of these coils transmits a time-varying fixed frequency electromagnetic signal (primary magnetic field) which induces the flow of electrical current in subsurface materials. This current flow produces a secondary magnetic field (Lenz's Law) which is detected by the second coil (receiver coil). The signal received by the second coil provides an estimate of electrical conductivity of the subsurface material it permeates.

The conductivity measured by the instrument is a resultant conductivity, referred to as "terrain conductivity". It represents the overall conductivity of material that the electromagnetic field permeates below the instrument. In other words, the volume of the material sampled by the electromagnetic field may include a number of different materials, with different conductivity values, all of which contribute to the resultant conductivity value (terrain conductivity).

Terrain conductivity values are effected by differences in moisture content, the composition/lithologic character of subsurface materials, the physical characteristics of subsurface materials, and the presence of buried metallic and non-metallic debris. Terrain conductivity measurements are commonly used in areas where rapid data acquisition is required. These measurements can be used to delineate trench fill material, determine the presence of buried objects, map contaminant plumes and other applications.

The instrumentation used for this investigation is a Geonics EM31-DL ground conductivity meter and an Omnidata data logger. The data logger stores the EM data as well as horizontal grid control data and field notes. These data are then downloaded to a computer for further processing. The EM-31 system has a fixed coil separation of 12 feet which results in a depth of investigation of approximately 18 feet under optimum conditions. The actual investigation depth is dependent upon the conductivity of shallow subsurface materials. For example, the presence of a highly conductive clay layer can reduce the depth of investigation.

2.2 Time-Domain Metal Detection

The Geonics EM61 (EM61) is an extremely sensitive high resolution time-domain metal detector that is used to detect both ferrous and non-ferrous buried metal objects. The EM61 is a state-of-the-art instrument due to its sensitivity, comprehensive detection, depth of investigation, and speed of surveying. The EM61 consists of a powerful generator that transmits a pulsed primary magnetic field which induces eddy currents in nearby subsurface metallic objects. The decay of these currents is measured by two receiver coils mounted together on a coil assembly. The decay responses are recorded, in milliVolts (mV), and displayed by an integrated data logger as two channel information. The data are downloaded to a PC for further processing.

The EM61 can detect a single 55-gallon drum at a depth of 10 feet beneath the instrument. The instrument is relatively insensitive to surface interferences from nearby surface metal. The measurement is obtained a relatively long time after termination of the primary pulse; therefore, the response is practically independent of the electrical conductivity of the ground.

Due to its coil arrangement, the response curve is a single, well-defined positive peak. Therefore, targets can be located accurately and their depth can sometimes be estimated from the width of the response and/or from relative response of each of the two receiver coils. The operator can carry the coils on a harness or can pull the coils mounted to a small cart.

3.0 DATA ACQUISITION

A grid system was established within the field area prior to obtaining geophysical data. The grid markers consisted of wooden lath and flagging. The markers were used to locate each traverse and locate mearsurement stations along each traverse.

The field area is approximately 150 by 400 feet which is bordered by a metal safety fence on its eastern side and by access roads on its northern and western sides. Building 23 is located within the grid area in the western section. Geophysical measurements (EM31 and EM61) were obtained at 5 foot intervals from north-south traverses spaced 5 feet apart (5 foot by 5 foot data grid). Data were downloaded from each data logger at the end of each field day for further processing.

At the end of the geophysical surveys the locations of surface structures, surface features, surface objects and debris were noted, mapped and referenced to the grid system. These maps were used in conjunction with the geophysical data for interpretation.

4.0 DATA ANALYSIS

At the conclusion of the geophysical surveys, the data were collated and computer processed using a contouring package (SURFER IV, Golden Software). The software first computes a uniform grid from the data. The values at the grid nodes were then computer contoured producing geophysical contour maps.

A terrain conductivity contour map was generated from the EM31 data (mS/m), and a EM61 secondary field response map (mV) was generated from the EM61 data. These maps were used to assess and locate target anomalies that are typical of buried pits/trenches and metallic debris. They are characterized by localized zones of high magnitude terrain conductivity and/or secondary field response contours. They may occur as an accumulation of small anomalies with closed contours or can occur as large anomalous areas enclosed with contours.

Surface structures/debris can generate similar anomalies as those caused by buried objects or debris. Therefore, the locations of all anomalies were correlated with the map indicating the locations of surface cultural features, structures and debris. Careful inspection and comparison between the geophysical maps and maps showing surface features indicates which anomalies are associated with surface features. In general, the only surface structures or objects located within the grid system are Building 23, the metal safety fence and a metal stake located at 185E, 20N.

Geophysical anomalies that were not associated with the location of known surface items may be target anomalies. The shape and lateral extent of these anomalies or anomalous zones is a practical assessment of the lateral extent of the buried trenches and/or pits. However, due to instrument sensitivity the area covered by the geophysical anomalies is slightly greater than the area where buried debris exists. In addition, geophysical anomalies not associated with surface structures may be caused by subsurface utilities or structures. These typically have a different signature and can usually be identified.

5.0 RESULTS

The results of the geophysical surveys are presented on Figure 1 which contains both of the geophysical contour maps. These maps are discussed separately in the following paragraphs.

Background values on the terrain conductivity contour map range between 10 and 20 mS/m. Numerous anomalies occur on the map. Some of the anomalies are caused by known surface structures. The linear anomaly trending east-west located along the southern border (0N) is caused by the metal safety fence. The linear anomaly which trends through the center of the field area and makes a turn toward the northwest in front of Building 23 is typical of a subsurface utility or pipeline (interpreted utility). The utility is likely constructed of metal due to its relatively high magnitude response. The utility occupies the location where Material Disposal Area N (MDA-N) is indicated on LANL site maps. However, no other anomalies typical of buried debris occur in that particular area.

A small closed contour anomaly occurs directly south of Building 23 at 180E, 90N. This anomaly is likely caused by a buried object. The size, character, location and magnitude of that anomaly is similar to that of a small underground storage tank or similar structure (septic tank). It is centered directly in front of Building 23 approximately 15 feet to the south.

A dense accumulation of anomalies is located between 300E and 400E from 70N to approximately 140N. These anomalies occur directly adjacent to the interpreted pipeline on its northern side. The anomalies are typical of buried debris and objects and likely represent MDA-N. No anomalies occur south of the interpreted utility in that vicinity.

The EM61 contour map is very similar to the terrain conductivity contour map. The interpreted utility anomaly and small closed contour anomaly located south of Building 23 (possible UST or septic tank) are also present on the EM61 contour map. A small anomaly centered at 185E, 20N which is not indicated on the terrain conductivity contour map is likely caused by a metal stake located there.

Anomalies typical of buried metallic debris and objects occur on the EM61 contour map from 270E to 400E and from 70N to 140N. They occupy the same general area that similar

terrrain conductivity anomalies occupy (interpreted MDA-N). This suggests that most of the terra conductivity anomalies are caused by buried metal objects and debris. However, resolution of the anomalies is better on the EM61 contour map.

Numerous small closed contour anomalies occur on the EM61 contour map that do not occur on the terrain conductivity contour map. Most of these are sparsely located in areas south of the interpreted pipeline. The anomalies are likely caused by small isolated buried metallic objects that are to small to be detected with the EM31.

The EM61 contour map indicates an anomalous zone which occurs from 200E to 250E along the northern boundary. These anomalies are also not resolved on the terrain conductivity contour map. They are likely caused by buried metallic objects. Their magnitude is generally low suggesting that they are caused by an accumulation of small objects.

6.0 DISCUSSION

MDA-N is located approximately 50 feet south of Building 23 on LANL site maps. However, the interpreted utility detected in the geophysical data occupies that location. The date of construction for the utility is not known. If the utility was constructed after MDA-N, debris may have been removed during its construction. If the utility already existed during disposal operations, the, debris may have been buried adjacent to the pipeline. MDA-N may be represented by the anomalies located in the northeast section of the field area (adjacent to pipe). The anomalies which occupy that location are typical of buried metallic debris.

Ground penetrating radar (GPR) surveys conducted in certain areas would complement the information that has already been collected. GPR data would confirm and define the presence of utilities and buried objects, as well as give a much better estimate of the size and depth of the buried sources. A small effort in conducting some GPR traverses based on the data from this report would greatly increase the definition in the anomalous areas and may answer some of the questions left unanswered.

150

Northing Distance (feet)

100

50

1

Northing Distance (feet)

1

ICF KAISER

Geophysical Survey MDA-N
SWMU 15-007(a), TA-15
Los Alamos National Lab

August 1995

FIGURE 1

APPENDIX G

PROCEDURES AND METHODS USED FOR SAMPLES

APPENDIX G

PROCEDURES AND METHODS USED FOR SAMPLES

The following ER Project procedures were used at the sampling site:

- LANL-ER-SOP-06.09, Spade and Scoop Method of Collection of Soil Samples
- LANL-ER-SOP-06.10, Hand Auger and Thin-Wall Tube Sampler
- LANL-ER-SOP-10.06, High Explosives Field Spot Test
- LANL-ER-SOP-10.07, Field Monitoring for Surface and Volume Radioactivity Levels

The following analytical methods were used for analyzing the samples according to EPA requirements (EPA, 1222):

- EPA SW-846 Method 6010, for metals
- EPA SW-846 Method 8260, for VOCs
- EPA SW-846 Method 8270, for SVOCs
- EPA SW-846 Method 8081, for PCBs
- EPA SW-846 Method 8330, for HE
- EPA SW-846 Method 9018, for cyanide

The following radioanalyses were conducted:

- KPA ASTM Z2907, for uranium
- DOE HASL 300, for gamma spectroscopy

APPENDIX A

ANALYTICAL DATA

All analytical data are available on FIMAD. If FIMAD is not accessible, data will be provided upon request. A hard copy of the data is available from the ER Records Processing Facility.

APPENDIX B

DATA QUALITY EVALUATION TABLES

TABLE B-1
DATA QUALITY EVALUATION FOR TA-15 SAMPLES

SUITE	BATCH NUMBER	COMMENTS
Inorganics	71206 (fourteen samples)[1]	Cadmium in eight samples, antimony in five samples, beryllium in five samples, cobalt in four samples, and selenium and silver in one sample are J qualified because they were below the method detection limits (MDLs). The sample results have a high degree of uncertainty because the values cannot be accurately distinguished from instrument "noise" levels. As a result, the data are useable as estimated values, but should be used with caution in the screening assessment because they cannot be accurately quantified.
	70317 (seventeen samples)	Antimony in fifteen samples, cadmium in thirteen samples, beryllium in five samples, cobalt in three samples, and selenium in two samples; same as above.
	71387 (eight samples)	Cadmium in seven samples, antimony in four samples, beryllium in two samples, selenium, silver, and thallium in one sample; same as above.
	70468 (twelve samples)	Cadmium in ten samples, antimony in nine samples, thallium in eight samples, and selenium in seven samples; same as above.
	69704 (four samples)	Antimony and cadmium in all samples, beryllium and thallium in one sample; same as above.
	69184 (two samples)	Antimony in two samples and selenium in one sample; same as above.
	71501 (one sample)	Antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, nickel, selenium, thallium, and vanadium in the sample; same as above.
	70476 (one sample)	Antimony, beryllium, cadmium, and selenium in the sample; same as above.
	82469 (four samples)	Beryllium in all samples an silver in one sample; same as above.
	82509 (one sample)	Arsenic, beryllium, cobalt, and vanadium as well as the laboratory duplicates of barium, nickel, and zinc in the sample; same as above.
	82885 (four samples)	Antimony in all three samples; same as above.
	82886 (four samples)	Selenium in two samples; same as above.
	71524 (fourteen samples)	Mercury in two samples; same as above.
	70015 (seventeen samples)	Mercury in thirteen samples; same as above.
	71175 (one sample)	Mercury in the sample; same as above.
	70756 (fourteen samples)	Mercury in six samples; same as above.
	70268 (six samples)	Mercury in one sample; same as above.
	70012 (four samples)	Mercury in two samples; same as above.

[1] Number in parenthesis is the total number of samples in each batch.

TABLE B-1
DATA QUALITY EVALUATION FOR TA-15 SAMPLES
(Continued)

SUITE	BATCH NUMBER	COMMENTS
Inorganics	70696 (one sample)[1]	Mercury in the sample is J qualified because it was below the method detection limit (MDL). The sample result has a high degree of uncertainty because the value cannot be accurately distinguished from instrument "noise" levels. As a result, the datum is useable as an estimated value, but should be used with caution in the screening assessment because it cannot be accurately quantified.
	82497 (four samples)	Mercury in one sample; same as above.
	82538 (one sample)	Mercury in the sample; same as above.
	69704 (four samples)	Antimony and barium in all samples had recoveries in the laboratory control samples (LCS) outside the established limits. Data are qualified as UJ or J and are useable because recovery for antimony was <1% below the limit, so the analytes would be detected and quantified if present and the results for barium are biased high.
	69184 (four samples)	Chromium in two samples same as above. Data are useable because the results are biased high.
	70476 (one sample)	Thallium in the sample same as above. Datum is useable because the result is biased high.
	70756 (fourteen samples)	Mercury in all samples same as above. Data are useable because the results are biased high.
	82886 (four samples)	Thallium in all the samples same as above. Data are useable because the results are biased high.
	71206 (fourteen samples)	Arsenic, barium, cadmium, chromium, lead, manganese, mercury, and nickel in all samples were detected in the laboratory blank. Sample values are greater than 5X the blank values and are considered valid. Data are not qualified and are useable as detected values.
	70317 (seventeen samples)	Arsenic, beryllium, barium, cadmium, chromium, lead, manganese, nickel, and zinc in all samples; same as above.
	71387 (eight samples)	Barium, beryllium, manganese, and zinc in all samples; same as above.
	70468 (twelve samples)	Arsenic, barium, beryllium, chromium, copper, manganese, nickel, and zinc in all samples; same as above.
	69704 (four samples)	Barium, beryllium, chromium, manganese, nickel, selenium, and zinc in all samples; same as above.
	69184 (two samples)	Barium, beryllium, cadmium, chromium, copper, manganese, nickel, vanadium, and zinc in all samples and chromium in two samples same as above.
	71501 (one sample)	Antimony, barium, cadmium, and thallium in the sample; same as above.
	70476 (one sample)	Barium, cadmium, chromium, lead, manganese, selenium, and zinc in the sample; same as above.
	71524 (fourteen samples)	Mercury in all samples; same as above.
	70268 (six samples)	Mercury in all samples; same as above.

[1] Number in parenthesis is the total number of samples in each batch.

TABLE B-1
DATA QUALITY EVALUATION FOR TA-15 SAMPLES
(Continued)

SUITE	BATCH NUMBER	COMMENTS
Inorganics	70012 (four samples)[1]	Mercury in all samples was detected in the laboratory blank. Sample values are greater than 5X the blank values and are considered valid. Data are not qualified and are useable as detected values.
	82509 (one sample)	Arsenic, beryllium, and lead in the sample; same as above.
	82885 (four samples)	Antimony in all the samples; same as above.
	71501 (one sample)	Cadmium and thallium in the sample were detected in the laboratory blank and are less than 5X the blank values. The values are not qualified and are useable as nondetects in the screening assessment due to blank contamination.
	71206 (sixteen samples)	Antimony, barium, copper, lead, manganese, and zinc in one sample, and antimony, copper and manganese, in another sample had matrix spike/matrix spike duplicate recoveries outside the established limits and are qualified as UJ or J. The data for barium, copper, manganese, and zinc are useable because the spike levels were too low and percent recoveries could not be determined. The antimony data are useable because recovery was sufficient to detect and quantify the analyte if present.
	70317 (seventeen samples)	Arsenic, barium, beryllium, chromium, cobalt, copper, lead, nickel, selenium, silver, thallium, and vanadium in one sample; same as above. Data are useable because the analytes were detected either well below background UTLs or SALs so the bias did not affect the data comparisons.
	71387 (eight samples)	Antimony, barium, manganese, silver, and zinc in one sample same as above. Data are useable because the recoveries for all analytes, except antimony and manganese, were <1% below the limit and were detected at concentrations more than a factor of 2 below their background UTLs or SALs so the bias did not affect the data comparison. The manganese data are useable because the sample value was 4 times higher than the spike value so percent recovery could not be determined. The antimony datum usability is compromised for this sample because the recovery was too low (<30%) and should not be used in the screening assessment.
	70468 (twelve samples)	Arsenic, barium, lead, nickel, vanadium, and zinc in one sample same as above. Data are useable for arsenic, nickel, lead, and vanadium because the sample values are well below background UTLs and the bias does not affect the data comparison.
	69704 (four samples)	Arsenic, chromium, cobalt, lead, nickel, selenium, silver, thallium, and vanadium in one sample; same as above. The data are useable because the analytes that were detected wither well below background UTLs or SALs so the bias did not affect the data comparison. The undetected analytes were also not affected by the bias because recoveries were 5% or less below the limits so they would be detected and quantified if present.
	71524 (sixteen samples)	Mercury in one sample; same as above. Datum is useable because the recovery was <2% outside the limits, the analyte was detected above the background UTL, and more than an order of magnitude below its SAL.

[1] Number in parenthesis is the total number of samples in each batch.

TABLE B-1
DATA QUALITY EVALUATION FOR TA-15 SAMPLES
(Continued)

SUITE	BATCH NUMBER	COMMENTS
Inorganics	82885 (four samples)[1]	Antimony in one sample had matrix spike/matrix spike duplicate recovery outside the established limits and is qualified as J. The low bias does not affect the data usability because the analyte was detected above its background UTL and is an order of magnitude below its SAL.
	82886 (four samples)	Thallium in one sample (same as above) is qualified as UJ. The sample result is useable because the recovery was >85%, and the analyte would be detected and quantified if present.
	82509 (one sample)	Selenium in the sample (same as above) is qualified as UJ. The sample result is useable because the recovery was >50% so the analyte would be detected and quantified if present.
SVOC	71478 (nine samples)	Anthracene, acenaphthene, benzo(b)fluoranthene, dibenzo(a,h)anthracene, naphthalene, fluoranthene, fluorene, and pyrene in one sample are J qualified because they were below the estimated quantitation limits (EQLs) and the MDLs. The sample results have a high degree of uncertainty because the values cannot be accurately distinguished from instrument "noise" levels. As a result, the data are useable as estimated values, but should be used with caution in the screening assessment because they cannot be accurately quantified.
	70235 (seventeen samples)	Chrysene in four samples, benzo(a)pyrene and benzo(b)fluoranthene in three samples, phenanthrene in two samples, and anthracene, acenaphthene, and indeno(1,2,3-cd)pyrene in one sample same as above.
	71478 (nine samples)	Pentachlorophenol and phenol in all samples had recoveries in the laboratory control samples outside the established limits and are qualified as UJ. Data are useable because the recoveries were between 68% and 74.6% so both analytes would be detected and quantified if present.
	71076 (five samples)	N-Nitrosodipropylamine in all samples same as above. Data are useable because the recovery was <3% below the limit, so the analytes would be detected and quantified if present.
	71377 (two samples)	Acenaphthene, 4-chloro-3-methyl phenol, 4-nitrophenol, 2-chlorophenol, 2,4-dinitrotoluene, pyrene, phenol, pentachlorophenol, N-nitrosodipropylamine in one sample same as above. Data are qualified as UJ, and are useable because surrogate recoveries were acceptable, and the analytes would be detected and quantified if present.
	70324 (thirteen samples)	4-Nitrophenol, 2-chlorophenol, and phenol in all samples same as above. Data are useable because recoveries were >50<75%, so the analytes would be detected and quantified if present.
	70235 (seventeen samples)	Phenol in all samples same as above. Data are useable because the recovery was <3% below the limit so the analytes would be detected and quantified if present.
	70384 (seven samples)	4-Chloro-3-methyl phenol, 2-chlorophenol, and 2,4-dinitrotoluene in all samples same as above. Data are useable because the recoveries were <3% below the limit , so the analytes would be detected and quantified if present.

[1] Number in parenthesis is the total number of samples in each batch.

TABLE B-1
DATA QUALITY EVALUATION FOR TA-15 SAMPLES
(Continued)

SUITE	BATCH NUMBER	COMMENTS
SVOC	71550 (one sample)[1]	4-Nitrophenol, 2-chlorophenol, phenol, and N-nitrosodipropylamine in the sample had recoveries in the laboratory control sample outside the established limits. Data are qualified as UJ, and are useable because the recoveries were between 62% and 74% so the analytes would be detected and quantified if present.
	70234 (four samples)	4-Nitrophenol, N-nitrosodipropylamine, pentachlorophenol in all samples same as above. Data are useable because recoveries were >50<75% so the analytes would be detected and quantified if present.
	69207 (two samples)	4-Nitrophenol, 2-chlorophenol, and phenol in both samples same as above. Data are useable because recoveries were >50<75% so the analytes would be detected and quantified if present.
	68345 (two samples)	4-Nitrophenol in both samples same as above. Data are useable because recovery was >50<75% so the analyte would be detected and quantified if present.
	82474 (four samples)	1,4-Dichlorobenzene, 2-chlorophenol, pentachlorophenol, and phenol in all samples same as above. Data are qualified as UJ and are useable because the recoveries were between 58% and 74.6% so the analytes would be detected and quantified if present
	71076 (five samples)	All SVOCs for two samples had surrogate recoveries outside the established limits. Data are qualified as UJ or J, and are useable because the spike levels were too low so percent recoveries could not be determined.
	70384 (seven samples)	All SVOCs in two samples same as above. Data are useable because the results are biased high.
	69207 (two samples)	All SVOCs in both samples same as above. Data are useable because the results are biased high.
	82474 (four samples)	All SVOCs in all samples same as above. Data are useable because the spike levels used for the surrogate recoveries were too low so percent recoveries could not be determined.
	71377 (two samples)	All SVOCs in one sample had matrix spike recoveries outside the established limits. Data are incorrectly qualified as UJ or J. Data are useable because the matrix spike recoveries are within the laboratory established control limits and the data should not be qualified.
	70235 (seventeen samples)	All SVOCs in one sample same as above. Data are incorrectly qualified as UJ or J. Data are useable because the matrix spike recoveries are within the laboratory established control limits and the data should not be qualified.
	71550 (one sample)	All SVOCs in the sample same as above. Data are incorrectly qualified as UJ or J. Data are useable because the matrix spike recoveries are within the laboratory established control limits and the data should not be qualified.
	82474 (four samples)	1,4-Dichlorobenzene, 2,4-dinitrotoluene, 2-chlorophenol, 4-chloro-3-methyl phenol, 4-nitrophenol, N-nitrosodipropylamine, phenol, and pyrene in one sample same as above. Data are useable because the spike levels used for the matrix spike recoveries were too low so percent recoveries could not be determined.

[1] Number in parenthesis is the total number of samples in each batch.

TABLE B-1
DATA QUALITY EVALUATION FOR TA-15 SAMPLES
(Continued)

SUITE	BATCH NUMBER	COMMENTS
SVOC	70324 (thirteen samples)[1]	All SVOCs in one sample had matrix spike recoveries outside the established limits. Data are incorrectly qualified as UJ or J. Data are useable because the matrix spike recoveries are within the laboratory established control limits and the data should not be qualified.
	71478 (nine samples)	All SVOCs in one sample same as above. Data are useable because the results are biased high.
	70234 (four samples)	All SVOCs in one sample same as above. Data are useable because the results are biased high.
VOC	71436 (six samples)	Methylene chloride in five samples, 1,1,1-trichloroethane in two samples, benzene, dichlorobromomethane, carbon tetrachloride, ethylbenzene, 1,4-dichlorobenzene, 1,1-dichloropropene, tetrachloroethylene, trichloroethylene, toluene, meta-, ortho-, and para-xylenes in one sample are J qualified because they were below the EQLs and the MDLs. The sample results have a high degree of uncertainty because the values cannot be accurately distinguished from instrument "noise" levels. As a result, the data are useable as estimated values, but should be used with caution in the screening assessment because they cannot be accurately quantified.
	70563 (eight samples)	Acetone, benzene, carbon tetrachloride, chloroform, dichlorobromomethane, ethylbenzene, methylene chloride, toluene, trichloroethylene, 1,2-trans-dichloroethylene, 1,2-cis-dichloroethylene, 1,1-dichloropropene, 1,1-dichloroethane, 1,1,1,-trichloroethane, cis-1,3-dichloropropylene in one sample same as above.
	70446 (eight samples)	Acetone and methylene chloride in two samples, 2-butanone and trichlorofluoromethane in one sample; same as above.
	71522 (two samples)	Methylene chloride in both samples; same as above.
	70809 (three samples)	Methylene chloride and meta- and para-xylenes in two samples, 1,3-dichlorobenzene, and toluene in one sample; same as above.
	71599 (two samples)	Methylene chloride in both samples and acetone in one sample; same as above.
	70369 (two samples)	Acetone in one sample; same as above.
	69364 (two samples	Carbon tetrachloride in both samples; same as above.
	68411 (two samples)	Acetone, 2-butanone, methylene chloride, toluene, trichloroethylene, and meta- and para-xylenes in one sample; same as above.
	82481 (two samples)	Methylene chloride, dichlorodifluoromethane, and toluene in one sample and acetone, methylene chloride, and trichloroethylene in the other sample; same as above.
	68411 (two samples)	Acetone in one sample was detected in the laboratory blank. The sample value was at a concentration greater than 10X the blank value and was above the EQL. Because this analyte was detected in the blank, it is not expected to be present as a result of site activities As it is a common laboratory contaminant, the detected value is considered to be a nondetect and is useable as such.

[1] Number in parenthesis is the total number of samples in each batch.

TABLE B-1
DATA QUALITY EVALUATION FOR TA-15 SAMPLES
(Continued)

SUITE	BATCH NUMBER	COMMENTS
VOC	70563 (eight samples)[1]	Acetone was detected in seven samples above the EQL. Because this analyte is not expected to be present as a result of site activities and is a common laboratory contaminant, the detected values are considered to be nondetects and are useable as such.
	71436 (six samples)	Acetone in one sample was detected in the laboratory blank. The sample value was at a concentration greater than 10X the blank value and was above the EQL. 2-Butanone was also detected in one sample above the EQL. Because the acetone was detected in the blank, neither chemical is expected to be present as a result of site activities. Both are common laboratory contaminants, therefore, the detected values are considered to be nondetects and are useable as such.
	70809 (three samples)	Acetone was detected in two samples at concentrations above the EQL. Because other contaminants were detected in the laboratory blank, and acetone is not expected to be present as a result of site activities, and it is a common laboratory contaminant, the detected values are considered to be nondetects and are useable as such.
	70446 (eight samples)	Acetone in two samples was detected in the laboratory blank. The sample values were at concentrations greater than 10X the blank value and were above the EQL. Because this analyte was detected in the blank, it is not expected to be present as a result of site activities. As it is a common laboratory contaminant, the detected values are considered to be nondetects and are useable as such.
	71599 (two samples)	Acetone was detected in one sample at a concentration above the EQL. Because acetone is not expected to be present as a result of site activities and it is a common laboratory contaminant, the detected value is considered to be a nondetect and is useable as such.
	69364 (two samples)	Acetone was detected in one sample above the EQL. Because this analyte is not expected to be present as a result of site activities, and it is a common laboratory contaminant, the detected value is considered to be a nondetect and is useable as such.
	71436 (six samples)	Acetone and bis(2-chloroisopropyl)ether were detected in the laboratory blank for six samples. Sample concentrations were less than 10X the blank value for acetone and less than 5X the blank value for bis(2-chloroisopropyl)ether. The values are not qualified and are used as nondetects in the screening assessment due to blank contamination.
	70446 (eight samples)	2-Butanone, and bis(2-chloroisopropyl)ether in all samples, and acetone in six samples same as above. Sample concentrations are less than 10X the blank value for acetone and 2-butanone, and less than 5X the blank value for bis(2-chloroisopropyl)ether. The values are not qualified and are used as nondetects in the screening assessment due to blank contamination.
	70369 (two samples)	Acetone, 2-butanone, and bis(2-chloroisopropyl)ether in both samples same as above. Sample concentrations are less than 10X the blank value for acetone and 2-butanone, and less than 5X the blank value for bis(2-chloroisopropyl)ether. The values are not qualified and are used as nondetects in the screening assessment due to blank contamination.

[1] Number in parenthesis is the total number of samples in each batch.

TABLE B-1
DATA QUALITY EVALUATION FOR TA-15 SAMPLES
(Continued)

SUITE	BATCH NUMBER	COMMENTS
VOC	70809 (three samples)[1]	Bromoform, 4-methyl-2-pentanone, 1,2-, 1,3-,1,4-dichlorobenzenes, bis(2-chloroisopropyl)ether, ethylbenzene, methylene chloride, and toluene in all samples were detected in the laboratory blank. Sample concentrations are less than 10X the blank values for methylene chloride and toluene, and less than 5X the blank values for the other contaminants. The values are not qualified and are used as nondetects in the screening assessment due to blank contamination.
	71599 (two samples)	Methylene chloride in both samples same as above. Sample concentrations are less than 10X the blank value. The values are not qualified and are used as nondetects in the screening assessment due to blank contamination.
	70563 (eight samples)	2-Butanone in all samples same as above. Sample values are less than 10X the blank value. The values are not qualified and are used as nondetects in the screening assessment due to blank contamination.
	69364 (two samples)	Acetone in one sample and bis(2-chloroisopropyl)ether in both samples same as above. Sample concentrations are less than 10X the blank value for acetone and less than 5X the blank value for bis(2-chloroisopropyl)ether. The values are not qualified and are used as nondetects in the screening assessment due to blank contamination.
	68411 (two samples)	Acetone in one sample was detected in the laboratory blank. Sample concentration is less than 10X the blank value. The value is not qualified and is used as a nondetect in the screening assessment due to blank contamination.
	71436 (six samples)	All VOCs in one sample and the all VOC laboratory duplicates in another sample are qualified UJ or J because the 14-day holding time was exceeded by 8 days and one day, respectively. The sample results are useable because the samples were properly stored at 4°C, preserved at a pH of 2, and the holding time was not grossly exceeded (more than 2X the holding time).
	70446 (eight samples)	All VOCs in three samples are qualified UJ or J because the 14-day holding time was exceeded by 3 days. The sample results are considered useable because the holding time was not grossly exceeded (more than 2X the holding time).
	70809 (three samples)	All VOCs in one sample had surrogate recoveries of 0%. Data were originally qualified as UJ or J, but should be qualified as R4 and the data not used in the screening assessment. The R4 qualifier indicates that recoveries were affected by matrix interference and the results cannot be accurately quantified.
	70563 (eight samples)	All VOCs in two samples had surrogate recoveries outside the established limits. Data are useable because the results are biased high.
	70446 (eight samples)	All VOCs in one sample had surrogate recoveries outside the established limits. Data are useable because the results are biased high.
	69364 (two samples)	All VOCs in two samples had surrogate recoveries outside the established limits. Data are useable because the results are biased high.

[1] Number in parenthesis is the total number of samples in each batch.

TABLE B-1
DATA QUALITY EVALUATION FOR TA-15 SAMPLES
(Continued)

SUITE	BATCH NUMBER	COMMENTS
VOC	69364 (two samples)[1]	All VOCs in one sample had matrix spike recoveries outside the established limits and are incorrectly qualified as UJ or J. Data are useable because the matrix spike recoveries are within the laboratory established control limits and should not be qualified.
HE	71116 (three samples)	2-Amino-4,6-dinitrotoluene in one sample is J qualified because it was below the MDL. The sample results have a high degree of uncertainty because the values cannot be accurately distinguished from instrument "noise" levels. As a result, the data are useable as estimated values, but should be used with caution in the screening assessment because they cannot be accurately quantified.
	71042 (three samples)	4-Amino-2,6-dinitrotoluene, 2,6-dinitrotoluene, m-dinitrobenzene, m-,o-,p-nitrotoluenes, sym-trinitrobenzene, TETRYL, RDX, and nitrobenzene in all samples had recoveries in the laboratory control sample outside the established limits and are qualified as UJ. Data are useable because recoveries were >50<75%, so the analytes would be detected and quantified if present.
Radionuclide	70390 (four samples)	Thorium-230 in all samples was detected in the laboratory blank. Sample values are greater than 5X the blank values and are considered valid. Data are not qualified and are useable as detected values.
	71441 (one sample)	Thorium-230 in the sample was detected in the laboratory blank. Sample value is less than 5X the blank value. The value is not qualified and is used as a nondetect in the screening assessment due to blank contamination.
	70177 (thirteen samples)	The reported concentration of thorium-230 in one sample is less than 3 σ and is considered to be a nondetect. Datum is useable as a nondetect in the screening assessment.
	70390 (four samples)	Thorium-230 in one sample; same as above.

[1] Number in parenthesis is the total number of samples in each batch.

APPENDIX C

METHODOLOGIES FOR DEVELOPING SITE-SPECIFIC PRELIMINARY REMEDIATION GOALS

C.1 Approach to PRG Development

Preliminary remediation goals (PRG) were calculated for several analytes from the PRSs investigated for this report to determine if these analytes posed an unacceptable risk to human health. Risk-based cleanup levels were calculated for those chemicals that failed the screening assessment as documented in this RFI Report.

C.2 PRG Equations

Site-specific PRGs have been calculated using the modified U.S. Environmental Protection Agency (EPA) equations and Los Alamos National Laboratory (Laboratory) site-specific input parameters presented in this appendix. These are based on a healthy working adult under a continued laboratory operations land-use scenario.

Under the industrial land-use scenario, risk resulting from exposure to chemicals in soil is assumed to result from direct ingestion, inhalation of particulates from soil, and dermal contact (for intrusive work only). The EPA default parameters are based on the type of industrial exposure activities expected after cleanup and the physical properties of the COPCs. One set of circumstances includes parameters such as exposure frequency and duration, which are adjusted to reflect a maintenance worker vs. a construction worker (or surface vs. subsurface contamination scenarios), depending on the type of continued laboratory operations activity expected (i.e., intrusive or nonintrusive, respectively). For the PRSs in this report for which PRGs have been calculated, intrusive work (i.e., digging to place/replace sewer lines or to construct buildings) is the exposure scenario of concern because the COPCs were detected at 18-24 in.; therefore, the nonintrusive scenario is not appropriate for these sites.

Calculation of PRGs are consistent with Risk Assessment Guidance for Superfund (RAGS) Part B (EPA 1991a, 0302) and also considers updates to the RAGS Part B equations (EPA 1991, 1994). The PRGs were developed using the most current sources of EPA-approved toxicity criteria, such as the Integrated Risk Information System (IRIS), the Health Effects Assessment Summary Table (HEAST), and the Environmental Criteria and Assessment Office (ECAO).

Equations 1 and 2 were used to calculate a spreadsheet of PRGs (for carcinogenic and noncarcinogenic chemicals, respectively) under the intrusive industrial exposure scenario (ingestion, inhalation, and dermal). The equations for each class of chemicals are similar but use different site-specific input parameters. The methodologies calculate a soil concentration for carcinogens from a target cancer risk of 10^{-6} (i.e., 1 in 1,000,000). PRGs for noncarcinogenic chemicals are calculated for a construction worker from a target hazard quotient of 1. The equations for soil combine across all pathways for direct exposure.

C.3 AOC C-15-005 and AOC C-15-010

C.3.1 Land Use

The anticipated future use of both AOC C-15-005 and AOC C-15-010 is industrial/commercial under continued Laboratory operations.

C.3.2 Cleanup of AOC C-15-005

One COPC—manganese—failed the screening assessment at AOC C-15-005 and was carried forward for further evaluation. Calculation of the site-specific PRG was based on the Laboratory's expected land use. The reference doses presented in Table C-1 were used to calculate the cleanup concentration, which is summarized in Table C-2.

C.3.2.1 Manganese

Under the intrusive industrial exposure scenario, an adult worker is the reasonable maximum exposed individual.

The PRG for manganese in soil was calculated using the equation for direct exposures to noncarcinogenic constituents in industrial soil (Equation 1). The intrusive PRG was calculated to be 2030 mg/kg for manganese.

C.3.3 Cleanup of AOC C-15-010

Four organics (PAHs), benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene, failed the screening assessment for AOC C-15-010 and were carried forward for further evaluation. Calculation of site-specific PRGs was based on the Laboratory's expected land use. The cancer slope factors for carcinogens presented in Table C-1 were used to calculate the cleanup concentrations, which are summarized in Table C-2.

C.3.3.1 Organics

Under the intrusive industrial exposure scenario, an adult worker is the reasonable maximum exposed individual.

The PRGs for the PAHs in soil were calculated using the equation for direct exposures to carcinogenic constituents in industrial soil (Equation 2). The intrusive PRGs were calculated to be 5 mg/kg for benzo(a)pyrene and 50 mg/kg for benzo(a)anthracene, benzo(b)fluoranthene, and indeno(1,2,3-cd)pyrene.

C.4 Multiple-Chemical PRG Analysis

When two or more COPCs are present at a site at concentrations at or below their respective PRGs, a multiple-chemical PRG risk analysis is conducted for carcinogenic risk and noncarcinogenic health hazard. The multiple-chemical PRG risk analysis is estimated by adding together the fractional contributions (i.e., site-specific concentration / PRG) of each chemical. For carcinogenic cancer risk estimates, the fractional contribution of each is added together and multiplied by 10^{-6} target cancer risk:

$$\text{Multiple PRG Risk} = [(conc_X / PRG_X) + (conc_Y / PRG_Y) + (conc_Z / PRG_Z)] \times 10^{-6}$$

If the multiple chemical PRG risk is at or below the target value of 10^{-6}, a site is considered to not present a carcinogenic risk.

For noncarcinogenic hazard estimates, the fractional contribution of each will be added together and compared with a target hazard index of 1:

$$\text{PRG Hazard Index} = [(conc_X / PRG_X) + (conc_Y / PRG_Y) + (conc_Z / PRG_Z)]$$

If the PRG hazard index is at or below the target hazard index of 1, a site is considered to not pose a hazard.

Equation 1: Direct Exposures to Noncarcinogenic Constituents in Industrial Soil

$$C(\text{mg/kg}) = \frac{THQ \times BW_a \times ED_o \times 365\text{d/y}}{EF_o \times ED_o \left[\frac{1}{RfD_o} \times \frac{IRS_o}{10^6 \text{mg/kg}} + \frac{1}{RfD_d} \times \frac{SA_a \times AF \times ABS}{10^6 \text{mg/kg}} + \frac{1}{RfD_i} \times \left(\frac{IRA_a}{VF_s} + \frac{IRA_a}{PEF} \right) \right]}$$

Where:

C(mg/kg) (mg/kg) = Preliminary remedial goal for soil based on exposure to noncarcinogenic constituents

THQ = Target hazard quotient (unitless)
Considered to be 1

BW_a = Body weight, adult (kg)
Considered to be 70 kg (EPA 1991b)

ED_o = Exposure duration - occupational (years)
Considered to be 25 years (EPA 1991b)

EF_o = Exposure Frequency - occupational (d/y)
Considered to be 250 d/y (EPA 1991a)

RfD_o = Reference dose-oral (mg/kg-d) (IRIS, HEAST, or ECAO)

IRS_o = Soil ingestion - occupational (mg/day)
Considered to be 480 mg/day (EPA 1991b)

RfD_d = Reference Dose, dermal (mg/kg-d) (IRIS, HE AST, or ECAO)

SA_a = Surface Area, adult (cm^2)
Considered to be 3200 (cm^2) (LANL 1993)

AF = Adherence Factor (mg/cm^2)
Considered to be 0.2 mg/cm^2 (EPA 1992)

ABS = Skin Absorption
Considered to be 0.1 for organics and 0.01 for inorganics (EPA 1994)

RfD_i = Reference dose inhalation (mg/kg-d) (IRIS, HEAST, or ECAO)

IRA_a = Inhalation rate - adult (mg/day)
Considered to be 20 m^3/day (EPA 1991b)

VF_s = Volatilization factor for soil (mg/kg)
Considered to be zero for chemicals with MW> 200 g/mole and Henry's Law Constant <1 x <10^{-5} atm-m^3/mole

PEF = Particulate emission factor (mg/kg)
Considered to be 1.32 x 10^{+9} (m^3/kg) (LANL 1993)

Equation 2: Direct Exposures to Carcinogenic Constituents in Industrial Soil

$$C(\text{mg/kg}) = \frac{TR \times BW_a \times AT_c \times 365 \text{ d/y}}{EF_o \times ED_o \left[\frac{IRS_o \times CSF_o}{10^6 \text{ mg/kg}} + \frac{SA_a \times CSF_d \times AF \times ABS}{10^6 \text{mg/kg}} + IRA_i \times CSF_i \times (\frac{1}{VF_s} + \frac{1}{PEF}) \right]}$$

Where:

C (mg/kg) = Preliminary remedial goal for soil based on exposure to carcinogenic constituents (mg/kg)

TR = Target cancer risk (unitless)
Considered to be 1 x 10^{-6}

BW_a = Body weight, adult (kg)
Considered to be 70 kg (EPA 1991b)

AT_c = Averaging Time - cancer (years)
Considered to be 70 years (EPA 1991b)

EF_o = Exposure Frequency - occupational (d/y)
Considered to be 90 d/y (EPA 1991a)

ED_o = Exposure duration - occupational (years)
Considered to be 1 year (EPA 1991b)

IRS_o = Soil ingestion - occupational (mg/day)
Considered to be 480 mg/day (EPA 1991b)

CSF_o = Cancer slope factor-dermal $(\text{mg/kg-d})^{-1}$ (IRIS, HEAST, or ECAO)

SA_a = Surface Area, adult (cm^2)
Considered to be 3200 (cm^2) (LANL 1993)

CSF_d = Cancer Slope Factor, dermal (mg/kg-d) (IRIS, HEAST, or ECAO)

AF = Adherence Factor (mg/cm^2)
Considered to be 0.2 (mg/cm^2) (EPA 1992)

ABS = Skin Absorption
Considered to be 0.1 for organics and 0.01 for inorganics (EPA 1994)

IRA_i = Inhalation rate - adult (mg/day)
Considered to be 20 m^3/day (EPA 1991b)

CSF_i = Cancer slope factor-inhalation $(\text{mg/kg-d})^{-1}$ (IRIS, HEAST, or ECAO)

VF_s = Volatilization factor for soil (mg/kg)
Considered to be zero for chemicals with MW> 200 g/mole and Henry's Law Constant <1 x <10^{-5} atm-m^3/mole

PEF = Particulate emission factor (mg/kg)
Considered to be 1.32 x 10^{+9} (m^3/kg) (LANL 1993)

TABLE C-1
SPREADSHEET FOR CALCULATING PRGS FOR INTRUSIVE INDUSTRIAL SOIL EXPOSURE

Chemical	Oral RfD (mg/kg/day)	Inhalation RfD (mg/kg/day)	Dermal RfD (mg/kg/day)
AOC C-15-005			
Manganese	5E-03	1.43E-05	1.5E-04
Chemical	**Oral Slope Factor (mg/kg/day)**	**Inhalation Slope Factor (mg/kg/day)**	**Dermal Slope Factor (mg/kg/day)**
AOC C-15-010			
Benzo(a)anthracene	7.3E-01	N/A	7.3E-01
Benzo(a)pyrene	7.3E+00	N/A	7.3E+00
Benzo(b)fluoranthene	7.3E-01	N/A	7.3E-01
Indeno[1,2,3-cd]pyrene	7.3E-01	N/A	7.3E-01

N/A = not available

TABLE C-2
PRG SUMMARY TABLE

Chemical	Intrusive Industrial Soil Scenario (mg/kg)	
	Noncancer PRG	Cancer PRG
Manganese	2030	N/A
Benzo(a)anthracene	N/A	50
Benzo(a)pyrene	N/A	5
Benzo(b)fluoranthene	N/A	50
Indeno[1,2,3-cd]pyrene	N/A	50

N/A = not available

REFERENCES

EPA (US Environmental Protection Agency), December 1991a. "Risk Assessment Guidance for Superfund, Volume I—Human Health Evaluation Manual (Part B, Development of Risk-Based Preliminary Remediation Goals)," Interim, EPA/540/R-92/003, Publication 9285.7-01B, Office of Research and Development, Washington, DC. (EPA 1991a, 0302)

EPA (US Environmental Protection Agency), March 25, 1991b. 'Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, Supplemental Guidance "Standard Default Exposure Factors," Interim Final,' OSWER Directive 9285.6-03, Office of Emergency and Remedial Response, Toxics Integration Branch, Washington, DC. (EPA 1991, 0746)

EPA (US Environmental Protection Agency Region IX), August 1994. Region IX Preliminary Remediation Goals (PRGs), Second Half 1994. Memo from Standford J. Smucker, Ph.D., Regional Toxicologist (H-9-3), Technical Support Section to PRG Table Mailing List. (EPA 1994a)

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