Los Alamos National Laboratory

UNIVERSITY OF CALIFORNIA

Environmental Restoration

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

Date: September 12, 1997
Refer to: EM/ER:97-366

Mr. Ted Taylor
Los Alamos Area Office
U.S. Department of Energy, MS A316
Los Alamos, NM 87544

SUBJECT: VCA REPORT FOR PRSs 0-030(d,k) and C-0-043 ACTIVITIES

Dear Ted:

Enclosed for your review and approval please find a copy of the Voluntary Corrective Action (VCA) Completion Report for Technical Area 0, Potential Release Sites (PRSs) 0-030(d,k) and C-0-043, for cleanup activities completed in Fiscal Year 1997. Also enclosed is the VCA Approval/Disapproval Form for your signature indicating your approval or disapproval of the report. If you do not approve this report, please include a brief description of the reason(s) for disapproval.

Once we have received your approval of this report, we will submit it to the regulators for their review/approval.

Your Field Project Manager participated in developing and reviewing this report. The Certification of Completion has been signed and is included in the enclosed report.

If you have any questions, please call Garry Allen at (505) 667-3394 or Bonnie Koch at (505) 665-7202. Thank you for your cooperation in this matter.

Sincerely,

Jorg Jansen
Program Manager

JJ/ss

Enclosures: (1) VCA Report for PRSs 0-030(d,k) and C-0-043
(2) Certification of Completion
(3) VCA Approval/Disapproval Form

Attachment 5

Cy (w/o encs.):
G. Allen, CST-7, MS E525
T. Baca, EM, MS J591
D. Bradbury, EM/ER, MS M992
J. Canepa, EM/ER, MS M992
T. Glatzmaier, DDEES/ER, MS M992
B. Koch, LAAO, MS A316
D. McInroy, EM/ER, MS M992
EM/ER File, MS M992
RPF, MS M707

VCA Report for Potential Release Sites

0-030(d,k) and C-0-043

Field Unit 1

Environmental
Restoration
Project

August 1997

A Department of Energy
Environmental Cleanup Program

LosAlamos
NATIONAL LABORATORY

LA-UR-97-3318

CONTENTS

EXECUTIVE SUMMARY vii

1.0 INTRODUCTION 1

1.1 General Site History and Description 1

1.2 RFI/VCA Overview 1

2.0 PRS 0-030(d) 5

2.1 Introduction 5

2.1.1 History 5

2.1.2 Investigations Previous to the RFI 5

2.2 Site Characterization 5

2.3 Background Comparison and Screening Assessment 16

2.3.1 Background Comparisons 16

2.3.1.1 Inorganics 16

2.3.1.2 Radionuclides 17

2.3.1.3 Evaluation of Organic Chemicals 20

2.3.2 Human Health Screening Assessment 25

2.3.3 Qualitative Risk Assessment 28

2.4 VCA Activities 28

2.4.1 Rationale For Conducting the VCA 28

2.4.2 Nature and Extent of Contamination 28

2.4.3 Cleanup Level Derivation 29

2.4.4 Remedial Activities and Results of Confirmation Sampling 29

2.4.4.1 Remedial Implementation 29

2.4.4.2 Confirmation Sampling 29

2.5 Waste Management 30

2.5.1 Deviations 30

2.5.2 Waste Characterization Data 30

2.6 Conclusions and Recommendations 31

3.0 PRS 0-030(k) 31

3.1 Introduction 31

3.1.1 History 31

3.1.2 Investigations Previous to the RFI 33

3.2 Site Characterization 33

3.3 Background Comparison and Screening Assessment 39

3.4 VCA Activities 39

3.5 Waste Management 39

3.6 Conclusions and Recommendations 39

4.0 PRS C-0-043 39

4.1 Introduction 40

4.1.1 History 40

4.1.2 Investigations Previous to the RFI 40

4.2 Site Characterization 40

4.3 Background Comparison and Screening Assessment 45

4.4 VCA Activities 45

4.4.1 Rationale For Conducting the VCA 45

4.4.2 Nature and Extent of Contamination 45

4.4.3 Cleanup Level Derivation 46

4.4.4 Remedial Activities and Results of Confirmation Sampling 46

4.4.4.1 Remedial Implementation 46

4.4.4.2 Confirmation Sampling 47

4.4.5 Background Comparison and Screening Assessment 48

4.4.5.1 Background Comparisons 48

4.4.5.1.1 Inorganics 48

4.4.5.1.2 Evaluation of Radionuclides 49

4.4.5.1.3 Evaluation of Organics 51

4.4.5.2 Human Health Screening Assessment 53

4.5 Waste Management 57

4.5.1 Deviations 57

4.5.2 Waste Characterization Data 57

4.6 Conclusions and Recommendations 58

5.0 REFERENCES 59

APPENDIX A RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES A-1

APPENDIX B ANALYTICAL DATA B-1

APPENDIX C COST COMPARISON C-1

APPENDIX D CERTIFICATE OF COMPLETION D-1

APPENDIX E RISK ASSESSMENT INFORMATION AND RATIONALE FOR SELECTION OF SALS E-1

LIST OF TABLES

TABLE 2.2-1 Summary of Samples Collected at PRS 0-030(d) 12

TABLE 2.3.1-1 Inorganics with Concentrations Exceeding Background Screening Values at PRS 0-030(d) 17

TABLE 2.3.1-2 Radionuclides with Concentrations Exceeding Background Screening Values at PRS 0-030(d) 19

TABLE 2.3.1-3 Organics with Detected Concentrations at PRS 0-030(d) 21

TABLE 2.3.1-4 PAHs with Detected Concentrations at PRS 0-030(d) 24

TABLE 2.3.2-1 Analytes Detected at Concentrations Greater than SAL at PRS 0-030(d) 25

TABLE 2.3.2-1 Multiple Chemical Evaluation for Carcinogenic Effects of Radionuclides at PRS 0-030(d) 27

TABLE 2.3.2-2 Multiple Chemical Evaluation for Noncarcinogenic Effects of Chemicals at PRS 0-030(d) 27

TABLE 2.3.2-3 Multiple Chemical Evaluation for Carcinogenic Effects of Chemicals at PRS 0-030(d) ... 27

TABLE 2.5.2-1 Summary of Projected and Generated Waste Volumes for PRS 0-030(d) 30

TABLE 4.2-1 Summary of Characterization Samples Collected at PRS C-0-043 44

TABLE 4.4.4-1 Confirmation Samples Collected at PRS C-0-043 48

TABLE 4.4.5-1 Inorganics with Concentrations Exceeding Background Screening Values at PRS C-0-043 49

TABLE 4.4.5-2 Organics with Detected Concentrations at PRS C-0-043 52

TABLE 4.4.5-3 PAHs with Detected Concentrations at PRS C-0-043 53

TABLE 4.4.5-4 Multiple Chemical Evaluation for Noncarcinogenic Effects of Chemicals for C-0-043 55

TABLE 4.4.5-5 Multiple Chemical Evaluation for Carcinogenic Effects of Chemicals for C-0-043 56

TABLE 4.5.2-1 Summary of Projected and Generated Waste Volumes for PRS C-0-043 57

TABLE A-1 Summary of Quality Control Results for PRS 0-030(d) A-3

TABLE A-2 Summary of Quality Control Results for PRS C-0-043 ..... A-7

LIST OF FIGURES

Fig. 1.1-1 Location of TA-0 within Los Alamos National Laboratory, Los Alamos County, New Mexico. 2

Fig. 1.1-2 Location of TA-0 with respect to Laboratory TAs and surrounding land holdings 3

Fig. 1.1-3 Locations of PRSs 0-030(d,k) and C-0-043 at TA-0 4

Fig. 2.1.1-1 Location of PRS 0-030(d) and associated structures 7

Fig. 2.2-1 Estimated locations of geophysical anomalies for PRS 0-030(d) 8

Fig. 2.2-2 Sampling locations for PRS 0-030(d) 10

Fig. 2.3.1-1 Locations of analytes exceeding background screening levels and SALs at PRS 0-030(d).. 22

Fig. 3.1.1-1 Probable septic tank locations for PRS 0-030(k) 32

Fig. 3.2-1 Locations of geophysical anomalies and trenched areas for PRS 0-030(k) 35

Fig. 3.2-2 Locations of hand-augered holes and trenches at PRS 0-030(k) 36

Fig. 4.1.1-1 Location of PRS C-0-043 41

Fig. 4.2-1 Locations of samples collected at PRS C-0-043 43

Fig. 4.2-2 Schematic cross section of PRS C-0-043 and estimated sample locations 44

Fig. 4.4.5-1 Locations of analytes exceeding background screening levels at PRS C-0-043 54

THIS PAGE LEFT INTENTIONALLY BLANK

EXECUTIVE SUMMARY

This report addresses the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) and voluntary corrective action (VCA) activities at potential release sites (PRSs) 0-030(d,k) and C-0-043 at Los Alamos National Laboratory (LANL). These septic tank PRSs are not included on the Hazardous and Solid Waste Amendments (HSWA) Module of LANL's RCRA operating permit because no hazardous contaminants were anticipated. The septic tanks handled only sanitary waste from early Laboratory operations at Technical Area (TA) 1; however, they were investigated to verify that no contamination was present. VCAs were conducted to remove structures associated with these sites as part of LANL's effort to remove legacy waste from the Los Alamos town site. Although radionuclides are regulated by the Department of Energy (DOE) and are not regulated under RCRA, it is more efficient and cost effective to investigate all types of potential contamination during a single site characterization. Therefore, radiochemical concerns are also addressed in this report.

PRSs 0-030(d,k) and C-0-043 are located in Technical Area (TA) 0. These PRSs are part of Solid Waste Management Unit (SWMU) Group 0-3, which includes 13 septic systems installed during the early 1940s. Most of these septic systems remained in operation until the Central Waste Water Treatment Plant was completed in late 1947. PRSs 0-030(d,k) and C-0-043 are described individually below. The proposed actions for each of these PRSs are summarized in Table ES-1.

PRS 0-030(d). PRS 0-030(d) is a septic tank located north of the cul-de-sac at the end of Pine Street. The results of the RFI for this PRS indicate that no chemicals are present at levels that pose an unacceptable risk to human health. A VCA was conducted to remove 170 ft of steel outfall pipe, but the septic tank was left in place because it met the criteria for inaccessibility outlined in the VCA plan (LANL 1996, 05-0244). PRS 0-030(d) is recommended for no further action (NFA) based on Criterion 4 of LANL's NFA Criteria Policy, which warrants no further action if chemicals of concern are present at concentrations that pose an acceptable level of risk under the expected land-use scenario.

PRS 0-030(k). PRS 0-030(k) is a suspected former septic tank location on private property north of East Road just off of Tewa Loop. No RFI samples were collected at this PRS and no VCA was conducted because no evidence of a former or existing septic system was found. Because the septic system was either removed before this investigation or never installed, PRS 0-030(k) is recommended for NFA based on Criterion 1 of LANL's NFA Criteria Policy, which warrants no further action if the PRS could not be located or was found never to have existed.

PRS C-0-043. PRS C-0-043 was a brick and mortar manhole that was believed to have been connected to sanitary sewer lines for the former Central Waste Water Treatment Plant. The results of the RFI indicated that there were no chemicals present at levels that posed an unacceptable risk to human health. A VCA was conducted to remove the manhole because it presented a potential safety risk to people using the site. PRS C-0-043 is recommended for NFA based on Criterion 4 of LANL's NFA Criteria Policy, which states that chemicals of concern are present at concentrations that pose an acceptable level of risk under the expected land-use scenario.

TABLE ES-1

SUMMARY OF PROPOSED ACTIONS

			PROPOSED ACTION				
PRS NUMBER	HSWA[a]	RAD COMPONENT[b]	NFA CRITERION	FURTHER ACTION[c]	ADD TO HSWA MODULE[d]	RATIONALE	SECTION NUMBER
0-030(d)		X	4			Analytes present at concentrations that pose an acceptable level of risk under the future residential land-use scenario	2.0
0-030(k)			1			PRS cannot be located	3.0
C-0-043		X	4			Analytes present at concentrations that pose an acceptable level of risk under the future residential land-use scenario	4.0

[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.

1.0 INTRODUCTION

This report addresses the Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) and voluntary corrective action (VCA) activities at Potential Release Sites (PRSs) 0-030(d,k) and C-0-043 at Los Alamos National Laboratory (LANL). These septic tank PRSs are not included on the Hazardous and Solid Waste Amendments (HSWA) Module of LANL's RCRA operating permit because no hazardous contaminants were anticipated. The septic tanks handled only sanitary waste from early Laboratory operations at Technical Area (TA) 1; however, they were investigated to verify that no contamination was present. VCAs were conducted to remove structures associated with these sites as part of the Laboratory's effort to remove legacy waste from the Los Alamos town site. Although radionuclides are regulated by the Department of Energy (DOE) and are not regulated under RCRA, it is more efficient and cost effective to investigate all types of potential contamination during a single site characterization. Therefore, radiochemical concerns are also addressed in this report.

1.1 General Site History and Description

PRSs 0-030(d,k) and C-0-043 are located in TA-0 (Figs. 1.1-1 and 1.1-2). These PRSs are part of Solid Waste Management (SWMU) Group 0-3, which includes 13 septic systems installed during the early 1940s. Most of these septic systems remained in operation until the Central Waste Water Treatment Plant was completed in late 1947. The septic systems in SWMU Group 0-3 handled sanitary waste from the original Los Alamos town site and from early Laboratory operations at TA-1. PRSs 0-030(d,k) and C-0-043 are described individually in Sections 2.0 through 4.0 of this report.

1.2 RFI/VCA Overview

The conceptual model for SWMU Group 0-3 is presented in Chapter 5.10 of the RFI Work Plan for Operable Unit (OU) 1071 (LANL 1992, 0781). This model assumes that contamination of soil or tuff might occur through leakage from the septic systems or releases from outfalls. The primary receptors are assumed to be residents, site visitors, and site workers.

The objective of the RFI characterization activities at PRSs 0-030(d,k) and C-0-043 was to determine whether contamination was present. Because historical information suggested that these PRSs should be easy to address, remedial options were to be evaluated and VCAs, if warranted, were to be implemented immediately after completion of site characterization. The field activities and data analysis for PRSs 0-030(d,k) and C-0-043 are discussed in detail in Sections 2.0 through 4.0 of this report.

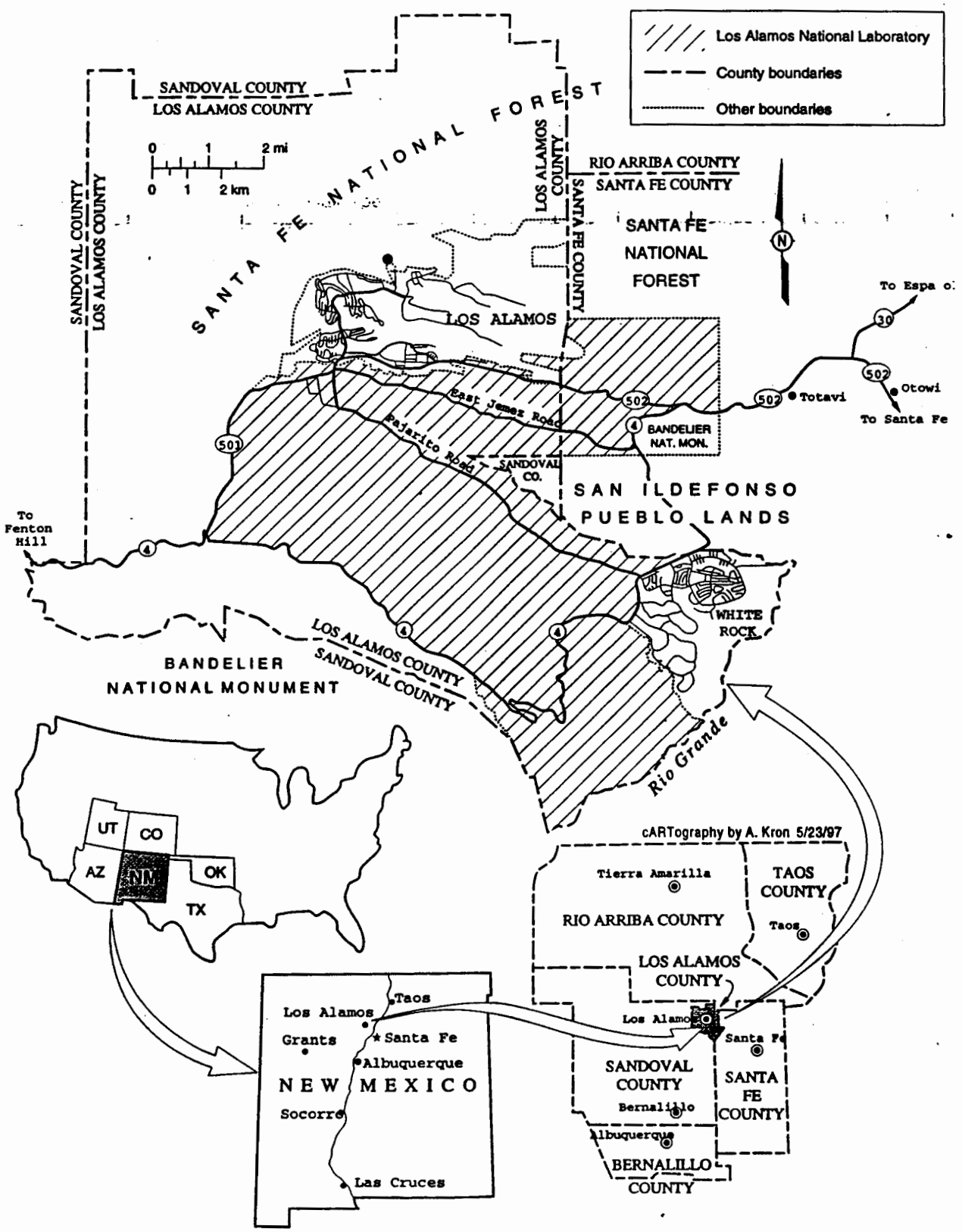


Fig. 1.1-1 Location of TA-0 within Los Alamos National Laboratory, Los Alamos County, New Mexico.

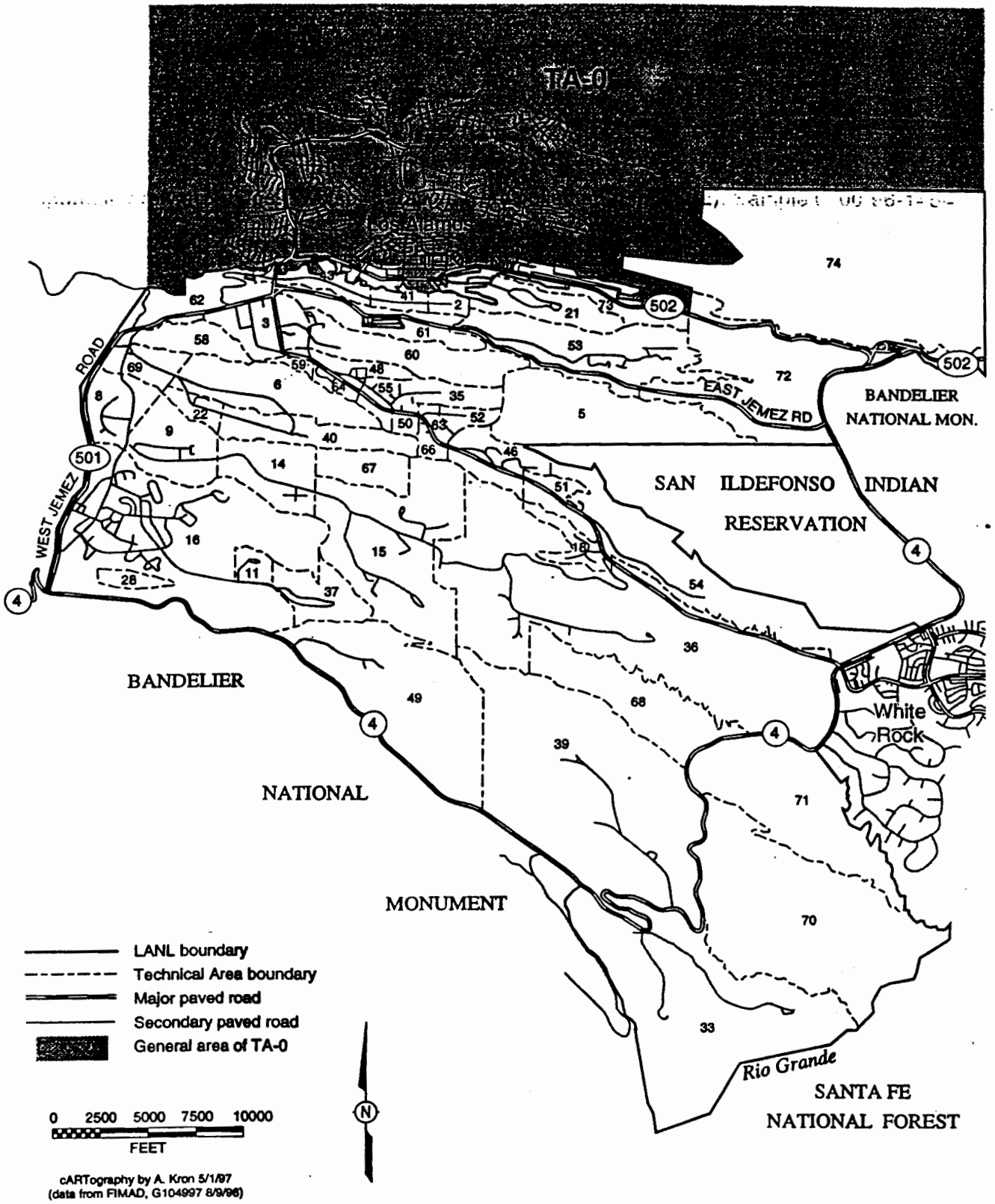


Fig. 1.1-2 Location of TA-0 with respect to Laboratory TAs and surrounding land holdings.

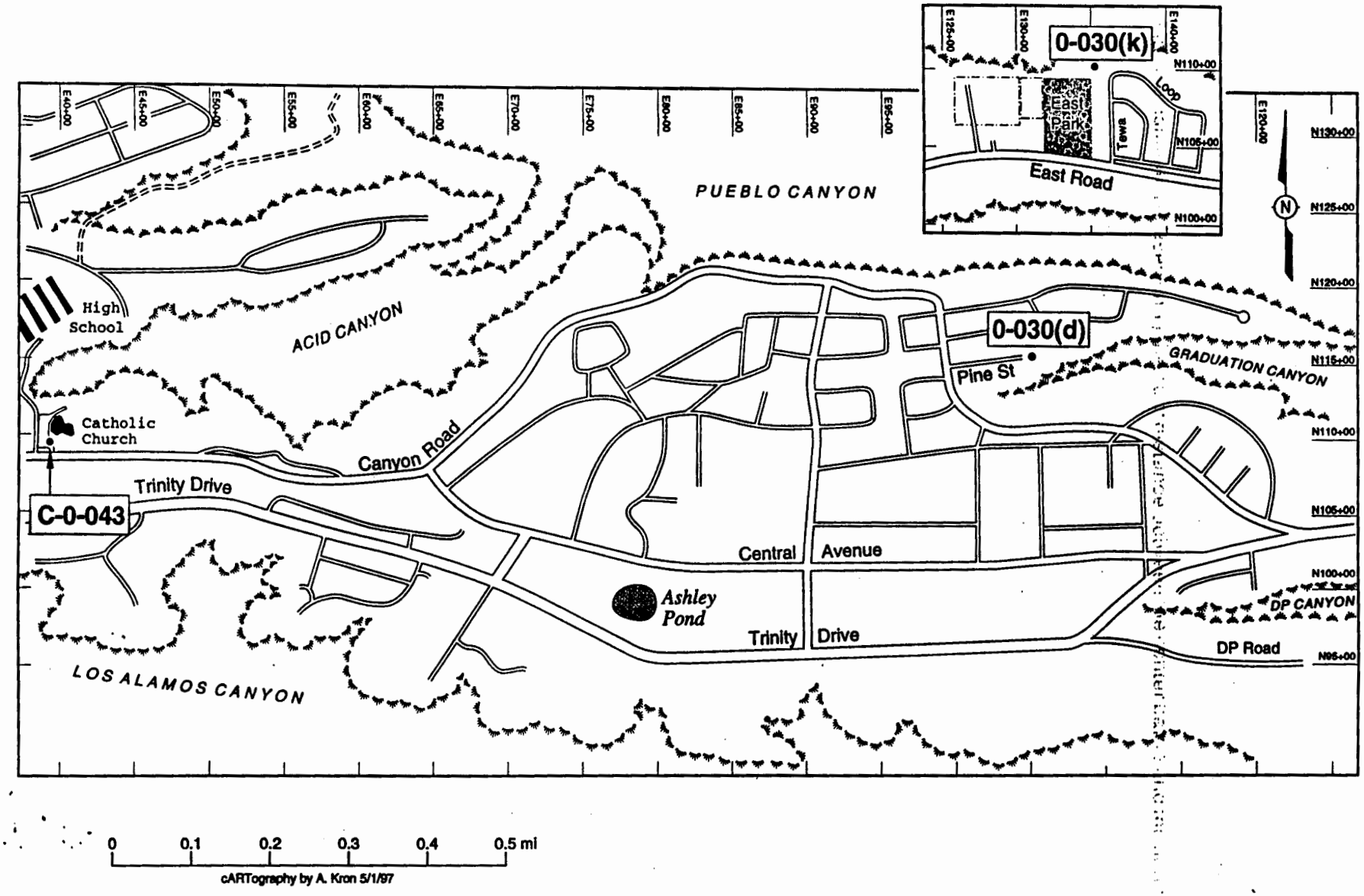


Fig. 1.1-3 Locations of PRSs 0-030(d,k) and C-0-043 at TA-0.

2.0 PRS 0-030(D)

PRS 0-030(d) is a septic system located north of the cul-de-sac at the end of Pine Street. The results of the RFI for this PRS indicate that no chemicals are present at levels expected to pose an unacceptable risk to human health. A VCA was conducted to remove 170 ft of steel outfall pipe, but the septic tank was left in place because it met the criteria for inaccessibility outlined in the VCA plan (LANL 1996, 05-0244). Based on the results from RFI characterization and VCA activities, this site is recommended for no further action (NFA).

2.1 Introduction

2.1.1 History

PRS 0-030(d) is described in Chapter 5.10 of the RFI Work Plan for OU 1071 (LANL 1992, 0781). This septic system lies partially on private property at 686 Pine Street and partially on Los Alamos County property that is currently used as a playground (Fig. 2.1.1-1). PRS 0-030(d) was installed in either 1943 or 1944, and it served McKee houses, apartments, and dormitories west of Canyon Road on streets currently known as Piñon Loop, Opal Street, Nugget Street, and Myrtle Street (Francis and Sullivan 1995, 05-0207). Because PRS 0-030(d) is believed to have served only residential areas, it was considered unlikely to contain RCRA or radioactive contamination.

2.1.2 Investigations Previous to the RFI

No investigations specific to PRS 0-030(d) were conducted before this RFI.

2.2 Site Characterization

The objective of the RFI for PRS 0-030(d) was to determine whether contamination was present. RFI activities at PRS 0-030(d) were conducted between April and November of 1996. These activities were conducted in accordance with the VCA Plan for PRSs 0-030(d,h,i,j,k,n,o,p) (LANL 1996, 05-0244). RFI activities at PRS 0-030(d) included site surveys, geodetic surveys, geophysical surveys, trenching in the Pine Street cul-de-sac, outfall area sampling, trenching and sampling in the playground area, and field screening. These activities are discussed in detail below.

Site Surveys

The PRS 0-030(d) septic tank was visible at the end of Pine Street during housing construction in November 1946. The location of the tank is shown on 1946 aerial photographs and on a 1947 Zia Company post-plan map (Zia Company 1947, 05-0132). Engineering drawings showing the buildings connected to this septic tank could not be located. A site survey was conducted on October 25, 1996, and an 8-in. diameter steel outfall pipe was found approximately 90 ft east of the cul-de-sac (Fig. 2.1.1-1). This pipe drains into a tributary of Graduation Canyon.

Geodetic Surveys

The approximate coordinates of the PRS 0-030(d) septic tank were obtained from 1947 Zia Company drawings (Zia Company 1947, 05-0132). These coordinates were surveyed and staked in the field. Upon completion of sampling activities, the locations of the utility lines, samples, septic tank features, the outfall pipe, landscaping features, playground boundaries, fences, and the Pine Street cul-de-sac were surveyed. Geodetic survey data were transferred to the Facility for Information Management, Analysis, and Display (FIMAD) for incorporation into the Environmental Restoration (ER) database.

Geophysical Surveys

A geophysical survey was conducted to locate the position and orientation of the septic tank and associated piping. This survey consisted of magnetic and electromagnetic (EM) surveys, which identified two anomalies (Fig. 2.2-1). The first anomaly was located beneath the asphalt cul-de-sac, and was interpreted to be the most likely location of the septic system (Geophex, Ltd. 1996, 05-0247). The second anomaly was located in the middle of the Los Alamos County playground. This anomaly was more prominent, but it was not expected to be the location of the septic tank. The second anomaly was only to be investigated if the septic tank was not found at the more likely septic tank location. As discussed below, the septic tank was found just north of the cul-de-sac. Therefore, the second anomaly was not investigated, and its source is unknown (Geophex, Ltd. 1996, 05-0247). Anomalies at the septic tank location established during the geodetic survey could not be accurately interpreted because a nearby chain-link fence and an underground utility corridor caused interference on the magnetic data (Geophex, Ltd. 1996, 05-0247).

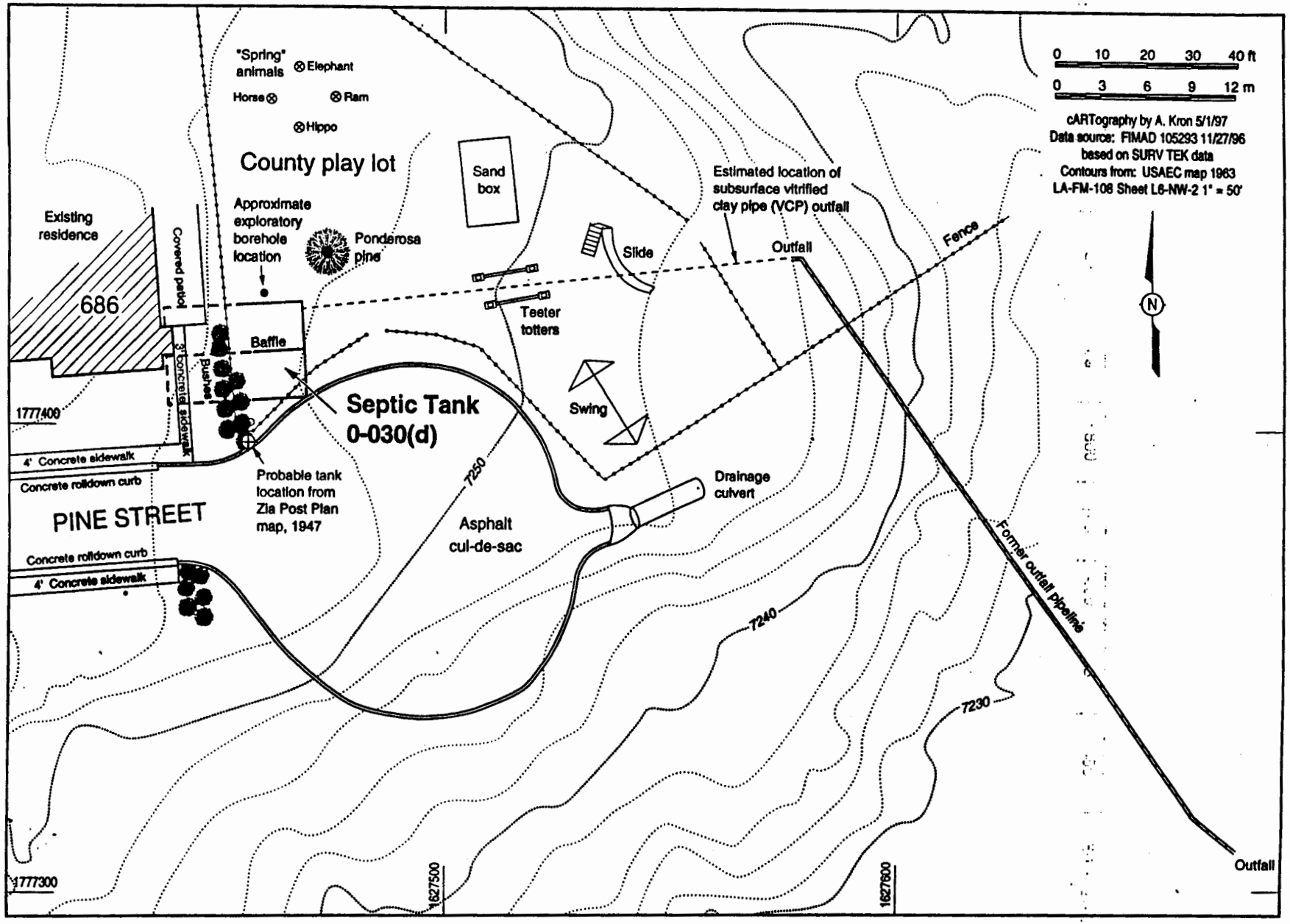


Fig. 2.1.1-1 Location of PRS 0-030(d) and associated structures.

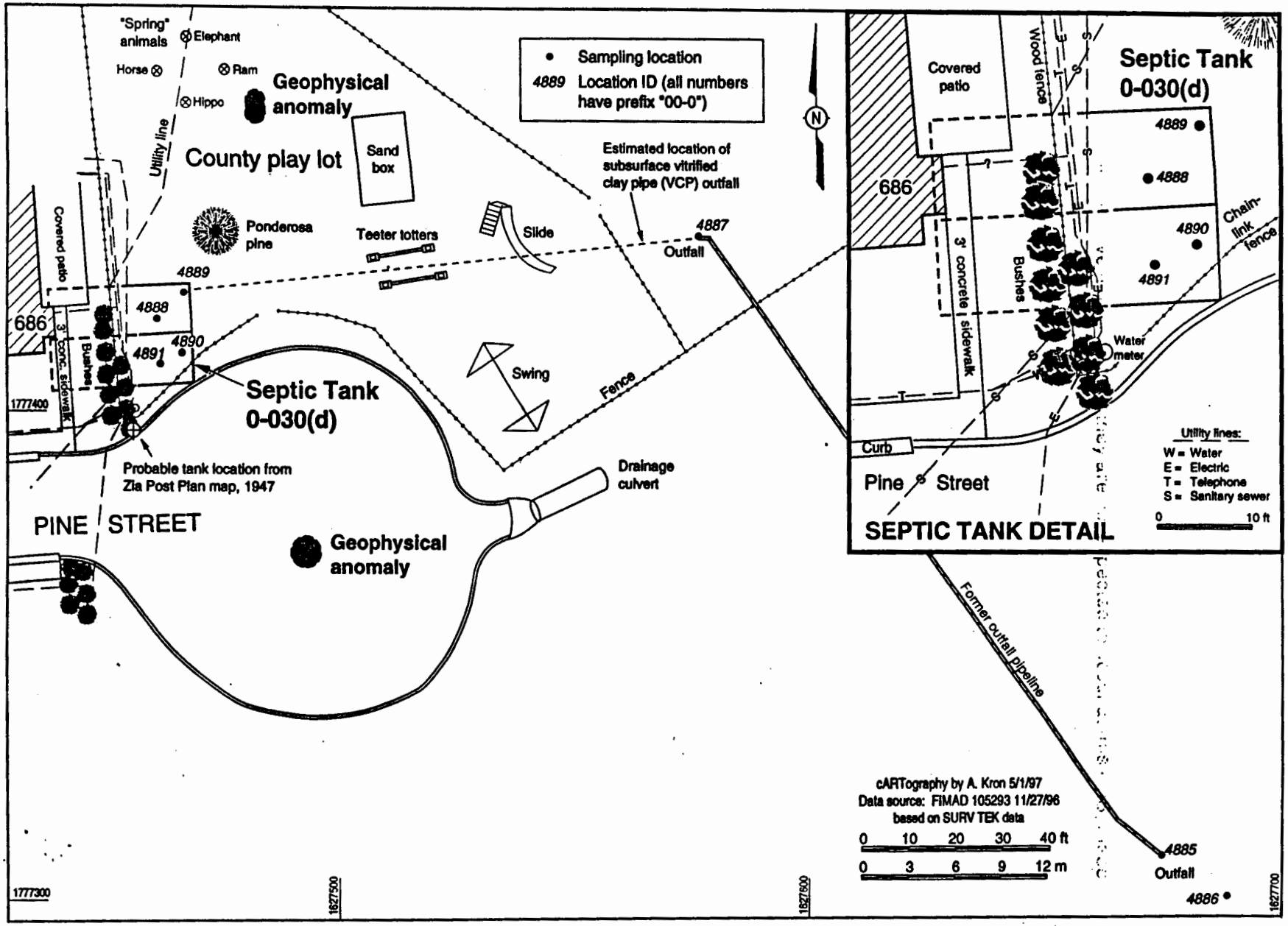


Fig. 2.2-1 Estimated locations of geophysical anomalies for PRS 0-030(d).

Cul-de-sac Trenching

Two trenches (trench 1 and trench 2) were excavated to investigate the geodetically surveyed septic tank coordinates, which were assumed to be the center of the tank. These trenches were located in the asphalt cul-de-sac south and east of the geodetically surveyed septic tank location because landscaping obstructions and underground utilities prevented excavation immediately adjacent to and north of this location (Fig. 2.2-2).

Trench 1 was oriented north-south and was 10 ft long x 2 ft wide x 6 ft deep. Backfill material (clay-rich soil and tuff cobbles) was observed beneath the asphalt to a depth of approximately 3 ft below ground surface (bgs). A weathered zone of soil and tuff cobbles was observed from 3–5 ft bgs, and tuff bedrock was encountered at approximately 5 ft bgs. Trench 2 paralleled the curb along the north side of the cul-de-sac and was oriented approximately northeast-southwest. Trench 2 was 10.5 ft long x 2 ft wide x 6 ft deep. The lithology of trench 2 was the same as trench 1. No evidence of a septic tank was found in either of these trenches.

Soil excavated from trenches 1 and 2 was screened in the field for organic vapors and gross radiological activity for worker health and safety. There were no detectable organic vapor readings, and no detectable alpha or beta/gamma activities above background levels.

Trenches 1 and 2 were backfilled with excavated material and compacted. Base coarse material (a road gravel mix) was placed in the upper 6 in. of each trench. The areas where asphalt was removed will be patched during the spring of 1997. Approximately 4 yd^3 of asphalt were excavated. The asphalt was screened in the field for gross radiological contamination using Ludlum™ Model 139 rate meters with air proportional (alpha) and Eberline™ ESP-1 (beta/gamma) probes. There were no detectable alpha or beta/gamma activities above background levels. The asphalt was therefore classified as construction debris and removed from the site for recycling.

Outfall Area Sampling

During the site survey, an 8-in. diameter steel outfall pipe was found approximately 90 ft east of the Pine Street cul-de-sac (Fig. 2.2-2). This pipe drains into a tributary of Graduation Canyon. Most of the pipe was above ground surface, and the northern end (16 ft) was shallowly buried. Los Alamos County utility personnel confirmed that the pipe was not part of the current County utility lines. The pipe was presumed to be the outfall line from the septic tank. The pipe was traced north for approximately 160 ft, at which point it angled 120° westward toward the suspected location of the tank (based on 1946 aerial photographs). The pipe continued approximately 2 ft to the west where it connected to a 6-in. diameter vitrified clay pipe (VCP). There was a 2-in. gap in the cement seal between the steel pipe and the VCP.

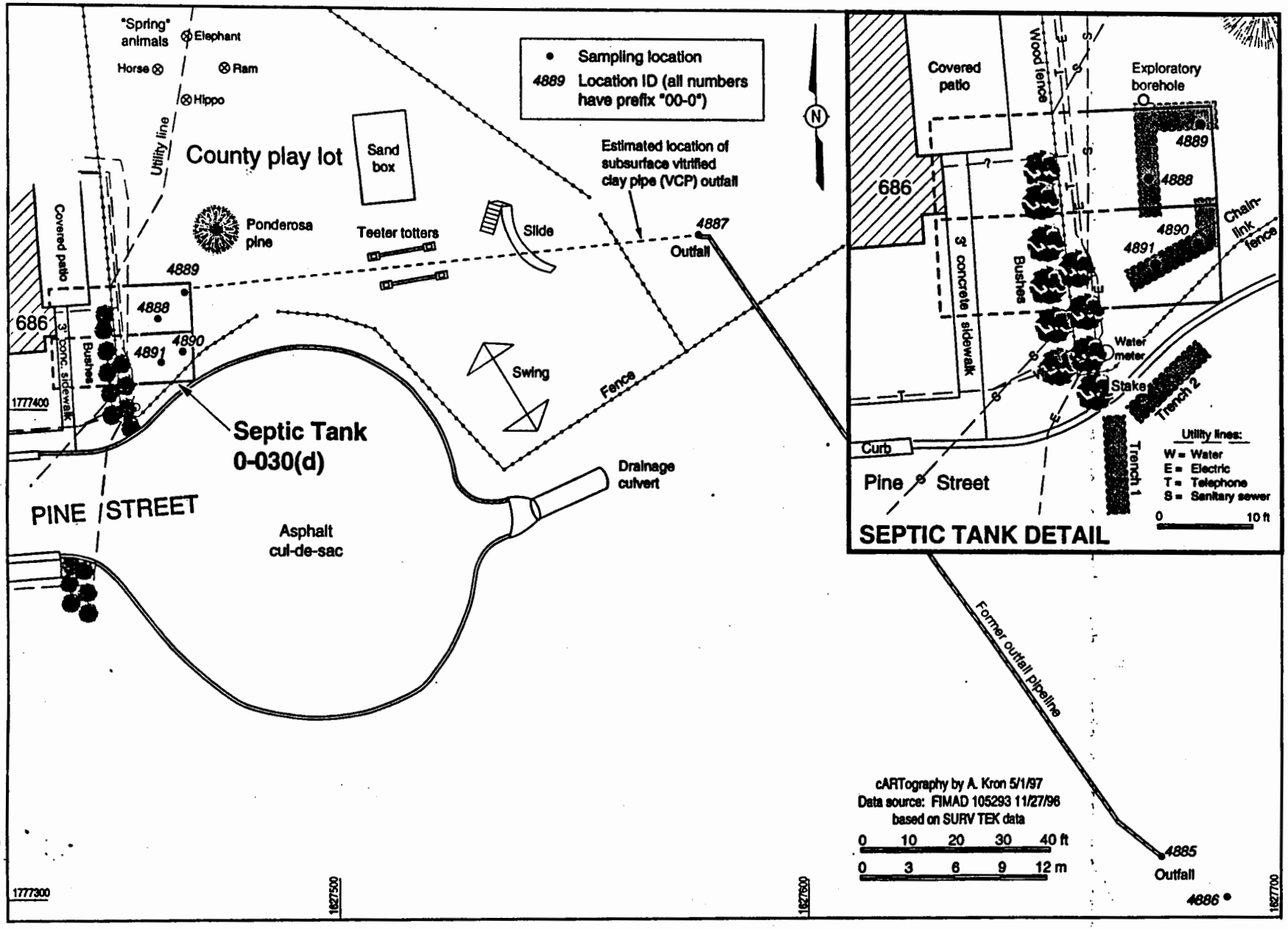


Fig. 2.2-2 Sampling locations for PRS 0-030(d).

To characterize the outfall area, two soil samples were collected below the outfall pipe (Fig. 2.2-2). Sample 0100-96-1451 (location 00-04885) was collected at 0–5 in. bgs, directly beneath the outfall from the steel pipe. Sample 0100-96-1452 (location 00-04886) was collected at 0–5 in. bgs in the drainage, approximately 15 ft downgradient from the steel outfall pipe. To determine whether a release occurred beneath the joint of the VCP and the steel pipe, an additional sample (sample 0100-96-1453, location 00-04887) was collected at 2–2.5 ft bgs directly beneath the pipe joint (Fig. 2.2-2). These three samples were collected using the Spade and Scoop Method for Collection of Soil Samples, LANL-ER-SOP-06.09, R0, ICN7 (LANL, 0875).

The three samples were screened in the field for organic vapors and gross radiological activity for worker health and safety. There were no detectable organic vapor readings, and no detectable alpha or beta/gamma activities above background levels. The samples were also submitted to the TA-21 radiochemical screening laboratory for gross alpha/beta/gamma radiation, moisture content, and tritium analyses. The samples were then submitted for off-site, fixed-laboratory analyses including target analyte list (TAL) metals by Environmental Protection Agency (EPA) SW-846 Methods 6010 and 7470 (mercury), volatile organic compounds (VOCs) by EPA SW-846 Method 8260, semivolatile organic compounds (SVOCs) by EPA SW-846 Method 8270, and polychlorinated biphenyls (PCBs)/pesticides by EPA SW-846 Method 8080. In addition, samples were analyzed for plutonium-238 and plutonium-239/240 by alpha spectrometry, americium-241 by gamma spectroscopy, and total uranium by inductively coupled plasma/mass spectroscopy (ICP/MS). Sample locations and requested analyses are summarized in Table 2.2-1.

Playground Trenching and Sampling

Because the tank was not located in the asphalt cul-de-sac (trenches 1 and 2), all of the relevant information was reassessed, including maps, aerial photographs, the orientation of the aboveground pipe, and information from the owner of 686 Pine Street. In addition, the magnetic map from the geophysical survey was reviewed. An anomaly at the geodetically surveyed septic tank coordinates, which was not addressed because of the interference associated with a nearby fence and underground utility corridor, was then recognized as potentially signifying the presence of the septic tank.

TABLE 2.2-1

SUMMARY OF SAMPLES COLLECTED AT PRS 0-030(d)[a]

SAMPLE NUMBER	LOCATION ID	LOCATION DESCRIPTION	DEPTH (ft bgs)	VOCs	SVOCs	PESTICIDES/ PCBs	TAL METALS	RAD[b]
0100-96-1451	00-04885	Directly below mouth of steel outfall pipe	0–0.42	2744	2744	2744	2745	2746
0100-96-1452	00-04886	15 ft down drainage from mouth of steel outfall pipe	0–0.42	2744	2744	2744	2745	2746
0100-96-1453	00-04887	Beneath connection between VCP and steel pipe	2–2.5	2744	2744	2744	2745	2746
0100-96-1454	00-04888	Inside northern portion of tank next to center baffle	4–4.5	2766	2766	2766	2767	2768
0100-96-1455	00-04888	Inside northern portion of tank next to center baffle	7.5–8	2766	2766	2766	2767	2768
0100-96-1456	00-04889	Inside northern portion of tank at northeast corner	4–4.5	2766	2766	2766	2767	2768
0100-96-1457	00-04889	Inside northern portion of tank at northeast corner	6.5–7	2766	2766	2766	2767	2768
0100-96-1458	00-04890	Inside southern portion of tank next to east end	2.5–3	2766	2766	2766	2767	2768
0100-96-1459	00-04890	Inside southern portion of tank next to east end	7–7.8	2766	2766	2766	2767	2768
0100-96-1460	00-04891	Inside central area of southern portion of tank	3–3.5	2766	2766	2766	2767	2768
0100-96-1461	00-04891	Inside central area of southern portion of tank	7–7.6	2766	2766	2766	2767	2768

[a] Samples were also submitted for gross alpha/beta/gamma radiation, moisture content, and tritium analyses at the TA-21 radiochemical screening laboratory.
[b] RAD = Plutonium-238, plutonium-239/240, total uranium, americium-241, and gamma spectroscopy.

An exploratory, hand-augered borehole was drilled at the location of the newly recognized anomaly (Fig.2.2-2). The hole was positioned to line up on an approximate east-west line with the outfall pipe east of the playground. The upper 1.5 ft of the core was moist, clay-rich fill, the portion from 1.5–3 ft bgs was crushed tuff fill material, and the portion from 3–6 ft bgs consisted of sand and gravel. Tuff bedrock was not encountered in this borehole. Based on the observed lithology, the hole was thought to have been located either in a backfilled pit where the septic tank had once been, or directly inside the abandoned and backfilled septic tank. It was later determined that this borehole was located north of the septic tank in backfill material (Fig. 2.2-2). The hand auger could not penetrate beyond 6 ft in the sand and gravel because the borehole tended to cave in. Therefore, a backhoe was used to excavate the area to determine whether a tank was present.

Three trenches were excavated. The first trench was located south of the exploratory borehole and was oriented north-south (Fig. 2.2-2). Two vertical concrete walls were found and determined to be the east-west oriented center baffle and the north wall of the septic tank. The tank cover had been removed, and the tank had been backfilled. The depth to the top of the center baffle was approximately 3 ft bgs, and the depth to the top of the north wall was approximately 1.5 ft bgs. Two soil samples were collected (Fig. 2.2-2). Sample 0100-96-1454 (location 00-04888) was collected north of the center baffle at 4–4.5 ft bgs. Sample 0100-96-1455 (location 00-04888) was collected north of the center baffle from the bottom of the septic tank (7.5–8 ft bgs).

The second trench was excavated to trace the top of the north wall to locate the northeast corner of the septic tank (Fig. 2.2-2). The top of the concrete wall at the northeast corner was approximately 3–4 in. bgs. To verify that this was the northeast corner, soil was excavated outside the north and east walls. Two soil samples were collected (Fig. 2.2-2). Sample 0100-96-1456 (location 00-04889) was collected inside the northeast corner of the tank at 4–4.5 ft bgs. Sample 0100-96-1457 (location 00-04889) was collected from the bottom of the northeast corner of the tank at 6.5–7 ft bgs. The northeast corner of the tank lined up on an approximate east-west line with the outfall pipe to the east; however, a connection for the outfall pipe was not found at the northeast corner. The outfall piping is believed to have been removed with the tank cover before the tank was backfilled. The remaining length of the east wall was not investigated because of a large pine tree located slightly to the north of the tank, which might have been damaged by further excavation. A chainlink fence located across the southeast corner of the tank also prevented further investigation of the east wall (Fig. 2.2-2).

The third trench was excavated across the southern half of the tank in a northeast-southwest orientation, from the approximate northeast corner of the southern portion of the tank toward the central area of the southern portion (Fig. 2.2-2). The east wall and center baffle were both found in this trench. Four soil samples were collected from the southern half of the tank. Sample 0100-96-1458 (location 00-04890) was collected near the east wall at 2.5–3 ft bgs. Sample 0100-96-1459 (location 00-04890) was collected from bottom of the tank, near the east wall, at 7–7.5 ft bgs. Sample 0100-96-1460 (location 00-04891) was collected in the eastern third of the southern portion of the tank at 3–3.5 ft bgs. Sample 0100-96-1461 (location 00-04891) was collected from the bottom of the eastern third of the southern portion of the tank at 7–7.6 ft. The septic tank contained moist, brown, clay-rich soil with tuff cobbles, wood, rebar, and concrete pieces.

The western portion of the septic tank was not investigated or sampled because fences, underground utility lines, landscaping, and the house foundation at 686 Pine Street render this portion of the tank inaccessible. However, the size of the tank can be estimated based on existing data. The septic tank is constructed of rebar-reinforced concrete and is estimated to be 30 ft long x 20 ft wide x 8 ft bgs deep. The long axis of the tank lies in an east-west direction. This size estimate is based on 1) the 10-ft distance between the center baffle and the north wall, 2) the rectangular shape and size of the tank in aerial photographs, and 3) the size of other septic tanks of similar construction and geometry investigated in 1996.

All samples from these three trenches were collected from the backhoe bucket using the Spade and Scoop Method for Collection of Soil Samples, LANL-ER-SOP-06.09, R0, ICN7 (LANL, 0875). Soil excavated from the trenches was screened in the field for organic vapors and gross radiological activity for worker health and safety. There were no detectable organic vapor readings, and no detectable alpha or beta/gamma activities above background levels. The samples were also submitted to the TA-21 radiochemical screening laboratory for gross alpha/beta/gamma radiation, moisture content, and tritium analyses. The samples were then submitted for off-site, fixed-laboratory analyses including TAL metals by EPA SW-846 Methods 6010 and 7470 (mercury), VOCs by EPA SW-846 Method 8260, SVOCs by EPA SW-846 Method 8270, and PCBs/pesticides by EPA SW-846 Method 8080. In addition, samples were analyzed for plutonium-238 and plutonium-239/240 by alpha spectrometry, americium-241 by gamma spectroscopy, and total uranium by ICP/MS. Sample locations and requested analyses are summarized in Table 2.2-1.

After completion of the investigation activities, the exploratory auger hole and trenches were backfilled with excavated material and compacted, and the area was graded with a backhoe. Erosion control matting was placed over the disturbed area to control dust and assist with site restoration. The disturbed area will be reseeded with grass seed in spring of 1997 to complete the site restoration.

Field Screening Methods

Field screening was performed to protect worker health and safety. Soil was screened for organic vapors using a Thermo Environmental Instruments, Inc. organic vapor meter (OVM) Model 580B photoionization detector (PID) with an 11.7 eV bulb. Soil was screened for ionizing radiation using Ludlum™ Model 139 rate meters with air proportional (alpha) and Eberline™ ESP-1 (beta/gamma) probes. All field screening instruments were calibrated as necessary and checked daily.

Deviations

All work was conducted in accordance with the VCA plan (LANL 1996, 05-0244). However, the following deviations occurred.

- Soil samples were not submitted to the Mobile Chemistry Analytical Laboratory (MCAL) for x-ray fluorescence (XRF) screening of metals as stated in the VCA plan. Objectives were not affected by this deviation because the samples were submitted to a fixed laboratory for TAL metals analysis with a seven-day turnaround.

- All samples collected inside the septic tank were submitted for all analyses rather than the selected analyses stated in the VCA plan. Because of the large soil volume in the eastern portion of the septic tank, it was considered necessary to analyze all samples for all analyses to adequately characterize the tank contents.

- The south and west walls (western two-thirds) of the septic tank were inaccessible because of underground utility lines (gas, water, sewer, and telephone lines), landscaping, fencing, and a house foundation. Therefore, the western portion of the septic tank was not investigated or sampled as stated in the VCA plan because it was inaccessible (as defined in the VCA plan) (LANL 1996, 05-0244). No sludge was found in the portion of the tank that was investigated, so the sludge is presumed to have been removed during decommissioning of the tank. The fill material sampled during this investigation is expected to be uniform across the entire septic tank. Therefore, the characterization samples collected are considered representative of the entire structure.

- Samples were not collected outside the eastern wall of the septic tank to characterize the outlet line because the line was not located at the northeast corner of the tank and the remainder of the east wall was inaccessible because of a large pine tree and a chainlink fence.

- The inlet line for the septic tank was not located and characterized as stated in the VCA plan. Assuming the accuracy of the estimated tank dimensions of 20 ft wide x 30 ft long, the inlet line is located on the western end of the tank beneath the house foundation at 686 Pine Street. It is therefore inaccessible.

2.3 Background Comparison and Screening Assessment

The purpose of this section is to assess potential human health effects resulting from exposure to residual contamination associated with PRS 0-030(d). A screening assessment was performed on the RFI data for this PRS following methodology presented in "Risk-Based Corrective Action Process" (LANL/SNL 1996, 1277). Only fixed-laboratory analytical data from characterization samples were included in this assessment.

2.3.1 Background Comparisons

Data for inorganics, radionuclides, and organics at PRS 0-030(d) were compared to background screening values presented in "Application of LANL Background Data to ER Project Decision-Making, Part I: Inorganics" (Ryti et al. 1996, 1298). The results of the background comparison are discussed below.

2.3.1.1 Inorganics

Eleven soil samples collected at PRS 0-030(d) were analyzed for TAL metals and total uranium. Eight of these samples were collected inside the septic tank, and three were collected outside the septic tank. Nine inorganics (antimony, calcium, copper, iron, lead, mercury, selenium, silver, and zinc) were detected at concentrations exceeding their respective background screening values. The concentrations of these analytes for each sample that has at least one value above background screening values are presented in Table 2.3.1-1. The locations where these analytes were detected at levels exceeding background screening values are shown on Fig. 2.3.1-1.

The qualifiers in the table were assigned during baseline validation. However, the data are usable for site-specific decisions for the following reasons. As discussed in Appendix A, selenium data were qualified UJ because of low matrix spike recoveries. The UJ qualifier indicates that selenium was not positively identified in the sample and the associated value is an approximation of the sample-specific detection limit. Other values of selenium were detected at higher concentrations with no qualification. Selenium will be further evaluated in the screening assessment for these samples.

Antimony, calcium, copper, iron, lead, mercury, selenium, silver, and zinc will be carried forward to the screening assessment.

TABLE 2.3.1-1

INORGANICS WITH CONCENTRATIONS EXCEEDING BACKGROUND SCREENING VALUES AT PRS 0-030(d)[a]

SAMPLE ID	DEPTH (ft)	ANTIMONY	CALCIUM	COPPER	IRON	LEAD	MERCURY	SELENIUM	SILVER	ZINC
	UTL	1	6 120	15.5	21 300	23	0.1	1.7	n/a[b,c]	50.8
	SAL	31	n/a	2 800	n/a	400	23	380	380	23 000
0100-96-1451	0–0.42	1 U	2 820	7.2	11 900	52.4	0.03	0.64 U	0.17 U	52.1
0100-96-1452	0–0.42	1.1 U	1 840	6.8	6 320	56.9	0.08	0.99	0.18 U	35.8
0100-96-1453	2–2.5	1.7	4 840	14.4	42 300	12.2	0.08	1.8	0.15 U	32.8
0100-96-1455	7.5–8	5.6 U	4 370	13.8	8 210	16.1	0.167	0.27 U	0.56 U	42.3
0100-96-1456	4–4.5	5.4 U	3 090	8.47	7 780	16.7	0.164	0.26 U	0.54 U	51.6
0100-96-1457	6.5–7	5.4 U	7 550	9.72	9 210	16.6	0.166	0.27 UJ	0.54 U	54.9
0100-96-1459	7–7.8	5.6 U	9 630	24.3	6 280	50.5	0.593	0.28 UJ	1.45	189
0100-96-1461	7–7.6	5.4 U	4 760	11.4	8 490	21.6	0.146	0.27 UJ	0.54 U	63.9

[a] All values are in mg/kg. Outlined cells indicate that concentrations are above the background screening value.
[b] n/a = Not available.
[c] The detection limit is used as a background screening value for silver.

2.3.1.2 Radionuclides

Eleven soil samples collected at PRS 0-030(d) were analyzed by gamma spectroscopy, and also analyzed for isotopic plutonium and total uranium. Eight of these samples were collected inside the septic tank and three were collected outside the septic tank.

Total uranium was evaluated in the previous section and was determined to be below the background screening value. Therefore, uranium will not be further evaluated in this section.

Analysis of radionuclides by gamma spectroscopy often leads to the reporting of concentrations for certain radionuclides that are inappropriate to evaluate as potential site contaminants. These include short-lived activation/fission products, naturally occurring background radionuclides, and daughter radionuclides of naturally occurring radionuclides. While these three classes of radionuclides were reported for PRS 0-030(d), they will not be considered site contaminants for the following reasons:

- Sixteen short-lived activation/fission products reported at PRS 0-030(d) (barium-140, cadmium-109, cerium-139, cesium-134, cobalt-57, europium-152, lanthanum-140, manganese-54, mercury-203, ruthenium-106, selenium-75, sodium-22, strontium-85, tin-113, yttrium-88, and zinc-65)

have half-lives ranging from a few days to 2.6 years (except for europium-152, which has a half-life of 13.4 years). Several of these radionuclides are used as internal standards to measure equipment performance and/or laboratory background (or contamination). Because activation/fission products with short half-lives are routinely reported for reasons not related to RFI investigations, and they are not expected to occur at this PRS, these short-lived activation/fission products are eliminated as potential radionuclide contaminants.

- Potassium-40 is a naturally occurring radionuclide that is also routinely reported by the analyst because it is used as an internal standard to measure such things as equipment performance and laboratory background (or contamination). There is no process knowledge of the use of potassium-40 at this PRS, and reported concentrations are generally within known background ranges (Longmire et al. 1995, 1142; Longmire et al. 1995, 1266). Therefore, potassium-40 will not be considered a potential radionuclide contaminant at this site.

- Daughters of naturally occurring radionuclides (uranium and thorium) are also reported by gamma spectroscopy analyses. These daughters (e.g., isotopes of actinium, bismuth, lead, protactinium, radium, radon, thallium, and thorium) are normally present in secular equilibrium concentrations and are not directly evaluated as potential radionuclide contaminants.

Estimated quantitation limits (EQLs) and minimum detectable activities are often not available for radionuclides analyzed by gamma spectroscopy. A value of three times the measurement uncertainty (3 sigma or three standard deviations) is used to calculate a sample-specific minimum detectable activity, which is then employed in the same manner as a detection limit. This methodology is similar to Currie's method of determining radionuclide minimum detectable activity (Currie 1988, 0792). This 3-sigma screening value takes into account variability due to counting statistics, but does not account for spectral peak identification problems. Thus, this 3-sigma screening may include radionuclides whose presence is spuriously reported due to spectral interferences or misidentifications. Americium-241, cerium-144, and cobalt-60 were eliminated from further consideration based on this criterion.

Of the remaining six radionuclides reported for PRS 0-030(d), cesium-137 and plutonium-238 were eliminated from further consideration because they were detected at concentrations below the background screening value. Iodine-129, neptunium-237, plutonium-239/240, and

uranium-235 have at least one detected concentration above background screening values. The detected values for these four radionuclides are presented below in Table 2.3.1-2. The locations where these analytes were detected at levels exceeding background screening values are shown on Fig. 2.3.1-1.

Iodine-129, neptunium-237, plutonium-239/240, and uranium-235 will be carried forward to the screening assessment.

TABLE 2.3.1-2

RADIONUCLIDES WITH CONCENTRATIONS EXCEEDING BACKGROUND SCREENING VALUES AT PRS 0-030(d)[a]

SAMPLE ID	DEPTH (ft)	IODINE-129	NEPTUNIUM-237	PLUTONIUM-239/240	URANIUM-235
Surface Samples					
	UTL	n/a[b]	n/a[c]	0.092[d]	0.084
	SAL	34	1.9	24	10
0100-96-1451	0–0.42	NA[e]	0.166 U	0.100	0.001 U
0100-96-1452	0–0.42	NA	0.671	0.120	0.095 U
Subsurface Samples[f]					
0100-96-1453	2–2.5	NA	0.455	0.090	0.103
0100-96-1454	4–4.5	NA	-0.002 U	0.021	NA
0100-96-1455	7.5–8	0.524	-0.032 U	0.061	NA
0100-96-1456	4–4.5	-0.088 U	0.025 U	0.033	NA
0100-96-1457	6.5–7	NA	0.013 U	0.089	NA
0100-96-1458	2.5–3	NA	0.018 U	0.017	NA
0100-96-1459	7–7.8	-0.104 U	0.082	0.446	NA
0100-96-1461	7–7.6	0.251 U	-0.064 U	0.215	NA

[a] All values are in pCi/g. Outlined cells indicate that concentrations are above the background screening value.
[b] n/a = Not available.
[c] The minimum detectable activity is used as a background screening value for neptunium-237.
[d] Value represents the maximum reported background concentration in soil from the Environmental Surveillance Reports (Purtymun et al. 1987, 0211; ESG 1988, 0408; ESG 1989, 0308; Environmental Protection Group 1990, 0497; Environmental Protection Group 1992, 0740).
[e] NA = Not analyzed.
[f] The minimum detectable activity was used as the background screening value for subsurface samples.

2.3.1.3 Evaluation of Organic Chemicals

Eleven soil samples collected at PRS 0-030(d) were analyzed for VOCs, SVOCs, and pesticides/PCBs. Eight of these samples were collected inside the septic tank and three were collected outside the septic tank. Twenty-seven organic chemicals (aldrin, anthracene, acenaphthene, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, carbazole, alpha-chlordane, gamma-chlordane, chrysene, dibenzo(a,h)anthracene, 1,4-dichlorobenzene, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, dieldrin, endosulfan sulfate, endrin ketone, fluoranthene, fluorene, indeno(1,2,3,cd-)pyrene, phenanthrene, pyrene, and toluene) were detected at PRS 0-030(d). Of these 27 organic chemicals, 15 are polycyclic aromatic hydrocarbons (PAHs). PAHs are discussed separately below. The concentrations of the 12 remaining organics for each sample that has at least one detected value are presented in Table 2.3.1-3. The locations where organics were detected are shown on Fig. 2.3.1-1.

The qualifiers in the table were assigned during baseline validation. However, the data are usable for site-specific decisions. As discussed in Appendix A, one sample analyzed for gamma chlordane and three samples analyzed for toluene were qualified J because the concentrations reported were between the method detection limit and the EQL. The J qualifier indicates that the results are estimated. Gamma chlordane and toluene are considered detected and will be further evaluated in the screening assessment.

Twelve organic chemicals will be carried forward to the screening assessment (aldrin, carbazole, alpha-chlordane, gamma-chlordane, 1,4-dichlorobenzene, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, dieldrin, endosulfan sulfate, endrin ketone, and toluene).

The 15 PAHs detected at PRS 0-030(d) will not be carried forward to the screening assessment because they are deemed not to be associated with a release from PRS 0-030(d). Because the septic tank is adjacent to an asphalt cul-de-sac and downgradient from paved areas to the west, the PAHs are most likely a result of runoff from the asphalt and should not be related to this PRS. Therefore, the following analytes will not be evaluated in the screening assessment: anthracene, acenaphthene, acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3,cd-)pyrene, phenanthrene, and pyrene.

TABLE 2.3.1-3

ORGANICS WITH DETECTED CONCENTRATIONS AT PRS 0-030(d)[a]

SAMPLE ID	DEPTH (ft)	ALDRIN (mg/kg)	CARBAZOLE	GAMMA-CHLORDANE	ALPHA-CHLORDANE	DDE	DDD	DDT	DIELDRIN	1,4-DICHLORO BENZENE	ENDOSULFAN SULFATE	ENDRIN KETONE	TOLUENE
	SAL	0.026	22	0.34	0.34	1.3	1.9	1.3	0.028	3.6	n/a	n/a	790
0100-96-1451	0–0.42	0.002 U	0.91 U	0.002 J	0.003	0.048	0.004 U	0.095	0.004 U	0.91 U	0.004 U	0.004 U	0.009 J
0100-96-1452	0–0.42	0.002 U	0.75 U	0.002 U	0.002 U	0.038	0.005	0.078	0.004 U	0.75 U	0.004 U	0.004 U	0.015 J
0100-96-1453	2–2.5	0.002 U	0.37 U	0.002 U	0.002 U	4.6	0.56	13	0.004 U	0.37 U	0.004 U	0.004 U	0.005 J
0100-96-1454	4–4.5	0.001 U	0.36 U	0.001 U	0.001 U	0.003	0.001 U[b]	0.003	0.001 U	0.36 U	0.001 U	0.001 U	0.005 U
0100-96-1455	7.5–8	0.001 U	0.39 U	0.001 U	0.001 U	0.008	0.016	0.013	0.001 U	0.11 J	0.002	0.001 U	0.006 U
0100-96-1456	4–4.5	0.001 U	0.36 U	0.001 U	0.001 U	0.012	0.001 U[b]	0.008	0.001 U	0.36 U	0.001 U	0.001 U	0.006 U
0100-96-1457	6.5–7	0.001 U	0.37 U	0.001 U	0.001 U	0.095	0.089	0.048	0.003	0.37 U	0.001 U	0.001 U	0.006 U
0100-96-1458	2.5–3	0.001	0.38 U	0.001 U	0.001 U	0.066	0.104	0.116	0.001 U	0.38 U	0.001 U	0.001 U	0.006 U
0100-96-1459	7–7.8	0.001 U	0.2 J	0.001 U	0.001 U	0.745	0.115	0.044	0.012	0.73 U	0.001 U	0.021	0.006 U
0100-96-1460	3–3.5	0.001	0.37 U	0.001 U	0.001 U	0.001	0.001 U	0.001 U	0.001 U	0.37 U	0.001 U	0.001 U	0.006 U
0100-96-1461	7–7.6	0.001 U	0.37 U	0.001 U	0.001 U	0.827	1.63	0.092	0.001 U	0.37 U	0.003	0.001 U	0.006 U

[a] All values are in mg/kg. Outlined cells indicate that concentrations are above the detection limit.
[b] Value does not exceed background. Outlining results from the surrounding cells.

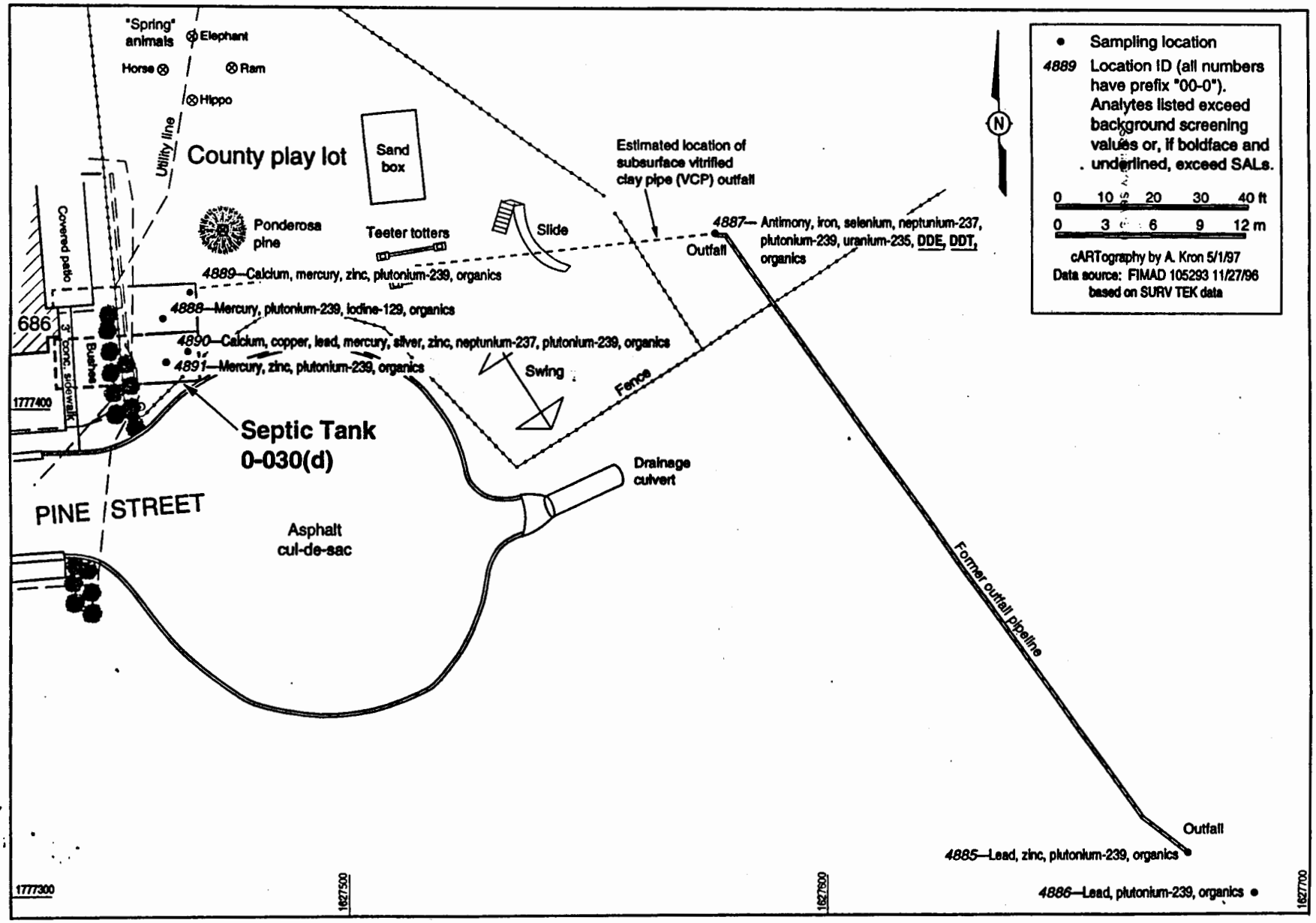


Fig. 2.3.1-1 Locations of analytes exceeding background screening levels and SALs at PRS 0-030(d).

Although it is not appropriate to evaluate the potential human health risks associated with 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 the RCRA corrective action process. These risk estimates are screening level in nature, and were calculated using US EPA Region IX preliminary remediation goals (PRGs) for residential soil, as shown in Appendix E. The total hazard index for these PAHs was estimated by summing the hazard quotients for each noncarcinogen and summing the risks for each carcinogen. The estimated hazard index for PRS 0-030(d) is 0.05, which is well below the acceptable hazard index of 1. The estimated excess lifetime cancer risk is approximately 6×10^{-6} which is within the acceptable risk range specified by the National Contingency Plan (EPA 1990, 0559). These calculations are shown in Appendix E.

The data for the detected PAHs are presented in Table 2.3.1-4. The qualifiers in the table were assigned during baseline validation. However, the data are usable for site-specific decisions. Fifteen PAHs were qualified J because the concentrations reported were between the method detection limit and the EQL. The J qualifier indicates that the results are estimated. For the reasons discussed above, these PAHs will not be evaluated further in the screening assessment.

TABLE 2.3.1-4

PAHs WITH DETECTED CONCENTRATIONS AT PRS 0-030(d)[a]

SAMPLE ID	DEPTH (ft)	ACENAPHTHENE	ACENAPHTHYLENE	ANTHRACENE	BENZO(a)ANTHRACENE	BENZO(b) FLUORANTHENE	BENZO(a) PYRENE	BENZO(g,h,i) PERYLENE	BENZO(k) FLUORANTHENE	CHRYSENE
	SAL	360	n/a	19	0.61	0.061	0.061	n/a	6.1	24
0100-96-1451	0–0.42	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U
0100-96-1452	0–0.42	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
0100-96-1453	2–2.5	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
0100-96-1454	4–4.5	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
0100-96-1455	7.5–8	0.39 U	0.085 J	0.062 J	0.17 J	0.2 J	0.27 J	0.15 J	0.081 J	0.22 J
0100-96-1456	4–4.5	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
0100-96-1457	6.5–7	0.37 U	0.37 U	0.081 J	0.4	0.48	0.43	0.21 J	0.22 J	0.42
0100-96-1458	2.5–3	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
0100-96-1459	7–7.8	0.085 J	0.18 J	0.88	2.7	3.1	2.7	1.1	1.2	2.6
0100-96-1460	3–3.5	0.37 U	0.37 U	0.059 J	0.17 J	0.14 J	0.12 J	0.37 U	0.065 J	0.2 J
0100-96-1461	7–7.6	0.37 U	0.2 J	0.1 J	0.55	0.64	0.75	0.33 J	0.24 J	0.62

SAMPLE ID	DEPTH (ft)	DIBENZO(a,h) ANTHRACENE	FLUORANTHENE	FLUORENE	INDENO(1,2,3,cd-)PYRENE	PHENANTHRENE	PYRENE
SAL	N/A	0.061	2 600	300	0.61	n/a	2 000
0100-96-1451	0–0.42	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U	0.91 U
0100-96-1452	0–0.42	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U	0.75 U
0100-96-1453	2–2.5	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U	0.37 U
0100-96-1454	4–4.5	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
0100-96-1455	7.5–8	0.39 U	0.16 J	0.39 U	0.14 J	0.1 J	0.21 J
0100-96-1456	4–4.5	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U	0.36 U
0100-96-1457	6.5–7	0.06 J	0.72	0.37 U	0.22 J	0.24 J	0.6
0100-96-1458	2.5–3	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U	0.38 U
0100-96-1459	7–7.8	0.31 J	5.6	0.17 J	1.2	2.8	4.6
0100-96-1460	3–3.5	0.37 U	0.36 J	0.37 U	0.057 J	0.32 J	0.33 J
0100-96-1461	7–7.6	0.083 J	0.44	0.37 U	0.3 J	0.18 J	0.62

[a] All values are in mg/kg. Outlined cells indicate that concentrations are above screening action levels.

2.3.2 Human Health Screening Assessment

Data carried forward from the background comparison were then compared with screening action levels (SALs). Nine inorganics (antimony, calcium, copper, iron, lead, mercury, selenium, silver, and zinc), four radionuclides (iodine-129, neptunium-237, plutonium-239/240, and uranium-235), and twelve organics (aldrin, carbazole, alpha-chlordane, gamma-chlordane, 1,4-dichlorobenzene, 4,4'-DDD, 4,4'-DDE, 4,4'-DDT, dieldrin, endosulfan sulfate, endrin ketone, and toluene) were detected at concentrations exceeding background screening values.

Greater than SAL. Two organics, 4,4'-DDE and 4,4'-DDT, were detected at concentrations greater than their SALs (Table 2.3.2-1). The locations at which these analytes were detected at levels exceeding SALs are shown on Fig. 2.3.1-1.

TABLE 2.3.2-1

ANALYTES DETECTED AT CONCENTRATIONS GREATER THAN SAL AT PRS 0-030(d)

LOCATION	DEPTH (ft)	SAMPLE ID	4,4'-DDE	4,4'-DDT
Directly below the mouth of the steel outfall pipe	0–0.42	0100-96-1451	0.048	0.095
20 ft down drainage from the mouth of the steel outfall pipe	0–0.42	0100-96-1452	0.038	0.078
Beneath the connection between the VCP and steel pipe	2–2.5	0100-96-1453	4.6	13
Inside the septic tank between the north wall and baffle	4–4.5	0100-96-1454	0.003	0.003
Inside the septic tank between the north wall and baffle	7.5–8	0100-96-1455	0.008	0.013
Inside the septic tank at the northeast corner	4–4.5	0100-96-1456	0.012	0.008
Inside the septic tank at the northeast corner	6.5–7	0100-96-1457	0.095	0.048
Inside the southern portion of the septic tank next to the baffle at the east end of the tank	2.5–3	0100-96-1458	0.066	0.116
Inside the southern portion of the septic tank next to the baffle at the east end of the tank	7–7.8	0100-96-1459	0.745	0.044
Inside the approximate middle of the southern portion of the tank	3–3.5	0100-96-1460	0.001	0.001U [a]
Inside the approximate middle of the southern portion of the tank	7–7.6	0100-96-1461	0.827	0.092

No SAL. Calcium, endosulfan sulfate, endrin ketone, and iron have no SALs.

SALs have not been developed for endosulfan sulfate and endrin ketone. Therefore, the SAL for endosulfan (390 mg/kg) was used as a surrogate for endosulfan sulfate, and a SAL for endrin ketone (2 mg/kg) was developed from the available toxicity data. These SALs were selected based on chemical structure or toxicity similarities as discussed in Appendix E. Endosulfan sulfate and endrin ketone are evaluated further in the less than SAL category.

Calcium is an essential nutrient, and it has no SAL. However, it can be compared to the recommended daily allowances (RDAs) of this nutrient for children and adults. The greatest concentration of calcium detected at PRS 0-030(d) was 9 630 mg/kg. At the standard soil ingestion rate of 200 mg/day for a child, the amount ingested per day would be approximately 1.9 mg. This amount is considerably less than the RDA of 800 mg/day (National Research Council 1989, 1251). At a standard soil ingestion rate of 100 mg/day for an adult, the amount ingested per day would be approximately 0.9 mg. This amount is considerably less than the RDA of 1 200 mg/day (National Research Council 1989, 1251). Therefore, calcium is eliminated as a COPC.

Iron is an essential nutrient, and it has no SAL. However, it can be compared to the RDAs of this nutrient for children and adults. The greatest concentration of iron detected at PRS 0-030(d) was 42 300 mg/kg. Although this value was detected beneath the steel outfall pipe and is not likely to be representative of other areas of the site, it was used in this assessment to provide the most conservative ingestion rate. At the standard soil ingestion rate of 200 mg/day for a child, the amount of iron ingested per day would be approximately 8.5 mg. At a standard soil ingestion rate of 100 mg/day for an adult, the amount ingested per day would be approximately 4.2 mg. Because these amounts are less than the RDAs of 15 mg/day for women and teenage girls, 12 mg/day for teenage boys, and 15 mg/day for men, iron is eliminated as a COPC (National Research Council 1989, 1251).

Less than SAL. Seven inorganics (antimony, copper, lead, mercury, selenium, silver, and zinc), four radionuclides (iodine-129, neptunium-237, plutonium-239/240, and uranium-235), and ten organics (aldrin, carbazole, alpha-chlordane, gamma-chlordane, 4,4'-DDD, 1,4-dichlorobenzene, dieldrin, endosulfan sulfate, endrin ketone, and toluene) were detected at concentrations less than their respective 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 effects of radionuclides, and carcinogenic or noncarcinogenic effects of chemicals). SALs for all chemicals were normalized and summed as described in "Risk-Based Corrective Action Process" (Dorries 1996, 1297). The results of this analysis are shown in Tables 2.3.2-1, 2.3.2-2, and 2.3.2-3. The result of each multiple chemical evaluation is less than or equal to one, indicating that potential resultant adverse human health effects from these exposures are unlikely. However, because 4,4'-DDD is similar in toxicity to 4,4'-DDE and 4,4'-DDT and it comprised approximately 86% of the normalized sum for carcinogenic effects, 4,4'-DDD is retained as a COPC. All other chemicals detected at values less than SALs are eliminated as COPCs.

At the conclusion of this human health screening assessment, three organic chemicals are retained as COPCs: 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT. These chemicals are addressed in a qualitative risk assessment in Section 2.3.3.

TABLE 2.3.2-1

MULTIPLE CHEMICAL EVALUATION FOR CARCINOGENIC EFFECTS OF RADIONUCLIDES AT PRS 0-030(d)

RADIONUCLIDE	SAMPLE ID	SAMPLE VALUE (pCi/g)	SAL (pCi/g)	NORMALIZED VALUE
Iodine-129	0100-96-1455	0.524	34	0.015
Neptunium-237	0100-96-1452	0.671	1.9	0.35
Plutonium 239/240	0100-96-1459	0.446	24	0.019
Uranium-235	0100-96-1453	0.103	10	0.01
Normalized Sum				0.4

TABLE 2.3.2-2

MULTIPLE CHEMICAL EVALUATION FOR NONCARCINOGENIC EFFECTS OF CHEMICALS AT PRS 0-030(d)[a]

CHEMICAL	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL (mg/kg)	NORMALIZED VALUE
Antimony	0100-96-1453	1.7	31	0.055
Copper	0100-96-1459	24.3	2 800	0.0087
Endosulfan sulfate	0100-96-1461	0.003	390[a]	7.7×10^{-6}
Endrin ketone	0100-96-1459	0.021	2[a]	0.011
Lead	0100-96-1452	56.9	400	0.14
Mercury	0100-96-1459	0.593	23	0.026
Selenium	0100-96-1453	1.8	380	0.0047
Silver	0100-96-1459	1.45	380	0.0038
Toluene	0100-96-1452	0.015	790	1.9×10^{-5}
Zinc	0100-96-1459	189	23 000	0.0082
Normalized Sum				0.3

[a] Endosulfan was used as a surrogate for endosulfan sulfate, and a SAL was developed for endrin ketone.

TABLE 2.3.2-3

MULTIPLE CHEMICAL EVALUATION FOR CARCINOGENIC EFFECTS OF CHEMICALS AT PRS 0-030(d)

CHEMICAL	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL (mg/kg)	NORMALIZED VALUE
Aldrin	0100-96-1460	0.001	0.026	0.038
Carbazole	0100-96-1459	0.2	22	0.009
Chlordane(alpha)	0100-96-1451	0.003	0.34	0.0088
Chlordane(gamma)	0100-96-1451	0.002	0.34	0.0059
4,4'-DDD	0100-96-1461	1.63	1.9	0.86
1,4-Dichlorobenzene	0100-96-1455	0.11	3.6	0.031
Normalized Sum				1.0

2.3.3 Qualitative Risk Assessment

This section presents a qualitative risk assessment to address the three chemicals retained as COPCs in the human health screening assessment. The screening assessment identified 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT as COPCs. All three chemicals are carcinogens. Assuming a residential land-use scenario and using EPA Region IX PRGs, a simple ratio calculation was used to quantify the risk posed by these three chemicals. This calculation is shown in Appendix E.

In summary, the highest detected concentrations of 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT were 4.6, 1.63, and 13 mg/kg, respectively. The arithmetic means for the samples with detected 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT are 0.59, 0.23, and 1.2, respectively. The SAL for 4,4'-DDE and 4,4'-DDT is 1.3 mg/kg, and the SAL for 4,4'-DDD is 1.9 mg/kg. Using a ratio to SAL, which is based on a risk of 1.0×10^{-6} (one in one million), the total excess carcinogenic risk posed by exposure to these chemicals is 1.4×10^{-5} if only the maximum concentration is considered, and 1.6×10^{-6} if the arithmetic mean is used in the calculation. Both results are within the acceptable risk range of 1.0×10^{-4} to 1.0×10^{-6} specified by the National Contingency Plan (EPA 1990, 0559).

It should be noted that the area of PRS 0-030(d) is approximately 300 ft^2, which is less than 10 percent of the 5000-ft^2 residential exposure area upon which the calculations are based. Therefore, the risks posed by 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT are likely an order of magnitude less than those calculated.

2.4 VCA Activities

2.4.1 Rationale For Conducting the VCA

A VCA was conducted at PRS 0-030(d) to remove 170 ft of steel outfall pipe associated with the septic system. This VCA was conducted as part of the RFI mobilization, and it added little additional cost. The VCA contributes to LANL's effort to remove legacy waste from the Los Alamos town site. The septic tank was not removed from the site because it met the criteria for inaccessibility defined in the VCA plan (LANL 1996, 05-0244).

2.4.2 Nature and Extent of Contamination

The results of RFI characterization activities indicated that no chemicals were present at levels that present an unacceptable risk to human health.

2.4.3 Cleanup Level Derivation

Because no unacceptable levels of contamination were present at PRS 0-030(d), no cleanup levels were calculated.

2.4.4 Remedial Activities and Results of Confirmation Sampling

2.4.4.1 Remedial Implementation

A VCA was conducted at PRS 0-030(d) on December 18, 1996. The objective of the VCA was to remove approximately 170 ft of 8-in. diameter steel outfall pipe associated with the septic system. Removal activities began at the southern end of the pipe. The 17-ft section of pipe hanging over the edge of the mesa was first tied off with steel cable, and then cut with a cutting torch. The pipe was moved to the cul-de-sac using a winch truck. The remaining pipe was cut into 20–30-ft sections, moved to the cul-de-sac, and then cut into 10–15-ft sections for off-site transportation. The last 40–50 ft of pipe, which were located east of the park, were buried under 0.5–2 ft of soil. A backhoe was used to excavate and remove the steel pipe. The pipe was cut into 6–10-ft sections and transported to the cul-de-sac using the backhoe. The VCP, which was located beneath the Los Alamos County playground, was left in place.

The steel pipe was screened in the field for organic vapors and gross radiological activity for worker health and safety. Organic vapor screening was conducted using a Thermo Environmental Instruments, Inc.™ OVM Model 580B PID with an 11.7 eV bulb. Ionizing radiation screening was conducted using Ludlum™ Model 139 rate meters with air proportional (alpha) and Eberline™ ESP-1 (beta/gamma) probes. All field screening instruments were calibrated as necessary and checked daily. There were no detectable organic vapor readings, and no detectable alpha or beta/gamma activities above background levels.

An adequate number of smears (as defined in DOE 1990, 0080) were collected from the steel pipe and delivered to TA-21 for analysis by LANL's Health Physics Operations group. The pipe was temporarily stored onsite until radiological results for the smears were obtained. The radiological counts for the smears were all below background. On December 18, 1996, upon approval from LANL's Health Physics Operations group, approximately 170 ft of steel pipe were transported off-site for recycling at a commercial facility.

2.4.4.2 Confirmation Sampling

Confirmation samples were not collected because the septic tank was not removed. The sample collected beneath the joint of the VCP and the steel pipe did not contain COPCs at

levels that pose an unacceptable risk to human health. This sample was considered characterization data and was presented in Section 2.3.

2.5 Waste Management

2.5.1 Deviations

All field work was conducted in accordance with the VCA plan and the waste characterization strategy form (LANL 1996, 05-0244). However, the following deviation occurred during the field investigation and VCA activities:

- The personal protective equipment (PPE) and sampling debris generated during precharacterization activities were not shipped under manifest to TA-3, SM-271, because the waste was considered a sanitary waste. This waste was stored in the equipment trailer in a 55-gal. drum as a sanitary waste and was disposed of at the Los Alamos County landfill.

2.5.2 Waste Characterization Data

Approximately 4 yd^3 of asphalt were removed during precharacterization activities. This waste was classified as construction debris and taken offsite for recycling. The 8-in. diameter steel outfall pipe was classified as scrap metal and recycled at a commercial facility. Decontamination water and final rinse water were not generated because disposable scoops were used to collect all samples. A comparison between the actual amount of waste generated and the amount of waste projected in the VCA plan is presented in Table 2.5.2-1.

TABLE 2.5.2-1

SUMMARY OF PROJECTED AND GENERATED WASTE VOLUMES FOR PRS 0-030(d)

WASTE ITEM	WASTE TYPE	PROJECTED VOLUME	GENERATED VOLUME
Sampling waste/PPE/plastic sheeting	Sanitary	1 ft^3	5 ft^3
Tank contents, soil	Nonhazardous	4–90 yd^3	None
Decontamination wash water	Liquid nonhazardous	20 gal.	None
Decontamination final rinse with water/methanol	Liquid nonhazardous	10 gal.	None
Asphalt	Industrial	Not applicable	Approximately 4 yd^3
Steel pipe	Industrial (scrap metal)	Not applicable	5 500 lb

2.6 Conclusions and Recommendations

The results of the screening assessment on the RFI results indicate that no chemicals are present at levels that present an unacceptable risk to human health. The VCA successfully removed 170 ft of steel outfall pipe associated with the site. The septic tank associated with PRS 0-030(d) was left in place because it met the criteria for inaccessibility defined in the VCA plan (LANL 1996, 05-0244). PRS 0-030(d) is recommended for NFA based on Criterion 4 of LANL's NFA Criteria Policy, EM/ER:95-PCT-015 (Project Consistency Team, 1210). This criterion states that chemicals of concern are present at concentrations that pose an acceptable level of risk under the expected land-use scenario.

3.0 PRS 0-030(k)

PRS 0-030(k) is a suspected former septic tank location on private property north of East Road just off of Tewa Loop (Zia Company 1947, 05-0132; Francis and Sullivan 1995, 05-0207). No RFI samples were collected and no VCA was conducted at this PRS because no evidence of a former or existing septic system was found. The septic system is presumed to have been removed. Based on these results, this site is recommended for NFA.

3.1 Introduction

3.1.1 History

PRS 0-030(k) is described in Chapter 5.10 of the RFI Work Plan for OU 1071 (LANL 1992, 0781). This PRS is located on private property north of East Road just off of Tewa Loop (Fig. 3.1.1-1). There is no information available concerning the dimensions of this septic tank or the buildings it served. However, it is likely that the septic tank served the Zia Company Warehouse Complex, which was located just south of the suspected septic tank location. The Zia Company Warehouse Complex contained building materials, electrical supplies, plumbing supplies, nails, cement, and machinery warehouses. The warehouse complex also stored sheet lead and small quantities of pesticides and herbicides, resulting in a potential for RCRA contamination in the septic tank. No radioactive materials are believed to have been associated with the warehouse complex, so radiological contamination is unlikely within the septic system (Francis and Sullivan 1995, 05-0207).

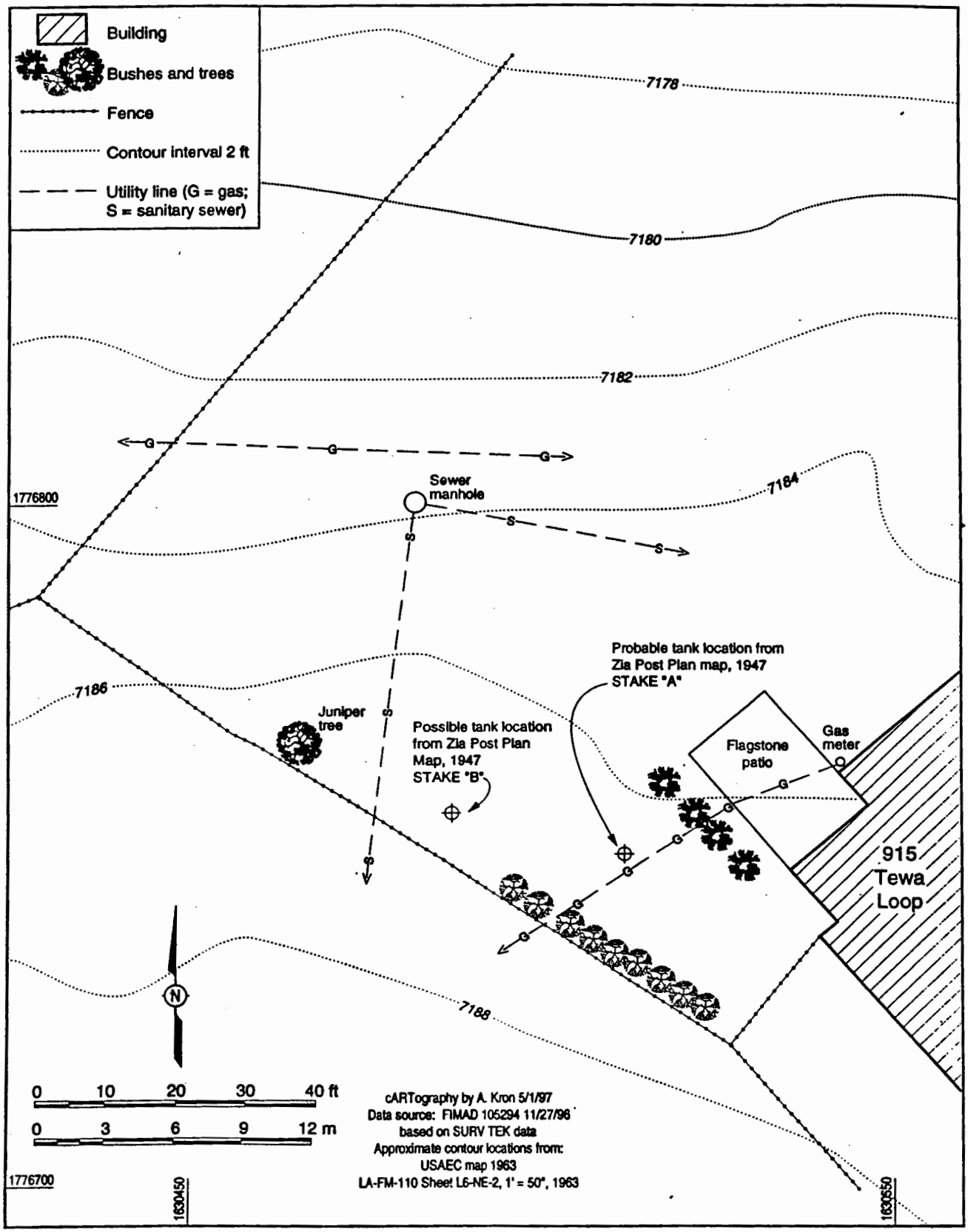


Fig. 3.1.1-1 Probable septic tank locations for PRS 0-030(k).

3.1.2 Investigations Previous to the RFI

No investigations specific to PRS 0-030(k) were conducted before the RFI. The limited historical information available for SWMU Group 0-3 suggests that wastes discharged to the septic tanks in this group were sanitary wastes from residential-type buildings. PRS 0-030(k) was thought to have served the Zia Warehouse Complex, where lead sheets and small quantities of pesticides and herbicides were stored. Nonetheless, because of its use primarily for sanitary waste purposes, the potential for chemical or radiological contamination within this septic system was expected to be low.

3.2 Site Characterization

The objective of the RFI for PRS 0-030(k) was to determine whether contamination was present. RFI activities at PRS 0-030(k) were conducted between June and October 1996. These activities were conducted in accordance with the VCA plan (LANL 1996, 05-0244). RFI activities at PRS 0-030(k) included site surveys, geodetic surveys, geophysical surveys, septic tank investigation, and field screening. These activities are discussed in detail below.

Site Surveys

The septic tank associated with PRS 0-030(k) was suspected to be located on private property at 915 Tewa Loop (The Zia Company 1947, 05-0132; Francis and Sullivan 1995, 05-0207) (Fig. 3.1.1-1). The Zia Company Warehouse Complex and the septic tank associated with PRS 0-030(k) are shown on the 1947 Zia Company post-plan map (The Zia Company 1947, 05-0132). Information could not be found concerning the dimensions of the septic tank or the buildings it served, but it is likely that this septic tank serviced the Zia Company Warehouse Complex. Aerial photographs from the 1940s were reviewed, and the septic tank was not visible north of the Zia Warehouse Complex. A field reconnaissance survey of PRS 0-030(k) was conducted, but the tank and the outfall pipe were not located.

Geodetic Surveys

The approximate coordinates for the septic tank location were obtained from 1947 Zia Company drawings (The Zia Company 1947, 05-0132). These drawings indicated two possible sets of coordinates for the septic tank. Both sets of coordinates were surveyed and staked in the field. The easternmost septic tank location is referred to as stake A and the westernmost septic tank location is referred to as stake B (Fig. 3.1.1-1). Upon completion of investigation

activities, the western corner of 915 Tewa Loop, the fence along the northwest and southwest property lines, utility lines, and the areas trenched and augered were surveyed. Geodetic survey data were transferred to FIMAD for incorporation into the ER database.

Geophysical Surveys

A geophysical survey consisting of magnetic and EM surveys was conducted to locate the position and orientation of the septic tank and associated piping. The geophysical survey identified two anomalies: one located adjacent to stake A and another located approximately 25 ft west of stake B near the southern edge of the property (Fig. 3.2-1). Both anomalies were interpreted as possible locations for the septic tank.

Septic Tank Investigation

Initial precharacterization activities followed a minimal-impact approach, using probing and augering in the estimated septic tank area. This area was based on the surveyed locations from the geodetic survey (stakes A and B), the marked boundaries of the geophysical anomalies detected in the geophysical survey, and maps in the VCA plan (LANL 1996, 05-0244). The probing and augering were initiated between a natural gas line and a sewer line that were present at the site (Fig. 3.2-2). This location was selected because there was a mound between stakes A and B where the yard might have been built up and graded around the septic tank. To determine whether the septic tank was present at this location, exploratory holes were probed and augered using a hand auger and an electric power auger. Probing and hand-augering were difficult because the soil was dry and hard-pack zones were encountered. The hard-pack zones consisted of tuff fragments, gravel, cobbles, and clay layers. Such zones were encountered most often from 16–24 in. bgs. Tuff was encountered at approximately 5–6 ft bgs in the area of the eastern anomaly, and at approximately 2–3 ft bgs in the area of the western anomaly. No signs of the septic tank were observed in any of these exploratory holes.

All auger cuttings were screened in the field for organic vapors and gross radiological activity for worker health and safety. There were no detectable organic vapor readings, and no detectable alpha or beta/gamma activities above background levels in any of the exploratory holes.

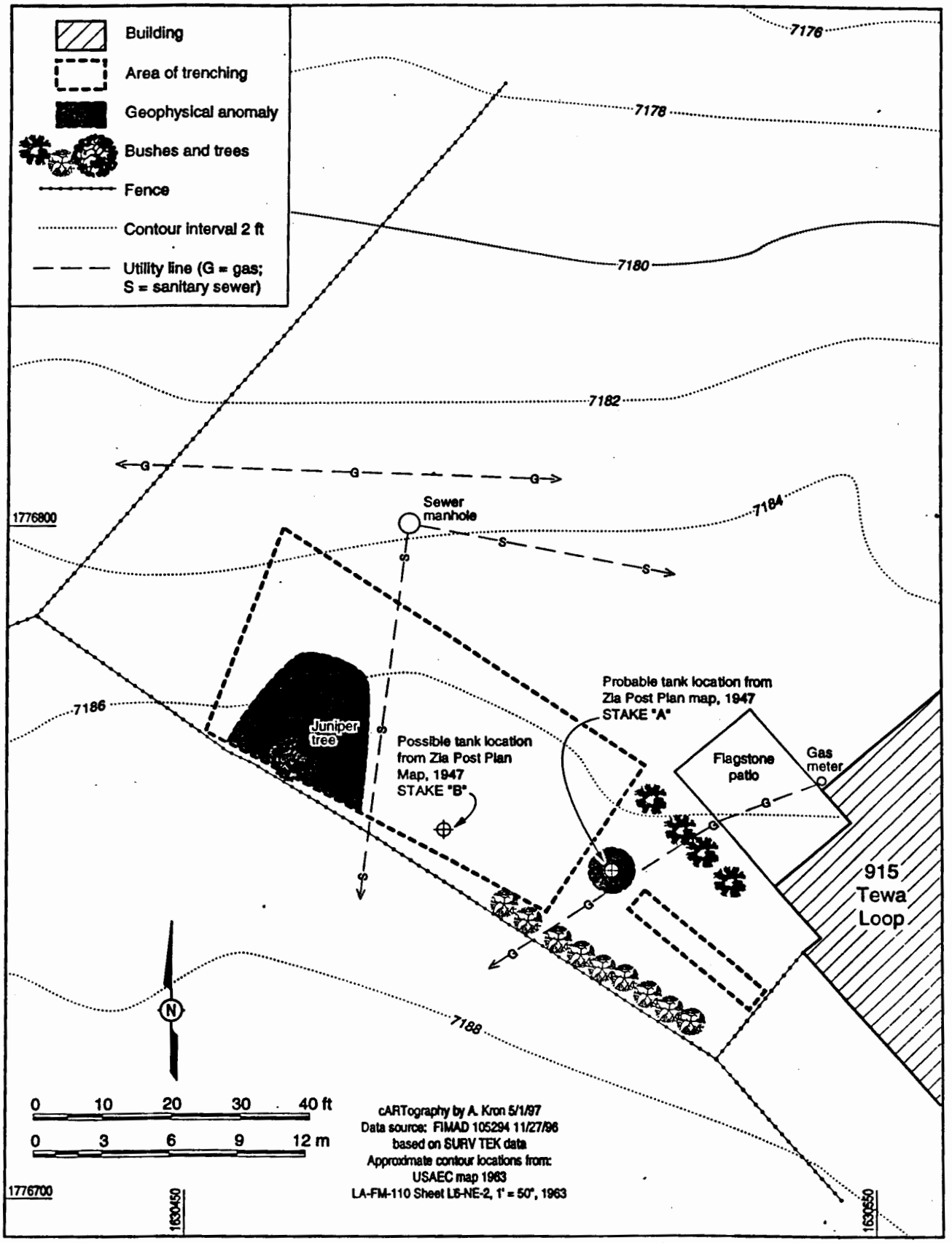


Fig. 3.2-1 Locations of geophysical anomalies and trenched areas for PRS 0-030(k).

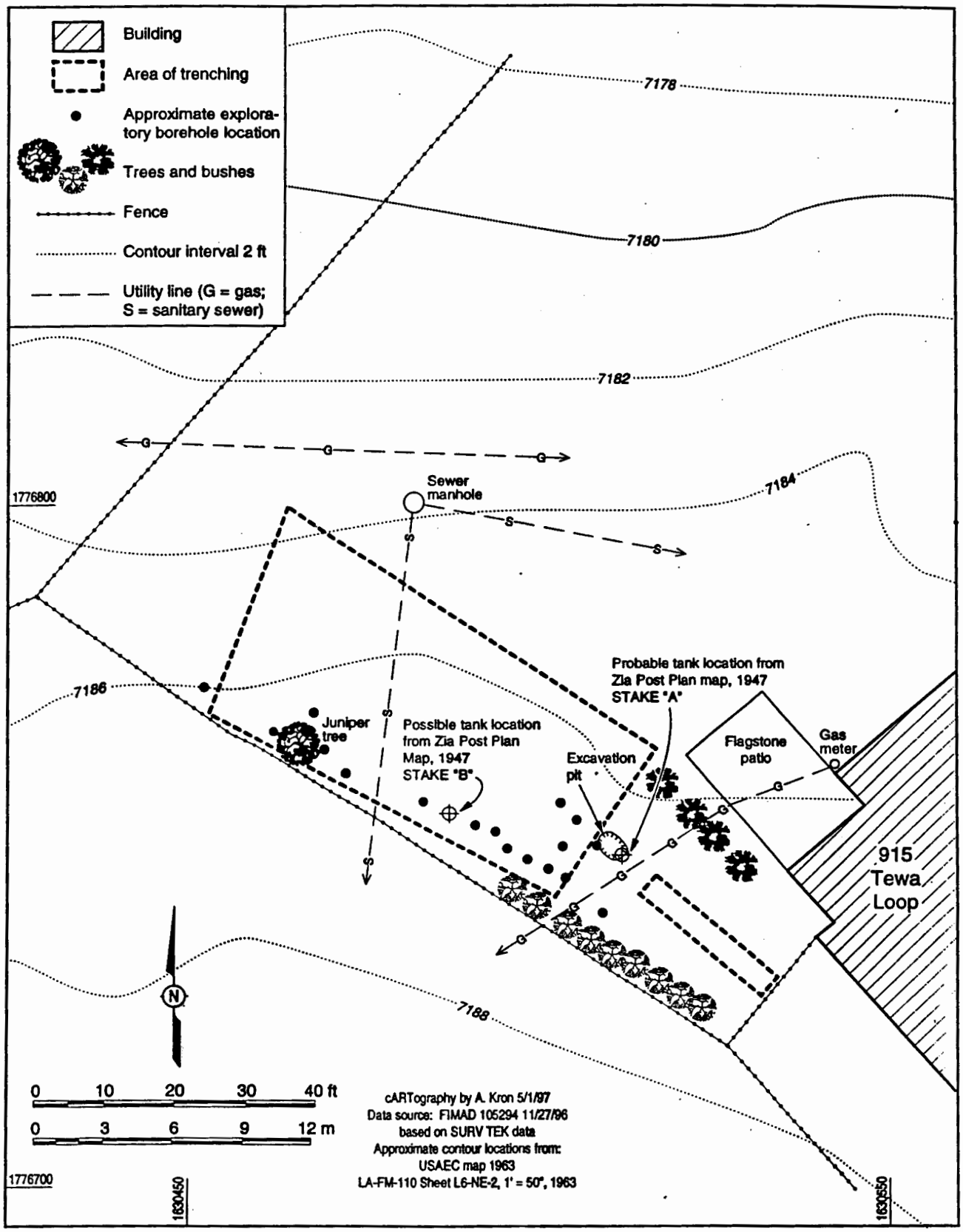


Fig. 3.2-2 Locations of hand-augered holes and trenches at PRS 0-030(k).

Because frequent equipment failures (cracked auger flights, broken bits, etc.) delayed progress of the investigation, larger equipment was brought in to expedite the investigation and locate the septic tank. Initial investigation activities determined that the maximum depth to tuff near the eastern stake was 5–6 ft bgs. Because the septic tank might have been built into the tuff, equipment capable of excavating to a minimum depth of 6 ft bgs was required. A Ditch Witch™ trencher was selected because numerous 8-in.-wide trenches could be excavated to a depth of 6 ft, disturbing a smaller area than would have been disturbed with a backhoe.

Before initiating trenching activities, all utilities and landscaping obstacles that might limit the investigation area were identified. These included shrubs, trees, a wood stockpile, and natural gas and sewer lines. Fifteen trenches (numbered trenches 1 through 15) were excavated near the southern property boundary at the suspected septic tank location. Thirteen of these trenches were oriented approximately north-south and were roughly parallel to the sewer line (Fig. 3.2-2). All trenches were approximately 8 in. wide x 6 ft deep and ranged from 24–32 ft long. The trenches were spaced approximately 3–4 ft apart so that the septic tank would not be missed if it was similar in size to the septic tank found at PRS 0-030(n), which is the smallest septic tank investigated to date (approximately 6.5 ft x 5.5 ft). Additional trenches could not be excavated with a north-south orientation between the gas line and the driveway because a fence, several trees, and a wood stockpile prevented excavation. Therefore, the last trench was oriented northwest-southeast and extended approximately 20 ft from the south side of the gas line and stake A to the driveway.

During monitoring and observation of trench 2, a backfilled trench oriented northwest-southeast to trench 2 was identified. This backfilled trench appeared to be 18–24 in. wide x 7 ft deep. An extension of the backfilled trench was also observed in trench 3 at a depth of 40 in. Trench 4 was excavated to follow the backfilled trench to the northwest. The backfilled trench apparently extended only 1.5 ft northwest from trench 3. The backfilled trench could not be traced to the southeast because trees and stockpiled wood prevented excavation. The dimensions and use of this trench are unknown. No other subsurface disturbances or manmade features that might have been associated with the septic tank were identified in the area east of the sewer line. Trenching in the area of the geophysical anomaly west of stake B and the sewer line did not reveal any subsurface disturbances or manmade features which indicated the presence of a septic tank.

All soil excavated from the trenches was screened in the field for organic vapors and gross radiological activity for worker health and safety . No organic vapors were detected. While detectable alpha and beta/gamma activities exceeded average background field screening

levels, all were within acceptable background ranges for field screening. All field screening results are presented in Appendix B.

After completion of investigation activities, the exploratory auger holes and trenches were backfilled with the material that had been excavated, and the area of disturbed soil was graded with a backhoe. Erosion control matting was placed over the disturbed area to control dust and assist with site restoration. During the spring of 1997, the disturbed area was reseeded with grass seed for completion of site restoration activities.

All available historical and archival information suggest that the area investigated included all possible locations for PRS 0-030(k). Coordinates from historical maps such as those used for this site have been accurate to within 10–20 ft (or better) for other septic tanks investigated in the Los Alamos town site. In addition, an out-of-place cement pillar similar to those used to support outfall pipes at other septic tank locations [e.g., 0-030(h)] was located northwest of the estimated tank location. Based on knowledge of historical practice regarding the installation of utility lines in Los Alamos County, the sewer and gas lines that are currently present at the site may have been installed in the trenches that once housed the septic lines for PRS 0-030(k). The narrow zones along the utility lines were investigated during initial hand-augering activities to determine whether any evidence of a former or existing tank was present. No evidence of a tank was found. All of this information suggests that the septic system was removed from the site during installation of the sewer and gas lines that are currently present, or during decommissioning of the former Zia Warehouse Complex.

Deviations

All work was conducted in accordance with the VCA plan (LANL 1996, 05-0244). However, the following deviation occurred.

- The VCA plan assumed that the septic tank could be found (LANL 1996, 05-0244). However, no evidence of a former or existing septic system was found during this field investigation. Because the specific location of the septic system could not be identified for sampling, no samples were collected.

Field Screening

Field screening was performed to protect worker health and safety. Soil was screened for organic vapors using a Thermo Environmental Instruments, Inc.™, OVM Model 580B PID with an 11.7 eV bulb. Soil was screened for ionizing radiation using Ludlum™ Model 139 rate meters

with air proportional (alpha) and Eberline™ ESP-1 (beta/gamma) probes. All field screening instruments were calibrated as necessary and checked daily.

3.3 Background Comparison and Screening Assessment

No samples were collected for analysis because neither the septic tank nor the outfall piping could be located. Therefore, no background comparison or screening assessment was conducted.

3.4 VCA Activities

No remedial activities were conducted at this site because the septic system could not be located.

3.5 Waste Management

No wastes were generated because the septic tank was not located and samples were not collected.

3.6 Conclusions and Recommendations

The septic system associated with PRS 0-030(k) could not be located, and no evidence of contamination was found using field screening instruments at the suspected tank locations. Because the septic system was either removed before this investigation or never installed, PRS 0-030(k) is recommended for NFA based on Criterion 1 of LANL's NFA Criteria Policy, EM/ER:95-PCT-015 (Project Consistency Team, 1210). This criterion states that the PRS cannot be located or was found never to have existed.

4.0 PRS C-0-043

PRS C-0-043 was a brick and mortar manhole that was believed to have been connected to sanitary sewer lines for the former Central Waste Water Treatment Plant. The results of the RFI indicated that there were no chemicals present at levels that posed an unacceptable risk to human health. A VCA was conducted to remove the manhole because it presented a potential safety risk to people using the site. This VCA was also conducted as part of LANL's effort to remove waste associated with former Laboratory operations from the Los Alamos town site. Based on the results from RFI characterization and VCA activities, this site is recommended for NFA.

4.1 Introduction

4.1.1 History

PRS C-0-043 was not described in the RFI Work Plan for OU 1071 because it was identified as a PRS in 1996, after the work plan was completed. This PRS was addressed in a separate VCA plan (LANL 1996, 05-0245).

PRS C-0-043 was located on private property north of Canyon Road along the west parking lot entrance road at the Immaculate Heart of Mary Catholic Church (Fig. 4.1.1-1). It is not known when this manhole was put into or taken out of service. The Central Waste Water Treatment Plant was in operation from the mid-1940's until it was decommissioned in the early 1960's. Sanitary waste passed through the manhole from original town site buildings (barracks) near the current site of the Catholic Church. It is believed that the manhole was connected to residential-type buildings, so it is unlikely that radioactive or RCRA materials would have been discharged into the sewer lines accessible by this manhole. Therefore, potential for chemical or radiological contamination within the manhole was considered low.

4.1.2 Investigations Previous to the RFI

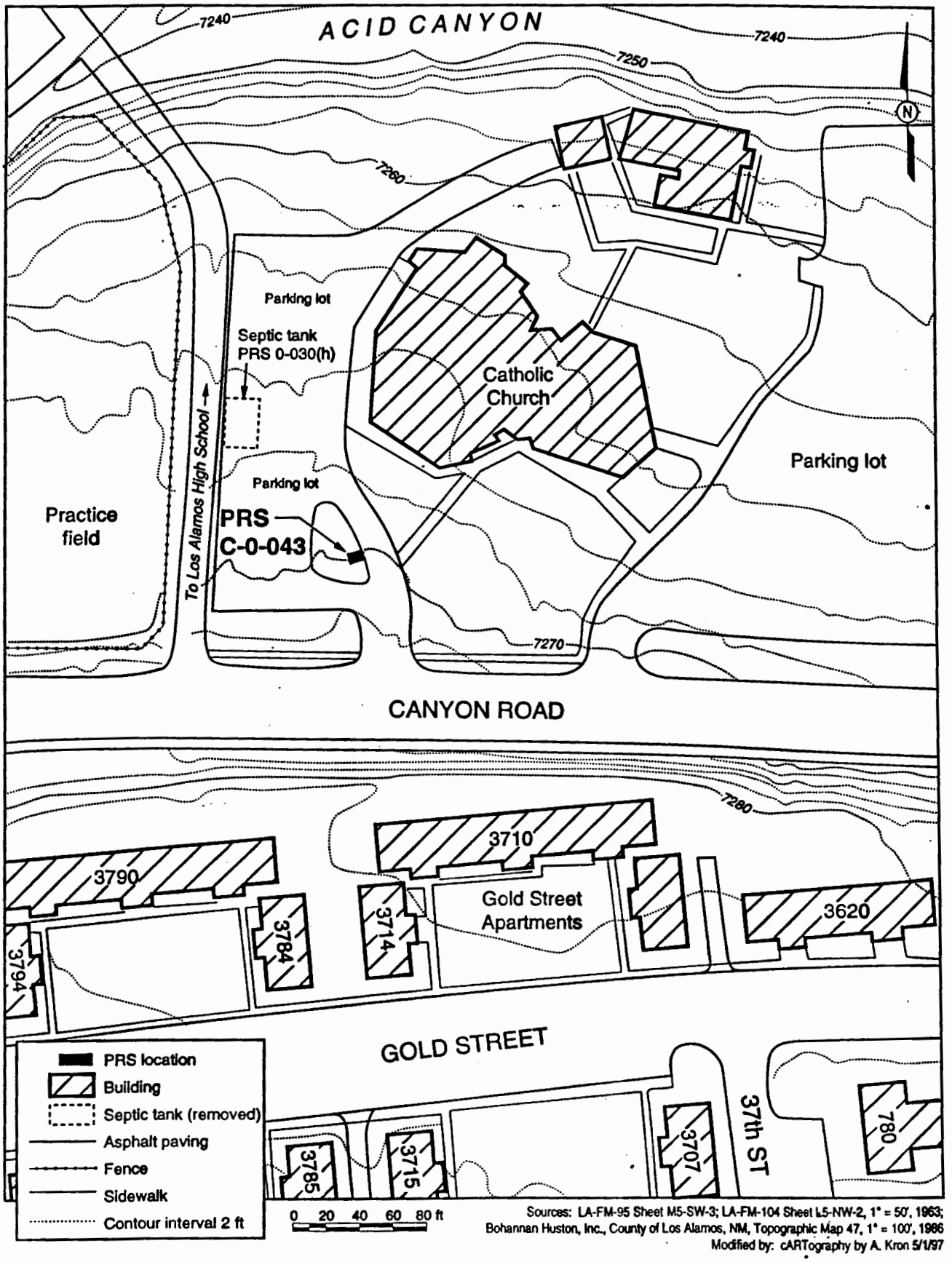
No previous investigations were conducted at PRS C-0-043.

4.2 Site Characterization

The objective of the RFI was to determine whether contamination was present at the location of the manhole. PRS C-0-043 RFI activities, including site surveys, geodetic surveys, manhole investigation and sampling, and field screening, were conducted on August 22, 1996. All were conducted in accordance with the VCA plan and are discussed in detail below (LANL 1996, 05-0245).

Site Surveys

The PRS C-0-043 manhole was located along the west parking lot entrance road at the Immaculate Heart of Mary Catholic Church (Fig. 4.1.1-1). The top of the manhole had been collapsed to ground level and was covered with a steel plate. The manhole is shown on a map which illustrates sewer lines for the Central Waste Water Treatment Plant (Zia Company 1954, 05-0246).



Sources: LA-FM-95 Sheet M5-SW-3; LA-FM-104 Sheet L5-NW-2, 1" = 50', 1963; Bohannan Huston, Inc., County of Los Alamos, NM, Topographic Map 47, 1" = 100', 1986
Modified by: cARTography by A. Kron 5/1/97

Fig. 4.1.1-1 Location of PRS C-0-043.

Geodetic Surveys

The location of the manhole, associated sampling locations, the parking lot, and landscaping were surveyed, and geodetic survey data were transferred to FIMAD for incorporation into the ER database.

Manhole Investigation and Sampling

PRS C-0-043 was a bell-shaped manhole constructed of brick, mortar, and cement. The estimated dimensions of the structure were 2 ft in diameter at the surface by 6–8 ft in diameter at the base by 4 ft deep. The tank was actually found to be 2 ft in diameter at the surface by 5–6 ft in diameter at the base by 5–5.5 ft deep. The manhole had not been backfilled, but it contained some loose bricks, asphalt from the road, a large tuff boulder, and approximately 5–10 in. of sediment.

Two samples were collected from the sediment in the bottom of the manhole (Figs. 4.2-1 and 4.2-2). Sample 0100-96-0427 (location 00-04905) was collected from sediment on the south side of the manhole. Sample 0100-96-0428 (location 00-04906) was collected from sediment on the north side of the manhole adjacent to an outlet pipe. Both samples were collected using the Spade and Scoop Method for Collection of Soil Samples, LANL-ER-SOP-06.09, R0, ICN7 (LANL, 0875).

The samples were screened in the field for organic vapors and gross radiological activity for worker health and safety (see "Field Screening Methods" at the end of this section). There were no detectable organic vapor readings, and no detectable alpha or beta/gamma activities above background levels. The samples were then submitted to the TA-21 radiochemical screening laboratory and for off-site, fixed-laboratory analysis. Screening analyses at TA-21 included gross alpha/beta/gamma radiation, moisture content, and tritium. Analyses at the fixed laboratory included TAL metals by EPA SW-846 Methods 6010 and 7470 (mercury), VOCs by EPA SW-846 Method 8260, SVOCs by EPA SW-846 Method 8270, and PCBs/pesticides by EPA SW-846 Method 8080. In addition, samples were analyzed for plutonium-238 and plutonium-239/240 by alpha spectrometry, americium-241 by gamma spectroscopy, and total uranium by ICP/MS. Sample locations and requested analyses are summarized in Table 4.2-1.

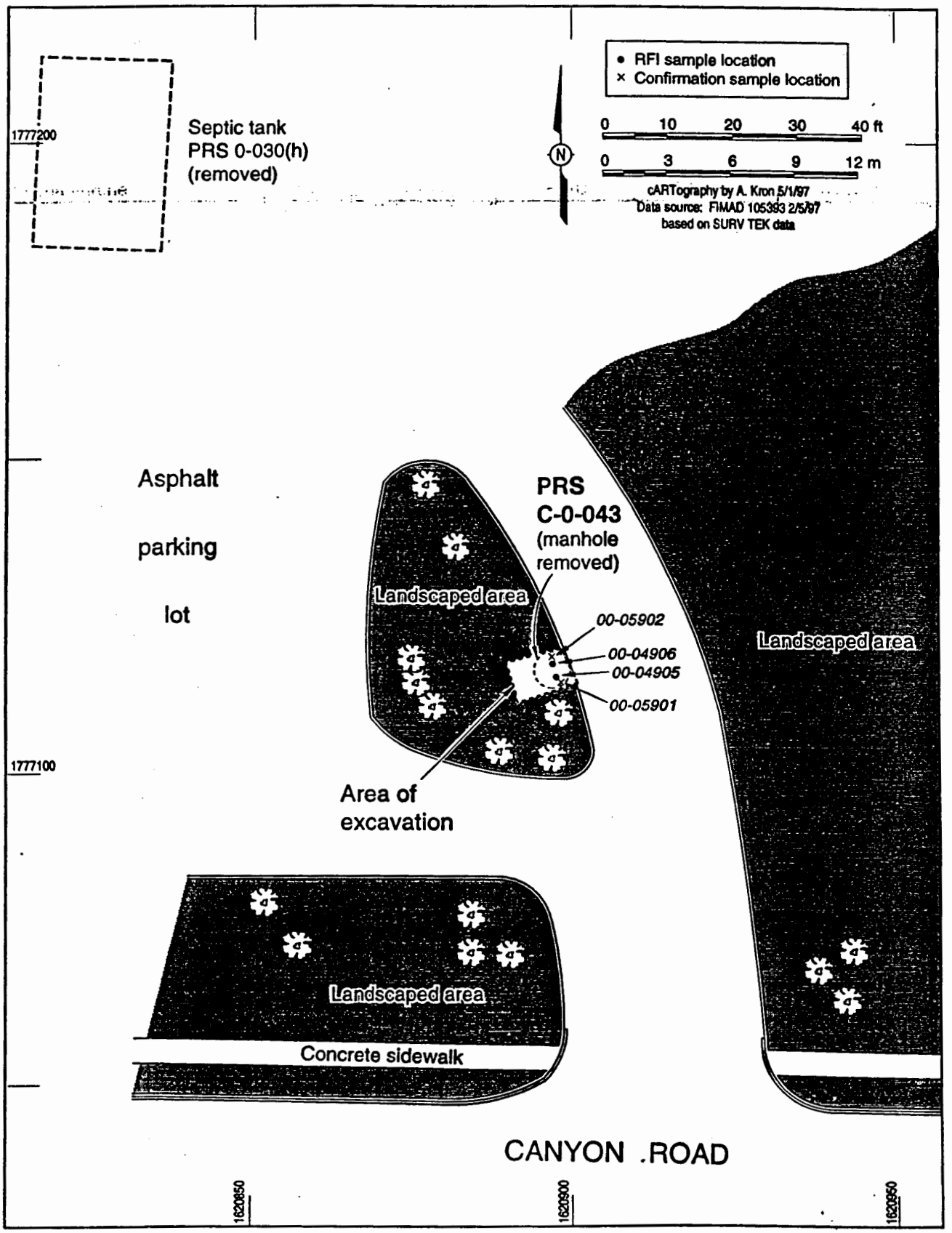


Fig. 4.2-1 Locations of samples collected at PRS C-0-043.

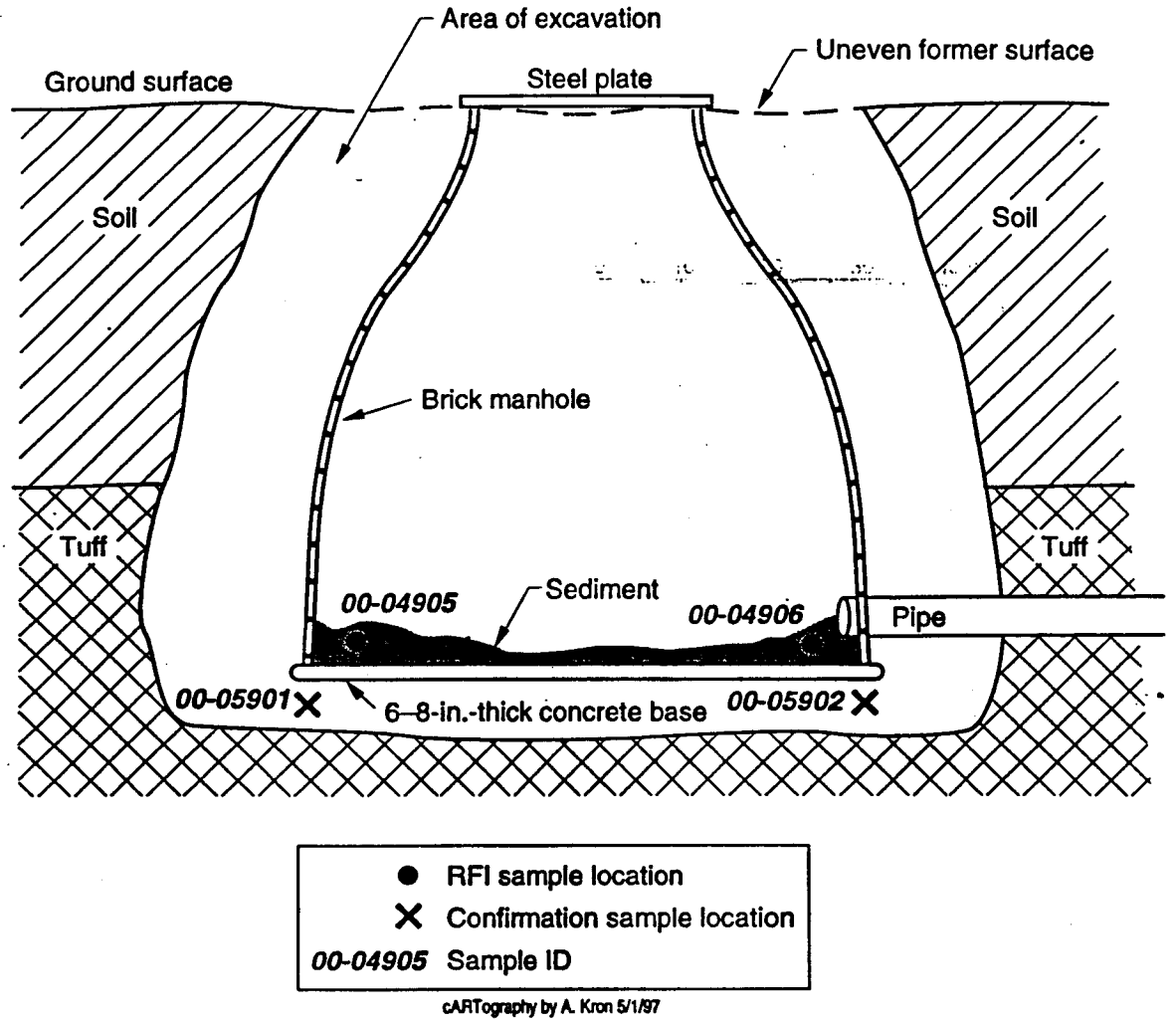


Fig. 4.2-2 Schematic cross section of PRS C-0-043 and estimated sample locations.

TABLE 4.2-1

SUMMARY OF CHARACTERIZATION SAMPLES COLLECTED AT PRS C-0-043[a]

SAMPLE NUMBER	LOCATION ID	LOCATION DESCRIPTION	DEPTH (in.)	VOCs	SVOCs	PESTICIDES/ PCBs	TAL METALS	RAD[b]
0100-96-0427	00-04905	Sediment in bottom of manhole, adjacent to south wall	0–8	2549	2549	2549	2550	2551
0100-96-0428	00-04906	Sediment in bottom of manhole, adjacent to north wall and pipe	0–5	2549	2549	2549	2550	2551

[a] Samples were also submitted for gross alpha/beta/gamma radiation, moisture content, and tritium analyses at the TA-21 radiochemical screening laboratory.

[b] RAD = Plutonium-238, plutonium-239/240, total uranium, americium-241, and gamma spectroscopy.

Field Screening Methods

Field screening was performed to protect worker health and safety. Soil was screened for organic vapors using a Thermo Environmental Instruments, Inc.™, OVM Model 580B PID with an 11.7 eV bulb. Soil was screened for ionizing radiation using Ludlum™ Model 139 rate meters with air proportional (alpha) and Eberline™ ESP-1 (beta/gamma) probes. All field screening instruments were calibrated as necessary and checked daily.

Deviations

All work was conducted in accordance with the VCA plan (LANL 1996, 05-0245). No deviations occurred.

4.3 Background Comparison and Screening Assessment

A preliminary assessment of the characterization data indicated that the soil from which characterization samples were collected contained no COPCs at levels greater than SALs. The excavated soil was returned to the excavation after the manhole structure was removed. As a result, the characterization data represent soil that will remain at the site. The characterization data are therefore included in a formal background comparison and screening assessment that includes the data from confirmation samples. This assessment is presented in Section 4.4.5.

4.4 VCA Activities

4.4.1 Rationale For Conducting the VCA

A VCA was conducted at PRS C-0-043 to remove the manhole structure. This VCA was conducted as part of the RFI mobilization, and it added little additional cost. The purpose of the VCA was to reduce the potential safety risk to people using the site, and to contribute to LANL's effort to remove legacy waste from the Los Alamos town site.

4.4.2 Nature and Extent of Contamination

The results of RFI characterization activities indicated that several chemicals were present at levels greater than background screening values in the sediment. There was a relatively small volume of sediment (approximately 20 cubic ft), all of which appeared to be confined in the structure because the floor of the tank was intact.

4.4.3 Cleanup Level Derivation

Because no chemicals were detected at levels greater than SAL, and because the area was very small, no cleanup levels were calculated.

4.4.4 Remedial Activities and Results of Confirmation Sampling

4.4.4.1 Remedial Implementation

A VCA was conducted to remove the manhole structure at PRS C-0-043 on December 20, 1996. A backhoe was used to excavate around the north, west, and south perimeter of the manhole in an attempt to loosen the structure and minimize the damage to the asphalt driveway to the east. Excavated soil was separated from debris from the manhole. The manhole broke into many pieces and could not be removed as one complete structure. The manhole structure was 2 ft in diameter at the surface by 5–6 ft in diameter at the base by 5–5.5 ft deep, and it was attached to a concrete base that was approximately 8 ft in diameter and 6–8 in. thick near the center. The concrete base was structurally sound and free of cracks. A 6–8-in.-diameter concrete pipe was found exiting the north side of the manhole. No additional pipes exiting and entering the manhole were not found during removal activities (Fig. 4.2-2).

The brick and mortar pieces and the concrete base of the septic tank were placed on plastic sheeting and field screened for organic vapors and gross radiological activity for worker health and safety. Organic vapor screening was conducted using a Thermo Environmental Instruments, Inc.™, OVM Model 580B PID with an 11.7 eV bulb. Ionizing radiation screening was conducted using Ludlum™ Model 139 rate meters with air proportional (alpha) and Eberline™ ESP-1 (beta/gamma) probes. All field screening instruments were calibrated (as necessary) and checked daily. There were no detectable organic vapor readings, and no detectable alpha or beta/gamma activities above background levels.

An adequate number of smears, as defined in "Radiation Protection of the Public and the Environment," (DOE 1990, 0080) were collected from the brick/mortar and concrete and delivered to TA-21 for analysis by LANL's Health Physics Operations group. The brick/mortar and concrete were temporarily stored on-site until approval was obtained to release the manhole structure as construction debris. The radiological counts for the smears were all below background, and on December 20, 1996, less than 10 yd^3 of brick/mortar and concrete were loaded onto a dump truck and transported to the Los Alamos County landfill as construction debris.

The excavation was immediately backfilled and compacted with excavated soil and clean fill material. The area was graded to restore the disturbed area to the original site grade. The disturbed area was reseeded during spring of 1997 to complete restoration activities.

4.4.4.2 Confirmation Sampling

After completion of the manhole removal, two confirmation soil samples were collected from beneath each half of the manhole footprint using a backhoe (Fig. 4.2-1). The samples were collected from the backhoe bucket using the Spade and Scoop Method for Collection of Soil Samples, LANL-ER-SOP-06.09, R0, ICN7 (LANL, 0875). Sample 0100-96-2261 (Location 00-05902) was collected from beneath the northern half of the manhole footprint and the concrete pipe at 6–6.25 ft bgs. Sample 0100-96-2262 (Location 00-05901) was collected from beneath the southern half of the manhole footprint at 6–6.25 ft bgs.

The samples were field screened for organic vapors and gross radiological activity for worker health and safety using the instruments and methodology described in Section 4.4.4.1. There were no detectable organic vapor readings, and no detectable alpha or beta/gamma activities above background levels. The samples were also submitted to the TA-21 radiochemical screening laboratory for gross alpha/beta/gamma radiation, moisture content, and tritium analyses. The samples were then submitted for off-site, fixed-laboratory analyses including TAL metals by EPA SW-846 Methods 6010 and 7470 (mercury), VOCs by EPA SW-846 Method 8260, SVOCs by EPA SW-846 Method 8270, and PCBs/pesticides by EPA SW-846 Method 8080. In addition, samples were analyzed for plutonium-238 and plutonium-239/240 by alpha spectrometry, americium-241 by gamma spectroscopy, and total uranium by ICP/MS. Sample locations and requested analyses are summarized in Table 4.4.4-1.

TABLE 4.4.4-1

CONFIRMATION SAMPLES COLLECTED AT PRS C-0-043[a]

SAMPLE NUMBER	LOCATION ID	LOCATION DESCRIPTION	DEPTH (ft bgs)	VOCs	SVOCs	PESTICIDE S/ PCBs	TAL METALS	RAD[b]
0100-96-2261	00-05902	Beneath manhole and concrete pipe on north side of excavation	6–6.25	2847	2847	2847	2851	2852
0100-96-2262	00-05901	Beneath manhole on south side of excavation	6–6.25	2847	2847	2847	2851	2852

[a] Samples were also submitted for gross alpha/beta/gamma radiation, moisture content, and tritium analyses at the TA-21 radiochemical screening laboratory.
[b] RAD = Plutonium-238, plutonium-239/240, total uranium, americium-241, and gamma spectroscopy.

4.4.5 Background Comparison and Screening Assessment

The purpose of this section is to assess potential human health effects resulting from exposure to residual contamination associated with PRS C-0-043. A screening assessment was performed on the RFI data for this PRS following methodology presented in "Risk-Based Corrective Action Process," (LANL/SNL 1996, 1277). Fixed-laboratory analytical data from both characterization and confirmation sampling were included in this assessment because these data represent soil remaining at PRS C-0-043.

4.4.5.1 Background Comparisons

Data for inorganics, radionuclides, and organics at PRS C-0-043 were compared to background screening values presented in "Application of LANL Background Data to ER Project Decision-Making, Part I: Inorganics," (Ryti et al. 1996, 1298). The results of the background comparison are discussed below.

4.4.5.1.1 Inorganics

Two characterization samples and two confirmation samples collected from PRS C-0-043 were analyzed for TAL metals and total uranium. Seven inorganics (antimony, calcium, copper, lead, manganese, thallium, and zinc) were detected at concentrations exceeding their respective background screening values. The concentrations of these analytes for each sample that has at least one value above background screening values are presented in Table 4.4.5-1. The locations where these analytes were detected at levels exceeding background screening values are shown on Fig. 4.4.5-1.

The qualifiers in the table were assigned during baseline validation. However, the data are usable for site-specific decisions for the following reasons. As discussed in Appendix A, antimony and manganese data were qualified because of a low matrix spike recovery. The J- qualifier indicates that the result may be biased low. Because at least one of the concentrations qualified J- for antimony and manganese was above the background screening value, antimony and manganese will be carried forward to the screening assessment for further evaluation.

Antimony, calcium, copper, lead, manganese, thallium, and zinc will be carried forward to the screening assessment.

TABLE 4.4.5-1

INORGANICS WITH CONCENTRATIONS EXCEEDING BACKGROUND SCREENING VALUES AT PRS C-0-043[a]

SAMPLE NUMBER	DEPTH (In.)	ANTIMONY	CALCIUM	COPPER	LEAD	MANGANESE	THALLIUM	ZINC
	UTL	1[b]	6 120	15.5	23.3	714	1[b]	50.8
	SAL	31	n/a[c]	2 800	400	3 200	5.4	23 000
0100-96-0427 [d]	0–8	4.9 (J-)	7 690	15.8	52.3	440 (J-)	1.1	115
0100-96-0428	0–5	0.75 (J-)	7 930	9.5	37.4	947 (J-)	3.5	77.8

[a] All values are in mg/kg. Outlined cells indicate that concentrations exceed the background screening value.
[b] Value represents the maximum reported background concentration in soil.
[c] n/a = Not available.
[d] Values represent the maximums from a sample and its laboratory duplicate.

4.4.5.1.2 Evaluation of Radionuclides

Two characterization samples and two confirmation samples collected from PRS C-0-043 were analyzed by gamma spectroscopy and also for isotopic plutonium. In addition, the two confirmation samples were analyzed for isotopic uranium. Because total uranium is not carried forward to the screening assessment in the previous section, uranium will not be evaluated further in this section.

Analysis of radionuclides by gamma spectroscopy often leads to the reporting of concentrations for certain radionuclides that are inappropriate to evaluate as potential site contaminants. These include short-lived activation/fission products, naturally occurring background radionuclides, and daughter radionuclides of naturally occurring radionuclides. While these

three classes of radionuclides were reported for PRS C-0-043, they will not be considered site contaminants for the following reasons.

- Sixteen short-lived activation/fission products reported at PRS C-0-043 (barium-140, cadmium-109, cerium-139, cesium-134, cobalt-57, europium-152, mercury-203, lanthanum-140, manganese-54, ruthenium-106, selenium-75, sodium-22, tin-113, strontium-85, yttrium-88, and zinc-65) have half-lives ranging from a few days to 2.6 years (except for europium-152, which has a half-life of 13.4 years). Several of these radionuclides are used as internal standards to measure equipment performance and laboratory background (or contamination). Because activation/fission products with short half-lives are routinely reported for reasons not related to RFI investigations, and they are not expected to occur at this PRS, these short-lived activation/fission products are eliminated as potential radionuclide contaminants.

- Potassium-40 is a naturally occurring radionuclide that is also routinely reported by the analyst because it is used as an internal standard to measure such things as equipment performance and laboratory background (or contamination). There is no process knowledge of the use of potassium-40 at this PRS, and reported concentrations are generally within known background ranges for potassium-40 (Longmire et al. 1995,1142; Longmire et al. 1995,1266). Therefore, potassium-40 will not be considered a potential radionuclide contaminant at this site.

- Daughters of naturally occurring radionuclides (uranium and thorium) are also reported by gamma-spectroscopy analyses. These daughters (e.g., isotopes of actinium, bismuth, lead, protactinium, radium, radon, thallium, and thorium) are normally present in secular equilibrium concentrations and are not directly evaluated as potential radionuclide contaminants.

EQLs and minimum detectable activities are often not available for radionuclides analyzed by gamma spectroscopy. A value of three times the measurement uncertainty (3 sigma or three standard deviations) is used to calculate a sample-specific minimum detectable activity, which is then employed in the same manner as a detection limit. This methodology is similar to Currie's method of determining radionuclide minimum detectable activity (Currie 1988, 0792). This 3-sigma screening value takes into account variability due to counting statistics, but does not account for spectral peak identification problems. Thus, this 3-sigma screening may

include radionuclides whose presence is spuriously reported due to spectral interferences or misidentifications. Cerium-144, cobalt-60, and neptunium-237 were eliminated from further consideration based on this criterion.

Americium-241, cesium-137, plutonium-238, and plutonium-239/240 are the remaining detected radionuclides. These four radionuclides were eliminated from further consideration because they were detected at concentrations below background screening values. Therefore, no radionuclides are carried forward to the screening assessment.

4.4.5.1.3 Evaluation of Organics

Two characterization samples and two confirmation samples collected from PRS C-0-043 were analyzed for VOCs, SVOCs, and PCBs/pesticides. Twelve organic chemicals were detected [acetone, bis(2-ethylhexyl)phthalate, 2-butanone, chloroform, 4,4'-DDE, 4,4'-DDT, 2-hexanone, 4-methyl-2-pentanone, phenanthrene, pyrene, trichloroethene, and m,p-xylenes]. Of these organic chemicals, two are PAHs and are discussed separately below. The concentrations of the 10 remaining organics for each sample that has at least one detected value are presented in Table 4.4.5-2. The locations at which organics were detected are shown on Fig. 4.4.5-1.

The qualifiers shown in the table were assigned during baseline validation. However, the data are usable for site-specific decisions. As discussed in Appendix A, data for 4,4'-DDE and 4,4'-DDT were qualified J+ for sample 0100-96-0427 because the surrogate recovery was above the upper limit. The J+ qualifier indicates that the results may be biased high. Data for 4,4'-DDE and 4,4'-DDT were qualified J- for sample 0100-96-0428 because the surrogate recovery was between 10% and the lower limit. The J- qualifier indicates that the results may be biased low. Data for 2-butanone, 2-hexanone, 4-methyl-2-pentanone, bis(2-ethyl hexyl)phthalate, and chloroform were qualified J because they were detected below the reporting limit. The J qualifier indicates that the result is estimated to be more uncertain than normally expected. All of these chemicals are considered detected and will be evaluated further in the screening assessment.

Ten organic chemicals [2-butanone, 2-hexanone, 4-methyl-2-pentanone, bis(2-ethyl hexyl)phthalate, and chloroform, acetone, m,p-xylene, 4,4'-DDE, 4,4'-DDT, and trichloroethene] will be carried forward to the screening assessment.

The two PAHs detected at PRS C-0-043 (phenanthrene and pyrene) will not be carried forward to the screening assessment because they are deemed not to be associated with a release from PRS C-0-043. Because the manhole lies in a low point that receives runoff from the surrounding

asphalt parking lot, the PAHs are most likely the result of runoff from the asphalt and should not be related to this PRS.

Although it is not appropriate to evaluate the potential human health risks associated with 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 IX PRGs for residential soil, as shown in Appendix E. The total hazard index for these PAHs was estimated by summing the hazard quotients for each chemical (both are noncarcinogenic). The estimated hazard index for PRS C-0-043 is 0.0002, which is well below the acceptable hazard index of 1. These calculations are shown in Appendix E.

The data for the PAHs are presented in Table 4.4.5-3. The qualifiers in the table were assigned during baseline validation. However, the data are usable for site-specific decisions for the following reasons. Phenanthrene and pyrene data were qualified J because they were detected below the reporting limit. The J qualifier indicates that the result is estimated to be more uncertain than normally expected. For the reasons discussed above, these PAHs will not be evaluated further in the screening assessment.

TABLE 4.4.5-2

ORGANICS WITH DETECTED CONCENTRATIONS AT PRS C-0-043[a]

SAMPLE ID		0100-96-0427	0100-96-0428	0100-96-2261	0100-96-2262
DEPTH		0–8 in. in sediment	0–5 in. in sediment	6–6.25 ft bgs	6–6.25 ft bgs
ANALYTE	SAL				
2-Butanone	7 100	0.074	0.019(J)	0.023 (U)	0.022 (U)
2-Hexanone	n/a[b]	0.024	0.006(J)	0.023 (U)	0.022 (U)
4-Methyl-2-Pentanone	770	0.005 (J)	0.025 (U)	0.023 (U)	0.022 (U)
Acetone	2 100	0.025 (U)	0.056	0.023 (U)	0.022 (U)
Bis(2-ethylhexyl)phthalate	32	0.82 (U)	0.19	0.38 (U)	0.37 (U)
Chloroform	0.25	0.002	0.003	0.006 (U)	0.006 (U)
m,p-Xylene	4 700	0.01	0.009	0.006 (U)	0.006 (U)
4,4'-DDE	1.3	0.016(J+)	0.011(J-)	0.004 (U)	0.004 (U)
4,4'-DDT	1.3	0.026 (J+)	0.028 (J-)	0.004 (U)	0.005
Trichloroethene	3.2	0.006 (U)	0.006 (U)	0.006	0.009

[a] All values are in mg/kg. Outlined cells indicate that concentrations are above the detection limit.
[b] n/a = Not available.

TABLE 4.4.5-3

PAHs WITH DETECTED CONCENTRATIONS AT PRS C-0-043[a]

SAMPLE ID		0100-96-0427	0100-96-0428	0100-96-2261	0100-96-2262
DEPTH (in.)		0–8	0–5	6–6.25	6–6.25
ANALYTE	SAL				
Phenanthrene	n/a	0.210(J)	0.83 (U)	0.38 (U)	0.37 (U)
Pyrene	1 900	0.170(J)	0.83 (U)	0.38 (U)	0.37 (U)

[a] All values are in mg/kg. Outlined cells indicate that concentrations are above the detection limit.

4.4.5.2 Human Health Screening Assessment

This subsection discusses the comparison with SALs for COPCs carried forward from the background comparison. Seven inorganics (antimony, calcium, copper, lead, manganese, thallium, and zinc) and ten organics [acetone, bis(2-ethylhexyl)phthalate, 2-butanone, chloroform, 4,4'-DDE, 4,4'-DDT, 2-hexanone, 4-methyl-2-pentanone, trichloroethene, and m,p-xylenes] were detected at concentrations exceeding background screening values.

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

No SAL. Calcium and 2-hexanone have no SALs. Calcium is an essential nutrient that can be compared with the calcium RDAs for children and adults. The greatest concentration of calcium detected at PRS C-0-043 was 7 930 mg/kg. At the standard soil ingestion rate of 200 mg/day for a child, the amount ingested per day would be approximately 1.6 mg. This amount is considerably less than the RDA of 800 mg/day (National Research Council 1989, 1251). At a standard soil ingestion rate of 100 mg/day for an adult, the amount ingested per day would be approximately 0.8 mg. This amount is considerably less than the RDA of 1 200 mg/day (National Research Council 1989, 1251). Therefore, calcium is eliminated as a COPC.

A SAL has not been developed for 2-hexanone. Therefore, the SAL for hexane (120 mg/kg) was used as a surrogate for 2-hexanone. This SAL was selected based on similarities in the mode of toxicity as discussed in Appendix E. The chemical 2-hexanone is evaluated further in the less than SAL category.

Less than SAL. Six inorganic chemicals (antimony, copper, lead, manganese, thallium, and zinc), and ten organic chemicals (acetone, bis(2-ethylhexyl)phthalate, 2-butanone, chloroform, 4,4'-DDE, 4,4'-DDT, 2-hexanone, 4-methyl-2-pentanone, trichloroethene, and m,p-xylenes) were detected at concentrations less than their respective SALs.

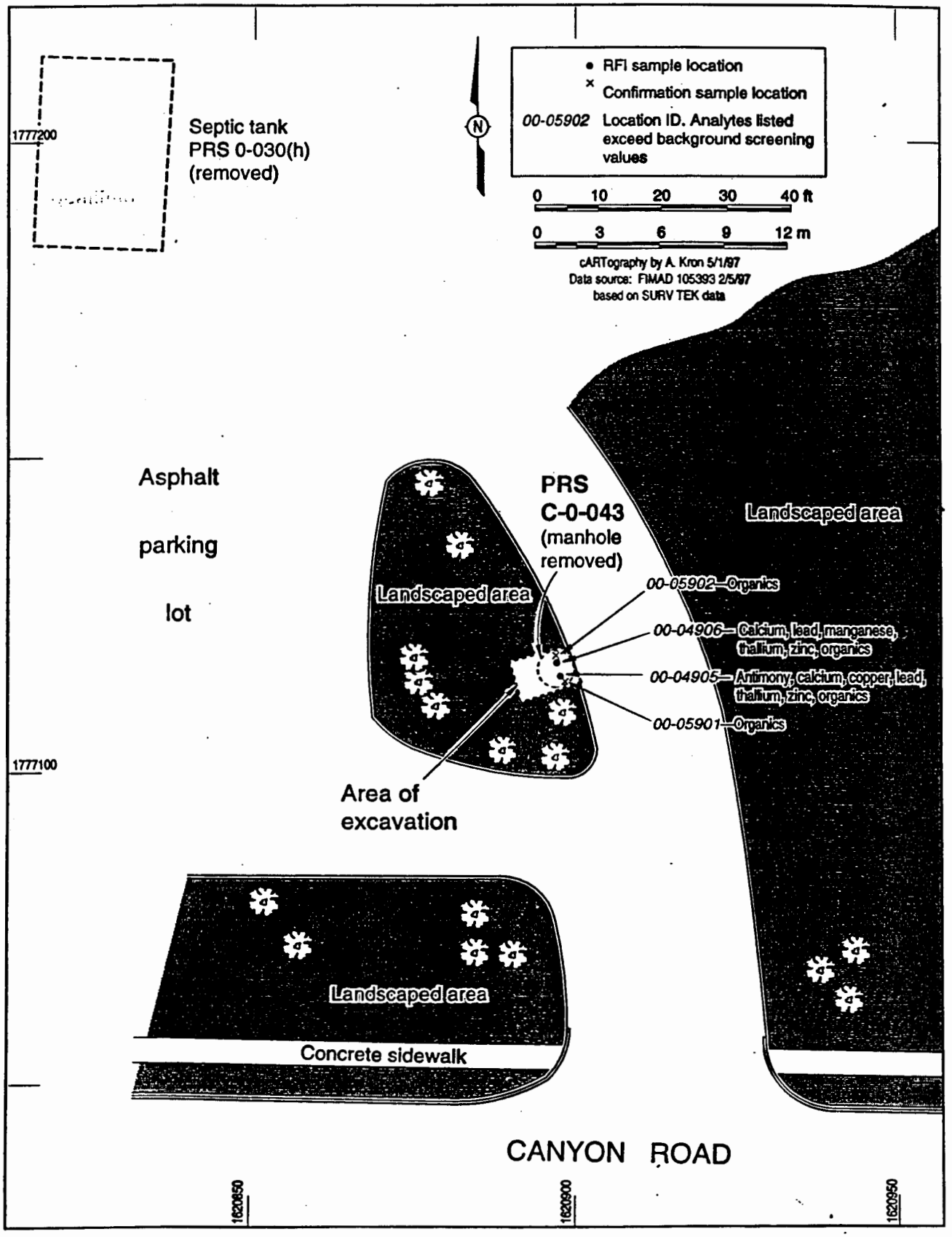


Fig. 4.4.5-1 **Locations of analytes exceeding background screening levels at PRS C-0-043.**

To evaluate multiple chemical effects for this data set, COPCs detected at concentrations less than their SALs were grouped according to toxicological effects (carcinogenic or noncarcinogenic). SALs for all chemicals were normalized and summed as described in "Risk-Based Corrective Action Process" (Dorries, 1996, 1297). The results of the analysis are shown in Tables 4.4.5-4 and 4.4.5-5. Because the result of the multiple chemical evaluation for carcinogens is less than one, potential resultant adverse human health effects from these exposures are unlikely. Therefore, all carcinogens detected at values less than SALs are eliminated as COPCs.

The result of the multiple chemical evaluation for noncarcinogens is greater than one. Therefore, those noncarcinogens with a normalized value greater than 0.1 (antimony, lead, manganese, and thallium) will be evaluated further in a discussion of COPCs.

TABLE 4.4.5-4

MULTIPLE CHEMICAL EVALUATION FOR NONCARCINOGENIC EFFECTS OF CHEMICALS FOR C-0-043

CHEMICAL	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL (mg/kg)	NORMALIZED VALUE
Acetone	0100-96-0428	0.056	2 100	2.7×10^{-05}
Antimony	0100-96-0427	4.9	31	0.16
2-Butanone	0100-96-0427	0.074	7 100	1.0×10^{-05}
Copper	0100-96-0427	15.8	2 800	0.006
2-Hexanone [a]	0100-96-0427	0.024	120	0.0002
Lead	0100-96-0427	52.3	400	0.13
Manganese	0100-96-0428	947	3 200	0.3
4-Methyl-2-pentanone	0100-96-0427	0.005	770	6.5×10^{-06}
Thallium	0100-96-0428	3.5	5.4	0.65
m,p-Xylene	0100-96-0427	0.01	4 700	2.1×10^{-06}
Zinc	0100-96-0427	115	23 000	0.005
Normalized Sum				1.3

[a] The SAL for hexane was used to derive a surrogate SAL for 2-hexanone.

TABLE 4.4.5-5

MULTIPLE CHEMICAL EVALUATION FOR CARCINOGENIC EFFECTS OF CHEMICALS FOR C-0-043

CHEMICAL	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL (mg/kg)	NORMALIZED VALUE
Bis(2-ethylhexyl)phthalate	0100-96-0428	0.19	32	0.0059
Chloroform	0100-96-0428	0.003	0.25	0.012
4,4'-DDE	0100-96-0427	0.016	1.3	0.012
4,4'-DDT	0100-96-0428	0.028	1.3	0.022
Trichloroethene	0100-96-2262	0.009	3.2	0.0028
Normalized Sum				0.05

Discussion of COPCs. This section evaluates the COPCs that were retained at the end of the human health screening assessment (antimony, lead, manganese, and thallium) in the context of their environmental setting. These chemicals were retained because although they were all detected at concentrations less than SAL, together their normalized values exceeded unity, resulting in a noncarcinogenic MCE of 1.3.

The highest concentrations of these COPCs were detected in the two samples collected from the sediment contained within the manhole structure. Extent is defined as within the manhole structure because the structure was intact and elevated levels of COPCs were not detected in the soil immediately beneath the manhole structure.

The sediment within the manhole structure was subsequently returned, along with clean fill, to the hole from which the manhole structure was extracted. The volume of sediment within the manhole was relatively small, approximately 20 cubic ft of soil, as compared to approximately 216 cubic ft of soil required to fill the approximately 6 ft long x 6 ft wide x 6 ft deep excavation. The amount of sediment within the manhole excavation is less than 10% of the total soil filling the excavation.

The SALs for the COPCs used in the MCE are based on a residential exposure scenario. The exposure area in the residential scenario is 5 000 sq ft. The area of the manhole is approximately 2 sq ft. The exposure area of the manhole is less than 1% of the size of a residential exposure area.

The combination of antimony, lead, manganese, and thallium at this PRS is not associated with a health risk for the following reasons:

- no chemicals were detected at concentrations greater than SAL
- the noncarcinogenic MCE barely exceeded 1

- the amount of sediment containing elevated COPCs is less than 10% of the total soil filling the excavation, and
- the whole manhole area is less than 1% of a residential exposure area

Therefore, antimony, lead, manganese, and thallium will not be considered further.

4.5 Waste Management

4.5.1 Deviations

All work was conducted in accordance with the VCA plan (LANL 1996, 05-0245) and the waste characterization strategy form. However, the following deviation occurred during the VCA activities:

- A greater volume of waste was generated when removing the manhole because the base of the manhole was larger than originally estimated.

4.5.2 Waste Characterization Data

The manhole structure consisted of approximately 10 yd^3 of brick/mortar and cement instead of the original estimate of 4 yd^3. This material was classified as construction debris and was disposed of at the Los Alamos County landfill. The PPE and sampling waste were classified as sanitary waste and disposed of at the Los Alamos County landfill. The steel plate was classified as scrap metal and recycled at a commercial facility. Decontamination water and final decontamination rinse water were not generated because disposable scoops were used to collect samples. A comparison between the actual amount of waste generated and the amount of waste projected in the VCA plan is presented in Table 4.5.2-1.

TABLE 4.5.2-1

SUMMARY OF PROJECTED AND GENERATED WASTE VOLUMES FOR PRS C-0-043

WASTE ITEM	WASTE TYPE	PROJECTED VOLUME	GENERATED VOLUME
Sampling waste/PPE	Solid sanitary waste	1 ft^3	0.25 ft^3
Bricks/mortar and concrete	Solid construction debris	4 yd^3	less than 10 yd^3
Steel plate	Industrial (scrap metal)	Not applicable	approximately 75 lb

4.6 Conclusions and Recommendations

The results of the screening assessment on the RFI and confirmation results indicate that no chemicals are present at levels that present an unacceptable risk to human health. The VCA successfully removed the manhole, and the site was restored. PRS C-0-043 is recommended for NFA based on Criterion 4 of LANL's NFA Criteria Policy, EM/ER:95-PCT-015 (Project Consistency Team, 1210). This criterion states that chemicals of concern are present at concentrations that pose an acceptable level of risk under the expected land-use scenario.

5.0 REFERENCES

Currie, L. A. (Ed.), 1988. "Detection in Analytical Chemistry: Importance, Theory, and Practice," 191st *Meeting of the American Chemical Society, New York, New York, April 13-18, 1986,* American Chemical Society, Washington, DC. **(Currie 1988, 0792)**

DOE (US Department of Energy), June 5, 1990. "Radiation Protection of the Public and the Environment," DOE Order 5400.5 (Change 1), Washington, DC. **(DOE 1990, 0080)**

Dorries, A. M. (Ed.), June 1,1996. "Risk-Based Corrective Action Process," Revision 1, Los Alamos National Laboratory Report LA-UR-96-2811, Los Alamos, New Mexico. **(Dorries 1996, 1297)**

Environmental Protection Group, December 1990. "Environmental Surveillance at Los Alamos During 1989," Los Alamos National Laboratory Report LA-12000-ENV, Los Alamos, New Mexico. **(Environmental Protection Group 1990, 0497)**

Environmental Protection Group, March 1992. "Environmental Surveillance at Los Alamos During 1990," Los Alamos National Laboratory Report LA-12271-MS, Los Alamos, New Mexico. **(Environmental Protection Group 1992, 0740)**

EPA (US Environmental Protection Agency), March 8, 1990. "National Oil and Hazardous Substances Pollution Contingency Plan," Final Rule, 40 CFR Part 300, Federal Register, Vol. 55, No. 46, p. 8666. **(EPA 1990, 0559)**

ESG, May 1988. *Environmental Surveillance at Los Alamos During 1987*, Los Alamos National Laboratory Report LA-11306-ENV, Los Alamos, New Mexico. **(ESG 1988, 0408)**

ESG, June 1989. *Environmental Surveillance at Los Alamos During 1988*, Los Alamos National Laboratory Report LA-11628-ENV, Los Alamos, New Mexico. **(ESG 1989, 0308)**

Francis, W. C. and J. A. Sullivan, 1995. "Historical Study of the Origin of Influent Into Eighteen Septic Tanks that Existed in the Los Alamos Townsite (Post Area) from about 1943 through 1947," Los Alamos National Laboratory Memorandum CST-10/95-0011 to Garry Allen (CST-18) from William C. Francis (CST-7) and John A. Sullivan (CST-18), Los Alamos, New Mexico. **(Francis and Sullivan 1995, 05-0207)**

Geophex Ltd., July 1996. "Geophysical Investigation of the Pine Street Cul-de-sac, Technical Area 0 (TA-0-030[d])," Geophex Job No. 625 submitted to Los Alamos National Laboratory, Los Alamos, New Mexico. **(Geophex, Ltd. 1996, 05-0247)**

LANL (Los Alamos National Laboratory). "Los Alamos National Laboratory Environmental Restoration Program Standard Operating Procedures," Los Alamos National Laboratory report, Los Alamos, New Mexico. **(LANL, 0875)**

LANL (Los Alamos National Laboratory), May 1992. "RFI Work Plan for Operable Unit 1071," Los Alamos National Laboratory Report LA-UR-92-810, Los Alamos, New Mexico. **(LANL 1992, 0781)**

LANL (Los Alamos National Laboratory), March 1996. "Voluntary Corrective Action Completion Plan for Potential Release Sites 0-030(d,h,i,j,k,n,o,p), Town Site Septic Tank Systems," Los Alamos National Laboratory Report LA-UR-96-936, Los Alamos, New Mexico. **(LANL 1996, 05-0244)**

LANL (Los Alamos National Laboratory), December 1996. "Voluntary Corrective Action Plan for Potential Release Site C-0-043, Catholic Church Manhole," Los Alamos National Laboratory Report LA-UR-97-301, Los Alamos, New Mexico. **(LANL 1996, 05-0245)**

LANL/SNL (Los Alamos National Laboratory and Sandia National Laboratories), January 2, 1996. "Risk-Based Corrective Action Process," A. M. Dorries (Ed.), Los Alamos National Laboratory Report LA-UR-96-111, Los Alamos, New Mexico. **(LANL/SNL 1996, 1277)**

Longmire, P. A., D. E. Broxton, and S. L Reneau (Eds.), October 1995. "Natural Background Geochemistry and Statistical Analysis of Selected Soil Profiles, Sediments, and Bandelier Tuff, Los Alamos, New Mexico," Los Alamos National Laboratory Report LA-UR-95-3486, Los Alamos, New Mexico. **(Longmire et al. 1995, 1266)**

Longmire, P., S. Reneau, P. Watt, L. McFadden, J. Gardner, C. Duffy, and R. Ryti, January 1995. "Natural Background Geochemistry, Geomorphology, and Pedogenesis of Selected Soil Profiles and Bandelier Tuff, Los Alamos, New Mexico," (draft) Los Alamos National Laboratory Report LA-12913-MS, Los Alamos, New Mexico. **(Longmire et al. 1995, 1142)**

National Research Council, 1989. "Recommended Dietary Allowances," 10th Edition, National Academy Press, Washington, DC. **(National Research Council 1989, 1251)**

Project Consistency Team. "Project Consistency Team (PCT) Policy Memo Notebook," (Controlled), Environmental Restoration Project, Los Alamos National Laboratory, Los Alamos, New Mexico. **(Project Consistency Team, 1210)**

Purtymun, W. D., R. J. Peters, T. E. Buhl, M. N. Maes, and F. H. Brown, November 1987. "Background Concentrations of Radionuclides in Soils and River Sediments in Northern New

Mexico, 1974-1986," Los Alamos National Laboratory Report LA-11134-MS, Los Alamos, New Mexico. **(Purtymun et al. 1987, 0211)**

Ryti, R., P. Longmire, and E. McDonald, March 29, 1996. "Application of LANL Background Data to ER Project Decision-Making, Part I: Inorganics," Los Alamos National Laboratory Report LA-UR-96-1534, Los Alamos, New Mexico. **(Ryti et al. 1996, 1298)**

Zia Company, February 14, 1947. "Post Plan, Buildings and Numbers," PA-100-B, Sheet 2 of 2, Los Alamos, New Mexico. **(Zia Company 1947, 05-0132)**

Zia Company, 1954. "United States Atomic Energy Commission, Sewage Distribution," Sheet 2 of 4, Los Alamos, New Mexico. **(Zia Company 1947, 05-0246)**

THIS PAGE LEFT INTENTIONALLY BLANK

APPENDIX A RESULTS OF QUALITY ASSURANCE/QUALITY CONTROL ACTIVITIES

1.0 PRS 0-030(d)

1.1 Inorganic Analyses

Three soil samples were analyzed for target analyte list (TAL) metals and total uranium in Request 2745. There were no quality control (QC) problems with this request. Therefore, all TAL metals and total uranium data for this request are valid and usable without added qualifiers.

Eight soil samples were analyzed for TAL metals and total uranium in Request 2767. The only QC problem with this request was that arsenic (39%) and selenium (69%) had low recoveries in the matrix spike sample. Matrix spike samples are used to assess the quality of the sample digestion, extraction, and analysis procedures. A low recovery suggests that either there was incomplete recovery of an analyte in these procedures or that the sample was heterogeneous. To address this problem, post-digestion spikes, which are used to assess the sample extraction and analysis procedures, were performed for arsenic and selenium. The recoveries for the post-digestion spikes were within the limits allowed in US Environmental Protection Agency (EPA) SW846 guidelines. As required in the Los Alamos National Laboratory (LANL) data validation guidelines, UJ and J- qualifiers were added to all arsenic and selenium data to acknowledge the possible low bias. All TAL metals and total uranium data for this request are valid and usable as qualified.

1.2 Organic Analyses

Three soil samples were analyzed for volatile organic compounds (VOCs) in Request 2744. There were several problems with this request. The first was that acetone and methylene chloride were found in the method blank at concentrations of 10 and 12 µg/kg, respectively. Because acetone and methylene chloride are common laboratory contaminants, the "10 times" rule was applied. Based on this rule, U qualifiers were added to all acetone and methylene chloride values detected at less than 10 times the blank values for all samples in this request. The second problem with this request was that the fourth internal standard for sample 0100-96-1451 and all of the internal standards for sample 0100-96-1452 were outside the range allowed by the EPA's Contract Laboratory Program National Functional Guidelines for Organic Data Review. Internal standards are used to assess instrument performance during

the analytical procedure. Standards outside the allowed range indicate interference from a sample or a change in the response of the instrument. As required in the LANL data validation guidelines, UJ or J- qualifiers were added to all analytes associated with the internal standards noted above. Associated analytes are those analytes that are in close proximity to the internal standard on the chromatogram. All data for VOCs in this request are valid and usable as qualified.

Eight soil samples were analyzed for VOCs in Request 2766. The only problem with this request was that acetone, trichlorofluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, and methylene chloride were found in the method blank at concentrations of 15, 16, 5, and 8 µg/kg, respectively. Because acetone and methylene chloride are common laboratory contaminants, the "10 times" rule was applied for these analytes. Based on this rule, U qualifiers were added to all acetone and methylene chloride values detected at less than 10 times the blank values for all samples in this request. Because trichlorofluoromethane and 1,1,2-trichloro-1,2,2-trifluoroethane are not common laboratory contaminants, the "5 times" rule was applied for these analytes. Based on this rule, U qualifiers were added to all trichlorofluoromethane and 1,1,2-trichloro-1,2,2-trifluoroethane values detected at less than 5 times the blank values for all samples in this request. All data for VOCs in this request are valid and usable as qualified.

Eleven soil samples were analyzed for semivolatile organic compounds (SVOCs) in Requests 2744 and 2766. There were no QC problems with these requests. Therefore, all data for SVOCs for these requests are valid and usable without added qualifiers.

Eleven soil samples were analyzed for pesticides/polychlorinated biphenyls (PCBs) in Requests 2744 and 2766. There were no QC problems with these requests. Therefore, all pesticides/PCBs data for these requests are valid and usable without added qualifiers.

1.3 Radiochemistry Analyses

Eleven soil samples were analyzed for isotopic plutonium by alpha spectroscopy and gamma activity by gamma spectroscopy in Requests 2746 and 2768. There were no QC problems with these requests. Therefore, isotopic plutonium and gamma activity data for these requests are valid and usable without added qualifiers.

TABLE A-1

SUMMARY OF QUALITY CONTROL RESULTS FOR PRS 0-030(d)

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
2744	0100-96-1451	Soil	VOCs[a]	Acetone and methylene chloride found in method blank (10 and 12 µg/kg, respectively). Data qualified appropriately (see text above). Fourth internal standard low. All associated analytes qualified UJ.
2744	0100-96-1452	Soil	VOCs	Acetone and methylene chloride found in method blank (10 and 12 µg/kg, respectively). Data qualified appropriately (see text above). All internal standards low. All associated analytes qualified UJ or J.
2744	0100-96-1453	Soil	VOCs	Acetone and methylene chloride found in method blank (10 and 12 µg/kg, respectively). Data qualified appropriately (see text above).
2766	0100-96-1454	Soil	VOCs	Acetone, trichlorofluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, and methylene chloride found in method blank (15, 16, 5, and 8 µg/kg, respectively). Data qualified appropriately (see text above).
2766	0100-96-1455	Soil	VOCs	Acetone, trichlorofluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, and methylene chloride found in method blank (15, 16, 5, and 8 µg/kg, respectively). Data qualified appropriately (see text above).
2766	0100-96-1456	Soil	VOCs	Acetone, trichlorofluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, and methylene chloride found in method blank (15, 16, 5, and 8 µg/kg, respectively). Data qualified appropriately (see text above).
2766	0100-96-1457	Soil	VOCs	Acetone, trichlorofluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, and methylene chloride found in method blank (15, 16, 5, and 8 µg/kg, respectively). Data qualified appropriately (see text above).
2766	0100-96-1458	Soil	VOCs	Acetone, trichlorofluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, and methylene chloride found in method blank (15, 16, 5, and 8 µg/kg, respectively). Data qualified appropriately (see text above).
2766	0100-96-1459	Soil	VOCs	Acetone, trichlorofluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, and methylene chloride found in method blank (15, 16, 5, and 8 µg/kg, respectively). Data qualified appropriately (see text above).
2766	0100-96-1460	Soil	VOCs	Acetone, trichlorofluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, and methylene chloride found in method blank (15, 16, 5, and 8 µg/kg, respectively). Data qualified appropriately (see text above).
2766	0100-96-1461	Soil	VOCs	Acetone, trichlorofluoromethane, 1,1,2-trichloro-1,2,2-trifluoroethane, and methylene chloride found in method blank (15, 16, 5, and 8 µg/kg, respectively). Data qualified appropriately (see text above).
2767	0100-96-1454	Soil	TAL metals, U[b]	Arsenic (39%) and selenium (69%) had low recoveries in the matrix spike samples. These analytes are qualified J- or UJ.

TABLE A-1 (continued)

SUMMARY OF QUALITY CONTROL RESULTS FOR PRS 0-030(d)

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
2767	0100-96-1455	Soil	TAL metals, U	Arsenic (39%) and selenium (69%) had low recoveries in the matrix spike samples. These analytes are qualified J- or UJ.
2767	0100-96-1456	Soil	TAL metals, U	Arsenic (39%) and selenium (69%) had low recoveries in the matrix spike samples. These analytes are qualified J- or UJ.
2767	0100-96-1457	Soil	TAL metals, U	Arsenic (39%) and selenium (69%) had low recoveries in the matrix spike samples. These analytes are qualified J- or UJ.
2767	0100-96-1458	Soil	TAL metals, U	Arsenic (39%) and selenium (69%) had low recoveries in the matrix spike samples. These analytes are qualified J- or UJ.
2767	0100-96-1459	Soil	TAL metals, U	Arsenic (39%) and selenium (69%) had low recoveries in the matrix spike samples. These analytes are qualified J- or UJ.
2767	0100-96-1460	Soil	TAL metals, U	Arsenic (39%) and selenium (69%) had low recoveries in the matrix spike samples. These analytes are qualified J- or UJ.
2767	0100-96-1461	Soil	TAL metals, U	Arsenic (39%) and selenium (69%) had low recoveries in the matrix spike samples. These analytes are qualified J- or UJ.

[a] VOCs = Volatile organic compounds.
[b] TAL metals, U = Target analyte list metals and total uranium.

2.0 QUALITY ASSURANCE/QUALITY CONTROL RESULTS FOR PRS C-0-043

2.1 Inorganic Analyses

Two soil samples were analyzed for TAL metals and total uranium in Request 2550. The only QC problem with this request was that antimony (51%) and manganese (67%) had low recoveries in the matrix spike sample. To address this problem, post-digestion spikes were performed for antimony and manganese. The recoveries for the post-digestion spikes were within the limits allowed in the EPA SW846 guidelines. As required in the LANL data validation guidelines, UJ or J- qualifiers were added to all antimony and manganese data to acknowledge the possible low bias. All TAL metals and total uranium data for this request are valid and usable as qualified.

Two soil samples were analyzed for TAL metals and total uranium in Request 2851. The only QC problem with this request was that lead had a low recovery in the matrix spike sample (<75%). To address this problem, post-digestion spikes were performed for lead. The recovery

for the post-digestion spike was within the limits allowed in the EPA SW846 guidelines. As required in the LANL data validation guidelines, UJ or J- qualifiers were added to all lead data to acknowledge the possible low bias. All TAL metals and total uranium data for this request are valid and usable as qualified.

2.2 Organic Analyses

Two soil samples were analyzed for VOCs in Request 2549. The only problem with this request was that methylene chloride, 1,2,4-trimethylbenzene, and naphthalene were found in the method blank at concentrations of 6, 7, and 3 µg/kg, respectively. Because methylene chloride is a common laboratory contaminant, the "10 times" rule was applied for this analyte. Based on this rule, U qualifiers were added to all methylene chloride values detected at less than 10 times the blank values for all samples in this request. Because 1,2,4-trimethylbenzene and naphthalene are not common laboratory contaminants, the "5 times" rule was applied for these analytes. Based on this rule, U qualifiers were added to all 1,2,4-trimethylbenzene and naphthalene values detected at less than 5 times the blank values for all samples in this request. All data for VOCs in this request are valid and usable as qualified.

Two soil samples were analyzed for VOCs in Request 2847. The only problem with this request was that acetone was found in the method blank at a concentration of 7 µg/kg. Because acetone is a common laboratory contaminant, the "10 times" rule was applied. Based on this rule, U qualifiers were added to acetone values detected at less than 10 times the blank values for all samples in this request. All data for VOCs in this request are valid and usable as qualified.

Two soil samples were analyzed for SVOCs in Request 2549. The only problem with this request was that di-n-butylphthalate was found in the method blank at a concentration of 1 000 µg/kg. Because di-n-butylphthalate is a common laboratory contaminants, the "10 times" rule was applied. Based on this rule, U qualifiers were added to di-n-butylphthalate values detected at less than 10 times the blank values for all samples in this request. All data for SVOCs in this request are valid and usable as qualified.

Two soil samples were analyzed for SVOCs in Request 2847. There were no QC problems with this request. Therefore, all data for SVOCs in this request are valid and usable without added qualifiers.

Two soil samples were analyzed for pesticides/PCBs in Request 2549. Both samples in this request had surrogate problems. Surrogates are added to 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. Sample 0100-96-0428 had a low recovery for the surrogate decachlorobiphenyl (DCB) (37%). Therefore, as required in the LANL data validation guidelines, all analytes for this sample are qualified J- or UJ to acknowledge the possible low bias. Sample 0100-96-0427 had an extremely high recovery for DCB (420%). This high recovery was attributed (by the analyst) to an interference in the sample. However, because of the high recovery, all detected values for this sample are qualified J+ to acknowledge the possible high bias. All data for pesticides/PCBs in this request are valid and usable as qualified.

Two soil samples were analyzed for pesticides/PCBs in Request 2847. There were no QC problems with this request. Therefore, all pesticide/PCB data in this request are valid and usable without added qualifiers.

2.3 Radiochemistry Analyses

Four soil samples were analyzed for isotopic plutonium by alpha spectroscopy and gamma activity by gamma spectroscopy in Requests 2551 and 2852. The only problem with these requests occurred in the gamma spectroscopy analyses for Request 2551. Peaks in the spectra were misidentified as cadmium-109 and neptunium-237. To account for this error, the values for these two isotopes are qualified U. All data for isotopic plutonium and gamma activity in this request are valid and usable as qualified.

TABLE A-2

SUMMARY OF QUALITY CONTROL RESULTS FOR PRS C-0-043

REQUEST NUMBER	SAMPLE ID	SAMPLE MATRIX	ANALYTE SUITE	QUALITY CONTROL (QC) COMMENTS
2549	0100-96-0427	Soil	VOCs[a]	Methylene chloride, 1,2,4-trimethylbenzene, and naphthalene found in method blank (6, 7, and 3 µg/kg, respectively). All data for these analytes qualified appropriately (see text above).
2549	0100-96-0428	Soil	VOCs	Methylene chloride, 1,2,4-trimethylbenzene, and naphthalene found in method blank (6, 7, and 3 µg/kg, respectively). All data for these analytes qualified appropriately (see text above).
2847	0100-96-2261	Soil	VOCs	Acetone found in method blank (7 µg/kg). All data for this analyte qualified appropriately (see text above).
2847	0100-96-2262	Soil	VOCs	Acetone found in method blank (7 µg/kg). All data for this analyte qualified appropriately (see text above).
2549	0100-96-0427	Soil	SVOCs[b]	Di-n-butylphthalate found in method blank (1 000ug/kg). All data for this analyte qualified appropriately (see text above).
2549	0100-96-0428	Soil	SVOCs	Di-n-butylphthalate found in method blank (1 000ug/kg). All data for this analyte qualified appropriately (see text above).
2549	0100-96-0427	Soil	Pest/PCBs[c]	High surrogate recovery (DCB = 3 420%). All detects qualified J+.
2549	0100-96-0428	Soil	Pest/PCBs	Low surrogate recovery (DCB = 37%). All analytes qualified J- or UJ.
2550	0100-96-0427	Soil	TAL metals, U[d]	Antimony (51%) and manganese (67%) had low recoveries in the matrix spike sample. Data for these analytes are qualified J- or UJ.
2550	0100-96-0428	Soil	TAL metals, U	Antimony (51%) and manganese (67%) had low recoveries in the matrix spike sample. Data for these analytes are qualified J- or UJ.
2851	0100-96-2261	Soil	TAL metals, U	Lead qualified J- for a low recovery in the matrix spike sample.
2851	0100-96-2262	Soil	TAL metals, U	Lead qualified J- for a low recovery in the matrix spike sample.
2551	0100-96-0427	Soil	Radionuclides[e]	Cadmium-109 and neptunium-237 qualified U for peak misidentification.
2551	0100-96-0428	Soil	Radionuclides	Cadmium-109 and neptunium-237 qualified U for peak misidentification.

[a] VOCs = Volatile organic compounds.
[b] SVOCs = Semivolatile organic compounds.
[c] Pest/PCBs = Pesticides/polychlorinated biphenyls.
[d] TAL metals, U = Target analyte list metals and total uranium.
[e] Radionuclides = Isotopic plutonium and gamma spectroscopy.

THIS PAGE LEFT INTENTIONALLY BLANK

APPENDIX B ANALYTICAL DATA

This appendix contains the analytical results for Potential Release Sites (PRSs) 0-030(d,k) and C-0-043. The results for PRS 0-030(d) are shown in Tables B-1 through B-3. These tables include data from characterization samples (no confirmation samples were collected). The field screening results for PRS 0-030(k) are shown in Table B-4. Only the field screening data are presented because no samples were collected at this PRS. The results for PRS C-0-043 are shown in Tables B-5 through B-7. These tables include the data from both characterization and confirmation samples.

TABLE B-1

ANALYTICAL RESULTS FOR INORGANICS IN CHARACTERIZATION SAMPLES AT PRS 0-030(d)

SAMPLE ID	0100-96-1451	0100-96-1451D	0100-96-1452	0100-96-1453	0100-96-1453D	0100-96-1454	0100-96-1454D
ANALYTE							
Aluminum	2170	2608	2240	4570		4570	4990
Antimony	1 U	1.04 U	1.1 U	1.7		5.2 U	5.43 U
Arsenic	3.1	3.37	3	4.6		0.197 U	0.193 U
Barium	60.7	67.6	55.6	136		105	114
Beryllium	0.42	0.556	0.42	0.75		0.637 U	0.635 U
Cadmium	0.05 U	0.049 U	0.05 U	0.04 U		0.52 U	0.543 U
Calcium	2820	2904	1840	4840		2430	2740
Chromium	4.8	5.3	5.9	9.9		4.65	5.18
Cobalt	2.5	2.8	2.4	3.9		4.13	5.22
Copper	7.2	7.92	6.8	14.4		5.21	5.52
Iron	11900	12780	6320	42300		6620	7400
Lead	52.4	58	56.9	12.2		20.8	0.145 U
Mercury	0.03	0.031	0.08	0.08		0.058	0.059
Magnesium	738	811	732	1080		1250	1350
Manganese	282	347	236	401		303	475
Nickel	3.8	4.2	3.3	13.4		5.23	5.98
Potassium	738	790	572	716		722	738
Silver	0.17 U	0.173 U	0.18 U	0.15 U		0.52 U	0.543 U
Sodium	64.8	68.9	53.2	151		529	561
Selenium	0.64 U	0.885	0.99	1.8		0.269 U	0.265 U
Thallium	0.79 U	0.791 U	0.82 U	0.68 U		0.215 U	0.233
Uranium	3.66	NA	3.92	2.4	2.27	2.8	NA
Vanadium	8.5	9.82	9.2	13.9		15.8	17.4
Zinc	52.1	71.8	35.8	32.8		17.3	18.5

TABLE B-1 (CONTINUED)

ANALYTICAL RESULTS FOR INORGANICS IN CHARACTERIZATION SAMPLES AT PRS 0-030(d)

SAMPLE ID	0100-96-1455		0100-96-1456		0100-96-1457		0100-96-1458		0100-96-1459		0100-96-1460		0100-96-1461	
ANALYTE														
Aluminum	4910		4520		5810		6250		3990		7150		4870	
Antimony	5.57	U	5.39	U	5.4	U	5.37	U	5.56	U	5.43	U	5.42	U
Arsenic	0.189	U	0.188	U	0.195	U	0.196	U	0.198	U	0.199	U	0.195	U
Barium	142		160		99.1		178		194		189		157	
Beryllium	0.835		0.778		0.878		0.943		0.902		0.95		0.757	
Cadmium	0.557	U	0.539	U	0.54	U	0.537	U	0.556	U	0.543	U	0.542	U
Calcium	4370		3090		7550		3180		9630		3150		4760	
Chromium	6.15		5.56		5.65		6.57		6.5		7.09		6.23	
Cobalt	5.71		6.94		5.81		5.21		5		6.09		5.12	
Copper	13.8		8.47		9.72		8.06		24.3		7.84		11.4	
Iron	8210		7780		9210		10200		6280		9890		8490	
Lead	16.1		0.141	U	16.6		0.147	U	50.5		14.1		21.6	
Mercury	0.167		0.164		0.166		0.076		0.593		0.094		0.146	
Magnesium	1320		1310		1580		1740		1070		1860		1380	
Manganese	407		502		509		388		340		424		408	
Nickel	7.51		6.57		7.95		8.04		5.25		7.72		7.19	
Potassium	946		750		1330		960		681		971		871	
Silver	0.557	U	0.539	U	0.54	U	0.537	U	1.45		0.543	U	0.542	U
Sodium	370		417		581		688		451		521		534	
Selenium	0.267	U	0.259	U	0.271	U	0.275	U	0.277	U	0.279	U	0.269	U
Thallium	0.213	U	0.207	U	0.217	U	0.22	U	0.222	U	0.224	U	0.215	U
Uranium	2.5		2.86		2.38		2.96		3.49		2.55		2.86	
Vanadium	18.8		19.5		20.9		22.5		15		24		19.4	
Zinc	42.3		51.6		54.9		25.5		189		23		63.9	

TABLE B-2

ANALYTICAL RESULTS FOR RADIONUCLIDES IN CHARACTERIZATION SAMPLES AT PRS 0-030(d)

SAMPLE ID	0100-96-1451		0100-96-1451D		0100-96-1452		0100-96-1453		0100-96-1453D		0100-96-1454		0100-96-1454D	
ANALYTE														
Actinium-228	0.994		0.951		0.909		1.2		NA		NA		NA	
Americium-241	0.044	U	0.15	U	-0.012	U	0.023	U	NA		0.006	U	NA	
Barium-140	0.12	U	0.033	U	-0.08	U	0.01	U	NA		NA		NA	
Bismuth-211	0	U	0	U	0	U	0	U	NA		NA		NA	
Bismuth-212	1.26	U	0.457	U	0.79	U	0.704	U	NA		NA		NA	
Bismuth-214	0.944		0.735		0.933		0.808		NA		NA		NA	
Cadmium-109	0.766	U	1.81		1.41		1.56		NA		NA		NA	
Cerium-139	-0.006	U	0.001	U	-0.004	U	-0.003	U	NA		NA		NA	
Cobalt-57	-0.001	U	0.005	U	-0.004	U	-0.007	U	NA		-0.004	U	NA	
Cobalt-60	-0.011	U	-0.005	U	0.009	U	0.001	U	NA		-0.003	U	NA	
Cesium-134	-0.007	U	-0.003	U	0.026	U	0.022	U	NA		NA		NA	
Cesium-137	1.01		0.913		0.57		0.013	U	NA		-0.005	U	NA	
Europium-152	-0.017	U	0.02	U	0.012	U	0.02	U	NA		0.058	U	NA	
Mercury-203	-0.02	U	0.004	U	0.007		-0.006	U	NA		NA		NA	
Iodine-129	NA		NA		NA		NA		NA		NA		NA	
Potassium-40	20.3		21.6		22.5		23.2		NA		23.8		NA	
Lanthanium-140	-0.185	U	-0.374	U	0.539	U	-0.088	U	NA		NA		NA	
Manganese-54	-0.005	U	-0.012	U	0.002	U	-0.007	U	NA		NA		NA	
Sodium-22	0.01	U	-0.002	U	-0.024	U	-0.004	U	NA		0.003	U	NA	
Neptunium-237	0.166	U	-0.258	U	0.671		0.455		NA		-0.002	U	NA	
Protactinium-231	1.47		1.39		1.5		1.55		NA		NA		NA	
Protactinium-233	0.041	U	-0.007	U	0.023	U	-0.012	U	NA		NA		NA	
Protactinium-234M	1.68	U	1.52	U	3.14	U	2.25	U	NA		NA		NA	
Lead-211	-0.01	U	0.077	U	-0.403	U	-0.032	U	NA		NA		NA	
Lead-212	1.12		0.988		1.02		1.23		NA		NA		NA	
Lead-214	0.844		0.781		0.821		0.871		NA		NA		NA	
Plutonium-238	0.01	U	NA		0	U	0.002	U	-0.005	U	0.001	U	-0.002	U
Plutonium-239	0.1		NA		0.12		0.09		NA		0.021		NA	
Radium-223	-0.229	U	0.2	U	0.261	U	-0.119	U	NA		NA		NA	
Radium-224	1.27	U	0.648		1.07	U	1.06		NA		NA		NA	
Radium-226	2.12		2.14		2.05		2.12		NA		NA		NA	

TABLE B-2 (CONTINUED)

ANALYTICAL RESULTS FOR RADIONUCLIDES IN CHARACTERIZATION SAMPLES AT PRS 0-030(d)

SAMPLE ID	0100-96-1451		0100-96-1451D		0100-96-1452		0100-96-1453		0100-96-1453D	0100-96-1454		0100-96-1454D
ANALYTE												
Radon-219	-0.138	U	-0.162	U	0.264	U	0.176	U	NA	NA		NA
Ruthenium-106	0.152	U	-0.063	U	-0.024	U	0.039	U	NA	0.031	U	NA
Selenium-75	-0.013	U	0.007	U	-0.001	U	-0.008	U	NA	NA		NA
Tin-113	0.017	U	-0.024	U	0.0032	U	-0.013	U	NA	NA		NA
Strontium-85	-0.054	U	-0.058	U	-0.044	U	-0.053	U	NA	NA		NA
Thorium-227	-0.502	U	0.018	U	0.027	U	-2.9	U	NA	NA		NA
Thorium-234	-2.4	U	-0.94	U	0.763		-0.178	U	NA	NA		NA
Thallium-208	0.356		0.347		0.337		0.391		NA	NA		NA
Uranium-235	0.001	U	0.068		0.095		0.103		NA	NA		NA
Yttrium-88	0.005	U	0.008	U	0.021	U	-0.012	U	NA	NA		NA
Zinc-65	-0.022	U	-0.018	U	-0.046	U	0.008	U	NA	NA		NA

TABLE B-2 (CONTINUED)

ANALYTICAL RESULTS FOR RADIONUCLIDES IN CHARACTERIZATION SAMPLES AT PRS 0-030(d)

SAMPLE ID	0100-1455		0100-1456		0100-1457		0100-1458		0100-1459		0100-14560		0100-96-1460D		0100-14561	
ANALYTE																
Actinium-228	NA		NA		NA		NA		NA		NA		NA		NA	
Americium-241	-0.029	U	0.056	U	-0.023	U	-0.018	U	0.017	U	-0.072	U	0.017	U	0.011	U
Barium-140	NA		NA		NA		NA		NA		NA		NA		NA	
Bismuth-211	NA		NA		NA		NA		NA		NA		NA		NA	
Bismuth-212	NA		NA		NA		NA		NA		NA		NA		NA	
Bismuth-214	NA		NA		NA		NA		NA		NA		NA		NA	
Cadmium-109	NA		NA		NA		NA		NA		NA		NA		NA	
Cerium-139	NA		NA		NA		NA		NA		NA		NA		NA	
Cobalt-57	0.011	U	0.002	U	0.012	U	0.023	U	0.001	U	-0.001	U	0.018	U	-0.007	U
Cobalt-60	-0.002	U	0.001	U	0.042	U	-0.019	U	0.026	U	0.023	U	NA		-0.022	U
Cesium-134	NA		NA		NA		NA		NA		NA		NA		NA	
Cesium-137	0.008	U	0.007	U	0.006	U	0.004	U	0.002	U	-0.014	U	0.001	U	-0.007	U
Europium-152	0.056	U	0.169	U	-0.061	U	0.283	U	0.069	U	0.076	U	0.115	U	0.057	U
Mercury-203	NA		NA		NA		NA		NA		NA		NA		NA	
Iodine-129	0.524		-0.088	U	NA		NA		-0.104	U	0.164	U	0.246	U	0.251	U
Potassium-40	20		24		26		17.8		20.4		21.3		19.8		20.9	
Lanthanium-140	NA		NA		NA		NA		NA		NA		NA		NA	
Manganese-54	NA		NA		NA		NA		NA		NA		NA		NA	
Sodium-22	-0.011	U	-0.022	U	-0.009	U	-0.047	U	-0.04	U	0.004	U	-0.059	U	-0.054	U
Neptunium-237	-0.032	U	0.025	U	0.013	U	0.018	U	0.082	U	0.015	U	-0.034	U	-0.064	U
Protactinium-231	NA		NA		NA		NA		NA		NA		NA		NA	
Protactinium-233	NA		NA		NA		NA		NA		NA		NA		NA	
Protactinium-234M	NA		NA		NA		NA		NA		NA		NA		NA	
Lead-211	NA		NA		NA		NA		NA		NA		NA		NA	
Lead-212	NA		NA		NA		NA		NA		NA		NA		NA	
Lead-214	NA		NA		NA		NA		NA		NA		NA		NA	
Plutonium-238	0.007		0.009		-0.001	U	-0.002	U	-0.003	U	0.011	U	NA		-0.001	U
Plutonium-239	0.061		0.033		0.089		0.017		0.446		-0.006	U	NA		0.215	
Radium-223	NA		NA		NA		NA		NA		NA		NA		NA	
Radium-224	NA		NA		NA		NA		NA		NA		NA		NA	
Radium-226	NA		NA		NA		NA		NA		NA		NA		NA	

TABLE B-2 (CONTINUED)

ANALYTICAL RESULTS FOR RADIONUCLIDES IN CHARACTERIZATION SAMPLES AT PRS 0-030(d)

SAMPLE ID	0100-1455		0100-1456		0100-1457		0100-1458		0100-1459		0100-14560		0100-96-1460D		0100-14561	
ANALYTE																
Radon-219	NA		NA		NA		NA		NA		NA		NA		NA	
Ruthenium-106	-0.186	U	-0.265	U	0.148	U	-0.048	U	-0.26	U	-0.062	U	-0.049	U	0.275	U
Selenium-75	NA		NA		NA		NA		NA		NA		NA		NA	
Tin-113	NA		NA		NA		NA		NA		NA		NA		NA	
Strontium-85	NA		NA		NA		NA		NA		NA		NA		NA	
Thorium-227	NA		NA		NA		NA		NA		NA		NA		NA	
Thorium-234	NA		NA		NA		NA		NA		NA		NA		NA	
Thallium-208	NA		NA		NA		NA		NA		NA		NA		NA	
Uranium-235	NA		NA		NA		NA		NA		NA		NA		NA	
Yttrium-88	NA		NA		NA		NA		NA		NA		NA		NA	
Zinc-65	NA		NA		NA		NA		NA		NA		NA		NA	

TABLE B-3

ANALYTICAL RESULTS FOR ORGANICS IN CHARACTERIZATION SAMPLES AT PRS 0-030(d)

SAMPLE ID	0100-96-1451		0100-96-1452		0100-96-1453		0100-96-1454		0100-96-1455		0100-96-1456	
ANALYTE												
Acetone	0.025	U	0.015	J	0.009	J	0.011	U	0.012	U	0.011	U
Aldrin	0.008	U	0.008	U	1.8	U	0.001	U	0.001	U	0.001	U
Anthracene	0.91	U	0.75	U	0.37	U	0.36	U	0.39	U	0.36	U
Benzo(a)pyrene	0.91	U	0.75	U	0.37	U	0.36	U	0.39	U	0.36	U
Benzo(a)anthracene	0.91	U	0.75	U	0.37	U	0.36	U	0.39	U	0.36	U
Benzo(b)fluoranthene	0.91	U	0.75	U	0.37	U	0.36	U	0.39	U	0.36	U
Benzo(g,h,i)perylene	0.91	U	0.75	U	0.37	U	0.36	U	0.39	U	0.36	U
Benzo(K)fluoranthene	ND		ND		ND		0.36	U	0.39	U	0.36	U
Bis(2-ethylhexyl)phthalate	0.91	U	0.75	U	0.37	U	0.36	U	0.39	U	0.36	U
Chlordane - Alpha	0.003		0.008	U	1.8	U	0.001	U	0.001	U	0.001	U
Chlordane (gamma)	0.002	J	0.008	U	1.8	U	0		0		0	
Chrysene	0.91	U	0.75	U	0.37	U	0.36	U	0.39	U	0.36	U
4,4'-DDD	0.016	U	0.012		3.2		0.001	U	0.028		0.001	U
4,4'-DDE	0.053		0.039		4.8		0.003		0.011		0.013	
4,4'-DDT	0.098		0.083		14		0.003		0.013		0.009	
Dieldrin	0.016	U	0.017	U	3.5	U	0.001	U	0.001	U	0.001	U
Endosulfan sulfate	0.016	U	0.017	U	3.5	U	0.001	U	0.015		0.001	U
Endrin Ketone	0.016	U	0.017	U	3.5	U	0.001	U	0.001	U	0.001	U
Fluoranthene	0.91	U	0.75	U	0.37	U	0.36	U	0.39	U	0.36	U
Indeno(1,2,3-cd)pyrene	0.91	U	0.75	U	0.37	U	0.36	U	0.39	U	0.36	U
Methylene Chloride	0.006	U	0.004	J	0.002	J	0.006		0.008		0.006	U
Phenanthrene	0.91	U	0.75	U	0.37	U	0.36	U	0.39	U	0.36	U
Pyrene	0.91	U	0.75	U	0.37	U	0.36	U	0.39	U	0.36	U
Trichlorofluoromethane	0.006	U	0.006	U	0.005	U	0.013		0.009		0.0012	
Toluene	0.009		0.009		0.005	J	0.006	U	0.006	U	0.006	U

TABLE B-3 (CONTINUED)

ANALYTICAL RESULTS FOR ORGANICS IN CHARACTERIZATION SAMPLES AT PRS 0-030(d)

SAMPLE ID	0100-96-1457		0100-96-1458		0100-96-1459		0100-96-1460		0100-96-1461	
ANALYTE										
Acetone	0.011	U	0.011	U	0.011	U	0.011	U	0.011	U
Aldrin	0.001	U	0.002		0.001	U	0.002		0.001	U
Anthracene	0.37	U	0.38	U	0.88		0.37	U	0.37	U
Benzo(a)pyrene	0.42		0.38	U	2.7		0.37	U	0.74	
Benzo(a)anthracene	0.4		0.38	U	2.7		0.37	U	0.55	
Benzo(b)fluoranthene	0.48		0.38	U	3.1		0.37	U	0.64	
Benzo(g,h,i)perylene	0.37	U	0.38	U	1.1		0.37	U	0.37	U
Benzo(K)fluoranthene	0.37	U	0.38	U	1.2		0.37	U	0.37	U
Bis(2-ethylhexyl)phthalate	0.37	U	0.38	U	0.73	U	0.58		0.37	U
Chlordane - Alpha	0.001	U	0.001	U	0.001	U	0.001	U	0.001	U
Chlordane (gamma)	0		0		0		0		0	
Chrysene	0.41		0.38	U	2.7		0.37	U	0.62	
4,4'-DDD	0.114		0.104		0.159		0.001	U	1.71	
4,4'-DDE	0.113		0.066		0.781		0.001		0.828	
4,4'-DDT	0.048		0.116		0.044		0.001	U	0.096	
Dieldrin	0.003		0.001	U	0.012		0.001	U	0.001	U
Endosulfan sulfate	0.001	U	0.001	U	0.001	U	0.001	U	0.015	
Endrin Ketone	0.001	U	0.001	U	0.021		0.001	U	0.001	U
Fluoranthene	0.71		0.38	U	5.7		0.37	U	0.44	
Indeno(1,2,3-cd)pyrene	0.37	U	0.38	U	1.2		0.37	U	0.37	U
Methylene Chloride	0.006		0.006	U	0.006	U	0.006	U	0.006	U
Phenanthrene	0.37		0.38	U	2.8		0.37	U	0.37	U
Pyrene	0.59		0.38	U	4.6		0.037	U	0.62	
Trichlorofluoromethane	0.014		0.006		0.006	U	0.006	U	0.006	U
Toluene	0.006	U	0.006	U	0.006	U	0.006	U	0.006	U

TABLE B-4

FIELD SCREENING RESULTS FOR PRS 0-030(k)

LOCATION	PID (ppm)	RADIOLOGICAL (cpm)	
		Alpha[a]	Beta/gamma[b]
Trench 1	0.0	NA[c]	NA
Trench 2	0.0	0	350
Trench 3	0.0	0	240
Trench 4	0.0	0	240
Trench 5	0.0	0	<100
Trench 6	0.0	0	<100
Trench 7	0.0	0	100
Trench 8	0.0	1	<100
Trench 9	0.0	1	100
Trench 10	0.0	0	110
Trench 11	0.0	0	120
Trench 12	0.0	0	180
Trench 13	0.0	0	150
Trench 14	0.0	1	140
Trench 15	0.0	0	100

[a] Background = 0.4 cpm.
[b] Background = 202 cpm.
[c] NA = Not available.

TABLE B-5

ANALYTICAL RESULTS FOR FOR INORGANICS IN CHARACTERIZATION AND CONFIRMATION SAMPLES AT PRS 0-030(k)

SAMPLE ID	0100-96-0427	0100-96-0427D	0100-96-0428	0100-96-2261	0100-96-2262
ANALYTE					
Aluminum	10100	11366.1747	10400	3090	2950
Antimony	4.9 J-	0.738 U	0.75 J-	5.6 U	5.7 U
Arsenic	4.4	4.3493	5.8	1.3	1.1
Barium	152	157.5031	218	67.9	70.1
Beryllium	0.81	0.9102	0.94	0.47	0.41
Cadmium	0.07 U	0.0738 U	0.08 U	0.56 U	0.57 U
Calcium	7690	4817.9803	7930	4130	4890
Chromium	11.6	9.6064	10.8	2.7	2.2
Cobalt	6.6	6.77	12.6	3.8	1.8
Copper	15.8	11.4096	9.5	3.5	3.2
Iron	11700	12696.2337	13400	4520	4930
Lead	52.3	34.2854	37.4	5.4 J-	4.5 J-
Magnesium	1930	1947.417	1910	734	575
Manganese	382 J-	439.5572	947 J-	287	284
Mercury	0.01 U	0.0123 U	0.01 U	0.054 U	0.056 U
Nickel	8.3	7.5498	8.5	4.7	3.9
Potassium	1980	2066.6568	1910	439	479
Selenium	0.73	0.4428 U	0.6	0.28 U	0.28 U
Silver	0.25 U	0.246 U	0.25 U	0.56 U	0.57 U
Sodium	369	384.6494	355	310	434
Thallium	1.1	0.9274	3.5	0.23 U	0.23 U
Vanadium	25.2	26.4428	28.5	9.6	7.3
Zinc	112	115.294	77.8	16.3	21.8
Uranium	2.6	2.27	2.04	2.29	2.23

TABLE B-6

ANALYTICAL RESULTS FOR FOR RADIONUCLIDES IN CHARACTERIZATION AND CONFIRMATION SAMPLES AT PRS 0-030(k)

SAMPLE ID	0100-96-0427		0100-96-0427D	0100-96-0428		0100-96-0428D	0100-96-2261		0100-96-2262	
ANALYTE										
Actinium-228	1.19		1.45	1.13		NA	NA		NA	
Americium-241	-0.25	U	0.0532	-0.023	U	NA	-0.016	U	0.065	
Annihilation Radiation	0.0824		0.0995	0.0845		NA	NA		NA	
Barium-140	0.007	U	-0.0933	0.162	U	NA	NA		NA	
Bismuth-211	0.048		NA	0.0868		NA	NA		NA	
Bismuth-212	0.881	U	1.2	0.249	U	NA	NA		NA	
Bismuth-214	0.739		0.926	0.806		NA	NA		NA	
Cadmium-109	1.69	R	2.74	2.01		NA	NA		NA	
Cerium-139	-0.007	U	-0.0125	0.001	U	NA	NA		NA	
Cerium-144	-0.013	U	0.0052	0.0329	U	NA	0.51	U	-0.82	U
Cesium-134	-0.015	U	0.0207	0.0108	U	NA	NA		NA	
Cesium-137	0.599		0.604	0.251		NA	-0.003	U	0.016	U
Cobalt-57	-0.011	U	-0.0013	0.0091	U	NA	-0.035	U	0.01	U
Cobalt-60	0.024	U	-0.0135	-0.0193	U	NA	0.005	U	-0.033	U
Europium-152	-0.038	U	0.0164	0.0168	U	NA	0.044	U	-0.014	U
Iodine-129	NA		NA	NA		NA	0.31		0.264	
Lanthanium-140	-15	U	-23	-35.4	U	NA	NA		NA	
Lead-211	-0.203	U	-0.182	-0.601	U	NA	NA		NA	
Lead-212	1.12		1.31	1.24		NA	NA		NA	
Lead-214	0.986		0.943	0.97		NA	NA		NA	
Manganese-54	0.017	U	0.0119	0.0288	U	NA	NA		NA	
Mercury-203	-0.021	U	0.0133	-0.0189	U	NA	NA		NA	
Neptunium-237	0.502	R	0.785	-0.437	U	NA	-0.067	U	-0.002	U
Plutonium 239/240	0.0309		NA	0.0112		0.00659	0.008		0.022	
Plutonium-238	0.00883		NA	0.00672		-0.00659	-0.008	U	-0.003	U
Potassium-40	19		22.1	21.4		NA	25.9		32	
Protactinium-231	1.76		1.42	1.04	U	NA	NA		NA	
Protactinium-233	0.019	U	0.0093	-0.0078	U	NA	NA		NA	
Protactinium-234M	1.59	U	3.35	2.57	U	NA				
Radium-223	-0.45	U	-0.0928	-0.144	U	NA	NA		NA	
Radium-224	0.67	U	0.835	1.2	U	NA	NA		NA	
Radium-226	2.11		2.79	2.06		NA	NA		NA	
Radon-219	-0.05	U	0.061	0.106	U	NA	NA		NA	

TABLE B-6 (CONTINUED)

ANALYTICAL RESULTS FOR FOR RADIONUCLIDES IN CHARACTERIZATION AND CONFIRMATION SAMPLES AT PRS 0-030(k)

SAMPLE ID	0100-96-0427		0100-96-0427D	0100-96-0428		0100-96-0428D	0100-96-2261		0100-96-2262	
ANALYTE										
Ruthenium-106	-0.145	U	0.0126	0.0351	U	NA	NA		NA	
Selenium-75	-0.015	U	-0.0245	0	U	NA	0.384		-0.166	U
Sodium-22	0	U	-0.0084	0.001	U	NA	NA		NA	
Strontium-85	-0.067	U	-0.0423	-0.0592	U	NA	0.038	U	-0.007	U
Thallium-208	0.409		0.413	0.422		NA	NA		NA	
Thorium-227	-0.086	U	-0.143	-0.104	U	NA	NA		NA	
Thorium-234	-0.251	U	-1.69	-1.59		NA	NA		NA	
Tin-113	-0.029	U	0.0114	-0.0326	U	NA	NA		NA	
Uranium	2.6		2.27	2.04		NA	NA		NA	
Uranium-235 (Gamma spec)	0.083		0.001	0.0657		NA	NA		NA	
Uranium-234(alpha spec)	NA		NA	NA		NA	NA		NA	
Uranium-235(alpha spec)	NA		NA	NA		NA	0.421		0.434	
Uranium-238(alpha spec)	NA		NA	NA		NA	0.023		0.024	
Yttrium-88	-0.023	U	-0.022	0.0189	U	NA	0.456		0.375	
Zinc-65	0.01	U	-0.015	-0.0199	U	NA	NA		NA	

TABLE B-7

ANALYTICAL RESULTS FOR FOR ORGANICS IN CHARACTERIZATION AND CONFIRMATION SAMPLES AT PRS 0-030(k)

SAMPLE ID	0100-96-0427		0100-96-0428		0100-96-2261		0100-96-2262	
ANALYTE								
1,1,1,2-Tetrachloroethane	0.0061	U	0.0063	U	0.006	U	0.006	U
1,1,1-Trichloroethane	0.0061	U	0.0063	U	0.006	U	0.006	U
1,1,2,2,-Tetrachloroethane	0.0061	U	0.0063	U	0.006	U	0.006	U
1,1,2-Trichloroethane	0.0061	U	0.0063	U	0.006	U	0.006	U
1,1-Dichloroethane	0.0061	U	0.0063	U	0.006	U	0.006	U
1,1-Dichloroethene	0.0061	U	0.0063	U	0.006	U	0.006	U
1,1-Dichloropropene	0.0061	U	0.0063	U	0.006	U	0.006	U
1,2,3-Trichloropropane	0.0061	U	0.0063	U	0.006	U	0.006	U
1,2,4-Trichlorobenzene	0.82	U	0.83	U	0.38	U	0.37	U
1,2,4-Trimethylbenzene	0.019	U	0.011	U	0.006	U	0.006	U
1,2-Dibromo-3-Chloropropane	0.012	U	0.013	U	0.012	U	0.011	U
1,2-Dibromoethane	0.0061	U	0.0063	U	0.006	U	0.006	U
1,2-Dichlorobenzene	0.82	U	0.83	U	0.006	U	0.006	U
1,2-Dichloroethane	0.0061	U	0.0063	U	0.006	U	0.006	U
1,2-Dichloropropane	0.0061	U	0.0063	U	0.006	U	0.006	U
1,3,5-Trimethylbenzene	0.0061	U	0.0063	U	0.006	U	0.006	U
1,3-Dichlorobenzene	0.82	U	0.83	U	0.006	U	0.006	U
1,3-Dichloropropane	0.0061	U	0.0063	U	0.006	U	0.006	U
1,4-Dichlorobenzene	0.82	U	0.83	U	0.006	U	0.006	U
2,2'-oxybis(1-Chloropropane)	0.82	U	0.83	U	0.38	U	0.37	U
2,4,5-Trichlorophenol	4.1	U	4.1	U	1.9	U	1.8	U
2,4,6-Trichlorophenol	0.82	U	0.83	U	0.38	U	0.37	U
2,4-Dichlorophenol	0.82	U	0.83	U	0.38	U	0.37	U
2,4-Dimethylphenol	0.82	U	0.83	U	0.38	U	0.37	U
2,4-Dinitrophenol	4.1	U	4.1	U	1.9	U	1.8	U
2,4-Dinitrotoluene	0.82	U	0.83	U	0.38	U	0.37	U
2,6-Dinitrotoluene	0.82	U	0.83	U	0.38	U	0.37	U
2-Butanone	0.074		0.019	J	0.023	U	0.022	U
2-Chloronaphthalene	0.82	U	0.83	U	0.38	U	0.37	U
2-Chlorophenol	0.82	U	0.83	U	0.38	U	0.37	U
2-Chlorotoluene	0.0061	U	0.0063	U	0.006	U	0.006	U
2-Hexanone	0.024		0.006	J	0.023	U	0.022	U
2-Methylnaphthalene	0.82	U	0.83	U	0.38	U	0.37	U
2-Methylphenol	0.82	U	0.83	U	0.38	U	0.37	U
2-Nitroaniline	4.1	U	4.1	U	1.9	U	1.8	U
2-Nitrophenol	0.82	U	0.83	U	0.38	U	0.37	U
3,3'-Dichlorobenzidine	1.6	U	1.7	U	0.77	U	0.74	U
3-Nitroaniline	4.1	U	4.1	U	1.9	U	1.8	U
4,4'-DDD	0.02	U	0.021	UJ	0.004	U	0.004	U
4,4'-DDE	0.016	J+	0.011	J-	0.004	U	0.004	U
4,4'-DDT	0.026	J+	0.028	J-	0.004	U	0.005	
4,6-Dinitro-2-methylphenol	4.1	U	4.1	U	1.9	U	1.8	U
4-Bromophenyl phenylether	0.82	U	0.83	U	0.38	U	0.37	U
4-Chloro-3-methylphenol	1.6	U	1.7	U	0.77	U	0.74	U
4-Chloroaniline	3.3	U	3.3	U	1.5	U	1.5	U
4-Chlorophenyl phenylether	0.82	U	0.83	U	0.38	U	0.37	U
4-Chlorotoluene	0.0061	U	0.0063	U	0.006	U	0.006	U
4-Methyl-2-Pentanone	0.005	J	0.025	U	0.023	U	0.022	U
4-Methylphenol	0.82	U	0.83	U	0.38	U	0.37	U

TABLE B-7 (CONTINUED)

ANALYTICAL RESULTS FOR FOR ORGANICS IN CHARACTERIZATION AND CONFIRMATION SAMPLES AT PRS 0-030(k)

SAMPLE ID	0100-96-0427		0100-96-0428		0100-96-2261		0100-96-2262	
ANALYTE								
4-Nitroaniline	1.5	U	1.5	U	0.77	U	0.74	U
4-Nitrophenol	4.1	U	4.1	U	1.9	U	1.8	U
Acenaphthene (PAH)	0.82	U	0.83	U	0.38	U	0.37	U
Acenaphthylene	0.82	U	0.83	U	0.38	U	0.37	U
Acetone	0.025	U	0.056		0.023	U	0.022	U
Aldrin	0.01	U	0.01	UJ	0.002	U	0.002	U
Alpha-BHC	0.01	U	0.01	UJ	0.002	U	0.002	U
Aniline	0.82	U	0.83	U	0.77	U	0.74	U
Anthracene (PAH)	0.82	U	0.83	U	0.38	U	0.37	U
Aroclor-1016	0.2	U	0.21	UJ	0.038	U	0.037	U
Aroclor-1221	0.41	U	0.41	UJ	0.077	U	0.074	U
Aroclor-1232	0.2	U	0.21	UJ	0.038	U	0.037	U
Aroclor-1242	0.2	U	0.21	UJ	0.038	U	0.037	U
Aroclor-1248	0.2	U	0.21	UJ	0.038	U	0.037	U
Aroclor-1254	0.2	U	0.21	UJ	0.038	U	0.037	U
Aroclor-1260	0.2	U	0.21	UJ	0.038	U	0.037	U
Azobenzene	0.82	U	0.83	U	0.77	U	0.74	U
Benzene	0.0061	U	0.0063	U	0.006	U	0.006	U
Benzo(a)anthracene (PAH)	0.82	U	0.83	U	0.38	U	0.37	U
Benzo(a)pyrene (PAH)	0.82	U	0.83	U	0.38	U	0.37	U
Benzo(b)fluoranthene (PAH)	0.82	U	0.83	U	0.38	U	0.37	U
Benzo(g,h,i)perylene	0.82	U	0.83	U	0.38	U	0.37	U
Benzoic acid	8.2	U	8.3	U	3.8	U	3.7	U
Benzyl alcohol	3.3	U	3.3	U	1.5	U	1.5	U
Beta-BHC	0.01	U	0.01	UJ	0.002	U	0.002	U
Bis(2-chloroethoxy)methane	0.82	U	0.83	U	0.38	U	0.37	U
Bis(2-chloroethyl)ether	0.82	U	0.83	U	0.38	U	0.37	U
Bis(2-ethylhexyl)phthalate	0.82	U	0.19	J	0.38	U	0.37	U
Bromobenzene	0.0061	U	0.0063	U	0.006	U	0.006	U
Bromochloromethane	0.0061	U	0.0063	U	0.006	U	0.006	U
Bromodichloromethane	0.0061	U	0.0063	U	0.006	U	0.006	U
Bromoform	0.0061	U	0.0063	U	0.006	U	0.006	U
Bromomethane	0.012	U	0.013	U	0.012	U	0.011	U
Butylbenzylphthalate	0.82	U	0.83	U	0.38	U	0.37	U
Carbazole	0.82	U	0.83	U	NA		NA	
Carbon Disulfide	0.0061	U	0.0063	U	0.006	U	0.006	U
Carbon Tetrachloride	0.0061	U	0.0063	U	0.006	U	0.006	U
Chlordane (gamma)	0.01	U	0.01	UJ	0.002	U	0.002	U
Chlordane - Alpha	0.01	U	0.021	UJ	0.002	U	0.002	U
Chlorobenzene	0.0061	U	0.0063	U	0.006	U	0.006	U
Chlorodibromomethane	0.0061	U	0.0063	U	0.006	U	0.006	U
Chloroethane	0.012	U	0.013	U	0.012	U	0.011	U
Chloroform	0.002	J	0.003	J	0.006	U	0.006	U
Chloromethane	0.012	U	0.013	U	0.012	U	0.011	U
Chrysene (PAH)	0.82	U	0.83	U	0.38	U	0.37	U
cis-1,2-Dichloroethene	0.0061	U	0.0063	U	0.006	U	0.006	U
cis-1,3-Dichloropropene	0.0061	U	0.0063	U	0.006	U	0.006	U
delta-BHC	0.01	U	0.01	UJ	0.002	U	0.002	U
Di-n-butylphthalate	1.1	U	2.5	U	0.38	U	0.37	U
Di-n-octyl phthalate	0.82	U	0.83	U	0.38	U	0.37	U

TABLE B-7 (CONTINUED)

ANALYTICAL RESULTS FOR FOR ORGANICS IN CHARACTERIZATION AND CONFIRMATION SAMPLES AT PRS 0-030(k)

SAMPLE ID	0100-96-0427		0100-96-0428		0100-96-2261		0100-96-2262	
ANALYTE								
Dibenz(a,h)anthracene (PAH)	0.82	U	0.83	U	0.38	U	0.37	U
Dibenzofuran	0.82	U	0.83	U	0.38	U	0.37	U
Dibromomethane	0.0061	U	0.0063	U	0.006	U	0.006	U
Dichlorodifluoromethane	0.012	U	0.013	U	0.012	U	0.011	U
Dieldrin	0.02	U	0.021	UJ	0.004	U	0.004	U
Diethylphthalate	0.82	U	0.83	U	0.38	U	0.37	U
Dimethyl phthalate	0.82	U	0.83	U	0.38	U	0.37	U
Endosulfan I	0.01	U	0.01	UJ	0.002	U	0.002	U
Endosulfan II	0.02	U	0.021	UJ	0.004	U	0.004	U
Endosulfan sulfate	0.02	U	0.021	UJ	0.004	U	0.004	U
Endrin	0.02	U	0.021	UJ	0.004	U	0.004	U
Endrin Ketone	0.02	U	0.021	UJ	0.004	U	0.004	U
Ethylbenzene	0.0061	U	0.0063	U	0.006	U	0.006	U
Fluoranthene (PAH)	0.82	U	0.83	U	0.38	U	0.37	U
Fluorene (PAH)	0.82	U	0.83	U	0.38	U	0.37	U
gamma-BHC	0.01	U	0.01	UJ	0.002	U	0.002	U
Heptachlor	0.01	U	0.01	UJ	0.002	U	0.002	U
Heptachlor epoxide	0.01	U	0.01	UJ	0.002	U	0.002	U
Hexachlorobenzene	0.82	U	0.83	U	0.38	U	0.37	U
Hexachlorobutadiene	0.82	U	0.83	U	0.38	U	0.37	U
Hexachlorocyclopentadiene	0.82	U	0.83	U	0.38	U	0.37	U
Hexachloroethane	0.82	U	0.83	U	0.38	U	0.37	U
Indeno(1,2,3-cd)pyrene (PAH)	0.82	U	0.83	U	0.38	U	0.37	U
Iodomethane	0.0061	U	0.0063	U	0.006	U	0.006	U
Isophorone	0.82	U	0.83	U	0.38	U	0.37	U
Isopropylbenzene	0.0061	U	0.0063	U	0.006	U	0.006	U
Methoxychlor	0.1	U	0.1	UJ	0.019	U	0.019	U
Methylene Chloride	0.0061	U	0.0063	U	0.006	U	0.006	U
N-Butylbenzene	0.0061	U	0.0063	U	0.006	U	0.006	U
N-Nitroso-di-n-propylamine	0.82	U	0.83	U	0.38	U	0.37	U
N-Nitrosodimethylamine	0.82	U	0.83	U	0.38	U	0.37	U
N-Nitrosodiphenylamine	0.82	U	0.83	U	0.38	U	0.37	U
N-Propylbenzene	0.0061	U	0.0063	U	0.006	U	0.006	U
Naphthalene (PAH)	0.006	U	0.006	U	0.38	U	0.37	U
Nitrobenzene	0.82	U	0.83	U	0.38	U	0.37	U
p-Isopropyltoluene	0.0061	U	0.0063	U	0.006	U	0.006	U
Pentachlorophenol	4.1	U	4.1	U	1.9	U	1.8	U
Phenanthrene	0.21	J	0.83	U	0.38	U	0.37	U
Phenol	0.82	U	0.83	U	0.38	U	0.37	U
Pyrene (PAH)	0.17	J	0.83	U	0.38	U	0.37	U
Sec-Butylbenzene	0.0061	U	0.0063	U	0.006	U	0.006	U
Styrene	0.0061	U	0.0063	U	0.006	U	0.006	U
T-1,2-Dichloroethene	0.0061	U	0.0063	U	0.012	U	0.011	U
T-1,3-Dichloropropene	0.0061	U	0.0063	U	0.006	U	0.006	U
Tert-Butylbenzene	0.0061	U	0.0063	U	0.006	U	0.006	U
Tetrachloroethene	0.0061	U	0.0063	U	0.006	U	0.006	U
Toluene	0.0061	U	0.0063	U	0.006	U	0.006	U
Toxaphene	1	U	1	UJ	0.19	U	0.19	U
Trichloroethene	0.0061	U	0.0063	U	0.006		0.009	
Trichlorofluoromethane	0.0061	U	0.0063	U	0.006	U	0.006	U
Vinyl chloride	0.012	U	0.013	U	0.012	U	0.011	U
Xylene (total)	0.01		0.009		0.006	U	0.006	U

APPENDIX C COST COMPARISON

Final costs for the remedial activities at PRSs 0-030(d) and C-0-043 are not yet available.

THIS PAGE LEFT INTENTIONALLY BLANK

APPENDIX D CERTIFICATE OF COMPLETION

THIS PAGE LEFT INTENTIONALLY BLANK

CERTIFICATION OF COMPLETION

I certify that all the work pertaining to the Voluntary Corrective Action Report has been completed in accordance with the Department of Energy approved VCA plan entitled VCA Plan for Potential Release Site 0-030(d), sanitary septic system. Based on my personal involvement or inquiry of the person or persons who managed this cleanup, a review of all data gathered and a visit to the site, to the best of my knowledge and belief, all criteria of the plan have been met or exceeded. I believe that the completion of this VCA is both protective to human health and the environment. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

SR Allen

Field Unit 1 Field Project Leader
Environmental Restoration Project
Los Alamos National Laboratory

22 Aug 97

Date Signed

CERTIFICATION OF COMPLETION

I certify that all the work pertaining to the Voluntary Corrective Action Report has been completed in accordance with the Department of Energy approved VCA plan entitled VCA Plan for Potential Release Site C-0-043, an abandoned manhole. Based on my personal involvement or inquiry of the person or persons who managed this cleanup, a review of all data gathered and a visit to the site, to the best of my knowledge and belief, all criteria of the plan have been met or exceeded. I believe that the completion of this VCA is both protective to human health and the environment. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

SR Allen

Field Unit 1 Field Project Leader
Environmental Restoration Project
Los Alamos National Laboratory

22 Aug 97
Date Signed

APPENDIX E RISK ASSESSMENT INFORMATION AND RATIONALE FOR SELECTION OF SALs

Section 1.0 of this appendix presents information supporting the risk discussions in this report. Section 2.0 presents the SAL calculations and the rationale for the surrogate screening action levels (SALs) used in the human health screening assessments included in this report.

1.0 RISK ASSESSMENT INFORMATION

To support the risk assessments included in this report, the following tables are included:

- Table E-1 presents a ratio of the maximum sample concentration of each polycyclic aromatic hydrocarbon (PAH) detected at PRS 0-030(d) to its screening action level (SAL), yielding a normalized value for each PAH. These ratios are summed, yielding a normalized sum. The normalized sum for carcinogens is multiplied by one in one million and the result is compared to the Environmental Protection Agency (EPA) acceptable risk range of one in one million to one in ten thousand. The normalized sum for noncarcinogens is directly compared to one.

- Table E-2 presents the arithmetic mean of 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT for samples collected at PRS 0—030(d).

- Table E-3 presents the ratio of the maximum detected sample concentrations for 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT at PRS 0-030(d) to the SAL, yielding the normalized value for each. These ratios are summed, yielding a normalized sum. The normalized sum is multiplied by one in one million and the result is compared to the EPA acceptable risk range of one in one million to one in ten thousand.

- Table E-4 presents the ratio of the arithmetic means of the sample concentrations for 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT at PRS 0-030(d) to the SAL, yielding the normalized value for each. These ratios are then summed, yielding a normalized sum. The normalized sum is multiplied by one in one million and the result is compared to the EPA acceptable risk range of one in one million to one in ten thousand.

TABLE E-1

HEALTH RISK CALCULATIONS FOR PAHs AT PRS 0-030(d)

PAHS	SAMPLE ID	SAMPLE VALUE (mg/kg)	SAL (mg/kg)	NORMALIZED VALUE
CARCINOGENS				
Benzo(a)anthracene	0100-96-1459	2.7	0.61	4.43
Benzo(b)fluoranthene	0100-96-1459	3.1	0.61	5.08
Benzo(a)pyrene	0100-96-1459	2.7	0.061	44.26
Benzo(k)fluoranthene	0100-96-1459	1.2	6.1	0.2
Dibenzo(a,h)anthracene	0100-96-1459	0.31	0.061	5.08
Indeno(1,2,3,cd-)pyrene	0100-96-1459	1.2	0.61	2
Normalized Sum				59.0
NONCARCINOGENS				
Acenaphthene	0100-96-1459	0.085	2 200	3.86×10^{-05}
Acenaphthylene	0100-96-1461	0.2	2 200 [a]	9.09×10^{-05}
Anthracene	0100-96-1459	0.88	18 000	4.89×10^{-05}
Benzo(g,h,i)	0100-96-1459	1.1	1 900 [b]	0.00058
Chrysene	0100-96-1459	2.6	61	0.043
Fluoranthene	0100-96-1459	5.6	2 600	0.0022
Fluorene	0100-96-1459	0.17	2 300	7.4×10^{-05}
Phenanthrene	0100-96-1459	2.8	18 000 [c]	0.00016
Pyrene	0100-96-1459	4.6	1 900	0.0024
Normalized Sum				0.05

[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.

TABLE E-2

CALCULATED ARITHMETIC MEAN FOR 4,4'-DDE, 4,4'-DDD, AND 4,4'-DDT AT PRS 0-030(d)

LOCATION	DEPTH (ft)	SAMPLE ID	4,4'-DDE	4,4'-DDT	4,4'-DDD
Directly below the mouth of the steel outfall pipe	0–0.42	0100-96-1451	0.048	0.095	0.004U
20 ft down drainage from the mouth of the steel outfall pipe	0–0.42	0100-96-1452	0.038	0.078	0.005
Beneath the connection between the VCP and steel pipe	2–2.5	0100-96-1453	4.6	13	0.56
Inside the septic tank between the north wall and baffle	4–4.5	0100-96-1454	0.003	0.003	0.001U
Inside the septic tank between the north wall and baffle	7.5–8	0100-96-1455	0.008	0.013	0.016
Inside the septic tank at the northeast corner	4–4.5	0100-96-1456	0.012	0.008	0.001U
Inside the septic tank at the northeast corner	6.5–7	0100-96-1457	0.095	0.048	0.089
Inside the southern portion of the septic tank next to the baffle at the east end of the tank	2.5–3	0100-96-1458	0.066	0.116	0.104
Inside the southern portion of the septic tank next to the baffle at the east end of the tank	7–7.8	0100-96-1459	0.745	0.044	0.115
Inside the approximate middle of the southern portion of the tank	3–3.5	0100-96-1460	0.001	0.001U [a]	0.001U
Inside the approximate middle of the southern portion of the tank	7–7.6	0100-96-1461	0.827	0.092	1.63
Sum			6.4	13.5	2.5
Arithmetic Mean			0.59	1.2	0.23

[a] The undetected values were used, assuming that this chemical is present at levels just less than the detection limit.

TABLE E-3

RISK ASSESSMENT RISK RATIOS USING THE MAXIMUM SAMPLE VALUE FOR 4,4'-DDE, 4,4'-DDD, AND 4,4'-DDT AT PRS 0-030(d)

CHEMICAL	SAMPLE ID	MAXIMUM SAMPLE VALUE (mg/kg)	SAL (mg/kg)	NORMALIZED VALUE
p,p-DDE	0100-96-1453	4.6	1.3	3.5
p,p-DDT	0100-96-1453	13	1.3	10
p,p-DDD	0100-96-1461	1.63	1.9	0.86
Normalized Sum				14.4

TABLE E-4

RISK ASSESSMENT RISK RATIOS USING THE ARITHMETIC MEAN FOR 4,4'-DDE, 4,4'-DDD, AND 4,4'-DDT AT PRS 0-030(d)

CHEMICAL	ARITHMETIC MEAN (mg/kg)	SAL (mg/kg)	NORMALIZED VALUE
p,p-DDE	0.59	1.3	0.45
p,p-DDT	1.3	1.3	1
p,p-DDD	0.23	1.9	0.1
Normalized Sum			1.6

2.0 SCREENING ACTION LEVEL SURROGATES AND CALCULATIONS

The following discussions describe the rationale for selecting the surrogate SALs for endosulfan sulfate, endrin ketone, and 2-hexanone used in the screening assessments in this report. 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 endosulfan sulfate, endrin ketone, or 2-hexanone.

Endosulfan sulfate. No data were found in HEAST for endosulfan sulfate. Therefore, the ATSDR toxicological profile for endosulfan was used as the basis for this review.

No information is available on the metabolism of endosulfan in humans, but endosulfan is converted to endosulfan sulfate and endosulfan diol in laboratory animals. Endosulfan and the primary metabolite, endosulfan sulfate, exhibit similar toxicities and are believed to be responsible for the toxicity observed in animals. Endosulfan sulfate has also been detected in autopsy samples following acute ingestion, but specific levels that elicited toxicity have not been determined. Other literature sources were consulted, specifically the Merck Index and the Registry of Toxic Effects of Chemical Substances (RTECS). The lethal dose of 50% of the experimental animal population (known as the LD_{50}) for endosulfan is listed in the Merck Index as 43 mg/kg for male rats and 18 mg/kg for female rats; endosulfan sulfate was not listed. The RTECS lists only one citation for endosulfan sulfate, which is titled Analytical Reference Standards and Supplemental Data: The Pesticides and Industrial Chemicals Repository (Life

Systems, Inc. 1984, 05-0251). This source listed the LD_{50} value of endosulfan sulfate as 18 mg/kg for rats. While there were no specifics given on the gender of the rats, this LD_{50} supports the statement that endosulfan sulfate is toxicologically similar to endosulfan (Clement Associates, Inc. 1990, 05-0249). Given the scarcity of toxicity data for endosulfan sulfate, and the fact that endosulfan sulfate is a primary metabolite of endosulfan, the SAL for endosulfan (390 mg/kg) was used for endosulfan sulfate in the screening assessment.

Endrin ketone. No data were found in 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.

2-Hexanone. The only information regarding 2-hexanone in HEAST was a statement that the available data are inadequate for quantitative risk assessment. Therefore, the ATSDR toxicological profile for 2-hexanone was used as the basis for this review (Clement Associates, Inc. 1991, 05-0248).

The ATSDR toxicological profile included summaries of several acute and subchronic animal studies conducted via the inhalation, oral, and dermal routes of exposure. Based on these studies, the most important and sensitive health effect associated with exposure to 2-hexanone is neurological dysfunction. Although the available studies do not appear adequate to develop a toxicity criterion (e.g., insufficient number of animals, dose levels, and/or duration), several animal and human studies have concluded that 2-hexanone's neurological effects are primarily associated with one of its metabolites, 2,5-hexanedione. This chemical is also the metabolite responsible for causing neurological dysfunction following exposure to hexane, a chemical for which a toxicity criterion and SAL have already been developed. Therefore, given the lack of available toxicity information for 2-hexanone and the fact that the primary metabolites and modes of action of 2-hexanone and hexane appear to be identical, the SAL for hexane, 120 mg/kg, was used as a surrogate for 2-hexanone in the screening assessment.

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)**

Clement Associates, Inc., October 1990. "Toxicological Profile for Endosulfan," 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, 05-0249)**

Clement Associates, Inc., February 15, 1991. "Toxicological Profile for 2-Hexanone, Draft for Public Comment" 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. 1991, 05-0248)**

EPA (US Environmental Protection Agency), March 8, 1990. "National Oil and Hazardous Substances Pollution Contingency Plan," Final Rule, 40 CFR Part 300, Federal Register, Vol. 55, No. 46, p. 8666. **(EPA 1990, 0559)**

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)**

Life Systems, Inc., October 1984. "Analytical Reference Standards and Supplemental Data: The Pesticides and Industrial Chemicals Repository," prepared under Contract No. 68-03-3136 for Environmental Monitoring Systems Laboratory, Office of Research and Development, US Environmental Protection Agency, Las Vegas, Nevada. **(Life Systems, Inc. 1984, 05-0251)**

VOLUNTARY CORRECTIVE ACTION (VCA) COMPLETION REPORT APPROVAL/DISAPPROVAL FORM

PRS(s) 0-030(d,k) and C-0-043.

The undersigned have reviewed the VCA Completion Report and believe that the intent and goals of the VCA plan have been met.

FPL JR Allen Date 9 Sept 97

FPC a. Koch Date Sept. 9, 1997

.....

I, Theodore J. Taylor, DOE-LAAO, **APPROVE** _____, **DISAPPROVE** _____ the accompanying Voluntary Correction Action Report for PRS(s) 0-030(d,k) and C-0-043, TA-0.

The following reasons reflect the decision for disapproval:

_____

_____

_____

_____

_____

_____

_____

Signed:_____ Date:_____