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Region 6
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Date: July 14, 1995
Refer to: EM/ER:95-329

SUBJECT: SUBMITTAL OF THE RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION (RFI) REPORT FOR POTENTIAL RELEASE SITE (PRS) AT TECHNICAL AREA (TA) 36

Dear Mr. Honker:

Enclosed is the Los Alamos National Laboratory's RFI Report concerning PRS 36-002. This RFI Report is due to your office by July 16, 1995. This RFI Report documents field work performed at TA-36 detailed in the approved RFI Work Plan for Operable Unit 1130.

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

Sincerely,

Jorg Jansen, Project Manager
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Sincerely,

Theodore J. Taylor, Program Manager
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2314

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Enclosure: RFI Report for PRS 36-002 (2 copies)

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CERTIFICATION

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

Document Title:

Submittal Of The Resource Conservation And Recovery Act Facility Investigation (RFI) Report For Potential Release Site (PRS) At Technical Area (TA) 36

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RFI Report for Potential Release Sites

36-002

(located in former Operable Unit 1130)

Field Unit 2

Environmental Restoration Project

July 1995

A Department of Energy Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-95-2390

95-329

RFI REPORT

FOR

FIELD UNIT 2

TECHNICAL AREA 36

POTENTIAL RELEASE SITE

36-002

Prepared for Los Alamos National Laboratory
by
ICF Kaiser Engineers, Inc.
Los Alamos, NM

July 14, 1995

EXECUTIVE SUMMARY

This Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) report addresses the field investigations, results of data analyses, and final disposition of Potential Release Site (PRS) 36-002, a sump at Field Unit 2, Technical Area (TA) -36, formerly designated as part of Operable Unit (OU) 1130, at Los Alamos National Laboratory (Laboratory). TA-36 is an explosives-testing area consisting of five firing sites that are used to conduct a total of approximately 1,500 explosives tests annually. TA-36 is bounded by TA-15 on the west; State Road 4 on the east; Pajarito Canyon to the north; and Fence Canyon to the south.

PRS 36-002 consisted of a sump located south of Potrillo Drive approximately 655 ft west of the security checkpoint at the entrance to TA-36. The sump had been constructed by excavating a pit 4 ft in diameter by 8 ft deep within the native soil and tuff. After excavation a corrugated metal culvert had been placed vertically in the excavation, and the entire excavation had been filled to a depth of 8 ft with pieces of 3-in.-diameter coarse rock and covered by a 5-foot-diameter metal cover. The sump served sinks in the Controlled Environment Building, TA-36-48, which was used for shot assembly and temperature-controlled experiments. Depleted uranium was cut, lapped, and polished in the building, and the chemical-resistant sink in the building was possibly used to discard acetone, alcohol, HMX (explosive powder), and nitromethane.

PRS 36-002 is a solid waste management unit listed in Table A of the Hazardous and Solid Waste Amendments Module of the RCRA Permit, requiring prompt investigation. The objective of the Phase I investigation of PRS 36-002 was to determine the presence, concentration, and migration of contaminants at the site. If contaminants were not present, the area would be backfilled with the excavated material and closed. If contaminants were present, a baseline risk assessment would have been prepared indicating what further corrective action would have been required. Selection of appropriate remediation methods would have been made based on the types of waste generated and appropriate treatment or disposal technologies for these wastes.

Field investigations were begun in September 1994, following the completion of the RFI Work Plan for Operable Unit 1130. The entire sump was excavated to ensure adequate characterization of the tuff below and surrounding the sump. The fill material, the 3-in. cobbles, the corrugated metal culvert, and the broken portion of the inlet pipe were temporarily stored on-site in a bermed area. This action was to allow the material to be reused as fill if the analyses indicated that no contaminants were present.

Soil samples were taken from below the sump starting at 5.5 ft below ground surface, going down to 9.5 ft. The samples were analyzed for chemicals of potential concern of the site listed in the RFI Work Plan. Results were compared with health-based screening action levels (SAL) and known background levels of contaminants. The SALs, including those for total uranium, were calculated using methodologies similar to that in the proposed rule for Subpart S of 40 CFR 264.

Sampling and quality assurance results were assessed. Trace amounts of mercury and 2,4,6-trinitrotoluene were found to be present, but comparison of these amounts with backgrounds and / or SALs indicated that the contaminants were no threat to humans or the environment. Therefore, field activities resumed on June 2, 1995, and the sump was backfilled with the excavated material. The corrugated metal culvert and broken inlet port were disposed at a permitted landfill.

The Laboratory will propose no further action for the sump, PRS 36-002.

TABLE OF CONTENTS

EXECUTIVE SUMMARY

1.0 INTRODUCTION 1-1
1.1 General Site History 1-1
1.2 RFI Overview 1-1
1.3 Field Activities 1-6

2.0 ENVIRONMENTAL SETTING 2-1
2.1 Climate 2-1
2.2 Geology 2-1
2.2.1 General Geology 2-1
2.2.2 Soils 2-4
2.2.3 Sedimentation and Erosion 2-4
2.3 Hydrology 2-4
2.3.1 Surface Water 2-4
2.3.2 Groundwater 2-4
2.4 Biology and Cultural Surveys 2-6

3.0 APPROACH TO DATA ASSESSMENT AND ANALYSIS 3-1
3.1 Summary of Quality Assurance/Quality Control Activities 3-1
3.1.1 Inorganic Analyses 3-1
3.1.2 Organic Analyses 3-2
3.1.3 Radiochemistry Analyses 3-2
3.1.4 High Explosives Analyses 3-3
3.2 Assessment Methodology 3-3
3.2.1 Background Comparison 3-3
3.2.1.1 Inorganics 3-3
3.2.1.2 Radionuclides 3-3
3.2.1.3 Organics 3-3
3.2.2 Screening Action Levels Comparison/Other Standards 3-3
3.2.2.1 Summary of Risk Screen Methodology 3-4
3.3 Risk Assessment Methodology 3-5
3.4 Development of Conclusions and Recommendations 3-5

4.0 SITE-SPECIFIC RESULTS, CONCLUSIONS, AND RECOMMENDATIONS 4-1
4.1 PRS 36-002 4-1
4.1.1 Previous Investigations 4-1
4.1.2 Field Investigation 4-1
4.1.2.1 Results of Field Surveys 4-1
4.1.2.2 Results of Field Screening 4-1
4.1.2.3 Results of Sample Analysis 4-1
4.1.3 Assessment of Sample Results 4-1
4.1.3.1 Comparison to Background/SALs 4-1
4.1.3.2 Data Interpretation 4-2
4.1.3.3 Risk Assessment 4-2
4.1.3.4 Ecotoxicological Screening Assessment 4-2
4.1.4 Conclusions and Recommendations 4-3

5.0 REFERENCES 5-1

List of Figures

Figure 1-1 Location map of formerly designated OU 1130 within Los Alamos National Laboratory, Los Alamos County, New Mexico 1-2
Figure 1-2 Location of formerly designated OU 1130 with respect to Laboratory TAs and surrounding landholdings 1-3
Figure 1-3 Location of TA-36-48 and sump....1-4
Figure 1-4 Sump with sample location and identifiers....1-5
Figure 2-1 Map showing locations of wells PM-2, PM-4, and DT-10....2-2
Figure 2-2 Generalized stratigraphy of formerly designated OU 1130 2-3
Figure 2-3 Topography of formerly designated OU 1130 2-5

List of Tables

Table 3-1 Summary of quality control issues for PRS 36-002 3-2
Table 4-1 Multiple constituent evaluation for concarcinogenic effects 4-2

Appendixes

Appendix A: Analytical Results
Appendix B: Sampling and Analysis Plan for PRS 36-002

Attachment A
Attachment B

1.0 INTRODUCTION

1.1 General Site History

Technical Area (TA) -36 is part of Field Unit 2 and was included in the formerly designated Operable Unit (OU) 1130. OU 1130 consisted of TAs -36, -68, and -71 at Los Alamos National Laboratory (Laboratory) in Los Alamos, New Mexico (NM) (Figures 1-1, and 1-2). These TAs are contiguous and cover a total of about 7 mi^2. TAs -68 and -71 are buffer areas, and no Laboratory activities were conducted in these TAs.

TA-36 in Field Unit 2, is an explosives-testing area consisting of five firing sites that are used to conduct a total of approximately 1,500 explosives tests annually. Other activities include the storage and assembly of prefabricated metal and explosives components, detonators, cables, and instrumentation for the shots.

Potential Release Site (PRS) 36-002, a sump (TA-36-49), is located on a mesa south of Potrillo Drive approximately 655 ft west of the security checkpoint at the entrance to TA-36 and approximately 40 ft northwest of building TA-36-48 (Figure 1-3), the Controlled Environment Building. The sump was constructed in 1965 to receive the drainage from the TA-36-48's (LASL 1965, 13-0069). A 4-in. vitrified clay pipe connected the sink drains to the sump (LANL 1993, 1083).

The sump was a pit that had been constructed by excavating 4 ft in diameter by 8 ft deep from native soil and tuff, and a corrugated metal culvert had been set vertically in the excavated area. The excavation had been then filled to a depth of 6 ft with pieces of 3-in.-diameter coarse rock and covered by a 5-ft-diameter metal cover. The adjoining building was used for shot assembly and temperature-controlled experiments. Depleted uranium was cut, lapped, and polished in the building, and it is possible that the chemical-resistant sink in the building was used to discard the depleted uranium (Stauffer 1992, 13-0078) acetone, alcohol, HMX (explosive powder), nitromethane (LANL 1993, 1083), zinc chloride, glues, and acids (LANL 1990, 0145).

Currently, the room containing the sinks that drained to the PRS is not being used for technical activities, and the sinks have been removed. Discharge of hazardous or radioactive materials to the sump is prohibited by Laboratory policy and controlled by Laboratory administrative procedures.

1.2 RFI Overview

PRS 36-002 is listed in Table A of the Hazardous and Solid Waste Amendments (HSWA) Module of the Laboratory's RCRA permit, which requires prompt investigation.

The conceptual model developed in the RFI Work Plan projected that liquids discharging from the sump bottom and sides could potentially involve the release of chemicals into the subsurface soils (LANL 1993, 1083). Discharges to the surrounding soils were expected to be small, if any, because the building was used infrequently, no more than 10 times per year, until recently (Henke and Van Marter 1993, 13-0093). Evaluation of possible pathways of migration of contamination helped identify locations, numbers, and types of samples required for adequate characterization.

For the Phase I work, the RFI Work Plan required excavation of the entire sump because the sump (filled with the 3-in. cobbles) could not be sampled by drilling. Three subsurface soil samples and one subsurface field duplicate sample were taken. See Appendix A for a listing of the sample results. Figure 1-4 shows a map of the PRS with the sample locations, depths, and numbers.

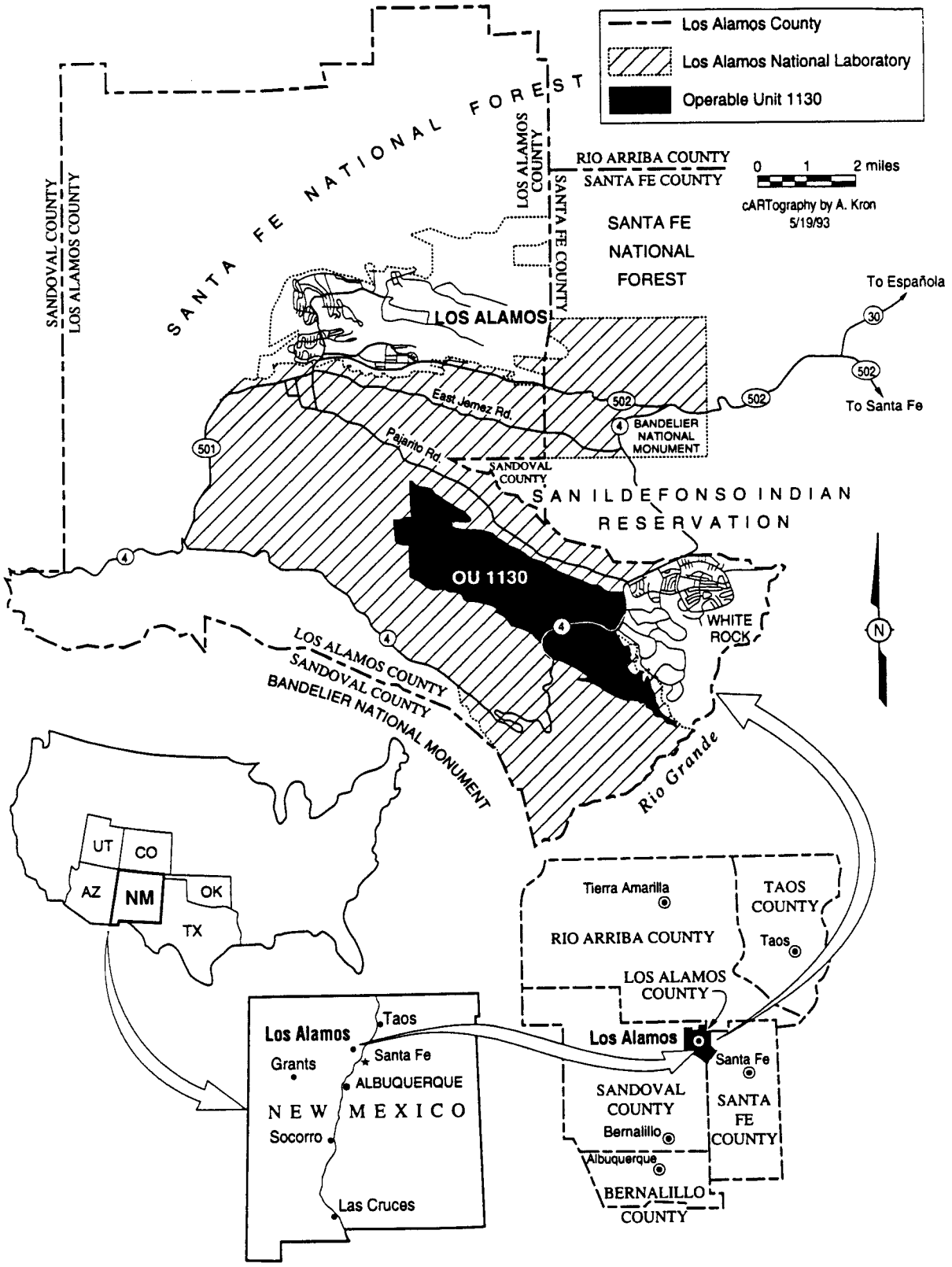

Figure 1-1. Location map of formerly designated OU 1130 within Los Alamos National Laboratory, Los Alamos County, New Mexico

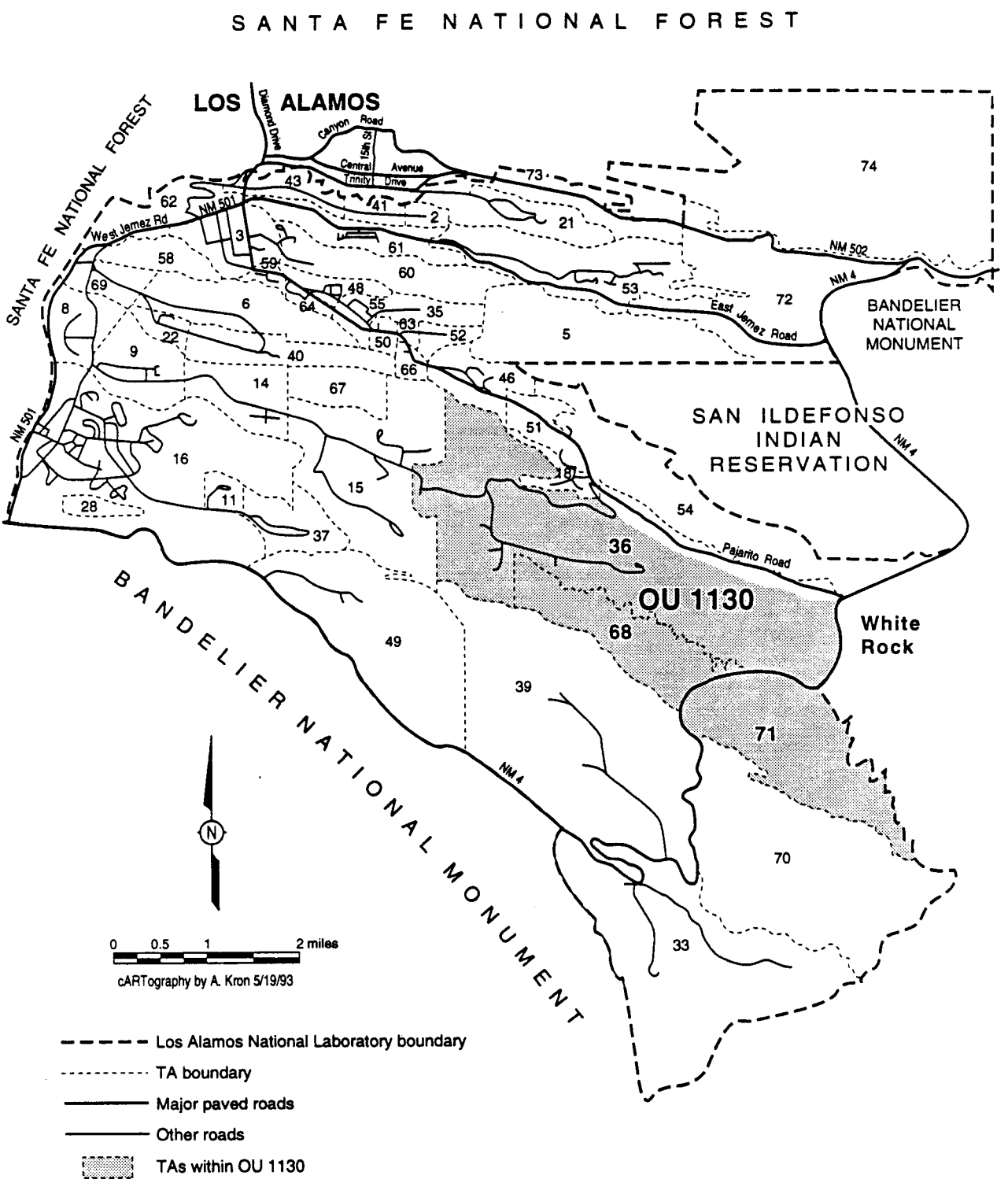

Figure 1-2. Location of formerly designated OU 1130 with respect to Laboratory TAs and surrounding landholdings

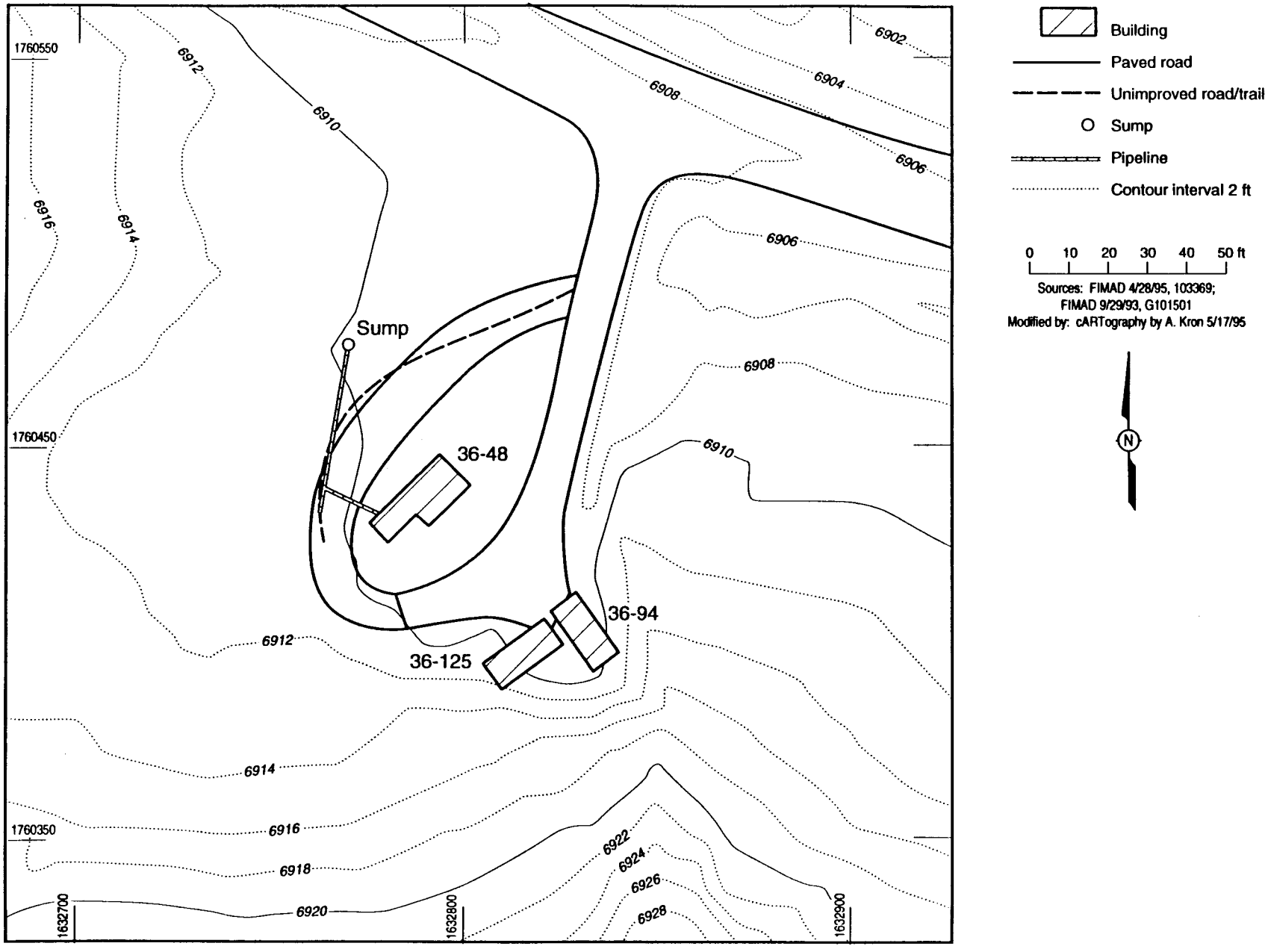

Figure 1-3. Location of TA-36-48 and sump

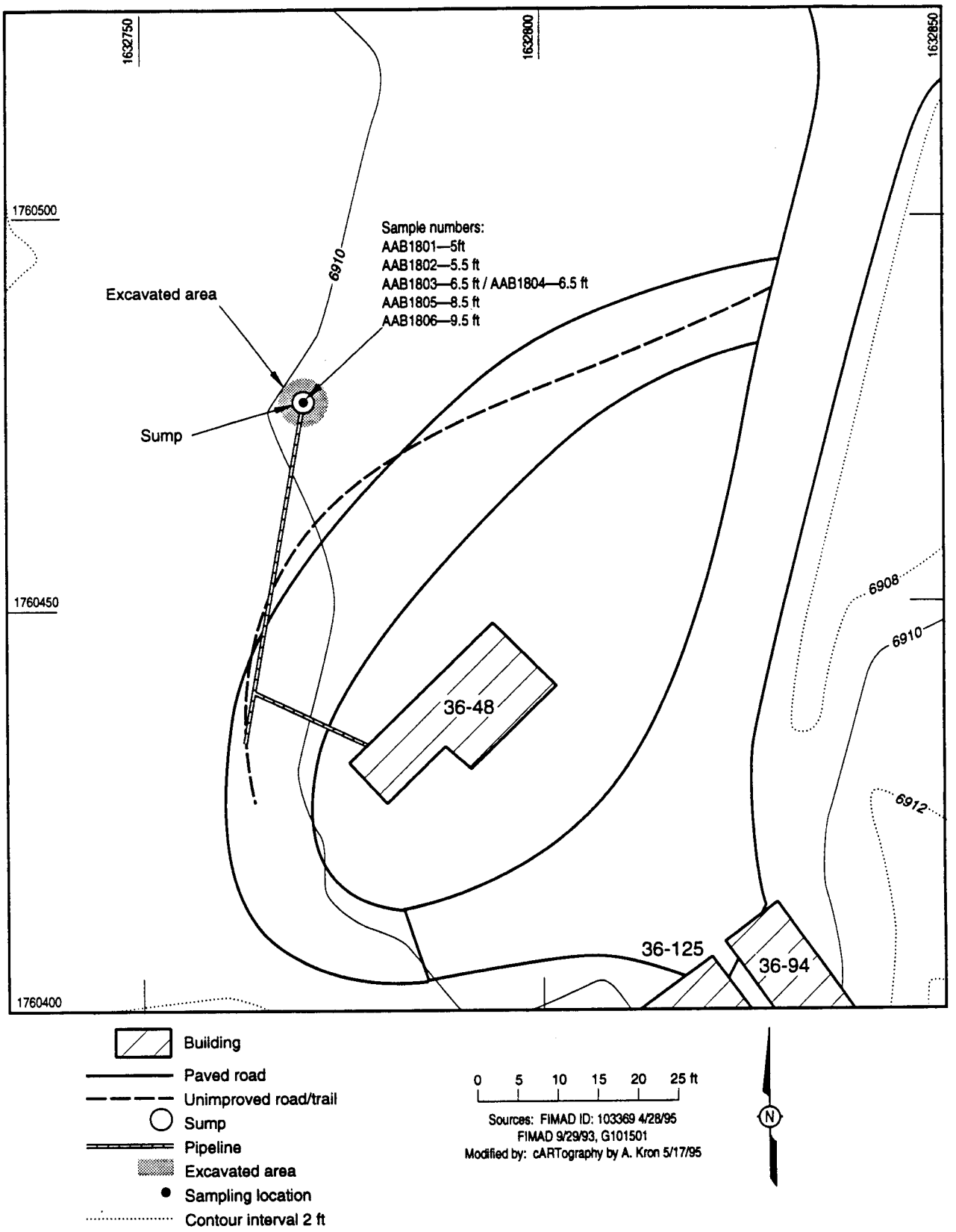

Figure 1-4. Sump with sample location and identifiers

1.3 Field Activities

The objective of the Phase I investigation of PRS 36-002 was to determine the presence, concentration, and migration of the contaminants of potential concern (COPC) at the site. The entire sump, including the corrugated metal culvert and 3 in. cobbles had to be excavated to enable adequate characterization of the surrounding soils. The excavated materials were temporarily stockpiled pending the sampling results. This stockpiling allowed the material to be reused as fill if the analyses indicated that no contaminants were present (LANL 1993, 1083).

Initial RFI field activities were conducted on September 14 and 15, 1994. Work performed during this period included the excavation, removal, stockpiling, and sampling of the PRS 36-002 sump material. The overburden and gravel fill was removed exposing the vertical corrugated metal culvert and an inlet port, a vitrified clay pipe approximately 4 ft below ground surface. The corrugated metal culvert and inlet port were removed, and a soil sample was taken at a depth of approximately 5 ft below ground level. The soil below the sump was mixed, fines to coarse sands with some silts and clays. Visible staining was not noted, and field screening was conducted for volatile organic compounds (VOC) and high explosives (HE), which produced negative results.

Excavation proceeded, and all excavated material was placed on a lined, bermed pad adjacent to the sump excavation, covered, and secured. The corrugated metal culvert and broken segment of the clay inlet port were decontaminated and placed in the bermed pad. During the excavation, samples were collected at depths of 5.5, 6.5, 8.5, and 9.5 ft. The sample was taken directly from the backhoe bucket and placed in dedicated stainless steel bowl. Samples were obtained in accordance with LANL-ER-SOP-06.09, Spade and Scoop Method (LANL 1993a, 0875). Samples were labeled and packaged according to standard ER practices and procedures and submitted for analyses under chain-of-custody procedures.

Sample aliquots for VOCs and semi-volatile organic compounds (SVOC) were placed directly into the appropriate laboratory supplied jars. The samples for VOCs were collected and analyzed according to the EPA SW-846 Method 8260, and the samples for SVOCs were collected and analyzed according to EPA SW-846, Method 8270 (EPA 1992, 1207).

The remaining material was homogenized in the bowl using a stainless steel spoon. Sample aliquots were then placed in sample containers for laboratory analyses for HE, radionuclides, and metals. Samples for HE were collected and analyzed according to USTHAMA LW12, a method similar to EPA SW-846 Method 8330, and radionuclides were collected and analyzed for total uranium, and metals were collected and analyzed according to EPA SW-846 Method 6010.

After sampling results were received, which indicated that the fill material and surrounding soils did not contain constituents that could pose any threat to human health or environment, the fill material was returned to the excavation. The corrugated metal culvert and segment of the inlet port were disposed as construction rubble in an appropriate landfill. Best effort was made to restore the area to its original condition. Field work was completed June 2, 1995.

2.0 ENVIRONMENTAL SETTING

The environmental setting of the Laboratory is described in Section 2.4 of the Installation Work Plan for Environmental Restoration (IWP) (LANL 1995, 1164). A discussion of the environmental setting, including climate, geology, hydrology, and a conceptual hydrogeologic model of OU 1130 and the surrounding area, is presented in the RFI Work, Plan, and a summary is presented in the following sections. This provides the information required to evaluate potential contaminant transport pathways and conceptual exposure models at OU 1130.

2.1 Climate

Los Alamos County has a semiarid, temperate, mountain climate. Summers are generally sunny with moderate, warm days and cool nights. High altitude, light winds, clear skies, and dry atmosphere allow summer temperatures to range from 45° F to 95° F. During the winter, temperature typically ranges from 15° F to 50° F. The average annual rainfall at OU 1130 is estimated to range from 14 to 16 in. Of this total, 40% occurs as brief intense thunderstorms during July and August. Stream flow in canyons can occur as a result of these storms. Spring snowmelt runoff may also induce streamflow in the area canyons.

2.2 Geology

2.2.1 General Geology

A detailed discussion of the geology of the entire Los Alamos area can be found in Section 2.5.1 of the IWP (LANL 1995, 1164). A summary of that material, emphasizing conditions expected at OU 1130, is presented below. The generalized stratigraphy of OU 1130 has been inferred from three wells drilled in the immediate vicinity (Figure 2-1).

The mesas on the Pajarito Plateau are immediately underlain by the Bandelier Tuff, which outcrops occasionally on mesa tops and is exposed along canyon walls. The major rock groups in the Bandelier Tuff that are likely to underlie OU 1130 are shown in Figure 2-2. Information from the wells was used to construct the stratigraphic columns and a schematic representation of the OU surface topography. The stratigraphic units that are important to OU 1130 are discussed briefly, beginning with the units highest in the column (i.e., the youngest) and progressing downward.

The top portion of Bandelier Tuff is the Tshirege Member, which underlies the mesa tops over most of OU 1130. Tshirege Member is ash-flow and airfall sequence from an explosive geologic event dated at 1.1 million years ago. The member is divided into several sub-units that can be correlated across the entire outcrop area of Bandelier Tuff (Crowe et al. 1978, 0041). The Tshirege Member sub-units are expected to be present at OU 1130 (Weir and Purtymun 1962, 0228).

Other formations and members underlie the Tshirege Member. The Otowi Member underlies the Tshirege Member, unconformably, and Guaje Pumice Bed forms the base of Otowi Member. Cerro Toledo Rhyolite occurs between the Otowi and Tshirege Members in some locations in Los Alamos County, but it is not distinguished in PM-4 (Purtymun et al. 1983, 0712), DT-10, nor PM-2 (Cooper et al. 1965, 0495). The Tschicoma Formation, the Puye Formation, and the Chino Mesa basalts underlie the Bandelier Tuff at depths to about 1000 ft below ground surface. The top of the main aquifer is located in the Chino Mesa basalts at approximately 1000 ft. Test boreholes have not penetrated these units.

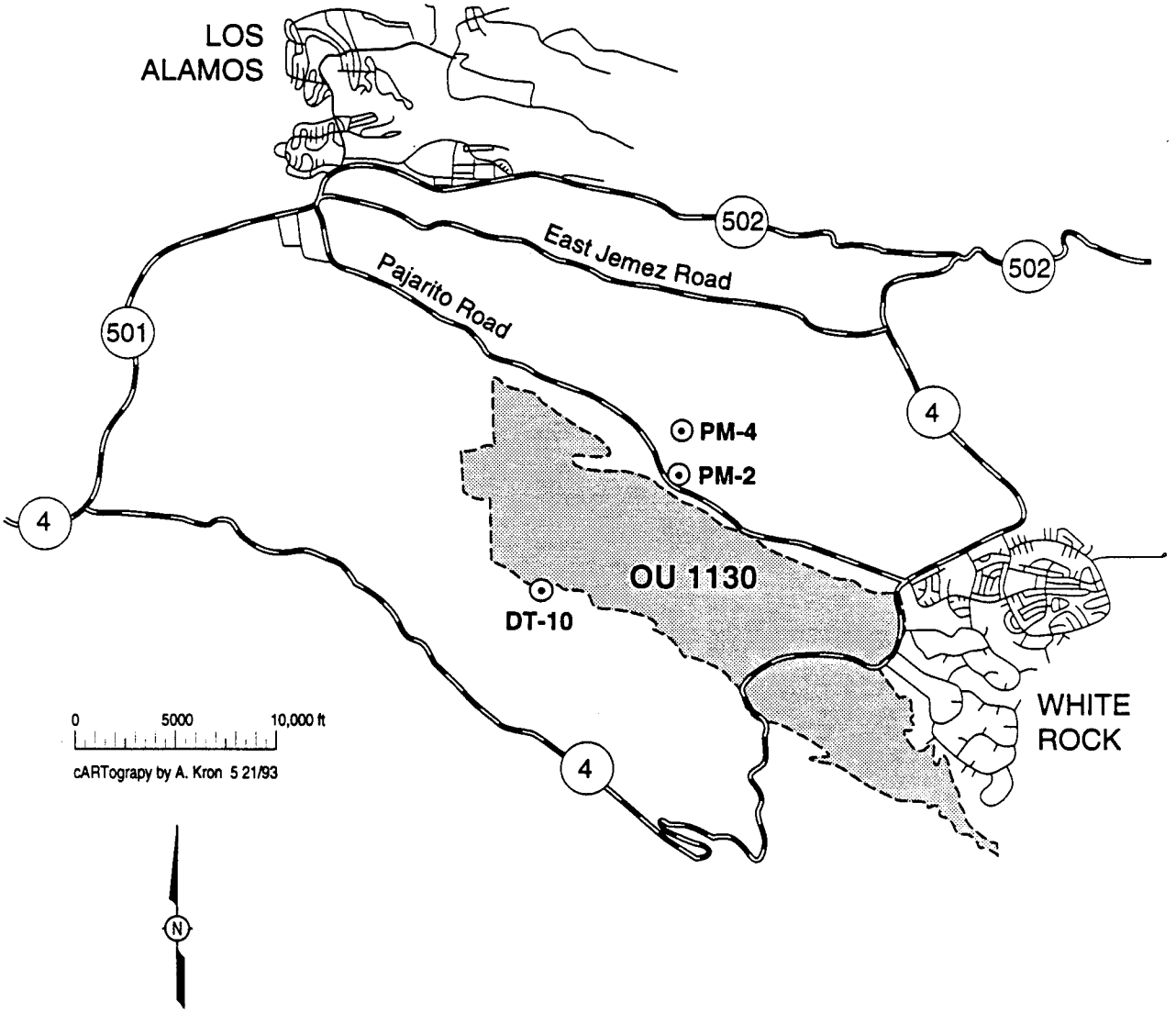

Figure 2-1. Map showing the locations of wells PM-2, PM-4, and DT-10

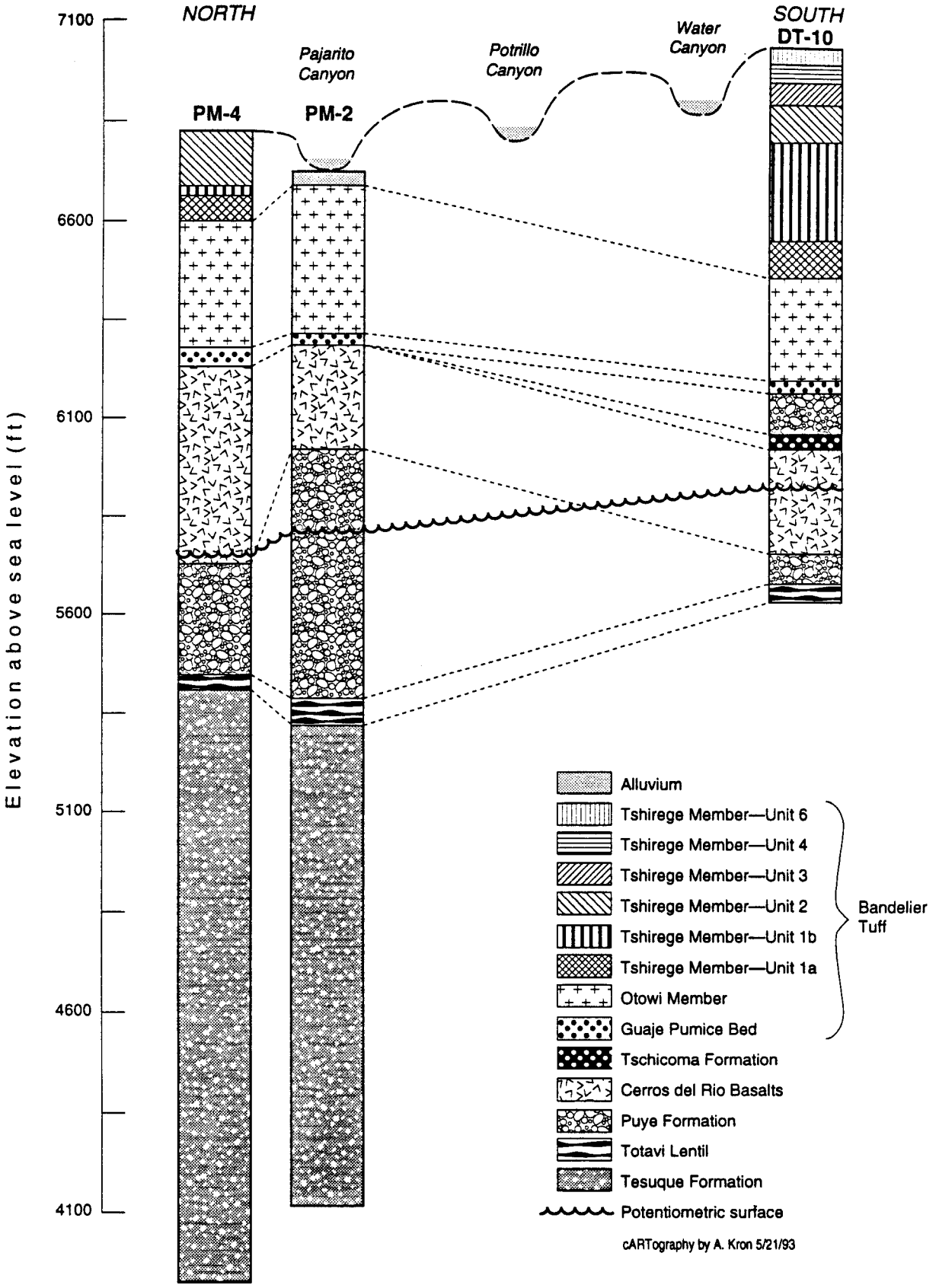

Figure 2-2. Generalized stratigraphy of formerly designated OU 1130

2.2.2 Soils

A discussion of the soils in the Los Alamos area can be found in Section 2.5.1.3 of the IWP (LANL 1995, 1164).

OU 1130 contains at least 18 different kinds of soils; and each is described and mapped by Nyhan et al. (1978, 0161). The Nyjack loam in the area of PRS 36-002 is moderately deep (20 to 40 in.) and well drained. The surface layer of the Nyjack loam consists of approximately 2 in. of either a loam, a very fine sandy loam, or a sandy loam. The subsoil is comprised of approximately 20 in. of clay loam, and the substratum is comprised of approximately 16 in. of gravely sandy loam that may contain up to 30% pumice. Permeability of this soil is moderate, with the surface slope generally ranging from 1 to 5%; therefore, surface runoff is slow (Nyhan et al. 1978, 0161).

2.2.3 Sedimentation and Erosion

Active erosional processes on the Pajarito Plateau are addressed in Section 2.5.1.6 of the IWP (LANL 1995, 1164). At OU 1130, sediment deposition and erosion by surface water occurs in response to snow melt and storm-water runoff events. Periods of runoff can produce erosion, sediment transport, and deposition. Sedimentation and erosion are not likely to have transported the contaminants from PRS 36-002, which was an underground sump.

2.3 Hydrology

The hydrology of the Pajarito Plateau is summarized in Section 2.5.2 of the IWP (LANL 1995, 1164).

2.3.1 Surface Water

Fence Canyon, Potrillo Canyon, and Water Canyon watersheds, each with an established stream channel drainage network, exist within OU 1130. Additionally, part of Pajarito Canyon watershed lies within the OU. Watershed locations are shown in Figure 2-3. Water and Pajarito Canyons receive flow from springs and flow directly into the Rio Grande. Other canyons that feed the major canyons flow ephemerally in response to rainfall and snow melt.

PRS 36-002 is not affected by surface water and has not contributed to surface contamination because it was an underground, contained sump.

2.3.2 Groundwater

Saturated groundwater occurs in three modes on the Pajarito Plateau: shallow, alluvial groundwater bodies in canyon bottoms; isolated perched horizons in conglomerates and basalts at depths between 120 and 200 ft; and the main aquifer underlying the entire plateau. A discussion of groundwater on the Pajarito Plateau is presented in Section 2.5.2.2 of the IWP (LANL 1995, 1164).

The only aquifer in Los Alamos capable of providing a municipal and industrial water supply is the main aquifer. The water in the main aquifer generally moves eastward across the plateau toward the Rio Grande with some discharge into the Rio Grande through seeps and springs (Purtymun 1984, 0196). The depth to the main aquifer varies from about 875 to over 1000 ft below ground surface in the area of PRS 36-002 (LANL 1973, 1088).

No wells reach into the main aquifer beneath OU 1130. Inferences regarding the portion of the main aquifer beneath the OU are derived from information on supply wells PM-2 and PM-4, and test well DT-10. The main aquifer beneath OU 1130 is stratigraphically within the basaltic rocks of Chino Mesa.

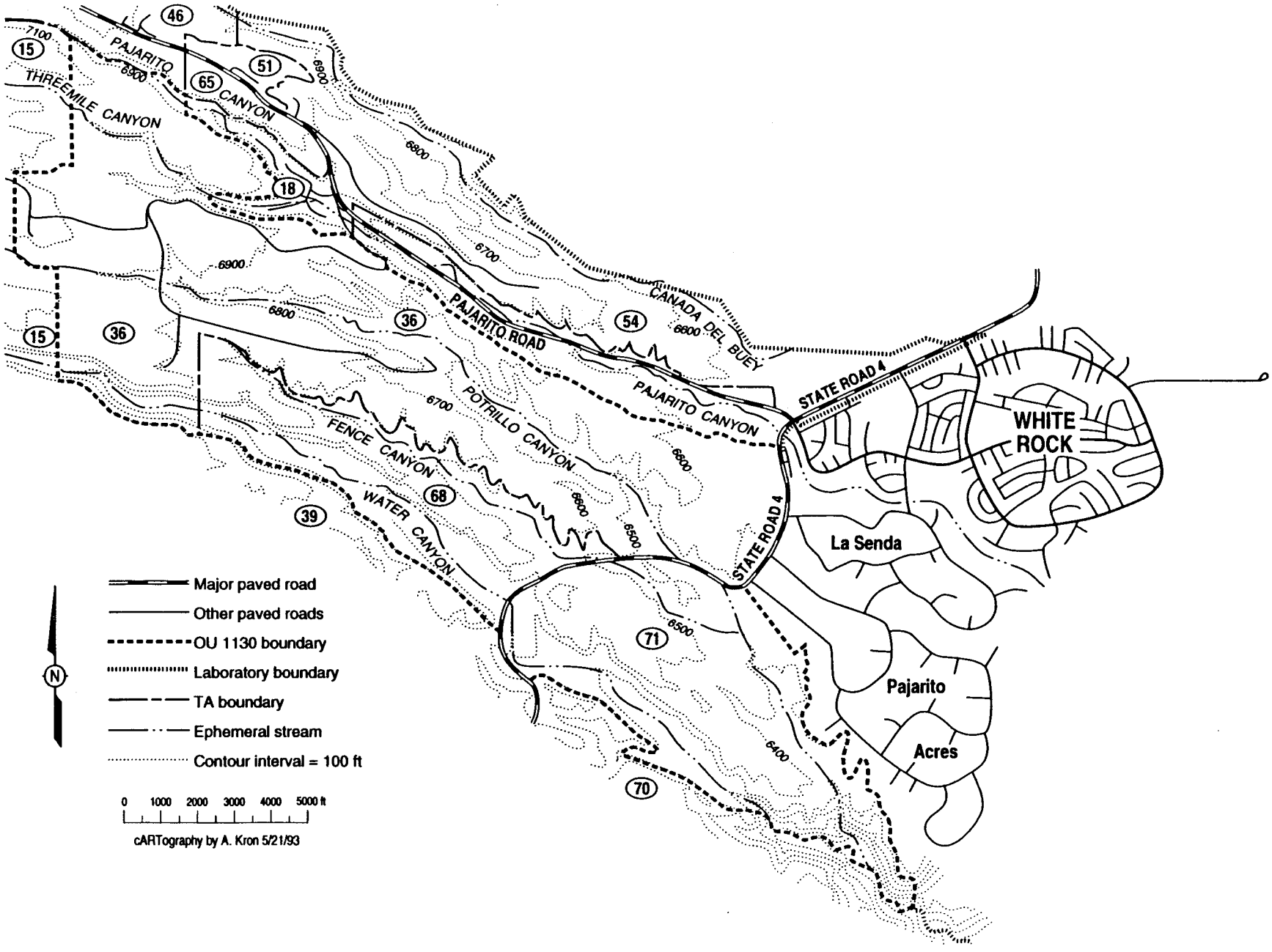

Figure 2-3. Topography of formerly designated OU1130

2.4 Biology and Cultural Surveys

Biological resource field surveys have been conducted at OU 1130 for compliance with the Federal Endangered Species Act of 1973; the New Mexico Wildlife Conservation Act; the New Mexico Endangered Plant Species Act; Executive Order 11990, "Protection of Wetlands"; Executive Order 11988, "Floodplain Management"; 10 CFR 1022; Compliance With Floodplain/Wetlands Environmental Review Requirements (DOE 1979, 0633) and DOE Order 5400.1, General Environmental Protection Program (DOE 1988, 0075).

A cultural resource survey has also been conducted at various areas in OU 1130, as required by the National Historic Preservation Act (amended).

The screening assessment of PRS 36-002 indicated that there were no biological or cultural sites at or near the sump; therefore, no special precautions (regarding biological/cultural resources) were needed when excavating the sump.

3.0 APPROACH TO DATA ASSESSMENT AND ANALYSIS

3.1 Summary of Quality Assurance/Quality Control Activities

Samples were collected, processed, and analyzed in accordance with the Environmental Restoration (ER) quality assurance/quality control (QA/QC) program [presented in the Site-Specific Quality Assurance Project Plan (QAPjP), Annex II of the RFI Work Plan for OU 1130 (LANL 1993, 1088)] and the Los Alamos National Laboratory Environmental Restoration Program Generic QAPjP (LANL 1991, 0412). The QA objectives for measured data given by the QAPjP are precision, accuracy, representativeness, sensitivity, completeness, and comparability.

Two types of field QA/QC samples were collected at PRS 36-002: performance evaluation (PE) samples and collocated field duplicate samples. The PE samples are used to check the accuracy of the analytical laboratories, and collocated samples measure spatial variation of contaminants. Specific routine procedures for assessing data include adherence to holding times, QC samples, and laboratory samples.

Laboratory samples (internal) QA/QC samples include such things as blind, surrogate, and spike samples (all standard practice at analytical laboratories). The information gained from the QA/QC samples make it possible to make statements regarding the accuracy of the sample results and is especially useful when sample results are at or less than the lower detection limit.

All QA/QC data associated with this investigation indicate that sample analyte results are acceptable and defensible. The QC issues for the analytical laboratories, including blind QC and laboratory control samples are discussed in the following sections and summarized in Table 3-1. The QA/QC measures were effective in ensuring the reliability of the data within the acceptable limits of sampling and analytical error.

3.1.1 Inorganic Analyses

Detection limits set for samples spiked with selenium (Se) and thallium (Tl) in the soil laboratory control samples were not met during analyses. The results were less than both the control limits and the instrument detection limits (IDL), which qualified the sample results as undetected estimates (UJ). In cases such as these, the amount below detection, known because of the spike, is calculated to be used as multiplier for making a conservative estimate of possible levels of contamination of the elements in question. Using the spike information, the Se was calculated to be a factor of 2.5 below spike value, and the Tl was a factor of 4.0 below spike value.

The limit of detection (LOD) for the analytical results were 0.25 mg/kg. If the level of Se was exactly 0.25 mg/kg, the maximum amount potentially present would be that amount times 2.5, or 0.625 mg/kg. Comparison of this Se value with the background concentration indicates that this metal is approximately a factor of 3.0 below this limit. For Tl the maximum present would then be 1.0 mg/kg, which was above background for Tl, and therefore this value was next compared with its SAL. Comparison of the calculated maximum Tl value with its SAL indicates that this metal is approximately a factor of 6.0 below this limit.

Cobalt (Co) was found to be biased low in the blind QC sample. The 71.3% recovery for this metal was below the EPA-determined lower limit of 75%. This metal was low by a factor of 1.1 relative to the nominal value for this sample. Using the rationale described above, the recovery value was multiplied by 1.1 and compared with the background concentration for Co, which indicated that Co is less than one-tenth of the background limit.

TABLE 3-1

SUMMARY OF QUALITY CONTROL ISSUES FOR PRS 36-002

SAMPLE TYPE	ASSOCIATED SAMPLES	ANALYSIS	QUALITY CONTROL COMMENTS
Laboratory control sample	AAB1801, AAB1802 AAB1803, AAB1804 AAB1805, AAB1806	Metals	Se and Tl were below their control limits metals by factors of 2.5 and 4.0. Comparison of Se with background and Tl with SAL indicates that these metals are below these limits. Sample results for these metals qualified as UJ; data usability is unaffected.
Blind QC Sample	AAB1801, AAB1802 AAB1803, AAB1804 AAB1805, AAB1806	Metals	Co was biased low in the QC sample. The % recovery below EPA-determined lower limit of 75% and was low by a factor of 1.1. Comparison of this value with background for Co indicates that Co is below limit. The data qualified as UJ and considered valid. Al and Be biased low in QC samples. Recoveries were 73.3% and 50.4%, respectively, low by factors of 1.02 and 1.5. Comparison with background indicates they were below limits. The data qualified as UJ and considered valid.
Blind QC Sample	AAB1801, AAB1802 AAB1803, AAB1804 AAB1805, AAB1806	SVOC	1,2-dichlorobenzene, 1,4-dichlorobenzene, 2-methylphenol, and 4-methylphenol biased low by factors of 3.5, 5, 2.5, and 2.5, respectively. Comparison of these values with SALs indicates compounds below limits. Results qualified as UJ and considered valid.

Aluminum (Al) and beryllium (Be) were also found to be biased low. Recoveries were 73.3% and 50.4% respectively, which were low by factors of 1.02 and 1.5, respectively. Multiplication of the recovery levels by the respective factors indicated that both metals were below the background concentrations.

The results analyses for the Co, Al, and Be were qualified as UJ and are considered valid.

3.1.2 Organic Analyses

The LODs in the blind laboratory QC samples for 1,2-dichlorobenzene, 1,4-dichlorobenzene, 2-methylphenol, and 4-methylphenol was set at 350 mg/kg, and these compounds were low by factors of 3.5, 5, 2.5, and 2.5, respectively. Using the rational as described for Se and Tl, the maximums would be 1225 mg/kg for 1,2-dichlorobenzene; 1750 mg/kg for 1,4-dichlorobenzene; 875 mg/kg for 2-methylphenol; and 875 mg/kg for 4-methylphenol. Because there were no background values available for these organic compounds, these results were compared with the SALs. Comparison of these values with the SALs indicates that these compounds are less than one-tenth of the SALs. The results for these compounds are qualified as UJ and are considered valid.

3.1.3 Radiochemistry Analyses

Overall, laboratory QC parameters for radionuclides sampled were within expected limits of sampling and analytical error. Therefore, the data for uranium are considered valid.

3.1.4 High Explosives Analyses

The laboratory QC parameters were found to be within the expected limits of sampling and analytical error and are therefore considered valid.

3.2 Assessment Methodology

3.2.1 Background Comparison

The initial screening assessment decision point is a comparison of analytical results with background soil concentrations. The statistical method used is the hot measurement test (this test is appropriate in an initial RFI screening assessment where a single high value can trigger further analysis). Each sample is compared with the upper tolerance limit (UTL) which is the 95% upper confidence limit for the 99th percentile of the background distribution (equal to the mean plus the standard deviation times EPA-published k-factors) (Ryti et al. 1995). Analytes that occur naturally in soils (e.g., some metals) are statistically compared with concentrations measured in comparable uncontaminated soils.

3.2.1.1 Inorganics

The Laboratory background database uses data from different types and horizons of surface soil samples at a variety of locations across Los Alamos County (Longmire et al. 1994, 1142). These data were used to calculate the UTL values for metals. The soil concentration distributions that were skewed (median not roughly equal to the mean) were log-transformed. The UTLs calculated for the lognormal distribution were backtransformed into the original units to simplify comparisons with site data (Ryti et al., 1995).

3.2.1.2 Radionuclides

Radionuclide results are reported by isotope in either pCi/g or pCi/L. The Laboratory background soil database includes measurement of the total concentration of uranium which were converted to elemental concentrations to activity by assuming natural abundance of the radioisotopes for the metal.

3.2.1.3 Organics

No background comparison was conducted for polycyclic aromatic hydrocarbons (PAH) because of the low levels of PAHs reported from the analyses.

3.2.2 Screening Action Levels Comparison/Other Standards

SALs are risk-based, media-specific action levels with which maximum concentrations of an analyte are compared to determine whether further evaluation of potential contamination is warranted (LANL 1993b, 1089). SALs are based on regulatory levels (e.g., maximum contaminant levels [MCL] for groundwater) or are calculated using a risk-based methodology described in the proposed rule for RCRA Subpart S, Corrective Action for Solid Waste Management Units (EPA 1990, 0432). An additional conservative modification of the Subpart S methodology was introduced to provide for exposure to VOCs volatilizing from water or soil. Calculation of the soil/water-to-air volatilization factor was based on an equation and chemical-specific parameters (LANL 1993b, 1089).

SALs are calculated using the most current chemical-specific, route-specific toxicity values, and default exposure parameters. The SALs are then based on average daily exposures that do not exceed those corresponding to target risk or hazard values (i.e., a cancer risk of 1 in a million for all Class A and B carcinogens [known and probable carcinogens, respectively], a cancer risk of 1 in 100,000 for all Class C carcinogens [possible carcinogens], and a hazard index of 1 for noncarcinogens).

Neither RCRA nor the proposed rule for RCRA Subpart S, Corrective Action for Solid Waste Management Units at Hazardous Waste Management Facilities (EPA 1990, 0432) addresses radioactive constituents. To ensure that radioactive and nonradioactive compounds are addressed similarly and to simplify integrating RCRA and DOE requirements for radioactive constituents, SALs for radioactive compounds were derived in a manner similar to that used for deriving action levels in the proposed rule for Subpart S (LANL 1993b, 1089).

For radionuclides for which media-specific concentration limits are not specified in other regulations (e.g., MCLs), LANL has proposed SALs based on an annual dose of 10 mrem/year (above background levels) from a single radioactive constituent via all pathways (inhalation, ingestion, etc.) (LANL 1993b, 1089).

3.2.2.1 Summary of Risk Screen Methodology

A screening assessment of potential site risks to human health at a site is done for all analytes except those present at concentrations below detection limits. All detected analytes are considered COPCs. The assessment consists of three simple comparisons, after which each COPC either does not require further evaluation and is eliminated or proceeds to the next comparison. Those constituents that remain of concern after the second comparison (with SALs) or after the third comparison (multiple constituent evaluation) are designated chemicals of concern (COCs). Analytes for which no SAL exists are considered COCs. For a detailed discussion of the screening assessment, see Appendix J of the IWP and for methodologies for assessing risks to human health see Appendix K (LANL 1995, 1164).

The first step in the screening assessment is the comparison of detected levels of analytes with background concentrations. For analytes that occur naturally in soils (e.g., inorganics such as arsenic (As) and Be), detected concentrations are compared with the UTL for that analyte in Los Alamos County. If the detected value of an analyte is equal to or less than its background UTL, it is eliminated as a COPC. If the detected value of an analyte is greater than its background UTL, it is retained as a COPC and is submitted to the next step in the screening process.

The second step in the screening assessment is the comparison of detected concentrations with SALs. SALs are conservative, risk-based levels, based primarily on formulas presented in proposed rule for Subpart S (EPA 1990, 0432), that are used as preliminary screening tools. If the maximum detected concentration of an analyte is greater than the background UTL, the detected value is then compared with the SAL for that analyte. On the basis of this comparison, analytes are categorized as being equal or exceeding SAL or as falling below SAL. (If no SAL currently exists for an analyte, it is categorized as no SAL.)

The following information indicates the use of the comparison with SALs:

> **Equal to or exceeding SAL** indicates that the concentration value is equal to or greater than the SAL for that analyte. The analyte therefore is considered a COC.
>
> **Below SAL** indicates that the concentration value is less than the SAL for that analyte. (See discussion paragraph following the No SAL.)
>
> **No SAL** indicates that while no SAL is available for comparison, the analyte is considered a COC because its concentration value exceeded background UTLs.

Chemicals that individually do not exceed their respective SALs but do exceed background UTLs could, by virtue of combination, prove a risk to human health. To evaluate the potential risks posed by such combinations of analytes, each analyte is first categorized as to whether or not it is a radionuclide, a carcinogen, or a noncarcinogen. The concentration value of each analyte in a given category is divided by the SAL for that analyte, and the resultant normalized values for all the analytes in a category are summed.

If the sum is less than or equal to 1, none of the analytes are considered to be COCs. If the sum is greater than 1, the major chemical contributors to that sum (i.e., those constituting 90% or more) are considered to be COCs. This evaluation is used for screening purposes only and does not indicate a particular risk level.

The equation for calculating the appropriate normalized sum is

$$M = S(C_i / SAL_i)$$

where

M = maximum sum of products;
C_i = maximum concentration of the ith chemical for a given site; and
SAL_i = chemical-specific SAL for the ith chemical.

For more information regarding this equation, refer to Appendix J of the IWP (LANL 1995, 1164).

3.3 Risk Assessment Methodology

No baseline or quantitative human health risk assessment was performed for this PRS.

3.4 Development of Conclusions and Recommendations

Conclusions concerning the level of risk posed by the PRS were drawn on the basis of the results of the screening assessment. These conclusions formed the basis for the recommendations for actions or no further action for this PRS.

4.0 SITE-SPECIFIC RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

4.1 PRS 36-002

For a detailed description of PRS 36-002, see Sections 1.1 and 1.2 in this document.

4.1.1 Previous Investigations

The sump has not been sampled previously, and the level of contamination was not known. Materials used in the shot assembly process initially performed in this building included known contaminants, and because the sinks and drains were designed to handle chemicals evidences the fact that the sump was designed to handle industrial wastes.

4.1.2 Field Investigation

For a detailed description of the field investigations for PRS 36-002, see Section 1.3 of this document.

4.1.2.1 Results of Field Surveys

A land survey was performed at PRS-036-002 to establish secondary control points and sample locations. Radiation and geophysical surveys were not performed.

4.1.2.2 Results of Field Screening

Field screening for VOCs and HE was conducted on all sample material collected. The photoionization detector/flame ionization detector was used to detect VOCs and combustible gases, and the HE spot test was used to screen for the presence of explosives. Portable field instruments were used to screen for alpha-, beta-, and gamma-emitters, and filter swipes, were used to screen for radioactivity. All field screening had negative results, that is, the contaminants for which the various instruments were screening were not detected.

4.1.2.3 Results of Sample Analysis

Analytical results (Appendix A) for concentrations of aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium (total), copper, iron, lead, magnesium, manganese, nickel, potassium, uranium, vanadium, and zinc were below background levels. The highest value of mercury was detected at a concentration at 0.76 ppm in Sample AAB1806. No measured concentrations of PAHs, VOCs, or SVOCs were identified in the analytical results. One HE compound (2,4,6-trinitrotoluene) was detected in concentration of 0.15 mg/kg in Sample AAB1806.

4.1.3 Assessment of Sample Results

4.1.3.1 Comparison to Background/SALs

Background Comparison

When analytical results for inorganic constituents were compared with background UTL concentrations Appendix A, aluminum, arsenic, barium, beryllium, cadmium, calcium, chromium (total), copper, iron, lead, magnesium, manganese, nickel, potassium, uranium, vanadium, and zinc were found to be below background, and on that basis, were eliminated as COPCs. The remaining inorganic (mercury) was above background and on that basis was next compared with its SAL.

No measured concentrations of PAHs, VOCs, or SVOCs were detected at the sump. One HE compound (2,4,6-trinitrotoluene) was detected for which background concentration data were not available (Appendix A). As a result, this compound was next compared to its SAL.

Screening Action Level Comparison

The analytes were compared with the SALs with the following results:

Equal to or Exceeds SAL. No analytes fell into this category.

No SAL. No analytes fell into this category.

Below SAL. Two analytes, mercury and 2,4,6-trinitrotoluene, have measured concentrations below their respective SALs and on that basis were submitted to the multiple constituent evaluation.

Multiple Constituent Evaluation

The multiple constituent evaluation showed mercury and 2,4,6-trinitrotoluene in the noncarcinogenic category, with a normalized sum of 0.03. Because this sum was less than 1, exposures to a combination of 0.78 mg/kg of mercury and 0.15 mg/kg 2,4,6-trinitrotoluene are unlikely to produce adverse health effects. Therefore, these analytes were eliminated as COPCs (Table 4-1). The evaluation for the radionuclide and carcinogenic effects were not conducted, since no analytes were present in these categories.

TABLE 4-1

MULTIPLE CONSTITUENT EVALUATION FOR CONCARCINOGENIC EFFECTS

Analyte	Maximum Soil Concentration Mg/Kg	Soil SAL Mg/Kg	Concentration Normalized to SAL Value
Mercury	0.78	24	0.03
2,4,6-Trinitrotoluene	0.15	40	0.004
Total			0.03

4.1.3.2 Data Interpretation

The screening assessment results shows that are no human health COCs were identified in the sump. Since no COCs were identified, subsequent sampling of the areas below and adjacent to the sump to determine migration did not occur.

4.1.3.3 Risk Assessment

No human health risk assessment was performed for this PRS.

4.1.3.4 Ecotoxicological Screening Assessment

No ecotoxicological screening assessment was performed for this PRS.

4.1.4 Conclusions and Recommendations

The results of the Phase I investigation indicate that no COPCs harmful to human health were present in PRS 36-002 and the surrounding area. After a complete review and validation of the analytical data, field activities resumed on June 2, 1995. The excavated material was returned to the sump area, and best effort was made to restore the area to its original condition. The corrugated metal pipe and the inlet port was disposed of in a permitted landfill. The Laboratory is recommending no further action for the PRS 36-002.

Sampling results indicated that the fill material and surrounding soils do not contain constituents that could pose any threat to human health or environment. Therefore, the fill material was returned to the excavation. The corrugated metal culvert and segment of the inlet port were disposed as construction rubble in an appropriate landfill. Best effort was made to restore the area to its original condition. Field work was completed June 2, 1995.

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APPENDIX A

ANALYTICAL RESULTS

Appendix A
Analytical Results

PRS	Sample Number	Sample Type	Units	Metals	Radionuclides	SVOCs	VOCs	High Explosives	SALs	Control Required Quantifaction Limit	Background
36-002	AAB1801	Soil	mg/kg	**6140 Aluminum(J)**		ND	ND	ND	~	40	58900
Sump			mg/kg	1.1 Arsenic					~	2	11.1
			mg/kg	**84.3 Barium**					5600	40	1140
			mg/kg	0.55 Beryllium(J)					NC	1	3.31
			mg/kg	**0.7 Cadmium**					80	1	2.7
(5 samples)			mg/kg	59.0 Calcium					~	1000	54400
			mg/kg	**11.8 Chromium**					400	10	51.1
			mg/kg	**10.6 Copper**					3000	5	15.7
			mg/kg	**7500 Iron**					~	20	35600
			mg/kg	30.4 Lead					400	0.6	39
			mg/kg	**1200 Magnesium**					~	1000	16100
			mg/kg	**317 Manganese**					11000	3	1030
			mg/kg	0.38 Mercury*					24	0.04	0.1
			mg/kg	**4.4 Nickel**					1600	8	26.7
			mg/kg	**1110 Potassium**					~	1000	6180
			mg/kg	**10.5 Vanadium**					560	10	66
			mg/kg	**1160 Zinc**					24000	4	101
			mg/kg		**0.14 U (Total)**				160	N/A	2.09
36-002	AAB1802	Soil	mg/kg	3940 Aluminum (J)		ND	ND	ND	~	40	58900
(continued)			mg/kg	**1.3 Arsenic**					~	2	11.1
			mg/kg	6.6 Barium					5600	40	1140
			mg/kg	**0.64 Beryllium(J)**					NC	1	3.31
			mg/kg	1570 Calcium					~	1000	54400
			mg/kg	3.7 Chromium					400	10	51.1
			mg/kg	4.8 Copper					3000	5	15.7
			mg/kg	4910 Iron					~	20	35600
			mg/kg	7.6 Lead					400	0.6	39
			mg/kg	1030 Magnesium					~	1000	16100
			mg/kg	274 Manganese					11000	3	1030
			mg/kg	0.1 Mercury					24	0.04	0.1
			mg/kg	940 Potassium					~	1000	6180
			mg/kg	8 Vanadium					560	10	66
			mg/kg	129 Zinc					24000	4	101
			mg/kg		0.11 U (Total)				160	NA	2.09

Maximum concentrations in **boldface**
*Values at or above background UTL
(J) = Estimated value
NC = SALs for Beryllium are set at background
NA = Not Applicable; ~ = Not Avail.
ND = None Detected
TNT= 2,4,6-Trinitrotoluene

PRS	Sample Number	Sample Type	Units	Metals	Radionuclides	SVOCs	VOCs	High Explosives	SALs	Control Required Quantifaction Limit	Background
36-002	AAB 1803	Soil	mg/kg	2210 Aluminum(J)		ND	ND	ND	~	40	58900
(continued)			mg/kg	60.8 Barium					5600	40	1140
			mg/kg	0.54 Beryllium(J)					NC	1	3.31
			mg/kg	1450 Calcium					~	1000	54400
			mg/kg	7.4 Chromium					400	10	51.1
			mg/kg	7.6 Copper					3000	5	15.7
			mg/kg	3300 Iron					~	20	35600
			mg/kg	**31.7 Lead**					400	0.6	39
			mg/kg	721 Magnesium					~	1000	16100
			mg/kg	184 Manganese					11000	3	1030
			mg/kg	0.48 Mercury*					24	0.04	0.1
			mg/kg	606 Potassium					~	1000	6180
			mg/kg	8.6 Vanadium					560	10	66
			mg/kg	177 Zinc					24000	4	101
			mg/kg		0.1 U (Total)				160	NA	2.09
36-002	AAB1805	Soil	mg/kg	3270 Aluminum(J)		ND	ND	ND	~	40	58900
(continued)			mg/kg	30.4 Barium					5600	40	1140
			mg/kg	1270 Calcium					~	1000	54400
			mg/kg	4.9 Chromium					400	10	51.1
			mg/kg	5320 Iron					~	20	35600
			mg/kg	2.6 Lead					400	0.6	39
			mg/kg	976 Magnesium					~	1000	16100
			mg/kg	129 Manganese					11000	3	1030
			mg/kg	0.27 Mercury*					24	0.04	0.1
			mg/kg	5.6 Vanadium					560	10	66
			mg/kg	66.2 Zinc					24000	4	101
			mg/kg		0.1 U (Total)				160	NA	2.09
36-002	AAB1806	Soil	mg/kg	3300 Aluminum		ND	ND	ND	~	40	58900
(continued)			mg/kg	44.4 Barium					5600	40	1140
			mg/kg	**1590 Calcium**					~	1000	54400
			mg/kg	7.2 Chromium					400	10	51.1
			mg/kg	5.1 Copper					3000	5	15.7
			mg/kg	4190 Iron					~	20	35600
			mg/kg	8.4 Lead					400	0.6	39
			mg/kg	712 Magnesium					~	1000	16100
			mg/kg	171 Manganese					11000	3	1030
			mg/kg	**0.76 Mercury***					24	0.04	0.1
			mg/kg	540 Potassium					~	1000	6180
			mg/kg	5.9 Vanadium					560	10	66
			mg/kg	127 Zinc					24000	4	101
			mg/kg		0.1 U (Total)				160	NA	2.09
			mg/kg					**0.15 TNT**	40	~	~

Maximum concentrations in **boldface**
*Values at or above background UTL
(J) = Estimated value
NC = SALs for Beryllium are set at background
NA = Not Applicable; ~ = Not Avail.
ND = None Detected
TNT= 2,4,6-Trinitrotoluene

APPENDIX B

SAMPLING AND ANALYSIS PLAN FOR PRS 36-002

Appendix B

Sampling and Analysis Plan For PRS 36-002

	Sampled Media			Samples				Field Screening					Laboratory Analyses										
				Structure		Subsurface																	
Description	soil/tuff	sludge	fill	primary	duplicate	primary	duplicate	Beta-gamma	Alpha	Organic Vapor	Combustible gas/oxygen	Explosives (Spot Test)	Gamma spectroscopy	Total uranium	Isotopic uranium	Plutonium	Metals (SW 6010/7000)	Mercury	Cyanides	VOCs (SW 8260)	SVOCs (SW 8270)	Explosives (SW 8330)	
AAB1801			x			x		x	x	x	x	x		x			x			x	x	x	visual inspec (highest contam)
AAB1802			x			x		x	x	x	x	x		x			x			x	x	x	visual inspection
AAB1803			x			x		x	x	x	x	x		x			x			x	x	x	visual inspection
AAB1804			x				x	x	x	x	x	x		x			x			x	x	x	dup of AAB1801
AAB1805		x				x		x	x	x	x	x		x			x			x	x	x	if liq. sludge present
AAB1806		x				x		x	x	x	x	x		x			x			x	x	x	if liq. sludge present
AAB1807		x					x	x	x	x	x	x		x			x			x	x	x	dup (highest contam)

The fill material samples are top be collected at three depths below the discharge point of the pipe entering the sump. The samples will be biased by visual indicators of staining. Sample AAB1801 will be collected from the location thought to be the most contaminated. Three liquid sludge samples will be collected from the bottom of the tank if sludge is present.

Attachment A

See Figure 1-1 for the location map of OU 1130

Attachment B

See Figure 1-4 for the map showing sample locations