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

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

RECEIVED
SEP 30 1997

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

SUBJECT: SUBMITTAL OF RFI REPORTs FOR PRSs IN TAs 0, 1, 3, 10, 11, 13, 15, 16, 19, 33, 36, AND 73

Dear Mr. Garcia:

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

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

Sincerely,

Jorg Jansen, Program Manager
LANL/ER Project

Sincerely,

Theodore J. Taylor, Program Manager
DOE/LAAO

JJ/TT/ss

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

6934

Reports
RFI RPT TA 0: PRS 0-003, 0-012
NFA RPT TAs 0, 73: PRS 0-034(a,b), 73-001(b), 73-004(c,d)
RFI RPT TA 1: PRS 1-001(s,u), 1-007(l)
RFI RPT TA 3: PRS 3-004(c,d),3-007, 3-014(o), 3-049(b), 3-052(b), 3-056(k), C-03-014, 3-014(k,l,m)
RFI RPT TA 3, PRS 3-054(e), C-3-006, CMR
RFI RPT TA 10: 10-008
Addendum RFI RPT TA 15: PRS C-15-001, C-15-007 LALR 97-3881
RFI RPT TA 19: 19-001, 19-003, C-19-001
Addendum RFI RPT TA 36: PRS 36-005
RFI RPT TA 16: 16-024(c,d,f,g,k,m,o,p-s) 16-025(b2,d,g,h,j,k,m,n,o,y), 16-034(c,d,e,f,l,m), C-16-005, C-16-017
RFI RPT TAs 11, 13, 16: PRSs 11-012(a,b), 13-003(a), 16-006(c,d), 16-010(a), 16-021(a), 16-026(c,d,v), 16-028(a), 16-030(g)
RFI RPT TA 33: PRSs 33-002(b,c), 33-003(b), 33-004(k), 33-006(a), 33-008(a,b), 33-011(d), 33-013, 33-017

Cy (w/ encs.):
G. Allen, CST-7, MS E525
M. Gilgosch, LAAO, MS A316
G. Gould, EES-15, MS J495
D. Griswold, AL-ERD, MS A906
J. Harry, EES-5, MS M992
B. Koch, LAAO, MS A316
D. Krier, EES-1, MS D462
R. Michelotti, CST-7, MS E525
J. Mose, LAAO, MS A316
D. Neleigh, EPA, R.6, 6PD-N
C. Rodriguez, CIO/ER, MS M769
T. Taylor, LAAO, MS A316
J. White, ESH-19, MS K490
S. Dinwiddie, NMED-HRMB
M. Leavitt, NMED-GWQB
J. Parker, NMED-OB
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Document Title: RFI Report for PRSs 3-054(e), C-3-006 in TA-3

Name: _____ Date: 9-30-97

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Tom Baca, Program Director
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Document Title: RFI Report for PRSs 19-001, 19-003, C-19-001 in TA-19

Name: _____ Date: 9-30-97

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Document Title: RFI Report for PRSs 0-003, 0-012 in TA-0

Name: _____ Date: 9-30-97

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Tom Baca, Program Director
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Document Title: NFA Report for PRSs 0-034(a,b), 73-001(b), 73-004(c,d) in TAs-0, 73

Name: _____ Date: 9-30-97

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Tom Baca, Program Director
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Document Title: RFI Report for PRSs 1-001(s,u), 1-007(l) in TA-1

Name: _____ Date: 9-30-97

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Los Alamos National Laboratory

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Document Title: RFI Report for PRSs 3-004(c,d), 3-007, 3-014(o), 3-049(b), 3-052(b), 3-056(k), C-03-014, 3-014(k,l,m) in TA-3

Name: _____ Date: 9-30-97

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Document Title: RFI Report for PRSs 10-008 in TA-10

Name: _____ Date: 9-30-97

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Document Title: Addendum RFI Report for PRSs C-15-001, C-15-007 in TA-15

Name: _____ Date: 9-30-97

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Document Title: Addendum RFI Report for PRS 36-005 in TA-36

Name: _____ Date: 9-30-97

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Document Title: RFI Report for PRSs 16-024(c, d, f, g, k, m, o, p, q, r, s), 16-025(b2, d, g, h, j, k, m, n, o, y), 16-034(c, d, e, f, l, m), C-16-005, C-16-017 in TA-16

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Document Title: RFI Report for PRSs 11-012(a, b), 13-003(a), 16-006(c,d), 16-010(a), 16-021(a), 16-026(c,d,v), 16-028(a), 16-030(g) in TAs-11, 13, and 16

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Document Title: RFI Report for PRSs 33-002(b,c), 33-003(b), 33-004(k), 33-006(a), 33-008(a,b), 33-011(d), 33-013, 33-017 in TA-33

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RFI Report for Potential Release Sites

0-003 and 0-012

OCT 1 1997

Field Unit 1

Environmental Restoration Project

September 1997

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-97-3828

LANL 1/1071/0

EXECUTIVE SUMMARY

This report presents the results of the Phase I Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) conducted at Los Alamos National Laboratory (LANL), Technical Area (TA) 0, Potential Release Sites (PRSs) 0-003 (container storage area) and 0-012 (blow-off tank). These PRSs are located at the inactive Western Steam Plant. Included in this report are the data assessment and analysis approach used in this investigation, and the site-specific results, conclusions, and recommendations regarding RCRA constituents for PRSs 0-003 and 0-012.

The Western Steam Plant is located at 3750 Finch Street, south of Trinity Drive and immediately northwest of the Department of Energy's (DOE's) Los Alamos Area Office (LAAO). The plant began operating in 1949. After the TA-3 power plant (TA-3-22) was put into service (circa 1952), the Western Steam Plant was on standby status until it was removed from service in the spring of 1990. The Zia Company's wastewater laboratory operated as part of the Western Steam Plant between 1976 and 1983.

PRSs 0-003, the product container storage area, was approximately 100 ft^2 and was located at the east end of the plant. Historic information indicates that the area has always been paved and was used to store 55-gallon steel drums on wooden pallets. These drums contained chemicals used for boiler water treatment. It is unknown how long the product storage area operated but it was decommissioned in 1987. During its period of operation, it was known that releases from corroded drums resulted in spillage below the pallets. However, the frequency, content, and volume of these releases were apparently not recorded, nor were the cleanup responses.

The RFI Work Plan for OU 1071 states that PRS 0-012 includes an underground filtration tank (now identified as the blow-off tank), floor drains that discharged to the asphalt street and parking area and Los Alamos Canyon, and a filtration tank outfall to Los Alamos Canyon. However, the SWMU report states that PRS 0-012 is composed solely of the blow-off tank. The floor drains are actually connected to the sanitary sewer system that routes sanitary waste to the Bayo Canyon Wastewater Treatment Plant, and were therefore not a part of this RFI. The drainpipes that discharge to the asphalt street and parking area carry storm water from roof drains. There is no explanation for the suggestion that the tank had an outfall to Los Alamos Canyon because the construction drawings show the blow-off tank discharging to the sanitary sewer, and during the RFI it was demonstrated to flow into a nearby active sanitary sewer manhole.

The primary objectives of the RFI were to determine whether contaminants were present at these sites and, if so, evaluate whether these sites are suitable for residential use. Field activities at PRSs 0-003 and 0-012 included site and geodetic surveys and geomorphologic mapping. At

PRS 0-012, six sediment samples were collected from sediment catchments in two first-order drainage channels that had developed downslope of the roof-drain outfall and of a pavement drainage point. One water sample was collected from inside the blow-off tank. At PRS 0-003, ten subsurface soil samples were collected from four locations. Samples were screened for radioactivity and volatile organic compounds (VOCs). The results of screening for radiation indicated no detectable activity and no VOCs were detected. Samples were submitted to a fixed laboratory for analysis of VOCs, semivolatile organic compounds, pesticides/polychlorinated biphenyls, and target analyte list metals.

Background comparison and screening assessment of the fixed laboratory analytical results indicated that no chemicals are present at the site at levels that pose an unacceptable risk to human health. Therefore, PRSs 0-003 and 0-012 are proposed for no further action (NFA) based on NFA Criterion 5 (see Table ES-1).

TABLE ES-1

SUMMARY OF PROPOSED ACTIONS

			PROPOSED ACTION				
PRS NUMBER	HSWA[a]	RADIONUCLIDE COMPONENT[b]	NFA CRITERION	FURTHER ACTION[c]	ADD TO HSWA MODULE[d]	RATIONALE	SECTION NUMBER
0-003	X		5			RCRA and radionuclide contamination are below SALs.	5.1
0-012	X		5			RCRA and radionuclide contamination are below SALs.	5.2

[a] An X in this column indicates that the site is listed on the Hazardous and Solid Waste Amendments (HSWA) Module (Module VIII) of the Laboratory's RCRA operating permit.
[b] An X in this column indicates that the site has a radionuclide component.
[c] VCA, EC, further investigation, or CMS.
[d] An X in this column indicates that hazardous constituents were confirmed at a site not already listed on the HSWA Module. The site requires further action; therefore, the site needs to be added to the Module.

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1.0 INTRODUCTION

This report presents the results of the Phase I Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) conducted at Los Alamos National Laboratory (LANL), Technical Area (TA) 0, Potential Release Sites (PRSs) 0-003 (container storage area) and 0-012 (blow-off tank). These PRSs are located at the inactive Western Steam Plant. Included in this report are the data assessment and analysis approach used in this investigation, and the site-specific results, conclusions, and recommendations regarding RCRA constituents for PRSs 0-003 and 0-012.

1.1 General Site History

The Western Steam Plant is located at 3750 Finch Street, south of Trinity Drive and immediately northwest of the Department of Energy's (DOE's) Los Alamos Area Office (LAAO) (Figs. 1.1-1, 1.1-2, and 1.1-3). The plant began operating in 1949 (DOE 1987, 0264). After the TA-3 power plant (TA-3-22) was put into service (circa 1952), the Western Steam Plant was on standby status until it was removed from service in the spring of 1990. The Zia Company's wastewater laboratory operated as part of the Western Steam Plant between 1976 and 1983.

To prevent buildup of calcium carbonate and magnesium carbonate inside the boiler tubes and drums, sodium hydroxide and hexameta phosphate were added to the boiler feed water to maintain a pH of 10 to 10.5 (Francis 1997, 05-0258). An oxygen scavenger (sodium sulphite) was also used. The closed steam generating system would not require the use of algaecides and there is no evidence that any were present or used at the plant. Chelating agents reportedly composed of organic acids were used occasionally, but their true chemical composition is unknown. There is also no information on the types of chemicals used at the wastewater laboratory, but it is assumed, at the very least, that certain surfactants were used to clean equipment and glassware.

PRS 0-003, the product container storage area, was approximately 100 ft^2 (LANL 1990, 0145) and was located at the east end of the plant. Historic information indicates that the area has always been paved and was used to store 55-gallon steel drums on wooden pallets. These drums contained chemicals used for boiler water treatment (LANL 1990, 0145). The RFI Work Plan for Operable Unit (OU) 1071 states that waste oils are possible solid wastes in Aggregate 0-A. The types of processes at this facility preclude the use or generation of large volumes of oils and waste oils. The work plan includes an undocumented statement that PRS 0-003 was used for storing waste in 55-gallon steel drums, but the LANL Solid Waste Management Unit (SWMU) Report describes the drum contents only as chemicals used for boiler water treatment (LANL 1990, 0145). There is no evidence that any wastes were stored at this site before decommissioning in 1987.

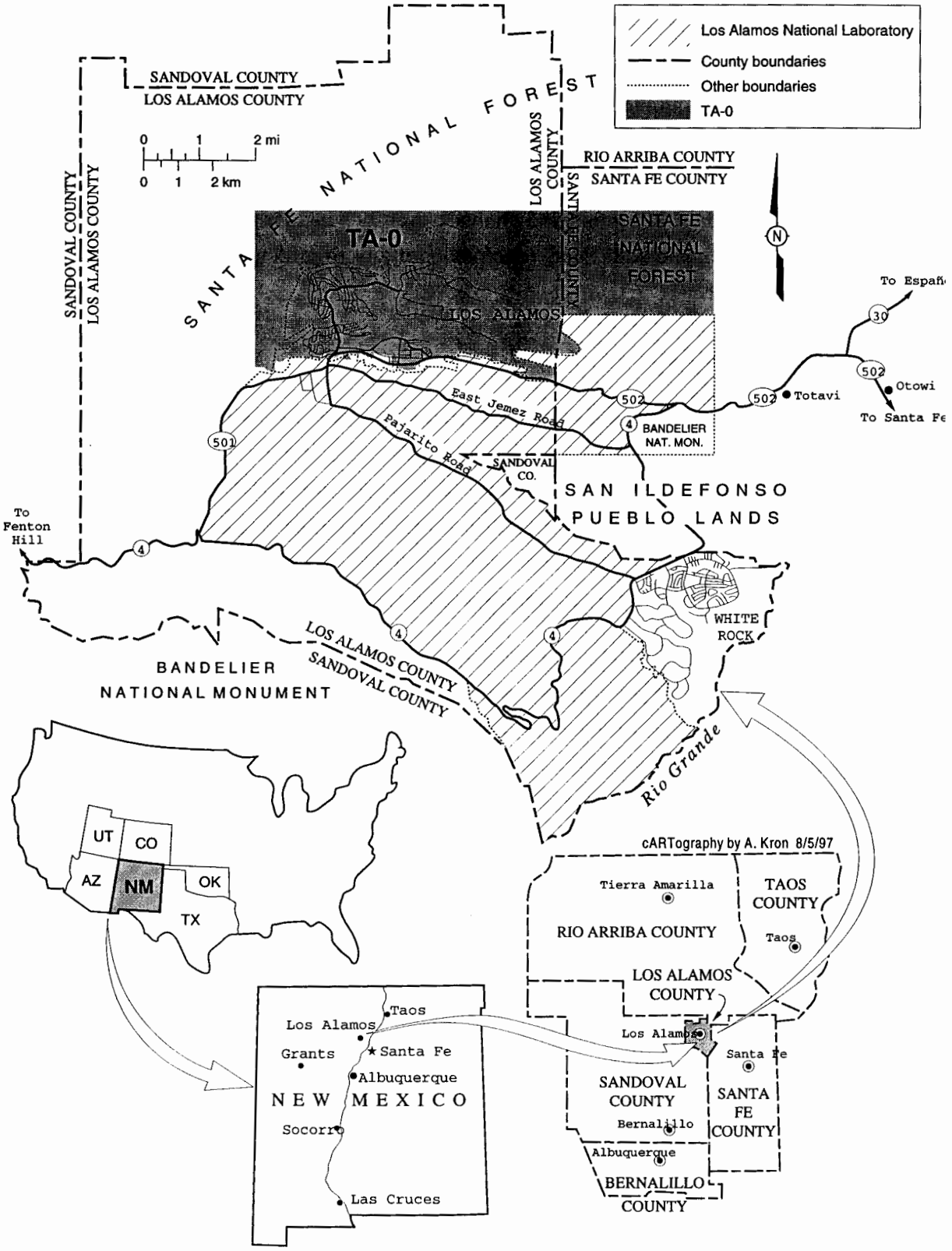

Fig. 1.1-1 **Location of TA-0 within Los Alamos National Laboratory, Los Alamos County, New Mexico.**

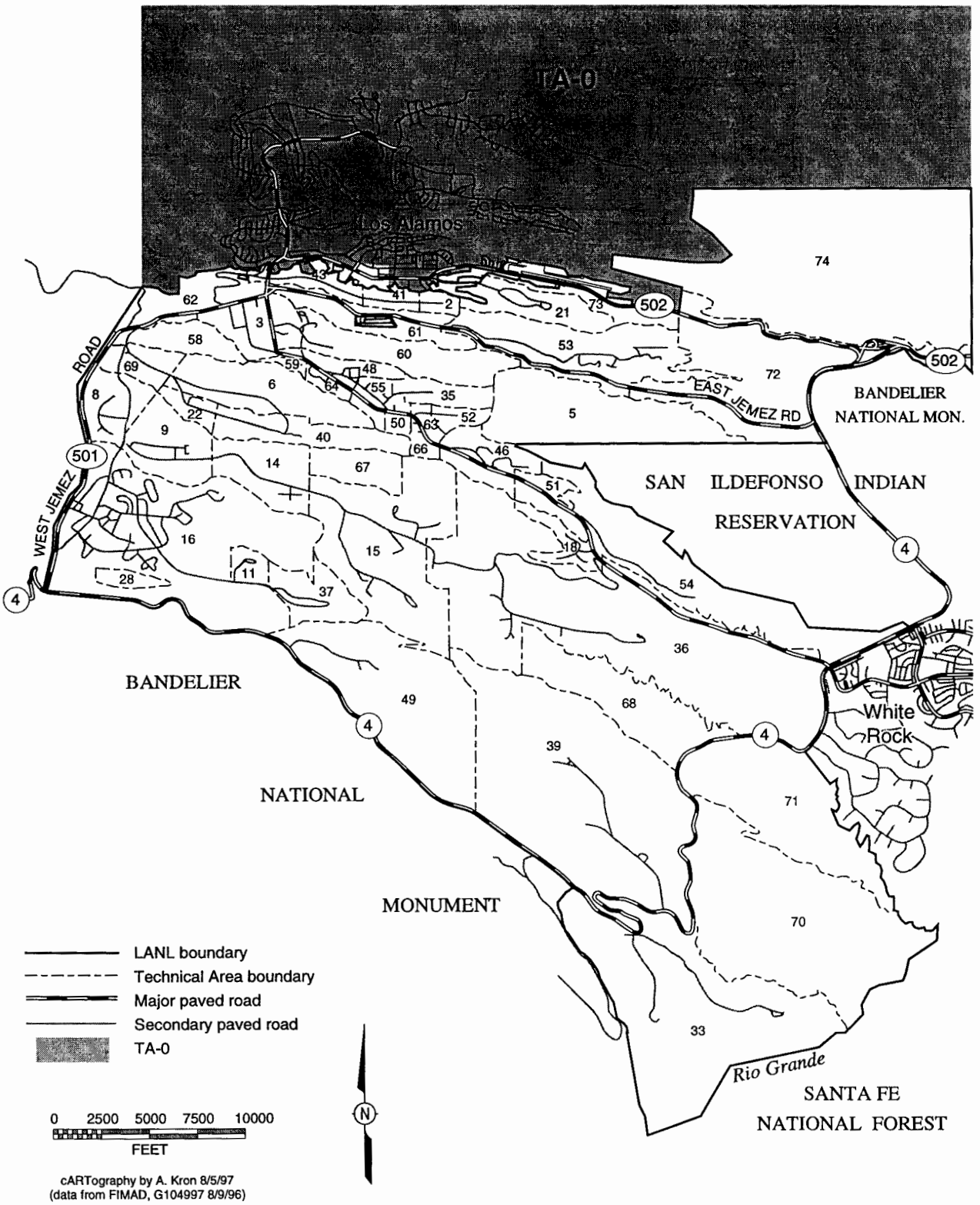

Fig. 1.1-2 Location of TA-0 with respect to Laboratory TAs and surrounding land holdings.

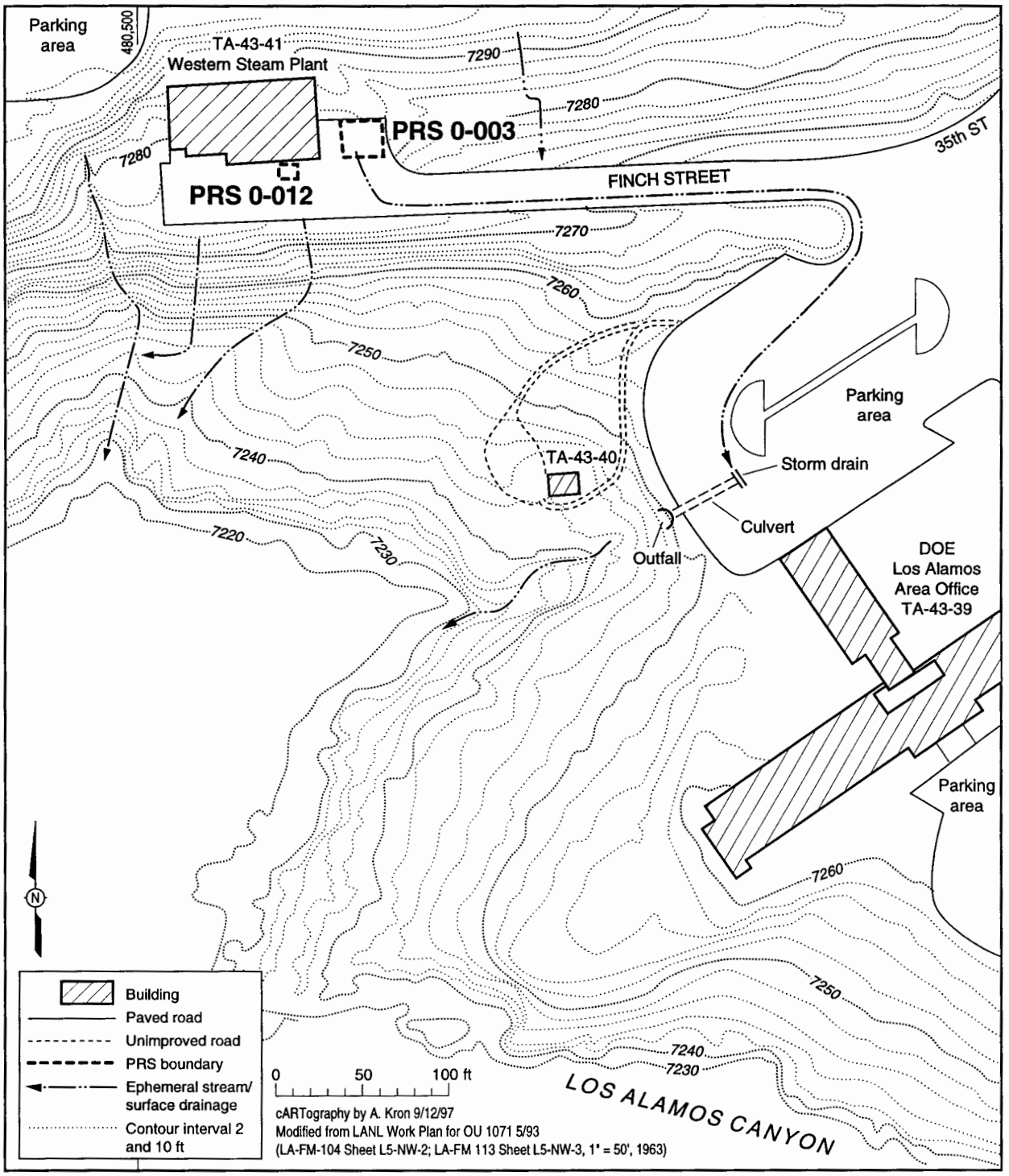

Fig. 1.1-3 Location of PRSs 0-003 and 0-012.

It is unknown how long the product storage area operated but it was decommissioned in 1987 (LANL 1989, 0444; LANL 1990, 0145). During its period of operation, it was known that releases from corroded drums resulted in spillage below the pallets. However, the frequency, content, and volume of these releases were apparently not recorded, nor were the cleanup responses.

The RFI Work Plan for OU 1071 states that PRS 0-012 includes the following (LANL 1992, 0781):

- an underground filtration tank, now identified as the blow-off tank;
- floor drains that discharged to the asphalt street and parking area through three drain pipes and to Los Alamos Canyon through an outfall; and
- a filtration tank outfall to Los Alamos Canyon (National Pollutant Discharge Elimination System [NPDES] permit number 108).

However, the SWMU report states that PRS 0-012 is composed solely of the blow-off tank (LANL 1990, 0145). The floor drains are actually connected to the sanitary sewer system that routes sanitary waste to the Bayo Canyon Wastewater Treatment Plant, and were therefore not a part of this RFI. The drainpipes that discharge to the asphalt street and parking area carry storm water from roof drains. There is no explanation for the existence of the NPDES permit outfall serial number because the construction drawings show the blow-off tank discharging to the sanitary sewer, and during the RFI it was demonstrated to flow through into a nearby active sanitary sewer manhole.

1.2 RFI Overview

The conceptual model for PRSs 0-003 and 0-012 is presented in Chapter 5.1 of the RFI Work Plan for OU 1071 (LANL 1992, 0781). The conceptual model assumes surface contamination and near-surface liquid releases that might result in contamination of the soil, channel sediments, tuff, and/or air. The primary objectives of the RFI were to determine whether contaminants were present at the site and, if so, evaluate whether the site is suitable for residential use.

1.3 Field Activities

Field activities at PRSs 0-003 and 0-012 were conducted in June and July 1997. These activities were conducted according to Chapter 5.1 of the RFI Work Plan for OU 1071 work plan, and they included the following (LANL 1992, 0781):

- Site and geodetic surveys were conducted to determine the locations and boundaries of pertinent site features and any outfall points along the rim of Los Alamos Canyon that may have been associated with the blow-off tank or the container storage area.
- Geomorphologic mapping was conducted to locate sediment catchments in first-order stream channels that originate at or transect the decommissioned container storage area or that carry discharges from the outfall points.
- At PRS 0-012, six sediment samples were collected from sediment catchments in two first-order drainage channels that had developed downslope of the roof-drain outfall and of a pavement drainage point. One water sample was collected from inside the blow-off tank.
- At PRS 0-003, ten subsurface soil samples were collected from four locations.

All applicable LANL Environmental Restoration (ER) standard operating procedures (SOPs) were followed (LANL, 0875).

2.0 ENVIRONMENTAL SETTING

The environmental setting of the Laboratory is described in Section 2.4 of Revision 5 of the ER Installation Work Plan (IWP) (LANL 1995, 1275). A detailed discussion of the environmental setting for TA-0, including climate, geology, hydrology, and a conceptual hydrogeologic model for the area and its surroundings, is presented in the RFI Work Plan for OU 1071 (LANL 1992, 0781). A summary of the environmental setting is presented in the following sections.

2.1 Climate

Los Alamos County has a semiarid, temperate, mountain climate. Summers are generally sunny with moderate, warm days and cool nights. High altitude, light winds, clear skies, and dry atmosphere allow summer temperatures to range from 50°F to 90°F. During the winter, temperatures typically range from 15°F to 50°F. Normal annual precipitation in Los Alamos, including rainfall and water-equivalent snowfall, is 18 in. Of this total, approximately 40% occurs as brief, intense thunderstorms during July and August. Stream flow in canyons can occur as a result of these storms. Spring snowmelt runoff may also induce stream flow in area canyons. Winter snowfall averages 51 in. annually. Wind speeds are less than 2.5 m/s (5.5 mph) about 40% of the time and greater than 5 m/s (11 mph) about 20% of the time. Strong winds occur mainly in the spring. The predominant wind direction is from the south-southwest.

2.2 Geology

2.2.1 Geologic Setting

A detailed discussion of the geology of the entire Los Alamos area can be found in Section 2.5.1.3 of Revision 4 of the IWP (LANL 1995,1164). TA-0 is located on the Pajarito Plateau at an average elevation of approximately 7 300 ft. PRSs 0-003 and 0-012 are located on the south edge of East Mesa and the upper, north slope of Los Alamos Canyon at an elevation of approximately 7 280 ft.

The mesa surfaces at TA-0 are immediately underlain by the Bandelier Tuff of Pleistocene age which occasionally outcrops at the surface and is exposed along all canyon walls. The Bandelier Tuff comprises two units: the Tshirege and Otowi Members. Beneath the Bandelier Tuff is a sequence of interstratified sedimentary and volcanic rocks of Miocene to Pleistocene age (Fig. 2.2.1-1).

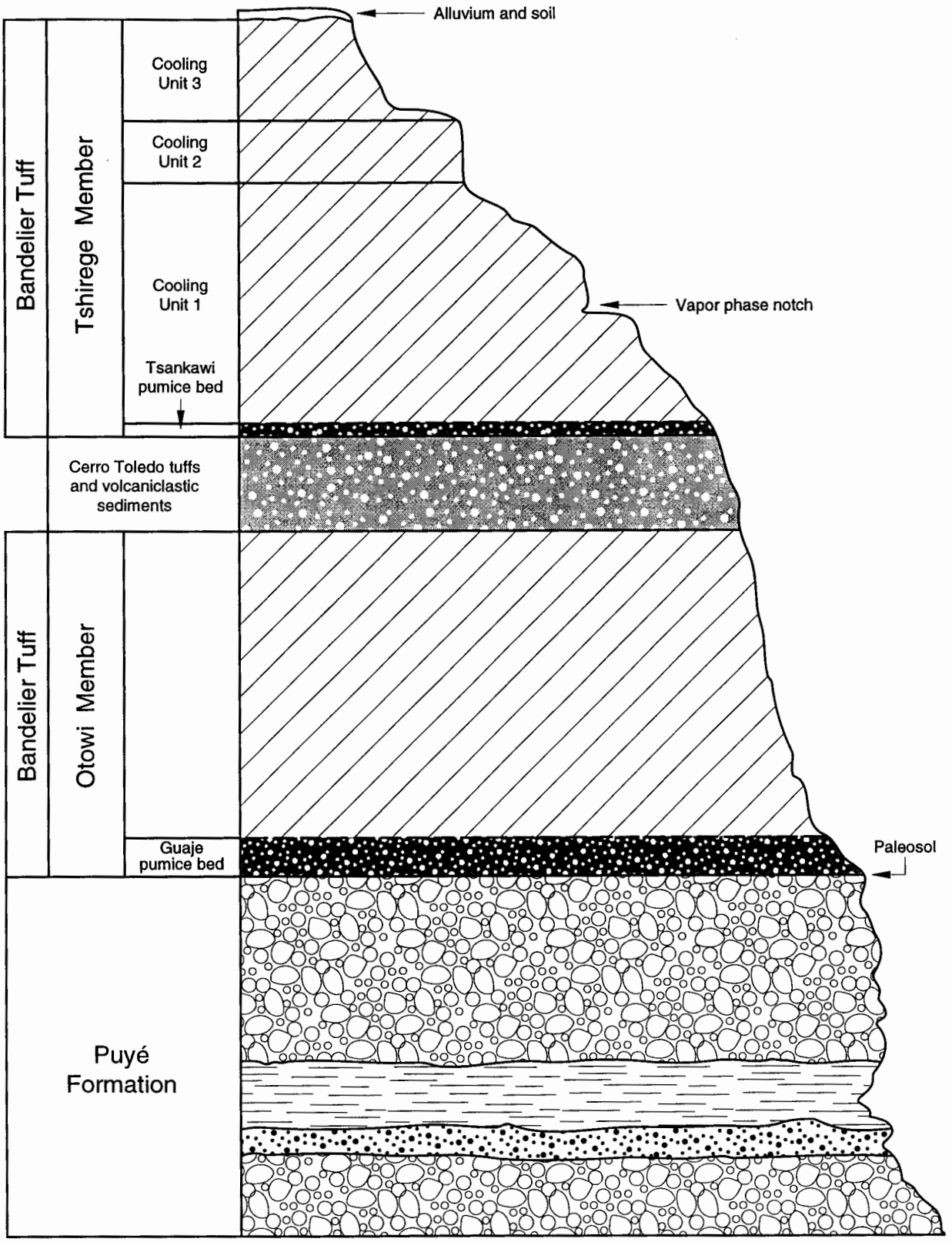

Fig. 2.2.1-1 Generalized Stratigraphy at TA-0.

2.2.2 Soils

A variety of soils have developed in the rocks and sediments in TA-0. Based on a soil survey of Los Alamos County, Nyhan et al. (1978, 0161) described the general character of these soils and their association with rock type, climate, slope, and vegetation.

Most of the moderately to well-developed soils that occur in TA-0 are present on the gently sloping surfaces of the mesa tops at elevations between 6 900 and 7 500 ft. These soils have primarily formed on Bandelier Tuff and possess one or more Bt subhorizons, which have relatively large amounts of clay and exhibit reddish hues and chromas.

Soils in the vicinity of the Western Steam Plant are composed of colluvium and fill material. Construction of the facility necessitated a great deal of cut and fill activity, thereby leaving very little if any of the original soil profile. At best, the existing soils are weakly developed with a thin A horizon, possibly darkened by the accumulation of humic material. In general, the existing soils are very sandy with abundant gravel and cobbles.

2.3 Hydrology

2.3.1 Surface water

PRSs 0-003 and 0-012 are located near the north edge of Los Alamos Canyon, approximately 170 ft above and 700 ft north of the canyon floor. Surface drainage from these PRSs flows directly south into the canyon via ephemeral, first order drainage channels arising at or near the steam plant. It is likely that very little runoff from this area actually reaches the canyon floor as it quickly infiltrates colluvium mantling the canyon slopes.

2.3.2 Groundwater

The main aquifer beneath TA-0 is at a elevation of approximately 6 000 ft (determined in Test Well 2 in Pueblo Canyon, and in Otowi 4 in Los Alamos Canyon), within sediments of the Puyé and Tesuque Formations (Purtymun 1995, 1293; Broxton and Eller 1995, 1162). Thus, for mesa-top sites at TA-0, some 1 300 ft of tuff and volcaniclastic sediments separate the surface from the main aquifer. In addition to the main aquifer, shallow alluvial aquifers are present in sediments of both Los Alamos Canyon and DP Canyon (Broxton and Eller 1995, 1162).

2.4 Biological Surveys

Comprehensive plant and animal inventories are required by the Federal Endangered Species Act of 1973; the New Mexico Wildlife Conservation Act; Executive Order 11990, "Protection of Wetlands;" Executive Order 11988, "Floodplain Management;" 10 CFR 1022; Compliance with Floodplain/Wetlands Environmental Review Requirements (DOE 1979, 0633), and DOE Order 5400.1, "General Environmental Protection Program" (DOE 1988, 0075).

The surface of East Mesa has undergone heavy commercial and urban development. Comprehensive plant and animal inventories were not performed for the mesa top because it is heavily developed. The wildlife habitats on the mesa top can be characterized as urban plant and animal communities.

2.5 Cultural Surveys

As required by the National Historic Preservation Act of 1966 (amended), a cultural resource survey was conducted at OU 1071 during the summer of 1991 (McGehee et al. in preparation, 0611). The methods and techniques used for this survey conform to those specified in the Secretary of the Interior's standards and guidelines for archeology and historic preservation.

There are no archeological sites in the area of PRSs 0-003 and 0-012 that are eligible for inclusion in the National Register of Historic Places under Criterion D.

3.0 APPROACH TO DATA ASSESSMENT AND ANALYSIS

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

- sampling and analysis design,
- field investigation and collection of field and quality assurance (QA) samples,
- chemical and radiochemical analyses of samples and reporting of analytical data,
- baseline verification and validation of analytical data,
- organization of field and analytical data into PRS-specific data sets,
- exploratory data analysis,

- focused validation when necessary to further assess questionable data,
- comparison of validated analytical results with LANL background data,
- comparison of validated analytical results with screening action levels (SALs),
- evaluation of sufficiency of data sets to support site decisions, and
- assessment of human health risk.

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

3.1 Sample Analysis

Samples were collected in accordance with the sampling design specified in the RFI Work Plan for OU 1071 (LANL 1992, 0781). Samples were submitted to the TA-21 radiological analytical laboratory and the sample management office (SMO).

3.1.1 Analytical Methods

The following analytical suites were used for the sample analyses in this RFI report: target analyte list (TAL) metals, semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), and pesticides/polychlorinated biphenyls (PCBs). A list of the target analytes for which analyses were performed for the purpose of this report can be found in Appendix A.

All samples were analyzed by contract analytical laboratories using methods specified in ER SMO analytical subcontracts (LANL 1995, 1278). The allowed methods are current Environmental Protection Agency (EPA) SW-846 and Contract Laboratory Program (CLP) methods or equivalent for TAL metals, SVOCs, VOCs, and pesticides/PCBs. Prior to analysis for TAL metals, solid samples were digested according to EPA SW-846 Method 3050 or equivalent (EPA 1992, 1207). The subcontracts specify LANL-approved methods for radiochemical analyses according to the technologies identified in the subcontract (e.g., americium-241 by alpha spectroscopy, tritium by liquid scintillation, or multiple gamma-emitting isotopes by gamma spectroscopy). Analytical method selection is described in Appendix IV of the ER Project Quality Assurance Project Plan Requirements for Sampling and Analysis (QAPP), which is included as Chapter 4 of Revision 6 of the LANL IWP (LANL 1996, 1379). For each analyte, quantitation or detection limits are specified as contract-required estimated quantitation limits (EQLs) for organic

chemicals and radionuclides and estimated detection limits (EDLs) for inorganic chemicals. These limits are included in Appendix III of the ER Project QAPP along with the target analytes for each analytical suite.

3.1.2 Data Validation

Data verification and baseline validation procedures were used to determine whether data packages received from the analytical laboratory were generated according to specifications and contain the information necessary to determine data sufficiency for decision-making. For analytical data used for decisions discussed in this RFI report, baseline data validation under the ER protocol was performed as described in the QAPP (LANL 1996, 1379).

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

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

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

- "A" signifies that the data required for data review and evaluation are not available.
- "U" signifies that the analyte was not positively identified in the sample, and the associated value is the sample-specific EQL/EDL.
- "J" signifies that the analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.
- "J+" signifies that the analyte was positively identified, and the result is likely to be biased high.

- "J-" signifies that the analyte was positively identified, and the result is likely to be biased low.
- "UJ" signifies that the analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific EQL/EDL.
- "RPM" signifies that without further review of the raw data, the sample results are unusable due to serious deficiencies in the ability to analyze the sample and meet quality control criteria. Presence or absence cannot be verified. Any results qualified as RPM must be evaluated for relevance to data use.
- "P" signifies that professional judgment should be applied to using the data in decision-making.
- "PM" signifies that professional judgment should be applied to using the data in decision-making. A manual review of raw data is recommended to determine if the defect impacts data use for decision-making.
- "R" signifies that the data are rejected as a result of major problems with quality assurance/quality control (QA/QC) parameters.

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

- The data are qualified as deficient or as requiring professional judgment during the verification/baseline validation process. For example, when holding times are exceeded or interferences are present, a focused validation may be required to assist in determining data adequacy for the intended use.
- The data quality assessment process requires additional information about (1) the variability or uncertainty of the reported data, or (2) data quality prior to making a data-use decision because of anomalies detected in a data set.

Details of QA/QC activities are presented in Chapter 4 of this RFI report. Qualifiers resulting from baseline and focused validation are shown in the analytical results tables included in

Chapter 5 of this report. Summaries of data quality evaluations and focused validation of analytical data relevant to this report are given in Appendix B. The RPM, P, and PM qualifiers do not appear in Chapter 5 data tables, nor in Appendix B, because they are replaced during focused validation according to the data use.

Laboratory contaminants are sometimes found in method blanks used by the analytical laboratories during organic analyses. When this occurs, there is a potential for samples to also be contaminated. To account for method blank contamination in samples, the "10 times" and "5 times" rules are applied as described in the Environmental Protection Agency (EPA) document "Contract Laboratory Program National Functional Guidelines for Organic Data Review" (EPA 1994, 1205). The "10 times" rule states that when a common laboratory contaminant is found in the method blank, any values of that analyte detected in the samples at levels less than 10 times the method blank concentration should be considered nondetected and a U qualifier should be added to the data. Common laboratory contaminants for VOC analysis include acetone, methylene chloride, and 2-butanone; common laboratory contaminants for SVOC analysis include the common phthalates. The "5 times" rule states that when an analyte that is not a common laboratory contaminant is found in the method blank, any values of that analyte detected in the samples at levels less than 5 times the method blank concentration should be considered nondetected and a U qualifier should be added to the data. These rules were used in addressing the data for PRSs 0-003 and 0-012 as discussed in Section 4.0 of this report.

3.2 Background Comparisons

3.2.1 Inorganic Chemicals

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

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

The RFI data considered in this report were collected from soil. The ER Project procedure is to make comparisons of PRS data to the most geologically relevant subset of the LANL-wide

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

Further statistical tests are used for background comparisons when sufficient data are available. When site data contain several nondetects and/or do not appear to satisfy normality assumptions, nonparametric tests are used for further background comparisons. The Gehan modification to the Wilcoxon Rank Sum test and the Quantile test, both of which account for nondetects, are used for these evaluations. The Gehan test is best suited for assessing complete shifts in distribution in a statistically robust manner, whereas the Quantile test is better suited for assessing shifts of a subset of the data. Between the two tests, most types of differences between distributions can be captured. Detailed information on selecting statistical tests is presented in the guidance document "Application of LANL Background Data to ER Project Decision-Making, Part I: Inorganics," EM/ER:96-PCT-010 (Project Consistency Team, 1210; Ryti et al. 1996, 1298). Observed significance levels (p-values) for these tests are presented in Sections 5.1.5 and 5.2.5 of this report. If a p-value is less than a specified probability, typically 0.05 or 5%, then there is some reason to suspect that there is a difference between the background and site distributions; otherwise, no difference is indicated. The results of these statistical tests, when available, are used in addition to the results of the comparison with background screening values to determine whether a chemical is considered greater than background.

3.2.2 Radionuclides

No radionuclide analyses were requested for samples collected at PRSs 0-003 and 0-012.

3.2.3 Organic Chemicals

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

3.2.4 Risk-Based Screening Assessment

Inorganic chemicals and radionuclides that exceed background and organic chemicals positively identified in one or more samples require further evaluation if they also exceed SALs. SALs for nonradioactive chemicals are based on EPA Region 9 preliminary remediation goals (PRGs) for residential soil. The decision to identify a chemical as a COPC when a SAL is not available is made on a case-by-case basis, taking into account the availability of process knowledge and toxicological information.

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

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

3.3 Human Health Assessment

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

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

Background risk estimates provided in Table 3.3.1-1 were calculated using the same exposure assumptions by which SALs are calculated. SALs are based on health-protective assumptions for a residential scenario (EPA 1995, 1307). For soil exposure, the pathways include incidental soil ingestion, inhalation of resuspended dust, and dermal contact with soil. The background soil data used for these calculations were collected from several soil horizons at geographically diverse locations. Background risks are estimated for two statistics. One statistic is the median, which represents the midpoint in the concentration range (technically, the median is the concentration value that divides the results into two equal groups or where half of the data are above and half are below this value). The second statistic represents the upper range on background concentration values, and is either a calculated UTL or a maximum concentration value. (UTLs and maximum concentration values are identical to those described in Section 3.2.1, Inorganic Chemicals.)

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

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

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

3.3.2 Risk Assessment

No risk assessment was conducted for PRSs 0-003 and 0-012.

TABLE 3.3.1-1

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

INORGANIC CHEMICAL	BACKGROUND SOIL CONCENTRATION[b] (mg/kg)		HAZARD QUOTIENT		LIFETIME CANCER RISK	
	MEDIAN	UTL	MEDIAN	UTL	MEDIAN	UTL
Aluminum	10 000	38 700	0.1	0.5	NC[c]	NC
Antimony	0.6	1[d]	0.02	0.03	NC	NC
Arsenic	4	7.82	0.2	0.4	1×10^{-5}	42×10^{-5}
Barium	130	315	0.03	0.06	NC	NC
Beryllium	0.895	1.95	0.003	0.006	6×10^{-6}	1×10^{-5}
Cadmium[e]	0.2	2.6[d]	0.005	0.07	1×10^{-10}	2×10^{-9}
Chromium[f]	8.6	19.3	9.0×10^{-5}	0.0002	NC	NC
Cobalt	6	19.2	0.001	0.004	NC	NC
Copper	5.75	15.5	0.002	0.01	NC	NC
Lead[g]	12	23.3	0.03	0.06	NC	NC
Manganese	320	714	0.8	1.9	NC	NC
Mercury	0.05	0.1[d]	0.002	0.004	NC	NC
Nickel	7	15.2	0.005	0.01	NC	NC
Selenium	0.3	1.7[d]	0.0008	0.005	NC	NC
Thallium	0.2	1[d]	0.03	0.2	NC	NC
Uranium	0.9	1.87	0.004	0.008	NC	NC
Vanadium	21	41.9	0.04	0.08	NC	NC
Zinc	30.7	50.8	0.001	0.002	NC	NC

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

3.4 Ecological Assessment

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

4.0 RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

4.1 Inorganic Analyses

Nine soil samples from PRSs 0-003 and 0-012 were analyzed for TAL metals in request 3287R. All QC parameters were met for this analysis in this request. All data are valid and usable and no qualifiers were added.

Seven soil samples from PRS 0-003 were analyzed for TAL metals in request 3301R. All QC parameters were met for this request with one exception. Antimony (68%) and manganese (70%) had low recoveries in the matrix spike sample. Matrix spikes are samples to which known quantities of analytes are added, and they are used to assess the quality of sample digestion, extraction, and analysis. Low recoveries of analytes in matrix spikes suggest that either there was incomplete recovery of an analyte in these procedures or sample heterogeneity. Post-digestion spikes, which are used to assess the quality of sample extraction and analysis, were also performed for antimony and manganese. The recoveries for antimony and manganese in the post-digestion spikes were within the limits allowed in the EPA SW846 methodology (EPA 1992, 1207). As required in LANL data validation guidelines, UJ or J- qualifiers were added to all antimony and manganese data in this request. All data are valid and usable as qualified.

One water sample from PRS 0-012 was analyzed for TAL metals in request 3322R. All QC parameters were met for this request with one exception. Arsenic (60%) had a low recovery in the matrix spike sample. A post-digestion spike was also performed for arsenic. The arsenic recovery for the post-digestion spike was within the limits allowed in the EPA SW846 methodology (EPA 1992, 1207). As required in LANL data validation guidelines, a UJ qualifier was added to the arsenic data for this request. All data are valid and usable as qualified.

4.2 Organic Analyses

Volatile Organic Compounds. Three soil samples were analyzed for VOCs in request 3286R. All QC parameters were met for this request with one exception. Acetone (10 µg/kg) was found in the method blanks. Because acetone is a common laboratory contaminant, the "10 times" rule was applied as described in Section 3.1.2 of this report. Based on this rule, U qualifiers were added to all acetone values detected at less than 10 times the blank value for all samples in this request. All data are valid and usable as qualified.

Seven soil samples from PRS 0-003 were analyzed for VOCs in request 3300R. All QC parameters were met for this request with one exception. The last internal standard for samples 0100-97-0165 and 0100-97-0166 was outside the ranges allowed by the EPA guidance document "Contract Laboratory Program National Functional Guidelines for Organic Data Review" (EPA 1994, 1205). Internal standards are added to samples to assess instrument performance during the analytical procedure. Standards outside the allowed ranges indicate that the results might be affected by matrix interference from a sample or a change in instrument response. Samples 0100-97-0165 and 0100-97-0166 were reanalyzed with similar results, indicating that matrix interferences were causing the internal standard problem. A UJ or J qualifier was added to all analytes associated with the internal standard. Associated analytes are those analytes which are in close proximity to the internal standard on the chromatogram. All data are valid and usable as qualified.

One water sample from PRS 0-012 was analyzed for VOCs in request 3321R. All QC parameters were met for this request with one exception. Acetone (2 µg/L) and methylene chloride (5 µg/L) were found in the method blanks. Because acetone and methylene chloride are common laboratory contaminants, the "10 times" rule was applied as described in Section 3.1.2 of this report. Based on this rule, U qualifiers were added to all acetone and methylene chloride values detected at less than 10 times the blank value for all samples in this request. All data are valid and usable as qualified.

Semivolatile Organic Compounds. Nine soil samples were analyzed for SVOCs in request 3286R. All QC parameters were met for this analysis in this request. However, there were matrix problems which required dilution of several samples, resulting in elevated detection limits. All data are valid and usable and no qualifiers were added.

Seven soil samples from PRS 0-003 were analyzed for SVOCs in request 3300R. All QC parameters were met for this analysis in this request. All data are valid and usable and no qualifiers were added.

One water sample from PRS 0-012 was analyzed for SVOCs in request 3391R. The only QC problem with this request was that di-n-butylphthalate (1 µg/L) and bis(2-ethylhexyl)phthalate (2 µg/L) were found in the method blanks. Because di-n-butylphthalate and bis(2-ethylhexyl)phthalate are common laboratory contaminants, the "10 times" rule was applied as described in Section 3.1.2 of this report. Based on this rule, U qualifiers were added to all di-n-butylphthalate and bis(2-ethylhexyl)phthalate values detected at less than 10 times the blank value for all samples in this request. All data are valid and usable as qualified.

Pesticides/PCBs. Nine soil samples from PRSs 0-003 and 0-012 were analyzed for pesticides/PCBs in request 3286R. All QC parameters were met for this request with one exception. For sample 0100-97-0151 there was a low recovery (45%) for the surrogate tetrachloro-m-xylene. Surrogates are added to the samples before extraction and are a measure of the efficiency of the extraction process. Surrogate recoveries can be affected by sample matrix interferences and high analyte concentrations. As required in the LANL data validation guidelines, UJ or J- qualifiers were added to all analytes in this sample. All data are valid and usable as qualified.

Seven soil samples from PRS 0-003 were analyzed for pesticides/PCBs in request 3300R. All QC parameters were met for this analysis in this request. All data are valid and usable and no qualifiers were added.

One water sample from PRS 0-012 was analyzed for pesticides/PCBs in request 3321R. All QC parameters were met for this analysis in this request. All data are valid and usable and no qualifiers were added.

4.3 Radiochemistry Analyses

No radiological analyses were performed for PRSs 0-003 an 0-012.

5.0 SPECIFIC RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

5.1 PRS 0-003

PRS 0-003 is a former container storage area. No chemicals were retained as COPCs after the risk-based screening assessment for this site. PRS 0-003 is therefore recommended for NFA. No ecological assessment was performed; all conclusions, decisions, and recommendations presented in this report are based solely on human health assessments.

5.1.1 History

PRS 0-003 is a former product container storage area used to store 55-gallon steel drums containing chemicals used to treat boiler water. The drums were placed on wooden pallets. This site was decommissioned in 1987. The RFI Work Plan for OU 1071 suggests that waste oil and algaecides, which may have been used to treat boiler feed water, were stored in the 55-gallon steel drums (LANL 1992, 0781). However, algaecides were not used for treating boiler feed water (Francis 1997, 05-0258) and there is no documentation that waste oil was ever stored in this area.

It was determined that sodium hydroxide and hexameta phosphate were added to the boiler feed water until a pH of 10 to 10.5 was maintained (Francis 1997, 05-0258). This was done to prevent the build-up of calcium carbonate and magnesium carbonate on the heated boiler metal. An oxygen scavenger (sodium sulphite) was also used. Chelating compounds (organic acids of unknown composition) were used sparingly, as needed. These chemicals were stored in 55-gallon steel drums in the container storage area. There were known releases from corroded drums; however, there is no specific information available regarding the frequency or magnitude of these releases or subsequent cleanups (LANL 1990, 0145).

5.1.2 Description

The container storage area was an approximately 100-ft^2 paved area (LANL 1990, 0145) located at the east end of the Western Steam Plant on the southern boundary of TA-0. The paved area currently contains numerous cracks but there is no staining or other evidence of past leaks or spills. The area is situated on the upper slope of Los Alamos Canyon, surrounded to the west, north, and east by developed areas.

5.1.3 Previous Investigation

No previous investigations were conducted at PRS 0-003.

5.1.4 Field Investigations

Field activities at PRS 0-003 were conducted in June and July 1997. These activities were conducted according to Chapter 5.1 of the RFI Work Plan for OU 1071, and all applicable LANL ER SOPs were followed (LANL 1992, 0781; LANL, 0875).

A site survey was conducted to determine the location and boundaries of the container storage area and any outfall points along the rim of Los Alamos Canyon that may have received runoff from the area. The location of the container storage area was described in the work plan, and only a single surface water drainage channel that potentially received runoff from this area and the other areas surrounding the steam plant could be located along the rim of the canyon. At this location, a low spot in the curb along the canyon side of the street allows surface runoff during major storm events to overflow down the embankment and enter the head of this drainage channel. This channel was examined for sediment catchments as part of the geomorphologic mapping task and was sampled as part of the PRS 0-012 investigation (Section 5.2.4). However, the majority of the runoff from the container storage area flows east along Finch Street, contained on the asphalt by the curb. It then flows south through the DOE LAAO parking lot to a storm drain that discharges to Los Alamos Canyon through a culvert that is approximately 50-ft long. This outfall was not sampled because of its distance from the container storage area (about 800 ft of asphalt paving) and the possibility that any contamination found at the outfall could have originated from other sources in this developed area such as polycyclic aromatic hydrocarbons (PAHs) from asphalt and vehicle emissions and leaks.

A total of ten subsurface soil samples were collected beneath the asphalt at four locations. These locations were selected to coincide with areas of severely cracked asphalt pavement, which were the areas of greatest potential for soil contamination. There were no stained areas or other indicators of potential leaks or spills to use in selecting sampling locations.

At each of the four locations, the asphalt was chipped away to expose the underlying base course, which was composed of sand and abundant quartzite gravel and cobbles. The upper two to three inches of base course were stained black, probably because the material was in contact with the deteriorating asphalt and was covered with a prime coat before the asphalt was laid. The base course material was also removed, and the first samples were collected from the 0.4- to 0.9-ft interval. Hand augering continued without additional sample collection at each location to a depth of 2.5 to 2.6 ft, and cuttings were visually screened for evidence of contamination. No evidence of contamination was noted and a second sample was collected at each location from the approximate 2.5- to 3.0-ft interval. The cuttings and deeper sample

intervals were still composed predominantly of sand and quartzite gravel and cobbles. Two duplicate samples were collected for QA purposes.

Sample locations are presented on Fig. 5.1.4-1. Information about the sample depth, analyses conducted, and request numbers for each sample collected at PRS 0-003 is summarized in Table 5.1.4-1.

All samples were screened in the field for radioactivity and VOCs to ensure worker health and safety and to help direct the sampling effort. All samples were also screened at the TA-21 radiological analytical laboratory to meet transportation and analytical laboratory acceptance criteria. The results of screening for radiation indicated no detectable activity and no VOCs were detected.

A geodetic survey was conducted to document the sampling locations at PRS 0-003. All sampling locations were recorded in New Mexico state plane coordinates and location identification numbers were assigned for entry into the Facility for Information Management, Analysis, and Display (FIMAD) database system.

Deviations. In general, the planned activities outlined in the RFI Work Plan for OU 1071 were completed (LANL 1992, 0781). However, the following deviations occurred:

- Boreholes were advanced using hand-held equipment as opposed to a drill rig. This deviation did not affect achievement of the objectives.
- The shallow sample at each of the four locations was not collected from the uppermost 6 in. directly beneath the pavement. As stated earlier, the nature of the uppermost 2 to 3 in. of base course directly below the asphalt prompted its removal before sampling. This eliminated most of the material affected by the asphalting process, and increased the probability that potential contamination originating from the container storage area would be detected. Therefore, this deviation did not affect achievement of the objectives.
- The analytical suite listed in the work plan called for analysis of SVOCs, TAL metals, toxicity characteristic leaching procedure (TCLP) metals, and PCBs/pesticides in all samples. Gamma spectrometry was also to be

analyzed in part or all of the samples. However, TCLP metals analyses were not conducted until the TAL metals results were received. Gamma spectrometry analysis was not conducted because the radiation screening results showed no elevated activity and because no radiological contamination was expected at the site. In addition, VOCs were added to the analyte list because of the uncertainty regarding the identity of the materials stored in the container storage area. These deviations did not affect achievement of the objectives. Adding VOC analyses provided a better characterization of the site.

TABLE 5.1.4-1

SUMMARY OF SAMPLES COLLECTED AT PRS 0-003

LOCATION ID	SAMPLE ID	DEPTH (ft.)	MATRIX	RAD SCREENING[a]	VOCs	SVOCs	PESTICIDES/ PCBs	METALS
				REQUEST NUMBER				
00-05917	0100-97-0157	0.4–0.9	Soil	TA-21	3286R	3286R	3286R	3287R
00-05917	0100-97-0165	2.5–3.0	Soil	TA-21	3300R	3300R	3300R	3301R
00-05917	0100-97-0166	2.5–3.0	Soil	TA-21	3300R	3300R	3300R	3301R
00-05918	0100-97-0159	0.4–0.9	Soil	TA-21	3286R	3286R	3286R	3287R
00-05918	0100-97-0161	2.5–3.0	Soil	TA-21	3300R	3300R	3300R	3301R
00-05919	0100-97-0160	0.4–0.9	Soil	TA-21	3286R	3286R	3286R	3287R
00-05919	0100-97-0164	2.5–3.0	Soil	TA-21	3300R	3300R	3300R	3301R
00-05920	0100-97-0162	0.4–0.9	Soil	TA-21	3300R	3300R	3300R	3301R
00-05920	0100-97-0163	2.6–3.1	Soil	TA-21	3300R	3300R	3300R	3301R
00-05920	0100-97-0195	0.4–0.9	Soil	TA-21	3300R	3300R	3300R	3301R

[a] Radiological screening was conducted at the TA-21 Radiological Analytical Laboratory to meet transportation and analytical laboratory acceptance criteria.

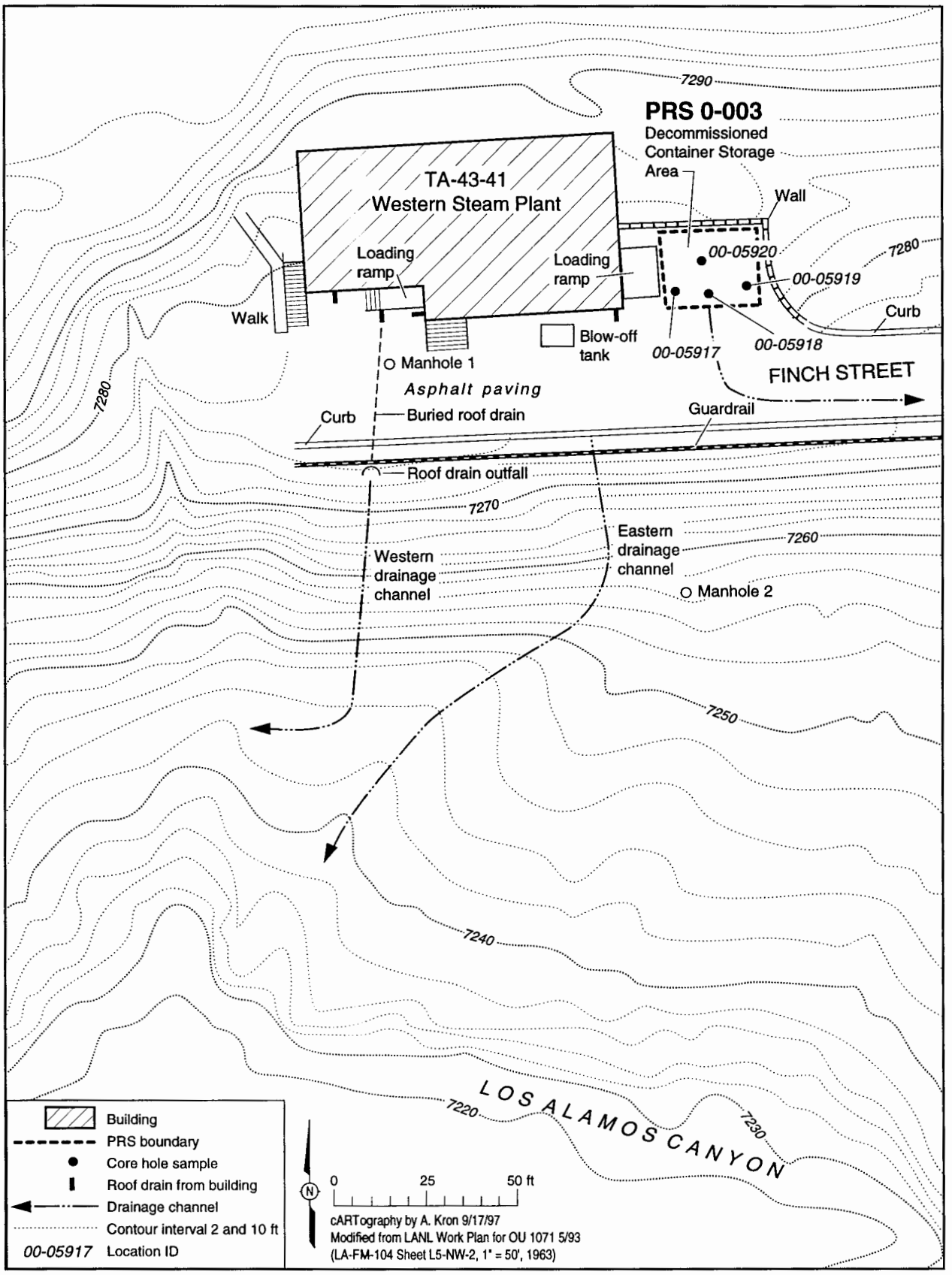

Fig. 5.1.4-1 Locations of samples collected at PRS 0-003.

5.1.5 Evaluation of Inorganics

Ten soil samples collected at PRS 0-003 were analyzed for TAL metals. Each inorganic soil result was compared to the all-soil-data background screening value (Longmire et al. 1995, 1142; Longmire et al. 1995, 1266).

As discussed in Section 4.1.1, manganese data were qualified J- in seven out of ten samples because of a low recovery in the matrix spike sample. A low recovery suggests either incomplete recovery of an analyte in these procedures or sample heterogeneity. The maximum concentration of 530 mg/kg is J- qualified. This value is below the background screening value of 714 mg/kg. The second highest value of manganese, 390 mg/kg, is also J- qualified. The manganese values in the other eight samples, three of which were not qualified, are all less than half the UTL. All of the reported manganese concentrations are consistent, and samples were collected from locations where the highest contamination was expected; therefore, a possible low bias does not indicate that manganese is present at levels exceeding background. Manganese is eliminated as a COPC and is not evaluated further.

Three inorganics, calcium, lead, and sodium, were detected at levels exceeding background screening values in at least one soil sample. Further background comparisons were not performed for calcium, lead, and sodium because the number of site samples for these metals are inadequate to support other statistical tests. Therefore, calcium, lead, and sodium are carried forward to the screening assessment. The data for the sample that had at least one concentration exceeding the background screening value for these three inorganics are shown in Table 5.1.5-1. The location where these inorganics were detected at levels exceeding background screening values is shown on Fig. 5.1.5-1.

TABLE 5.1.5-1

INORGANIC CHEMICALS WITH CONCENTRATIONS EXCEEDING BACKGROUND SCREENING VALUES IN SOIL AT PRS 0-003[a]

LOCATION ID	DEPTH (ft)	SAMPLE ID	CALCIUM	LEAD	SODIUM
		SAL	N/A[b]	400	N/A
		UTL	6 120	23.3	915
00-05917	0.4–0.9	0100-97-0157	**20 500**	**36.9**	**1 030**

[a] Values in bold exceed the UTL. Units are in mg/kg.
[b] N/A = Not available.

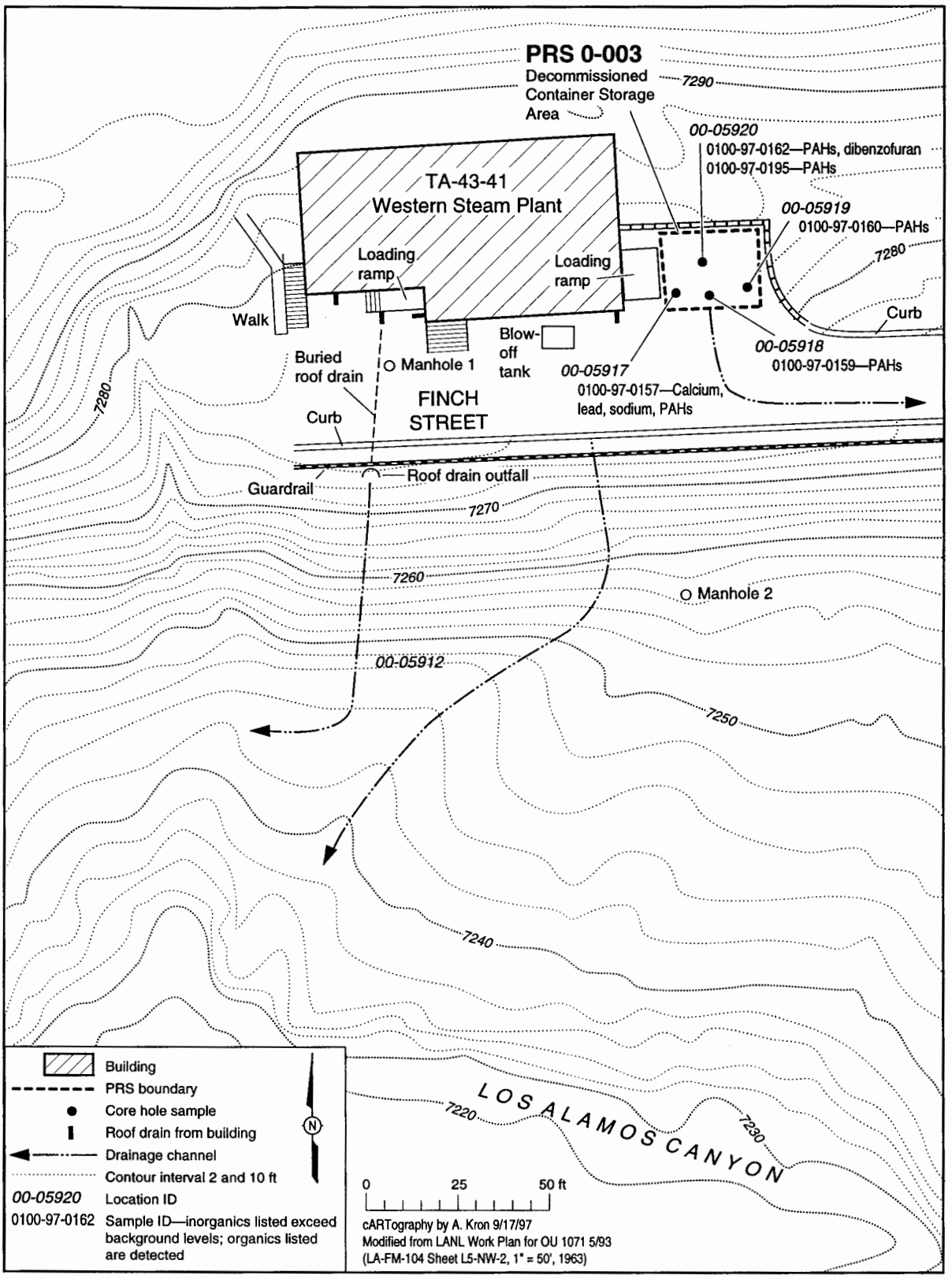

Fig. 5.1.5-1 Location where inorganics were detected at levels exceeding background screening values and organics were detected at PRS 0-003.

5.1.6 Evaluation of Radionuclides

Samples collected at PRS 0-003 were not analyzed for radionuclides as noted in Section 5.1.4 because radiological contamination was not expected at the site and no elevated radioactivity was observed in the field or at the TA-21 radiological analytical laboratory. Therefore, no radionuclides are carried forward to the human health screening assessment.

5.1.7 Evaluation of Organic Chemicals

Ten soil samples collected at PRS 0-003 were analyzed for a suite of SVOCs, VOCs, and pesticides/PCBs. No VOCs or pesticides/PCBs were detected in the soil samples.

As discussed in Section 4.1.2, three of the soil samples analyzed for PRS 0-003 had matrix problems in the analysis. These matrix problems required the dilution of several samples, which resulted in elevated detection limits for some of the SVOCs. Because most of the SVOCs with elevated detection limits were reported as detected in at least one of these three samples, and the other seven samples did not have elevated detection limits, the SVOCs that were detected are further evaluated in this section or in the human health screening assessment.

Fifteen SVOCs were detected in at least one soil sample. Additionally, the analytical laboratory reported the combination of benzo(b)fluoranthene and benzo(k)fluoranthene as benzo(b+k)fluoranthene in three samples.

Of the sixteen organic chemicals detected, 15 are PAHs. The PAHs detected in samples from PRS 0-003 were not included in the screening assessment because they are not believed to be associated with a release from this PRS. This decision was based on the following:

- At each of the four locations, the asphalt was cracked and was chipped away to expose the underlying base course material. The upper 2 to 3 in. of base course were stained black, probably because the material was in contact with the deteriorating asphalt and was covered with a prime coat before the asphalt was laid. Although this base course material was removed before the first samples were collected from the 0.4- to 0.9-ft interval, it is probable that the shallow samples contained some minute asphalt fragments or some of the stained base course material.

- Each PAH detected in the 0.4- to 0.9-in. interval was not detected in the next deeper 2.5- to 3.0-ft or 2.6- to 3.1-ft interval. Therefore, this

contamination is very shallow and consistent with having come from the asphalt or base course material.

Although it is not appropriate to evaluate the potential human health risks associated with these PAHs within the same framework as chemicals potentially released from a PRS, it is appropriate to provide some estimate of potential health risks so that the need for action can be assessed either within or outside of the RCRA corrective action process. These risk estimates are screening-level in nature, and were calculated using the US EPA Region 9 PRGs for residential soil as shown in Appendix C. The sample results reported for benzo(b+k)fluoranthene were included in the separate calculations for benzo(b)fluoranthene and benzo(k)fluoranthene. The total carcinogenic risk or hazard index (for noncarcinogenic chemicals) was estimated by summing the risk or hazard index for each detected chemical. The data for the detected PAHs are presented in Table 5.1.7-1.

TABLE 5.1.7-1

DETECTED PAH CONCENTRATIONS AT PRS 0-003[a]

	LOCATION ID	00-05917	00-05918	00-05919	00-05920	00-05920
	SAMPLE ID	0100-97-0157	0100-97-0159	0100-97-0160	0100-97-0162	0100-97-0195
	DEPTH (ft)	0.4–0.9	0.4–0.9	0.4–0.9	0.4–0.9	0.4–0.9
ANALYTE	SAL					
Acenaphthene	2 200	**3.7 J**	**0.55 J**	1.8 U	**1.7**	0.35 U
Anthracene	18 000	20 U	**1.2 J**	**0.33 J**	**4.6**	**1.2**
Benzo(a)anthracene	0.61	**13 J**	**3.5 J**	**1.2 J**	**11**	**3.3**
Benzo(a)pyrene	0.061	**11 J**	**3.2 J**	**0.93 J**	**8.9**	**2.9**
Benzo(b&k)fluoranthene	0.61	**22**	**6.8**	**1.8**	N/A	N/A
Benzo(b)fluoranthene	0.61	N/A [b]	N/A	N/A	**9.2**	**2.6**
Benzo(g,h,i)perylene	1 900	**4.1 J**	**0.91 J**	**0.37 J**	**6.2**	**2**
Benzo(k)fluoranthene	6.1	N/A	N/A	N/A	**4.2**	**2.3**
Carbazole	22	**3.5 J**	**0.48 J**	1.8 U	N/A	N/A
Chrysene	61	**13 J**	**3.3 J**	**1.1 J**	**12**	**3.9**
Dibenzo(a,h)anthracene	0.061	20 U	3.8 U	1.8 U	**2.1**	**0.75**
Fluoranthene	2 600	**43**	**10**	**2.9**	**28**	**8.7**
Fluorene	2 300	**3.5 J**	**0.43 J**	1.8 U	**1.8**	0.35 U
Indeno(1,2,3-cd)pyrene	0.61	**4 J**	**0.82 J**	**0.38 J**	**6**	**1.9**
Phenanthrene	n/a	**32**	**5.4**	**1.7 J**	**22**	**5.4**
Pyrene	1 900	**27**	**6.8**	**2.6**	0.36 U	**7.7**

[a]Values in bold are detected. Units are mg/kg.
[b] N/A = Not available.

The estimated carcinogenic risk for exposure to these PAHs in a residential exposure scenario is approximately 113 in one million or 1.13×10^{-4}. This number is compared to the acceptable risk range of 10^{-4} to 10^{-6} for carcinogens specified in the National Contingency Plan (EPA 1990, 0559) and in proposed RCRA Subpart S (EPA 1990, 0432). The estimated risk of 1×10^{-4} is at the lower end of the acceptable range and may be considered as borderline acceptable risk. The hazard index is less than the acceptable hazard index of 1 for noncarcinogens indicating that noncarcinogenic health effects would not be expected from exposure to these noncarcinogens at these average concentrations.

Only one non-PAH organic chemical, dibenzofuran, was detected at PRS 0-003. The data for each sample that had at least one detected concentration of this chemical are presented in Table 5.1.7-2. Dibenzofuran is carried forward to the risk-based screening assessment. The location were this organic was detected is shown on Fig. 5.1.5-1.

TABLE 5.1.7-2

DETECTED ORGANIC CHEMICAL CONCENTRATIONS AT PRS 0-003[a]

	LOCATION ID	00-05920
	SAMPLE ID	0100-97-0162
	DEPTH (ft)	0.4–0.9
ANALYTE	SAL	
Dibenzofuran	250	**0.71**

[a]Values in bold are detected. Units are mg/kg.

5.1.8 Risk-Based Screening Assessment

This subsection discusses the comparison with SALs for COPCs detected at levels greater than background screening levels in the investigation at PRS 0-003. A screening assessment was conducted on the RFI data for this PRS following methodology discussed in chapter three of this report and presented in "Risk-Based Corrective Action Process" (LANL/SNL 1996, 1277).

Calcium, dibenzofuran, lead, and, sodium were carried forward from the background evaluation of soil data. These four chemicals were compared to their respective SALs.

Greater than SAL. No chemical was detected at concentrations greater than SAL.

No SAL. Both calcium and sodium are essential nutrients and have no SALs. These essential nutrients can be eliminated as COPCs on the basis of best professional judgment (EPA 1989,

0305). Calcium is compared to the recommended daily allowance (RDA) for children and adults. (The calcium RDA is 800 mg/day for a child and 1 200 mg/day for an adult). The highest detected concentration of calcium at PRS 0-003 was 20 500 mg/kg. At the EPA default child soil ingestion rate of 200 mg/day, a child would ingest about 4.1 mg of calcium per day. An adult, at the EPA default adult soil ingestion rate of 100 mg/day, would ingest about 2.05 mg of calcium per day. Because both amounts are considerably less than the RDAs for children and adults, calcium is eliminated as a COPC.

Sodium is also compared to the RDA for children and adults. (The sodium RDA is 46 mg/day for a child and 500 mg/day for an adult). The highest detected concentration of sodium at PRS 0-003 was 1 030 mg/kg. At the EPA default child soil ingestion rate of 200 mg/day, a child would ingest about 0.2 mg of sodium per day. At the EPA default adult soil ingestion rate of 100 mg/day, an adult would ingest about 0.1 mg of sodium per day. Because both amounts are considerably less than the RDAs for children and adults, sodium is eliminated as a COPC.

Less than SAL. The chemicals dibenzofuran and lead were detected at concentrations less than their SALs.

To evaluate multiple chemical effects for this data set, COPCs detected at concentrations less than their SALs were grouped according to their toxicological effects (carcinogenic or noncarcinogenic effects of chemicals). Because there are no carcinogens in the less than SAL category, a multiple chemical evaluation for carcinogens cannot be conducted. However, the multiple chemical evaluation for the noncarcinogens dibenzofuran and lead is conducted.

The maximum concentration for each chemical is divided by its SAL to produce a normalized value. The sum of the normalized values yields a normalized sum. The normalized sum is compared to one. If the normalized sum is equal to or less than one, this indicates that adverse health effects are unlikely to occur from exposure to these chemicals at the maximum concentrations detected and all chemicals require no further evaluation as COPCs. If the normalized sum is greater than one, then any chemical with a normalized value of 0.1 or greater is retained as a COPC for further evaluation.

The result of the multiple chemical evaluation for noncarcinogens is less than one, indicating that potential adverse human health effects resulting from these chemical exposures are unlikely (Table 5.1.8-1). Therefore, all noncarcinogen chemicals detected at values less than SALs are eliminated as COPCs.

TABLE 5.1.8-1

MULTIPLE CHEMICAL EVALUATION FOR NONCARCINOGENIC CHEMICALS AT PRS 0-003

CHEMICAL	SAMPLE ID	MAXIMUM SAMPLE VALUE (mg/kg)	SAL (mg/kg)	NORMALIZED VALUE
Dibenzofuran	0100-97-0162	0.71	250	0.003
Lead	0100-97-0157	36.9	400	0.09
Normalized Sum				**0.09**

At the conclusion of this human health screening assessment for soil, no chemicals remain as COPCs.

5.1.9 Human Health Risk Assessment

No human health risk assessment was conducted for PRS 0-003 because no chemicals were carried forward from the screening assessment.

5.1.10 Preliminary Ecological Assessment

In cooperation with the New Mexico Environment Department and EPA Region 6, the Laboratory ER Project is developing an approach for ecological risk assessment. Further ecological risk assessment at PRS 0-003 will be deferred until the site can be assessed as part of the ecological exposure unit methodology currently being developed.

5.1.11 Extent of Contamination

No chemicals were retained as COPCs following the human health screening assessment. Therefore, determination of extent of contamination is not required.

5.1.12 Conclusions and Recommendations

Based on the results of the evaluations of inorganic and organic chemicals and the risk-based screening assessment, no analytes are retained as COPCs at PRS 0-003. PRS 0-003 is therefore proposed for NFA based on NFA Criterion 5. This criterion states that the PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants of concern are either not present or are present in concentrations that would pose an acceptable level of risk under the projected future land use.

5.2 PRS 0-012

PRS 0-012 was originally thought to be composed of the Western Steam Plant facility itself, including the blow-off tank, floor drains, and surface drainage channels receiving runoff from the facility. However, the SWMU report states that PRS 0-012 is comprised solely of the blow-off tank (see Section 5.2.1 of this report) (LANL 1990, 0145). No chemicals were retained as COPCs after the risk-based screening assessment for this site. PRS 0-012 is therefore recommended for NFA. No ecological assessment was performed; all conclusions, decisions, and recommendations presented in this report are based solely on human health assessments.

5.2.1 History

For information regarding the general history of PRS 0-012, refer to Section 1.1 of this report.

During the site survey and preparatory to RFI field work, it was observed that the RFI Work Plan for OU 1071 incorrectly depicted the locations of the filtration tank and manhole (LANL 1990, 0781). Engineering drawings were difficult to locate for this site because the facility had been renamed and renumbered several times, and no drawings were found under either the original or current designations. Film copies of some 1948 drawings were eventually located. These drawing revealed the existing layout of the site, and changes were made in the scope of the work plan based on the new information these drawings provided.

According to the RFI Work Plan for OU 1071, three features of PRS 0-012 were of primary environmental concern: an underground filtration tank, floor drains, and an outfall from the filtration tank to Los Alamos Canyon (LANL 1992, 0781). However, it was determined that the filtration tank, which the work plan shows at the southwest corner of the site, is actually a blow-off tank buried near the southwest corner of the plant (see Engineering Drawing ENG-C 45497, Sheet Nos. 43, 44, and 45) (Francis 1997, 05-0257). The tank is made of cylindrical steel and is 4 ft in diameter and 10 ft long. The tank was accessed through a 24-in. diameter manhole in the pavement (found with a lid that was welded in place). The inside of the tank was accessed through a second, smaller manhole that had a bolted lid at a depth of about 3 ft. A 2.5-in. diameter blow-off line leaves the back of each boiler and connects to a 3-in. diameter line leading to the blow-off tank.

The work plan was also incorrect in stating that the outfall from the filtration tank (now known to be the blow-off tank) discharged to Los Alamos Canyon. Effluent from the blow-off tank discharged through a 4-in. diameter drainline to the sanitary sewer (see Section 5.2.4). An effort to locate information regarding the NPDES permitted outfall described in the work plan

revealed that NPDES Serial Number 108 was in inactive status when the permit was issued in 1978, and no description exists of the tank or discharge line in the permit. No other information or documentation regarding the permit or application could be located. Based on the lack of documentation, the fact that the permit was supposedly issued after the plant had already been in operation for at least 29 years, and the fact that the engineering drawing of the plant shows that the blow-off tank discharge line connected to the sanitary sewer, it is assumed that the permit was issued based on inaccurate information.

The discussion in the RFI Work Plan for OU 1071 regarding the floor drains and outfall to Los Alamos Canyon is also inaccurate. The four drainpipes that extend from the south wall of the plant, three of which discharge to the asphalt street and parking area, receive rain water from a roof drain system only, and not water from the floor drains as stated in the work plan (see Engineering Drawing ENG-C 45497, Sheet No. 39). One of the four drainpipes carrying stormwater released from the roof connects to an underground pipe leading to the canyon edge. The work plan incorrectly stated that this drainpipe was connected to the filtration tank (which is now understood to be the blow-off tank) and functioned as the discharge line. According to the drawings, the floor drains, boiler pit drains, sink drain, and bathroom drains all connect to a single vitrified clay pipe (VCP) header that connects to the sanitary sewer. Therefore, the implication that various chemicals used by the Zia wastewater laboratory could have discharged to the street and parking area via the floor drains is incorrect.

The only chemicals used in the steam plant that would have been discharged to the blow-off tank after reacting with the mineral scale in the boilers are sodium hydroxide, hexameta phosphate, sodium sulphite, and chelating compounds.

This investigation of PRS 0-012 includes only the blow-off tank contents. The blow-off tank drainline and floor drains all connect to the active sanitary sewer, do not outfall to Los Alamos Canyon, and therefore would not be appropriate for this investigation.

5.2.2 Description

PRS 0-012 is located on the southern boundary of TA-0 and is surrounded to the west, north, and east by developed areas. Because of its location on the upper slope of Los Alamos Canyon, construction of the facility necessitated a great deal of cut and fill activity.

5.2.3 Previous Investigation

No previous investigations were conducted at PRS 0-012.

5.2.4 Field Investigations

Field activities at PRS 0-012 were conducted in June and July 1997. These activities were conducted according to Chapter 5.1 of the RFI Work Plan for OU1071 and all applicable LANL ER SOPs were followed (LANL 1992, 0781; LANL, 0875).

A site survey was conducted to determine the location of the blow-off tank and any outfall points along the rim of Los Alamos Canyon that may have received runoff from the area. The outfall that supposedly received discharge from the blow-off tank was located and its channel was examined for sediment catchments as part of the geomorphologic mapping task. A second drainage channel was located that receives runoff from the asphalt street and parking area to the south of the building, and possibly from a portion of the container storage area (PRS 0-003). This channel was also examined for sediment catchments.

A total of six surface soil samples were collected from six locations, three within each of the two drainage channels. At each sampling location, approximately 0.5-in. of surface soil and organic debris were brushed aside and the sample was collected from the 0.05- to 0.5-ft interval. No staining or other indicators of potential contamination were noted at any of the sampling locations. It was not until after the samples were collected and shipped to the laboratory that it was confirmed by examining engineering drawings and verifying the actual blow-off tank discharge location, that the westernmost outfall received water from a roof drain only, and not from the blow-off tank. Therefore, analytical results for samples collected at locations 00-05911, 00-05912, and 00-05913 are not representative of PRS 0-012.

The blow-off tank was accessed through two manholes, a 24-in. diameter manhole in the paved area near the southeast corner of the plant, and a second 18-in. diameter manhole with a bolted lid located approximately 3.5 ft directly below the surface manhole. The second lid was removed and the tank was found to contain 2.57 ft of water. The bottom of the tank was partially covered with 0.25 to 0.5 in. of granular sediment. Some places on the bottom seemed to contain no sediment at all. Because there was insufficient sediment to allow the collection of a sediment sample, only a water sample was collected from the tank. The water sample was collected with a bailer of sufficient length to simultaneously sample the entire water column. The water was clear with two to three inches of fine suspended sediment at the bottom. Information about the sample depth, analyses conducted, and request numbers for each sample collected at PRS 0-012 is summarized in Table 5.2.4-1. Sample locations are presented in Fig. 5.2.4-1.

TABLE 5.2.4-1

SUMMARY OF SAMPLES COLLECTED AT PRS 0-012

LOCATION ID	SAMPLE ID	DEPTH (ft.)	MATRIX	RAD SCREENING[a]	VOCs	SVOCs	PESTICIDES/PCBs	METALS	PH	TDS[b]	TSS[c]
				REQUEST NUMBER							
00-05911	0100-97-0151	0.05–0.5	Soil	TA-21	NR[d]	3286R	3286R	3287R	NR	NR	NR
00-05912	0100-97-0152	0.05–0.5	Soil	TA-21	NR	3286R	3286R	3287R	NR	NR	NR
00-05913	0100-97-0153	0.05–0.5	Soil	TA-21	NR	3286R	3286R	3287R	NR	NR	NR
00-05914	0100-97-0154	0.05–0.5	Soil	TA-21	NR	3286R	3286R	3287R	NR	NR	NR
00-05915	0100-97-0155	0.05–0.5	Soil	TA-21	NR	3286R	3286R	3287R	NR	NR	NR
00-05916	0100-97-0156	0.05–0.5	Soil	TA-21	NR	3286R	3286R	3287R	NR	NR	NR
00-05921	0100-97-0181	NA[e]	Water	TA-21	3321R	3321R	3321R	3322R	3323R	3323R	3323R
00-05921	0100-97-0182	NA	Water	NR	NR	3391R	NR	NR	NR	NR	NR

[a] Radiological screening was conducted at the TA-21 Radiological Analytical Laboratory to meet transportation and analytical laboratory acceptance criteria.
[b] TDS = Total dissolved solids.
[c] TSS = Total suspended solids.
[d] NR = Not requested.
[e] NA = Not applicable.

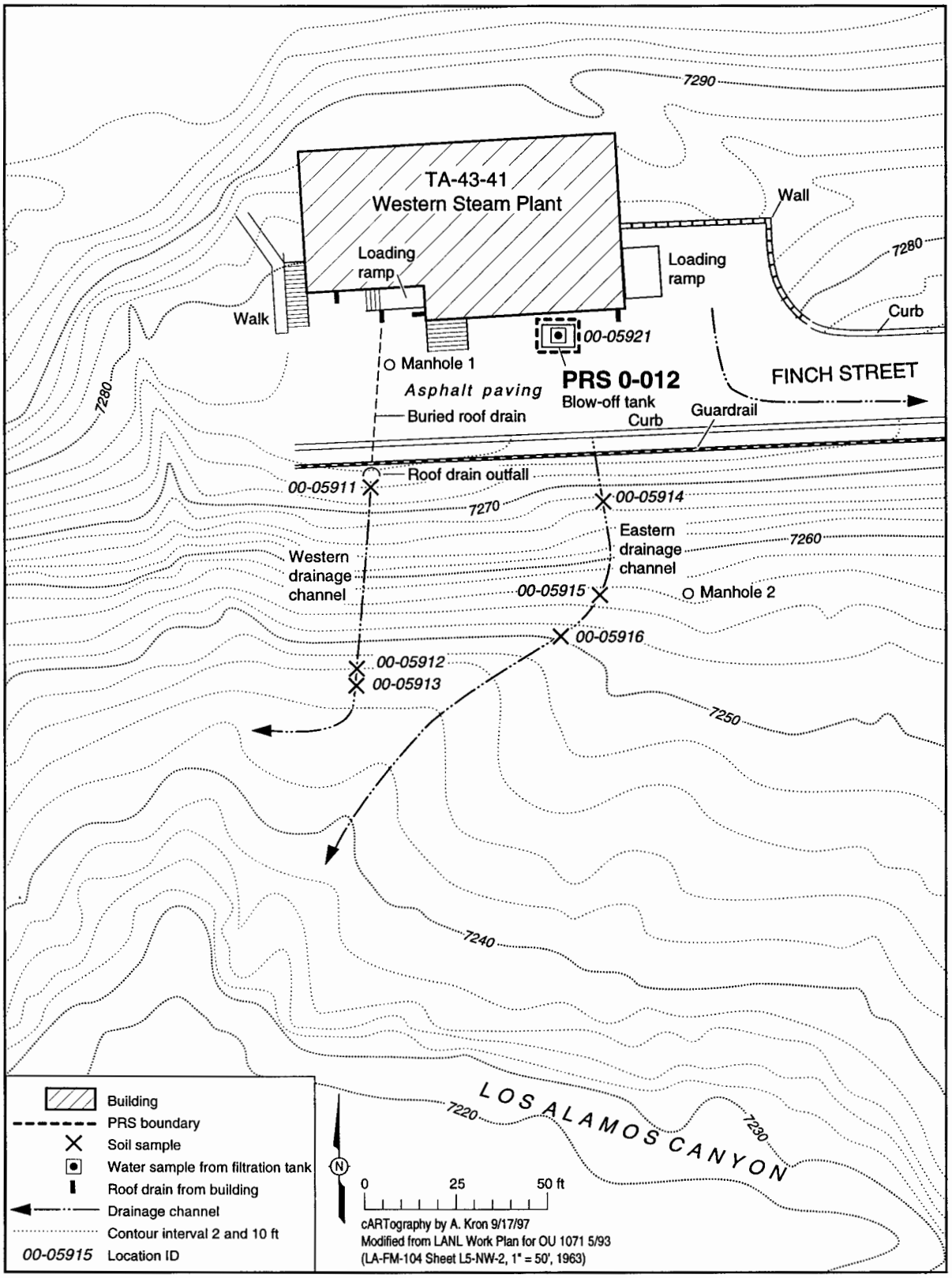

Fig. 5.2.4-1 Locations of samples collected at PRS 0-012.

Following collection of the water sample, potable water was added to the tank to raise the water level above the 3-ft level to induce flow through the discharge line to determine which sanitary sewer manhole received the blow-off tank discharge. It was verified that the discharged water flowed into the active sanitary sewer and through manhole number 2, southeast of the steam plant (Figure 5.2.4-1). This confirmed that the tank discharged to a sanitary sewer as shown in the construction drawings, and not to Los Alamos Canyon. After the water stopped flowing through manhole number 2, the water level in the tank was remeasured and found to be 2.65 ft, only 0.08-ft higher than the original level. This supports the conclusion that the tank has no leaks. Based on the amount by which the water level changed, it is estimated that approximately 20 to 25 gallons of water discharged to the sanitary sewer.

All samples were screened in the field for radioactivity and VOCs to ensure worker health and safety. All samples were also screened at the TA-21 radiological analytical laboratory to meet transportation and analytical laboratory acceptance criteria. The results of screening for radiation indicated no detectable activity and no VOCs were detected.

A geodetic survey was conducted to document the sampling locations at PRS 0-012. All sampling locations were recorded in New Mexico state plane coordinates and location identification numbers were assigned for entry into FIMAD.

Deviations. In general, the planned activities outlined in the RFI Work Plan for OU 1071 were completed (LANL 1992, 0781). However, the following deviations occurred:

- A field duplicate of a channel sediment sample was not collected. Instead, two duplicate samples were collected from the container storage area. This deviation did not affect achievement of the objectives.

- There was insufficient material on the bottom of the blow-off tank to allow the collection of a sample. What material was available was thin and irregularly distributed. The material also seemed to be hard and granular, consistent with the probability that it was granulated scale or iron deposits. The lack of analytical data for this material does not affect achievement of the objectives. Furthermore, the tank does not have any apparent leaks based on its original water level being only one inch below the outlet line after at least seven years of inactivity. Because the tank has no apparent leaks and it discharges to the sanitary sewer, it is unlikely that releases to the environment from this tank have occurred.

- The analytical laboratory dropped and broke the SVOC sample bottle and was instructed to obtain water from the pesticide/PCB bottle for the SVOC analyses. However, there was an insufficient volume of water left in the pesticide/PCB bottle. Therefore, the blow-off tank was resampled for SVOCs. Before collecting the second SVOC sample, 50 gallons of potable water had been added to the tank to induce flow in the discharge line. It is estimated that the water in the tank was diluted by approximately 10 percent of its original volume. However, because SVOCs are not thought to have been associated with the tank contents, the dilution is unlikely to have had any affect on the outcome of the SVOC analyses.

5.2.5 Evaluation of Inorganics

Seven samples collected at PRS 0-012 were analyzed for TAL metals. Six of these samples were collected in surface soil. The other sample was water collected from the blow-off tank. Each inorganic soil result was compared to the all-soil-data background screening value (Longmire et al. 1995, 1142; Longmire et al. 1995, 1266). Because there is no background water data, the detection limit was used as the background screening value for the water samples.

Four inorganics, copper, lead, mercury, and zinc, were detected above background screening values in at least one surface soil sample. Further background comparisons were not performed for copper, lead, mercury, and zinc because the number of site samples for these metals are inadequate to support other statistical tests. Therefore, copper, lead, mercury, and zinc are carried forward to the screening assessment. The data for each sample that had at least one concentration above the background screening value for these four inorganics are shown in Table 5.2.5-1. The locations where these inorganics were detected above background screening values are shown on Figure 5.2.5-1.

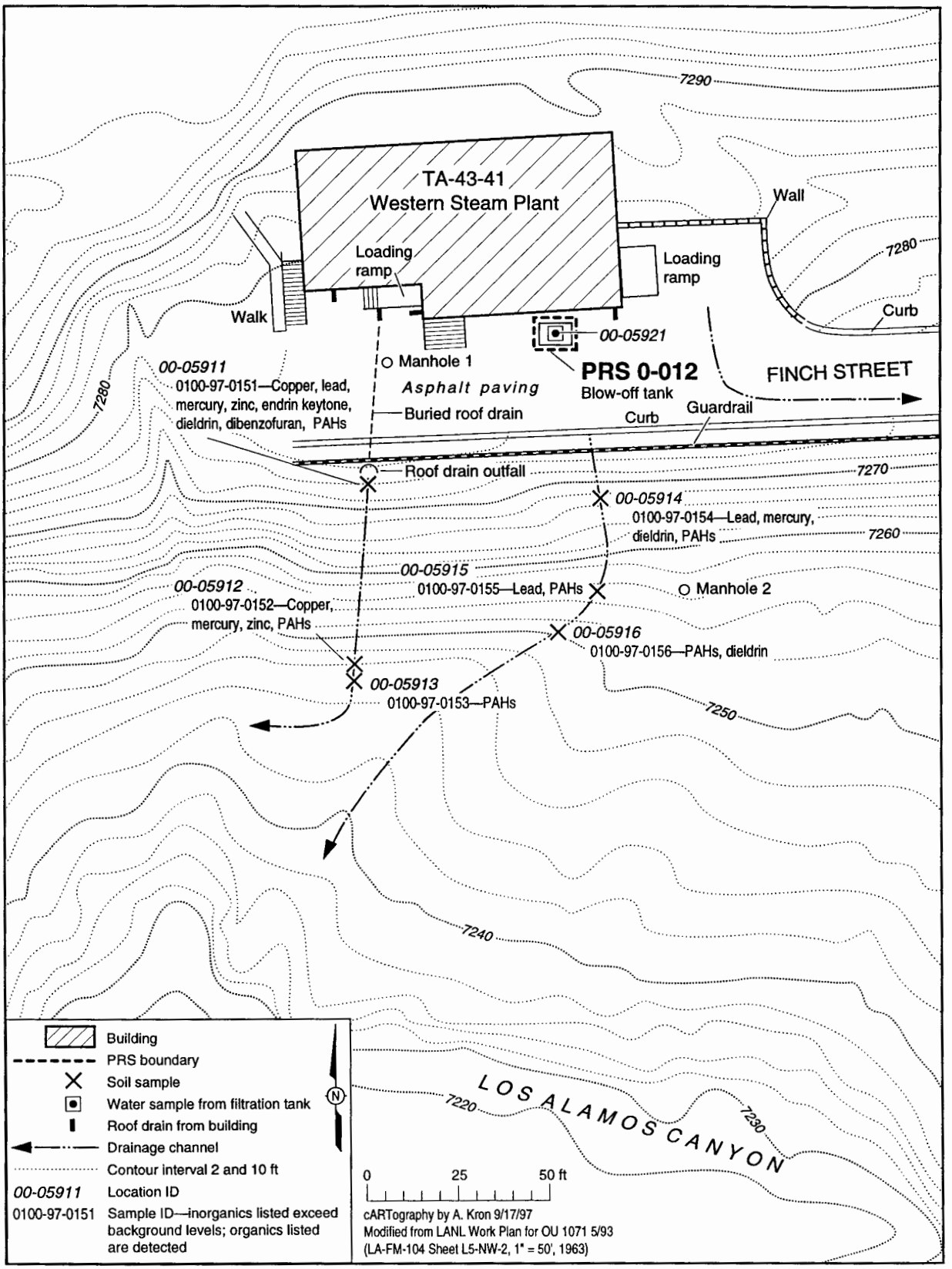

Fig. 5.2.5-1 Locations where inorganics exceeded background screening values and organics were detected in soil samples at PRS 0-012.

TABLE 5.2.5-1

INORGANIC CHEMICALS WITH CONCENTRATIONS EXCEEDING BACKGROUND SCREENING VALUES IN SOIL AT PRS 0-012[a]

LOCATION ID	DEPTH (in.)	SAMPLE ID	COPPER	LEAD	MERCURY	ZINC
		SAL	2 800	400	23	23 000
		UTL	15.5	23.3	0.1	50.8
00-05911	0.05–0.5	0100-97-0151	**19.3**	**44.9**	**0.23**	**628**
00-05912	0.05–0.5	0100-97-0152	**16.5**	21.2	**0.13**	**86.7**
00-05914	0.05–0.5	0100-97-0154	7	**24.2**	0.061	41.2
00-05915	0.05–0.5	0100-97-0155	5.7	**24.6**	0.046 U	31.3

[a] Values in bold are above the UTL. Units are in mg/kg.

As discussed in Section 4.1.1, arsenic data were qualified UJ in the water sample that was collected in the blow-off tank. The arsenic data were qualified UJ because of a low recovery in the matrix spike sample. A post digestion spike was performed and the recovery was within the limits allowed in USEPA SW846 guidelines. The UJ indicates that the analyte is not detected and the reported detection limit is estimated. Arsenic will not be further evaluated because it is not considered detected in water.

Fifteen inorganics (aluminum, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, silver, sodium, vanadium, and zinc) were detected in the water sample that was collected from the blow-off tank. The data for each detected inorganic in this sample are shown in Table 5.2.5-2.

Sixteen inorganics (aluminum, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, silver, sodium, vanadium, and zinc) are carried forward to the human health screening assessment because they were detected above background screening values in at least one soil sample or were detected in the water sample.

5.2.6 Evaluation of Radionuclides

Samples collected at PRS 0-012 were not analyzed for radionuclides as noted in Section 5.2.4 because radiological contamination was not expected at the site and no elevated radioactivity was observed in the field or at the TA-21 radiological analytical laboratory. Therefore, no radionuclides are carried forward to the human health screening assessment.

TABLE 5.2.5-2

INORGANIC CHEMICALS WITH DETECTED CONCENTRATIONS IN WATER AT PRS 0-012[a]

LOCATION ID	00-05921
SAMPLE ID	0100-97-0181
ANALYTE	
Aluminum	90.7
Barium	24.8
Calcium	8 370
Chromium	5.8
Cobalt	5.8
Copper	474
Iron	21 000
Lead	38.6
Magnesium	1 770
Manganese	198
Nickel	23.9
Silver	4.1
Sodium	752
Vanadium	4.7
Zinc	203

[a] Units are µg/L.

5.2.7 Evaluation of Organic Chemicals

Seven samples collected at PRS 0-012 were analyzed for a suite of SVOCs and pesticides/ PCBs. Six of these samples were collected in surface soil. The other sample was water collected from a blow-off tank. The water sample was also analyzed for a suite of VOCs.

Sixteen organics were detected in the soil samples. Of these 16 detected organics, 13 were PAHs.

PAHs detected in samples from PRS 0-012 were not included in the screening assessment because they are not believed to be associated with a release from the PRS. This decision was based on the following:

- The westernmost drainage channel only receives water from a steam plant roof drain. Runoff from the asphalt parking lot is prevented from entering this drainage channel by a curb along the south edge of the pavement. Because the roof of the steam plant is coated with tar, the presence of PAHs in this outfall is expected. The surface soil samples were collected

immediately following a brief rainfall event that created a slight discharge from the roof drain, temporarily saturating the soil for a short distance below the outfall. The most upgradient sample (0100-97-0151) was collected from the saturated soil immediately below the outfall and contained the highest concentrations of PAHs. The two downgradient samples (0100-97-0152 and 0100-97-0153) contained a similar but smaller suite of PAHs and at much reduced concentrations. It is reasonable to assume that the source for the PAHs is the tarred roof of the steam plant and not a release from the PRS.

- The eastern most drainage channel receives runoff from the asphalt parking lot and indirectly from two of the remaining three roof drains. A low spot in the curb along the south side of the pavement allows runoff from a portion of the area around the steam plant, including discharges from the two roof drains, to flow over the curb and down the embankment. Therefore, the presence of PAHs in this drainage channel is also expected. However, consistent with the fact that this drainage channel receives runoff from a much larger area, thus causing a dilution effect, the PAH concentrations are much lower than in the western channel, which receives water from a single concentrated source. As before, these PAHs are related to roof and asphalt parking lot runoff and not to a release from the PRS.

Although it is not appropriate to evaluate the potential human health risks associated with PAHs that are not associated with site releases within the same framework as chemicals potentially released from a PRS, it is appropriate to provide some estimate of potential health risks so that the need for action can be assessed either within or outside of the RCRA corrective action process. These risk estimates are screening-level in nature, and were calculated using the US EPA Region 9 PRGs for residential soil as shown in Appendix C. Because the analytical laboratory reported benzo(b)fluoranthene and benzo(k)fluoranthene as benzo(b&k)fluoranthene, the most stringent Region 9 PRG, that of benzo(b)fluoranthene, was used. The total carcinogenic risk or hazard index (for noncarcinogenic chemicals) was estimated by summing the risk or hazard index for each detected chemical. The data for these detected PAHs are presented in Table 5.2.7-1.

TABLE 5.2.7-1

DETECTED PAH CONCENTRATIONS AT PRS 0-012[a]

LOCATION ID		00-05911	00-05912	00-05913	00-05914	00-05915	00-05916
SAMPLE ID		0100-97-0151	0100-97-0152	0100-97-0153	0100-97-0154	0100-97-0155	0100-97-0156
DEPTH (ft)		0.05–0.5	0.05–0.5	0.05–0.5	0.05–0.5	0.05–0.5	0.05–0.5
ANALYTE	SAL						
Acenaphthene	2 200	**24 J**	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U
Anthracene	18 000	**33 J**	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U
Benzo(a)anthracene	0.61	**61**	**2.9 J**	**0.52 J**	1.8 U	1.8 U	**0.4 J**
Benzo(a)pyrene	0.061	**65**	**3 J**	**0.68 J**	1.8 U	1.8 U	**0.4 J**
Benzo(b&k)fluoranthene	0.61	**110**	**5.7**	**1.5 J**	1.8 U	**0.47 J**	**0.81 J**
Benzo(g,h,i)perylene	N/A[b]	**31 J**	**2 J**	**0.36 J**	1.8 U	1.8 U	1.8 U
Carbazole	22	**19 J**	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U
Chrysene	61	**64**	**3 J**	**0.81 J**	1.8 U	1.8 U	**0.42 J**
Fluoranthene	2 600	**160**	**7.6**	**1.5 J**	**0.48 J**	**0.74 J**	**1.1 J**
Fluorene	2 300	**16 J**	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U
Indeno(1,2,3-cd)pyrene	0.61	**28 J**	**1.7 J**	1.8 U	1.8 U	1.8 U	1.8 U
Phenanthrene	N/A	**140**	**2.4 J**	1.8 U	1.8 U	**0.55 J**	**0.77 J**
Pyrene	1 900	**180**	**4.7**	**0.87 J**	1.8 U	**0.67 J**	**1.1 J**

[a]Values in **BOLD** are detected. Units are mg/kg.
[b] N/A = Not available.

The J qualifiers in Table 5.2.7-1 were assigned by the laboratory to indicate that the results were reported between the method detection limit and the EQL and are estimated values. Because of matrix problems in some of these samples (see Section 4.1.2), the samples were diluted, resulting in elevated detection limits. These organics are still considered detected and are discussed below.

The estimated carcinogenic risk for exposure to these detected PAHs in a residential exposure is approximately 3×10^{-4}. This number is compared to the acceptable risk range of 10^{-4} to 10^{-6} for carcinogens specified in the National Contingency Plan (EPA 1990, 0559) and in proposed RCRA Subpart S (EPA 1990, 0432). The estimated risk of 3×10^{-4} is at the lower end of the acceptable range and may be considered as borderline acceptable or nonacceptable risk for a residential exposure scenario. However, this site is located on a steep slope unsuitable for residential development. The estimated noncarcinogenic hazard index is approximately 0.04. The hazard index is less than the acceptable hazard index of 1 for noncarcinogens indicating that noncarcinogenic health effects would not be expected from exposure to these noncarcinogens at these average concentrations.

Three of the 16 detected organics were not PAHs. The data for each sample that had at least one detected concentration of non-PAH organic chemicals are presented below in Table 5.2.7-2. The locations of these detected organics are shown on Figure 5.2.5-1. These three detected organic chemicals are carried forward to the human health screening assessment. No organic chemicals were detected in the water sample.

TABLE 5.2.7-2

DETECTED ORGANIC CONCENTRATIONS IN SOIL AT PRS 0-012[a]

LOCATION ID		00-05911	00-05912	00-05913	00-05914	00-05915	00-05916
SAMPLE ID		0100-97-0151	0100-97-0152	0100-97-0153	0100-97-0154	0100-97-0155	0100-97-0156
DEPTH (ft)		0.05–0.5	0.05–0.5	0.05–0.5	0.05–0.5	0.05–0.5	0.05–0.5
ANALYTE	SAL						
Dibenzofuran	250	**10 J**	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U
Dieldrin	0.028	**0.0086 J-**	0.0036 U	0.0036 U	**0.011**	**0.0044**	**0.0044**
Endrin ketone	N/A	**0.012 J-**	0.0036 U	0.0036 U	0.0036 U	0.0036 U	0.0036 U

[a]Values in bold are detected. Units are mg/kg.
[b] N/A = Not available.

The J qualifiers in Table 5.2.7-2 were assigned to indicate that the results were reported between the method detection limit and the EQL and are estimated values. These organics are still considered detected and are further evaluated in the human health screening assessment.

5.2.8 Risk-Based Screening Assessment

This subsection discusses the comparison with SALs for COPCs detected at levels greater than background screening levels in the investigation at PRS 0-012. A screening assessment was conducted on the RFI data for this PRS following methodology discussed in chapter three of this report and presented in "Risk-Based Corrective Action Process" (LANL/SNL 1996, 1277). The screening assessment is conducted separately for soil and water samples.

5.2.8.1 Screening Assessment for Soil Samples

Copper, dibenzofuran, dieldrin, endrin ketone, lead, mercury, and zinc were carried forward from the background evaluation of soil data. These seven chemicals were compared to their respective SALs.

Greater than SAL. No chemical was detected at concentrations greater than SAL.

No SAL. A SAL has not been developed for endrin ketone. Therefore, the SAL for endrin ketone (2 mg/kg) was developed from the available toxicity data. This SAL was selected based on chemical structure and toxicity similarities as discussed in Appendix C. Endrin ketone is evaluated further in the less than SAL category.

Less than SAL. The chemicals copper, dibenzofuran, dieldrin, endrin ketone, lead, mercury, and zinc were all detected at concentrations less than their SALs.

To evaluate multiple chemical effects for this data set, COPCs detected at concentrations less than their SALs were grouped according to their toxicological effects (carcinogenic or noncarcinogenic effects of chemicals). Because there is only one carcinogen, dieldrin, no multiple chemical evaluation for carcinogens is conducted and dieldrin is eliminated as a COPC.

The maximum concentration for each chemical is divided by its SAL to produce a normalized value. The sum of the normalized values yields a normalized sum. The normalized sum is compared to one. If the normalized sum is equal to or less than one, this indicates that adverse health effects are unlikely to occur from exposure to these chemicals at the maximum concentrations detected and all chemicals require no further evaluation as COPCs. If the normalized sum is greater than one, then any chemical with a normalized value of 0.1 or greater is retained as a COPC for further evaluation.

The result of the multiple chemical evaluation for noncarcinogens (shown in Table 5.2.8-1) is less than one, indicating that potential adverse human health effects resulting from these chemical exposures are unlikely. Therefore, all noncarcinogen chemicals detected at values less than SALs are eliminated as COPCs.

At the conclusion of this human health screening assessment for soil, no chemicals remain as COPCs.

5.2.8.2 Screening Assessment for Water Samples

Aluminum, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, nickel, silver, sodium, vanadium, and zinc were carried forward from the background screening section because they were detected in a water sample (see Table 5.2.8-2). A screening of chemicals detected in water contained in the blow-off tank was conducted by comparing the maximum detected value to the water screening concentration. The water screening concentration is based on the most stringent value listed in the following sources:

- Livestock Watering Standard from "Standards for Interstate and Intrastate Streams" (State of New Mexico 1995, 1267).
- Ground Water Standard for Human Health from "New Mexico Water Quality Control Commission Regulations" (State of New Mexico 1995, 1318).
- Maximum Contaminant Level from "Drinking Water Regulations" (State of New Mexico 1995, 1268).

TABLE 5.2.8-1

MULTIPLE CHEMICAL EVALUATION FOR NONCARCINOGENIC CHEMICALS IN SOIL SAMPLES FOR PRS 0-012

CHEMICAL	SAMPLE ID	MAXIMUM SAMPLE VALUE (mg/kg)	SAL (mg/kg)	NORMALIZED VALUE
Copper	0100-97-0151	19.3	2 800	0.007
Dibenzofuran	0100-97-0151	10	250	0.04
Endrin ketone	0100-97-0151	0.012	2[a]	0.006
Lead	0100-97-0151	44.9	400	0.11
Mercury	0100-97-0151	0.23	23	0.01
Zinc	0100-97-0151	628	23 000	0.03
Normalized Sum				**0.2**

[a] SAL for endrin ketone calculated in Appendix C of this report.

TABLE 5.2.8-2

COMPARISON TO WATER SCREENING CONCENTRATIONS FOR INORGANIC CHEMICALS WITH DETECTED CONCENTRATIONS IN WATER AT PRS 0-012[a]

	LOCATION ID	00-05921
	SAMPLE ID	0100-97-0181
ANALYTE	WATER SCREENING CONCENTRATION	
Aluminum	5 000 [b]	90.7
Barium	1 000 [c]	24.8
Calcium	N/A [d]	8 370
Chromium	50 [c]	5.8
Cobalt	1 000 [b]	5.8
Copper	500 [b]	474
Iron	1 000 [c]	21 000
Lead	50 [c]	38.6
Magnesium	N/A	1 770
Manganese	200 [c]	198
Nickel	100 [e]	23.9
Silver	50 [c]	4.1
Sodium	N/A	752
Vanadium	100 [b]	4.7
Zinc	10 000 [c]	203

[a] Units are µg/L.
[b] Screening concentration is based on the Livestock Watering Standard from "Standards for Interstate and Intrastate Streams" (State of New Mexico 1995, 1267), which is based on dissolved portion (i.e., filtered portion) of water samples for inorganic chemicals with the exception of mercury.
[c] Screening concentration is based on the Ground Water Standard for Human Health from "New Mexico Water Quality Control Commission Regulations" (State of New Mexico 1995, 1318), which is based on dissolved portion (i.e., filtered portion) with the exception of mercury, organic chemicals, and nonaqueous phase liquids (such as oil).
[d] N/A = not available.
[e] Screening concentration is based on the Maximum Contaminant Level from "Drinking Water Regulations" (State of New Mexico 1995, 1268), which is based on dissolved portion (i.e., filtered portion) with the exception of organic chemicals.

Aluminum, barium, chromium, cobalt, copper, lead, manganese, nickel, silver, vanadium, and zinc were detected at levels below water screening concentrations. These chemicals are eliminated as COPCs and will not be evaluated further.

Water screening levels are not available for calcium, magnesium, and sodium, which are all essential nutrients. Therefore, the intake of these essential nutrients was calculated based on the concentrations from water sample 0100-97-0181 and standard exposure parameters. Two liters of water is the amount of water an adult drinks per day and one liter is the amount of water a child drinks per day according to the EPA *Exposure Factors Handbook* (EPA 1989, 0304). The concentrations shown in Table 5.2.8-3 were converted from µg/L to mg/L and then

multiplied by 2 liters/day to provide the concentration that would be ingested if an adult ingested 2 liters of water from the blow-off tank. The corresponding recommended daily allowances for both adults and children are also presented in the table.

A comparison of the amount of nutrient ingested to the RDA for each chemical (National Research Council 1989, 1251) shows that calcium, magnesium, and sodium do not exceed the RDAs. Therefore, calcium, magnesium, and sodium are eliminated as COPCs and will not be evaluated further.

Only iron was detected at a concentration exceeding the water screening value. Iron is also an essential nutrient, and the detected levels exceed the RDA. The elevated levels of iron detected in the blow-down tank water are likely the result of the water having been contained in the steel tank for a minimum of seven years. The iron level exceeds the RDA under the conservative assumption that the child and adult drink their entire daily water intake from water enclosed within the sealed blow-down tank. In addition, RDAs are levels that are judged to be adequate to meet the nutritional needs of healthy persons, and exceeding a recommended daily allowance does not necessarily indicate toxicity. With respect to iron, *Recommended Dietary Allowances* states: "Deleterious effects of daily intakes between 25 and 75 mg are unlikely in healthy persons" (National Research Council 1989, 1251). The calculated daily intake of iron from water in the blow-down tank does not exceed 75 mg. Therefore, iron is eliminated as a COPC and will not be evaluated further.

Because none of the chemicals detected in the water samples were detected at concentrations expected to pose a risk to human health, all are eliminated as COPCs and will not be evaluated further.

TABLE 5.2.8-3

DATA AND RECOMMENDED DAILY ALLOWANCE COMPARISONS FOR ESSENTIAL NUTRIENTS DETECTED IN BLOW-OFF TANK WATER AT PRS 0-012

NUTRIENT	VALUE FOR SAMPLE 0100-97-0181 mg/L	ADULT DAILY INTAKE[a] mg/L	ADULT RDA mg/day[b]	CHILD DAILY INTAKE[b] mg/L	CHILD RDA[b] mg/day	LISTED AGE OF CHILD[c]
Calcium	8.37	16.74	1 200	8.37	800	Ages 1–10
Magnesium	1.77	3.54	280–350	1.77	300–400	Ages 15–18
Sodium	0.752	1.504	500	0.752	300	Ages 2–5
Iron	21.0	42.0	10	21. 0	12-15	Teens

[a] Based on two liters per day (EPA 1989, 0304).
[b] Based on one liter per day (EPA 1989, 0304).
[c] Listed in *Recommended Dietary Allowances* (National Research Council 1989, 1251).

5.2.9 Human Health Risk Assessment

No human health risk assessment was conducted for PRS 0-012 because no chemicals were carried forward from the screening assessment.

5.2.10 Preliminary Ecological Assessment

In cooperation with the New Mexico Environment Department and EPA Region 6, the Laboratory ER Project is developing an approach for ecological risk assessment. Further ecological risk assessment at PRS 0-012 will be deferred until the site can be assessed as part of the ecological exposure unit methodology currently being developed.

5.2.11 Extent of Contamination

No chemicals were retained as COPCs following the human health screening assessment. Therefore, determination of extent of contamination is not required.

5.2.12 Conclusions and Recommendations

Based on the results of the evaluations of inorganic chemicals, radionuclides, and organic chemicals, PRS 0-012 is proposed for NFA based on NFA Criterion 5. This criterion states that the PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants of concern are either not present or are present in concentrations that would pose an acceptable level of risk under the projected future land use.

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APPENDIX A ANALYTICAL RESULTS

Analytical results for Potential Release Sites (PRSs) 0-003 and 0-012 can be found in the Facility for Information Management, Analysis, and Display (FIMAD). Hard copies of supporting information will be provided upon request.

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

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

Inorganic Suite (Metals)

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

Volatile Organic Suite

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

Semivolatile Organic Suite

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

Pesticides/Polychlorinated biphenyls

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

TABLE A-1

ANALYTICAL RESULTS FOR INORGANIC ANALYTES DETECTED AT PRS 0-003[a]

	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead	Magnesium
UTL	38 700	1	7.82	315	1.95	2.6	6 120	19.3	19.2	15.5	21 300	23.3	4 610
0100-97-0157	4 010	5.3 U	0.97	151	0.46	0.53 U	20 500	5.8	2.7	8.8	6 720	36.9	1 550
0100-97-0159	2 730	4.3 U	0.61	131	0.35 U	0.43 U	4 320	4.2	2.4	4.6	6 150	4.9	1 180
0100-97-0160	5 210	5.3 U	0.96	144	0.61	0.53 U	4 270	8.2	2.7	6.1	6 700	8.2	1 310
0100-97-0161	6 000	11 UJ	0.22 U	37	0.55 U	0.55 U	960	3.1	2.4	2.5	4 600	7.7	530
0100-97-0162	4 000	11 UJ	0.21 U	150	0.53 U	0.53 U	3 400	7.5	2.9	5.7	6 100	5.3	1 400
0100-97-0163	8 900	12 UJ	0.24 U	52	0.77	0.6 U	1 300	3.9	1.2	3.6	4 800	8.4	730
0100-97-0164	7 400	13 UJ	0.26 U	110	1	0.65 U	1 800	2.9	1.9	4	4 400	10	740
0100-97-0165	6 500	11 UJ	1.3	76	0.56 U	0.56 U	1 500	4.8	4.8	3.1	7 100	12	820
0100-97-0166	4 400	11 UJ	0.23 U	60	0.57 U	0.57 U	1 400	3.6	3.2	2.5	5 700	8	600
0100-97-0195	3 200	11 UJ	0.22 U	120	0.54 U	0.54 U	2 900	6	2.4	4.6	5 100	3.7	1 000

	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
UTL	714	0.1	15.2	3410	1.7	n/a	915	1	41.9	50.8
0100-97-0157	244	0.049	4.5	695	0.23 U	0.53 U	1 030	0.18 U	15.1	31.2
0100-97-0159	251	0.049 U	3.7	736	0.2 U	0.43 U	612	0.16 U	12.7	13.7
0100-97-0160	356	0.047 U	6.2	819	0.24 U	0.53 U	428	0.19 U	14	23
0100-97-0161	110 J-	0.11 U	3	730	1.1 U	2.2 U	230	0.27 U	6.6	13
0100-97-0162	390 J-	0.11 U	5.9	810	1.1 U	2.1 U	130	0.27 U	15	18
0100-97-0163	84 J-	0.12 U	4.6	1 000	1.2 U	2.4 U	330	0.3 U	6.1	16
0100-97-0164	220 J-	0.13 U	5.5	1 200	1.3 U	2.6 U	470	0.32 U	7.5	14
0100-97-0165	530 J-	0.11 U	4.3	940	1.1 U	2.2 U	260	0.28 U	12	20
0100-97-0166	190 J-	0.11 U	3.2	750	1.1 U	2.3 U	240	0.28 U	9.2	16
0100-97-0195	320 J-	0.11 U	3.9	650	1.1 U	2.2 U	130	0.27 U	12	16

[a] Units are mg/kg.

TABLE A-2

ANALYTICAL RESULTS FOR ORGANIC ANALYTES DETECTED AT PRS 0-003[a]

	Acenaphthene	Dibenzofuran	Fluorene	Phenanthrene	Anthracene	Carbazole	Fluoranthene	Pyrene	Benzo(a)anthracene
0100-97-0157	3.7 J		3.5 J	32	20 U	3.5 J	43	27	13 J
0100-97-0159	0.55 J		0.43 J	5.4	1.2 J	0.48 J	10	6.8	3.5 J
0100-97-0160	1.8 U		1.8 U	1.7 J	0.33 J	1.8 U	2.9	2.6	1.2 J
0100-97-0161	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	NA	0.38 U	0.38 U	0.38 U
0100-97-0162	1.7	0.71	1.8	22	4.6	NA	28	0.36 U	11
0100-97-0163	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	NA	0.41 U	0.41 U	0.41 U
0100-97-0164	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	NA	0.41 U	0.41 U	0.41 U
0100-97-0165	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	NA	0.38 U	0.38 U	0.38 U
0100-97-0166	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	NA	0.38 U	0.38 U	0.38 U
0100-97-0195	0.35 U	0.35 U	0.35 U	5.4	1.2	NA	8.7	7.7	3.3

	Chrysene	Benzo(b&k) fluoranthene	Benzo(b) fluoranthene	Benzo(k) fluoranthene	Benzo(a) pyrene	Indeno(1,2,3-cd) pyrene	Benzo(g,h,i)pe rylene	Dibenzo(a,h)anthracene
0100-97-0157	13 J	22	NA	NA	11 J	4 J	4.1 J	20 U
0100-97-0159	3.3 J	6.8	NA	NA	3.2 J	0.82 J	0.91 J	3.8 U
0100-97-0160	1.1 J	1.8	NA	NA	0.93 J	0.38 J	0.37 J	1.8 U
0100-97-0161	0.38 U	NA[b]	0.38 U	0.38	0.38 U	0.38 U	0.38 U	0.38 U
0100-97-0162	12	NA	9.2	4.2	8.9	6	6.2	2.1
0100-97-0163	0.41 U	NA	0.41 U	0.41	0.41 U	0.41 U	0.41 U	0.41 U
0100-97-0164	0.41 U	NA	0.41 U	0.41	0.41 U	0.41 U	0.41 U	0.41 U
0100-97-0165	0.38 U	NA	0.38 U	0.38	0.38 U	0.38 U	0.38 U	0.38 U
0100-97-0166	0.38 U	NA	0.38 U	0.38	0.38 U	0.38 U	0.38 U	0.38 U
0100-97-0195	3.9	NA	2.6	2.3	2.9	1.9	2	0.75

[a] Units are mg/kg.
[b] NA = Not analyzed.

TABLE A-3

ANALYTICAL RESULTS FOR INORGANIC ANALYTES DETECTED AT PRS 0-012[a]

	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
UTL	38 700	1	7.82	315	1.95	2.6	6 120	19.3	19.2	15.5	21 300	23.3
0100-97-0151	4 040	5.6 U	2	87	0.7	1.2	1 990	5.1	11.9	19.3	20 200	44.9
0100-97-0152	5 250	5 U	0.97	87.7	0.83	0.5 U	1 870	4.5	2.5	16.5	7 060	21.2
0100-97-0153	3 960	4.6 U	0.99	61.6	0.6	0.46 U	1 310	2.7	1.6	6.8	5 880	13.3
0100-97-0154	5 690	4.9 U	1.4	77.1	0.8	0.49 U	1 880	5.3	2.8	7	9 160	24.2
0100-97-0155	5 060	3.8 U	1.2	71.9	0.66	0.38 U	1 820	4	2.1	5.7	6 190	24.6
0100-97-0156	4 670	5.2 U	1.3	77	0.71	0.52 U	1 870	3.6	2.1	5.4	6 450	22.1
0100-97-0181 (µg/L)	90.7	35.8 U	1.2 UJ	24.8	1.1 U	3.1 U	8 370	5.8	5.8	474	21 000	38.6

	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
UTL	4 610	714	0.1	15.2	3 410	1.7	n/a	915	1	41.9	50.8
0100-97-0151	801	630	0.23	6.9	707	0.3 U	0.56 U	201	0.24 U	13.6	628
0100-97-0152	1 030	188	0.13	5.1	949	0.25 U	0.5 U	312	0.2 U	9.1	86.7
0100-97-0153	727	249	0.05 U	3.2	638	0.24 U	0.46 U	304	0.19 U	6.5	37.4
0100-97-0154	1 150	223	0.061	5.9	1 090	0.25 U	0.49 U	282	0.2 U	11.5	41.2
0100-97-0155	973	176	0.046 U	4.2	910	0.22 U	0.38 U	248	0.17 U	8.6	31.3
0100-97-0156	928	173	0.047 U	3.9	922	0.25 U	0.52 U	286	0.2 U	7.8	30.3
0100-97-0181 (µg/L)	1 770	198	0.1 U	23.9	567 U	1.5 U	4.1	752	0.9 U	4.7	203

[a] Units are mg/kg.

TABLE A-4

ANALYTICAL RESULTS FOR ORGANIC ANALYTES DETECTED AT PRS 0-012[a]

	Acenaphthylene	Dibenzofuran	Fluorene	Phenanthrene	Anthracene	Carbazole	Fluoranthene	Pyrene	Benzo(a)anthracene
0100-97-0151	24 J	10 J	16 J	140	33 J	19 J	160	180	61 J
0100-97-0152	3.6 U	3.6 U	3.6 U	2.4 J	3.6 U	3.6 U	7.6	4.7	2.9 J
0100-97-0153	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.5 J	0.87 J	0.52 J
0100-97-0154	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	0.48 J	1.8 U	1.8 U
0100-97-0155	1.8 U	1.8 U	1.8 U	0.55 J	1.8 U	1.8 U	0.74 J	0.67 J	1.8 U
0100-97-0156	1.8 U	1.8 U	1.8 U	0.77 J	1.8 U	1.8 U	1.1 J	1.1 J	0.4 J
0100-97-0181 (µg/L)	NA[b]	NA	NA	NA	NA	NA	NA	NA	NA
0100-97-0182 (µg/L)	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	NR[c]	0.01 U	0.01 U	0.01 U

	Chrysene	Benzo(b&k)fluoranthene	Benzo(a)pyrene	Indeno(1,2,3-cd)pyrene	Benzo(g,h,i)perylene	Dieldrin	Endrin keytone
0100-97-0151	64	110	65	28 J	31 J	0.0086 J-	0.012 J-
0100-97-0152	3 J	5.7	3 J	1.7 J	2 J	0.0036 U	0.0036 U
0100-97-0153	0.81 J	1.5 J	0.68 J	1.8 U	0.36 J	0.0036 U	0.0036 U
0100-97-0154	1.8 U	1.8 U	1.8 U	1.8 U	1.8 U	0.011	0.0036 U
0100-97-0155	1.8 U	0.47 J	1.8 U	1.8 U	1.8 U	0.0044	0.0036 U
0100-97-0156	0.42 J	0.81 J	0.4 J	1.8 U	1.8 U	0.0044	0.0036 U
0100-97-0181 (µg/L)	NA	NA	NA	NA	NA	0.0001 U	0.0001 U
0100-97-0182 (µg/L)	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	NA	NA

[a] Units are mg/kg.
[b] NA = Not analyzed
[c] NR = Not reported

APPENDIX B DATA VALIDATION

TABLE B-1

SUMMARY TABLE OF QUALITY CONTROL RESULTS FOR SAMPLES COLLECTED AT PRSs 0-003 and 0-012

REQUEST NUMBER	SAMPLE ID	MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
3286R	0100-97-0157	Soil	VOCs	Acetone was found in the method blank. All detected acetone values less than10 times the blank level are qualifed U.
3286R	0100-97-0159	Soil	VOCs	Acetone was found in the method blank. All detected acetone values less than10 times the blank level are qualifed U.
3286R	0100-97-0160	Soil	VOCs	Acetone was found in the method blank. All acetone values less than10 times the blank detected level are qualifed U.
3300R	0100-97-0165	Soil	VOCs	The last internal standard was outside allowed limits. All analytes associated with this internal standard are qualified J or UJ.
3300R	0100-97-0166	Soil	VOCs	The last internal standard was outside allowed limits. All analytes associated with this internal standard are qualified J or UJ.
3321R	0100-97-0181	Water	VOCs	Acetone and methylene chloride were found in the method blank. All detected acetone and methylene chloride values less than10 times the blank level are qualifed U.
3391R	0100-97-0182	Water	SVOCs	Bis(2-ethylhexyl)phthalate and di-n-butylphthalate were found in the method blank. All detected bis(2-ethylhexyl)phthalate and di-n-butylphthalate values less than 10 times the blank level are qualified U.
3286R	0100-97-0151	Soil	Pest/PCB	All data are qualified J- or UJ for a low surrogate recovery for TCMX (45%).
3301R	0100-97-0161	Soil	Metals	Antimony (68%) and manganese (70%) data are qualified J- or UJ for low recoveries in the matrix spike sample.
3301R	0100-97-0162	Soil	Metals	Antimony (68%) and manganese (70%) data are qualified J- or UJ for low recoveries in the matrix spike sample.
3301R	0100-97-0163	Soil	Metals	Antimony (68%) and manganese (70%) data are qualified J- or UJ for low recoveries in the matrix spike sample.
3301R	0100-97-0164	Soil	Metals	Antimony (68%) and manganese (70%) data are qualified J- or UJ for low recoveries in the matrix spike sample.
3301R	0100-97-0165	Soil	Metals	Antimony (68%) and manganese (70%) data are qualified J- or UJ for low recoveries in the matrix spike sample.
3301R	0100-97-0166	Soil	Metals	Antimony (68%) and manganese (70%) data are qualified J- or UJ for low recoveries in the matrix spike sample.
3301R	0100-97-0195	Soil	Metals	Antimony (68%) and manganese (70%) data are qualified J- or UJ for low recoveries in the matrix spike sample.
3322R	0100-97-0181	Water	Metals	Arsenic (60%) data are qualified J- or UJ for a low recovery in the matrix spike sample.

VOCs = Volatile organic compounds.
SVOCs = Semivolatile organic compounds.
Pest/PCBs = Pesticides and polychlorinated biphenyls.
Metals = Target analyte list metals.

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APPENDIX C RISK ASSESSMENT CALCULATIONS

1.0 SCREENING-LEVEL RISK ESTIMATES OF NON-PRS-RELATED ORGANIC CHEMICALS IN SOIL

In risk assessment, the concentration of a chemical in soil is linearly related to the associated hazard quotient (for noncarcinogenic health effects) or theoretical excess cancer risk. In other words, doubling the soil concentration would double the hazard quotient or risk, which are referred to collectively as the risk level. Therefore, the relationship between a known soil concentration and associated risk level (expressed as a ratio) can be used to estimate the risk associated with the measured concentration of the same chemical in soil at the site, as shown below.

For a given chemical:

$$\frac{\text{Risk Level Associated with Known Soil Concentration}}{\text{Known Soil Concentration}} = \frac{\text{Site Risk Level}}{\text{Site Soil Concentration}} \quad \text{Exp. C-1}$$

For this evaluation, the US Environmental Protection Agency (EPA) Region 9 preliminary remediation goals (PRGs) (EPA 1995, 1307) were used as the "known soil concentrations" because they represent readily available soil concentrations associated with specified risk levels. Equation C-1 is rearranged and solved for the risk posed by each individual chemical at the site as follows:

$$\text{Site Risk Level} = \frac{\text{PRG Risk} \times \text{Site Soil Concentration}}{\text{PRG}} \quad \text{Exp. C-2}$$

where:

Site Risk Level = Calculated risk value,

PRG Risk Level = 1×10^{-6} for carcinogens or a hazard index of 1 for noncarcinogens,

Site Soil Concentration = Concentration of polycyclic aromatic hydrocarbon (PAH) in soil at the site (mg/kg), and

PRG = Risk-based concentration in soil for residential (or commercial/ industrial, whichever is appropriate for a particular potential release site [PRS]) exposure assumptions (mg/kg).

The total carcinogenic risk or total hazard index (for noncarcinogenic chemicals) was estimated by summing the individual risk or hazard index for each detected chemical. It should be noted that this relationship is not valid for chemicals with PRGs based on saturation concentrations (denoted "sat" by US EPA Region 9) or a theoretical maximum concentration (denoted "max" by US EPA Region 9) because these PRGs are not truly health-based values. In these cases, alternative PRGs calculated by US EPA Region 9 were used (see Table C-1). These alternative PRGs are intended to represent "health-based" values, and are provided in the electronic version of the US EPA Region 9 PRG table and in Table C-1. In the event that a PRG had not been calculated due to a lack of toxicity information, a surrogate PRG based on the toxicity information for a structurally similar compound was used.

TABLE C-1

HEALTH-BASED PRGs

CHEMICAL	HEALTH ENDPOINT	HEALTH-BASED PRG RESIDENTIAL SOIL (mg/kg)	HEALTH-BASED PRG INDUSTRIAL SOIL (mg/kg)
Acenaphthylene	Noncarcinogen	2 200[a]	11 000[a]
Anthracene	Noncarcinogen	18 000	160 000
Benzo(g,h,i)perylene	Noncarcinogen	1 900[b]	20 000[b]
Chrysene	Carcinogen	61	260
Fluorene	Noncarcinogen	2 300	18 000
Phenanthrene	Noncarcinogen	18 000[c]	160 000[c]
Pyrene	Noncarcinogen	1 900	20 000

[a] Toxicity criteria are not available for acenaphthylene; therefore, the toxicity criteria for acenaphthene were used as surrogates based on similarity in chemical structure.
[b] Toxicity criteria are not available for benzo(g,h,i)perylene; therefore, the toxicity criteria for pyrene were used as surrogates based on similarity in chemical structure.
[c] Toxicity criteria are not available for phenanthrene; therefore, the toxicity criteria for anthracene were used as surrogates based on similarity in chemical structure.

Tables C-2 through C-5 present the calculation of average PAH concentrations for carcinogenic and noncarcinogenic PAHs at PRSs 0-003 and 0-012. The information presented in these tables is discussed in Sections 5.1.7 and 5.2.7 of this report.

TABLE C-2

AVERAGE OF DETECTED CARCINOGENIC PAH CONCENTRATIONS AT PRS 0-003[a]

SAMPLE ID	CARBOZOLE	BENZO(a) ANTHRACENE	CHRYSENE	BENZO(b) FLUORANTHENE	BENZO(k) FLUORANTHENE	BENZO(a) PYRENE	INDENO(1,2,3-cd) PYRENE	DIBENZO(a,h) ANTHRACENE	TOTAL
0100-97-0157	3.5 J	13 J	13 J	22[b]	22[b]	11 J	4 J	20 U	
0100-97-0159	0.48 J	3.5 J	3.3 J	6.8[b]	6.8[b]	3.2 J	0.82 J	3.8 U	
0100-97-0160	1.8 U	1.2 J	1.1 J	1.8[b]	1.8[b]	0.93 J	0.38 J	1.8 U	
0100-97-0161	NA[c]	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	
0100-97-0162	NA	11	12	9.2	4.2	8.9	6	2.1	
0100-97-0163	NA	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	
0100-97-0164	NA	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	
0100-97-0165	NA	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	
0100-97-0166	NA	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	
0100-97-0195	NA	3.3	3.9	2.6	2.3	2.9	1.9	0.75	
Average	1.93	3.396	3.526	4.436	3.906	2.889	1.506	3.041	
SAL	22	3.4	3.53	0.61	6.1	0.061	0.61	0.061	
Average/SAL Ratio	0.1	5.6	0.06	7.3	0.6	47.4	2.5	49.8	113

[a] Units are mg/kg.
[b] These sample results were reported as benzo(b&k)fluoranthene; therefore, they are added into the average of both benzo(b)fluoranthene and benzo(k)fluoranthene.
[c] NA = Not analyzed.

TABLE C-3

AVERAGE OF DETECTED NONCARCINOGENIC PAH CONCENTRATIONS AT PRS 0-003[a]

SAMPLE ID	ACENAPHTHENE	FLUORENE	PHENANTHRENE	ANTHRACENE	FLUORANTHENE	PYRENE	BENZO(g,h,i) PERYLENE	HAZARD INDEX
0100-97-0157	3.7 J	3.5 J	32	20 U	43	27	4.1 J	
0100-97-0159	0.55 J	0.43 J	5.4	1.2 J	10	6.8	0.91 J	
0100-97-0160	1.8 U	1.8 U	1.7 J	0.33 J	2.9	2.6	0.37 J	
0100-97-0161	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	
0100-97-0162	1.7	1.8	22	4.6	28	0.36 U	6.2	
0100-97-0163	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	
0100-97-0164	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	0.41 U	
0100-97-0165	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	
0100-97-0166	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	
0100-97-0195	0.35 U	0.35 U	5.4	1.2	8.7	7.7	2	
Average	1.006	0.984	6.846	2.929	9.456	4.642	1.554	
SAL	2 200	2 300	18 000	18 000	2 600	1 900	1 900	
Hazard Quotient	0.0005	0.0004	0.0004	0.0002	0.004	0.002	0.0008	0.008

[a] Units are mg/kg.

TABLE C-4

AVERAGE OF DETECTED CARCINOGENIC PAH CONCENTRATIONS AT PRS 0-012[a]

ANALYTE	0100-97-0151	0100-97-0152	0100-97-0153	0100-97-0154	0100-97-0155	0100-97-0156	AVERAGE	SAL	RATIO AVERAGE/SAL
Benzo(a)anthracene	**61**	**2.9 J**	**0.52 J**	1.8 U	1.8 U	**0.4 J**	11.40	0.61	18.69
Benzo(a)pyrene	**65**	**3 J**	**0.68 J**	1.8 U	1.8 U	**0.4 J**	12.11	0.061	198.58
Benzo(b&k) fluoranthene	**110**	**5.7**	**1.5 J**	1.8 U	**0.47 J**	**0.81 J**	20.05	0.61[b]	32.86
Carbozole	**19 J**	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U	4.97	22	0.23
Chrysene	**64**	**3 J**	**0.81 J**	1.8 U	1.8 U	**0.42 J**	11.97	61	0.20
Indeno(1,2,3-cd) pyrene	**28 J**	**1.7 J**	1.8 U	1.8 U	1.8 U	1.8 U	6.15	0.61	10.08
Ratio Sum									260.6

[a] Units are mg/kg. Values in **BOLD** are detected.
[b] The most stringent SAL, that of benzo(b)fluoranthene, was used.

TABLE C-5

AVERAGE OF DETECTED NONCARCINOGENIC PAH CONCENTRATIONS AT PRS 0-012[a]

ANALYTE	0100-97-0151	0100-97-0152	0100-97-0153	0100-97-0154	0100-97-0155	0100-97-0156	AVERAGE	SAL	HAZARD INDEX
Acenaphthene	**24 J**	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U	5.8	2 200	0.0026
Anthracene	**33 J**	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U	7.3	18 000	0.0004
Benzo(g,h,i) perylene	**31 J**	**2 J**	**0.36 J**	1.8 U	1.8 U	1.8 U	6.46	1 900	0.0034
Fluoranthene	**160**	**7.6**	**1.5 J**	**0.48 J**	**0.74 J**	**1.1 J**	28.6	2 600	0.011
Fluorene	**16 J**	3.6 U	1.8 U	1.8 U	1.8 U	1.8 U	4.47	2 300	0.0019
Phenanthrene	**140**	**2.4 J**	1.8 U	1.8 U	**0.55 J**	**0.77 J**	24.6	18 000	0.0014
Pyrene	**180**	**4.7**	**0.87 J**	1.8 U	**0.67 J**	**1.1 J**	31.5	1 900	0.017
Ratio Sum									0.04

[a] Units are mg/kg. Values in **BOLD** are detected.

2.0 SCREENING ACTION LEVEL SURROGATES AND CALCULATIONS

The following discussions describe the rationale for selecting the surrogate screening action level (SAL) for endrin ketone used in the screening assessment for PRS 0-012. The available toxicity data were reviewed to either develop a toxicity criterion as a basis for a SAL, or identify a surrogate compound with similar physical, chemical, or toxicological properties. Three sources of toxicity information were consulted as part of this review: the US EPA Integrated Risk Information Systems (IRIS) (EPA 1996, 1313), US EPA Health Effects Assessment Summary Tables (HEAST) (EPA 1995, 1310), and the US Department of Health & Human Services Agency for Toxic Substances and Disease Registry (ATSDR) toxicological profiles. No data were found in IRIS for endrin ketone.

Endrin ketone. No data were found in IRIS HEAST for endrin ketone. Therefore, the ATSDR toxicological profile for endrin was used as the basis for this review.

Endrin ketone is a metabolite of endrin and is most likely the toxic entity of endrin (Clement Associates, Inc. 1990, 05-0250). The LD_{50} for endrin ketone is 1.1 mg/kg for male rats and 0.8 mg/kg/day for female rats. The LD_{50} for endrin is 18 mg/kg for male rats and 7.5 mg/kg/day for female rats (Clement Associates, Inc. 1990, 05-0250). The rats died at lower doses of endrin ketone than endrin and the female rats died at lower doses than the male rats. The female rat LD_{50} ratio between endrin ketone and endrin yields a toxic equivalency factor (TEF) of 9.4. Applying the TEF to the endrin SAL of 20 mg/kg yields a SAL of 2 mg/kg for endrin ketone. Therefore, given the lack of SAL for endrin ketone and the fact that endrin ketone is a primary metabolite of endrin, the SAL of 2 mg/kg, was used in the screening assessment.

APPENDIX C REFERENCES

Clement Associates, Inc., 1990. "Toxicological Profile for Endrin/Endrin Aldehyde," prepared under Contract No. 205-88-0608 for Agency for Toxic Substances and Disease Registry, US Department of Health & Human Services, Washington, D.C. **(Clement Associates, Inc. 1990, 05-0250)**

EPA (Environmental Protection Agency), May 1995. "Health Effects Assessment Summary Tables, FY-1995 Annual," Office of Solid Waste and Emergency Response, 9200.6-303 (95-1), EPA/540/R-95/036, PB95-921199, Washington, DC. **(EPA 1995, 1310)**

EPA (US Environmental Protection Agency), 1996. "Integrated Risk Information System (IRIS)," Office of Science and Technology, National Technical Information Service, Springfield, Virginia. **(EPA 1996, 1313)**

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