RFI Work Plan
for
Operable Unit
1157

Environmental Restoration Program

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EXECUTIVE SUMMARY

Purpose

The primary purpose of this Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Work Plan is to determine the presence or absence of releases of hazardous waste or hazardous constituents from potential release sites (PRSs) in Operable Unit (OU) 1157, and to determine the need for further action. Secondly, this document satisfies part of the regulatory requirements contained in Los Alamos National Laboratory's (the Laboratory's) permit to operate under RCRA. This work plan covers OU 1157, which includes Technical Areas (TAs) -8, -9, -23 and -69. These TAs are located on the western boundary of the Laboratory. Within these TAs are 116 PRSs, which are located entirely on Department of Energy (DOE) land.

The installation work plan (IWP) is a Laboratory document, prepared and updated annually under requirements set forth in the Hazardous and Solid Waste Amendments (HSWA) Module VIII (referred to in this document as the HSWA Module) issued by the Environmental Protection Agency (EPA). The IWP describes the Laboratory-wide system for accomplishing the RFI, corrective measures study (CMS), and corrective measures implementation (CMI). It also identifies the Laboratory's PRSs, describes their aggregation into 24 OUs, and presents the Laboratory's overall management plan and technical approach for meeting the requirements of the HSWA Module. The HSWA Module was issued to address potential corrective action for solid waste management units (SWMUs) at the Laboratory. These permit requirements are addressed by the DOE's Environmental Restoration (ER) Program at the Laboratory.

Potential release sites that have not been identified as SWMUs in the SWMU Report are called areas of concern (AOCs). The term PRS is a generic name for both SWMUs and AOCs and will be used throughout this work plan. This work plan includes sites that are not identified in the HSWA Module and are outside the regulatory scope of the permit. These units are included to ensure that all potential environmental problems at the OU are investigated and to present to the public and the regulators a unified plan that addresses all potential environmental problems onsite. Inclusion of these sites in the work plan does not confer additional regulatory responsibility or authority for these sites to the regulators and does not bind the Laboratory to additional commitments outside the scope of the permit. The Laboratory will consider all comments received on this work plan.

OU 1157 Background

The Laboratory has conducted research activities within OU 1157 since 1943, primarily in the areas of explosives development and testing and the application of various x-ray techniques. In addition, during World War II, gun-firing experiments were performed as part of the development of the gun-assembled nuclear weapon known as Little Boy. Preliminary investigations of the OU conducted in 1987 revealed 115 PRSs, which warranted more detailed investigation. One other site was found during preliminary site investigations and is being investigated under this work plan. Most of the PRSs are drains, sumps, septic tanks, and other structures associated with ongoing, permitted activities in the OU. Others are associated with activities that were discontinued after the war or were conducted in the area known as Old Anchor East, which was cleaned up and decommissioned in the early 1960s. In most cases, potential contaminants in OU 1157 include various explosives, photo-processing chemicals, solvents, metals such as copper and lead, and, in the case of a few PRSs, small amounts of radioactive constituents that include uranium, plutonium, and strontium.

Technical Approach

For the purposes of designing and/or implementing the sampling and analysis plans described in this work plan, most PRSs are grouped, although selected PRSs are investigated individually as necessary. This work plan presents the description and operating history of each PRS or aggregate, together with an evaluation of the existing data, if any, in order to develop a preliminary conceptual exposure model for the site. For some sites, no further action (NFA) can be proposed on the basis of this review; these sites are discussed in Chapter 7. For other, currently active sites, this review is sufficient to determine that investigation and remediation (if required) may be deferred until the site is decommissioned. These and the remaining sites, for which RFI field work and/or voluntary corrective actions (VCAs) are proposed, are discussed in Chapter 5.

A phased technical approach to field sampling is followed at most sites in this work plan. Phase I is designed to determine whether hazardous constituents have been released to the environment in excess of screening action levels. Screening action levels are conservative guidelines based on risk assessment, for soil, water, and air, that indicate potentially hazardous contaminant levels. If screening action levels are exceeded and it is unclear whether a VCA is warranted, a preliminary baseline risk assessment may be performed using Phase I data to provide additional information upon which to base a decision for a VCA. Alternatively, additional data may be collected in a Phase II sampling program to refine the conceptual exposure models for the PRSs or aggregates to a level of detail sufficient for baseline risk assessment and the evaluation of remedial alternatives. A phased approach to the RFI is used to ensure that any environmental impacts associated with past and present activities are investigated in a manner that is both cost-effective and complies with the HSWA Module. This phased approach permits intermediate data evaluation, with opportunities for additional sampling, if required.

Data quality objectives (DQOs) to support the required decisions are developed for RFI Phase I sampling and analysis plans described in this work plan to ensure that the right type, amount, and quality of data are collected. Field work for many sites includes field surveys and field screening of soils and other materials on which the selection of samples for laboratory analysis will be based. Laboratory analyses will be performed in mobile and fixed analytical laboratories.

The body of the text in this work plan is followed by five annexes, which consist of project plans corresponding to the program plans in the IWP: project management, quality assurance, health and safety, records management, and public involvement.

Schedule, Costs, and Reports

The RFI Phase I field work described in this document will require almost 3 years (Figure ES-1) to complete. A single phase of field work is expected to be sufficient to complete the RFI for most PRSs; however, a second phase will occur if warranted by the results of the first phase, in which case, the field work may take a longer time to complete.

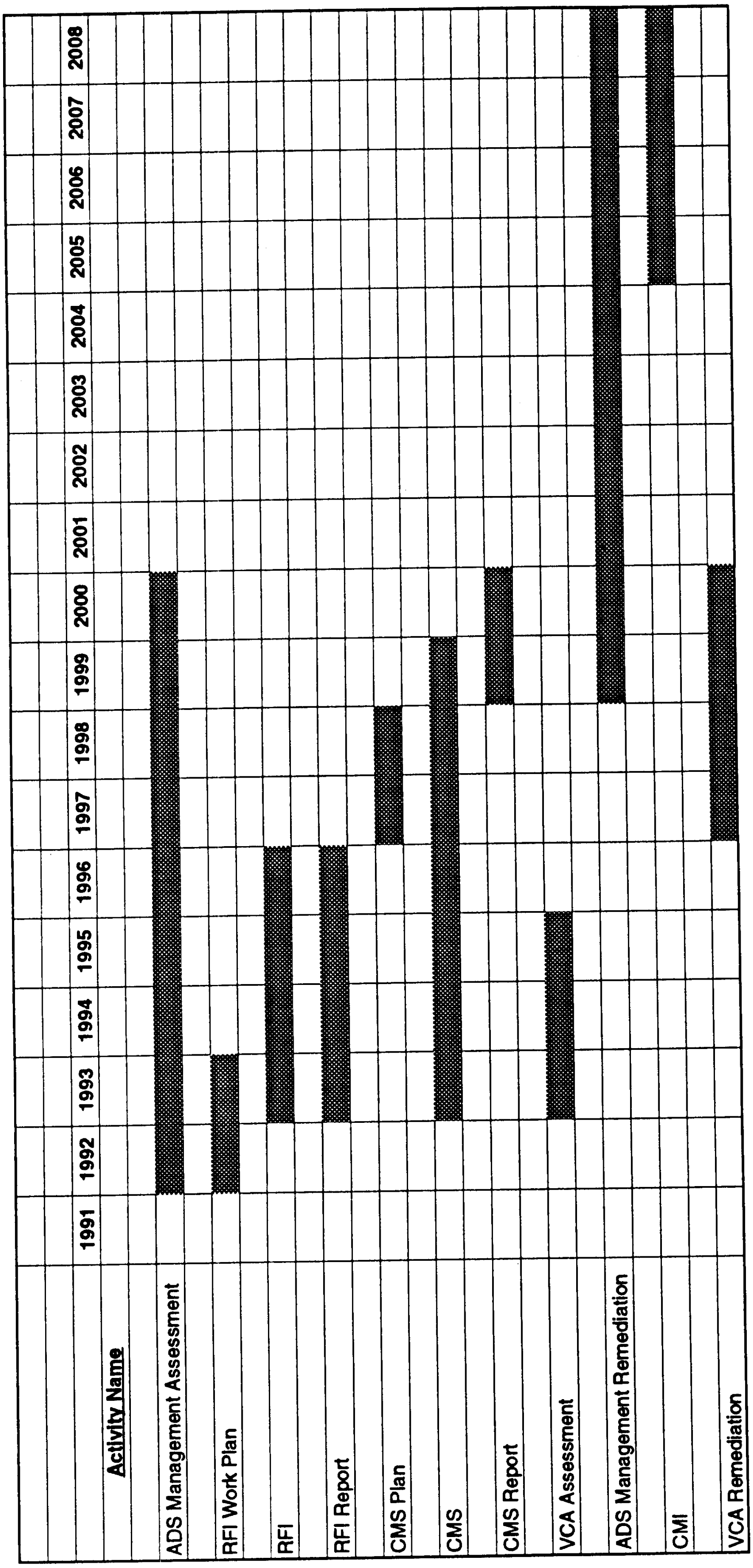

Figure ES-1. RFI/CMS Milestone Chart for OU 1157

Cost estimates for baseline activities for OU 1157 are provided in Table ES-1. The costs are based upon assumptions that are generic to the Program and are, therefore, only approximate. The estimated cost for implementing the RFI and reporting is $15.4 million. If a CMS is necessary, the estimated cost for its implementation and reporting is $14.1 million. The total estimated cost for the corrective action process at OU 1157 is approximately $29.5 million, without escalation.

TABLE ES-1

ESTIMATED COSTS OF BASELINE ACTIVITIES AT OU 1157

Task	Budget (K)	Scheduled Start	Scheduled Finish
ADS Management Assessment	1,060	12/2/91	7/31/00
RFI Work Plan	1,059	12/2/91	7/16/93
RFI	7,719	10/15/93	8/1/96
RFI Report	2,661	11/15/93	9/30/96
CMS Plan	776	7/30/97	6/22/98
CMS	0	10/1/92	9/30/99
CMS Report	596	10/1/99	7/31/00
VCA Assessment	2,883	10/1/92	9/30/96
ADS Management Remediation	109	3/1/99	9/30/08
CMI	7,296	10/1/04	9/30/08
VCA Remediation	5,360	3/3/97	9/29/00
Report Total	29,519		

Estimate at completion	29,519
Escalation	10,448
Total at completion	39,967

The HSWA Module specifies the submittal of monthly reports and quarterly technical progress reports. In addition, RFI phase reports will be submitted at the completion of each of the sampling events. The RFI phase reports will serve as

- partial summaries of the results of initial site characterization activities,
- vehicles for proposing modifications to the sampling plans suggested by the initial findings,
- work plans that describe the next phase of sampling, when such sampling is required,
- vehicles for recommending VCA or NFA as mechanisms for removing PRSs shown by the RFI to have acceptable health-based risk levels, and
- summary reports of the sampling plans.

At the conclusion of the RFI, a final RFI report will be submitted to the EPA.

Public Involvement

Regulations issued pursuant to HSWA, and the HSWA Module itself, mandate public involvement in the corrective action process. In addition, the Laboratory is providing a variety of opportunities for public involvement, including meetings held as needed to disseminate information, to discuss significant milestones, and to solicit informal public review of this and the other draft work plans. It also distributes meeting notices and updates the ER Program mailing list; prepares fact sheets summarizing completed and future activities; and provides public access to plans, reports, and other ER Program documents. These materials are available for public review between 9:00 a.m. and 4:00 p.m. on Laboratory business days at the ER Program's Public Reading Room the Museum Parke Complex at the corner of 15th and Central in Los Alamos. The main branches of the public libraries in Española, Los Alamos, and Santa Fe also have these materials available for public viewing.

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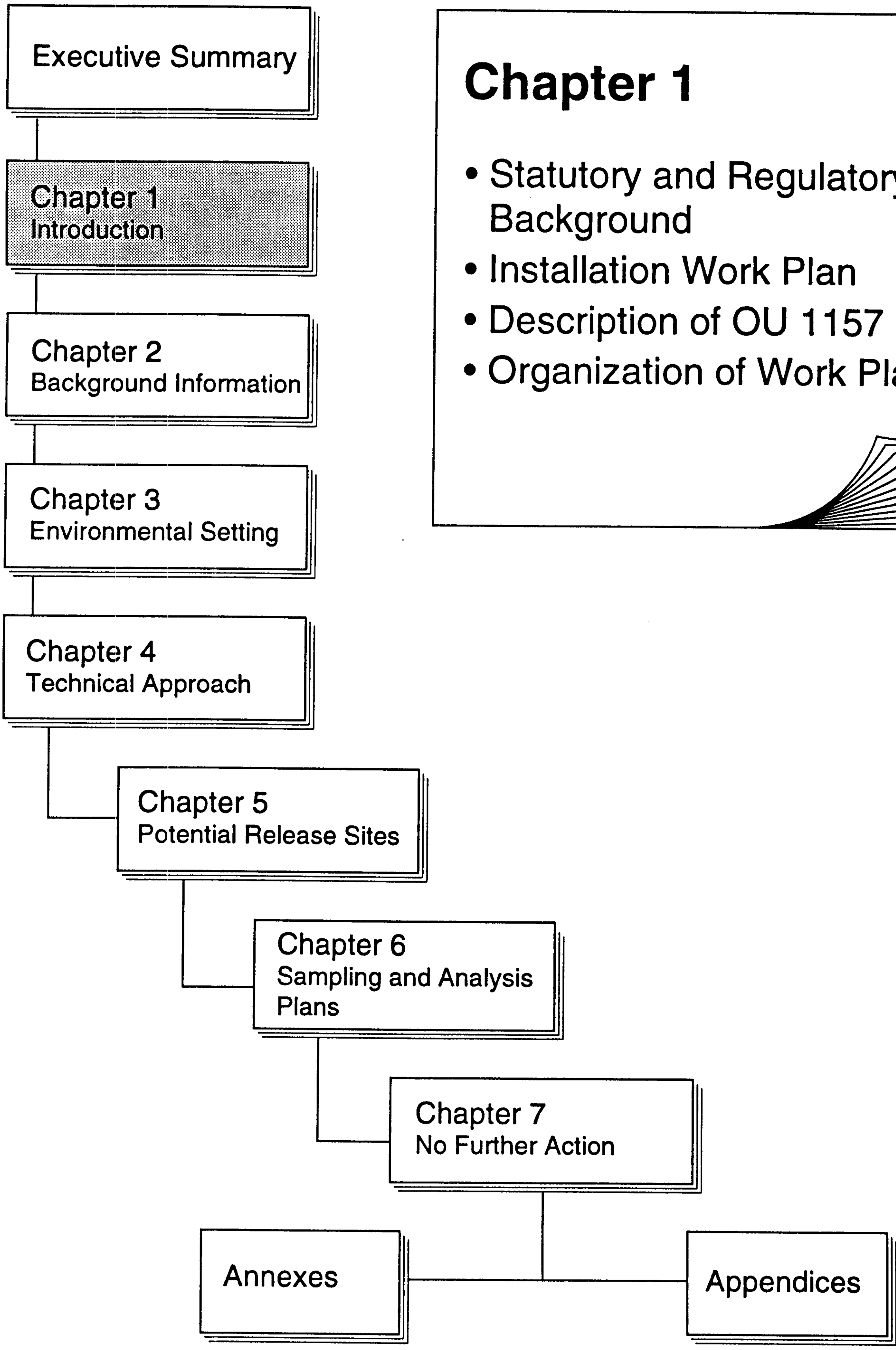
ADS	Activity data sheet
AE	Anchor East
AEC	U.S. Atomic Energy Commission
ALARA	As low as reasonably achievable
ANSI	American National Standards Institute
AOC	Area of concern
ASD	Alpha scintillation detector
ASME	American Society of Mechanical Engineers
BRET	Biological Resource Evaluation Team
CCF	Central Computing Facility
CEARP	Comprehensive Environmental Assessment and Response Program
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CMI	Corrective measures implementation
CMS	Corrective measures study
COC	Contaminant of concern
cpm	Counts per minute
DA	Deferred action
D&D	Decontamination and decommissioning
DOE	U.S. Department of Energy
DQO	Data quality objective
EDNA	Ethylene dinitramine, an explosive
EES	Earth and Environmental Sciences (Division)
EM	Environmental Management (Division) (Office of Environmental Restoration and Waste Management)
ENG	Facilities Engineering (Division)
EO	Executive Order
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
ERDA	U.S. Energy Research and Development Administration
ES&H	Environment, safety, and health
FID	Flame ionization detector
GC	Gas chromatograph
GMX	Gadgets Testing and Explosives
gpm	Gallons per minute
H&S	Health and safety
HASL	Health and Safety Laboratory
HCN	Hydrogen Cyanide
HE	High explosives
HMX	High melting explosive
HPLC	High-performance liquid chromatography
HS	Health and Safety (Division)
HSWA	Hazardous and Solid Waste Amendments

IA	Interim action
IT	International Technology Corp.
IWP	Installation Work Plan (for Environmental Restoration)
JCI	Johnson Controls World Services, Inc.
LAAO	Los Alamos Area Office (of DOE)
LANL	Los Alamos National Laboratory
LASL	Los Alamos Scientific Laboratory (LANL before 1979)
M	Dynamic Testing (Division)
Ma	Million years ago
MASH	Macrostatistical hydrodynamic (research)
MCL	Maximum contaminant level
MDA	Material disposal area
MDL	Method detection limit
Mev	Million electron volts
mr	Milliroentgens
NaID	Sodium iodide detector
NEPA	National Environmental Policy Act
NFA	No further action
NIOSH	National Institute for Occupational Safety and Health
NPDES	National Pollutant Discharge Elimination System
NQ	Nitroguanidine, an explosive
OU	Operable Unit
OUPL	Operable Unit Project Leader
OVA	Organic vapor analyzer
PARCC	Precision, accuracy, representativeness, completeness, and comparability
PARD	Protect as restricted data
PB-RDX	Plastic-bonded RDX
PBX	Plastic-bonded explosive
PCB	Polychlorinated biphenyl
PETN	Pentaerythritol tetranitrate
PID	Photoionization detector
PL	Project Leader
PQL	Practical quantitation limit
PRS	Potential release site
PTLA	Protection Technology Los Alamos
QA	Quality assurance
QAPjP	Quality Assurance Project Plan
QC	Quality control
QPP	Quality Program Plan
RCRA	Resource Conservation and Recovery Act
RDX	Royal Demolition Explosive
RFI	RCRA facility investigation
SAP	Sampling and analysis plan
SOP	Standard operating procedure
SR	State Route
SVOC	Semivolatile organic compound
SWMU	Solid waste management unit

TA	Technical Area
TBD	To be determined
TCLP	Toxicity characteristics leaching procedure
TNT	Trinitrotoluene
TRU	Transuranic (waste)
TSD	Treatment, storage, and disposal
UST	Underground storage tank
VCA	Voluntary corrective action
VOC	Volatile organic compound
WX	Design Engineering (Division)



Chapter 1

- Statutory and Regulatory Background
- Installation Work Plan
- Description of OU 1157
- Organization of Work Plan

1.0 INTRODUCTION

1.1 Statutory and Regulatory Background

In 1976, Congress enacted the Resource Conservation and Recovery Act (RCRA), which governs the day-to-day operations of hazardous waste treatment, storage, and disposal (TSD) facilities. Sections 3004(u) and (v) of RCRA established a permitting system, which is implemented by the EPA or by a state authorized to implement the program, and set standards for all hazardous-waste-producing operations at a TSD facility. Under this law, the Laboratory qualifies as a treatment and storage facility and must have a permit to operate. The State of New Mexico, which is authorized by the EPA to implement portions of the RCRA permitting program, issued the Laboratory's RCRA permit.

In 1984, Congress amended RCRA by passing the Hazardous and Solid Waste Amendments (HSWA), which modified the permitting requirements of RCRA by, among other things, requiring corrective action for releases of hazardous wastes or constituents from SWMUs. The EPA administers the HSWA requirements in New Mexico at this time. In accordance with this statute, the Laboratory's permit to operate (EPA 1990, 0306) includes a section, HSWA Module VIII, that prescribes a specific corrective action program for the Laboratory. The HSWA Module includes provisions for mitigating releases from facilities currently in operation and for cleaning up inactive sites. This RCRA facility investigation work plan meets the requirements of the HSWA Module and is also consistent with the scope of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) per DOE policy (DOE 1989, 0078).

The HSWA Module lists SWMUs, which are defined as "any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or hazardous waste." These wastes may be either hazardous or nonhazardous (an example of nonhazardous solid waste is construction debris). Table A of the HSWA Module identifies 605 SWMUs at the Laboratory, and Table B is a subset of those SWMUs that must be investigated first. Other SWMUs not listed in the HSWA Module have also been identified in the SWMU Report (LANL 1990, 0145), and will be addressed in this work plan. In addition, the Laboratory has identified AOCs, which do not meet the HSWA Module's definition of a SWMU. These sites may contain radioactive materials and other hazardous substances of concern under CERCLA. Solid waste management units and AOCs are collectively referred to as PRSs. The ER Program uses the mechanism of recommending no further action for AOCs as well as SWMUs. However, using this approach for AOCs does not imply that AOCs fall under the jurisdiction of the HSWA Module.

For the purposes of implementing the cleanup process, the Laboratory has aggregated PRSs that are geographically related in groupings called OUs. The Laboratory has established 24 OUs, and an RFI work plan has been or will be prepared for each. This work plan for OU 1157 addresses PRSs located in TA-8, TA-9, TA-23, and TA-69 of the Laboratory. This plan, together with nine other work plans submitted to EPA in 1993 and nine plans submitted in 1991 and 1992, meets the schedule requirements of the HSWA Module, which is to address a cumulative total of 55% of the SWMUs in Table A of the HSWA Module and a cumulative total of 100% of the 182 priority SWMUs listed in Table B. Specifically, the OU 1157 work plan addresses 7.3% of the Laboratory's SWMUs listed in Table A and includes 3.3% of the SWMUs appearing on the HSWA Module Table B list of priority SWMUs. Table 1-1 presents the OU 1157 SWMUs listed in Tables A and B of the HSWA Module. Although not required by the permit, all of the OU 1157 SWMUs and AOCs are addressed in this work plan. These SWMUs and AOCs were originally documented in the November 1990 SWMU Report (LANL 1990, 0145). One new PRS [8-009(f)] has been potentially identified during this initial investigation. It has been included in this work plan for characterization.

Section 3.5 of the IWP states that each OU work plan may contain an application for a Class III permit to modify Table A of the HSWA Module when it is determined that a PRS needs no further investigation or when it is necessary to add PRSs to the current listing. Table 1-2 lists the PRSs within OU 1157 proposed for no further action; EPA's approval of this work plan has the effect of delisting these PRSs unless otherwise specified by that agency. Official delisting is by permit modification, if appropriate. As more information is obtained, the Laboratory proposes modifications in the HSWA Module for EPA approval. When applications to modify the permit are pending, the ER Program submits work plans consistent with current permit conditions. Program documents, including

TABLE 1-1

OU 1157 PRSs Listed In Table A and Table B of HSWA Permit

PRS NUMBER	TYPE OF UNIT	STATUS	HSWA TABLE A?	HSWA TABLE B?
8-002	Firing Site	Decommissioned	YES	NO
8-003(a-c)	Septic Systems	Inactive	YES	YES
8-004(a-d)	Drains	Active and Inactive	YES	NO
8-006(a-b)	Landfill	Inactive	YES	NO
8-007	Resin Bed	Inactive	YES	YES
9-003(a-f)	Settling Tanks	Decommissioned	YES	NO
9-004(a-o)	Settling Tanks	Active	YES	NO
9-005(a-h)	Septic System	Active and Inactive	YES	NO
9-006	Septic System	Decommissioned	YES	NO
9-007	Sump	Inactive	YES	NO
9-008(a-b)*	Surface Impound.	Abandoned	YES	YES
9-009	Surface Impound.	Active	YES	YES

*This PRS is listed only as 9-008 in the HSWA Permit.
The PRS is listed as 9-008(a) and 9-008(b) in the SWMU Report.

TABLE 1-2

PRSs in OU 1157 Proposed for No Further Action

PRS Number	Title	Section
8-007	Silver Recovery Resin Bed	7.2.1.1
8-008(a)	Transformer Storage Area	7.2.1.2
8-008(b)	Transformer Storage Area	7.2.1.3
8-008(c)	Transformer Storage Area	7.2.1.4
8-008(d)	Transformer Storage Area	7.2.1.5
8-009(b)	Outfall	7.2.1.6
8-010(a)	Waste Container Storage Area	7.2.1.7
8-010(b)	Waste Container Storage Area	7.2.1.8
8-010(c)	Waste Container Storage Area	7.2.1.9
8-006(b)	Possible Disposal Area	7.2.2.1
8-003(b)	Inactive Septic Tank	7.2.3.1
8-003(c)	Inactive Septic Tank	7.2.3.2
8-011(a)	Decommissioned UST	7.2.3.3
8-011(b)	Decommissioned UST	7.2.3.4
9-003(f)	Settling Tank	7.2.4.1
9-005(b)	Inactive Sanitary Septic Tank	7.2.4.2
9-005(c)	Inactive Sanitary Septic Tank	7.2.4.3
9-005(e)	Inactive Sanitary Septic Tank	7.2.4.4
9-005(f)	Inactive Sanitary Septic Tank	7.2.4.5
9-005(g)	Active Sanitary Septic Tank	7.2.4.6
9-005(h)	Inactive Sanitary Septic Tank	7.2.4.7
9-007	Inactive Basket Pit	7.2.4.8
9-010(c)	Waste Can Shelter	7.2.4.9
9-011(a)	Waste Container Storage Area	7.2.4.10
9-003(c)	Electrical Waste Manhole	7.2.5.1
9-008(a)	Lagoon	7.2.5.2
9-016	Decommissioned UST	7.2.5.3
9-015	Electrical Waste Manhole	7.2.6.1
69-002(a)	Septic System	7.2.8.1
69-002(b)	Septic System	7.2.8.2
C-8-001	Gun Building	7.2.9.1
C-8-002	Gun Building	7.2.9.1
C-8-003	Carpenter Shop	7.2.9.1
C-8-004	Main Ranch House	7.2.9.1
C-8-005	Guest House	7.2.9.1
C-8-006	Guest House	7.2.9.1
C-8-007	Bunk House	7.2.9.1
C-8-008	Ranch Barn	7.2.9.1
C-8-009	Ranch Barn	7.2.9.1
C-8-011	Storage Building	7.2.9.1
C-8-012	Carpenter Shop	7.2.9.1
C-8-013	Office Building	7.2.9.1
C-8-015	HE Magazine	7.2.9.1
C-8-016	HE Magazine	7.2.9.1
C-8-017	Storage Vault	7.2.9.1

TABLE 1-2 (continued)

PRSs in OU 1157 Proposed for No Further Action

PRS Number	Title	Section
C-8-018	Storage/Radiation Laboratory	7.2.9.1
C-8-019	Storage/Radiation Laboratory	7.2.9.1
C-8-020	Disposal Area	7.2.9.1
C-9-002	Trimming Buildings	7.2.9.2
C-9-003	Pump House	7.2.9.2
C-9-004	Oven Building	7.2.9.2
C-9-005	X-unit Chamber	7.2.9.2
C-9-006	Magazines	7.2.9.2
C-9-007	Storage Buildings	7.2.9.2
C-9-008	UST	7.2.9.2
C-9-009	Mechanical Machine Shop	7.2.9.2
C-9-010	Burning Pit	7.2.9.2
C-9-011	Burn Area	7.2.9.2

RFI reports and the IWP, are updated and phase reports are prepared to reflect changing permit conditions.

1.2 Installation Work Plan

The HSWA Module requires that the Laboratory prepare a master plan, called the installation work plan, to describe the Laboratory-wide system for accomplishing all RFIs and CMSs. The IWP has been prepared in accordance with the HSWA Module and is consistent with EPA's interim final RFI guidance (EPA 1989, 0088) and proposed Subpart S of 40 CFR 264 (EPA 1990, 0432), which proposes the cleanup program mandated in Section 3004(u) of RCRA. The IWP was first prepared in 1990 and is updated annually. This work plan generally follows the guidance in Revision 2 of the IWP (LANL 1992, 0768).

The IWP describes the aggregation of the Laboratory's PRSs into 24 OUs (Subsection 3.4.1). It presents a facilities description in Chapter 2 and a description of the structure of the Laboratory's ER Program in Chapter 3. Chapter

4 describes the technical approach to corrective action at the Laboratory. Annexes I-V contain the Program Management Plan, Quality Program Plan, Health and Safety Program Plan, Records Management Program Plan, and the Public Involvement Program Plan, respectively. The document also contains a proposal to integrate RCRA closure and corrective action and a strategy for identifying and implementing interim remedial measures. When information relevant to this work plan has already been provided in the IWP, the reader is referred to the 1992 revision of the IWP.

1.3 Description of OU 1157

Operable Unit 1157 is located along the western boundary of the Laboratory in Los Alamos County, New Mexico (see Figure 1-1). It contains TAs-8, -9, -23, and -69 (see Figure 1-2). Technical Area 8 contains remnants of the pre-World War II homestead known as Anchor Ranch and, as well, the wartime facilities known as Anchor West, which were used for gun-firing experiments and for small-scale, contained explosives experiments. After the war, new buildings were erected at TA-8 to house various x-ray facilities that are still in use. Technical Area 9 contains the decommissioned wartime Old Anchor East facilities, which were used for x-ray work and for explosives development, fabrication, and testing and also, the postwar New Anchor East facilities, which are still in use for explosives development and testing. A decommissioned firing site known as Far Point was also part of TA-9. Technical Area 23, a wartime explosives firing site, was decommissioned in 1949 and is now incorporated into the current TA-9 boundary. Structures of interest to this work plan at TA-69 include the sanitary waste disposal systems serving a guard station and two office trailers and an inactive incinerator used for the destruction of classified documents.

For the purpose of evaluation, the PRSs within OU 1157 have been divided into nine groups based primarily on geographic location and current status (Figure 1-3), excluding Group 9 PRSs, which are not included in Figure 1-3 because they are located throughout TA-8 and TA-9. Group 1 contains 14 PRSs associated with ongoing activities at TA-8. These include various building drains and outfalls, three waste containers, and four locations where electric transformers containing polychlorinated biphenyls (PCBs) were placed on the ground for a few days prior

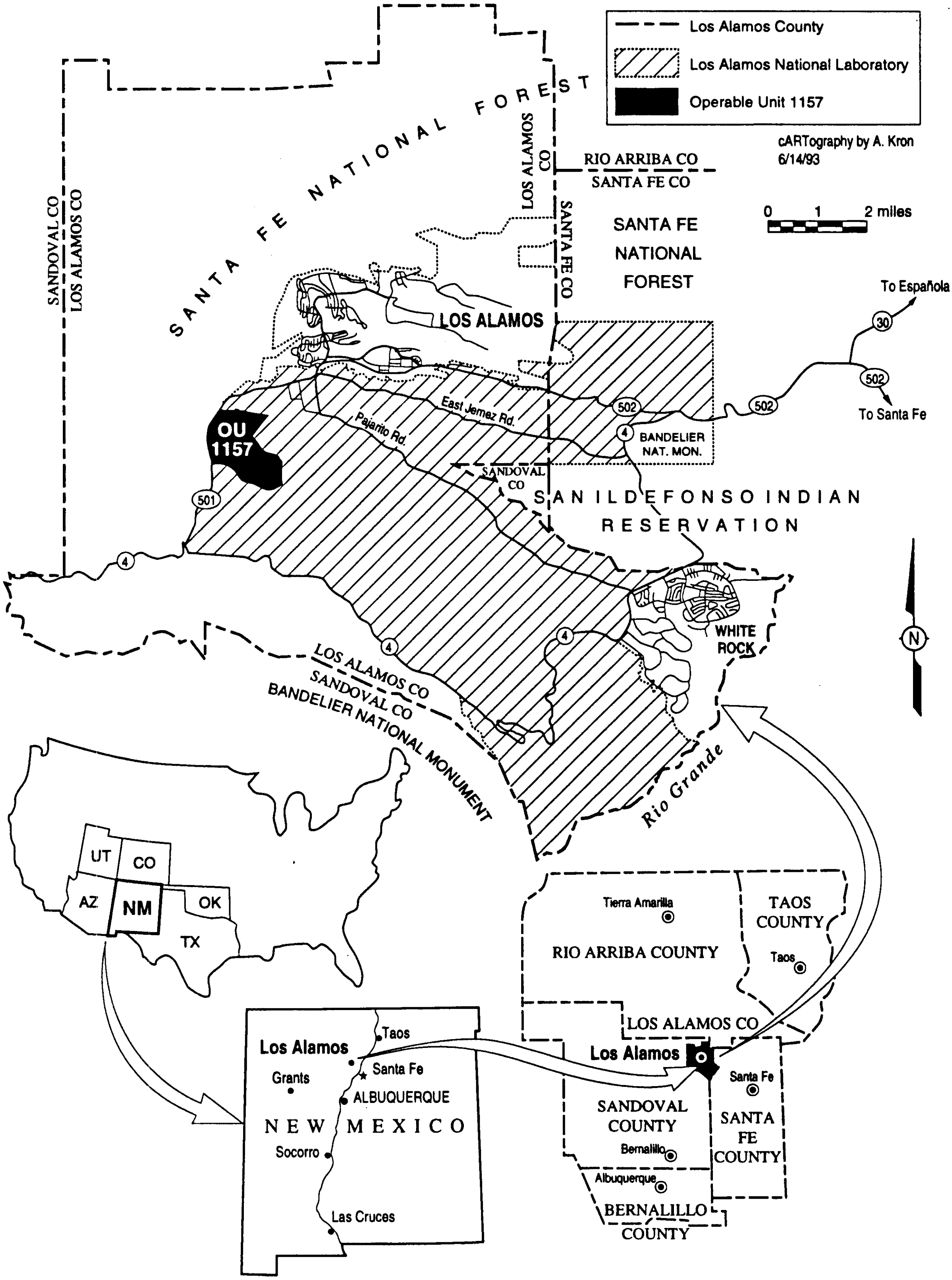


Figure 1-1. Location of Operable Unit 1157.

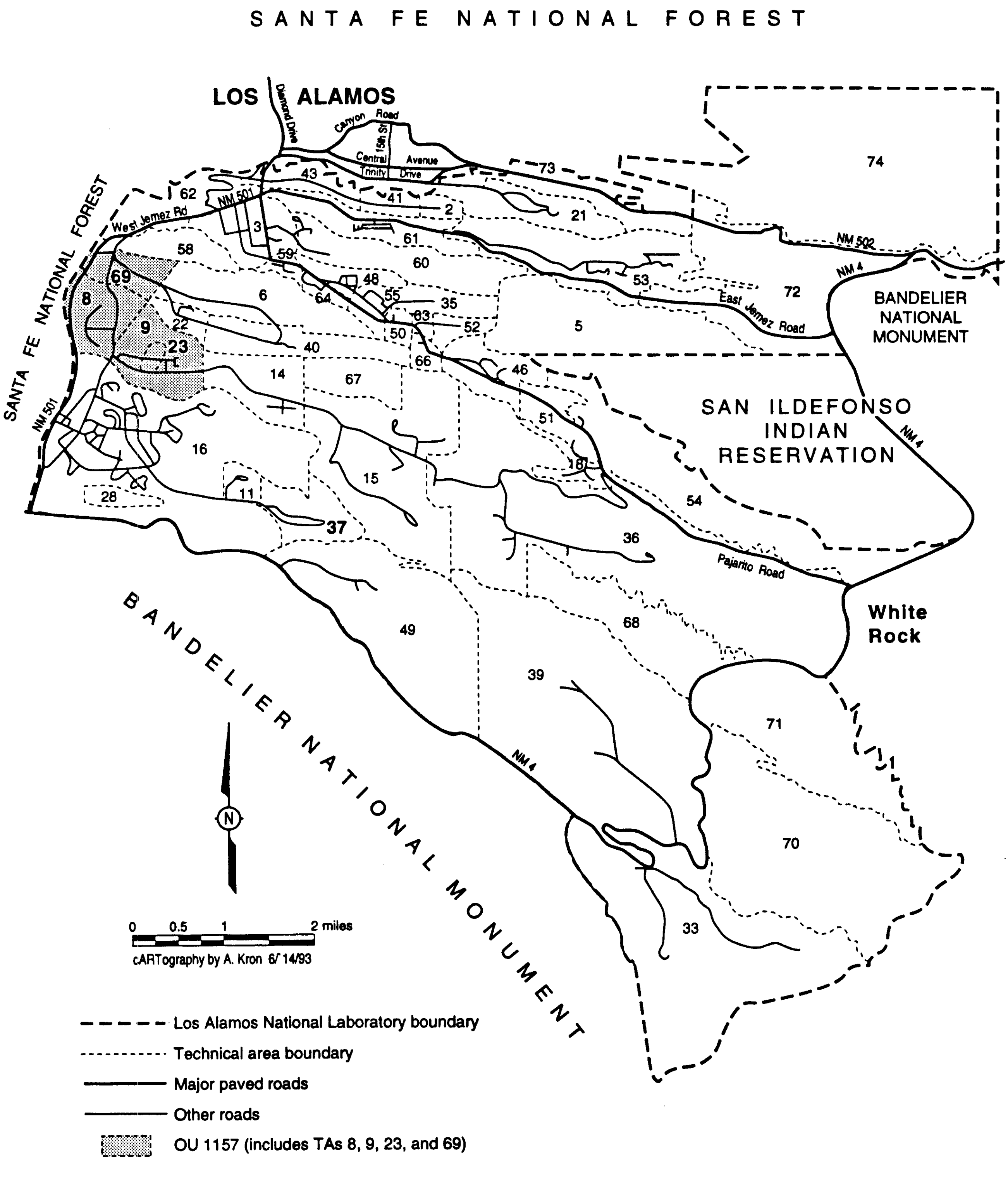


Figure 1-2. Location of Operable Unit 1157 with respect to Laboratory technical areas and surrounding landholdings.

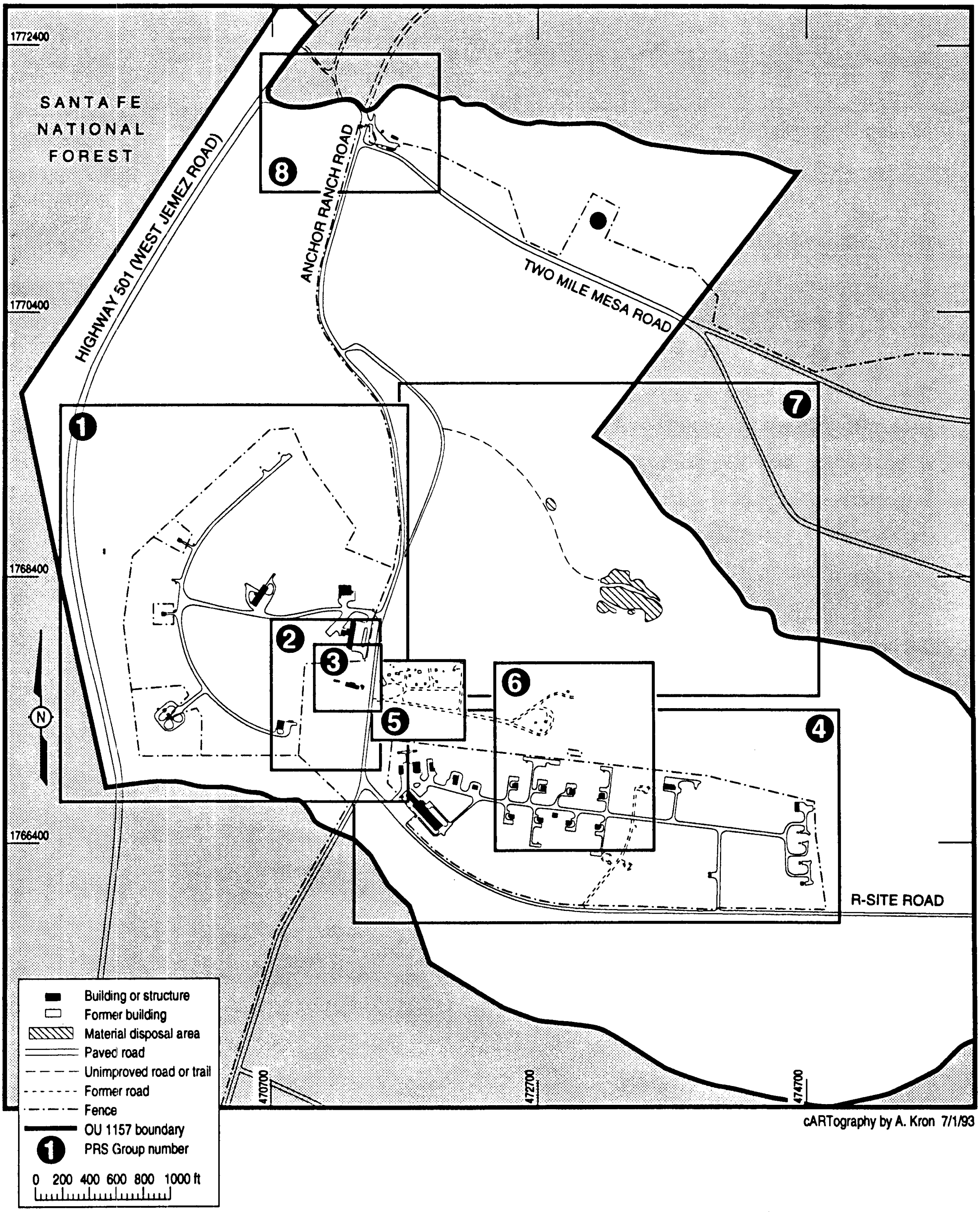


Figure 1-3. Location of PRS Group maps.

to removal from the site. Group 2 contains three PRSs associated with the World War II Gun-Firing Site. These include: the firing site itself; Material Disposal Area (MDA) Q where guns, projectiles, and other materials were buried in 1946; and a second, postulated burial site that has proved to be the original MDA Q. Group 3 includes 12 PRSs associated with a group of abandoned, wartime bunkers located just north of the Gun-Firing Site. This group includes drains, septic tanks, explosives-contaminated duct work, a waste storage vessel, and two fuel storage tanks. Group 4 includes 30 PRSs associated with existing, active facilities at TA-9 (New Anchor East). Most are sumps or septic tanks associated with explosives processing facilities but the group also includes five small waste storage areas. Group 5 includes 16 PRSs associated with the decommissioned area in TA-9 (Old Anchor East). Most of these PRSs are sumps or settling tanks but the group also includes an inactive oxidation pond and a decommissioned underground fuel tank. Also included in Group 5 is a decommissioned firing chamber that was used in connection with the Far Point firing site at TA-9. Group 6 includes six PRSs associated with four decommissioned explosives firing sites that were once present at TA-9 and TA-23. Group 7 consists only of MDA M, which is located north of Old Anchor East and south of Pajarito Canyon. Material Disposal Area M was used primarily for the disposal of construction debris—much of it from Old Anchor East—but also contains discarded chemical bottles and other items.

Group 8 includes three PRSs at TA-69, of which two are septic tanks and the third is an inactive incinerator, once used for the destruction of classified documents. Finally, Group 9 includes all of the AOCs, which are spread out within TAs 8 and 9. Table 1-3 briefly describes all of the PRSs in OU 1157 and lists the types of actions proposed for each PRS in this work plan. These actions are described in Section 4.1.

Figure 1-4 is provided to show how the site looked in 1947, after construction of the facilities during the war and prior to construction of the current TA-8 and TA-9 facilities.

TABLE 1-3

Proposed Status of Potential Release Sites in OU 1157

Group	PRS Number	Unit Type	NFA	VCA	Phase 1	Deferred	Comments
1	8-004(d)	Drain			X		Active
1	8-007	Resin Bed	X				Inactive
1	8-008(a)	Container Storage	X				PCB Transformer
1	8-008(b)	Container Storage	X				PCB Transformer
1	8-008(c)	Container Storage	X				PCB Transformer
1	8-008(d)	Container Storage	X				PCB Transformer
1	8-009(b)	Outfall	X				Active
1	8-009(c)	Outfall			X		Active
1	8-009(d)	Outfall			X		Active
1	8-009(e)	Outfall			X		Active
1	8-009(f)	Outfall			X		Active, new PRS
1	8-010(a)	Container Storage	X				Active
1	8-010(b)	Container Storage	X				Active
1	8-010(c)	Container Storage	X				Active
2	8-002	Firing Site			X		Abandoned Site
2	8-006(a)	Landfill			X		Inactive
2	8-006(b)	Landfill	X				Unconfirmed
3	8-001(a)	Off-gas System				X	Abandoned Bldg
3	8-001(b)	Off-gas System				X	Abandoned Bldg
3	8-003(a)	Septic System		X	X		Inactive
3	8-003(b)	Septic System	X				Inactive
3	8-003(c)	Septic System	X				Inactive
3	8-004(a)	Floor Drain				X	Abandoned Bldg
3	8-004(b)	Drainline				X	Abandoned Bldg
3	8-004(c)	Floor Drain				X	Abandoned Bldg
3	8-005	Container Storage		X	X		Inactive
3	8-009(a)	Drain and Outfall			X		Active
3	8-011(a)	UST	X				Decommissioned
3	8-011(b)	UST	X				Decommissioned
4	9-003(f)	Settling Tank	X				Decommissioned
4	9-004(a)	Settling Tank				X	Active
4	9-004(b)	Settling Tank				X	Active
4	9-004(c)	Settling Tank				X	Active
4	9-004(d)	Settling Tank				X	Active
4	9-004(e)	Settling Tank				X	Active
4	9-004(f)	Settling Tank				X	Active
4	9-004(g)	Settling Tank				X	Active
4	9-004(h)	Settling Tank				X	Active

TABLE 1-3 Continued

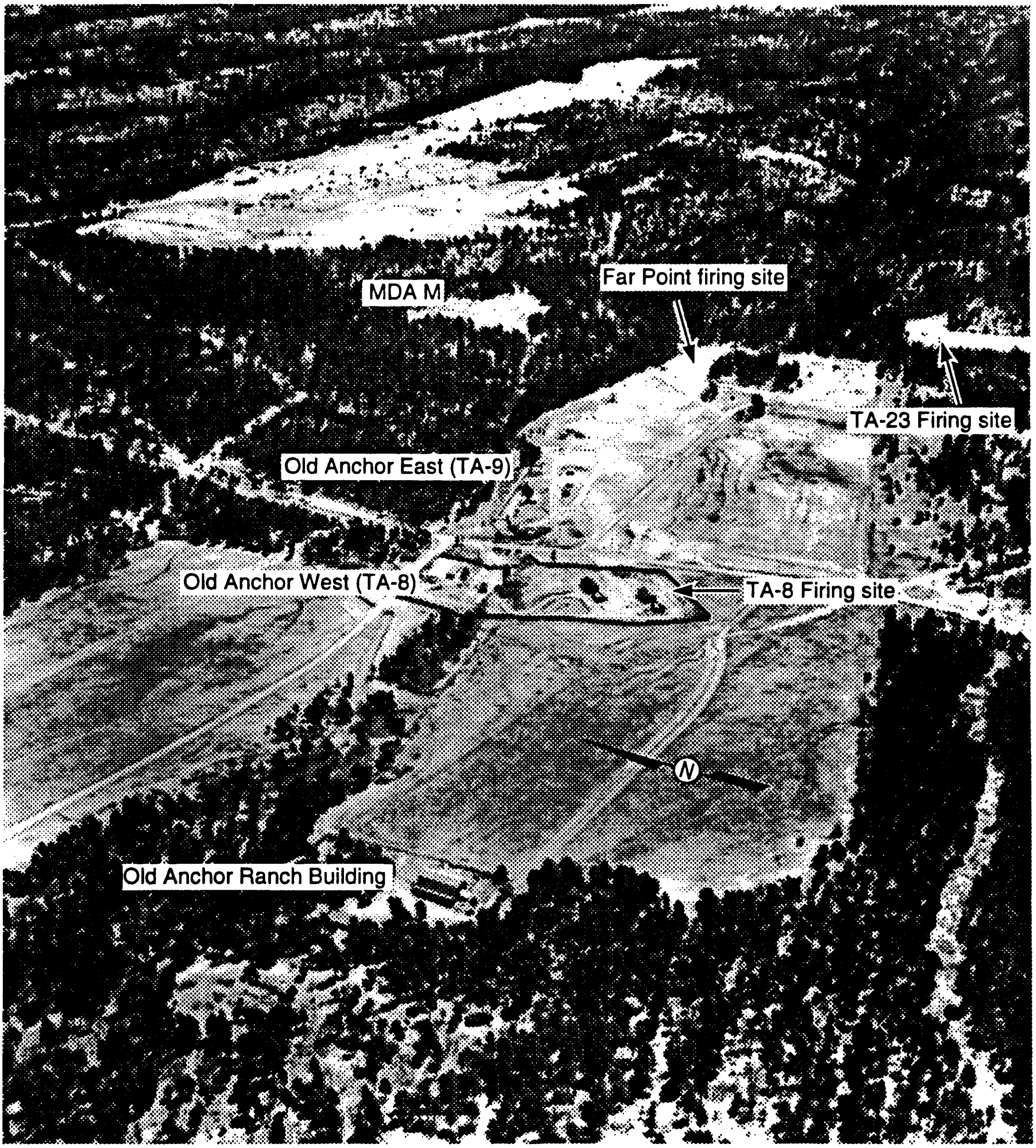
Proposed Status of Potential Release Sites in OU 1157

Group	PRS Number	Unit Type	NFA	VCA	Phase 1	Deferred	Comments
4	9-004(i)	Settling Tank				X	Active
4	9-004(j)	Settling Tank				X	Active
4	9-004(k)	Settling Tank				X	Active
4	9-004(l)	Settling Tank				X	Active
4	9-004(m)	Settling Tank				X	Active
4	9-004(n)	Settling Tank				X	Active
4	9-004(o)	Settling Tank				X	Active
4	9-005(b)	Septic System	X				Inactive
4	9-005(c)	Septic System	X				Inactive
4	9-005(e)	Septic System	X				Inactive
4	9-005(f)	Septic System	X				Inactive
4	9-005(g)	Septic System	X				Active
4	9-005(h)	Septic System	X				Inactive
4	9-007	Basket Pit	X				Inactive
4	9-009	Lagoon			X		Active
4	9-010(a)	Container Storage			X		Active
4	9-010(b)	Container Storage			X		Inactive
4	9-010(c)	Container Storage	X				Unconfirmed
4	9-011(a)	Container Storage	X				Removed
4	9-011(b)	Container Storage			X		Active
4	9-011(c)	Container Storage			X		Active
5	9-001(d)	Firing Site			X		Decommissioned
5	9-003(a)	Settling Tank			X		Decommissioned
5	9-003(b)	Settling Tank			X		Decommissioned
5	9-003(c)	Electrical Manhole	X				Decommissioned
5	9-003(d)	Settling Tank			X		Decommissioned
5	9-003(e)	Settling Tank			X		Decommissioned
5	9-003(g)	Settling Tank			X		Decommissioned
5	9-003(h)	Settling Tank			X		Decommissioned
5	9-003(i)	Settling Tank			X		Decommissioned
5	9-005(a)	Septic System			X		Removed
5	9-005(d)	Septic System		X	X		Abandoned
5	9-006	Septic System			X		Decommissioned
5	9-008(a)	Lagoon	X				Unconfirmed
5	9-008(b)	Oxidation Pond			X		Inactive
5	9-012	Waste Pit			X		Inactive
5	9-016	UST	X				Decommissioned
6	9-001(a)	Firing Site			X		Decommissioned
6	9-001(b)	Firing Site			X		Decommissioned
6	9-001(c)	Firing Site			X		Decommissioned

TABLE 1-3 Continued

Proposed Status of Potential Release Sites in OU 1157

Group	PRS Number	Unit Type	NFA	VCA	Phase 1	Deferred	Comments
6	9-002	Burn Pit			X		Decommissioned
6	9-014	Firing Site			X		Decommissioned
6	9-015	Electric Manhole	X				Decommissioned
7	9-013	Landfill			X		Inactive
8	69-001	Incinerator			X		Inactive
8	69-002(a)	Septic System	X				Active
8	69-002(b)	Septic System	X				Active
9	C-8-001	Field Test Building	X				Removed
9	C-8-002	Field Test Building	X				Removed
9	C-8-003	Carpenters Shop	X				Removed
9	C-8-004	Ranch House	X				Removed
9	C-8-005	Guest House	X				Removed
9	C-8-006	Guest House	X				Removed
9	C-8-007	Bunk House	X				Removed
9	C-8-008	Ranch Barn	X				Removed
9	C-8-009	Ranch Barn	X				Removed
9	C-8-010	Drum Storage			X		Removed
9	C-8-011	HE Storage	X				Removed
9	C-8-012	Carpenter Shop	X				Removed
9	C-8-013	Office Shop	X				Removed
9	C-8-014	Laboratory				X	Active
9	C-8-015	HE Magazine	X				Inactive
9	C-8-016	HE Magazine	X				Storage
9	C-8-017	Storage	X				Storage
9	C-8-018	Storage	X				Storage
9	C-8-019	Storage	X				Active
9	C-8-020	Disposal Area	X				Unconfirmed
9	C-9-001	Stained ground			X		Active
9	C-9-002	Buildings	X				Included in Grp. 5
9	C-9-003	Pump building	X				Included in Grp. 5
9	C-9-004	Oven building	X				Included in Grp. 5
9	C-9-005	X-unit Chamber	X				Included in Grp. 5
9	C-9-006	Magazines	X				Included in Grp. 5
9	C-9-007	Storage	X				Included in Grp. 5
9	C-9-008	UST	X				Included in Grp. 5
9	C-9-009	Oil stains	X				Active
9	C-9-010	Burning Pit	X				Included in Grp. 5
9	C-9-011	Burn area	X				Included in Grp. 5



Source: LAHM 1947 (12-0146); courtesy of Los Alamos Historical Museum photo archives.

Figure 1-4. 1947 Aerial photograph of OU 1157.

1.4 Organization of this Work Plan and Other Useful Information

This work plan generally follows the generic outline provided in Table 3-3 of the IWP (LANL 1992, 0768). Following this introductory chapter, Chapter 2 provides background information on OU 1157, which includes a description and history of the OU, a description of past waste management practices, and current conditions at technical areas in the OU.

Chapter 3 describes the environmental setting, and Chapter 4 presents the technical approach to the field investigation. Because the technical approach is specific to this work plan, the details in Chapter 4 are slightly different than those proposed in the generic IWP outline. Chapter 5 contains an evaluation of all the PRSs in OU 1157, which includes a description and history of each PRS; a conceptual exposure model; remediation alternatives and evaluation criteria; and data needs and data quality objectives. Chapter 6 of this work plan includes the sampling plans for each PRS proposed for Phase I sampling. Chapter 6 was designed as a stand-alone document for use by the field teams when executing the sampling activities. Chapter 7 provides a description of each PRS proposed for no further action and the basis for that recommendation.

The body of the text is followed by five annexes, which consist of project plans corresponding to the program plans in the IWP: project management, quality assurance, health and safety, records management, and public involvement. Appendix A contains a list of contributors to this work plan.

Both English and metric units are used in this document, depending upon which unit of measurement is commonly used in the field being discussed. For example, English units are used in text pertaining to engineering, and metric units are often used in discussions referring to sampling techniques and analysis, geology, and hydrology. When information is derived from other published reports, the units are consistent with those used in that report. Table 1-4 is a conversion table provided for convenience.

A list of acronyms precedes Chapter 1. Definitions of unfamiliar terms specific to this work plan can be found in the glossary. A glossary of generic unfamiliar terms is provided in the IWP (LANL 1992, 0768).

TABLE 1-4

Approximate Conversion Factors for Selected SI (Metric) Units

Multiply SI (Metric) Unit	by	To Obtain US Customary Unit
Cubic meters (m^3)	35	Cubic feet (ft^3)
Centimeters (cm)	0.39	Inches (in.)
Meters (m)	3.3	Feet (ft)
Kilometers (km)	0.62	Miles (mi)
Square kilometers (km^2)	0.39	Square miles (mi^2)
Hectares (ha)	2.5	Acres
Liters (L)	0.26	Gallons (gal.)
Grams (g)	0.035	Ounces (oz)
Kilograms (kg)	2.2	Pounds (lb)
Micrograms per gram (mg/g)	1	Parts per million (ppm)
Milligrams per liter (mg/L)	1	Parts per million (ppm)
Celsius (^{o}C)	9/5 + 32	Fahrenheit (^{o}F)

References

DOE (US Department of Energy), October 6, 1989. "Comprehensive Environmental Response, Compensation, and Liability Act Requirements," DOE Order 5400.4, Washington, DC. (DOE 1989, 0078)

EPA (US Environmental Protection Agency), May 1989. "Interim Final RCRA Facility Investigation (RFI) Guidance, Volume I of IV, Development of an RFI Work Plan and General Considerations for RCRA Facility Investigations," EPA/530-SW-89-031, OSWER Directive 9502.00-6D, Office of Solid Waste, Washington, D.C. (EPA 1989, 0088)

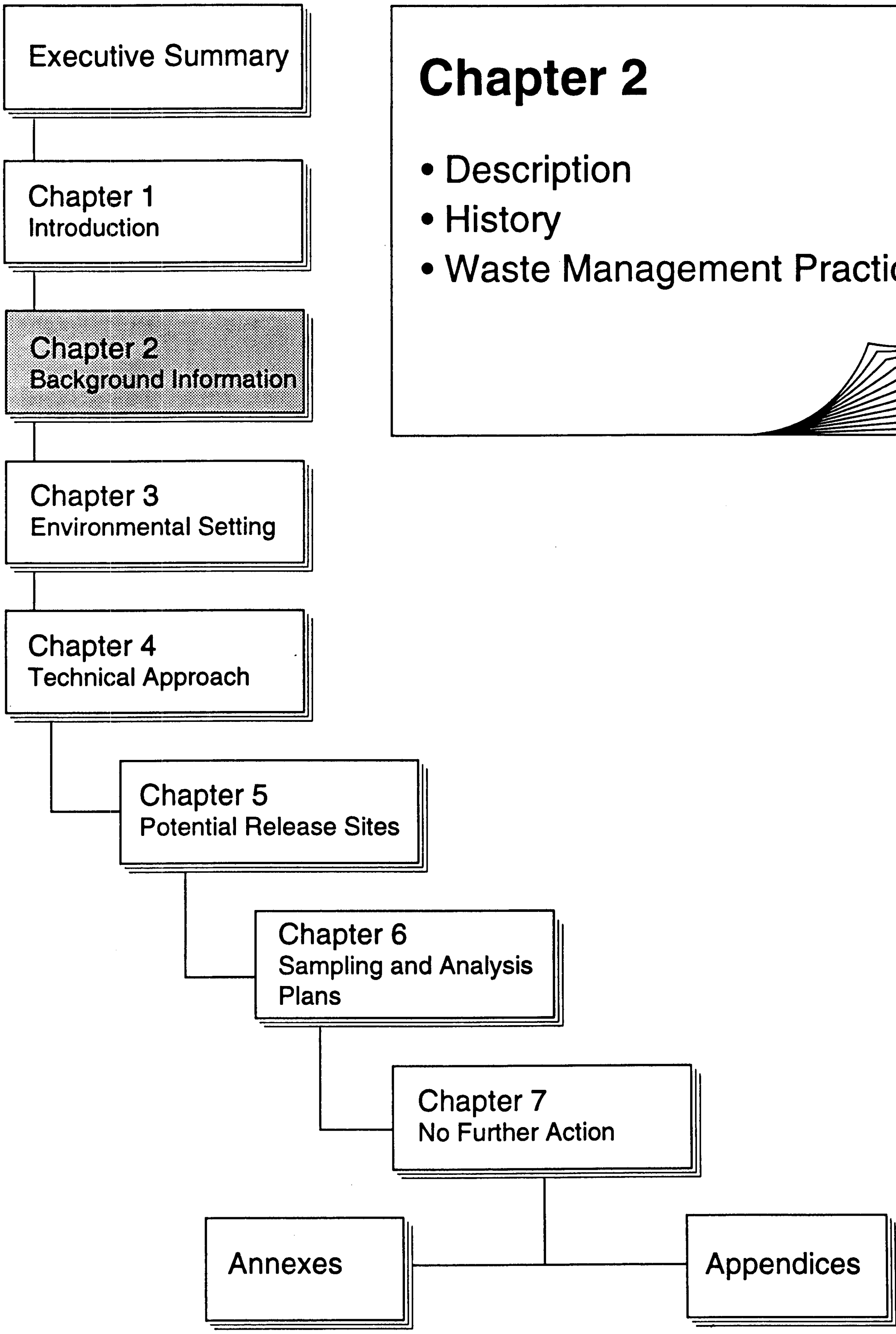
EPA (US Environmental Protection Agency), April 10, 1990. RCRA Permit No. NM0890010515, EPA Region VI, issued to Los Alamos National Laboratory, Los Alamos, New Mexico, effective May 23, 1990, EPA Region VI, Hazardous Waste Management Division, Dallas, Texas. (EPA 1990, 0306)

EPA (US Environmental Protection Agency), July 27, 1990. "Corrective Action for Solid Waste Management Units (SWMUs) at Hazardous Waste Management Facilities," proposed rule, Title 40 Parts 264, 265, 270, and 271, Federal Register, Vol. 55. (EPA 1990, 0432)

LAHM (Los Alamos Historical Museum) 1947, Photo number P1990-40-1-3148, ER ID No. 15139, Los Alamos, New Mexico (LAHM 12-0146)

LANL (Los Alamos National Laboratory), November 1992. "Installation Work Plan for Environmental Restoration," Revision 2, Los Alamos National Laboratory Report LA-UR-92-3795, Los Alamos, New Mexico. (LANL 1992, 0768)

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report No. LA-UR-90-3400, prepared by International Technology Corporation under Contract 9-XS8-0062R-1, Los Alamos, New Mexico. (LANL 1990, 0145)



Chapter 2

- Description
- History
- Waste Management Practices

2.0 BACKGROUND INFORMATION FOR OPERABLE UNIT 1157

Operable Unit 1157 encompasses TAs-8, -9, -23, and -69 and contains some of the earliest Manhattan Project facilities built at Los Alamos. At various times, the facilities of OU 1157 have been used for gun-firing experiments, x-ray work, and various explosives development and testing activities. Technical Area 8 occupies the southwestern portion of the OU and is bounded, for the purposes of this work plan, by Anchor Ranch Road on the east and by State Road 501 and the Jemez Mountains on the west. The official TA-8/TA-9 boundary has been changed since the original inception (in 1943) of TA-8 and TA-9 and is shown in the figures. Technical Area 8, which is known as Anchor West, was the site of the original Anchor Ranch homestead, the Manhattan Project Gun-Firing Site, referred to as Old Anchor West, as well as, MDA Q and other postwar facilities. The area is also known as GT Site, named for one of the workers, Gerald Tinney. Figure 2-1 is an aerial photograph showing TA-8 in 1946. Technical Area 9 lies east of Anchor Ranch Road and encompasses three Manhattan Project sites known as Old Anchor East, the Far Detonation Point (also known as Far Point), and Nu Site. Prior to its incorporation into TA-9 in 1950, Nu Site was also known as TA-23. Technical Area 9 also contains MDA M and the postwar site known as New Anchor East. The developed areas of both TA-8 and TA-9 lie on a broad mesa that is bounded on the north by Pajarito Canyon and on the south by Cañon del Valle. The mesa is drained by three tributaries to Pajarito Canyon. Technical Area 69 is located on Two-Mile Mesa, across Pajarito Canyon to the north of TA-8 and TA-9. Two-Mile Mesa, in turn, is bounded by Two-Mile Canyon on the north. Figure 2-2 shows the technical areas and the physiographic and cultural features of the OU.

2.1 Description

Generally, the terrain within OU 1157 slopes downward to the east, and much of it is heavily wooded. Anchor Ranch Road runs from north to south, roughly through the center of the OU. A homestead, known as Anchor Ranch, originally occupied some of the land on OU 1157 from the early 1900s to 1943. At the time the War Department acquired Anchor Ranch, there were eight log/adobe structures on the site. The original buildings of the Anchor Ranch homestead were located among the trees on the western fringes of a large meadow in what is

Source: LAHM 1946 (12-0147); courtesy of Los Alamos Historical Museum photo archives.

Figure 2-1. 1946 view to east of Old Anchor West (TA-8) and Old Anchor East (TA-9).

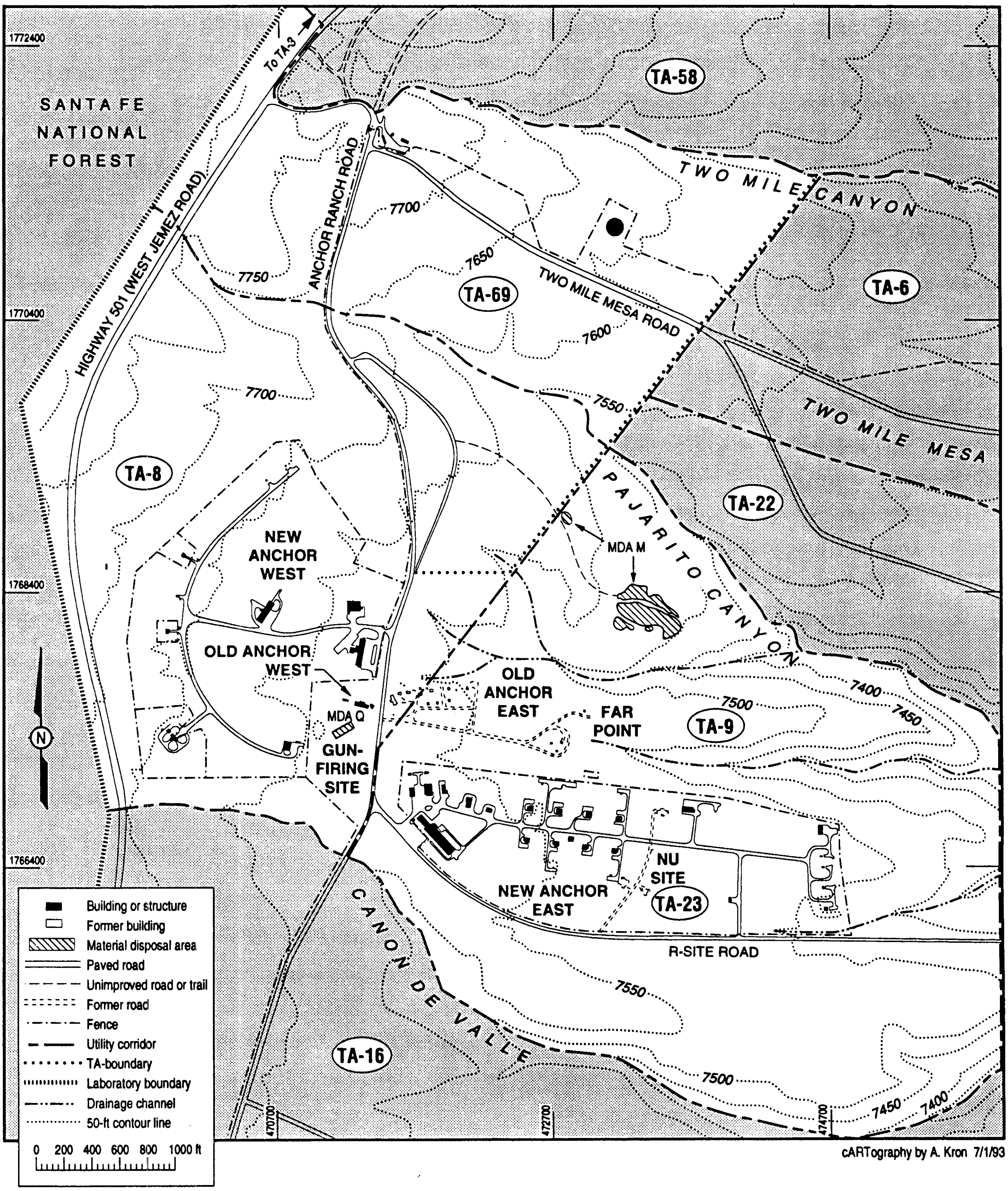


Figure 2-2. Map of OU 1157 showing physiographic and cultural features.

now TA-8. Anecdotal information suggests that some of the buildings were used for recreational purposes during the war and also that, for a time in 1944 prior to the construction of dedicated facilities, one of the buildings housed a medical x-ray unit that was used to examine various objects for manufacturing flaws and for other purposes (LANL 1990, 0145; Jones 1993,12-0078; LANL 1944 to present, 12-0003).

In 1943, a gun-firing site was established west of Anchor Ranch Road (Hawkins et al. 1983, 0850; LANL 1944 to present, 12-0003). Structures included buried concrete bunkers, which housed control rooms and various laboratory and storage facilities, and four wooden structures used for office space, storage space, and a carpenter's shop. South of the control bunkers, two gun mounts were installed and, in front of them to the southwest, two sand butts were emplaced to catch experimental projectiles. The gun mounts were covered by rail-mounted, movable wooden sheds. The Gun-Firing Site was abandoned in 1946, and, at various times between 1949 and 1968, the wooden structures were removed. In 1992, the only remaining relics of the wartime activities were the now abandoned concrete bunkers, the concrete pads that supported the gun mounts, and two piles of sand that mark the locations of the sand butts.

In 1949 and 1950, modern TA-8 was established north and west of the Gun-Firing Site. During the initial construction phase, wartime office building TA-8-9 was moved from its original location north of the bunkers to a location near the northernmost of the gun mounts to make way for the new office building TA-8-21. Seven major structures were erected at this time, along with utility buildings, magazines, sewer lines, septic tanks, electric utilities, and other support facilities. Building TA-8-70 was added in 1960. These new buildings were used primarily for x-ray work and, among other features, contained photo-processing laboratories.

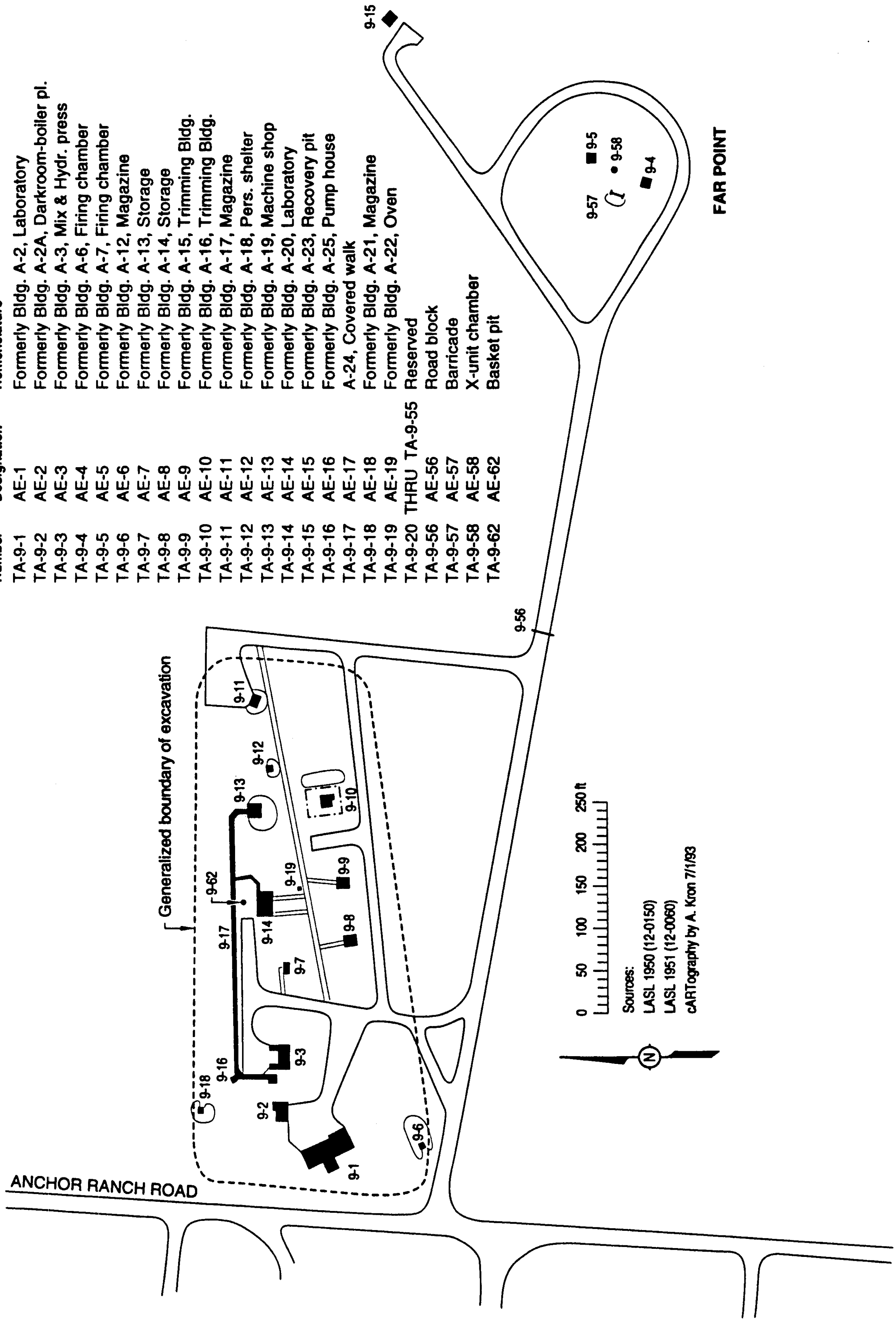
Old Anchor East, the original TA-9, was established in 1943 to house explosives production, development, and test experiments, and x-ray work. The main explosives manufacturing and x-ray facilities were located east and north across Anchor Ranch Road from the Gun-Firing Site. There were eight major structures along with associated sewers, septic tanks, manholes, and electric and steamheating utilities. A covered walkway connected three of the major structures, with steam pipes running under the roof. Figure 2-3 shows the layout of the Old Anchor Site East buildings. Some of the structures housed firing chambers and were shielded with earthen berms and/or covered with mounds of dirt. Old Anchor Site East was returned to the Atomic Energy Commission in 1957; the permission to decommission it was given in 1959 and the buildings and substructures were removed between 1960 and 1965 (LASL 1957, 12-0079; Hodler 1959, 12-0031; Wingfield and Courtright 1960, 12-0080; Wingfield 1960, 12-0032; Sizer 1961, 12-0092).

Far Point, which consisted of a pair of shelters each buried in a mound, was established in 1944 to conduct various explosives detonation experiments. These explosives tests were conducted in the open, west of the mounds. Far Point was decommissioned in 1959 (Jones 1993, 12-0082). Figure 2-3 shows the layout of the Far Point Firing Site structures.

Nu Site (TA-23) was established in 1943/44 and was used for explosives testing. The site contained one firing point and four small structures and, during World War II, explosives tests of up to 135 lb of high explosives (HE) were conducted regularly. See Figure 2-4 for the former building locations at NU site. The firing site was located just west of Building TA-9-76. The site was decommissioned in 1949/50 in preparation for the construction of New Anchor East and, at that time, was incorporated into TA-9 for administrative purposes (LANL 1990, 0145; LANL 1944 to present, 12-0003).

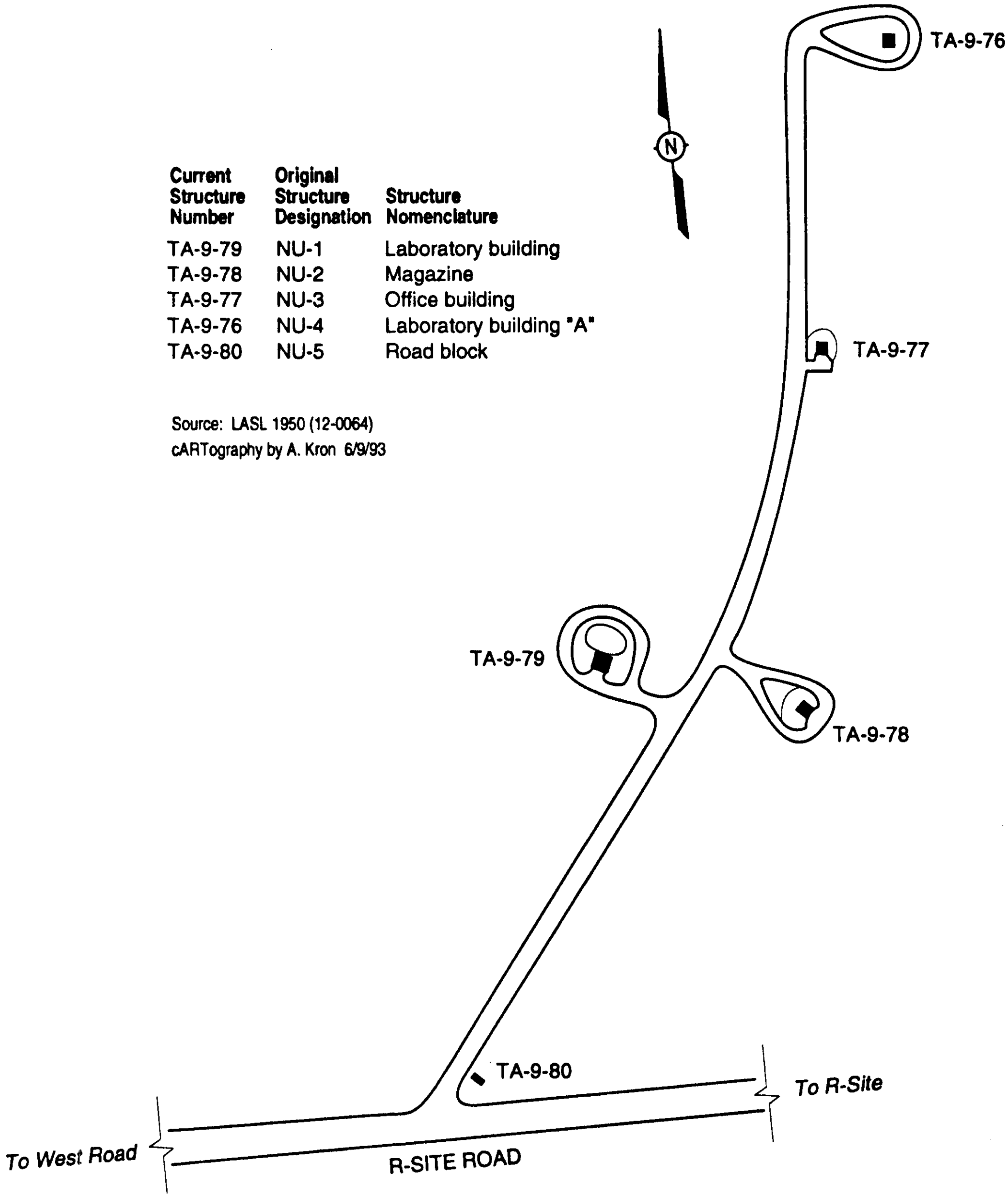
Construction of New Anchor East, TA-9, began in 1950, immediately following the completion of construction activities at TA-8. Approximately 30 new structures were erected, together with associated settling tanks, septic tanks, drain lines, manholes, and other support facilities (LANL 1944 to present, 12-0003). Generally, the site, which is still active, has been used for the development, production, compatibility studies, and testing of explosives.

Technical Area 69, which lies north of TA-8 and TA-9, was created in 1989. It incorporates a number of small structures at the intersection of Anchor Ranch Road and Two-Mile Mesa Road as well as structures on what was the northwest section of TA-6. Prior to 1989, the structures now in TA-69 were designated with



Structure Number	Structure Designation	Structure Nomenclature
TA-9-1	AE-1	Formerly Bldg. A-2, Laboratory
TA-9-2	AE-2	Formerly Bldg. A-2A, Darkroom-boiler pl.
TA-9-3	AE-3	Formerly Bldg. A-3, Mix & Hydr. press
TA-9-4	AE-4	Formerly Bldg. A-6, Firing chamber
TA-9-5	AE-5	Formerly Bldg. A-7, Firing chamber
TA-9-6	AE-6	Formerly Bldg. A-12, Magazine
TA-9-7	AE-7	Formerly Bldg. A-13, Storage
TA-9-8	AE-8	Formerly Bldg. A-14, Storage
TA-9-9	AE-9	Formerly Bldg. A-15, Trimming Bldg.
TA-9-10	AE-10	Formerly Bldg. A-16, Trimming Bldg.
TA-9-11	AE-11	Formerly Bldg. A-17, Magazine
TA-9-12	AE-12	Formerly Bldg. A-18, Pers. shelter
TA-9-13	AE-13	Formerly Bldg. A-19, Machine shop
TA-9-14	AE-14	Formerly Bldg. A-20, Laboratory
TA-9-15	AE-15	Formerly Bldg. A-23, Recovery pit
TA-9-16	AE-16	Formerly Bldg. A-25, Pump house
TA-9-17	AE-17	A-24, Covered walk
TA-9-18	AE-18	Formerly Bldg. A-21, Magazine
TA-9-19	AE-19	Formerly Bldg. A-22, Oven
TA-9-20	THRU TA-9-55	Reserved
TA-9-56	AE-56	Road block
TA-9-57	AE-57	Barricade
TA-9-58	AE-58	X-unit chamber
TA-9-62	AE-62	Basket pit

Figure 2-3. Old Anchor Site East (buildings removed).



Current Structure Number	Original Structure Designation	Structure Nomenclature
TA-9-79	NU-1	Laboratory building
TA-9-78	NU-2	Magazine
TA-9-77	NU-3	Office building
TA-9-76	NU-4	Laboratory building "A"
TA-9-80	NU-5	Road block

Figure 2-4. Technical Area 23 (Nu Site).

either TA-0 or TA-6 numbers. The structures include a guard station, two trailers used for office space, an inactive incinerator building, and other miscellaneous facilities (LANL 1944 to present, 12-0003).

2.2 History

In 1943, the War Department acquired the site of the Anchor Ranch homestead for development of the gun-assembled nuclear weapon known as Little Boy. Various x-ray and explosives development, production, and testing activities were also conducted by the Ordnance Division of the U.S. Army, which was responsible for the gun-assembly and implosion programs (Hawkins et al. 1983, 0850).

Anchor West (TA-8) was an attractive site for the gun work because it offered a large flat area where specially designed naval guns could be mounted and fired. In addition, on the northern fringe of the gun site, control bunkers could be built into the southern wall of a small arroyo. Construction of the control bunkers and the associated wooden structures began in June 1943. The buried structures were completed in October 1943, the remainder of the buildings by March 1944, and office building AW-9 (TA-8-9) in December 1944. Figure 2-5 shows the location of Old Anchor West and the Gun-Firing Site. Although the naval guns to be used for the main experimental program were not delivered until March 1944, operation of the Gun-Firing Site began in the previous September when a 3-in. naval anti-aircraft gun was used in tests for instrumentation, propellants (cordite and others), and various preliminary projectile designs (Hawkins et al. 1983, 0850). Propellant was placed behind the projectiles when firing, and none of the projectiles used at the site are thought to have contained explosives.

The guns used at Anchor West were mounted on one or the other of two concrete pads, oriented roughly northeast to southwest, which are still in place. Each of the gun mounts was covered by a rail-mounted shed for weather protection and security purposes. Before firing a shot, the shed was towed out of the way by a truck, and the projectile was fired into a sand-filled, wooden butt located just a few yards southwest of the gun (Jones 1993, 12-0082). The projectiles were made of various combinations of steel, tungsten carbide, boron carbide, lead, copper, and depleted uranium and were recovered for detailed

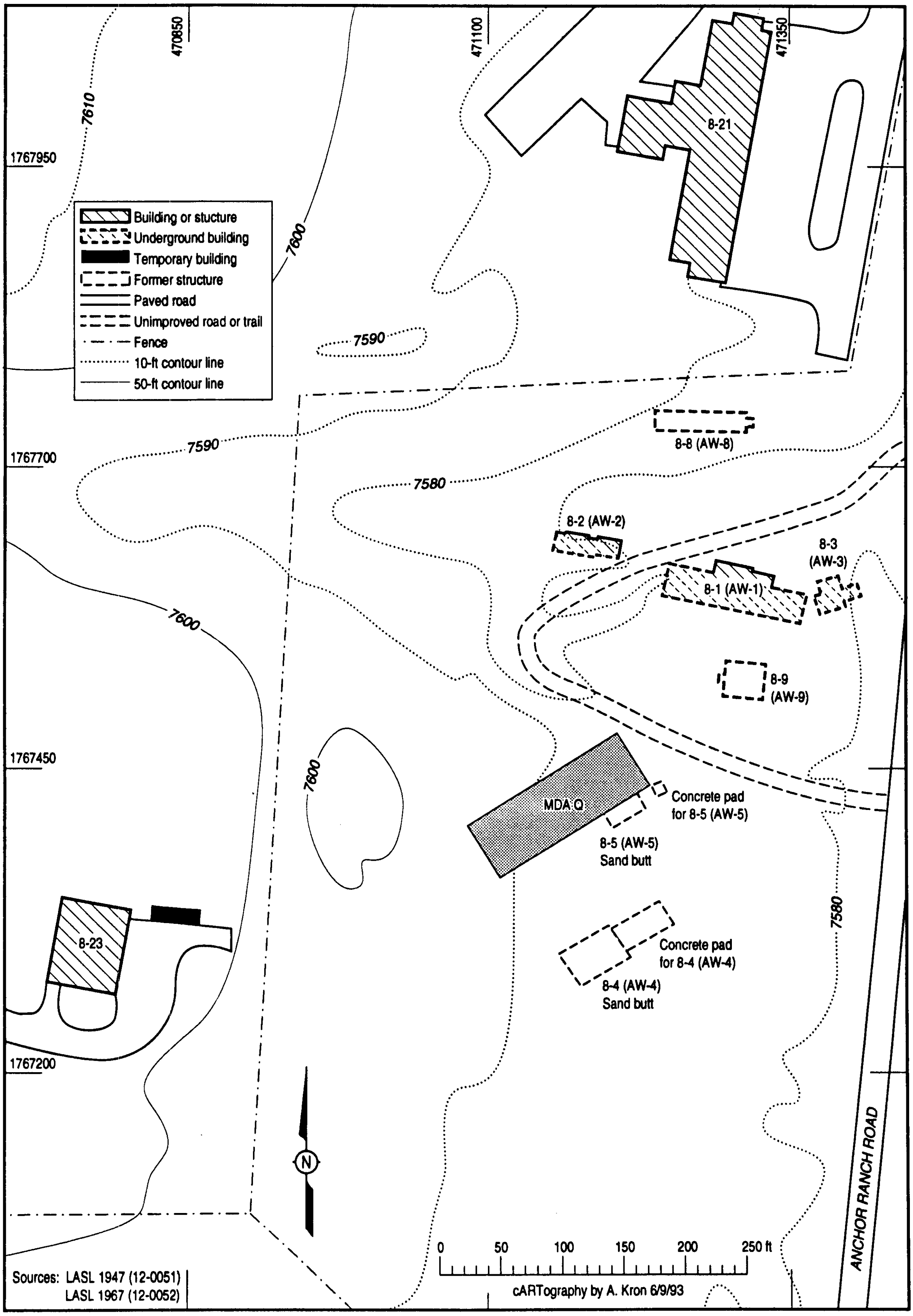


Figure 2-5. Location of Old Anchor West and Gun-Firing Site.

examination. In the latter stages of testing, projectiles were sometimes fired into targets placed in the sand butt and, on occasion, the projectile and/or the target would fracture, reportedly scattering fragments over distances of up to 75 yd (Jones 1993, 12-0047).

In 1945, prototypes of the Little Boy weapon were tested at the Gun-Firing Site. In these tests, depleted uranium was used in place of the enriched uranium contained in the actual weapon. Because the two materials have virtually the same mechanical properties, the nation's small supply of enriched uranium was conserved, and there was no risk of contamination of the site. Testing occasionally was performed in 1945 using small quantities of polonium and beryllium; however, there are no indications that any of these materials ever escaped the targets (Jones 1993, 12-0047).

In the implosion experiments conducted by the Ordnance Division, division personnel gathered data on the detonation of small, spherical charges and also developed techniques for using x-rays as a diagnostic tool (Hawkins et al. 1983, 0850). This work was primarily conducted across the road at Old Anchor East and at sites outside OU 1157; however, some of the small-charge experiments were also conducted in laboratories in bunker buildings AW-1, -2, and -3 (TA-8-1, -2, and -3) at TA-8. A 1967 memo suggests that small amounts of enriched uranium were used in the experiments at AW-1 (Barnett 1967, 12-0013).

Gun testing at Anchor Ranch was not resumed after the War. The gun weapon, although reliable, required large quantities of enriched uranium, and the program was abandoned in favor of the development of implosion weapons. In 1946 the naval guns and various other items were buried in a pit. One of the gun mounts was recovered in 1947 for use in research that was being conducted in Idaho. During a 1964 effort to locate waste disposal sites at the Laboratory, individuals who had witnessed the burial at TA-8 indicated the burial location was next to the northernmost sand butt. Although two inert steel projectiles exposed on the surface provided strong evidence of the location of the burial site, a pipe detector further confirmed the location, which has been designated as MDA Q (Courtright 1964, 12-0008).

New construction began at TA-8 in 1949-50 to house Group X-1 (later GMX-1), which had been developing x-ray techniques at a location outside OU 1157. In conjunction with this construction, the gun sheds were removed and, in order to make way for the new Building TA-8-21, the Wartime office building AW-9 was moved onto the old gun site. In addition, several of the original ranch buildings were removed to make way for the new construction, and the rest were abandoned in place (LANL 1944 to present, 12-0003).

Most of the structures erected at TA-8 during the 1949-50 period are still in use. The twelve new buildings contained office space, photographic-processing labs, and laboratories devoted to various types of x-ray work, some involving the use of contained radioactive sources. In addition to these buildings, septic and drainage systems were installed, along with water and electric utilities, which included nine electric transformer stations. One of these transformer stations (TA-8-38) was decommissioned in 1968, and three others (TA-8-72, -76, and -77) were decommissioned from 1986 to 1987. Five other 1950-era transformers (TA-8-35, -36, -37, -78, and -79) containing PCBs were replaced with modern units in 1986-87 (LANL 1944 to present, 12-0003; LANL 1990, 0145).

Also during the war, Old Anchor East, now TA-9, was established across Anchor Ranch Road from the Gun-Firing Site. The main explosives manufacturing and x-ray facilities were next to Anchor Ranch Road, with the test-firing facilities several hundred yards to the east in an open meadow. The facilities at Old Anchor East included eight major buildings, which contained laboratories, offices, machine shops, and storage areas. Some of the buildings served as explosives magazines, AE-6, -11, and -18, and, in two others, AE-9 and -10, explosive assembles were prepared for testing. In 1945, there was a facility upgrade that included: an addition to the casting facility; a steam oven that would handle up to 400 lb of explosives (Stout 1945, 12-0084); a covered walkway from the casting building to the ovens; and a new boiler for the steam supply at Anchor East (LANL 1944 to present, 12-0003). Activities of this type continued at Old Anchor East after the War until the early 1950s when the modern TA-9 was constructed.

Beginning in 1950, the activities that had been conducted at Old Anchor East were moved to the New Anchor East and, in 1957, the buildings at Old Anchor Site East were declared excess real property and decommissioned (Hodler 1959, 12-0031; Wingfield and Courtright 1960, 12-0080). Reusable structures were removed in 1957 or abandoned in place and removed in 1959. Major projects to burn the remaining buildings to eliminate HE contamination and to remove associated drains, sumps, pipes, and debris were conducted in 1960 and in 1965. Buildings known to contain radioactive contamination were removed and disposed of at Mesita del Buey. When the excavations were complete, the remaining holes were filled and the entire area was graded. Soil testing indicated no explosives contamination remained (Courtright 1961, 12-0033; Blackwell 1959, 12-0085; Penland 1959, 12-0086; Baytos 1965, 12-0028; Baytos 1965, 12-0037). In 1992, only broken concrete, bricks, bits of plumbing pipe, some burn pits, and some of the manholes remained at Old Anchor East. Since 1965, the surface has been disturbed numerous times for the installation of various cable, electrical, and communication lines.

During the war, there were three firing sites in the area encompassed by the present TA-9: two at Old Anchor East and one at Nu Site (TA-23). Structure AE-15 (TA-9-15) at Far Point consisted of an underground steel-lined pit with a heavy roof that was used for recovery shots. This structure was abandoned in the spring of 1945 for similar but larger facilities at TA-12 and TA-14 (outside OU 1157) and then was decommissioned in 1965 (LANL 1944 to present, 12-0003; LASL 1949, 12-0041). At the second Anchor East location, also part of Far Point, shots were fired in the open, next to a pair of buried control rooms. Far Point was abandoned in the late 1940s because the structural integrity of the control rooms had deteriorated due to repeated shock loading and was decommissioned in 1965 (Jones 1993, 12-0078). The firing site at Nu Site (TA-23) was located south of Far Point. The original location can be observed in Figure 2-4, which shows the loop road that circled the firing site (LASL 1958, 12-0087) and four small structures associated with this firing site. During and after the war, Nu Site was used for explosives testing. Postwar activities, in particular, resulted in contamination with HE, beryllium, and heavy metals such as ^{238}U, mercury, cadmium, and lead. In 1949, Nu Site was decommissioned, and its buildings were removed in 1952 (LANL 1944 to present, 12-0003; Harris 1993, 12-0088).

New Anchor East consists of a collection of permanent structures that range from laboratory/office building combinations to process and development buildings, a pressing facility, a machining building, a carpenter shop, compressed gas- and solvent-storage buildings, magazines for HE storage, and ovens. Many of the buildings have associated settling tanks and septic tanks (LANL 1944 to present, 12-0003; LASL 1957, 12-0079; Hodler 1959, 12-0031). The overall mission of the present Explosive Technology Group M-1, (previously known as WX-2 and GMX-2), which occupies the facility, has not changed significantly over the last four decades. The group synthesizes and formulates energetic materials, tests their sensitivity and performance, and monitors their compatibility with other weapons components.

The oldest structure at TA-69 is a guard station (TA-69-1) that has been occupied since 1955 and is served by Septic Tank TA-69-9 (LANL 1944 to present, 12-0003). The other notable structure is an inactive incinerator building (TA-69-3) that was built in 1959 to destroy such classified documents as computer listings. The exact date of suspending operations at the incinerator is unknown but probably occurred in the late 1970s when large-format computer output became obsolete (Harry 1992, 12-0045; Harry 1992, 12-0053). Office trailers TA-69-2 and TA-69-11 were installed between 1986 and 1989. Trailer TA-69-2 is served by Septic Tank TA-69-10, and Trailer TA-69-11 does not have any sanitary facilities (LANL 1944 to present, 12-0003).

2.3 Waste Management Practices

A tremendous effort was devoted to the development, manufacture, and testing of HE at Old Anchor East (TA-9) and Anchor West (TA-8) during World War II. Pure HE was formulated (mixed with other compounds) to produce melt-cast, and in 1952, plastic-bonded explosives, which were pressed and machined for incorporation into weapon components (Harris 1993, 12-0024). Because of insufficient awareness of proper waste collection and disposal methods, the research facilities became contaminated with explosives, chemicals, and in a few areas, radiation (Harry 1992, 12-0029). Although no procedures were found that described the method of disposal, it was a common practice to collect process waste and detonate it at a local firing site.

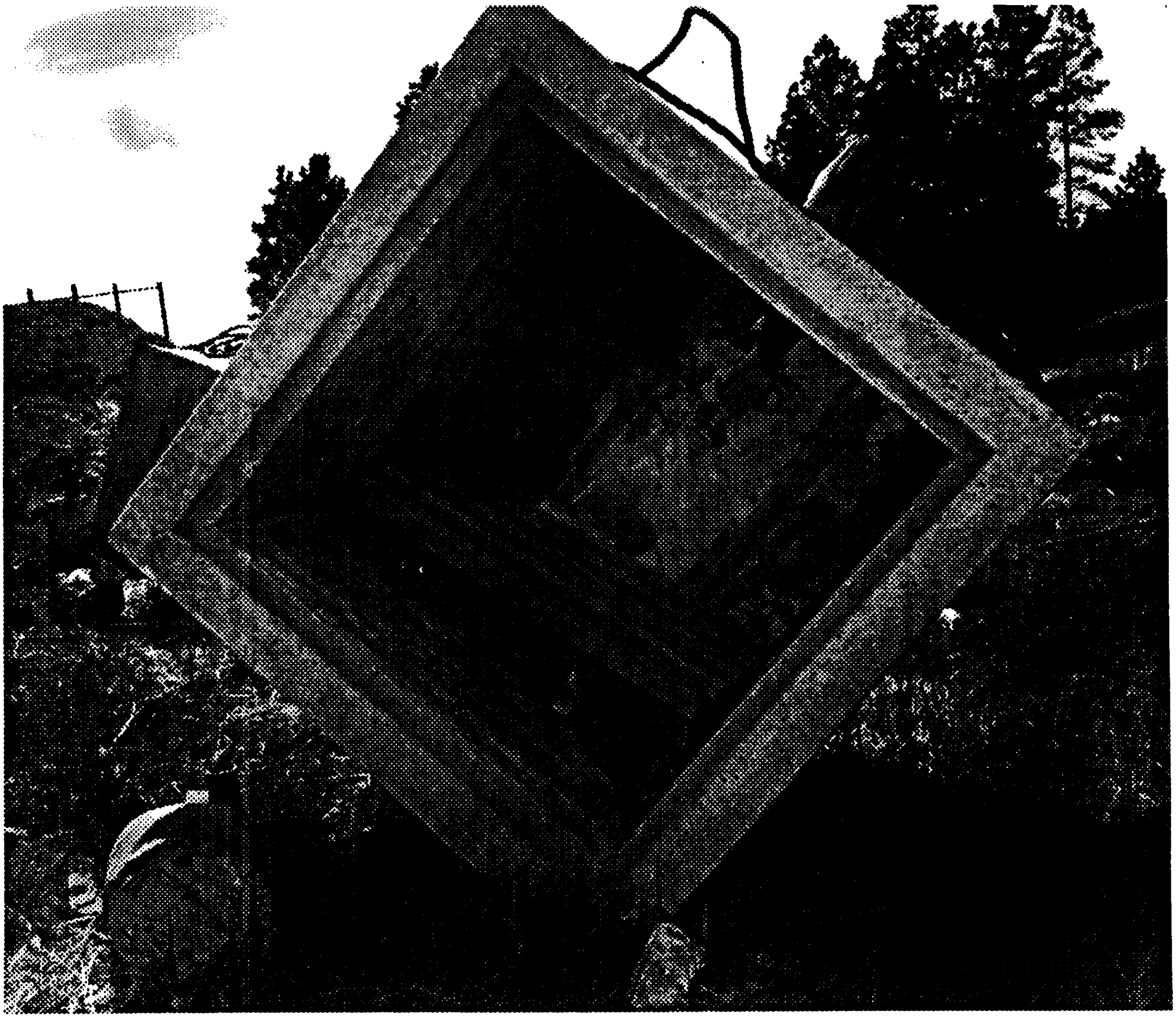
The aqueous HE-contaminated waste was managed through industrial waste lines, sumps, a basket pit, and settling tanks. Sanitary sewage was handled by a separate system of drains, pipe lines, and tanks. From 1943 to about 1950, aqueous explosive-contaminated waste was poured into sumps that lead to settling tanks or basket pits. There is no record of procedures indicating how these facilities were cleaned during that period. However, it was reported that a basket pit receiving waste from one laboratory was emptied, cleaned, and reused (Harry 1992, 12-0029). High explosive residues can be seen inside tanks and pits in photographs taken during the removal of those facilities in 1965. Figure 2-6 is a 1965 photograph showing the removal of a basket pit. Figure 2-7 shows extensive HE residue on the bottom of a settling tank that was removed. Aqueous chemical waste was often neutralized, diluted, and poured directly into the industrial drains. Some buildings had dedicated drains for corrosive chemical waste, such as acid or basic solutions, and for waste from photo-processing and fluorescent penetrant laboratories. Through the lessons learned at Old Anchor East and Anchor West, significant improvements were incorporated into the waste handling facilities at the new TA-9.

Radioactive waste was generated primarily from gloves, kimwipes, and paper used to handle depleted uranium or parts containing depleted uranium, and from rags used to clean contaminated equipment. The procedure used for collecting and disposing of radioactive waste in the 1940s is not known (Harris 1993, 12-0097). Procedures used today date back to the early 1950s. The radioactive waste is kept separate, packaged in plastic bags, and stored either in cardboard boxes (TA-8 radiography laboratories) or metal containers (TA-9 facilities). An identifying hazard label is attached to the containers, which are picked up and disposed of by Group EM-7.

Most of the contamination occurred at Old Anchor East (TA-9) and at Anchor West (TA-8). The buildings at Old Anchor East were evaluated for HE, toxic chemicals, and radioactive contamination (Blackwell 1959, 12-0085). Afterwards, buildings and associated substructures at these facilities were either burned and removed or simply removed and buried off-site (Wingfield and Courtright 1960, 12-0080). The removal was followed by a mass cleanup of debris and recontouring of the soil (Courtright 1961, 12-0033; Courtright 1965, 12-0091; Sizer 1961, 12-0092; Reider 1965, 12-0093). The general boundary of the excavated area is shown on Figure 2-3.

Source: LANL 1965 (12-0148)

Figure 2-6. Basket pit, TA-9-62 (photo LANL 664259).



Source: LANL 1965 (12-0149)

Figure 2-7. Settling tank at TA-9 during removal, with HE residue on bottom (photo LANL 654850).

From the early 1950s to the present, operations at the Explosive Technology Testing facility (TA-9) have generated HE, chemicals, and small quantities of radioactive as well as nonhazardous waste. Until 1989, the hazardous material inventory (excluding explosives) at the Explosive Technology Group M-1, which included TA-9, numbered more than 8,000. A massive cleanup and reduction n chemical inventory during 1989, 1990, and 1991 has left a database of approximately 2,000 hazardous materials. Nonhazardous waste at this site consists mostly of office materials and sanitary waste. Building designs and a waste management system were put into place with guidelines and regulations (Standard Operating Procedures and Administrative Requirements) governing Laboratory operations for disposal. For example, laboratory practices prohibit personnel from pouring chemicals or explosives directly into industrial drains. Waste is separated into categories, properly packaged, and stored in satellite areas until it can be disposed of by either Group WX-3 at TA-16, Group M-1 at TA-14, or Group EM-7. For solids contaminated with explosives, open air burning or open air detonation are the two most often-used technologies for destruction that are performed by either Group WX-3 or Group M-1, outside of OU 1157.

High explosive-contaminated water is currently managed through an industrial system consisting of traps and filters, sumps, setting tanks, and outfalls that meet applicable DOE guidelines. This system is regulated by guidelines provided in the DOE Safety Manual (DOE 1991, 0949), which states that all drain lines handling explosive waste shall be provided with sumps or basins of adequate design and capacity for the removal of explosives by settling. Settling tanks must be designed so suspended and solid explosive material that can settle out cannot be carried in the waste waters beyond the tanks. Drains containing explosive waste materials must not be connected to normal sewage systems carrying sanitary wastes and shall be inspected periodically. Necessary steps are taken to prevent the build up of explosive deposits in the drain lines. Sumps, settling tanks, and other traps combined must remove explosives so that discharges at the outfalls meet environmental standards.

The current sanitary system, which consists of waste from toilets, showers, eyewash fountains, and roof drains (rain water), is separate from the industrial system. The isolation of the sanitary and industrial waste systems serving the buildings in TA-9 were verified in 1988 by a dye study conducted by Santa Fe

Engineering, Ltd., and assisted by Laboratory personnel (Santa Fe Engineering 1991, 12-0019). A drain pipe schematic was prepared for each building from the existing plumbing drawings, and at each building, drains were tested by flowing dyed water through the pipes to confirm or refute the piping schematic. All drains that were not used in the dye tests were located by site inspection. The outfalls associated with specific buildings were also located and inspected.

Several modifications were made as a result of the Santa Fe Engineering dye study. Septic tanks TA-9-107, -108, and -109 were pumped out, the lines leading from them were plugged, absorption trenches were dug, and the discharge from the tanks was rerouted to the absorption trenches (LANL 1989, 12-0096). In addition, the sanitary wastewater systems consolidation line was installed in December 1992, which inactivated three septic tanks and the sanitary wastewater lagoon.

Technical Area 8 is a nondestructive test facility containing radiography instruments, laboratories for the chemical detection of imperfections in parts using fluorescent penetrants and ferrous solutions, and photo-processing and development laboratories that produce silver-contaminated waste. In the earlier years, kerosene-based ferrous solutions were poured over parts or components, and the parts were magnetized to check for cracks. The waste from this process was collected in 5-gal. metal containers and disposed of by the Laboratory's Waste Management Group, EM-7. By 1990, water had replaced kerosene in this solution (Harris 1993, 12-0089), reducing the health risk to personnel. The used solutions are still collected and disposed of by Group EM-7.

Cooling fluids and oils from equipment and rags contaminated with chemicals, which are used to clean instruments or equipment, are another class of waste that has become regulated in recent years. This equipment may also be contaminated with HE. This waste is stored in RCRA-regulated storage areas by operating personnel and disposed of by Groups EM-7 and WX-3 (Harris 1993, 12-0097). Nonhazardous waste generated at these sites is picked up and disposed of by custodians working for Johnson Controls, Inc.

Waste was also disposed of within Operable Unit 1157 at MDA Q and MDA M. Material Disposal Area Q is located on the wartime Gun-Firing Site at Anchor West and contains guns, gun mounts, unused inert projectiles, and other hardware that was no longer needed and buried in 1946 (Harris 1993, 12-0098). The buried materials were made of various combinations of steel, tungsten carbide, depleted uranium, copper, and lead. The burial pit was estimated to be about 30 ft on a side; however, waste materials were observed over a larger area during a recent site visit. The pit is located next to the northernmost of the two sand piles that mark the former location of the sand butts once used to catch projectiles. The burial was disturbed in 1947 when one of the gun mounts was dug up for reuse, and again during the postwar construction period (Courtright 1964, 12-0008; Courtright 1964, 12-0006). Four projectiles are now exposed on the surface.

Material Disposal Area M, which was used as a surface dump for construction debris and other solid wastes, is located in a clearing about 1200 ft north-northeast of the Far Detonation Point. Access is provided by an unpaved road from Anchor Ranch Road. This MDA occupies approximately 3.2 acres and is roughly circular in shape. Material Disposal Area M contains many noncombustibles and had been suspected of being contaminated with radioactive materials (LANL 1990, 0145). However, a general radiation survey conducted in October 1992 did not register any areas above background. Another smaller disposal area is located about 750 ft northwest of the larger MDA. During a site visit to MDA M in the spring of 1992, rusted metal cans ranging in size from 12 ounces to 5 gallons were found. A white fibrous substance believed to be asbestos is visible on the ground in this area. Other materials, including metal and wood objects, chemical and HE laboratory appliances and fixtures, metal and glass containers, and construction and demolition debris, were disposed of at the main MDA and the satellite site. Figure 5-13 shows the locations of MDA M and it's satellite area in TA-9. For purposes of this work plan, both areas are being evaluated together and will be investigated as part of the Phase I characterization.

The final waste disposal system of note is the inactive incinerator at TA-69. This facility, Building TA-69-3, was built in 1959 for the purpose of destroying classified computer listings and other classified documents. According to A. Montoya, who worked in the Los Alamos Central Computing Facility through the 1970s, roughly a "pick-up truck full" of classified computer output was generated each day. These listings and other classified documents awaiting destruction were collected by security guards and taken to the incinerator where they were shredded and burned. For security purposes, the ashes from the burned documents were wetted down behind the incinerator building in a small pond (Jones 1993, 12-0010; Harry 1992, 12-0045).

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3.0 ENVIRONMENTAL SETTING

3.1 Physical Description

Operable Unit 1157, at an elevation ranging between 7300 and 7800 ft above mean sea level (see Figure 3-1), is located at the western edge of the Pajarito Plateau on land owned by the DOE and occupied by the Laboratory. Most of OU 1157 is located on a mesa between Cañon de Valle on the south and Pajarito Canyon on the north. The western boundary of OU 1157 coincides with the western boundary of DOE property. The northwest corner of the OU lies north of Pajarito Canyon, extending to Two-Mile Canyon. The operable unit extends roughly 1.5 mi north-south by 1.3 mi east-west. The Pajarito Plateau is bounded on the west by the Jemez Mountains volcanic complex that rises to an elevation of about 10 000 ft, and on the east by the Rio Grande, whose canyon walls descend from an elevation of about 6300 ft at the edge of the plateau to the river at an elevation of about 5500 ft.

The surface of the mesa is partially dissected by tributary drainages to Pajarito Canyon and narrows from west to east as the canyons become progressively wider and deeper. The canyons drain east-southeast to the Rio Grande about 10 mi east of the OU. Primary drainages grade from shallow depressions at the western boundary of the OU to relatively steep-sided 200-ft-deep canyons. Deeper sections have cliffs and steep colluvium-covered slopes on the north sides and cliffs separated by gentler slopes. Both north and south slopes are forested. Shallow tributary drainages with intermittent flow are common and drain into the canyons flanking and intersecting the OU. During site tours in the months of March and September of 1992, there was a small volume (2-5 gpm) of running water in Cañon de Valle, Pajarito Canyon, and two tributaries of Pajarito Canyon within the OU. The presence of aquatic flora and fauna in the canyons and tributaries suggests that this is not an unusual situation. Water-washed debris found a foot or so above the usual stream level indicates that high-energy run-off occurs at times, probably during summer thunderstorms. Sediment storage is limited in the upper reaches of the canyons; sediment volume generally increases in the canyon bottoms as they widen and deepen to the east of the OU.

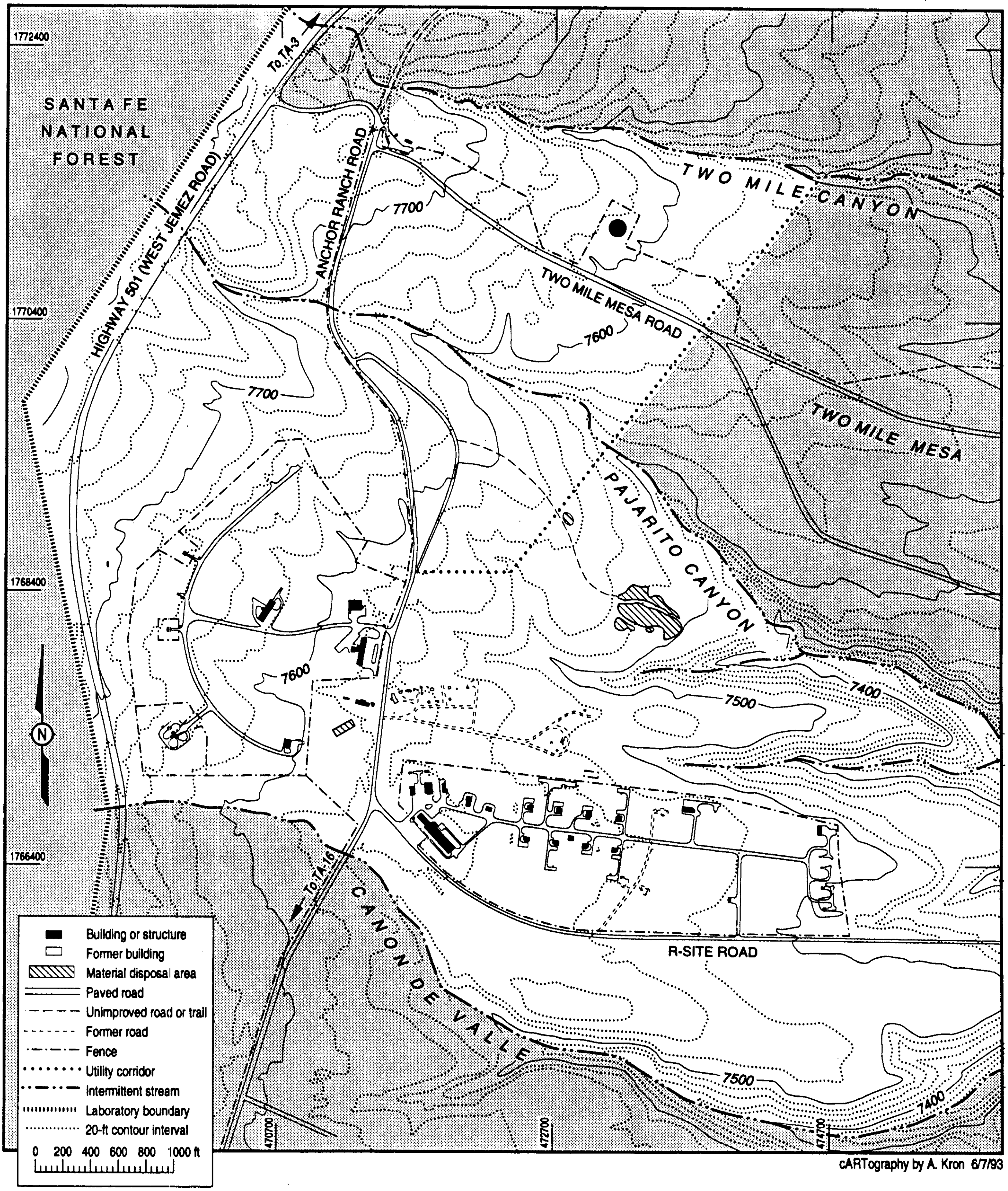


Figure 3-1. Topographic map of OU 1157.

New Mexico State Road 501 lies just within the western perimeter of the OU. Access to all operational areas of the OU, except for the small cluster of structures just outside the gate in TA-69 and Building TA-8-30, is restricted by a security fence with entry limited to laboratory employees with DOE security (Q) clearance and approved visitors. Visitors without Q clearances (or equivalent) are under escort at all times.

Technical areas within the OU are currently occupied by various groups of personnel working in M (Dynamic Testing) and WX (Design Engineering) divisions. The buildings in TA-69 are occupied by M Division Office, Engineering Division personnel, and by security guards who attend the entry gate on the road into this region of the Laboratory. Technical Area 8 is primarily occupied by M Division Office personnel and part of WX-3, Fabrication and Assembly. Technical Area 9 is occupied by M-1, Explosives Technology.

In the years before development of the Laboratory the area was largely occupied by Anchor Ranch, for which the Laboratory site that was built there was named. A sign in Pajarito Canyon indicates that a state wildlife preserve once was located there, and early photographs show cattle or horses grazing in what is now TA-8. A herd of elk frequents the site as well as mule deer, black bear, and numerous smaller wildlife species. The mesa-top topography in OU 1157 has undergone minor cultural modification over the years for installation of various roads, buildings, and other Laboratory facilities.

3.2 Climate

Los Alamos County has a semiarid, temperate mountain climate. (Bowen 1990, 0033) describes the climate of the county in detail. Operable Unit 1157, at a higher elevation than much of the county, could be expected to receive 20 to 22 in. of water-equivalent precipitation with approximately 50% occurring during summer thunderstorms. The wettest years have produced about 30 in. of precipitation, whereas the driest years have produced less than 10 in. As much as 2.51 in. of rain have been recorded in Los Alamos on one summer day. There have been years with less than 20 in. of snowfall and one year with more than 153 in. (1986-1987). The average is about 50 to 60 in. of snowfall. Winds at TA-59, the nearest wind-measurement location, are predominantly from the south during midday and from the west-northwest during evening and nighttime hours. Average wind speeds are in the

3 to 5 mph range. April is usually the windy season when wind velocities are in the 10-mph range from the west during the mid-afternoon.

3.3 Biological and Cultural Resources

During 1992, field surveys were conducted by the Biological Resource Evaluations Team (BRET) of the Environmental Protection Group (EM-8) for OU 1157 to provide information on the biological components before site characterization. Further information concerning the biological field surveys for OU 1157 will be contained in a report "Biological Assessment for Environmental Restoration Program, Operable Unit 1157" (Banar in prep, 12-0159). This report will provide specific information on survey methodology, results, and mitigation measures and will also contain information that may aid in defining ecological pathways and site restoration.

3.3.1 Threatened, Endangered, and Sensitive Species

A search of the EM-8 database containing the habitat requirements for all state- and federally listed threatened, endangered, and sensitive plant and animal species known to occur within the boundaries of the Laboratory indicated that there are seven species of concern for this OU. These are the Jemez Mountain salamander, northern goshawk, Mexican spotted owl, meadow jumping mouse, spotted bat, checker lily, and wood lily (Table 3-1).

The spotted bat is found in piñon-juniper, ponderosa, mixed conifer, and riparian habitats. The two critical requirements for the spotted bat are a source of open surface water and roost sites (caves in cliffs or rock crevices). Suitable roost sites are present in portions of Pajarito Canyon; open water sources are somewhat limited and include the narrow-flowing streams and the pond at the old Anchor Ranch.

The northern goshawk's habitat is mature ponderosa pine forest; goshawks have been found within the northwest portions of the Laboratory. Nest sites are known to exist outside OU 1157 borders and could occur within these borders as well.

Habitat requirements for the Mexican spotted owl include uneven-aged, multistory mixed conifer forests with closed canopies. Spotted owls have been detected in Los Alamos County and may be present in mixed conifer areas in Pajarito Canyon.

Table 3-1
THREATENED, ENDANGERED, AND SENSITIVE SPECIES

Species of Concern for OU 1157

Species		Status	
Common name	Latin name	Federal	State
Northern goshawk	*Accipiter gentilis*	candidate	
Mexican spotted owl	*Strix occidentalis lucida*	candidate	
Spotted bat	*Euderma maculatum*	candidate	endangered
Meadow jumping mouse	*Zapus hudsonius*	candidate	endangered
Jemez Mountain salamander	*Plethodon neomexicanus*	candidate	endangered
Say's pond snail	*Lymnaea captera*		endangered
Wood lily	*Lilium philadelphicum*		endangered
Checker lily	*Fritillaria atropurpurea*		sensitive
Sandia alumroot	*Huechera pulchella*		sensitive

There is a moderate potential for the occurrence of the meadow jumping mouse in the upper reaches of OU 1157. It lives in riparian or wetland zones along permanent water sources. The stream in Pajarito Canyon, its tributaries, and the Anchor Ranch pond represent a potentially suitable habitat.

The Jemez Mountain salamander inhabits mixed conifer to spruce-fir plant communities. The salamanders prefer moist soil and therefore occur most frequently in areas of closed canopies, north-facing slopes, or near streams and seeps within decaying logs and litter. Certain reaches within Pajarito Canyon and its tributaries may support Jemez Mountain salamanders.

The wood lily and checker lily may possibly be found in OU 1157 but only in moist-shaded areas. These lilies have been found in Los Alamos County but are very rare.

3.3.2 Other Biologic Resources

Vegetation within OU 1157 is primarily pine forest with dense stands of relatively young ponderosa pine to more open stands of mature ponderosa pine and mixed conifer forest. Open grassy meadows have formed in areas that were cleared before the establishment of the Laboratory and in areas that were subsequently used for Laboratory buildings and operations. The canyon bottoms are host to numerous old-growth ponderosa pines of remarkable size and thick stands of locust, raspberries, and other plants found only where there is adequate water and some amount of protection. Because of restricted access to this area for nearly 50 years, it is essentially a wilderness preserve with signs of elk, deer, bear, and smaller animals common.

3.3.3 Cultural Resources

Thirty-one archaeological/historical sites and Manhattan Project structures located within OU 1157 are listed on Table 3-2. (Environmental Restoration Program, Operable Unit 1157, Cultural Resource Survey Report (McGehee et al. in prep, 12-0164). Twenty-eight of these are archaeological/historical sites, of which ten are eligible for inclusion on the National Register of Historic Places based on their research potential. The attributes of these sites, which make them eligible for inclusion on the National Register, will not be affected by any ER sampling activities proposed at OU 1157. The remaining three sites are Manhattan Project and early Atomic Energy Commission (AEC)-era structures (circa 1942 to 1948). These structures will be evaluated for National Register eligibility prior to decommissioning.

Table 3-2

Cultural Resources of OU 1157

Site #	Site Type	Cultural Affiliation	Time Period	Eligible
LA 16808 LA 21296	HS	Euro-American	Homesteading	Yes
LA 21292	LS	Archaic	Archaic	No
LA 21293	LS	Archaic/Anasazi	Unknown	No
LA 21294	LS	Archaic/Anasazi	Unknown	No
LA 21295	LS	Archaic	Archaic	Yes
LA 21297	AS	Euro-American	Homesteading	No
LA 87428	LS	Archaic	Archaic	Yes
M-50	LS	Archaic/Anasazi	Unknown	Yes
M-51	OH -bridge	Hispanic/Euro-American	Homesteading	No
M-52	WC	Hispanic/Euro-American	Homesteading/Recent	No
M-53	RD	Hispanic/Euro-American	Homesteading	No
M-55	SS	Unknown	Unknown	No
M-56	CP	Anasazi	Unknown	PE
M-57	SH	Anasazi	Unknown	PE
M-58	CP	Anasazi	Unknown	PE
M-59	AS	Euro-American	Recent	No
M-60	OH-camp site	Hispanic/Euro-American	Homesteading	No
M-61	AS	Euro-American	Homesteading	No
M-62	AS	Euro-American	Homesteading	No
M-63	AS	Hispanic/Euro-American	Homesteading	No
M-64	AS	Hispanic/Euro-American	Homesteading	No
M-65	AS	Hispanic/Euro-American	Homesteading	No
M-66	AS	Hispanic/Euro-American	Homesteading	No
M-67 A & B	(A)OR-brick bldg. (B)IR	Hispanic/Euro-American	Homesteading/Recent	PE
M-68	AS	Hispanic/Euro-American	Homesteading	No
M-69	AS	Hispanic/Euro-American	Homesteading	No
M-70	OR-wood bldg.	Hispanic/Euro-American	Homesteading/Recent	PE
M-71	LS	Archaic/Anasazi	Unknown	PE
TA-8-1	RB	Euro-American	Manhattan Project	TBE
TA-8-2	RB	Euro-American	Manhattan Project	TBE
TA-8-3	RB	Euro-American	Manhattan Project	TBE

Codes for Site Types: AS = Artifact Scatter, CP = Cavate(s) or Cavate Pueblo, HS = Homestead, IR = Indeterminate Rubble, LS = Lithic Scatter, OH = Other Historic Site Type, OR = Other Recent Site Type, RD = Roadway, RB = Recent Building, SH = Rock Shelter, SS = Small Rock Structure, and WC = Water or Soil Control Device

Eligibility Codes: PE = Potentially Eligible, TBE = To Be Evaluated

Time Period Dates:

Archaic = 4000 B.C. - A.D. 600
Homesteading = A.D. 1890 - A.D. 1943
Manhattan Project = circa A.D. 1942 - A.D. 1948
Recent = A.D. 1944 to present

3.4 Geology

The following brief discussion is restricted to the geology in the general area of OU 1157. Figure 3-2 shows the generalized conceptual geohydrologic model of the OU. The reader is referred to the Installation Work Plan for Environmental Restoration (LANL 1992, 0768) for a discussion of the regional setting and general geology of the Pajarito Plateau.

3.4.1 Bedrock Stratigraphy

Core from hole SHB-3 drilled at TA-16 to the south of OU 1157 confirms the continuity of Bandelier Tuff units in this area of the Pajarito Plateau (Gardner et al. 1993, 12-0163). Stratigraphic boundaries in the TA-16 hole conform closely to those logged by Wier and Purtymun (1962, 0228) at TA-49, southeast of OU 1157. The lithologic log as determined from examination of the core from hole SHB-3 is shown in Figure 3-3.

The rocks exposed within OU 1157 are entirely of the Tshirege Member (1.13 Ma) of the Bandelier Tuff. Two relatively detailed geologic maps of the Bandelier Tuff exist for the western Laboratory property (Wier and Purtymun, 1962, 0228; Vaniman and Wohletz, 1990, 0541), and each of these divides the Tshirege Member into units based mainly on physical characteristics imparted by the cooling history of ignimbrite flow units. Factors that may affect the actual geometry and distribution of stratigraphic units include abrupt lateral and vertical facies variations in rock units, significant relief on paleotopographic surfaces on which rock units were deposited, and fault offsets in the older units that are masked by younger rocks which themselves show little or no displacement.

Noteworthy within the Tshirege Member is a widespread pyroclastic surge bed (Gardner et al. in prep., 0639), previously described as fluvial, cross-bedded sandstone (e.g., Wier and Purtymun 1962, 0228; Purtymun and Stoker 1987, 0204). This surge bed provides a useful stratigraphic marker and, because of its apparent greater permeability than the surrounding tuff, may contain perched water. The surge deposit outcrops at Old Anchor West.

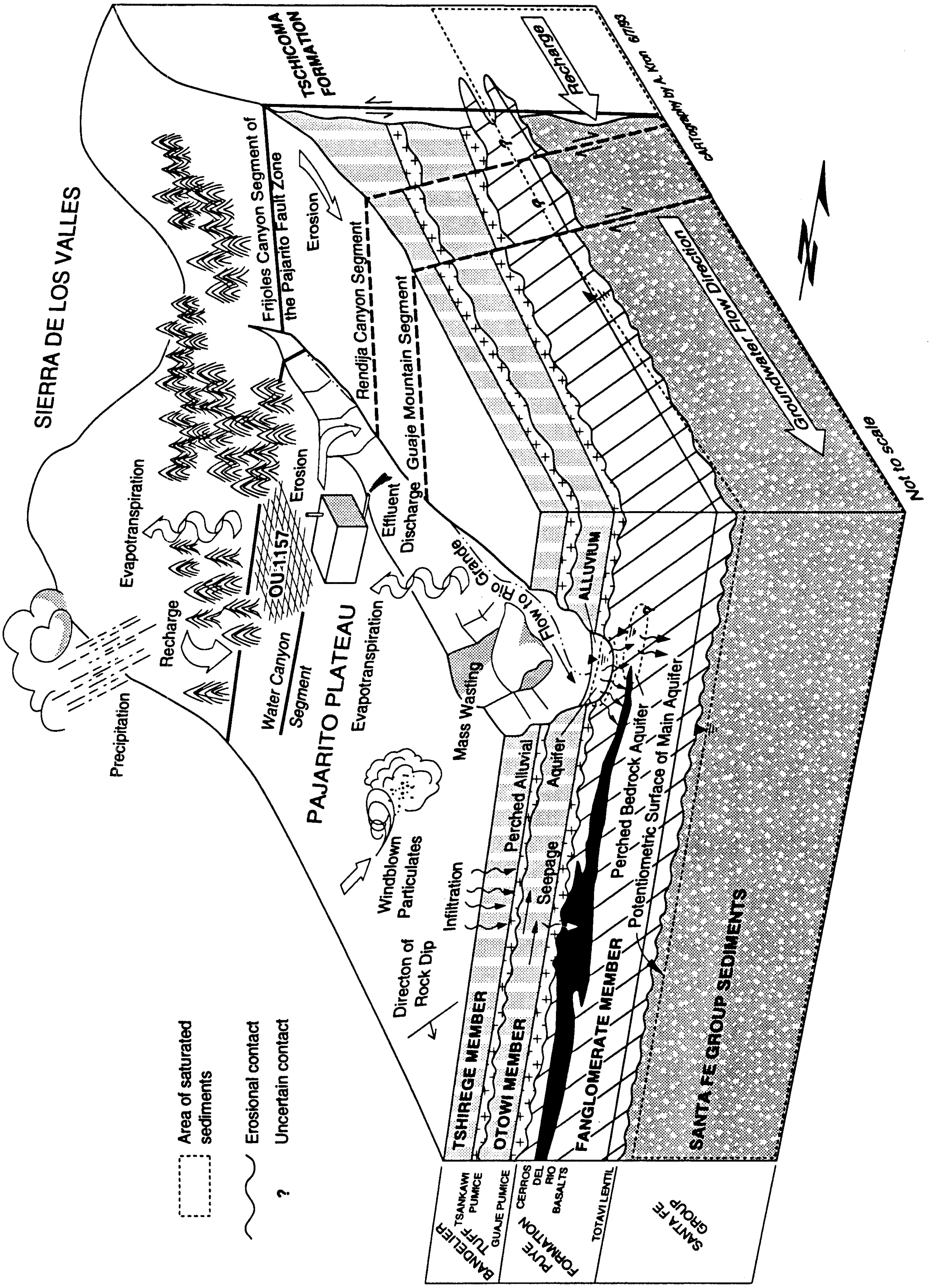


Figure 3-2. Schematic geohydrologic model of OU 1157 showing general relationship of major geologic units.

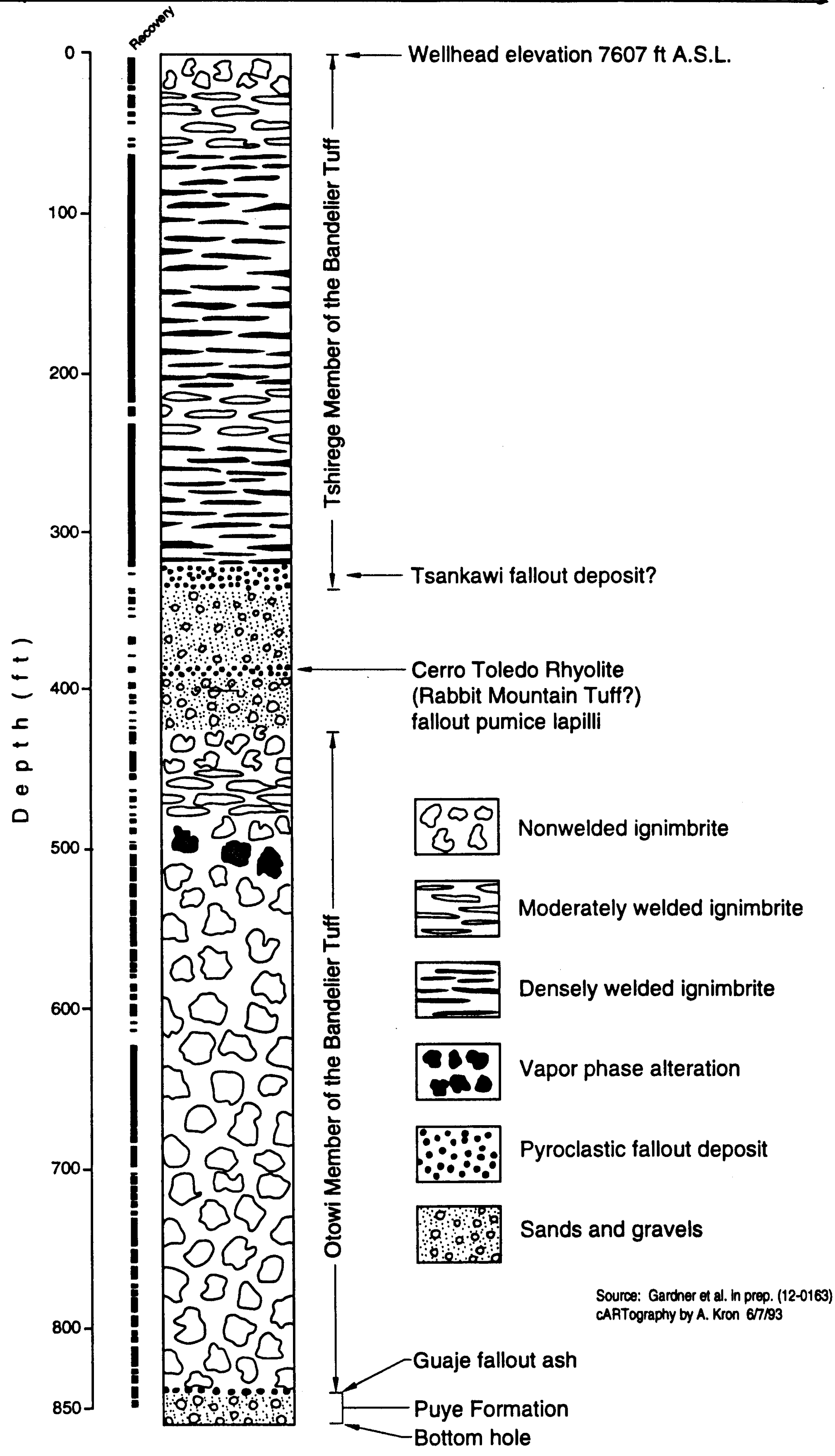


Figure 3-3. Graphic lithologic log for corehole SHB-3.

3.4.2 Structure

Operable Unit 1157 is on the Pajarito Plateau that lies at the western margin of the Española Basin of the Rio Grande rift, a major tectonic feature. The Pajarito fault system forms the western margin of the Española Basin and has had Holocene movement and historic seismicity (Gardner and House 1987, 0110; Gardner et al. in prep., 0639; Gardner et al. 1993, 12-0163). In addition to the main trace of the Pajarito Fault system, three other fault segments break the surface of the Bandelier Tuff in Los Alamos County: the Water Canyon, Guaje Mountain, and Rendija Canyon (Figure 3-4).

At least the western one-third of OU 1157 lies close to or on the Pajarito fault zone. In contrast to cooling joints, these tectonic fractures cross flow-unit and lithologic-unit boundaries; thus tectonic fractures may provide more continuous and deeper penetrating flow paths for groundwater migration than cooling joints.

Minor fracture sets may be associated with tectonic fractures and/or cooling joints. A fracture noted in Pajarito Canyon between TA-9 and TA-22 appears to exhibit a few inches of offset but no apparent fault gouge or standoff. This fracture appears to parallel the Pajarito fault zone. Fractures in the platy welded tuff unit, which outcrops at higher elevations on the east side of the operable unit, are probably examples of cooling joints. That particular horizon could promote infiltration where it is exposed at or near the surface.

3.4.3 Surficial Deposits

3.4.3.1 Alluvium and Colluvium

Surficial deposits on the plateau surface of OU 1157 consist of coarse-grained colluvium on steep hill slopes, generally fine-grained fluvial and colluvial sediments with a thin cover of eolian fine-grained sediments on the flatter parts of mesa surfaces, and alluvial fan deposits at the mouths of drainages cut into the mountain front or escarpments related to post-Bandelier faulting. Deposits in the canyons consist of colluvial materials against canyon walls, representing mass wasting, and fluvial

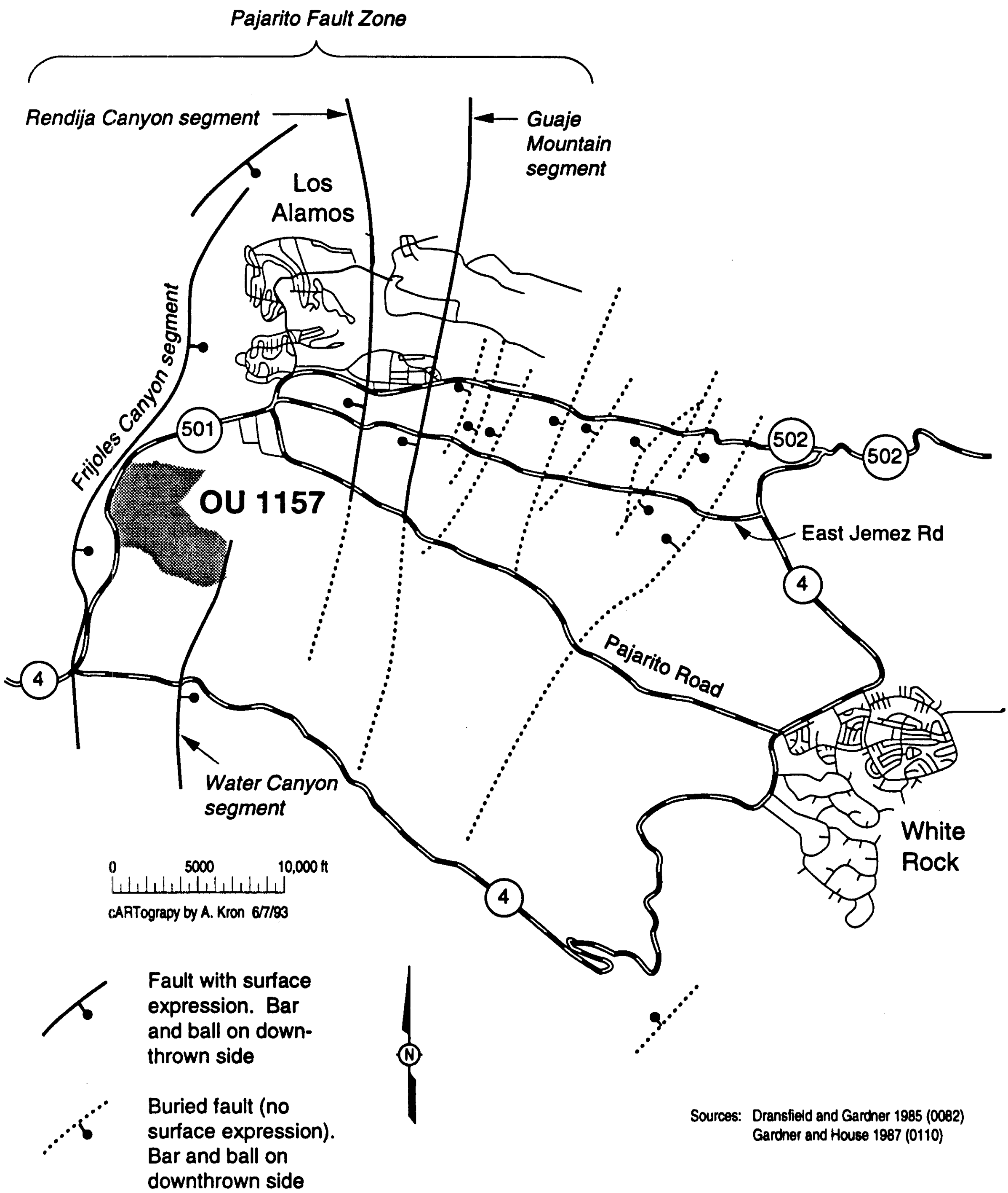


Figure 3-4. Faults in the vicinity of OU 1157.

sediments deposited by streams along the canyon floors. Alluvial material may be present in greater amounts at the mouths of tributary streams.

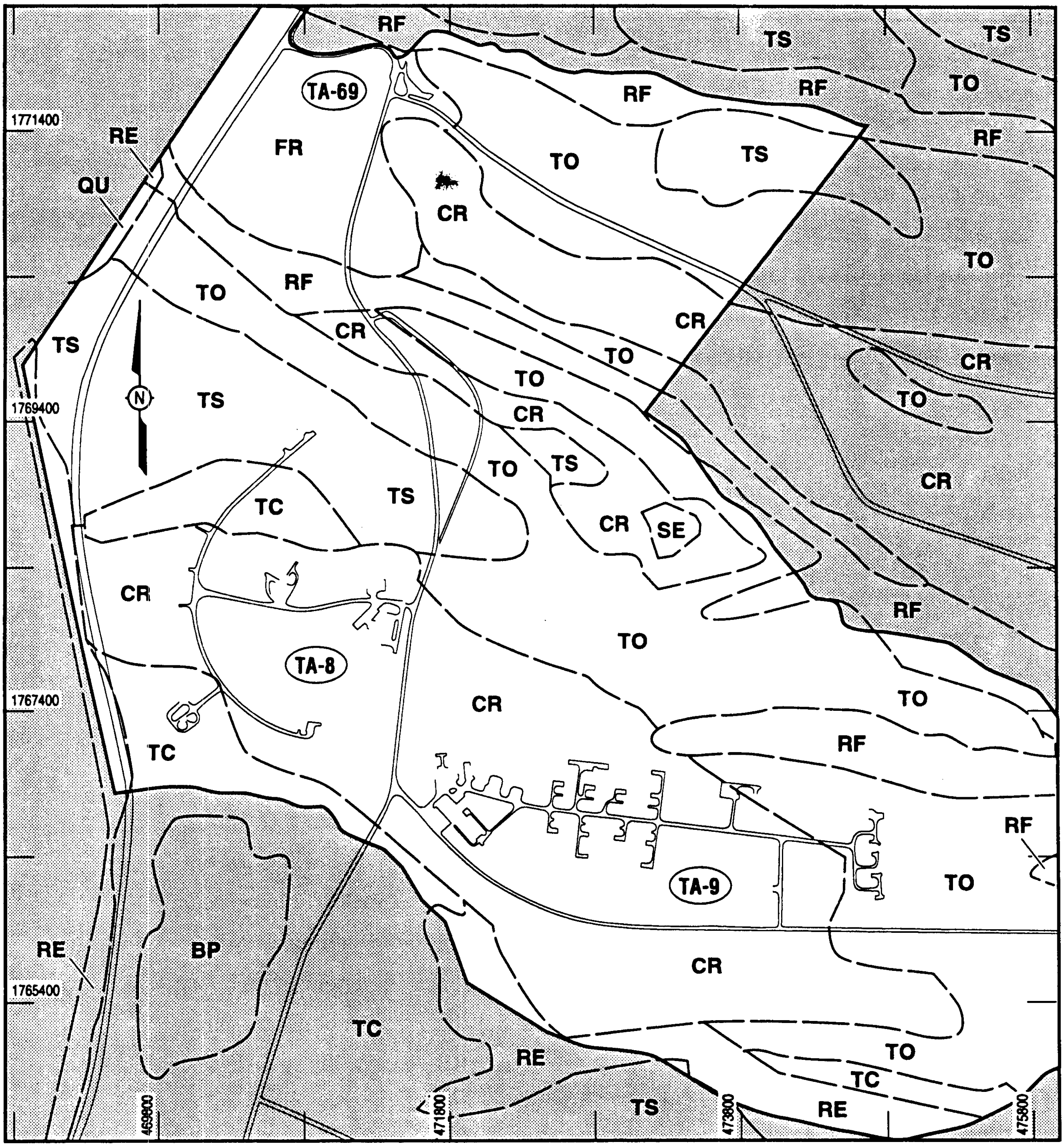
3.4.3.2 Soils

A variety of soils have developed from bedrock and sediments in OU 1157. Soils that develop on south-facing slopes tend to be thin and sandy, whereas those that form on north-facing slopes tend to be thick and humic. Based on a soil survey of Los Alamos County, Nyhan (Nyhan et al. 1978, 0161) described the general character of these soils and their association with rock type, climate, slope, and vegetation. In the study, OU 1157 soils are mapped primarily as Carjo Loam. Tocal, Typic Eutroboralfs, and Seaby Series soils are also present across the OU. Soil types over the OU are shown in Figure 3-5. Typical profiles and thicknesses of these soils are shown in Figure 3-6. Nyhan's classifications are useful to point out the potential diversity of soil types and engineering/construction aspects; they also offer some basis for assessment of the potential for soils influencing contaminant transport. A framework study on soils and soil geochemistry is expected to provide more information, and site-specific studies will be done if needed to characterize soil-dependent pathways.

3.4.3.3 Erosional Processes

Erosion on the mesa tops in OU 1157 is caused primarily by run-off on the relatively flat part of the mesas, by higher energy run-off in channels cut into the mesa surfaces, and by rockfall and colluvial transport on the canyon slopes. Erosion of mesa tops generally takes place where gradients steepen into canyon slopes or where vegetation has been removed. Erosion rates of undisturbed or vegetated soils are probably low, and there is no evidence of major recent episodes of either downcutting or deposition in the vicinity of OU 1157 PRSs except in the disturbed soils at MDA M and where recent installation of sewer lines around the perimeter of the TA-9 fenced area left unvegetated earth.

Erosion in canyons occurs primarily by stream flow along the canyon floors. Erosion in alluvium of the OU 1157 canyon bottoms appears to be minimal; vegetation in and around the stream bed is well established; and even occasional flooding episodes (as evidenced by accumulation of flood-deposited vegetative debris well above the



Source: Nyhan et al. 1978 (0161)
cARTography by A. Kron 6/7/93

CR Carjo loam
FR Frijoles very fine sandy loam
QU Quemazon-Arriba-Rock outcrop complex
RE Rock outcrop, Pines-Tentrock complex
RF Rock outcrop, frigid
SE Seaby loam
TC Typic Eutroboralfs, clayey-skeletal
TO Tocal very fine sandy loam
TS Typic Eutroboralfs, fine
BP Borrow pit

——— ——— ——— Soil boundary

0 200 400 600 800 1000 ft

Figure 3-5. Soil map of OU 1157.

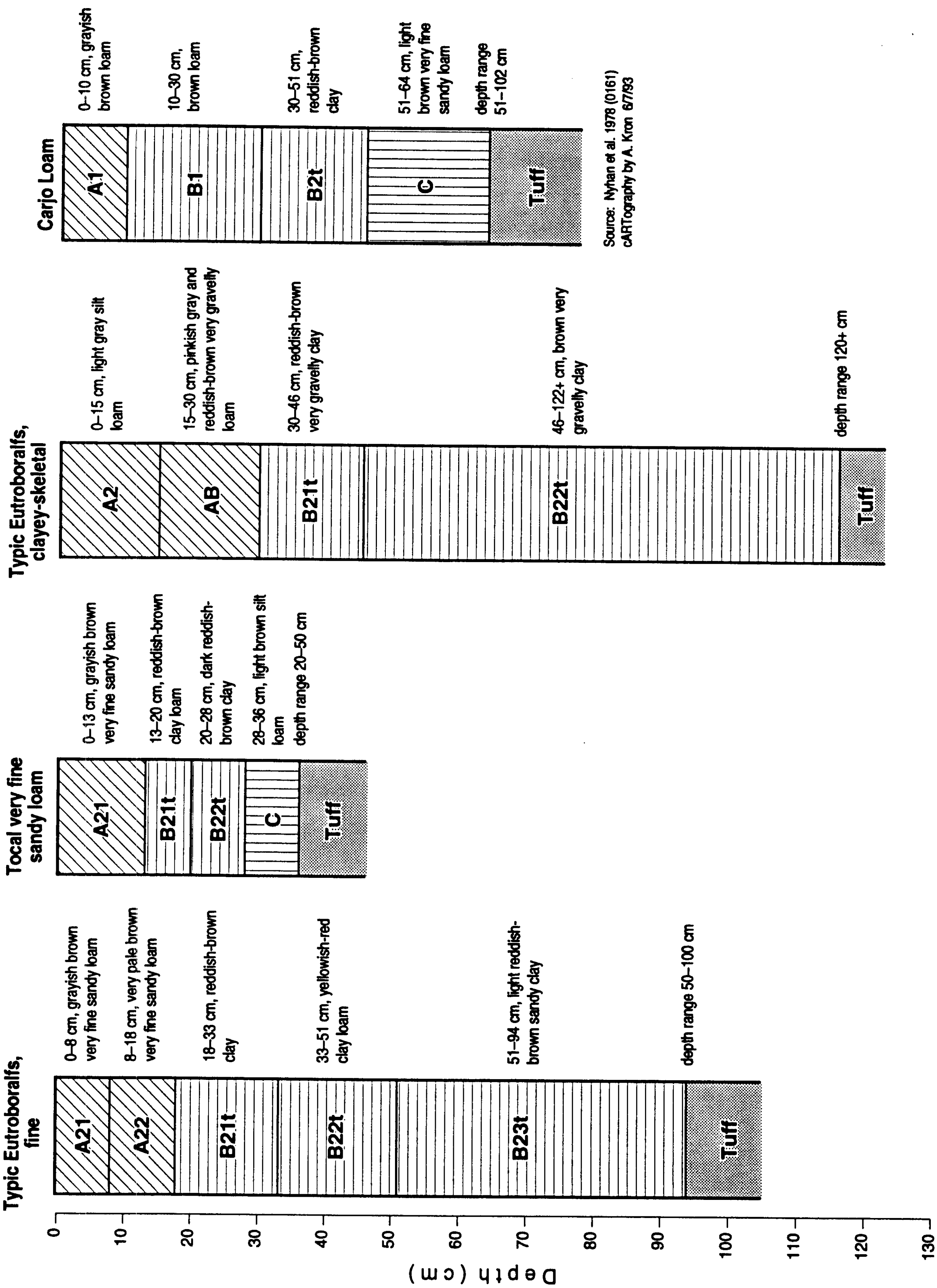


Figure 3-6. Typical profiles of soils found in OU 1157.

current stream level) do not appear to have changed the basic characteristics of the stream bed.

Contaminants deposited in soils or in natural sediment traps on mesa tops may be transported into the canyons by extreme run-off events on the mesa surface or may be carried in masses of rock and debris as they slide down canyon slopes. Waste sites in OU 1157 most likely to be exposed by erosion are those that lie close to the edges of mesas or near active drainage channels. The fine loamy soils present at some locations may become airborne during episodes of high winds, particularly where natural vegetation has been removed or disturbed.

3.5 Conceptual Hydrologic Model

The hydrology of the Pajarito Plateau is summarized in Section 2.6 of the IWP (LANL 1992, 0768). The canyon and mesa topography and deposits of the volcanic Bandelier Tuffs are key features of the Pajarito Plateau and are important in controlling the hydrogeology of the region. The hydrology of specific PRS sites in OU 1157 is primarily controlled by the topographic location of the PRS. The majority of PRSs in OU 1157 are located on mesa tops. The only PRSs that directly impact drainages are outfalls, and all of the outfalls enter shallow tributaries to the major canyons in the OU. The deep groundwater is unlikely to be an important transport pathway in OU 1157 due to the great depth (800 to 1100 ft) to the regional aquifer. However, surface-, perched-, and alluvial-aquifer hydrology may control the movement of some contaminants.

3.5.1 Surface Water Hydrology

Surface water run-off and infiltration are potential hydrologic transport pathways in OU 1157. Aspects of the surface hydrology that may be relevant to contaminant transport include: 1) the location of pathways of surface water run-off and associated erosion and sediment deposition; 2) rates of soil erosion, transport, and sedimentation; 3) the effects of operational disturbances on surface hydrology; 4) the relative importance of surface run-off versus infiltration as a transport pathway in different soil types; and 5) the nature of interactions between soils and waterborne contaminants.

A spring, known as Homestead Spring, on the south flank of Pajarito Canyon, near the north-central boundary of TA-9, was found in mid March of 1992. The spring was flowing into the upper reaches of the canyon at a rate of approximately 5 gpm. It was also observed to be flowing at nearly that rate in September. Based on the rainfall-equivalent tritium content measured in a sample, the source for this spring is probably soil-level infiltration of recent snow-melt and/or rain draining from the southwest (Adams and Goff 1991, 12-0158). There was essentially no water flowing in the stream above the spring in September, although there had been some flow from beneath fractured tuff in the stream bed just upstream of the spring in March. MDA M is on the mesa just south of this location. Two other small springs (see Figure 6-15) are located in a Pajarito Canyon tributary just south of MDA M. The flow in this tributary was equal to or slightly greater than that in Pajarito Canyon.

3.5.1.1 Surface Water Run-off

The heaviest run-off on the Pajarito Plateau occurs during summer thunderstorms yielding transient high-discharge rates that may transport dissolved material, colloids, and sediments. Run-off on the relatively flat mesa tops is generally by sheet wash. This sheet wash may coalesce into small channels and eventually lead to flow in the canyon tributaries and the canyons. Snow melt may also lead to brief flows in the canyons. It is conceivable that transient high-discharge run-off from the operable unit could reach the Rio Grande. Pajarito Canyon, Cañon de Valle and two tributaries to Pajarito Canyon appear to sustain perennial flow, at least in some years.

Surface water run-off can potentially mobilize contaminants or concentrate dispersed surficial contaminants through sediment transport, and solution and reprecipitation processes. Mobilization of contaminants by surface water run-off is a potential exposure pathway at OU 1157 sites, such as MDA M, where evidence of erosion can be seen. Surface water run-off flows from the mesa tops into canyons and ultimately into the Rio Grande or downgradient aquifers.

3.5.1.2 Surface Water Infiltration

Surface water could infiltrate into the underlying tuff along fractures related to faults. At least the western third of the operable unit may be affected by the Pajarito fault zone, and the Water Canyon fault segment on the east side of the operable unit may have produced increased fracturing there. The uppermost unit on the east side of OU 1157 is a highly fractured densely welded tuff that might increase infiltration. In the central part of the operable unit the exposed pyroclastic surge bed may also permit increased infiltration. At this time it is unclear how deep infiltrating run-off may penetrate. Deep penetration is considered a minor transport mechanism for the Laboratory in general because of the high evaporative potential of the upper tuff units, the effectiveness of vegetative transpiration, and the low-moisture content of the tuffs (LANL 1992, 0768). Infiltration could occur to a perched water table in the vicinity of MDA M. The likely occurrence of perched water in this area is based on the presence of springs in Pajarito Canyon and in the adjacent tributary to the south (see Figure 6-15). Infiltration into sediments in the canyon bottoms is also likely. Studies of infiltration through natural and engineered covers are currently underway at the Laboratory.

3.5.2 Hydrogeology

3.5.2.1 Vadose Zone

The mesa top area of OU 1157 overlies up to 1100 ft of unsaturated volcanic tuff and sediments of the Bandelier and Puye formations and Cerros del Rio basalts. As previously mentioned, this thick unsaturated zone is considered to inhibit groundwater recharge by surface water infiltration within the boundaries of the Laboratory. The general hydrology of the mesa top vadose zone is discussed in Section 2.6.3 of the IWP, "Review of Studies of the Geohydrology of Mesa Tops and Vadose Zone" (LANL 1992, 0768). Numerous investigations focusing on hydrologic characterization of the upper 100 ft of the Bandelier Tuff have been conducted in the Los Alamos area since the 1950s (Abrahams et al. 1961, 0015; Weir and Purtymun 1962, 0228; Abrahams 1963, 0011; Purtymun and Koopman 1965, 0201; Purtymun and Kennedy 1971, 0200; Purtymun et al. 1978, 0207; Abeele et al. 1981, 0009; Kearl et al. 1986, 0135; Purtymun et al. 1989, 0214). Factors inhibiting extensive water movement are high ratio of evapotranspiration to precipitation, a thick vadose zone, and low *in situ* moisture content of the vadose zone.

The hydrologic properties of the Bandelier Tuff have been described by Abeele et al. (1981, 0009). Porosity of the tuff varies from 20 to 60%; below about 35 ft, moisture content of the tuff is consistently less than 10%. Abeele (1981, 0009) noted that weathering and plant roots were absent below 35 ft in the tuff, suggesting that water movement below this depth is very slow and unusual. Abrahams (1961, 0015) also monitored soil moisture in a variety of locations and found no evidence of rapid water movement from the soil to the tuff.

The movement of water and contaminants deeper within the tuff has been studied by Purtymun (1989, 0214) and Nyhan (1985, 0168). Purtymun performed injection well experiments into the Bandelier Tuff; 335 000 gal. of water were pumped into the tuff at a depth of 65 ft over a period of 89 days. After 200 days, the water plume extended to a depth of 200 ft. The authors concluded that, unless large quantities of water are provided continuously, there was little chance of water movement from the surface to the main aquifer. Although the vadose zone below 100 ft has not been thoroughly characterized, in general, the findings summarized in the IWP indicate that the Bandelier Tuff (which forms the mesa top vadose zone) does not bear water, except in very shallow and localized areas (LANL 1992, 0768). The low moisture content and extensive thickness of the unsaturated zone minimize the potential for downward movement of water through the Bandelier Tuff and into the main aquifer. Moreover, it can only be assumed that findings from mesa top studies conducted in areas outside of OU 1157 are representative of conditions in this OU.

3.5.2.2 Saturated Alluvium

Saturated alluvium occurs in the bottoms of Pajarito Canyon, Cañon de Valle, and in the lower reaches of two tributaries to Pajarito Canyon. The relationship of surface water to saturated alluvium within canyons is discussed in Section 2.6.4 of the IWP (LANL 1992, 0768).

3.5.2.3 Perched Aquifers

The saturated alluvium may recharge perched zones below canyon fill. The nature and extent of such perched zones is not known but may occur under any of the canyons mentioned above. As noted in Section 3.5.1, perched water may exist in the vicinity of, and perhaps beneath, MDA M. It is not expected that this perched water would be usable as a water supply for the town site or the Laboratory.

3.5.2.4 Regional Aquifer

The regional aquifer, which lies beneath the Laboratory and serves as the municipal water supply for the Los Alamos area, is located in the lower Puye formation and Santa Fe group sediments. The depth to the regional aquifer is between 800 and 1100 ft at OU 1157.

3.6 Conceptual Three-Dimensional Geologic/Hydrologic Model of OU 1157

A conceptual model for OU 1157 has been developed based on the discussion of the environmental setting presented in Section 3.1. The conceptual model is presented in diagram form in Figure 3-2. The physical processes and major pathways included in the model are based on current knowledge of the environment and the types of PRSs present at OU 1157. The processes and pathways discussed below provide the basis for the PRS-specific conceptual models for potential contaminant releases. Release mechanisms and migration pathways of concern are

- surface run-off and sediment transport,
- infiltration and transport in the subsurface, and
- atmospheric dispersion.

These pathways are believed to provide the greatest potential for release and transport of contaminants, when they are present, to the environment at OU 1157. Existing data presented in the IWP (LANL 1992, 0768) and the present level of knowledge of the PRSs in OU 1157 indicate that no pathway exists to the regional aquifer below the plateau; therefore, deep groundwater is not discussed further in this work plan.

3.6.1 Surface Water Run-Off and Sediment Transport

Surface run-off and sediment transport are the migration pathways of greatest concern for transport of contaminants on the surface to off-site receptors. Surface run-off is generally channeled into canyons by natural topographic features and manmade diversions. Contaminant transport by surface run-off can occur in solution, adsorbed to suspended colloids, or with movement of heavier bedload sediments. Surface soil erosion and sediment transport are functions of soil properties and run-off intensity. Contaminants transported in run-off can concentrate in sediment traps in drainages. Erosion of drainage channels can disperse contaminants downgradient in the drainage system.

3.6.2 Infiltration and Transport in the Subsurface

Infiltration into surface soils and tuff depends on the rates of precipitation and snow melt, the amount of ponding, antecedent moisture content, and the hydraulic properties of soil and tuff. Movement of liquids in soil and tuff is dominated by transient, unsaturated flow processes influenced by infiltration and evapotranspiration. Joints and faults may provide pathways for infiltration and release of contaminants into the shallow subsurface. The movement of contaminants in the unsaturated zone can occur in the free-liquid phase, in solution, or adsorbed on suspended colloids. Dissolved contaminants may be retarded as the result of adsorption on tuff , clays, or on organic material present in soil or alluvium. Lateral flow of perched water may occur at unit contacts, between layers whose hydraulic properties differ, and in alluvial aquifers. Saturated or unsaturated lateral flow may discharge as springs or seeps on canyon walls and in canyon bottoms.

Vapor-phase movement in the unsaturated zone is an important transport mechanism for volatile contaminants (if present) such as organic solvents and tritium. Movement of contaminants in the vapor phase is influenced by concentration gradients, temperature gradients, density gradients, and/or air pressure gradients. Fractures may facilitate vapor phase transport of volatile contaminants.

3.6.3 Atmospheric Dispersion

Wind entrainment of contaminated particulates or volatile organic compounds is a potentially significant pathway for widespread atmospheric dispersion of contaminants. This dispersal mechanism is limited to surface contamination and vapors released to the atmosphere from soil pore gas. Entrainment and deposition of particulates are controlled by soil properties, surface roughness, vegetative cover, terrain, and atmospheric conditions, including wind speed, wind direction, and precipitation. Vapor dispersion is influenced by similar atmospheric conditions. Gas exchange between soil and tuff and the atmosphere is controlled by temperature gradients and air pressure gradients and may be enhanced along open fractures.

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Executive Summary

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- Decision Process and Management of Uncertainty
- Assessment Considerations
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4.0 TECHNICAL APPROACH

The overall objective of this work plan is the identification and in some instances the characterization of environmental contamination. The term "environmental contamination" is defined rather closely as the contamination of environmental media because of the wide variety of PRSs in OU 1157, ranging from sites of demolished structures, to inactive structures, to active operating facilities. The focus of this work plan is the contamination of environmental media. Environmental media are natural or manmade materials that have been abandoned to become part of the long-term environment. Environmental media can therefore include soils, sediments, springs, and surface water, as well as abandoned waste materials and facilities such as tile leach lines, concrete pads, and septic tanks that are not currently planned to be removed and may be left in place indefinitely. Contaminated facilities that are planned to be removed or are still actively used are addressed in this work plan only as sites to be deferred for characterization to a later time, unless a likely mechanism for significant accidental release to environmental media has been identified.

This chapter describes the technical approach to RFI/CMS actions adopted for OU 1157. It provides the strategy and rationale for a phased approach to the RFI and describes how other philosophical and practical considerations from the IWP (LANL 1992, 0768) were incorporated into this document. This chapter also provides details of technical aspects of the project, such as the methods for determining appropriate sampling techniques, analytical methods, and the number of samples required based on the use of the available information to control uncertainty. A generalized conceptual exposure model and a discussion of potential remediation alternatives specific to types of PRSs in OU 1157 are also provided.

Risk-based considerations in this work plan are limited to the comparison of screening action levels (SALs) described in the IWP. The SALs are based on theoretical exposure of a resident to various chemical substances that might be present in the environmental media sampled. In developing SALs no consideration is given to exposure of humans under land use scenarios other than residential use, because decisions regarding future land use have not been made. Neither is there consideration given to exposure of wildlife, because the approach used in assessment of ecological risk potential has not been determined. However, limiting risk-based decisions to comparisons to SALs does not diminish the quality of information that will be gathered during the Phase I effort.

Based upon detailed review of historic information, references, interviews, and discussion among the OU team members, PRSs in OU 1157 have been grouped for investigation and remediation. Assignment of a PRS to a group was based primarily on the geographical proximity of the PRSs within each group. The kind of site, the potential contaminants present, and the potential for required remediation were also considered. A summary matrix that lists this information is presented as Figure 4-1. The matrix also displays where these units are located within the groupings and the contaminants likely to be associated with each potential release site. This information guided the preparation of the detailed sampling plans in Chapter 6. Details of the implementing process and some of the technical considerations that are the bases of the OU 1157 approach are presented in the following sections of this chapter.

4.1 Phased Approach

A phased approach has been adopted by the OU 1157 project team to meet the site assessment objective of the RFI/CMS process in an efficient and cost-effective manner. The phased approach uses available data, as they are obtained, to determine the requirements for further investigation, the adequacy of the data as a basis for making the decision at hand, and the data quality needs of a particular stage of the investigation or corrective measures action.

The phased approach to site assessment used in this work plan is consistent with EPA (1987, 0821) and the Laboratory's IWP (LANL 1992, 0768) guidelines. A minimal Phase I field investigation is first used to confirm the presence or absence of contaminants of concern (COCs) at a site. A potential COC becomes a confirmed COC if that constituent is found in concentrations exceeding background and exceeding established threshold levels based on screening action levels. If COCs are determined to be present based on the Phase I sampling results, the site is either recommended for a voluntary corrective action, deferred action, or is further sampled under a Phase II program. The Phase I Sampling and Analysis Plans (SAPs) are presented in Chapter 6 of this work plan. Any Phase II SAPs that may be needed will be developed base on the Phase I results and will be described in future reports.

The logic for the phased approach adopted for OU 1157 is presented in Figure 4-2. Existing information is reviewed to develop an understanding of the processes and

PRS TYPES	PRS GROUPS									TYPES OF CONTAMINANTS										AFFECTED MEDIA								RESPONSE ACTIONS				CORRECTIVE MEASURES		
	1—TA-8 Active Site	2—TA-8 Gun-Firing Site	3—TA-8 Abandoned	4—TA-8 MDA Q	5—TA-9 Active Site	6—TA-9 Decommissioned	7—TA-9/23 Firing Sites	8—TA-9 MDA M	9—Areas of Concern (AOCs)	High explosives (HE)	Radioactivity	Metals	PCBs	Solvents (VOCs, SVOCs)	Cyanide	Petroleum hydrocarbons	Industrial wastes	Sanitary wastes	Asbestos	Waste materials	Sewage	Structures	Surface soils	Subsurface soils	Sediments	Groundwater	Air	No further action (NFA)	Deferred action (DA)	Voluntary Corrective Action (VCA)	RFI (CMS)	Removal action	Treatment	Closure in place
Ventilation ducts			●							○	○				○				○								○		●			●		
Drains and sumps	●		●	●	●					●	●	●		●			●			○	●	●		●		○		○			●	○	○	○
Sewers and septic tanks	●		●	●	●	●		●		●	●	●		●			●	●		●	●			●		○		●		●		●	○	○
Settling pits				●	●					●	○	●		●	○		●			○	●	●	○	●		○		○			●	○	●	○
Ponds and drain fields				●						○	○	●		○				●		●	●			●		●	○	○			●	●	●	○
Outfalls	●			○						○	○	●		○									●	○	●	○	○		●		○	○		○
Transformer storage areas	●			○									●[2]										○					●				○		
Container storage	●			●					●	●	●	●		●			●						●	○	○		○	●		○		●		
Firing sites—HE						●				●	○	●										●	○			○					●	●	○	●
Firing sites—depleted uranium		●								○	○	●										●	○			○					●	○	○	●
Underground storage tanks			●		●											●							○					●				○		
Material disposal areas		●	●		○		●			●	○	●					●		●	●			●	○	○	●[3]	○					○	○	●
Miscellaneous process units	●[1]									○	●	●					●			●		●	○	○		○						○		
Incinerator and residue								●																		○			○		●	○		

● Likely
○ Possible

1. Silver recovery
2. Not RCRA waste
3. Especially MDA M

Figure 4-1. PRS matrix types in OU 1157.

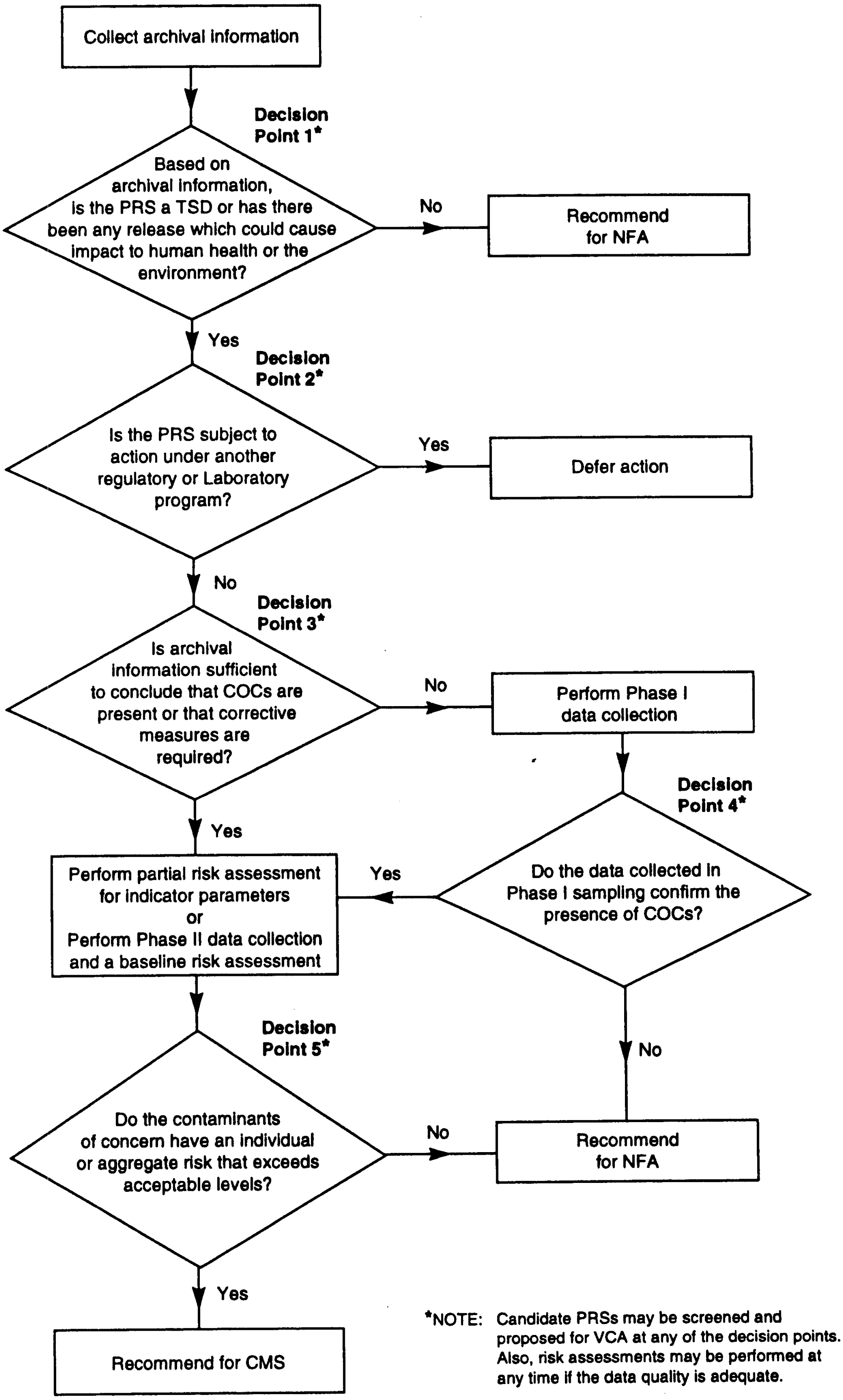

Figure 4-2. Decision process for OU 1157.

events that produced each PRS and any potential COCs. On the basis of existing information, four types of actions are being considered for OU 1157 PRSs. A fifth possible action, to immediately initiate a Phase II sampling program, was not considered necessary for any PRSs within OU 1157. The four actions are described below.

No Further Action (NFA). If, based on archival information, sampling and analysis results, or baseline risk assessment, the PRS is not now and will not in the future be a threat to human health or the environment, the site may be proposed for removal from the HSWA portion (Module VIII) of the Laboratory's RCRA permit (EPA 1990, 0306) through the permit modification process and from further consideration by the ER Program. This finding can be made if the PRS meets one or more of four conditions (see Table 4-1) specified in Module VIII. This finding may be made as the first step in the RFI/CMS process based primarily on archival information. It may, however, be made at any step of the process when sufficient information becomes available to support the decision.

Deferred Action (DA). Deferred action is only possible if present conditions and associated risks are consistent with the current use of the site. Sites proposed for DA are generally in use or slated for D&D. If currently used for treatment or storage of hazardous materials, they are covered under the Laboratory's RCRA permit (EPA 1990, 0306) or the Laboratory's DOE-based operational controls. If permitted, the active sites would be closed under the RCRA permit conditions. The Laboratory's D&D approach, on the other hand, consists of a flow of custody from the most recent Laboratory landlord to the Space Planning Group (ENG-2) through facility transition to the D&D Section of the ER Program. The potential contamination associated with OU 1157 PRSs proposed for deferred action is contained within existing structures that are either part of facilities operating under the Laboratory's RCRA permit or are slated for D&D. There is no indication of releases to the environment at any of these PRSs, and any current risk associated with these PRSs is considered acceptable. Activities of the D&D Section and the work described in this work plan will be closely coordinated.

Voluntary Corrective Action (VCA). A voluntary corrective action is initiated by the Laboratory if archival information, site observations, or sampling and analysis results indicate that immediate action is required, the corrective action is obvious and does not require study, and the action can be accomplished in an efficient and cost-effective manner. A VCA will involve cleanup or stabilization measures adequate to reduce risk to an acceptable level. The VCA may, however, consist of an interim action, also known as a conditional remedy. An interim action could include covering or removal of selected wastes, installation of a barrier fence or warning signs, or improving storm water management. An interim action will generally include plans for monitoring and implies that the PRS continues through the RFI/CMS process. The EPA may, usually based on new information, require the Laboratory to proceed with closure or other mitigation of a PRS in advance of the schedule set forth in Module VIII of the Laboratory's RCRA permit (EPA 1990, 0306). Interim actions required by EPA are known as interim measures.

Phase I Sampling. For those PRSs not qualifying for NFA, DA, or VCA based on archival information, data are gathered during Phase I investigations to identify those PRSs that may be recommended later for NFA, DA, or VCA, and those that may need further characterization by Phase II sampling. Phase I data may also be used to help identify any COCs present at the site and may be used for baseline risk assessments.

Phase II Sampling. Phase II field investigations are conducted to characterize the nature and extent of contamination. Data collected at this stage must be of adequate quality to develop the quantitative risk assessments that will be conducted for each PRS not subject to NFA, DA, or VCA. After a quantitative risk assessment is performed, a final decision for NFA, VCA, or corrective measures studies will be made.

The remainder of this section discusses decisions to be made as the phased approach is implemented. The decision points of Figure 4-2 and the information used at each point are discussed briefly. The sampling and analysis considerations introduced here, as well as the treatment of uncertainty, are subjects discussed in more detail in later sections.

4.1.1 Decision Point 1

On the basis of archival information, is the PRS a TSD or has there been any release which could cause impact to human health or the environment?

The function of Decision Point 1 is to differentiate, on the basis of available archival data and observation, between PRSs that clearly do not pose a potential risk to receptors and those that require further investigation. This decision must often be made on the basis of qualitative archival information and requires professional judgment on the part of the decision-makers.

Section J of the Laboratory HSWA permit (EPA 1990, 0306) allows the Laboratory to submit an application for a permit modification at locations for which existing information demonstrates that hazardous wastes, including hazardous constituents, that pose a threat to human health or the environment have not been released (and will not be released) from the PRSs. In those instances, no further action may be proposed. Any of four conditions, as specified in the permit, must be met for NFA. Table 4-1 lists the specific conditions.

TABLE 4-1

NFA Criteria[1] for OU 1157

1. The site or PRS has never been used for the management (that is, generation, treatment, storage, or disposal) of RCRA hazardous wastes or radionuclides - the site is not a TSD facility.
2. Site design, conditions, or institutional controls prohibit the release of substances that would pose a threat to human health or the environment from the PRSs.
3. The PRS is part of a process operating under the Laboratory's current RCRA Part B permit, NPDES permit, or other applicable discharge permit.
4. The PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants of concern are either not present or are present in concentrations at or below background levels.

1 These criteria are based on the conditions in Section J of the Laboratory's Hazardous Waste Permit (EPA 1989, 0088).

An affirmative decision at Decision Point 1 indicates that the PRS under consideration poses some degree of potential risk or that the available data are insufficient to deny the possible existence of risk. All such PRSs are recommended for further consideration at Decision Point 2. A negative decision indicates that, on the basis of professional judgment, the PRS poses no potential risk and should be recommended for NFA.

Because of the judgmental nature of this decision, a recommendation of NFA cannot be made unless the available documentation and/or site inspections clearly show that at least one of the four NFA criteria is met.

Evaluation at Decision Point 1 divides the OU 1157 PRSs into two sets: one consisting of PRSs recommended for NFA and another set that will be evaluated at Decision Point 2. Because the first decision is made on the basis of existing archival information, all PRSs in OU 1157 were evaluated at Decision Point 1 during the preparation of the work plan. Potential release sites recommended for NFA at Decision Point 1 and the criteria used for the basis of such recommendations are presented in Chapter 7.

4.1.2 Decision Point 2

Is the PRS subject to action under another Laboratory or regulatory program?

At this point, selection and implementation of corrective measures may be postponed until a future date associated with RCRA closure or with D&D activities. It is assumed that the responsibility for clean-up rests with the D&D program or with the program responsible for RCRA closure activities. Although immediate action, a VCA in effect, could be recommended to the responsible program or undertaken by the ER Program at this time, no PRSs included in OU 1157 and found eligible for deferred action showed any evidence of a release to environmental media based on archival information and visual inspection. Based on archival information, operating practices, and the physical condition of the facility, any current risk associated with all such sites is considered acceptable. The rationale supporting this conclusion is presented with the discussions of the individual facilities in Chapter 5.

4.1.3 Decision Point 3

Is the archival information sufficient to conclude that COCs are present or that corrective measures are required?

Decision Point 3 allows the set of PRSs requiring further characterization to be sorted for development of Phase I or Phase II SAPs. The purpose of this decision is to determine which PRSs need Phase I characterization before initiating a more detailed (and costly)

Phase II investigation. Pre-existing analytical data will not be used at OU 1157 for comparisons to background, screening action level comparisons, or risk calculations. This is because archival data are sparse, are of unverifiable quality, and are therefore used only as information to support NFA, DA, or VCA recommendations or sampling plan design.

Archival data and information gathered in site visits during SAP preparation were used to help determine if Phase I or Phase II sampling is more appropriate. All OU 1157 PRSs under consideration at Decision Point 3 were recommended for Phase I sampling. No PRS under consideration after Decision Point 1 will be recommended for NFA without a minimum amount of characterization performed under the strict RCRA-based quality assurance (QA) requirements presented in Annex II of this work plan.

4.1.3.1 Phase I Sampling

Phase I sampling will be conducted at PRSs where contamination is suspected based on archival information. The goal of Phase I sampling is not complete characterization of the site but discovery of COCs. Information on site history, physical site characteristics, chemical and physical behavior of suspected constituents, and other factors must all be considered in determining the appropriate locations and depths at which samples must be collected to confirm the presence or absence of COCs. The potential COCs are identified from archival information that indicate the source of the waste materials, site visits during work plan preparation, and, when available, past sampling analytical results. No analytical data pertaining to OU 1157 were of sufficient quality to justify bypassing Phase I sampling for the purpose of comparing data to background levels, screening action levels, or for use in baseline risk assessments.

Phase I sampling is performed for selected indicator parameters at locations that are highly likely to have been contaminated if a release to environmental media had occurred. These indicator parameters are generally a subset of the potential COCs that may be present and are selected on the basis of their quantity, toxicity, mobility, and/or ease of detection. In many instances, the laboratory analyses for the specified indicator parameters are expected to employ quantitative scanning methodologies. These methodologies will also yield information on many other related chemical constituents, such as other metals, volatile organics, or semivolatile organics. Even though not all constituents that could be detected by the methods are specified indicator parameters, the analytical laboratories will be instructed to provide data on anomalous quantities of any constituents that the methods detect.

4.1.3.2 Phase I Analytical Levels

Phase I samples will be analyzed to determine if a release has occurred that exceeds background levels as well as established threshold levels based on screening action levels for the type of chemical and radiological constituents that are likely to have been present. If a significant release has occurred, these data will be supplemented as required during Phase II sampling with any additional information that is needed to conduct a risk assessment.

Phase I samples will be analyzed in a manner appropriate for defensibly determining the presence or absence of environmental contamination and for supporting defensible risk assessments. Field screening for organic vapors and radioactive materials will be performed to determine the degree of required worker protection and to provide an initial indication of contamination. Hand-held instruments will be used to screen all materials as they are sampled. Established Laboratory protocols will be used for radionuclides and HE, and standard EPA protocols, or the equivalent, will be used for the remaining parameters. This will include both level II and level III analytics and may include the use of field laboratories.

4.1.4 Decision Point 4

Do the data collected in Phase I sampling confirm the presence of COCs?

Decision Point 4 addresses confirming the presence or absence of COCs at the PRS following Phase I sampling. The purpose of Phase I sampling is to acquire the analytical and field data needed to make a defensible decision at this point. If the sampling confirms the presence of COCs (that is, that waste constituents are present at concentrations above both threshold levels and background levels), Phase II data collection or a preliminary baseline risk assessment may be performed. Alternatively, the discovery of COCs could lead to consideration of a PRS for voluntary corrective action. If the sampling indicates the absence of COCs, the PRS is recommended for NFA. A recommendation of NFA is justified by a technically sound and QA-validated sampling effort that has confirmed the absence of COCs at the PRS.

A threshold level may be exceeded if one or more screening action level(s) are exceeded by validated waste constituent concentrations at a site, or if the cumulative effects of multiple contaminants exceed acceptable limits as defined in Appendix J of the IWP (LANL, 1992, 0768). Phase I data will first be compared with threshold levels. If threshold levels are not exceeded, the site may be recommended for NFA without further analysis. If threshold levels are exceeded, the data are then compared to background levels. If background levels are also exceeded, COCs are considered to be present and the site is recommended for either Phase II action or a VCA, as described above. If threshold levels are exceeded but background levels are not exceeded, COCs are not considered to be present and the site is recommended for NFA. The ongoing framework study to determine background levels for the Laboratory is expected to provide adequate information to support this decision process. For manmade constituents, background is generally considered to be zero.

4.1.4.1 Phase II Sampling and Analysis

The purpose of Phase II sampling is to develop a more complete picture of the nature and extent of contamination at a site. The Phase II sampling program will be developed based upon the results obtained from the Phase I sampling. Phase II SAPs are expected to vary significantly for individual PRSs depending upon the amount and type of data available from archives and from Phase I sampling results. Information on background levels and sources of potential variation in the environmental measurement process will be included in the design of Phase II sampling plans.

Phase II will likely be an iterative process for most sites. The available analytical data, starting with the validated Phase I sampling and analysis results, will be used for risk assessments, planning additional physical and chemical site characterization activities, and evaluating alternative corrective measures. Phase II sampling may include determination of local background if necessary to make defensible comparisons. Phase II data collection and analysis activities will cease when a sufficient data base is established to perform defensible assessments of risk and defensible evaluations of alternative corrective measures. We expect to find that sites with extensive Phase I data will not require full Phase II sampling. The Phase II data requirements will also be amended as necessary to accommodate future program guidance on human health and ecological risk assessment methods.

4.1.5 Decision Point 5

Do COCs have an individual or aggregate risk that exceeds acceptable levels?

Decision Point 5, the final step in the phased approach decision process, is an evaluation of the total set of validated data now available for each PRS. It is triggered at the point at which PRSs have undergone field investigations and will be recommended either for CMS or NFA. Concentrations of individual COCs at each PRS will be compared to acceptable risk levels for the COC. The calculated aggregate risk from COCs at the PRS will be compared to acceptable aggregate risk levels, where aggregate risk is the cumulative risk due to impacts of more than one contaminant.

Risk assessment methodologies adopted by the Laboratory reflect the basic concepts of the proposed Subpart S to 40 CFR 264 and incorporate guidance issued by the EPA under CERCLA and the Superfund Amendments and Reauthorization Act (SARA); calculation of risk as additive for sites with multiple contaminants is assumed.

Based on baseline risk assessment results, a recommendation of NFA at this point in the decision process will be justified for a PRS if both of the following criteria are met:

- The risk calculated for any COC does not exceed acceptable risk levels, and
- An aggregate risk value for the COCs present does not exceed an acceptable risk value.

If these criteria are not met, a CMS is required unless a case can be made for immediate VCA. That is, an obvious, simple, accepted, and effective corrective action is available and practicable.

4.2 Decision Process and Management of Uncertainty within OU 1157

Any decision made on the basis of archival data or data sampled from environmental media will inevitably involve some degree of uncertainty. The following discussion describes the measures taken to manage uncertainty at each decision point.

The phased approach to site assessment is dependent on decisions at the five points in the RFI process (Figure 4-2). Each of the five diamonds in Figure 4-2 represents a point at which a decision will be made for each PRS under consideration. For each point, the OU 1157 team has established constraints on uncertainty to ensure simplicity in the decision-making process. Each question posed has only two possible answers; "yes" or "no." Each of the decision points detailed in Section 4.1 depends on environmental sampling or archival data and therefore requires management of the uncertainty associated with those data. All OU 1157 PRSs have been evaluated using the first three steps in the phased approach: collect archival data and determine eligibility for designation as NFA, DA, or Phase I sampling on the basis of that data. Management of uncertainty at Decision Points 1 through 5 is described below.

4.2.1 Management of Uncertainty at Decision Points 1 and 2

The approach taken to managing uncertainty at Decision Points 1 and 2 was to assemble as much historical information as possible about the PRSs within OU 1157. The decision at these points depended on existing data that the OU 1157 team collected and judged to be relevant to one or more PRSs. In most cases, qualitative information about past practices and processes and other programs were considered reliable for decision-making. To gain a preliminary understanding of current conditions at OU 1157, the OU team assembled archival information from a variety of sources. Published accounts of Laboratory operations provided a framework for developing ideas about general operations at various PRSs. In addition, memoranda, files, Laboratory reports, and engineering drawings, including change orders and as-built drawings, were researched and analyzed. Current and retired employees contributed operational information in interviews with OU 1157 team members. These sources of information were used to determine what (if any) contaminants may be present at a given PRS.

Historical quantitative data about contamination are also useful, but in general must be regarded with caution. In most cases, it is not possible to make statements about the uncertainty associated with historical quantitative data. Therefore the OU 1157 team used this data conservatively. Whenever information was judged inadequate or data were suspect, the team elected to collect additional data. Any PRS at which the presence of contamination was questionable based on historical information moved on to Decision Point 3. Otherwise, the PRS was assigned to the NFA or DA category or possibly recommended for VCA at Decision Points 1 and 2.

4.2.2 Management of Uncertainty at Decision Point 3

Decision Point 3 entails a judgment about the quality and utility of historical data. Data must be satisfactory to confirm the presence or absence of contaminants. The team has taken a very conservative approach to using available data to ensure this result. If the data set in question is recent, of known quality, and unambiguous with respect to screening action levels, Phase I sampling will not be conducted. In practice, all OU 1157 PRSs that are being recommended for further action will be subjected to Phase I sampling.

4.2.3 Management of Uncertainty at Decision Point 4

Decision Point 4 involves the comparison of quantitative data collected during Phase I investigations with background and threshold levels to confirm the presence of COCs. The primary focus of OU 1157 Phase I investigations will be to collect sufficient data to determine whether COCs are present at a given PRS.

4.2.3.1 The Data Quality Objective Process

The principal tool for managing uncertainty in Phase I data collection will be the DQO process. This is a technique that carefully defines the specific role to be played by data in Phase I decision-making and identifies the quality and quantity of data required to make the decision. As applied to OU 1157, the DQO process has the following steps.

Summary of the Problem. A concise statement of the environmental problem potentially associated with a given PRS or group of PRSs, including any existing data relevant to the problem.

Decision(s) To Be Addressed. A statement of the specific decision(s) to be made in order to resolve the problem. A typical decision for the OU 1157 Phase I investigation will be to proceed to Phase II if contamination at a given PRS is found to exceed established threshold and background levels.

Inputs. A description of the type(s) of environmental data that will be required to make the decision, including a specific list of constituents to be investigated.

Boundaries. A description of the spatial (and, if appropriate, temporal) boundaries that define the area from which samples will be taken and to which the decision will apply. For Phase I, this may be a segment of a PRS, an entire PRS, or a group of PRSs.

Decision Logic. A statement that builds on the preceding steps to rigorously define the decision to be made with data, the way in which data will be used to make the decision, and what actions will follow as a consequence of the decision. A typical Phase I decision rule will involve comparison of the maximum measured concentrations of a given set of indicator parameters to the threshold and background levels for those parameters.

Design Criteria. A qualitative or quantitative statement of what will be done to assure that the decision can be made with an acceptable degree of uncertainty. For the typical Phase I decision, an important criterion will be to employ judgmental sampling, that is, to locate sampling points in areas most likely to be contaminated. In some cases, visual evidence or historical process knowledge will make it possible to rely only on judgmental sampling as a design criterion (i.e., to specify a given number of judgmental sampling points as an adequate basis for the Phase I decision).

While the design criteria provided in this work plan place limits on acceptable uncertainty, they do so primarily by specifying an acceptable number of sampling locations. While it is recognized that this approach does not incorporate statistical sampling designs whose performance can be fully quantified, the approach does provide adequate planning specifications for the typical Phase I decision. It is anticipated that Phase II sampling designs may require a more rigorous statistical basis.

The outputs of the DQO process, described above, lead to definition of DQOs, including but not limited to specifications of the media and areas to be sampled, sampling protocols to be used, variables to be measured, analytical methods to be used, and precision and accuracy requirements for the sampling and analysis procedures. These specifications are the foundation for the Phase I sampling and analysis plans.

4.2.3.2 Statistical Sampling Approach

Another element of the strategy for managing uncertainty during Phase I is to employ a statistical approach to reconnaissance sampling. This approach directly links the number of samples to be taken in a given area to the importance of detecting contamination over a defined fraction of that area. This approach is described in Section 4.1 of Appendix H of the IWP (LANL 1992, 0768) and in Section 4.3.1 below.

Statistically based techniques are used to guide sampling designs at PRSs where locations of potentially contaminated sites are uncertain. This uncertainty may arise either because the method of dispersal of potentially hazardous materials is random (such as through debris scatter from firing sites) or where the location of a facility that may have released hazardous materials is now uncertain (such as a potentially contaminated settling tank that was removed decades ago). In both cases, the sampling design was based upon both judgmental and statistical considerations.

4.2.4 Management of Uncertainty at Decision Point 5

Decision Point 5 will depend on Phase II sampling to establish the nature and extent of contamination at a given PRS as well as on the performance of a baseline risk assessment to establish the need for cleanup or other corrective measures and appropriate cleanup levels. Phase II sampling will also be based on application of the DQO process. Because the decision to be made will be different from that at Decision Point 4, the DQO outputs will also differ. The steps of the process will, however, remain the same.

4.3 Assessment Considerations

Data quality requirements for field and analytical data collected at OU 1157 are governed by the need to make defensible, risk-based decisions for each PRS. The information collected will be based on sound professional judgment, required EPA protocol, statistical requirements, and overall data objectives for the project. This section presents information on sampling and analysis methods to be used for the OU 1157 RFI.

4.3.1 Sampling Designs

The reconnaissance sampling approach described in Appendix H of the IWP (LANL 1992, 0768) was used to incorporate statistically based techniques into sampling design. This approach relates the number of samples (N) to the fraction of the site (f) over which releases may have occurred and to the probability (P) that at least one of the samples will be within a release area. This relationship is expressed by the equation $P = 1 - (1-f)^N$. For consistency, and to assure an adequately high level of confidence in the results, a probability P of 95% was used in each case. For this value of P, the relation between f and N is shown in Table 4-2.

TABLE 4-2

Values of f and N for P = 95%[1]

Percent of Area Contaminated (f)	Number of Samples (N)
5	59
10	29
20	14
30	9
40	6
50	5
60	3
70	2
90	1
100	1

1 Based on the relation $P = 1 - (1-f)^N$ among the number of samples (N), the fraction of the site (f) over which releases may have occurred, and the probability (P) that at least one of the samples will be within a release area.

The tabulation indicates that the number of samples increases dramatically as the percent of area that may be contaminated decreases. For this reason, the method is not recommended in the IWP for detecting small areas of contamination. Further, the method is independent of the size of the area to be sampled (which is considered large relative to the size of each sample). It also does not take into account the potential severity of the contamination hazard that may be present (except through adjusting one of the three parameters, for example, the value of P), and it assumes that all sampling results are accurate.

At some sites the value of f could be reasonably estimated based upon archival information, but at other sites such information did not provide a reliable basis for determining f. Because of the lack of a reliable basis at many sites for assuming a value of f, and in view of the aforementioned limitations in the statistical method, the approach was taken to determine a reasonable value for N based upon the size of the site, the expected severity of the contamination hazard, and the expected nature and distribution characteristics of the potential contaminants. In general, the sample sizes were increased for larger size sites and for higher potential contamination hazards. After a value for N was determined, the statistical method was used to determine the corresponding value of f, which was then qualitatively checked for general reasonableness considering the available information on the quantities of potential contaminants, the potential methods of release to the environment, and any possible dispersal processes occurring since release. Both N and f were then adjusted to achieve a reasonable sampling design for the site. For application to OU 1157 sites, the parameter f is defined as the fraction of area that may have received waste constituents, rather than the fraction of area above screening action levels as defined in the IWP. At most of the PRSs in OU 1157, no waste constituents are expected to be above screening action levels.

At each site where sampling locations were randomly selected, a square grid was established and a random number table was used to select numbered nodal points. Although the grid axes were aligned either in the cardinal compass directions or parallel to the boundaries of the area to be sampled, each grid was translated to a random location in space. The grid size was generally selected to provide at least an order of magnitude more nodal points than sampling points to reduce bias in the selected sampling point. However, at some smaller sites the nodal points were sufficiently close so that they were within the zone of expected spatial correlation with adjacent points. At such sites, conditional sampling rules were applied to help assure the independence of each sample.

The aforementioned approach was used at all uncontained experimental firing sites in OU 1157 where soil contamination may have occurred from debris scattered in an approximately random manner. At each of these sites, 10 samples will be taken, with a corresponding contaminated area fraction of about 30%. Although this sampling design allows for some analytical inaccuracy, it is considered conservative because given the hundreds of shots fired at each site, the contaminated area fraction could easily be higher.

A greater degree of contamination would be expected near the firing sites than at more distant locations, and nodal points near the sites were therefore weighted to bias sampling toward them. The weighting found to provide the most acceptable results was to assign four nodal numbers to nodes nearest the firing sites, two numbers to nodes farther away and one number to the most distant nodes. The weighted sampling grids are presented in Chapter 6 in the sampling plans for these sites. The firing site sampling grids have a minimum 10-ft spacing, and no allowance was considered necessary for spatial correlation.

Statistically based techniques were also used to guide sampling designs at locations where the structure associated with the potential release has been removed, the site has been graded, and the exact location of the potential release is uncertain. In all cases, the size of the structure was known, and it could be assumed that if a release had occurred, the area of contamination above background levels would have been at least as large as the area covered by the structure. The target for sampling was the former location of the center of the structure (for example, the center of a waste water settling tank that could have released contaminants to the underlying soil with subsequent lateral spreading beneath the tank).

The size of the sampling area was the area of a circle centered on the best estimated location of the center of the removed structure, with a radius equal to the uncertainty in the location of that structure. This uncertainty was estimated on the basis of comparing measured dimensions with scaled distances on copies of original site maps showing the pertinent structures. The average map accuracy was found to be on the order of 2 to 3% of the distance measured, and the location accuracy was estimated to be 2 or 3% of the distance to the structure from landmarks on the original drawings that have not been removed. The value of f was computed as the ratio of the area of the facility to the area of the circle, and the number of samples N was determined from Table 4-2. For all such structure sites, a spatial correlation was assumed and sampling points were spaced a minimum distance equal to one-half of the short axis of the structure. Although this method is not entirely rigorous (for example, it ignores edge effects), it provided numbers of samples that appeared reasonable given the expected severity of the contamination hazard. Specific discussions of this approach are presented in the sampling plans for the applicable structures in Chapter 6.

In some cases, sample locations are determined by means of sampling grids (see Chapter 6). In each case, these grids feature a random start point leading to random or stratified random sample selection.

4.3.2 Sampling Actions

A variety of actions will be taken during the RFI sampling for OU 1157. Because it is often not known whether environmental contamination has occurred at any of the PRSs planned to be sampled, the objective of the sampling is to determine whether a release has occurred that exceeds established screening action levels for the types of chemical constituents that are likely to have been present. These techniques are summarized in Table 4-3. Also indicated in Table 4-3 are the applicable Laboratory SOPs for each activity.

Most of the sampling proposed for OU 1157 is sampling of surface soils, sediments, and surface waters. A summary of drilling activities is presented in Table 4-4.

Numerous field activities have an impact on the overall quality for an ER Program. The sample collection activities that have a direct effect on data quality include equipment calibration schedules and procedures, sample method selection and technique, sample containers, preservatives, sample holding times, the number or type of quality checked (QC) samples, sample documentation, and equipment decontamination. To ensure that data quality is maintained in the field, specific details for each of these activities are included as part of the SOPs listed in Table 4-3 and in Annex II, the QAPjP for this work plan, and in the Laboratory Standard Operating Procedures Manual for the ER Program (LANL 1991, 0411).

4.3.3 Analytical Methods and Levels

The analytical methods presented in this work plan are considered preliminary, pending adoption of screening action levels for all indicator parameters and completion of contractual agreements with analytical laboratories. The final analytical methods must be capable of achieving routine detection limits below the screening action levels and must be within the capability of the analytical laboratory. The sample volume and container requirements will also depend upon the laboratory's capabilities and may be slightly different from the requirements presented in this work plan.

TABLE 4-3
OU 1157 Sampling

PRS TYPE	TECHNIQUE	SOP (or Reference)
1. Sumps	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Soil Gas Sampling	LANL-ER-SOP-03.03
	Drilling Methods and Drill Site Management	LANL-ER-SOP-04.01
	General Borehole Logging	LANL-ER-SOP-04.04
	Hand Auger and Thin-Wall Tube Sampler	LANL-ER-SOP-06.10
	Soil and Rock Borehole Logging and Sampling	LANL-ER-SOP-06.12
	Field Logging, Handling, and Documentation of Borehole Materials	LANL-ER-SOP-12.01
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
2. Sewers		
PRS 8-004(d)	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
(Drains)	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Wipe Sampling of Solid Surfaces	To Be Determined
	Coliwasa Samples for Liquids and Slurries	LANL-ER-SOP-06.15
	Trier Samples for Sludges and Moist Powders or Granules	LANL-ER-SOP-06.17
	Hand-held Instruments for Field Screening of VOCs	To Be Determined
	Hand-held Instrmts for Field Screening Radioactive Substances	To be Determined
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
3. Waste Water Treatment Ponds and Drain Fields		
PRS 9-009	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
(Lagoon and Sand Filters)	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-06.09
	Sediment Material Collection	LANL-ER-SOP-06.14
	Hand Auger and Thin-Wall Tube Sampler	LANL-ER-SOP-06.10
	Trier Samples for Sludges and Moist Powders or Granules	LANL-ER-SOP-06.17
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
PRSs 9-005a and 9-006	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
(TA-9 Leach Fields)	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Soil Gas Sampling	LANL-ER-SOP-03.03
	Drilling Methods and Drill Site Management	LANL-ER-SOP-04.01
	General Borehole Logging	LANL-ER-SOP-04.04
	Soil and Rock Borehole Logging and Sampling	LANL-ER-SOP-06.12
	Field Logging, Handling, and Documentation of Borehole Materials	LANL-ER-SOP-12.01
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05

TABLE 4-3
OU 1157 Sampling

PRS TYPE	TECHNIQUE	SOP (or Reference)
PRS 9-008b	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
(Oxidation Pond)	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-06.09
	Stainless Steel Surface Soil Sampler	LANL-ER-SOP-06.11
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
4. Outfalls	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
(PRS 8-009d, e, and f only)	Hand Auger and Thin-Wall Tube Sampler	LANL-ER-SOP-06.10
	Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-06.09
	Stainless Steel Surface Soil Sampler	LANL-ER-SOP-06.11
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
5. Transformers	*No sampling described*	
6. Waste Container Storage Areas	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-06.09
	Stainless Steel Surface Soil Sampler	LANL-ER-SOP-06.11
PRS 8-005 only	Trier Samples for Sludges and Moist Powders or Granules	LANL-ER-SOP-06.17
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
7. Firing Site - HE (High Explosives)	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
SURFACE SOIL SAMPLING	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
(PRSs 9-001a, b, d, 9-014,	Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-06.09
and 9-015)	Stainless Steel Surface Soil Sampler	LANL-ER-SOP-06.11
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
BOREHOLE SAMPLING	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
(PRSs 9-001c and 9-002)	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Drilling Methods and Drill Site Management	LANL-ER-SOP-04.01
	General Borehole Logging	LANL-ER-SOP-04.04
	Soil and Rock Borehole Logging and Sampling	LANL-ER-SOP-06.12
	Field Logging, Handling, and Documentation of Borehole Materials	LANL-ER-SOP-12.01
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
8. Firing Site -- depleted U	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
(Gun Firing)	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-06.09
Sand Butts only	Hand Auger and Thin-Wall Tube Sampler	LANL-ER-SOP-06.10
	Stainless Steel Surface Soil Sampler	LANL-ER-SOP-06.11
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05

TABLE 4-3
OU 1157 Sampling

PRS TYPE	TECHNIQUE	SOP (or Reference)
9. USTs (Underground Storage Tanks)	*No USTs scheduled to be sampled*	
10. MDAs		
MDA-Q	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-06.09
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
MDA-M Asbestos Sampling	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Sampling for Asbestos	To Be Determined
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
Waste Material Sampling (Judgemental soil, solid, residual liquid, and wipe sampling, and random soil and downstream sediment sampling)	General Sampling Instructions	LANL-ER-SOP-01.01-06
	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Sampling for Volatile Organics	LANL-ER-SOP-06.03
	Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-06.09
	Stainless Steel Surface Soil Sampler	LANL-ER-SOP-06.11
	Weighted Bottle Sampler for Liquids and Slurries in Tanks	LANL-ER-SOP-06.19
	Wipe Sampling of Solid Surfaces	To Be Determined
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
Spring Sampling	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Field Analytical Measurements of Groundwater Samples	LANL-ER-SOP-06.02
	Sampling for Volatile Organics	LANL-ER-SOP-06.03
	Surface Water Sampling	LANL-ER-SOP-06.13
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
11. Miscellaneous Process Units **PRS 69-001** **(Ash Pond)**	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-06.09
	Stainless Steel Surface Soil Sampler	LANL-ER-SOP-06.11
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
12. Reported/Unreported Releases	*No sampling described*	

TABLE 4-3
OU 1157 Sampling

PRS TYPE	TECHNIQUE	SOP (or Reference)
13. Septic Tanks	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Soil Gas Sampling	LANL-ER-SOP-03.03
	Drilling Methods and Drill Site Management	LANL-ER-SOP-04.01
	General Borehole Logging	LANL-ER-SOP-04.04
	Sampling for Volatile Organics	LANL-ER-SOP-06.03
PRS 8-003a only	Soil Water Samples	LANL-ER-SOP-06.05
PRS 8-003a only	Trier Samples for Sludges and Moist Powders or Granules	LANL-ER-SOP-06.17
PRS 8-003a only	Hand Auger and Thin-Wall Tube Sampler	LANL-ER-SOP-06.10
	Soil and Rock Borehole Logging and Sampling	LANL-ER-SOP-06.12
	Field Logging, Handling, and Documentation of Borehole Materials	LANL-ER-SOP-12.01
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05
14. TA-9 Bulk Cover Soils (d)	General Sampling Instructions (a)	LANL-ER-SOP-01.01-06
	Field Health and Safety (b)	LANL-ER-SOP-02.01-11
	Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-06.09
	Stainless Steel Surface Soil Sampler	LANL-ER-SOP-06.11
	Curatorial Sample Management (c)	LANL-ER-SOP-12.01-05

(a) General Sampling Instructions include six SOPs:
- SOP-01.01 General Instructions for Field Investigations
- SOP-01.02 Sample Containers and Preservation
- SOP-01.03 Handling, Packaging, and Shipping of Samples
- SOP-01.04 Sample Control and Field Documentation
- SOP-01.05 Field Quality Control Samples
- SOP-01.06 Management of RFI-Generated Waste

(b) Health and Safety in the Field Instructions include 11 SOPs: (Procedures are in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.
- SOP-02.01 Personal Protective Equipment
- SOP-02.02 Respirators
- SOP-02.03 Pre-Entry Briefings for Site Personnel
- SOP-02.04 Pre-Entry Briefings for Visitors
- SOP-02.05 Safety Meetings and Inspections
- SOP-02.06 Heat and Cold Stress and Natural Hazards
- SOP-02.07 General Equipment Decontaminatoin
- SOP-02.08 Personnel Decontamination

TABLE 4-3
OU 1157 Sampling

PRS TYPE	TECHNIQUE	SOP (or Reference)

SOP-02.09 Accident/Incident Reporting
SOP-02.10 Radiation Protection
SOP-02.11 Training and Medical Surveillance

(c) Curatorial Sample Management Instructions include five SOPs: (Procedures are in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

SOP-12.01 Field Logging, Handling, and Documenting Borehole Samples
SOP-12.02 Transport and Receipt of Borehole Samples by the Curatorial Management Facility
SOP-12.03 Physical Processing and Storage of Borehole Samples at the Curatorial Management Facility
SOP-12.04 Examination of Samples at the Curatorial Management Facility
SOP-12.05 Acceptance of Non-Borehole Samples by the Curatorial Management Facility

(d) This category is not a PRS, but related to several PRSs associated with the decommissioning and demolition of the TA-9 Decommissioned Area facilities.

TABLE 4-4

Summary of Drilling Activity for PRSs with Borehole Sampling

PRS	Number of Boreholes	Expected Borehole Depth (ft)	Total Expected Borehole Footage (ft)
Group 3			
8-003(a)	2	8	16
Group 5			
9-003(a)&(e)	10	13	130
9-003(b)	6	11	66
9-003(d)	6	15	90
9-005(a)Tank	2	7	14
9-005(a)Leach	2	8	16
9-005(d)	2	5	10
9-006	2	10	20
9-012	2	5	10
Group 6			
9-001(c)	6	14	84
9-002	6	5	30
Totals	46		486

The determination of analytical methods and levels for field and laboratory tasks will help to standardize analytical procedures for the project. The analytical levels used for OU 1157 are as follows:

Level I Field Screening. PID/FID instruments or equivalent will be used to screen soils for organic vapors; a GM detector or ion chamber will be used to screen soils and water for gross beta and gamma contamination; an alpha scintillation detector (ASD) or equivalent will be used to screen soils and water for gross alpha contamination. A spot-test (Baytos 1991, 12-0141) for the identification of HE will be used to indicate the presence of explosives as contaminants on equipment and materials.

Level II Field Analysis. A field gas chromatograph (GC) will be used to analyze soil gas samples for organic vapors.

Level III Standard Laboratory Analysis. EPA SW-846 laboratory methods (EPA 1987, 0518), or equivalent, will be used on soil and water samples for routine analytes. A mobile laboratory utilizing SW-846 or equivalent methods may be utilized if available and if able to produce the required data quality.

Level V Specialized Laboratory Analysis. Analytical procedures developed by the U.S. Department of Energy (DOE 1983, 0516) will be used for radiological analyses. Analytical procedures developed at LANL employing liquid chromatography or an equivalent method will be used for HE analytes (Harris et al. 1989, 12-0155); these procedures were adapted from high-pressure liquid chromatography (HPLC) (or equivalent) methods used by the Pollution Monitoring and Abatement Program of the U.S. Army Toxic and Hazardous Materials Agency (U.S. Army no date, 0522).

In general, Levels I and II are associated with on-site portable field instrumentation or tests that may be semi-quantitative or quantitative. For example, spot tests that may be used to detect high explosives are effectively binary, indicating presence/absence with a detection limit of about 100 ppm in soil. Field portable radiation detection equipment is semi-quantitative indicating level of contamination in counts per minute (cpm) but do not normally yield quantified concentration levels. Some portable instruments for detection of organics can yield semi-quantitative concentration information.

Level III analyses are associated with standard laboratory protocols and documentation that will generate high-quality, defensible data. These analyses may be conducted in field laboratories to similar levels of precision and accuracy. Organic analyses are expected to be performed using standard techniques that include use of gas chromatography, high-pressure liquid chromatography, and possibly gas chromatography coupled with mass spectrometry. Inorganic analyses are expected to be conducted using standard inductively coupled plasma emission and atomic absorption spectrometric techniques, and possibly instrumental neutron activation analysis or x-ray fluorescence techniques.

This work plan assumes availability of real-time Level I data. Level IV analyses are not specified for the Phase I and Phase II investigations described in this work plan because the Level III analyses specified, carried out under the QAPjP presented in Annex II of the work plan, are of equivalent quality to Level IV analyses. Level V will accommodate all special analytical methods that are not covered under standard Level III. Quantitative analysis of radionuclides is conducted by laboratory counting using calibrated instruments under controlled conditions. Special techniques developed by the laboratory utilizing high-pressure liquid chromatography are to be used for quantitative determination of HE. The quality of Level V work can meet Level III precision and accuracy requirements.

Level V analyses will be used at several PRSs to determine the concentrations of eight commonly used high explosives. These are: TNT (trinitrotoluene); RDX (hexahydro-1,3,5-trinitro-1,3,5-triazine); HMX (cyclotetramethylenetetranitramine); PETN (pentaerythritol tetranitrate); tetryl (N-methyl-N,2,4,6-tetranitrobenzamine); 2,4-dinitrotoluene; 1,3,5-trinitrobenzene; and explosive D (ammonium picrate).

Investigations at OU 1157 will be performed under a combination of analytical levels to meet the specific project needs. Table 4-5 provides details concerning the analytical methods and levels expected to be used for the various types of PRSs that are to be investigated for the OU 1157 RFI.

4.3.4 Extended Analyte List

The OU 1157 extended analyte list (EAL) is presented in Table 4-6. This list is used where there is a need to characterize a site for a VCA or when limited process knowledge exists, because a restricted suite of indicator parameters would not provide adequate information concerning potential contamination. The EAL for OU 1157 was created from the Appendix IX target analyte list by removing those compounds that have not been used at OU 1157 and have not been used routinely at other areas within the Laboratory. Much of the information used to select compounds for the extended analyte list was provided by B. W. Harris (Vanden Plas 1993, 12-0143), a long-time employee of the Laboratory's M-1 Group who has broad knowledge of past and present operations at both TA-8 and TA-9.

Using information supplied by Harris and general knowledge of Laboratory operations, compounds and classes of compounds known to have been used within OU 1157 were included in the EAL. Classes of compounds such as dioxins, herbicides, and organophosphorous pesticides were not included on the EAL because they have had very limited to no use at the Laboratory. However, certain classes of compounds that were used extensively at other Laboratory areas, such as chlorinated solvents, were retained on the EAL, even though they were not routinely used at OU 1157. Individual compounds were also not included on the EAL based on their lack of use at OU 1157 and at the Laboratory in general. However, individual compounds were retained on the list if the compounds were known to be degradation products of other compounds on the list or were used extensively in other areas of the Laboratory.

4.3.5 Screening Action Levels

Screening action levels for contaminants of concern are presented in Appendix J of the Laboratory's IWP (LANL 1992, 0768) and are summarized for the indicator parameters in Tables II-1 and II-2 of the QAPjP (Annex II of this document). These screening action levels will be used in establishing threshold values to help determine whether a PRS

TABLE 4-5
OU 1157 SAMPLE ANALYSIS

PRS TYPE	PORTABLE	FIELD LAB	* LABORATORY
1. Bulk Cover Soils Group 5, TA-9 Decommissioned Area 9-001(d), 9-003(g), (h), (i) Surface Soil	Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha Field Screen for VOCs Level I: -Portable OVA/PID/FID or equivalent	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518) Radiological Analysis Level V Reference: DOE 1983, 0516 High Explosives Analysis Level V Reference: Harris et al. 1989, 12-0142
2. Burn Pit Group 6, TA-9 and TA-23 9-002 Surface Soil	Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518)

* See Chapter 6 Tables for Indicator Parameters

TABLE 4-5 Continued
OU 1157 SAMPLE ANALYSIS

PRS TYPE	PORTABLE	FIELD LAB	* LABORATORY
3. Firing Sites			
Group 2, TA-8 Gun Firing Site 8-002 Sand Butt and Surface Soil	Field Screen for Metallic Objects Level I: -Portable terrain conductivity meter Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518) Radiological Analysis Level V Reference: DOE 1983, 0516
Group 6, TA-9 and TA-23 9-001(a), (b) Surface Soil; (c)Deep Subsurface Soil; 9-014 Deep Subsurface Soil	Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha Field Screen for VOCs Level I: -Portable OVA/PID/FID or equivalent	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518) Radiological Analysis Level V Reference: DOE 1983, 0516 High Explosives Analysis Level V Reference: Harris et al. 1989, 12-0142
4. Material Disposal Areas			
Group 2, TA-8 Gun Firing Site 8-006(a)MDA Q	Field Screen for Metallic Objects Level I: -Portable terrain conductivity meter Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518) Radiological Analysis Level V Reference: DOE 1983, 0516

* See Chapter 6 Tables for Indicator Parameters

TABLE [illegible] Continued
OU 1157 SAMPLE ANALYSIS

PRS TYPE	PORTABLE	FIELD LAB	* LABORATORY
Group 7, MDA-M 9-013 Landfill Fibers	Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha Field Screen for VOCs Level I: -Portable OVA/PID/FID or equivalent	None	Asbestos Polarized Light Microscopy, 40 CFR Part 763, Subpart F, App. A
Residual Liquids	Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha Field Screen for VOCs Level I: -Portable OVA/PID/FID or equivalent	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518) Radiological Analysis Level V Reference: DOE 1983, 0516 High Explosives Analysis Level V Reference: Harris et al. 1989, 12-0142
Water	Same as above Field 310.1 Alkalinity Field 120.1 Conductivity Field 360.2 Dissolved Oxygen	None	Same as above Total Uranium LANL 1992, 0552
Wipe or Chip	Same as Residual Liquids	None	High Explosives Analysis Level V Reference: Harris et al. 1989, 12-0142

* See Chapter 6 Tables for Indicator Parameters

TABLE 4-5 Continued
OU 1157 SAMPLE ANALYSIS

PRS TYPE	PORTABLE	FIELD LAB	* LABORATORY
Sediment, Solid Materials, and Surface Soil	Field Screen for Metallic Objects Level I: -Portable terrain conductivity meter Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha Field Screen for VOCs Level I: -Portable OVA/PID/FID or equivalent	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518) Radiological Analysis Level V Reference: DOE 1983, 0516 High Explosives Analysis Level V Reference: Harris et al. 1989, 12-0142
5. Miscellaneous Process Unit Group 8, TA-69 69-001 Incinerator, Surface Soil	Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha Field Screen for VOCs Level I: -Portable OVA/PID/FID or equivalent	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518)

* See Chapter 6 Tables for Indicator Parameters

TABLE 4-[illegible] Continued
OU 1157 SAMPLE ANALYSIS

PRS TYPE	PORTABLE	FIELD LAB	* LABORATORY
6. Outfalls			
Group 1, Active TA-8 8-009(c), (d) Surface Soil	<u>Field Screen for Radiation</u> Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha <u>Field Screen for VOCs</u> Level I: -Portable OVA/PID/FID or equivalent	None	<u>Routine Analytes</u> Level III Reference: EPA SW-846 (EPA 1987, 0518)
8-009(e) Surface Soil	Same as Above	None	<u>Routine Analytes</u> Level III Reference: EPA SW-846 (EPA 1987, 0518) <u>Radiological Analysis</u> Level V Reference: DOE 1983, 0516
8-009(f) Surface Soil	Same as above	None	<u>Routine Analytes</u> Level III Reference: EPA SW-846 (EPA 1987, 0518) Total Petroleum Hydrocarbons 8015M
Group 9, Areas of Concern C-9-001 Surface Soil	Same as above	None	<u>Routine Analytes</u> Level III Reference: EPA SW-846 (EPA 1987, 0518)

* See Chapter 6 Tables for Indicator Parameters

TABLE 4-5 Continued
OU 1157 SAMPLE ANALYSIS

PRS TYPE	PORTABLE	FIELD LAB	* LABORATORY
7. Septic Systems			
Group 5, TA-9 Decommissioned Area 9-005(a)leach field; 9-005(d) ,9-006,septic tanks; Deep Subsurface Soil	Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha Field Screen for VOCs Level I: -Portable OVA/PID/FID or equivalent	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518) Radiological Analysis Level V Reference: DOE 1983, 0516 High Explosives Analysis Level V Reference: Harris et al. 1989, 12-0142
9-005(d)septic tank: Deep Subsurface Soil, Residual Liquids, Wipe or Chip; 9-005(a)former septic tank: Deep Subsurface Soil	Same as above	None	Radiological Analysis Level V Reference: DOE 1983, 0516
8. Settling Tanks			
Group 5, TA-9 Decommissioned Area 9-003(a), (b), (d), (e) Deep Subsurface Soil	Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha Field Screen for VOCs Level I: -Portable OVA/PID/FID or equivalent	Portable Gas VOC	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518) Radiological Analysis Level V Reference: DOE 1983, 0516 High Explosives Analysis Level V Reference: Harris et al. 1989, 12-0142

* See Chapter 6 Tables for Indicator Parameters

TABLE [illegible] Continued
OU 1157 SAMPLE ANALYSIS

PRS TYPE	PORTABLE	FIELD LAB	* LABORATORY
9. Sewer System Group 1, Active TA-8 8-004(d) Sludge, Wipe/Chip	<u>Field Screen for Radiation</u> Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha <u>Field Screen for VOCs</u> Level I: -Portable OVA/PID/FID or equivalent	None	<u>Radiological Analysis</u> Level V Reference: DOE 1983, 0516
10. Waste Containers Group 4, Active TA-9 9-010(a), (b), 9-011(c) Surface Soil	<u>Field Screen for Radiation</u> Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha <u>Field Screen for VOCs</u> Level I: -Portable OVA/PID/FID or equivalent	None	<u>Routine Analytes</u> Level III Reference: EPA SW-846 (EPA 1987, 0518) <u>High Explosives Analysis</u> Level V Reference: Harris et al. 1989, 12-0142
9-011(b) Surface Soil	Same as above	None	<u>High Explosives Analysis</u> Level V Reference: Harris et al. 1989, 12-0142
Group 9, Areas of Concern C-8-010 Surface Soil	Same as above	None	<u>Routine Analytes</u> Level III Reference: EPA SW-846 (EPA 1987, 0518) Total Petroleum Hydrocarbons 8015M

* See Chapter 6 Tables for Indicator Parameters

TABLE 4-5 Continued
OU 1157 SAMPLE ANALYSIS

PRS TYPE	PORTABLE	FIELD LAB	* LABORATORY
11. Waste Pit			
Group 5, TA-9 Decommissioned Area 9-012 Deep Subsurface and Surface Soil	Field Screen for Metallic Objects Level I: -Portable terrain conductivity meter Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha Field Screen for VOCs Level I: -Portable OVA/PID/FID or equivalent	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518) Radiological Analysis Level V Reference: DOE 1983, 0516 High Explosives Analysis Level V Reference: Harris et al. 1989, 12-0142
12. Waste Storage Vessel			
Group 3, TA-8 Abandoned Bunker Site 8-005 Surface Soil	Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha Field Screen for VOCs Level I: -Portable OVA/PID/FID or equivalent	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518)
Sludge	Same as above	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518) Compatibility, Corrosivity, Ignitability, Reactivity Toxic Characteristics Leaching Procedure, Fed. Reg. 6/29/90

* See Chapter 6 Tables for Indicator Parameters

TABLE 4[illegible]Continued
OU 1157 SAMPLE ANALYSIS

PRS TYPE	PORTABLE	FIELD LAB	* LABORATORY
13. Waste Water Treatment Units			
Group 3, TA-8 Abandoned Bunker Site 8-003(a) Crystals, Sludges	<u>Field Screen for Radiation</u> Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha <u>Field Screen for VOCs</u> Level I: -Portable OVA/PID/FID or equivalent <u>High Explosives Field Sceening</u> Level I: Spot-Test, Baytos 1991, 12-041	None	<u>Routine Analytes</u> Level III Reference: EPA SW-846 (EPA 1987, 0518) Compatibility, Corrosivity, Ignitability, Reactivity Toxicity Characteristics Leaching Procedure, Fed Reg. 6/29/90 <u>Radiological Analysis</u> Level V Reference: DOE 1983, 0516 <u>High Explosives Analysis</u> Level V Reference: Harris et al. 1989, 12-0142
8-003(a) Deep Subsurface and Surface Soil	<u>Field Screen for Radiation</u> Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha <u>Field Screen for VOCs</u> Level I: -Portable OVA/PID/FID or equivalent	Portable Gas VOC	<u>Routine Analytes</u> Level III Reference: EPA SW-846 (EPA 1987, 0518) <u>Radiological Analysis</u> Level V Reference: DOE 1983, 0516 <u>High Explosives Analysis</u> Level V Reference: Harris et al. 1989, 12-0142

* See Chapter 6 Tables for Indicator Parameters

TABLE 4-5 Continued
OU 1157 SAMPLE ANALYSIS

PRS TYPE	PORTABLE	FIELD LAB	* LABORATORY
8-009(a) Sediment	Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha Field Screen for VOCs Level I: -Portable OVA/PID/FID or equivalent	None	Routine Analytes Level III Reference: EPA SW-846 (EPA 1987, 0518) Radiological Analysis Level V Reference: DOE 1983, 0516 High Explosives Analysis Level V Reference: Harris et al. 1989, 12-0142
Group 4, Active TA-9 9-009 Clay/Sludge	Field Screen for Radiation Level I: -Portable NaI detectors or equivalent for gross gamma -GM detector or ion chamber for gross beta and gamma -Alpha scintillator for gross alpha Field Screen for VOCs Level I: -Portable OVA/PID/FID or equivalent	None	Radiological Analysis Level V Reference: DOE 1983, 0516
Group 5, Decommissioned Area 9-008(b) Surface Soil	Same as above	None	Radiological Analysis Level V Reference: DOE 1983, 0516

* See Chapter 6 Tables for Indicator Parameters

TABLE 4-6

OU 1157 Extended Analyte List

Volatile Compounds		Semi-Volatile Compounds		Organochlorine Pesticides and PCBs	Inorganic Compounds
Acetone	Isobutyl alcohol	Acetophenone	Fluorene	Aldrin	Antimony
Acetonitrile	Methacrylonitrile	Aniline	Hexachlorocyclo-	alpha-BHC	Arsenic
Acrolein	Methyl chloride	Anthracene	pentadiene	beta-BHC	Barium
Acrylonitrile	Methylene bromide	Aramite	Hexachloroethane	delta-BHC	Beryllium
Benzene	Methylene chloride	Benzyl alcohol	Hexachlorophene	Lindane	Cadmium
Bromoform	Methyl ethyl ketone	p-Chloro-m-cresol	Naphthalene	Chlordane	Chromium
Carbon disulfide	Methyl iodide	2-Chloronaphthalene	1-Naphthylamine	4,4-DDD	Cobalt
Carbon tetrachloride	Methyl methacrylate	2-Chlorophenol	2-Naphthylamine	4,4-DDE	Copper
Chlorobenzene	4-Methyl-2-pentanone	o-Cresol	o-Nitroaniline	4,4-DDT	Lead
Chloroethane	Pentachloroethane	m-Cresol	m-Nitroaniline	Dieldrin	Mercury
Chloroform	Pyridine	p-Cresol	p-Nitroaniline	Endosulfan I	Nickel
Dichlorodifluoro-	Styrene	Dibenzofuran	Nitrobenzene	Endosulfan II	Selenium
methane	1,1,1,2-	o-Dichlorobenzene	o-Nitrophenol	Endosulfan sulfate	Silver
1,1-Dichloroethene	Tetrachloroethane	m-Dichlorobenzene	p-Nitrophenol	Endrin	Thallium
1,2-Dichloroethane	1,1,2,2-	p-Dichlorobenzene	Pentachloronitro-	Endrin aldehyde	Tin
1,1-Dichloroethane	Tetrachloroethane	2,4-Dichlorophenol	benzene	Heptachlor	Vanadium
trans-1,2-Dichloro-	Tetrachloroethene	2,6-Dichlorophenol	Pentachlorophenol	Heptachlor epoxide	Zinc
ethene	Toluene	Diethyl phthalate	Phenol	Methoxychlor	Cyanide
1,2-Dichloropropane	1,1,1-Trichloroethane	2,4-Dimethylphenol	p-Phenylenediamine	Toxaphene	Sulfide
cis-1,3-Dichloro-	1,1,2-Trichloroethane	Dimethyl phthalate	1,2,4,5-Tetrachloro-	Aroclor 1016	
propene	Trichloroethene	m-Dinitrobenzene	benzene	Aroclor 1221	
trans-1,3-Dichloro-	Tricholorofluoro-	4,6-Dinitro-o-cresol	2,3,4,6-Tetrachloro-	Aroclor 1232	
propene	methane	2,4-Dinitrophenol	phenol	Aroclor 1242	
1,4-Dioxane	1,2,3-	2,4-Dinitrotoluene	1,2,4-Trichloro-	Aroclor 1248	
Ethylbenzene	Trichloropropane	2,6-Dinitrotoluene	benzene	Aroclor 1254	
Ethyl methacrylate	Vinyl acetate	Di-n-octyl phthalate	2,4,5-Trichlorophenol	Aroclor 1260	
Hexachlorobutadiene	Vinyl chloride	Diphenylamine	2,4,6- Trichlorophenol		
2-Hexanone	Xylenes (total)	Fluoranthene	sym-Trinitrobenzene		

contains COCs and whether to recommend for no further action, consider a voluntary corrective action, or to perform Phase II sampling. These screening action levels are based upon a residential exposure scenario that is very conservative compared to other exposure scenarios. Because of this conservatism, chemical constituent concentrations below the screening action levels are unlikely to be of concern from the perspective of human health, regardless of future land use. The lower SAL from the IWP (LANL 1992, 0768), representing systemic or carcinogenic action, will be used. The SALs presented in the OU 1157 QAPjP are those currently in effect; however, contaminant levels of concern are periodically reviewed by EPA as additional data become available, and the screening action levels in effect at the time of sampling will be used in analyzing the Phase I data obtained under this work plan.

The methods for determining the screening action levels are based upon EPA guidance and are described in Appendix J of the IWP (LANL 1992, 0768). If a Laboratory screening action level is not available for a parameter at the time of Phase I sampling, an alternative screening action level will be developed based upon available defensible toxicological data, or upon such considerations as comparison with background, regulatory limits, and the practical quantification limit for the parameter.

4.3.6 Required Quantification Limits

As a general rule, the required quantification limits for laboratory analyses will be the practical quantification limits (PQLs) for the analytical methods as applied to OU 1157 water and soils. On a case-by-case basis, limits higher than PQLs can be allowed if they will produce data acceptable for site decisions. The analytical methods for the selected indicator parameters are given in Table 4-5 and in the QAPjP in Annex II. The PQLs for these parameters are shown in Tables II-1 and II-2 in the QAPjP. Analytical methods for HE are summarized by Harris (Harris et al. 1989, 12-0155) and were adapted by the Laboratory from the U.S. Army Toxic and Hazardous Materials Agency (U.S. Army, no date, 0522). Methods for the radiometric analyses were drawn from the U.S. Department of Energy (DOE 1983, 0516), and the remaining methods were drawn from standard EPA sources (EPA 1987, 0518). Practical quantification limits are media-specific, and those that have not yet been identified for Los Alamos soils will be determined as part of the Phase I sampling effort. Alternative analytical methods will be sought if the PQL is determined to be greater than the screening action level in effect at the time of sampling.

Tables II-1 through II-3 in the QAPjP for OU 1157 contain additional information concerning analytical methods for constituents of interest at OU 1157. The QAPjP for OU 1157 lists the individual constituents analyzed under each method and the PQL for each constituent using the specific method.

4.3.7 Quality Assurance Sampling

Quality assurance sampling consists of the collection of (1) duplicate samples of environmental media to monitor the consistency in analytical extraction methodology, (2) equipment rinsate samples to monitor the efficiency and thoroughness of the field decontamination procedures, and (3) field blanks to monitor the sample preparation and handling processes.

Collection protocols for these and other quality assurance samples are described in LANL ER Standard Operating Procedure (SOP) 1.05 (LANL 1991, 0411). The SOP does not contain guidance on selection of the appropriate locations for collection of quality assurance samples. This section explains how the sample locations that should yield the most useful quality assurance samples will be chosen in the field by the sampling teams.

Duplicate samples are two samples taken from the same sampling location and represent the same sampled material. Duplicate samples best serve the intended purpose if those samples are collected at locations containing a range of concentrations of one or more potential contaminants of concern. The usefulness of a duplicate sample is substantially reduced if collected at a sample location that contains no potential contaminant of concern. The selection of an appropriate field sampling location should be biased toward those areas that have visible staining or areas that exhibit detectable concentrations on direct-reading monitoring instruments. If neither staining is observed nor detectable readings are obtained, the duplicate samples should be collected in areas that may accumulate any environmental releases, such as low-lying areas within the boundary of the PRS or in a drainage-way leading from the PRS. To maximize the chance of obtaining a useful duplicate sample, decisions regarding sampling locations for the duplicate samples will be made by the field sampling team after they have observed several sampling locations and have completed any surveys with direct-reading instruments.

Equipment rinsate samples should be collected after sampling equipment has been used in likely contaminated areas; there is little utility in collecting equipment rinsate samples from "clean" areas. The decision regarding which equipment rinsate sample to collect as the rinsate sample representing the sample batch is made by the field sampling team.

Field blank samples should also be prepared at locations that are potentially contaminated. The purpose of a field blank is to monitor the possible introduction of spurious constituents during the sample preparation and handling processes and is best served by preparing the sample in areas where contaminants not present in the sampled medium may be entrained during preparation and handling.

4.3.8 Record keeping and Field Logs

All records generated by OU 1157 field investigations will be processed and archived in accordance with the Records Management Plan presented in Annex IV of the IWP (LANL 1992, 0768). Records generated during field activities will be documented in the field log. Records documenting activities occurring after samples are shipped from the field to the analytical laboratory, including laboratory analyses, laboratory analytical results, data validation, data analysis, and preparation of the RFI Report, will be archived in accordance with the Records Management Plan.

A field log will be maintained during the sampling program. The log will document all field activities, including the sampling activity, record the information obtained from the field screening instrumentation, identify the procedures used in sampling and sample site selection, identify the personnel involved, and record any other information pertinent to the sampling process and to the quality of the results. Field logs maintained by individual field team members will be consolidated into a master log at the end of each major sampling activity.

The completed field log will document the implementation of this work plan. Most importantly, it will document the site-specific decisions of the Field Team Leader required under the phased approach presented in this plan as well as any modifications to the plan required to address unanticipated site conditions. Because sampling and site characterization are essentially processes of discovery, minor modifications to the sampling plan and to its implementing procedures may occur. As a vehicle for documentation, the field log will be written to provide sufficiently comprehensive descriptions of the sampling activities and their rationale so that modifications to the work plan are not expected to be needed.

4.4 Conceptual Exposure Model

The Laboratory RFI program is based on reducing the risk to human health and the environment to acceptable levels. The technical approach to reducing those risks to acceptable levels for OU 1157 is based on risk analysis. This requires the estimation of acceptable risks based on knowledge of present use and assumed reasonable scenarios of future use.

4.4.1 Potential Transport Processes

Review of historical information that described past operations at the various PRSs within OU 1157 and evaluation of the likely chemical transport processes indicate that affected environmental media consist of surface and subsurface soil and, possibly, surface water and sediments. A variety of above-ground and below-ground PRSs are found in this OU. Releases from below-ground PRSs, such as sumps, settling tanks, chemical and sanitary sewer systems, and associated piping and drains, may have caused contamination of subsurface soil. Releases from above-ground PRSs, including firing sites, an incinerator, a burn pit, chemical storage areas, and outfalls, may also have caused contamination of surface soil, subsurface soil, or both. Most of the PRSs are not associated with releases or direct discharges to water bodies, so contaminants that might be present at a PRS should be confined primarily to the soil medium.

Once present on the surface, transport of chemical substances may occur through one or more of several mechanisms. Substances with the potential to volatilize will transfer from the soil surface directly into the air. Nonvolatile but water-soluble substances will dissolve into water from rain or snowmelt moving across the soil surface or infiltrate into the subsurface. Water-insoluble and nonvolatile substances will adsorb to soil particles, and movement of such substances is largely limited to movement of the soil particles. Erosion of the surface soil through the action of wind (i.e., dust) and water is the primary mechanism for movement of such substances. The conceptual exposure model is presented in Figure 4-3.

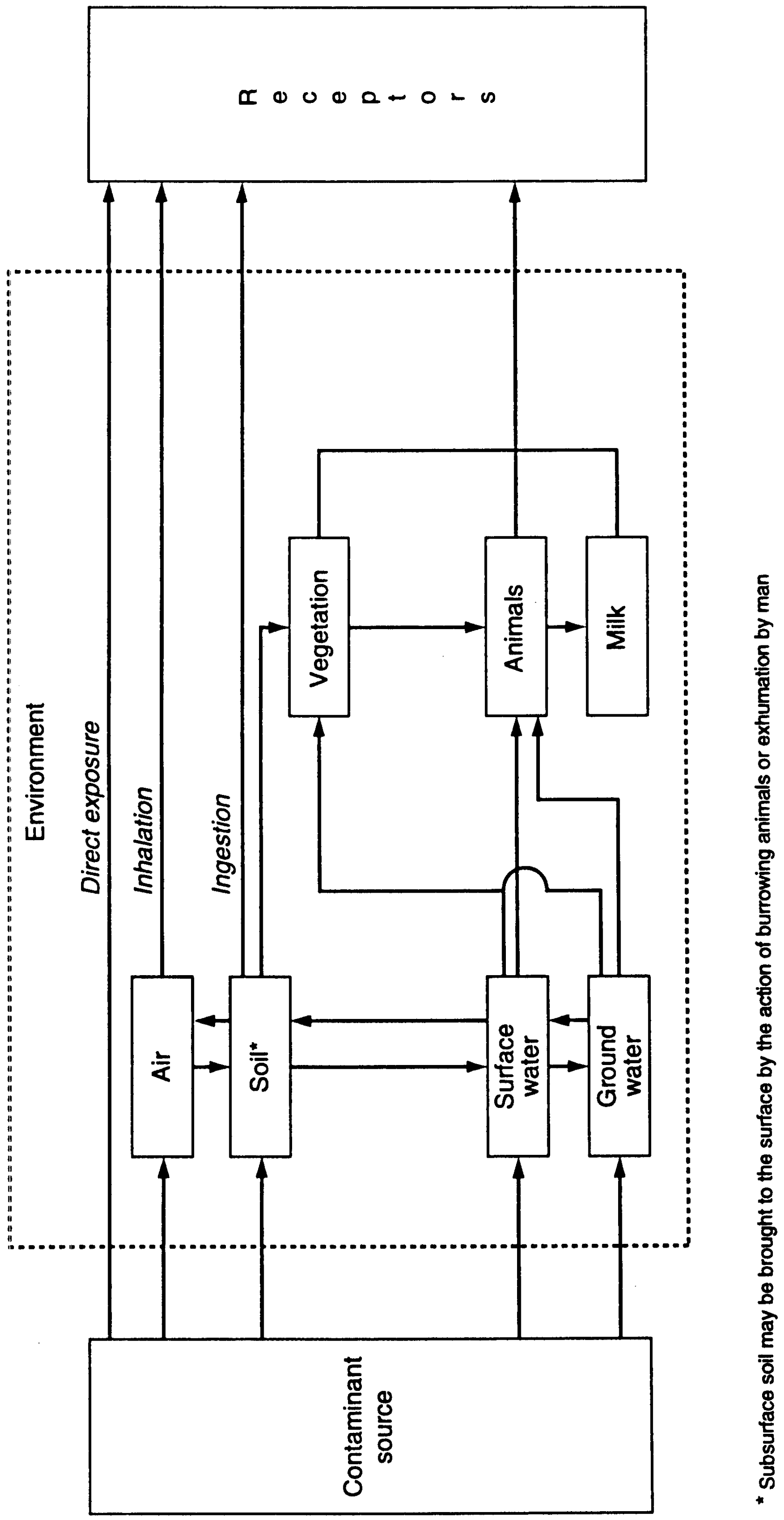

Figure 4-3. OU 1157 conceptual exposure model.

If chemical contamination is present in subsurface soil, the possible transport scenarios consist of:

- no movement beyond the point of release, particularly when nonvolatile water insoluble constituents are considered;
- movement to the surface through evapotranspiration or, when volatile chemical substances are present, through vapor emission from the soil;
- movement to the surface through excavation activities of man or through activities of burrowing animals;
- downward movement with percolating water through the soil; and
- downward movement with percolating water to perched ground water, with subsequent lateral movement with the perched water.

The only probable shallow water-bearing zone beneath OU 1157 is associated with small springs located near MDA M (see Figure 6-17). The springs or consequent stream flow, if derived from this water-bearing zone, could be impacted through downward migration of chemicals with infiltrating precipitation. Once in the water-bearing zone, lateral movement with the perched groundwater to the point of discharge into the springs is possible. Contamination of the main aquifer is not considered in Phase I investigations because depth to groundwater is on the order of 1000 ft and movement of contaminants to the aquifer is unlikely (LANL 1992, 0768).

Two major drainage systems, Pajarito Canyon and Cañon de Valle, receive storm water runoff from OU 1157. It is probable that soil carried by the action of surface water from PRSs on OU 1157 has been deposited within the canyons. The risk considerations associated with transported soils in canyon bottoms will not be evaluated as a part of the investigation of OU 1157. Instead, all information obtained as part of the OU 1157 investigation will be integrated, and an evaluation will be performed, as a part of a separate investigation of canyons within the Laboratory.

4.4.2 Affected Environmental Media

At OU 1157, the environmental media subject to investigation under Phase I include soil, surface water, and sediments. There is insufficient archival information to indicate that investigation of any shallow groundwater under the PRSs within OU 1157 is warranted during Phase I. The results of the surface and subsurface soil data collection activities performed during Phase I will be compared with established threshold values based on screening action levels that were developed based on a residential use scenario that is presented in Appendix J of the IWP. For surface water quality comparisons, the groundwater screening action levels will be applied, per Section 4.2.2.1 of the IWP. In accordance with IWP guidance, the screening action levels for soils will also be applied to sediments.

Although the screening action levels developed for use in the ER Program at the Laboratory reflect a residential use scenario, the data collected during Phase I investigations may be applied to virtually any land use scenario that might be appropriate for conducting the human and ecological baseline risk assessments. An exception would be a site where institutional control is to be maintained as part of the long-term corrective measure. At such sites, the comparison of concentration data to SALs would have limited utility because constituent concentrations exceeding SALs may be left in place. The sampling actions proposed in this work plan are based upon the potential application of long-term institutional controls for the two material disposal areas in OU 1157, MDA M and MDA Q.

For purposes of the Phase I investigation presented in this work plan, the conceptual exposure model has been defined in the IWP (Chapter 4) as theoretical exposure of a resident to soil, air, and groundwater. Discussion of how the residential exposure scenario relates to the overall conceptual exposure model for OU 1157 is presented in the following text.

Section 4.1.3 of the IWP states that "investigations to support risk assessment generally require samples that are representative of the exposure units and contact media corresponding to the land use scenario and exposure routes for which risk is to be estimated" (LANL 1992, 0768). Sample data in the Phase I investigation are being collected for comparison based on SALs derived for theoretical exposure of a resident, although the statement is made in Section 4.3.3 of the IWP that "for most PRSs located on Laboratory property, continued commercial/industrial use and eventual release of these lands for recreational use (e.g., camping) is assumed." Use of screening action levels derived for residential exposure does not conflict with the land use scenarios envisioned for Laboratory property. Although the ultimate future use of Laboratory property has not been decided and, therefore, the future exposure scenarios are unknown, the use of the screening action level approach accommodates virtually any future use considerations. Screening action levels based on residential exposure were chosen for Phase I data comparisons because the residential exposure scenario represents the most sensitive human population of any that could potentially occupy the sites. Therefore, the SALs are the most stringent of any of the land use scenarios.

The approach to be followed in assessing ecological risk is under development by the Laboratory and is expected to be available in the next revision of the IWP. The decision making strategy presented in this work plan, including decisions to perform no further action (NFA) at a site or to perform Phase II sampling if Phase I sample data indicate the presence of COCs, is based on consideration of impact potential to human health. Although this work plan includes no consideration of ecological effects, ecological risks will be addressed at each PRS when the approach to assessing such risks is developed.

Because the ultimate use of the land could be for purposes other than residential use, the data gathered during the Phase I investigation of OU 1157 will be important to any future land use scenario that may be envisioned for the Laboratory property. Thus, for purposes of designing a Phase I sampling strategy, it is not necessary to have already formulated exposure scenarios for future land use. The various environmental media that could become contaminated are limited in number and are largely important to exposure scenarios pertinent to a wide variety of receptors.

The presence of chemical constituents and radionuclides in surface (0 to 2 ft) and subsurface (to 12 ft in depth) soils may be considered in all evaluations of risk, whether they are human-oriented or ecologically oriented. Human exposure to soils, regardless of the type of receptor (i.e., resident, worker, recreational, or agricultural users of the land), may occur through ingestion, dermal contact, and inhalation of soil in the form of dust. Additional exposure pathways may occur to residential and agricultural users through use of the land to grow food for direct consumption or for indirect consumption (i.e., through growth of animal feed and subsequent consumption of the animals). Although dust exposure occurs by way of air, it is important to recognize that the source of contaminated dust is most likely to be the soil. Also, there is an exposure potential to chemical vapors that might be emanating from the soil. Vapor exposure of relevance to the ER Program largely occurs as a result of contaminated soil even though the exposure is occurring by way of the air. Therefore, characterization of the soil medium at the PRSs under investigation is important to the evaluation of risk potential of virtually any future human receptor. Assumed direct contact of a resident with soil and air serves as the basis for deriving screening action levels for those media.

Characterization of soil as a contaminated environmental medium is equally important in ecological risk assessments. Virtually any plant and animal exposure model will include exposure to soil. To illustrate, exposure to terrestrial animals may occur as a result of ingestion of plants that grow in contaminated soil. The plants take up (through the roots) many of the contaminants that might occur in soil or become contaminated as contaminated dust settles on the plant surfaces. Also, many animals incidentally ingest soil as a part of their diet (e.g., burrowing animals and animals that pull the entire plant from the soil when grazing), have dermal contact with contaminated soil, and breathe in contaminated dust and vapors just as do humans. Therefore, soil sample data gathered during Phase I investigations have utility in evaluation of potential impact to plants or animals, regardless of what the approach to assessment of ecological risk at the Laboratory may be.

Surface water and sediments also are important media in the evaluation of risk to human or ecological receptors and, therefore, must be evaluated for any future land use scenario. To illustrate, surface water exposure pathways to humans who may use the land at OU 1157 for recreational purposes could include ingestion and dermal contact with the water and sediments during play or swimming. Consumption of contaminated aquatic life (primarily fish in a freshwater system) as a result of recreational use of the water is not a plausible exposure scenario because the surface water systems are small. If the land remained commercial/industrial, workers could contact surface water and sediment through maintenance or construction activities (e.g., installation of utility lines across the stream systems). If the land were used for livestock production or other such agricultural use, the animals, when watering, could contact the water and sediments. Livestock could also ingest vegetation growing in contaminated soil or sediment in the stream channels. Thus, evaluation of the quality of surface water and sediments has utility in human health risk assessment under a variety of land use scenarios.

A wide variety of ecological receptors also may be exposed to surface water and sediments. Terrestrial wildlife may contact the water and sediments when crossing streams, drinking water from the streams, and eating plant or animal life living in the stream or along its boundaries. Avian predators can become contaminated if the diet of their prey is obtained from the streams. Aquatic life (plant and animal) in the surface water systems unavoidably comes in contact with any contaminated surface water and sediments. When ecological effects are considered, characterization of water and sediment quality is essential to the evaluation of risk to the ecosystem.

4.5 Remediation Alternatives and Evaluation Criteria

Remediation alternatives and evaluation criteria for each PRS type involve a variety of considerations. While there are a range of possible response actions, the remediation alternative at a particular site depends on the affected media, the types of constituents, and the nature and extent of contamination. Subsequent to the CMS, an appropriate corrective action is selected. Specific criteria are used in the evaluation process, and these criteria determine the data required for each PRS.

4.5.1 Affected Media

The preliminary evaluation of remediation alternatives requires listing the media that may have become contaminated at the various units under consideration. The affected media include surface and subsurface soils, waste materials, sewage, structures, sediments, and possibly perched water. Any PRS type may contain one or more of these media. The results of evaluating PRSs and associated affected media are shown on Figure 4-1. It should be noted that for the purpose of corrective action, the affected media are somewhat more broadly defined than for environmental media (Section 4.4.2).

4.5.2 Types of Response Actions

Generally, as the IWP points out in Section 4.5 (LANL 1992, 0768), the RCRA process can terminate at a number of points. The end points include: NFA, DA, VCA, and final remediation through implementation of corrective measures. Voluntary corrective actions may include interim actions, interim measures, and conditional remedies. No further action, deferred action, and voluntary corrective actions have been discussed in Section 4.1. Corrective measures study and corrective measures implementation (CMS/CMI) follow the RFI if none of the above actions lead to termination or postponement of the RCRA process. If a PRS is found to have COCs present above levels considered protective of human health and the environment, as determined by baseline risk assessment, a CMS will be undertaken to compare optional remedies against criteria specified in Module VIII of the Laboratory's RCRA permit (EPA 1990, 0306). The IWP summarizes corrective measures under four categories: containment technologies, removal technologies, treatment technologies, and disposal technologies. The corrective measures may be conducted on- or off-site.

4.5.3 Types of Corrective Measures

Removal actions: Under this corrective measure, all or part of the waste would be removed. Depending upon the type of contaminated media, removal technologies can consist of excavating earth materials, dredging sediments, and pumping liquids and sludges. While these removal technologies are standard practices, their applications to the removal of hazardous wastes require special technical considerations including extensive safety and monitoring procedures, special adaptive equipment, significant amounts of hand work, and the selective removal and segregation of incompatible wastes may be required. Generation of mixed waste if both hazardous and radioactive constituents are present must be avoided or minimized.

Treatment: Some wastes will require treatment prior to disposal. These treatment technologies are designed to change the physical, chemical, or biological character or composition of a hazardous waste so as to render it nonhazardous or less hazardous or to make it amenable for volume reduction. The nature of the treated waste material would determine whether ultimate disposal would be on- or off-site. The treated wastes must also meet land disposal restrictions; otherwise, a variance will have to be secured. Waste treatment can take place off-site at a separate facility or on-site; however, hazardous waste treatment facilities do not currently exist at the Laboratory. For example, incineration is a treatment technology for waste streams containing organics and/or PCBs; these wastes would have to be incinerated at an off-site facility prior to disposal. While on-site treatment technologies have extensive applications in closures of hazardous waste sites, available treatment processes or techniques that are either located at off-site facilities or that could be implemented *in situ* include solidification, physical stabilization, chemical fixation, encapsulation, bioremediation, soil flushing/washing, soil vapor extraction, reverse osmosis, ion exchange, and vitrification. However, *in situ* treatment applications for many disposal areas will be limited because of the heterogeneous nature of the waste type and forms. Again, generation of mixed waste is to be minimized because treatment capacity for this type of waste is limited.

Closure in place: For the non-RCRA, nonradioactive waste disposal areas in OU 1157, the closure in place option is likely to be the most widely implemented corrective measure. Certain types of PRSs, such as firing sites, sewers, septic tanks, and material disposal areas, could be suitable for this option. The main element of this option includes a low-permeability barrier (or cap) designed to prevent direct contact with receptors, control the infiltration of surface water and precipitation, control the release of soil vapors, and prevent wind-blown transport of dust. Various cap designs and materials are available, including compacted local soil and topsoil caps, asphalt or Portland cement concrete caps, and multilayered caps consisting of a low-permeability layer, a drainage layer, and topsoil. In addition, these engineered caps help prevent erosion and plant and animal intrusion as well as isolate radioactive components of a waste if present. Other elements of closure in place may include subsurface drains when shallow groundwater is present, storm water management (i.e., grading, terracing, ditches, channels, berms, dikes, and floodwalls), groundwater controls, and post-closure monitoring and maintenance.

4.5.4 Evaluation Criteria

The Laboratory's RCRA permit (EPA 1990, 0306) specifies the criteria that will be considered in evaluating, recommending, and selecting a corrective action. Chapter 4 of the IWP (LANL 1992, 0768) further describes the criteria that will be considered at each stage of the evaluation process. In an early, focused mode, these criteria can be simplified to the following elements:

Technical Concerns: Each corrective measure shall be evaluated based on the technical criteria of performance, reliability, implementability, and safety. Performance is based on the effectiveness and useful life of the measure. Corrective measure reliability includes operation and maintenance requirements and is a way of measuring the risk and effect of its failure. Implementability of each corrective measure assesses the constructibility and the total time required to achieve a given level of response. The safety evaluation includes threats to the safety of nearby communities and environments as well as to workers during corrective measure implementation.

Environmental Concerns: Environmental assessment for each corrective measure alternative focuses on facility conditions and pathways of contamination. At a minimum, this evaluation consists of short- and long-term beneficial and adverse effects, adverse effects on environmentally sensitive areas, and analysis of measures to mitigate adverse impacts.

Human Health Concerns: The human health assessment describes the levels and characterizations of contaminants on-site, potential exposure routes, and potentially affected populations. This assessment also evaluates each corrective measure alternative in terms of the extent to which it mitigates short- and long-term exposure to any residual contamination and protects human health.

Institutional Concerns: Institutional needs for each corrective measure alternative are evaluated in terms of other environmental and public health standards, regulations, and guidance for the design, operation, and timing of each alternative.

Cost Concerns: A cost estimate will be prepared for each corrective measure alternative. This estimate shall include capital costs and operation and maintenance costs.

4.5.5 Data Requirements for Remediation

Based on the evaluation criteria, data should be collected about PRS conditions that affect the evaluation and recommendation of remedial alternatives. Field investigation activities consist of measurements, sample collection, and sample analysis that are designed to obtain site data to characterize environmental conditions and contaminant concentrations and distributions in suspect media. These data are then used to support the selection or revision of remedial alternatives. Phase I reconnaissance sampling data identifies the presence or absence of contaminants and, if necessary, Phase II sampling characterizes the nature and extent of a contamination release. Typical Phase I and Phase II field investigation activities include field and engineering surveys, geophysical surveys, surface and near-surface sampling, borehole sampling and monitor well construction, and field screening.

At later stages of the corrective action process (post Phase I and II sampling), additional site characterization data may be needed to support or evaluate a remedial alternative. Because soil and rock are the likely suspect contaminated media for many PRSs, some investigations may require quantitative measurements of the geotechnical and/or geochemical properties of soil or rock. Identification of properties such as grain size, bulk density, porosity, permeability, cation exchange capacity, or total organic carbon may be needed to complete remedial alternative evaluation. Other site characterization data that could be required are site specific testing data from innovative technologies.

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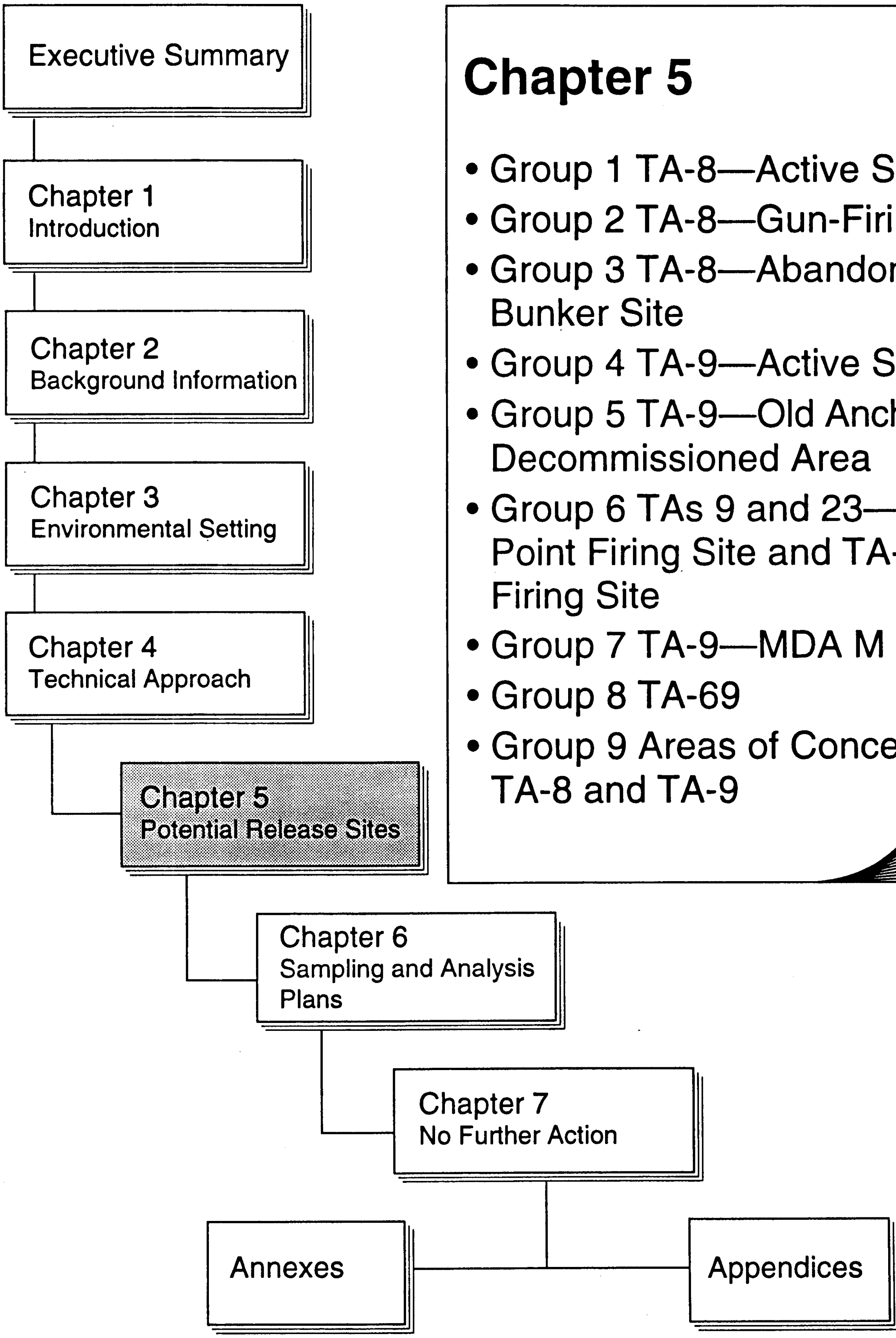
Chapter 5

- Group 1 TA-8—Active Site
- Group 2 TA-8—Gun-Firing Site
- Group 3 TA-8—Abandoned Bunker Site
- Group 4 TA-9—Active Site
- Group 5 TA-9—Old Anchor East Decommissioned Area
- Group 6 TAs 9 and 23—Far Point Firing Site and TA-23 Firing Site
- Group 7 TA-9—MDA M
- Group 8 TA-69
- Group 9 Areas of Concern TA-8 and TA-9



5.0 INTRODUCTION

Chapter 5 presents a discussion of the PRSs in OU 1157 that have been recommended for Phase I sampling, deferred action, or voluntary corrective action. The PRSs that have been recommended for no further action are listed in Chapter 5 but reference is made to Chapter 7 for complete descriptions.

Chapter 5 has been divided into sections that correspond to the nine groups of PRSs that comprise OU 1157. In each section, a description and history of the group are presented followed by descriptions of each PRS in that group. Then, the remediation decisions and investigation objectives are presented followed by the data needs and DQOs used to create the sampling and analysis plans for each PRS in that group.

A brief description of all PRSs in OU 1157 and the actions proposed for each PRS are presented in Table 1-3. Each group of PRSs in OU 1157 was identified based primarily on the geographical proximity of associated PRSs. The current status of the PRS (active versus inactive), the anticipated sampling activities, and the potential remediation alternatives were also considered. Figure 5-1 shows eight of the nine groups within OU 1157. The actions to be taken at the eight groups are summarized in Table 5-1 along with those for Group 9, which consists of all of the AOCs. The AOCs are spread out among TA-8 and TA-9. It may be noted that more than one type of action may be taken at a single PRS.

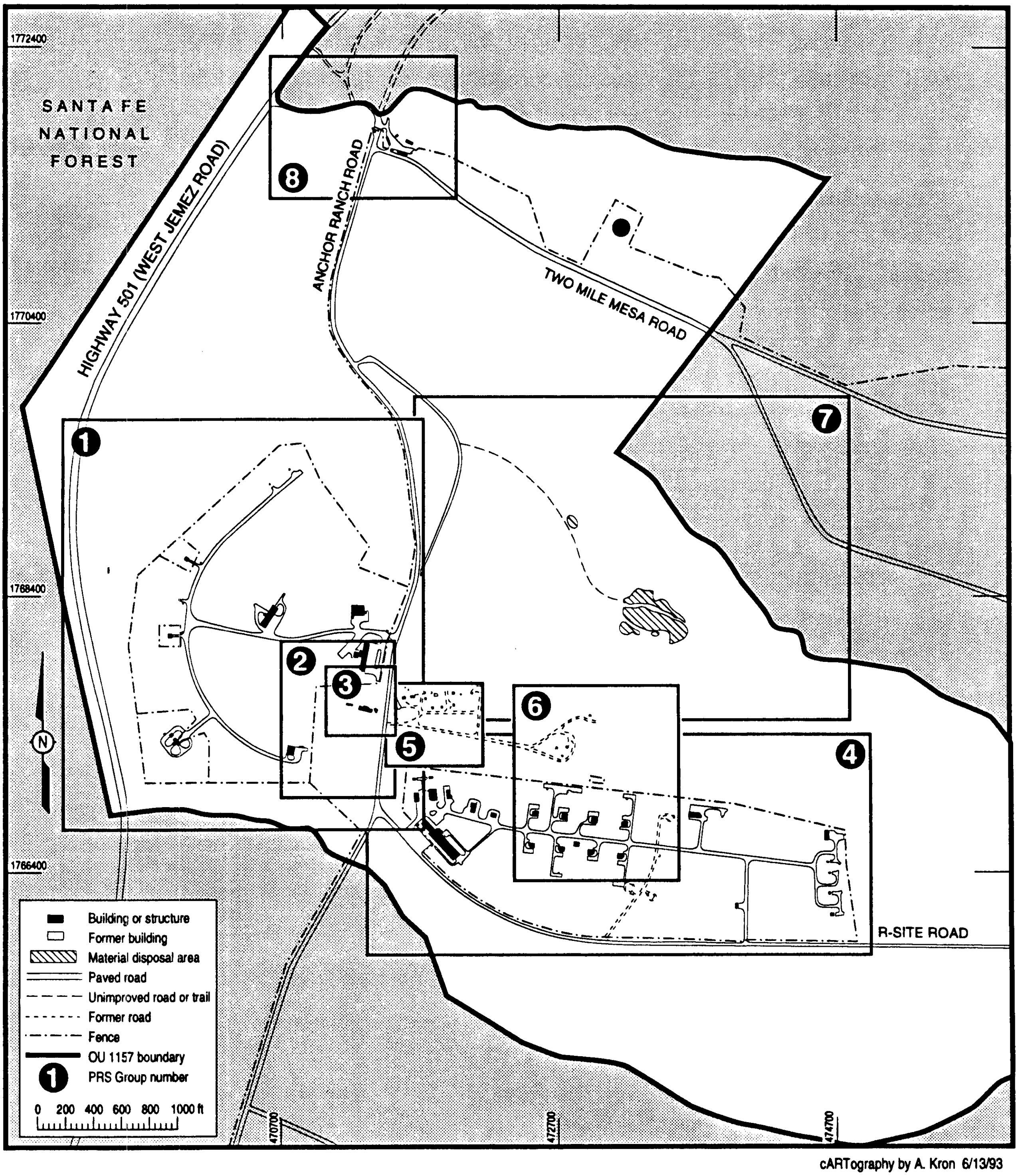


Figure 5-1. Location of PRS Group maps shown in Chapter 5.

TABLE 5-1

Summary of PRSs in OU 1157

Group	Description	Total PRSs	Phase I	NFA	DA	VCA
1	Active TA-8	14	5	9	0	0
2	TA-8 Gun Firing Site	3	2	1	0	0
3	TA-8 Abandoned Bunker Site	12	3	4	5	2
4	Active TA-9	30	5	10	15	0
5	TA-9 Decommissioned Area	16	13	3	0	1
6	TA-9 and TA-23 Decommissioned Firing Sites	6	5	1	0	0
7	MDA-M	1	1	0	0	0
8	TA-69	3	1	2	0	0
9	AOCs	31	2	28	1	0
	Totals	116	37	58	21	3

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5.1 GROUP 1: TECHNICAL AREA 8—ACTIVE SITE

5.1.1 Group 1 General Description and History

Technical Area 8 Active Site comprises 14 PRSs, which include building drains, a resin bed, transformer storage areas, process waste water outfalls, and waste container storage areas. None of these facilities have been decommissioned, and most are associated with buildings that are in use at the present time. The buildings were built in 1949-1950 and have been used for various purposes related to nondestructive testing (x-ray methods). Film processing and development operations, the fluorescent penetrant and magnetic scanning processes, and the Macrostatistical Hydrodynamics (MASH) operations are the primary sources of many of the potential COCs for this group of PRSs. Figure 5-2 shows the locations of these potential PRSs. Technical Area 8 is sometimes referred to as Anchor West (AW) site and also as GT site.

5.1.1.1 Potential Release Site 8-004(d)—Drains Associated with Building TA-8-24

Building TA-8-24 was used to radiograph nuclear fuel elements from 1950 to about 1971. Since that time, the building has had various other uses, none associated with activities involving hazardous or radioactive materials. It is currently used for storage of nonhazardous materials. An associated structure, TA-8-65, is used to store contained radioactive sources. However, this building has no drains and could not contribute to contamination of drain lines or the general environment (Harris 1993, 12-0001).

In the past, portable sources were used in TA-8-24 to make x-radiographic examinations of high explosives assemblies and other artifacts. The drains in this building were contaminated with ^{90}Sr, a radioactive isotope, as a result of a spill on 29 March 1954. An 800 lb, heavily shielded metal container (pig) was being unloaded at the dock on the south side of the building for x-ray examination. During unloading, the container slipped and dropped to the tailgate of the truck, dumping a white powder (probably a salt of ^{90}Sr) on both the truck and the dock. The white powder was checked with a dosimeter and found to be highly radioactive. The four individuals involved in the incident immediately rushed to

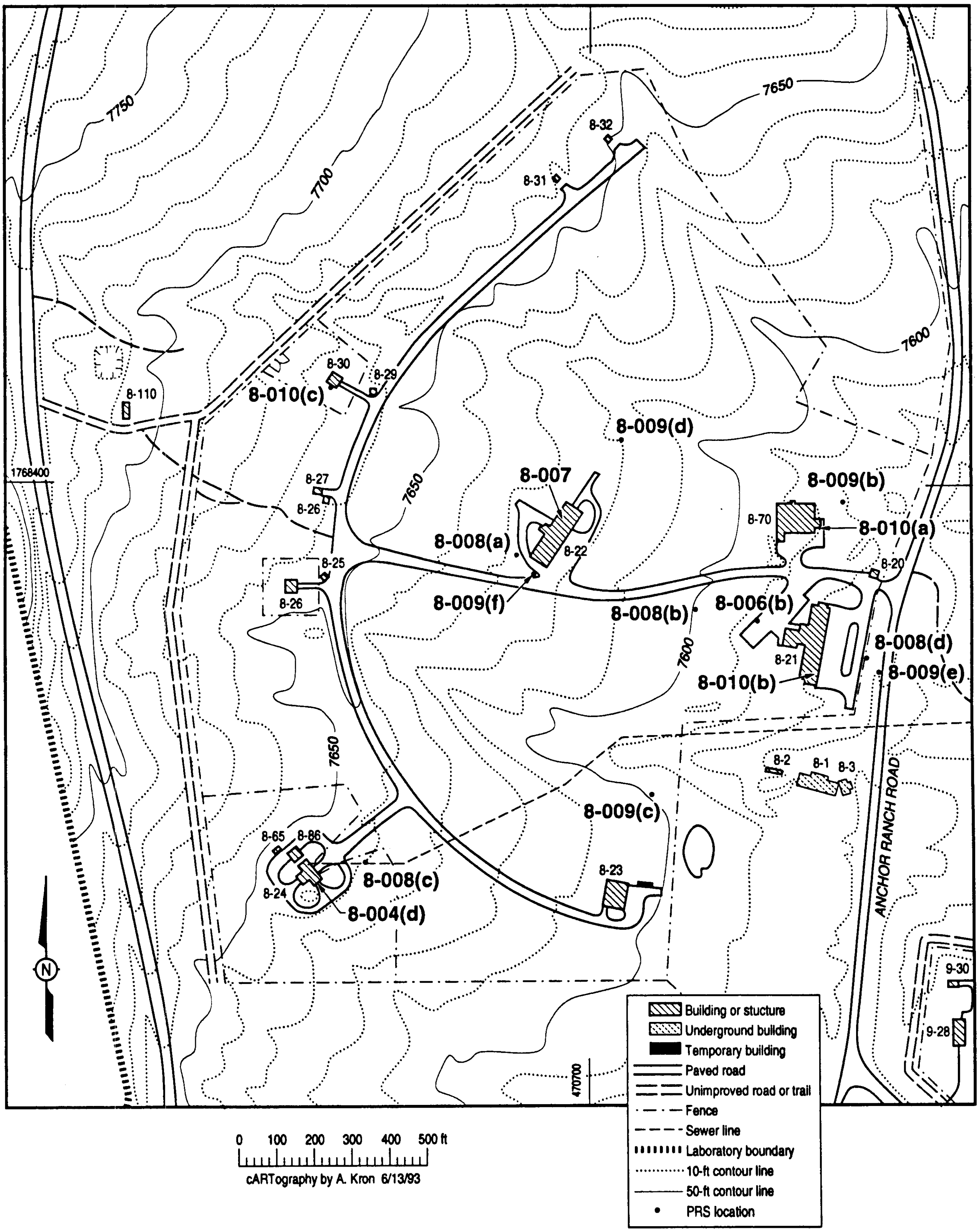

Figure 5-2. Locations of PRSs in Group 1, active area of TA-8.

the sink in the center room of TA-8-24 to decontaminate their hands. Following the accident, the interior of the building was scrubbed with water and decontaminated. Contaminated dirt and asphalt outside the building were removed and disposed of in a radioactive waste disposal area outside OU 1157. At the end of April 1954, a survey of the area indicated that the only remaining contamination was in a crack in the concrete loading dock and in recesses between various sections of the dock. Because any further remedial efforts would only spread the contamination, the area was sealed with fresh concrete (Buckland 1954, 12-0002; Buckland 1954, 12-0066).

Residual contamination of both the drain and sewer lines is likely, although a considerable volume of water has gone into the drain and the associated sewer line in the years since the accident occurred. Strontium-90 is a beta emitter with a half-life of 28.8 years. The spill occurred over one half-life ago, and at this time less than half of the original amount spilled would remain.

The sewer line runs east/northeast from TA-8-24 and, at successively greater distances from the building, is accessible through manholes TA-8-55, -63, -54, and -53. Beyond Manhole TA-8-53, outflow from buildings TA-8-22 and TA-8-23 enters the sewer line that, at the time of the accident, flowed into Septic Tank TA-9-81 [PRS 9-005(a)].

5.1.1.2 Potential Release Site 8-007—Silver Recovery Resin Bed at Building TA-8-22

This PRS is being recommended for no further action. See Section 7.2.1.1 for details specific to this PRS.

5.1.1.3 Potential Release Site 8-008(a)—Transformer Storage Area

This PRS is being recommended for no further action. See Section 7.2.1.2 for details specific to this PRS.

5.1.1.4 Potential Release Site 8-008(b)—Transformer Storage Area

This PRS is being recommended for no further action. See Section 7.2.1.3 for details specific to this PRS.

5.1.1.5 Potential Release Site 8-008(c)—Transformer Storage Area

This PRS is being recommended for no further action. See Section 7.2.1.4 for details specific to this PRS.

5.1.1.6 Potential Release Site 8-008(d)—Transformer Storage Area

This PRS is being recommended for no further action. See Section 7.2.1.5 for details specific to this PRS.

5.1.1.7 Potential Release Site 8-009(b)—Outfall serving Building TA-8-70

This PRS is being recommended for no further action. See Section 7.2.1.6 for details specific to this PRS.

5.1.1.8 Potential Release Site 8-009(c)—Storm Sewer and Outfall serving Building TA-8-23

Building TA-8-23, the betatron building, was built in 1950 and houses a 20 million electron volt (Mev) betatron (LANL 1944 to present, 12-0003) A betatron is a fixed-radius electron accelerator. It was used to radiograph large items such as nuclear fuel elements, waste barrels, and weapon assemblies.

Floor drain BFD2 is located in the basement of Building TA-8-23 next to several step-up voltage regulators that feed the transformers to provide power to the betatron. About 1 pint of oil containing an unknown amount of polychlorinated biphenyls (PCBs) was reported to have spilled from these transformers in 1990

(Sandoval 1991, 12-0004). The PCB spill was cleaned up and a trough and an absorbent boom were installed to intercept future leaks. All of the old transformers have been replaced, and recommendations were made to plug the drains in order to eliminate future contamination (Harris 1993, 12-0130). The drains were not plugged because of the possibility of flooding the transformers. Two other floor drains in the basement of Building TA-8-23, BFD1 and BFD3, receive storm water directly and also from a French drain that surrounds the building. The storm water run-off and drain BFD2 are discharged through a nonpermitted outfall, TA-8-23-OPN-2, located about 350 ft northeast of the parking lot (Santa Fe Engineering 1991, 12-0019).

5.1.1.9 Potential Release Site 8-009(d)—Drains and Outfall serving Building TA-8-22

Building TA-8-22 was built in 1950 to house several x-ray machines that are used to radiograph various items. Radiography is used to produce an image on a radiosensitive surface, such as photographic film, by radiation (x-rays). Photo-processing and photo-development solutions, containing silver salts from the x-ray photography laboratory, were sometimes disposed directly into a dedicated drain at Building TA-8-22 (LANL 1944 to present, 12-0003) The drains flow to a permitted outfall, TA-8-22-OPN-5, and the outfall discharges into a tributary of Pajarito Canyon. The Environmental Surveillance Group, EM-8, monitors this outfall bimonthly, and no violations have been reported. While this monitoring accounts for current practices, the possibility of an earlier release based on historical practices remains.

The SWMU Report (LANL 1990, 0145) states incorrectly that this PRS resulted from fluorescent penetrant experiments performed inside the building (Harris 1993, 12-0001). Waste water from these experiments is discharged at another outfall, which is being proposed in this work plan as a separate PRS [8-009(f)]. The process of listing another PRS (see Section 5.1.1.11) is being initiated to investigate the outfall from the fluorescent penetrant experiments.

5.1.1.10 Potential Release Site 8-009(e)—Drains and Outfall serving Building TA-8-21

Building TA-8-21 was built in 1950 as an administration and laboratory building (Harris 1993, 12-0005). The south wing houses a photo-processing and development laboratory together with 13 darkrooms. Prior to 1991, the waste generated in the photo lab was sent through a silver recovery resin bed for the removal of silver. After the silver was removed, the waste water was discharged into a dedicated sewer and flowed to an outfall. The waste water now directly flows to the permitted outfall, EPA-06A075, which is monitored by EM-8.

Until about 1987, the south wing of TA-8-21 also contained a metallography laboratory where plutonium parts coated with nickel carbonyl were radiographed (x-rayed) and fuel elements consisting of graphite impregnated with ^{235}U were polished. In about 1982 or 1983, the metallography lab was decontaminated and the floor removed and replaced. Within the last five years, this part of the building was converted to office space, and now only the photo lab and the dark rooms remain in place (Harris 1993, 12-0098).

5.1.1.11 Potential Release Site 8-009(f)—Outfall from Fluorescent Penetrant Laboratory at Building TA-8-22

The outfall of concern has not been designated a PRS at the time of this writing. The process to list this as a PRS has been initiated in order to characterize the outfall. It is assumed this PRS will be numbered as 8-009(f).

Fluorescent penetration experiments are performed in laboratories at TA-8-22 and are the source of potential contamination at an unpermitted outfall at the southeast end of the building. Fluorescent penetrants are mixtures of dyes and surfactants. The components of the fluorescent penetrant are kerosene, carbon dioxide, and naphthalene. the developer contains 1,1,1-trichloroethane, chlorodifluoro methane, methyl, and 2-methyl-2-propanol. They are used to detect cracks in parts being prepared for installation into a weapons assembly. Chemicals used in the laboratories are kerosene, fluoranthenes, sodium nitrite, naphthalene, isopropyl amine, petroleum distillate, organic solvents, and mineral oil. In the past, fluorescent penetrant, developer, and emulsifiers have been discharged to the outfall (near Manhole TA-8-57) through drains 1FD12 and 1FD13 (Harris 1993, 12-0001). Currently, waste penetrant, developer, and emulsifiers are collected and disposed of by EM-7.

5.1.1.12 Potential Release Site 8-010(a)—Waste Container Storage Area

This PRS is being recommended for no further action. See Section 7.2.1.7 for details specific to this PRS.

5.1.1.13 Potential Release Site 8-010(b)—Waste Container Storage Area

This PRS is being recommended for no further action. See Section 7.2.1.8 for details specific to this PRS.

5.1.1.14 Potential Release Site 8-010(c)—Waste Container Storage Area

This PRS is being recommended for no further action. See Section 7.2.1.9 for details specific to this PRS.

5.1.2 Remediation Decisions and Investigation Objectives

5.1.2.1 PRSs Recommended for NFA

The following nine PRSs in this group are recommended for NFA:

PRS 8-007	PRS 8-009(b)
PRS 8-008(a)	PRS 8-010(a)
PRS 8-008(b)	PRS 8-010(b)
PRS 8-008(c)	PRS 8-010(c)
PRS 8-008(d)	

The justification for this designation can be found in Chapter 7.

5.1.2.2 Drain

Potential Release Site 8-004(d) will be the focus of a Phase I investigation. Phase I sampling will be designed to screen the manmade media (i.e., in the piping and traps) to determine the presence or absence of ^{90}Sr. If Phase I data indicate concentrations of COCs above both background and threshold levels, a Phase II investigation will be initiated to determine the nature and extent of contamination.

5.1.2.3 Outfalls

The following PRSs will also be the focus of Phase I investigations:

PRS 8-009(c)
PRS 8-009(d)
PRS 8-009(e)
PRS 8-009(f)

For these PRSs, Phase I sampling will determine the presence or absence of constituents above background and threshold levels. If both background and threshold levels are exceeded for a given PRS, then it will be the focus of a Phase II investigation to define the nature and extent of contamination. Otherwise, the PRS will be recommended for no further action

5.1.3 Data Needs and Data Quality Objectives

5.1.3.1 Drain

Source characterization data will be required to make the Phase I decision for PRSs 8-004(d). Data quality objectives specifications for this PRS are as follows:

- **Inputs:** Concentrations of ^{90}Sr in chip samples, if possible, or wipe samples as well as sediments in the sink trap and sewer pipe.

- **Boundaries:** The sink drain trap and the downstream sewer line. The potential for releases from the pipe into the environment will not be addressed until Phase II, if necessary (see Figure 6-1).

- **Decision Logic:** If the maximum concentration from any sample exceeds the threshold and background levels for ^{90}Sr, then proceed to Phase II to determine the nature and extent of contamination, including any environmental release. Otherwise, recommend this PRS for no further action.

- **Design Criteria:** Sampling will be located at points of opportunity (the sink trap and a downstream manhole). There will be a minimum of two chip or wipe samples and two sediment samples.

5.1.3.2 Outfalls

Source characterization data will be required to make the Phase I decision for PRSs 8-009(c–f). Data quality objectives specifications for these PRSs are as follows:

- **Inputs:**
  PRS 8-009(c)—Concentrations of PCBs in outfall sediments.
  PRS 8-009(d)—Concentrations of silver, chromium, and pentachlorophenol in outfall sediments.
  PRS 8-009(e)—Concentrations of inorganic compounds, pentachlorophenol, and radionuclides in outfall sediments.
  PRS 8-009(f)—Concentrations of volatile and semivolatile organics, TPH, and inorganic nitrogen compounds in outfall sediments.

- **Boundaries:** Sediments (generally 0-6 in.) within the outfall channels, and no more than 8 ft downstream from the outfall pipe or culvert (See Figure 6-2). Whenever possible, sediment traps have been identified as the basis for judgmental sampling.

- **Decision Logic:** If the maximum concentration from any surface soil sample exceeds both threshold and background levels for a constituent of concern in a given PRS, then proceed to Phase II to define the nature and extent of contamination. Otherwise, recommend the PRS for no further action.

- **Design Criteria:** Location of sampling points will be determined on a judgmental basis to maximize the likelihood of detecting contamination. There will be two samples per outfall.

5.2 GROUP 2: TECHNICAL AREA 8—GUN-FIRING SITE

5.2.1 Group 2 General Description and History

The three PRSs of Group 2 are associated with the wartime Gun-Firing Site at Old Anchor West (TA-8).

The TA-8 Gun-Firing Site consists of PRS 8-002, an experimental firing site for specially designed naval guns used in developing the Little Boy weapon (Hawkins et al. 1983, 0850). Two concrete anchor pads for the gun mounts and two target sand butts still remain on the ground surface. A burial ground for the naval guns, called MDA Q, is listed as PRS 8-006(a) and 8-006(b). PRS 8-006(b) was originally thought to be a second waste material disposal area associated with the gun-firing site, but it is now considered to be identical with the original MDA Q, PRS 8-006(a). Both the gun-firing site and MDA Q are located on a level area in TA-8 on the west side of Anchor Ranch Road. The Gun-Firing Site was active only during World War II, and the burial at MDA Q was done in 1946 (Courtright 1964, 12-0008). See Figure 5-3 for the locations of these PRSs.

5.2.1.1 Potential Release Site 8-002—Gun-Firing Site

Operations at the Gun-Firing Site began in September 1943 and ended in the summer of 1945. Two separate concrete gun mounts were each covered by rail-mounted movable wooden sheds. Wooden-sided sand butts were placed a few meters southwest of each of the mounts. Various experiments were performed using specially designed naval guns and prototypes of the Little Boy weapon (Hawkins et al. 1983, 0850). Generally, experimental projectiles were fired into the sand butts for recovery and examination. On occasion, projectiles were fired into targets placed in the sand butts and, in some cases, the projectiles and/or targets broke, and fragments were scattered for distances of up to 75 yds. The HE propellants were placed behind rather than inside the projectile casing, thus all projectiles were inert. The most commonly used propellant in these experiments was cordite, which is composed of gun cotton and a petroleum substance usually gelatinized by the addition of acetone and pressed into cord resembling brown twine. The active components in cordite are nitroglycerin and nitrocellulose. The projectiles and targets were made of various combinations

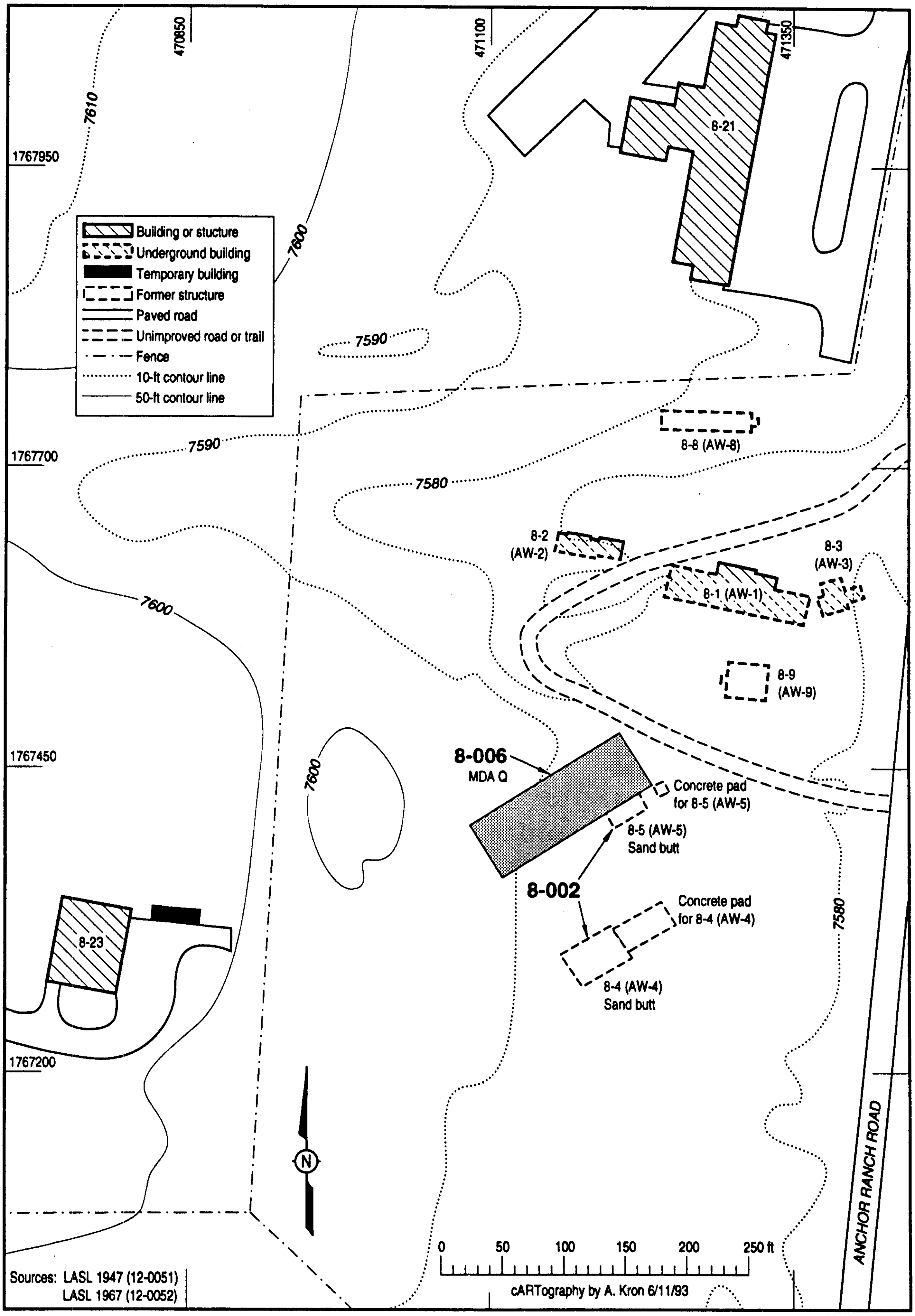

Figure 5-3. Location of PRSs in Group 2, Gun-Firing Site.

of steel, tungsten carbide, depleted uranium, copper, and lead. Plutonium and enriched uranium were never present in the projectiles or targets. Explosives would have been consumed in the firing process and are not expected to be present in the soils at the site. In some instances, small components made of beryllium and polonium were incorporated into the targets, but there are no indications in the records that any of these materials escaped the targets. (Jones 1992, 12-0007) In 1946, the gun mounts and other articles were buried in a pit (MDA Q) near the northernmost of the two gun locations [refer to PRS 8-006(a)]. In 1949, the sheds were removed from the site, and today all that remains are the concrete pads, two piles of sand at the locations of the butts, and four rusting projectiles that are probably relics of excavation episodes in 1947 and 1949 or 1950 when MDA Q was disturbed (Courtright 1964, 12-0008; Tenney 1956, 12-0009).

5.2.1.2 Potential Release Site 8-006(a)—Material Disposal Area Q

According to a 13 October 1964 draft memo by W. C. Courtright (Courtright 1964, 12-0008), in 1946 various pieces of equipment used at the wartime gun-firing site were buried in a pit dug near the northernmost of the two sand butts. Because the sand butt was abandoned in place, a mound of sand is still present to mark the approximate location. In a 15 October 1964 draft memo (Courtright 1964, 12-0008) Courtright reports that, on the previous day, Thurman Hargett, who worked at the site during World War II and was present when the guns were buried, showed Courtright and E. G. McAndrew where the burial had occurred. The location was confirmed with a pipe detector and by the presence of two exposed, 6-in. by 15-in. inert projectiles. The pit proved to be about 90 ft south-southwest of the southwest corner of building TA-8-9 (this building has since been removed) or about 40 ft west-southwest of the decommissioned transformer station TA-8-72 (still in place). The pipe detector was also used to estimate that the pit covered a roughly square area about 30 ft on a side (LANL 1990, 0145). Recent site investigations have indicated this disposal area covers a larger area than the original estimate and also, four projectiles are now exposed.

From memory, Hargett (Courtright 1964, 12-0008) provided a list of buried items that included five or six gun barrels, thirty to forty 6-in. by 15-in. inert projectiles, thirty to forty 3-in. by 10-in. inert projectiles, about fifty 14-in. by 24-in. steel blocks with 3-in. inert projectiles embedded in central holes, some 3-in. and 6-in. expended casings, and some Little Boy Bomb parts. Hargett was fairly confident that there was no live ammunition buried at the site. A review of wartime activities carried out at the gun-firing site indicates that the Little Boy Bomb parts were portions of prototypes that incorporated no ^{235}U or other radioactive materials, a fact confirmed in a brief conversation with former Laboratory Director Norris Bradbury (Jones 1992; 12-0007).

Courtright also reported a conversation with Harlow Russ in which Russ stated that one of the gun mounts that was dug up in 1947 for use off site was free of radioactive contamination (Courtright 1964, 12-0008).

5.2.1.3 Potential Release Site 8-006(b)—Possible Disposal Area near Building TA-8-21

This PRS is being recommended for no further action. See Section 7.2.2.1 for details specific to this PRS.

5.2.2 Remediation Decisions and Investigation Objectives

5.2.2.1 Firing Site

The objective of the Phase I investigation is to sample surface soil for depleted uranium, lead, copper, and beryllium in the vicinity of the Gun-Firing Site (PRS 8-002). Subsurface investigations are not warranted during Phase I because the residual metals would have been deposited on the soil surface only. Penetration of any shrapnel to the subsurface is unlikely because the metallic fragments were directed laterally or upward as a result of the firing. Downward movement of metallic fragments is likely only at the point of disintegration of the test projectiles, that is, in the sand butts. If contamination above threshold and background levels is detected during Phase I, it will be followed either by a VCA or by a Phase II investigation of the nature and extent of this contamination. Any remediation indicated as a result of this investigation is likely to consist of stabilization-in-place and/or removal of soil and debris.

The specific decision to be addressed during Phase I is as follows:

> If concentrations of any constituents of concern exceed threshold and background levels in surface soils in the vicinity of the Gun-Firing Site, then those results will be used to identify and define a VCA or Phase II investigation. Otherwise, recommend this PRS for NFA.
>
> If the Phase I investigation indicates that contamination at this site includes large pieces of metallic debris, then consider a VCA to remove this debris.

5.2.2.2 Landfill

There will be a Phase I investigation to sample surface soils for uranium and other metals at MDA Q [PRS 8-006(a)]. Data obtained from this investigation will be used to help design a system to stabilize the site.

Potential Release Site 8-006(b) will be recommended for no further action because it is identical to PRS 8-006(a). The OU 1157 technical team has concluded that the SWMU Report identifying it as a separate burial area is in error. See Chapter 7 for details associated with PRS.

5.2.3 Data Needs and Data Quality Objectives

5.2.3.1 Firing Site

Source characterization data will be required to make the Phase I decision. Data quality objectives specifications for this PRS area as follows:

- **Inputs:** Concentrations of constituents of concern (depleted uranium, lead, and copper) in surface soil.

- **Boundaries:** The Phase I investigation will focus on two separate boundary conditions:

  (1) the top 3 ft of soil in the immediate vicinity of the two sand butts; and

  (2) surface soil (0 to 6 in.) within a 75-yd radius of each of the sand butts.

- **Decision Logic:** If the maximum concentration from any sample drawn from surface soil samples in the two areas defined above exceeds both background and threshold levels for any contaminant of concern, then (1) consider whether a VCA would be advantageous; and/or (2) proceed to Phase II to define the nature and extent of contamination in both areas.

- **Design Criteria:** Reconnaissance sampling will be designed so that

  (1) for the immediate vicinity of the sand butts, if 80 percent of the area is contaminated, there shall be at most a 5 percent probability of failing to detect the contamination; and

  (2) for the area within a 75-yd radius of the sand butts, if 30 percent of the area is contaminated, there shall be at most a 5 percent probability of failing to detect the contamination.

5.2.3.2 Landfill

Source characterization data will be required to make the Phase I decision for PRS 8-006(a). Data quality objectives specifications for this PRS are as follows:

- **Inputs:** Inputs will be concentrations of constituents of concern (see Table 6-7) in surface soil.

- **Boundaries:** The top 2 ft of soil in the area of MDA Q (the 50 by 150 ft area of evident surface disturbance indicated in Figure 6-5).

- **Decision Logic:** Data obtained from this investigation will be used to help design a system to stabilize the site.

- **Design Criteria:** Sampling will be designed so that if 50 percent of the area is contaminated, there shall be, at most, a 5 percent probability of failing to detect the contamination.

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5.3 GROUP 3: TECHNICAL AREA 8 — ABANDONED BUNKER SITE

5.3.1 Group 3 General Description and History

The TA-8 abandoned bunker site contains 12 PRSs that fall into six types of groupings. These consist of off-gas ventilation systems (two PRSs), septic systems (three PRSs), floor drains (three PRSs), a waste storage vessel (one PRS), an outfall (one PRS), and underground storage tanks (two PRSs). Most of these facilities remain in place, but all are no longer in use and have been abandoned. These PRSs are associated with buried, concrete bunkers built during World War II in a small arroyo north of the Gun-Firing Site that served as control points for gun site operations and also were used for laboratory and storage space. See Figure 5-4 for the locations of these PRSs.

5.3.1.1 Potential Release Site 8-001(a)—Off-Gas System

Building TA-8-1 was built in 1943 and, during the war, served as a control building for the Gun-Firing Site. After the war, it was used for explosives development until the new buildings at TA-9 became available in the period 1950-1953. In later years crystal growth experiments were also conducted in the building. These activities led to contamination of the duct work. Possible contaminants included explosives, styrene, thallous iodide, cyanogen, and methyl chloroform. A fire occurred in the building sometime in the 1960s that may have eliminated any possible HE contamination (Courtright 1971, 12-0011).

In a 12 July 1972 memo, Courtright detailed remedial actions to be taken in buildings TA-8-1, -2, and -3 (Courtright 1972, 12-0012). These actions included removal of the duct work and exhaust fans that served hoods in the west end of Building TA-8-1 and the placement of warning signs. It is unknown if the duct work in TA-8-1 was removed. There are warning signs on Building TA-8-2 but none on TA-8-1 or -3. The external ducts are still in place. These buildings are structurally unsafe to perform a visual inspection. Laboratory Operations personnel are aware of the status of these buildings, and appropriate precautions will be taken during decontamination and decommissioning.

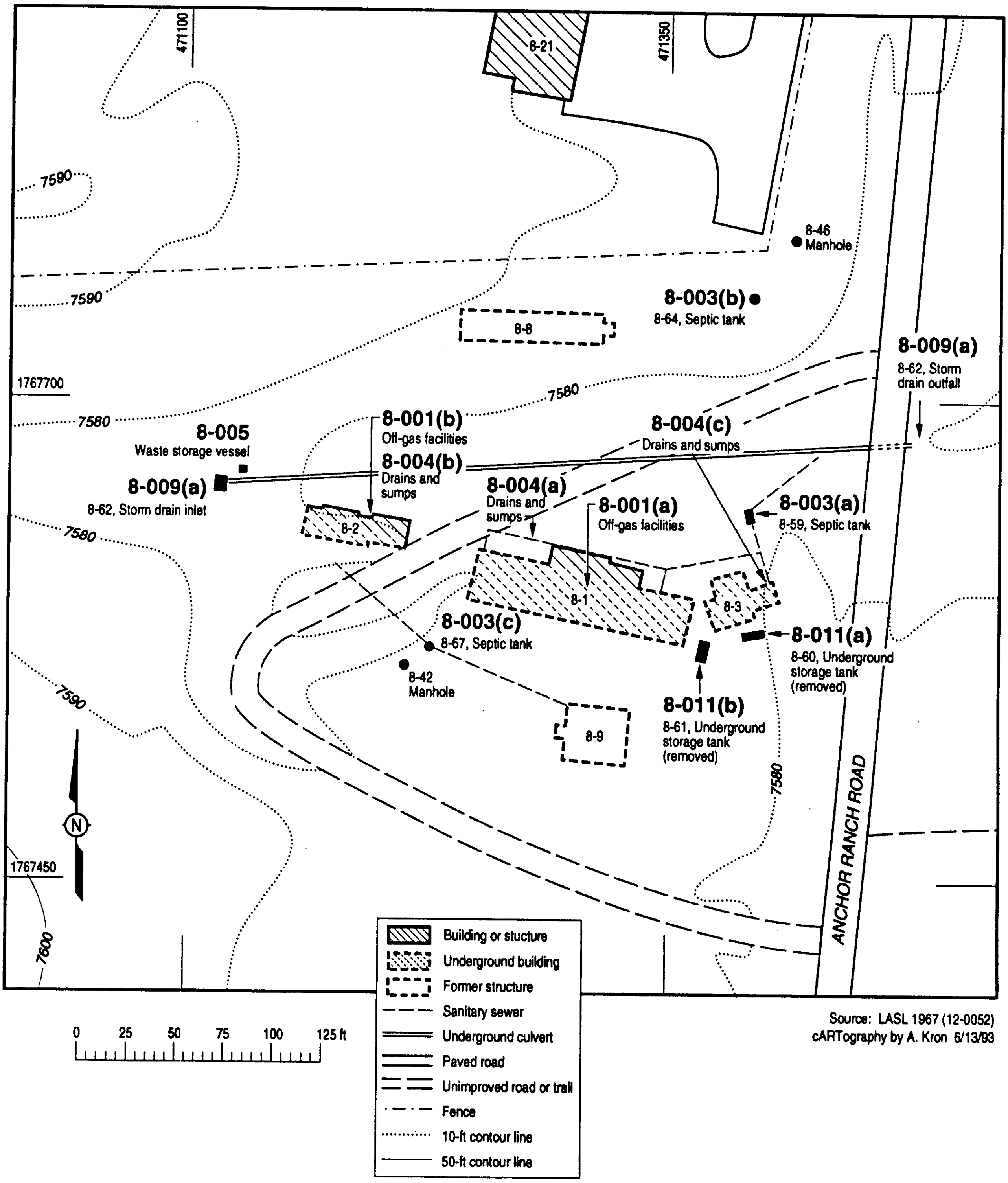


Figure 5-4. Locations of PRSs in Group 3, abandoned bunker site.

Decontamination and decommissioning are planned for the abandoned bunker site. Characterization activities associated with these buildings will be deferred to D&D.

5.3.1.2 Potential Release Site 8-001(b)—Off-Gas System

Building TA-8-2 was built in 1943 and, during the war, served as a machine shop and storage area for the Gun-Firing Site. A memo from W. C. Courtright to S. E. Russo dated 7 September 1971 indicated that the building was contaminated with HE (Courtright 1971, 12-0011).

In a 12 July 1972 memo, Courtright detailed remedial actions to be taken in Buildings TA-8-1, 2, and 3 (Courtright 1972, 12-0012). Because Courtright made no explicit mention of contamination of the Building TA-8-2 duct work, it seems unlikely that any action was taken, and the possibility of residual HE contamination remains. There are warning signs on TA-8-2 but none on TA-8-1 or -3. The external ducts are still in place.

The abandoned bunker site is scheduled to be decontaminated and decommissioned. Characterization activities associated with these buildings will be deferred to D&D.

5.3.1.3 Potential Release Site 8-003(a)—Inactive Septic Tank TA-8-59

Septic Tank TA-8-59 was installed in 1943 and served Buildings TA-8-1 and -3. It was connected to the sanitary sewage piping system that discharged at PRS 8-009(a) (Figure 5-4). Over the years, a variety of activities involving the use of photo-processing chemicals, explosives, solvents, and other chemicals were conducted in the buildings and might have led to contamination of the septic tank. The possibility of uranium contamination may also exist (Barnett 1967, 12-0013). In 1971, liquid samples were taken from Septic Tank TA-8-59 and, although background counts of gross alpha and gross beta indicated it was free of radioactive contamination, it was considered to have probable explosives and chemical contamination, and it contained some volatile hydrocarbon and oil (Buckland 1971, 12-0016; Jordan 1971, 12-0040). In a 31 August 1971 memo,

J. DeField of the Industrial Hygiene Group stated, "past history indicates that...[TA-8-59]...may contain enough significant amounts of acids, solvents, etc., to render them unsafe for release to salvage" (DeField 1971, 12-0014).

5.3.1.4 Potential Release Site 8-003(b)—Inactive Septic Tank TA-8-64

This PRS is being recommended for no further action. See Section 7.2.3.1 for details specific to this PRS.

5.3.1.5 Potential Release Site 8-003(c)—Inactive Septic Tank TA-8-67

This PRS is being recommended for no further action. See Section 7.2.3.2 for details specific to this PRS.

5.3.1.6 Potential Release Site 8-004(a)—Floor Drain in Building TA-8-1

Building TA-8-1 was built in 1943 and served as a control site for the wartime gun-firing site. It also contained laboratory space where small-scale explosive experiments and crystal-growth experiments were conducted. The only floor drains located in the available engineering drawings are in the boiler room at the east end of the building. A lead-lined tub is in Room 2 (southwest corner of the building), with drains leading to a sewer line that also drains a sink, toilet, and shower in Room 1, adjacent. All of these drain lines lead to Septic Tank TA-8-59 [PRS 8-003(a)] (LASL 1943, 12-0015).

This building is scheduled for decontamination and decommissioning. Characterization activities associated with these buildings will be deferred to D&D.

5.3.1.7 Potential Release Site 8-004(b)—Drain Line from TA-8-2

Building TA-8-2 was built in 1943 and served as a machine shop and storage structure. The building has been described as HE-contaminated (Courtright 1961, 12-0033). During the war, the machine shop may have been used to fabricate parts made of depleted uranium, lead, copper, steel and tungsten carbide. After the war, explosives were present in the building (Jones 1992, 12-0133). In a 12 July 1972 memo from Courtright to Owen on proposed remedial procedures, the drain in the east bay of Building 2 was to be labeled "Caution: No heat or impact—Possible Explosive Contaminated Under Floor Drain" (Courtright 1972, 12-0012). Signs with this wording are in place on the exterior of the building. The drain line from Building TA-8-2 leads to Septic Tank TA-8-59 [PRS 8-003(a)].

This building is scheduled for decontamination and decommissioning. Characterization activities associated with these buildings will be deferred to D&D.

5.3.1.8 Potential Release Site 8-004(c)—Floor Drain and Two Sumps in TA-8-3

Building TA-8-3 was built in 1943 and served as a laboratory for the wartime gun-firing site. Each of the two bays contained a floor drain and, as stated in the 7 September 1971 memo from Courtright to Russo, are probably contaminated with explosives (Courtright 1971, 12-0011). The proposed remedial action outlined in the 12 July 1972 memo from Courtright to Owen included filling each of the drains with silicone elastomer and placing a caution sign "Possible Explosive Contaminated Under Floor Drains" (Courtright 1972, 12-0012). No such signs are currently in place on the exterior of the building. This latter memo also mentions two outside sumps that are not marked on the available engineering drawings and could not be found in a visual inspection of the outside of the building. In the engineering drawings, however, there is an oil sump in the larger, west bay of Building TA-8-3 (LASL 1943, 12-0015). The SWMU Report (LANL 1990, 0145) mentions a possibility of ^{235}U and plutonium contamination, but no other references to such contamination of this building have been found. A 24 August 1971 memo from Buckland to Russo reports that all of the buildings in the bunker area, including Building TA-8-3, are free of radioactive contamination (Buckland 1971, 12-0016). Based on the uses of the building, there is no reason to believe that such contamination exists.

This building is scheduled for decontamination and decommissioning. Characterization activities associated with these buildings will be deferred to D&D.

5.3.1.9 Potential Release Site 8-005—Waste Storage Vessel

This square-shaped storage vessel is located on the ground outside the west end of Building TA-8-2, a machine shop and storage building. The vessel is approximately 4 ft by 4 ft by 4 ft and was used during the 1950s for crystal-growth experiments conducted by Group J-16 in the now-abandoned bunker buildings. Crystals were grown at Building TA-8-1 (next to TA-8-2) for use in photographic equipment, and crystal growth residue is contained in this vessel from those experiments. Other chemicals used were terphenyl, alpha naphthyl oxazole, styrene, methyl chloroform, and thallous iodide (DOE 1987, 0264). A visual inspection of the storage vessel revealed residue in the bottom of the vessel and a strong camphor-like odor coming from it. The vessel has a cover with two windows in it. There were no visible signs of stained ground around the vessel.

This PRS is being recommended for a VCA.

5.3.1.10 Potential Release Site 8-009(a)—Drain and Outfall

Potential Release Site 8-009(a) consists of a storm drain inlet and outfall that served the abandoned bunker site. The inlet is located west of the abandoned bunker site and receives only storm water run-off. The drain line continues east in front (north) of Buildings TA-8-1, -2, and -3. Just before crossing under Anchor Ranch Road, a discharge line from Septic Tank TA-8-59 [PRS 8-003(a)] flows into the drain line. Any potential contamination from Buildings TA-8-1,-2 and -3, and therefore from Septic Tank TA-8-59, would have entered this line and been transported to the outfall on the west side of Anchor Ranch Road. Potential contaminants include HE, acids, solvents, and volatile hydrocarbons. There is also a slight possibility of radioactive contamination (LASL 1943, 0018).

5.3.1.11 Potential Release Site 8-011(a)—Decommissioned Underground Storage Tank TA-8-60

This PRS is being recommended for no further action. See Section 7.2.3.3 for details specific to this PRS.

5.3.1.12 Potential Release Site 8-011(b)—Decommissioned Underground Storage Tank TA-8-61

This PRS is being recommended for no further action. See Section 7.2.3.4 for details specific to this PRS.

5.3.2 Remediation Decisions and Investigation Objectives

5.3.2.1 Off-Gas Systems

Because any contamination potentially associated with PRS 8-001(a) and PRS 8-001(b) remains within the interiors of Buildings TA-8-1 and TA-8-2 (both of which remain in place), any action on these PRSs will be deferred to D&D.

5.3.2.2 Septic Systems

Potential Release Site 8-003(a) will be the subject of a Phase I investigation to determine the presence or absence of constituents in soils beneath the septic tank. Soil beneath the tank was determined to be the most likely contaminated medium due to the possibility of cracks within the body of the tank. If contamination above threshold levels is detected, there will be a Phase II investigation of the nature and extent of contamination in subsurface soil. Otherwise, only the structure itself will be removed. Potential Release Sites 8-003(b) and 8-003(c) are recommended for no further action.

5.3.3.3 Drains and Drain Lines

Investigation of PRS 8-004(a), PRS 8-004(b), and PRS 8-004(c) will be deferred to D&D.

5.3.2.4 Waste Storage Vessel

The structure itself will be removed as a voluntary corrective action. If evidence of a release is found, the surface soil will be the subject of the Phase I investigation because the likelihood of detection of any contamination from the above-ground structure is greatest in the surface soil.

5.3.2.5 Outfall

Potential Release Site 8-009(a) will be the subject of a Phase I investigation to determine the presence or absence of constituents in outfall surface soil. If contamination above threshold levels is detected, there will be a Phase II investigation of the nature and extent of contamination in the outfall. Otherwise, this PRS will be recommended for no further action.

5.3.2.6 Underground Storage Tanks

These underground storage tanks, PRS 8-011(a) and PRS 8-011(b), have already been removed along with any contaminated soil. Therefore, these PRSs will be recommended for no further action.

5.3.3 Data Needs and Data Quality Objectives

5.3.3.1 Septic System

Source characterization data will be required to support the Phase I decision for PRS 8-003(a). Data quality objectives specifications are as follows:

- **Inputs:** Concentrations of constituents of concern (see Table 6-11) in subsurface soil surrounding the septic tank will be needed to support the Phase I decision. In addition, concentrations of constituents within the contents of the tank itself will be determined to help plan and manage the removal and disposal of the structure.

- **Boundaries:** Boundaries include subsurface soil (6- to 8-ft depth) underneath the tank as well as the structure itself along with its contents (see Figure 6-6).

- **Decision Logic:** The structure itself will be removed, if storage or disposal capacity is available, in order to facilitate Phase I sampling. If the maximum concentration in subsurface soil samples collected during Phase I exceeds background and threshold levels for any potential constituents of concern, then proceed to Phase II to determine the nature and extent of soil contamination. Otherwise, recommend this PRS for no further action once the structure is removed.

- **Design Criteria:** Two sample locations will be determined judgmentally based on visual inspection of the excavation site or underneath the center of the tank if no likely release point can be determined.

5.3.3.2 Waste Storage Vessel

Source characterization data will be required to support the Phase I decision for this PRS. Data quality objectives specifications are as follows:

- **Inputs:** Concentrations of potential constituents (see Table 6-11) in surface soil underneath the vessel may be needed to support the Phase I decision. In addition, concentrations of constituents within the vessel itself will be determined to help plan and manage the removal and disposal of the vessel.

- **Boundaries:** Boundaries include surface soil (to 6 in.) underneath the waste storage vessel as well as the vessel itself along with its contents.

- **Decision Logic:** The vessel itself will be removed in order to facilitate Phase I sampling. If the maximum concentration in surface soil samples collected during Phase I exceeds background and threshold levels for any potential constituents of concern, then proceed to Phase II to determine the nature and extent of soil contamination. Otherwise, recommend this PRS for no further action once the structure is removed.

- **Design Criteria:** Two sample locations may be determined judgmentally based on visual inspection of the surface underneath the vessel in order to maximize the likelihood of identifying any contamination.

5.3.3.3 Outfall

Source characterization data will be required to support the Phase I decision for PRS 8-009(a). Data quality objectives specifications are as follows:

- **Inputs:** Concentrations of constituents of concern in the outfall surface soil (see Table 6-11).

- **Boundaries:** Boundaries include surface soil within the discharge ditch near the end of the outfall pipe (which is currently covered by a road embankment) (see Figure 6-6).

- **Decision Logic:** If the maximum concentration in surface soil samples collected during Phase I exceeds background and threshold levels for any potential constituents of concern, then proceed to Phase II to determine the nature and extent of contamination. Otherwise, recommend this PRS for no further action.

- **Design Criteria:** Two sample points will be located judgmentally at locations close to the outfall discharge point in order to maximize the likelihood of identifying any contamination.

5.4 GROUP 4: TECHNICAL AREA 9—ACTIVE SITE

5.4.1 Group 4 General Description and History

The construction of buildings and support structures at New Anchor Site East (TA-9) began in 1949 and continued for about five years. Thirty-eight permanent structures were erected about one mile south of the old facility, (Old Anchor East), to house the Explosive Technology Group (M-1) (previously X-2, GMX-2, WX-2). The major purpose of this group is to research and develop HE for the Laboratory's nuclear weapon systems. This is a concept-to-retirement support that has recently included the dismantlement of explosive components from discontinued stockpiled weapons and recycling of HE waste. Activities include synthesizing, characterizing, formulating, pressing, machining, performance testing, and determining the compatibility of HE with other weapon materials. Therefore, the buildings were designed for specific purposes, and their functions have not changed much over the 40 years of operation. There is a laboratory/office building combination, pressing buildings, a security guard station (converted to an office), a machine shop, process and development laboratories, an environmental test chamber, drying ovens, ovens for accelerated aging and compatibility studies, storage magazines and magazettes, a component machining building, a carpenter shop, a radioactive material and waste storage building, a solvent storage building, a shipping and receiving building, a chemical and equipment storage building (the warehouse), and a refrigerator shelter. The relative location of these buildings is given in Figure 5-5. Substructures installed were a part of the sewer and industrial lines supporting this facility. Thirty PRSs have been identified in this area. The PRSs associated with activities in this area are shown on Figure 5-6.

Several sanitary septic tanks in active TA-9 were designated as PRSs. The sanitary waste system is composed of active, inactive, and decommissioned septic tanks. The sanitary system has always been kept separate from the industrial waste lines. In 1988 Santa Fe Engineering, assisted by Paul Loren Abercrombie, Group WX-12, did a dye study of both systems (Santa Fe Engineering 1991, 0019). This study confirmed the separate nature of these systems. The sanitary systems flow out of the buildings through a lagoon and sand filters into an EPA-permitted outfall, 555-02S. The outfall is sampled

Structure Number	Structure Designation	Structure Nomenclature	Structure Number	Structure Designation	Structure Nomenclature	Structure Number	Structure Designation	Structure Nomenclature
TA-9-20	AE-20	Guard station	TA-9-33	AE-33	Laboratory building	TA-9-46	AE-46	Process laboratory
TA-9-21	AE-21	Laboratory and office building	TA-9-34	AE-34	Process laboratory	TA-9-47	AE-47	Magazine
TA-9-22	AE-22	Magazette	TA-9-35	AE-35	Process laboratory	TA-9-48	AE-48	HE machining building
TA-9-23	AE-23	Magazette	TA-9-36	AE-36	Magazine	TA-9-49	AE-49	Magazine
TA-9-24	AE-24	Magazette	TA-9-37	AE-37	Process laboratory	TA-9-50	AE-50	Receiving and shipping building
TA-9-25	AE-25	Magazette	TA-9-38	AE-38	Process laboratory	TA-9-51	AE-51	Environmental test chamber
TA-9-26	AE-26	Magazette	TA-9-39	AE-39	Magazine	TA-9-52	AE-52	Magazine
TA-9-27	AE-27	Magazette	TA-9-40	AE-40	Ovens	TA-9-53	AE-53	Magazine
TA-9-28	AE-28	Machine shop	TA-9-41	AE-41	Comfort station building	TA-9-54	AE-54	Magazine
TA-9-29	AE-29	Chemical equipment storage bldg.	TA-9-42	AE-42	Process laboratory	TA-9-55	AE-55	Magazine
TA-9-30	AE-30	Rad storage	TA-9-43	AE-43	Process laboratory	TA-9-204	AE-204	Refrigerator shelter
TA-9-31	AE-31	Solvent storage	TA-9-44	AE-44	Magazine	TA-9-208	AE-208	HE waste and magazine
TA-9-32	AE-32	Laboratory building	TA-9-45	AE-45	Process laboratory	TA-9-214	AE-214	Carpenter shop

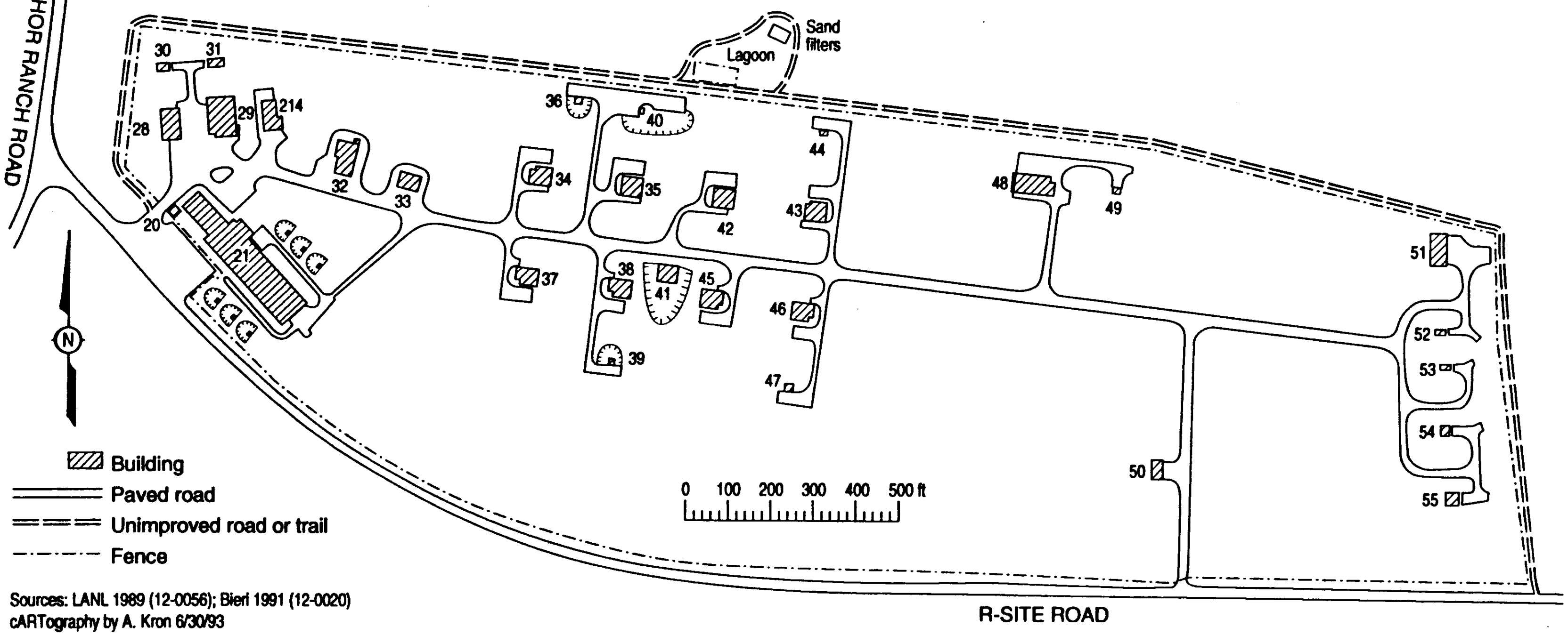


Figure 5-5. Locations of structures at active TA-9.

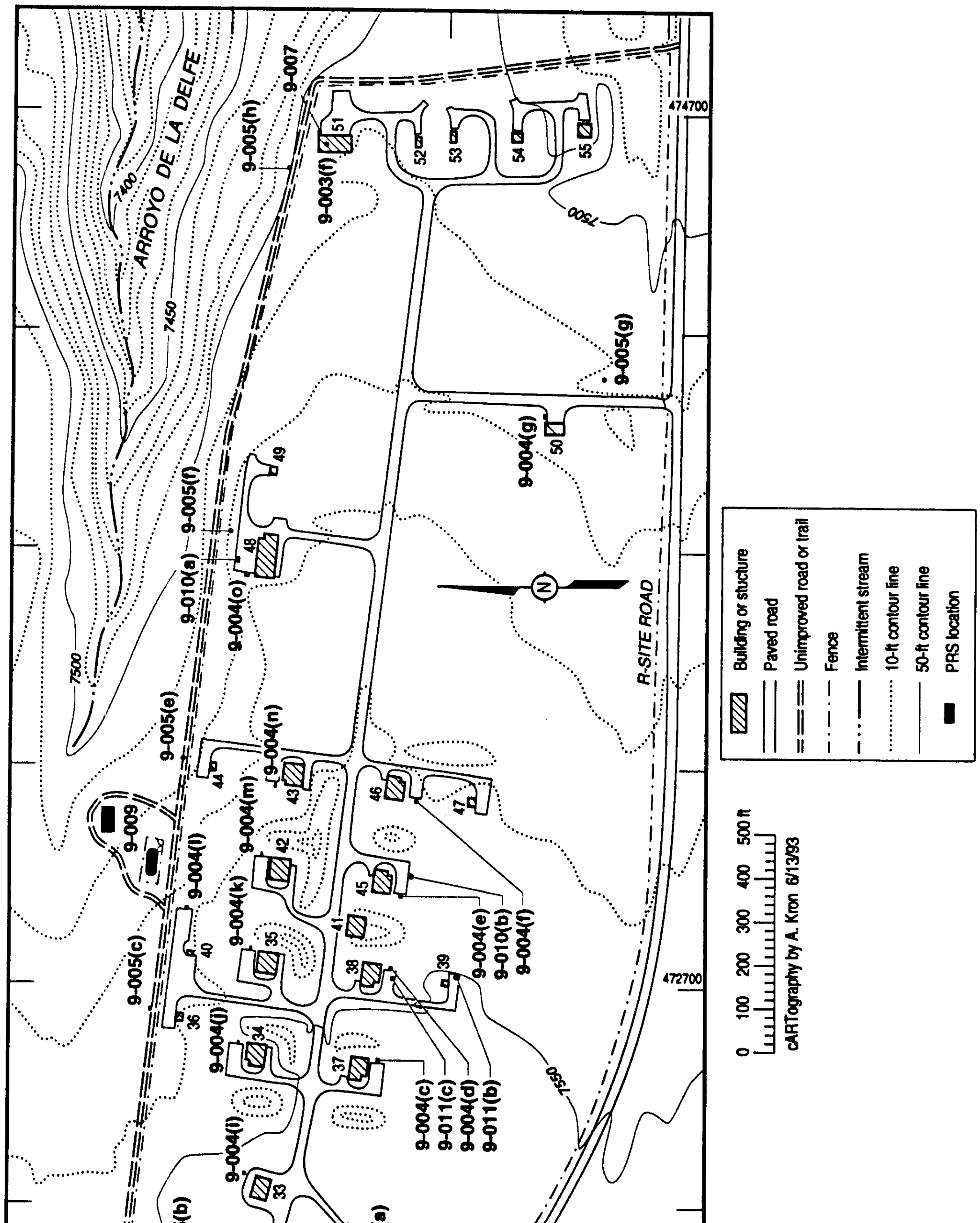


Figure 5-6. Locations of PRSs in Group 4, active TA-9.

bimonthly by EM-8. The sanitary septic tanks in this area that have been designated as PRSs are being recommended for no further action. Complete information on these PRSs can be found in Chapter 7. Figure 5-7 shows the locations of the sanitary sewer lines in TA-9.

Several more PRSs in TA-9 are designated under PRS 9-004(a-o) as settling tanks. Settling tanks are externally submerged concrete basins lined with a corrosion resistant material and open to the outside. Settling tanks are generally found at the end of industrial waste plumbing systems as it exits the building.

The settling tanks in active TA-9 were installed and completed in August 1952 (LANL 1944 to present, 12-0003) All were made of reinforced concrete. Waste from the buildings travels through a sump and into these settling tanks. Large pieces of solids are collected before entering the waste system; small pieces of solids are filtered out. However, fine particles may go into the settling tanks. This is particularly true in machining operations. All settling tanks at TA-9 are cleaned, and debris is removed using specially equipped trucks.

A few of the remaining PRSs in TA-9 are designated as waste can shelters. When TA-9 was built in 1949, several support structures were also built. The type of structure of concern here was a free-standing, three-sided, corrugated-steel shelter, supported on four or six steel posts about 6 in. in diameter and anchored in cement. These shelters were usually located about 50 ft from the rear doors of some of the buildings. A few of these shelters had structure numbers. Because several have been removed, their actual location will have to be estimated. They contained HE waste or contaminated equipment. A few of them were designed with shelves to hold solvent containers or gas cylinders. The buildings in the process and development area have plastic-lined, 5-gal. metal cans inside the building in the equipment room. These cans hold nonhazardous waste. They are emptied by the custodians, who are not allowed in the process bays containing HE.

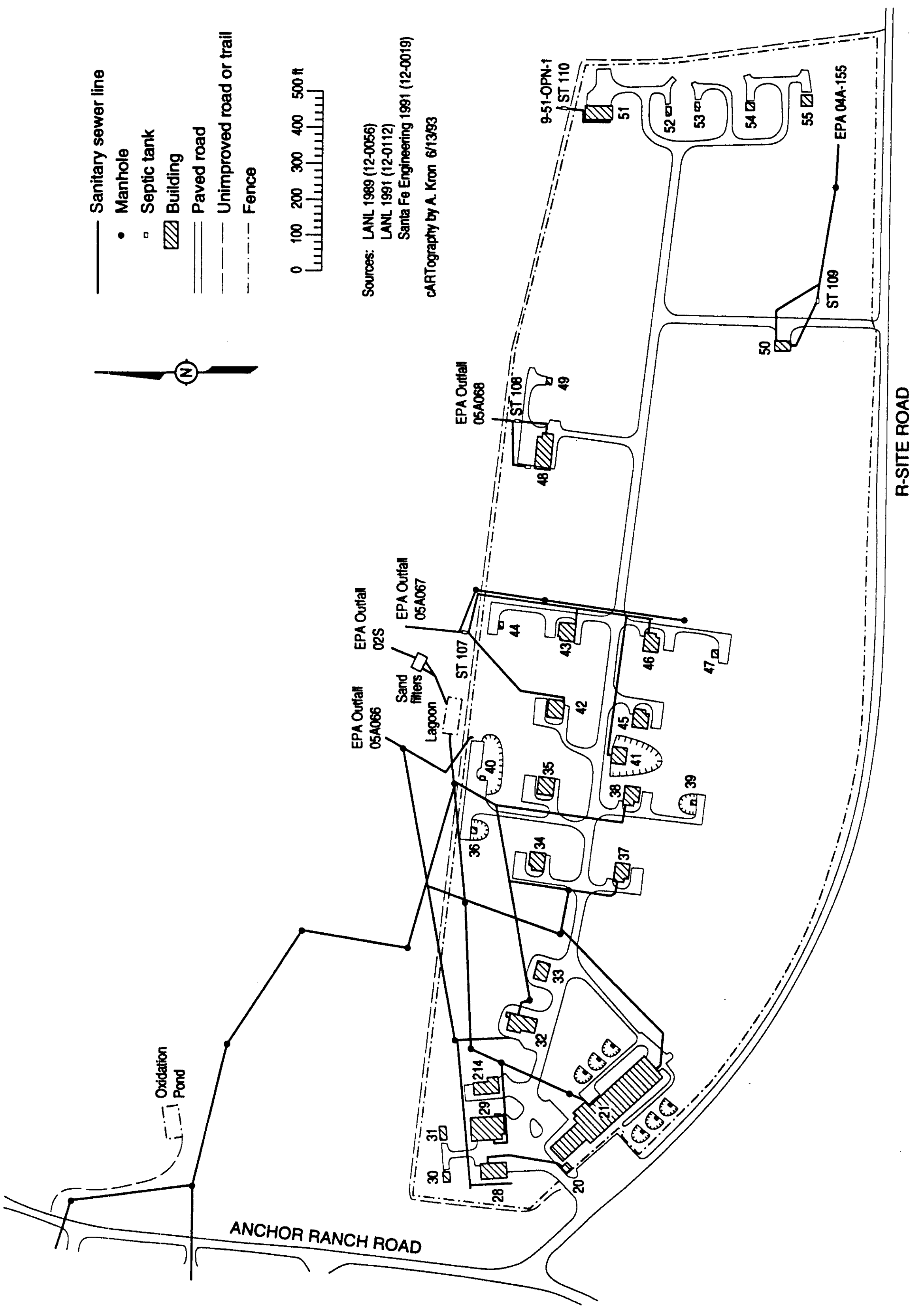


Figure 5-7. Locations of structures and sanitary sewer lines at the decommissioned and active TA-9.

5.4.1.1 Potential Release Site 9-003(f)—Settling Tank served Building TA-9-51

This PRS is being recommended for no further action. See Section 7.2.4.1 for details specific to this PRS.

5.4.1.2 Potential Release Site 9-004(a)—Settling Tank serving Building TA-9-21

Structure TA-9-184 is a reinforced-concrete, rectangular-shaped settling tank receiving industrial waste from the south-side laboratories in Building TA-9-21. The aluminum lining in this structure was not chemically resistant and had to be replaced in 1991. No signs of leakage or contamination of the concrete or soil around the settling tank were identified. The activities in Building TA-9-21 include HE synthesis and testing on a laboratory scale. The settling tank traps HE residues.

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.3 Potential Release Site 9-004(b)—Settling Tank serving Building TA-9-21

Structure TA-9-185 is a reinforced-concrete, rectangular-shaped settling tank receiving industrial waste from the north-side laboratories in Building TA-9-21. The aluminum lining in this structure was not chemically resistant and had to be replaced in 1991. No signs of leakage or contamination of the concrete or soil around the settling tank were identified. The activities in Building TA-9-21 include HE-synthesis and testing on a laboratory scale. The settling tank traps HE residues.

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.4 Potential Release Site 9-004(c)—Settling Tank serving Building TA-9-37

Structure TA-9-186 is a reinforced-concrete, rectangular-shaped, settling tank receiving industrial waste from the south-side laboratory at Building TA-9-37. Activities in TA-9-37 include HE-synthesis scale-up and processing. This involves the use of equipment for HE processing and development (Bieri 1991, 12-0020; Harris 1993, 12-0135). The settling tank traps HE residues.

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.5 Potential Release Site 9-004(d)—Settling Tank serving Building TA-9-38

Structure TA-9-187 is a reinforced-concrete, rectangular-shaped settling tank currently receiving industrial waste from the south-side laboratory at Building TA-9-38. Activities in TA-9-38 include HE casting and pressing. Also, small-scale mixers and extruders are located in this building (Bieri 1991, 12-0020; Harris 1993, 12-0135; Harris 1993, 12-0134). The settling tank traps HE residues.

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.6 Potential Release Site 9-004(e)—Settling Tank serving Building TA-9-45

Structure TA-9-188 is a reinforced-concrete, rectangular-shaped, settling tank currently receiving industrial waste from the south-side laboratory at Building TA-9-45. The aluminum lining in this structure was not chemically resistant and had to be replaced in 1991. No signs of leakage or contamination of the concrete or soil around the settling tank were identified. Activities in Building TA-9-45 include HE synthesis scale-up and process and development. There are various sized reactors, mixers, and extruders in this building. The ball-milling and sieving of explosives are also performed in TA-9-45 (Bieri 1991, 12-0020; Harris 1993, 12-0136; 12-0134). The settling tank traps HE residues.

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.7 Potential Release Site 9-004(f)—Settling Tank serving Building TA-9-46

Structure TA-9-189 is a reinforced-concrete, rectangular-shaped settling tank currently receiving industrial waste from Building TA-9-46. This building, which has not been extensively used, was used as a storage facility for radioactive materials and waste until 1991. However, past activities in TA-9-46 included HE-synthesis scale-up and processing (Harris 1993, 12-0136; 12-0134). The settling tank traps HE residues.

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.8 Potential Release Site 9-004(g)—Settling Tank serving Building TA-9-50

Structure TA-9-190 is a reinforced-concrete, rectangular-shaped settling tank currently receiving industrial waste from Building TA-9-50. Activities in Building TA-9-50 include shipping and receiving and short-term storage of HE. Small-scale laser experiments have been conducted in the past. Hazardous waste was not generated in these operations. The building is now inactive and being used for storage (Harris 1993, 12-0050; Harris 1993, 12-0134). It is highly unlikely that this settling tank is contaminated. However, because it is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned.

5.4.1.9 Potential Release Site 9-004(h)—Settling Tank serving Building TA-9-32

Structure TA-9-191 is a reinforced-concrete, rectangular-shaped settling tank currently receiving industrial waste from Building TA-9-32. Activities in TA-9-32 include mass spectroscopy, tritium analysis, and analytical work on high explosives. Also, some pressing, packaging, and short-term storage is performed at TA-9-32 (Harris 1993, 12-0137). The settling tank traps HE residues.

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.10 Potential Release Site 9-004(i)—Settling Tank serving Building TA-9-33

Structure TA-9-192 is a reinforced-concrete, rectangular-shaped settling tank that received industrial waste from Building TA-9-33. Activities in TA-9-33 included compressed gas reactions using cyanogen, fluorine, chlorine, and hydrogen cyanide. This building has been decontaminated and is currently inactive (Harris 1993, 12-0138; Harris 1993, 12-0099; Harris 1993, 12-0134).

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.11 Potential Release Site 9-004(j)—Settling Tank serving Building TA-9-34

Structure TA-9-193 is a reinforced-concrete, rectangular-shaped settling tank currently receiving industrial waste from Building TA-9-34. Activities at Building TA-9-34 have included HE pressing, mixing, and sieving. Small-scale preparation of propellant grain was also done at TA-9-34. However, the major activity at TA-9-34 is the welding and opening of containers with weapons' components and the cutting of explosive crystals (Bieri 1991, 12-0020; Harris 1993, 12-0139). The settling tank traps HE residues.

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.12 Potential Release Site 9-004(k)—Settling Tank serving Building TA-9-35

Structure TA-9-194 is a reinforced-concrete, rectangular-shaped settling tank currently receiving industrial waste from Building TA-9-35. Activities in Building TA-9-35 have been large-scale pressing of HE. Except for kimwipes contaminated with solvent, oil, and/or HE from cleanup of equipment, no waste is generated during these operations. The solid waste is collected by WX-3 for proper disposal. This tank is not expected to be contaminated with HE but is cleaned periodically (Bieri 1991, 12-0020).

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.13 Potential Release Site 9-004(l)—Settling Tank serving Building TA-9-40

Structure TA-9-195 is a reinforced-concrete, rectangular-shaped settling tank currently receiving industrial waste from Building TA-9-40. Activities in Building TA-9-40 include temperature compatibility studies. This building contains large environmental test chambers and ovens. No liquid wastes are generated (Harris 1993, 12-0140). The settling tank was installed for potential HE operation.

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.14 Potential Release Site 9-004(m)—Settling Tank serving Building TA-9-42

Structure TA-9-196 is a reinforced-concrete, rectangular-shaped settling tank currently receiving industrial waste from Building TA-9-42. Building TA-9-42 contains ovens for nuclear compatibility aging studies. No liquid or solid waste is generated in these operations, and this tank would not be contaminated with HE (Harris 1993, 12-0140).

Although it is highly unlikely that this settling tank is contaminated, and because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.15 Potential Release Site 9-004(n)—Settling Tank serving Building TA-9-43

Structure TA-9-197 is a reinforced-concrete, rectangular-shaped settling tank that received industrial waste from Building TA-9-43. Building TA-9-43 contains presses for HE operations but hasn't been used for several years, and is inactive. No liquid waste was generated in these processes. This tank is not thought to be contaminated with HE. Kimwipes contaminated with solvents, oil, and/or HE during the cleaning of equipment after pressing are collected and disposed of by WX-3 (Harris 1993, 12-0139).

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.16 Potential Release Site 9-004(o)—Settling Tank serving Building TA-9-48

Structure TA-9-198 is a reinforced-concrete, rectangular-shaped settling tank currently receiving industrial waste from Building TA-9-48. Building TA-9-48 is used for machining HE. Very little hazardous liquid waste is generated in this process. Large pieces of HE waste are picked up after machining. Smaller pieces are filtered out through traps or filters on the drains as they are washed down. Fine particles may enter the sump and settling tank (Harris 1993, 12-0131). The settling tank traps HE residues.

Because this PRS is not a threat to human health or the environment, it will be deferred for characterization until it is decommissioned. The PRS is inspected periodically to ensure its integrity.

5.4.1.17 Potential Release Site 9-005(b)—Inactive Sanitary Septic Tank served Buildings TA-9-21, -28, and -29

This PRS is being recommended for no further action. See Section 7.2.4.2 for details specific to this PRS.

5.4.1.18 Potential Release Site 9-005(c)—Inactive Sanitary Septic Tank served Buildings TA-9-21, -33, -34, -37, and -38

This PRS is being recommended for no further action. See Section 7.2.4.3 for details specific to this PRS.

5.4.1.19 Potential Release Site 9-005(e)—Inactive Sanitary Septic Tank serving Buildings TA-9-41, -42, -43, -45, and -46

This PRS is being recommended for no further action. See Section 7.2.4.4 for details specific to this PRS.

5.4.1.20 Potential Release Site 9-005(f)—Inactive Sanitary Septic Tank serving Building TA-9-48

This PRS is being recommended for no further action. See Section 7.2.4.5 for details specific to this PRS.

5.4.1.21 Potential Release Site 9-005(g)—Active Sanitary Septic Tank serving Building TA-9-50

This PRS is being recommended for no further action. See Section 7.2.4.6 for details specific to this PRS.

5.4.1.22 Potential Release Site 9-005(h)—Active Sanitary Septic Tank serving Building TA-9-51

This PRS is being recommended for no further action. See Section 7.2.4.7 for details specific to this PRS.

5.4.1.23 Potential Release Site 9-007—Basket Pit

This PRS is being recommended for no further action. See Section 7.2.4.8 for details specific to this PRS.

5.4.1.24 Potential Release Site 9-009—Lagoon and Sand Filters

Structure TA-9-218 was a sanitary waste treatment lagoon built in 1961 to treat the sanitary waste from Buildings TA-9-20, -21, -28, -29, -32, -33, -34, -35, -37, and -38. It measures 60-ft long by 32-ft wide by 7-ft deep. The lagoon has concrete sides and bentonite bottom. The lagoon discharged to a set of two sand filters, which have a combined area of 60-ft long by 33-ft wide (LASL 1973, 12-0023; LASL 1973, 12-0057). The sand filters contain a flexible membrane liner and are surrounded by a concrete lip. After flowing through the sand filters, the effluent was discharged to NPDES-permitted outfall, 555 02S (LANL 1944 to present, 12-0003). The lagoon and sand filter system have been replaced by a site-wide sanitary wastewater systems consolidation line.

Although this lagoon is used only for sanitary waste, it may have been contaminated with ^{90}Sr after it was connected to the sewer lines from TA-8 in 1986.

5.4.1.25 Potential Release Site 9-010(a)—Waste Container Storage Area (Waste Can Shelter)

Potential Release Site 9-010(a) is a waste can shelter (Structure TA-9-207) that is currently inactive and scheduled to be removed. It was used to store HE-contaminated solid waste from Building TA-9-48, the HE machining building. High explosive waste, in the form of chips and chunks from machining operations, and solvent-contaminated kimwipes from cleaning machinery and equipment, were collected in heavy plastic bags and kept in metal containers until they were ready to be transferred to the open shelter outside. As a precaution, they were double-packaged in another heavy duty plastic bag. The contaminated waste was then picked up and disposed of by either Group WX-3, Group M-1, or Group EM-7 (Harris 1993, 12-0131). The structure is made of corrugated steel, 2-ft 6-in. wide by 11-ft 6-in. long by 6-ft 6-in. high (LASL 1960, 12-0058).

5.4.1.26 Potential Release Site 9-010(b)—Waste Container Storage Area (Waste Can Shelter)

Structure TA-9-206 was a waste can shelter built on 6 January 1961. It was a steel-framed structure with corrugated steel sides 2-ft 6-in. wide by 11-ft long by 6-ft 6-in. high (LANL 1944 to present, 12-0003) It was located northeast of Building TA-9-42. Building TA-9-42 was used for nuclear compatibility aging studies, and the waste can shelter was possibly associated with the activities in Building TA-9-42. The waste can shelter has been removed.

5.4.1.27 Potential Release Site 9-010(c)—Waste Container Storage Area (Waste Can Shelter)

This PRS is being recommended for no further action. See Section 7.2.4.9 for details specific to this PRS.

5.4.1.28 Potential Release Site 9-011(a)—Waste Container Storage Area at Building TA-9-21

This PRS is being recommended for no further action. See Section 7.2.4.10 for details specific to this PRS.

5.4.1.29 Potential Release Site 9-011(b)—Waste Container Storage Area at Magazine TA-9-39

This satellite storage area was in the corner of an asphalt-paved parking lot south of Magazine TA-9-39. It housed HE-contaminated equipment until the equipment could be cleaned, flashed, and properly disposed. There was no structure associated with this storage area. It is about 10 ft square and was once fenced with wire and had signs posted. This is now an inactive area and the wire has been removed.

5.4.1.30 Potential Release Site 9-011(c)—Container Storage Area at Building TA-9-38

This PRS includes the site of a solvent storage rack and a storage and washdown area for HE-contaminated equipment. The storage rack has been removed but was located at the south entrance to Building TA-9-38 (Harris 1993, 12-0099). Building TA-9-38 is used for HE process and development operations. The solvent storage rack once housed dimethylsulfoxide and isobutyl acetate in support of the activities in Building TA-9-38.

5.4.2 Remediation Decisions and Investigation Objectives

5.4.2.1 PRSs Recommended for NFA

PRS 9-003(f)	PRS 9-005(g)
PRS 9-005(b)	PRS 9-005(h)
PRS 9-005(c)	PRS 9-007
PRS 9-005(e)	PRS 9-010(c)
PRS 9-005(f)	PRS 9-011(a)

The justification for NFA designations can be found in Chapter 7.

5.4.2.2 PRSs Deferred to D&D

The following PRSs will be deferred to the D&D phase because they are currently active sites:

PRS 9-004(a) PRS 9-004(i)
PRS 9-004(b) PRS 9-004(j)
PRS 9-004(c) PRS 9-004(k)
PRS 9-004(d) PRS 9-004(l)
PRS 9-004(e) PRS 9-004(m)
PRS 9-004(f) PRS 9-004(n)
PRS 9-004(g) PRS 9-004(o)
PRS 9-004(h)

5.4.2.3 Phase I Investigations

The following PRSs will be the focus of a Phase I screening to determine the presence or absence of constituents above background and threshold levels:

PRS 9-009
PRS 9-010(a)
PRS 9-010(b)
PRS 9-011(b)
PRS 9-011(c)

Because these PRSs are all above-ground structures, the sample media are limited to surface soils and sediments (in the bottom of the lagoon). If the background and threshold levels are exceeded during Phase I for PRS 9-009, then a Phase II investigation will be initiated to determine the nature and extent of contamination. If threshold and background levels are exceeded at the remaining PRSs, the PRSs will be candidates for VCAs.

5.4.3 Data Needs and Data Quality Objectives

5.4.3.1 Lagoon

Source characterization data will be required to make the Phase I decision for PRS 9-009. Data quality objectives specifications for PRS 9-009 are as follows:

- **Inputs:** Concentrations of ^{90}Sr in the lagoon sediment.

- **Boundaries:** Sediments in the top 6 in. of bottom of the lagoon (see Figure 6-7).

- **Decision Logic:** If the maximum concentration from any sample exceeds both background and threshold levels, then proceed to Phase II to define the nature and extent of contamination in the lagoon, sand filters, and outfall. Otherwise recommend NFA for this PRS.

- **Design Criteria:** Two sampling points will be located on a judgmental basis in the center of the lagoon to maximize the likelihood of detecting any contamination.

5.4.3.2 Container Storage Areas

Source characterization data will be required to make the Phase I decision for the following PRSs:

PRS 9-010(a)
PRS 9-010(b)
PRS 9-011(c)

Data quality specifications are as follows:

- **Inputs:** Concentrations of constituents of concern (see Table 6-16) in soil associated with these PRSs.

- **Boundaries:** Boundaries include surface soil (0-12 in.) at the site of each storage area (see Figure 6-7).

- **Decision Logic:** For a given PRS, if the maximum concentration from any sample exceeds the background and threshold levels for any constituent of concern, then proceed to Phase II to define the nature and extent of contamination or recommend the PRS for VCA. Otherwise, recommend no further action for that PRS. A separate decision will be made for each PRS.

- **Design Criteria:** Two sampling points will be located at PRSs 9-010(a) and (b), and six sampling points will be located at PRS 9-0111(c). The points will be located on a judgmental basis at each site to maximize the likelihood of detecting any contamination.

5.4.3.3 Storage Area

Source characterization data will be required to make the Phase I decision for PRS 9-011(b). Data quality specifications are as follows:

- **Inputs:** Concentrations of constituents of concern (see Table 6-16) in surface soil associated with these PRSs.

- **Boundaries:** Surface soil (0 to 6 in.) within 5 ft of the corner of this paved area (see Figure 6-8).

- **Decision Logic:** If the maximum concentration from any sample exceeds the background and threshold levels for any constituent of concern, then proceed to Phase II to define the nature and extent of contamination. Otherwise, recommend no further action.

- **Design Criteria:** Two sampling points will be located on a judgmental basis to maximize the likelihood of detecting any contamination.

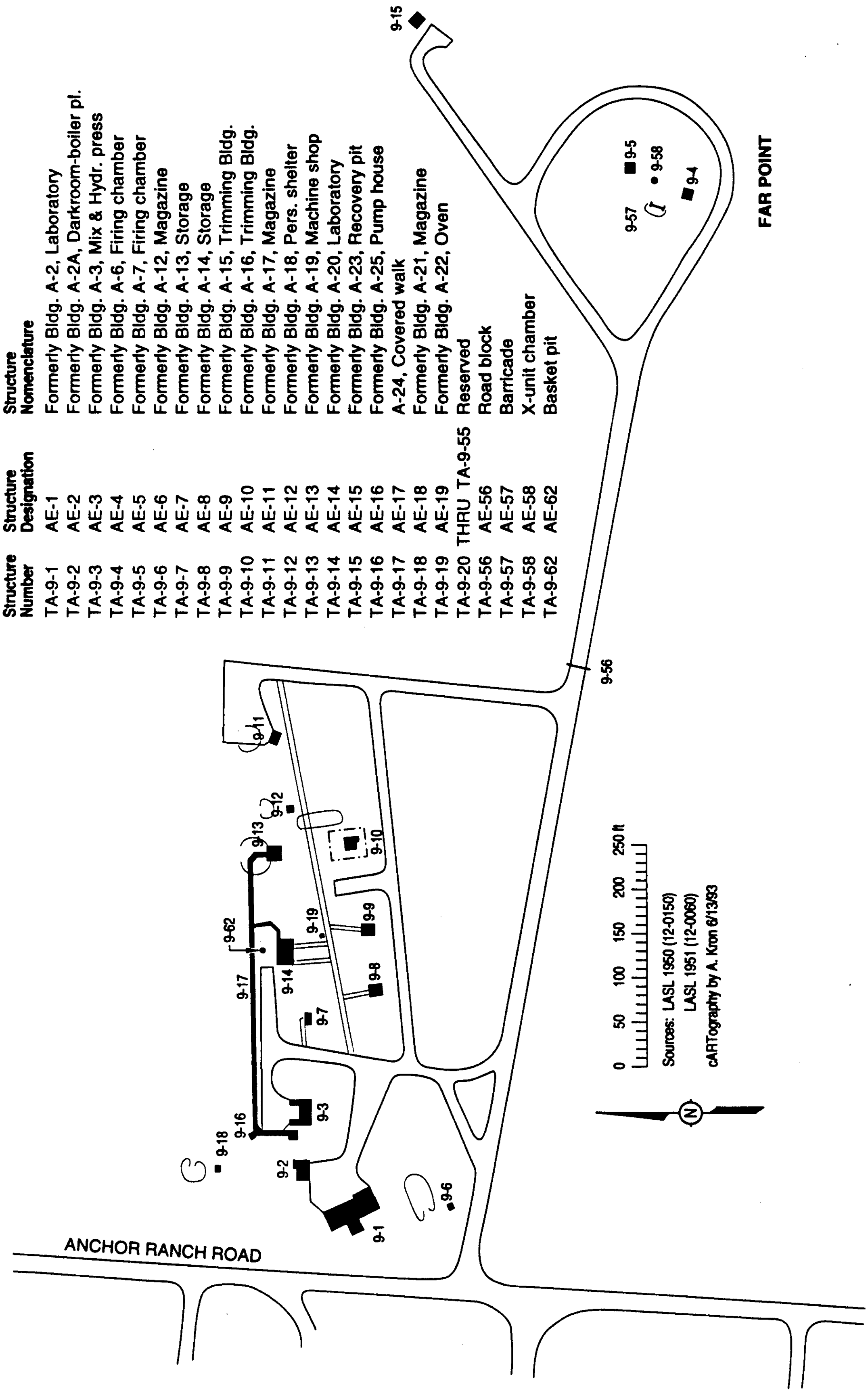
5.5 GROUP 5: TECHNICAL AREA 9—OLD ANCHOR EAST DECOMMISSIONED AREA

5.5.1 Group 5 General Description and History

The TA-9 Decommissioned Area (also referred to as Old Anchor Site East) was a collection of temporary and semipermanent buildings that composed the east part of the Anchor Ranch facility. These buildings housed research and development activities on explosion systems as well as the casting, characterization, formulation, pressing, and machining of explosives. The structures in this area were built in the early 1940s and were in use until the 1950s when the new TA-9 was built. Old Anchor Site East contained an x-ray facility with one closed and one open firing chamber where implosion studies of small spherical charges occurred. The building, TA-9-1, also contained a laboratory with an x-ray facility and high-speed rotating prism cameras for studying the small spherical charges. The other buildings used to support the activities in the now decommissioned area and their descriptions are listed in Figure 5-8. There were few reported spills in this area. Most of the known chemical contaminants, including any plastics, are expected to have biodegraded after 50 years.

Very few of the original structures remain in Old Anchor Site East. The decommissioned buildings have been burned and/or removed along with their associated pipes, drain lines, sumps, basket pits, manholes, and settling tanks. Some broken cement, bricks, bits of plumbing pipe, burn pits, and manholes are all that remain.

It is significant to note that many mounds of dirt generated during the removal and cleanup of the area were used to fill in and level the terrain so that only a meadow remains at this site. Some contaminated soils adjacent to the structures were removed for disposal along with the structures (LASL 1965, 12-0025). After the cleanup, the soil was tested for explosives and barium nitrate contamination, and none was found. Background radiation was not sufficient after cleanup to warrant concern.



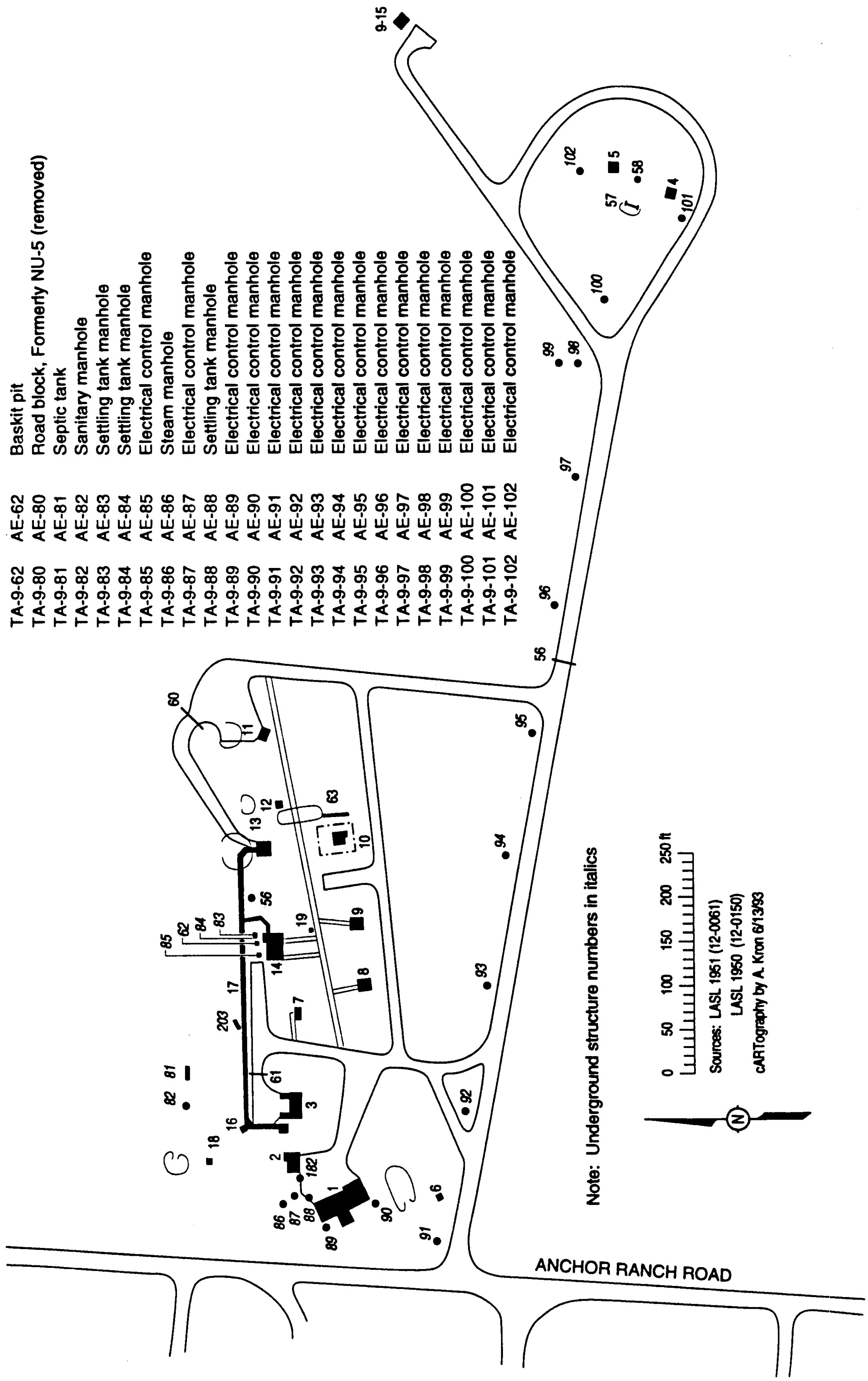
Structure Number	Structure Designation	Structure Nomenclature
TA-9-1	AE-1	Formerly Bldg. A-2, Laboratory
TA-9-2	AE-2	Formerly Bldg. A-2A, Darkroom-boiler pl.
TA-9-3	AE-3	Formerly Bldg. A-3, Mix & Hydr. press
TA-9-4	AE-4	Formerly Bldg. A-6, Firing chamber
TA-9-5	AE-5	Formerly Bldg. A-7, Firing chamber
TA-9-6	AE-6	Formerly Bldg. A-12, Magazine
TA-9-7	AE-7	Formerly Bldg. A-13, Storage
TA-9-8	AE-8	Formerly Bldg. A-14, Storage
TA-9-9	AE-9	Formerly Bldg. A-15, Trimming Bldg.
TA-9-10	AE-10	Formerly Bldg. A-16, Trimming Bldg.
TA-9-11	AE-11	Formerly Bldg. A-17, Magazine
TA-9-12	AE-12	Formerly Bldg. A-18, Pers. shelter
TA-9-13	AE-13	Formerly Bldg. A-19, Machine shop
TA-9-14	AE-14	Formerly Bldg. A-20, Laboratory
TA-9-15	AE-15	Formerly Bldg. A-23, Recovery pit
TA-9-16	AE-16	Formerly Bldg. A-25, Pump house
TA-9-17	AE-17	A-24, Covered walk
TA-9-18	AE-18	Formerly Bldg. A-21, Magazine
TA-9-19	AE-19	Formerly Bldg. A-22, Oven
TA-9-20	THRU TA-9-55	Reserved
TA-9-56	AE-56	Road block
TA-9-57	AE-57	Barricade
TA-9-58	AE-58	X-unit chamber
TA-9-62	AE-62	Basket pit

Figure 5-8. Old Anchor Site East (buildings removed).

The TA-9 Decommissioned Area contains 13 PRSs being considered for Phase 1 investigation. Eight of these are settling tanks for industrial process waste streams [PRSs 9-003(a)–(i), excluding 9-003(f)], three are septic tanks primarily associated with sanitary wastes [PRSs 9-005(a) and (d); 9-006]; one is an inactive oxidation pond for sanitary wastes [PRSs 9-008(b)]; and one is a reported waste pit of which very little is known (PRS 9-012). Three PRSs in this group are being recommended for NFA. One [PRS 9-003(c)] is an electrical manhole that was misidentified in the SWMU Report; the second [PRS 9-008(a)] is an unconfirmed lagoon; and the third is an underground petroleum product storage tank (PRS 9-016). Several of the subsurface structures at Old Anchor Site East, such as septic tanks, settling tanks, and manholes, are shown in Figure 5-9 (LANL 1944 to present, 12-0003) Figure 5-10 shows the locations of all of the PRSs in this area.

Many of the PRSs in Old Anchor Site East were settling tanks, sumps, and basket pits [PRSs 9-003(a) through 9-003(i), excluding 9-003(c) and 9-003(f)]. Because some of the sumps and settling tanks were in the SWMU Report (LANL 1990, 0145) and on engineering drawings as manholes, a general description is provided here to facilitate the explanations that are provided with each PRS.

Manholes are circular with a covered opening and are designed to allow access to utility lines, sewers, or the industrial waste system. Sumps are reservoirs representing a low point for collection of a liquid. Sumps were originally designed so that suspended and other solid materials could not be carried by the waste water beyond them. If this could not be accomplished, then settling tanks or basket pits were provided. Settling tanks are subsurface structures located adjacent to the buildings they served. The tanks were the last component of the solids collection system in the waste water discharge lines. The tanks were concrete basins lined with a corrosion-resistant material, designed to trap the remaining suspended solids in the waste water. A cross section of a typical settling tank is shown in Figure 5-11. Basket pits were concrete basins lined with a corrosion-resistant material, designed to collect large particle-size materials within a removable screened container.



Structure Number	Structure Designation	Structure Nomenclature
TA-9-62	AE-62	Baskit pit
TA-9-80	AE-80	Road block, Formerly NU-5 (removed)
TA-9-81	AE-81	Septic tank
TA-9-82	AE-82	Sanitary manhole
TA-9-83	AE-83	Settling tank manhole
TA-9-84	AE-84	Settling tank manhole
TA-9-85	AE-85	Electrical control manhole
TA-9-86	AE-86	Steam manhole
TA-9-87	AE-87	Electrical control manhole
TA-9-88	AE-88	Settling tank manhole
TA-9-89	AE-89	Electrical control manhole
TA-9-90	AE-90	Electrical control manhole
TA-9-91	AE-91	Electrical control manhole
TA-9-92	AE-92	Electrical control manhole
TA-9-93	AE-93	Electrical control manhole
TA-9-94	AE-94	Electrical control manhole
TA-9-95	AE-95	Electrical control manhole
TA-9-96	AE-96	Electrical control manhole
TA-9-97	AE-97	Electrical control manhole
TA-9-98	AE-98	Electrical control manhole
TA-9-99	AE-99	Electrical control manhole
TA-9-100	AE-100	Electrical control manhole
TA-9-101	AE-101	Electrical control manhole
TA-9-102	AE-102	Electrical control manhole

Figure 5-9. Substructure locations at old Anchor Site East.

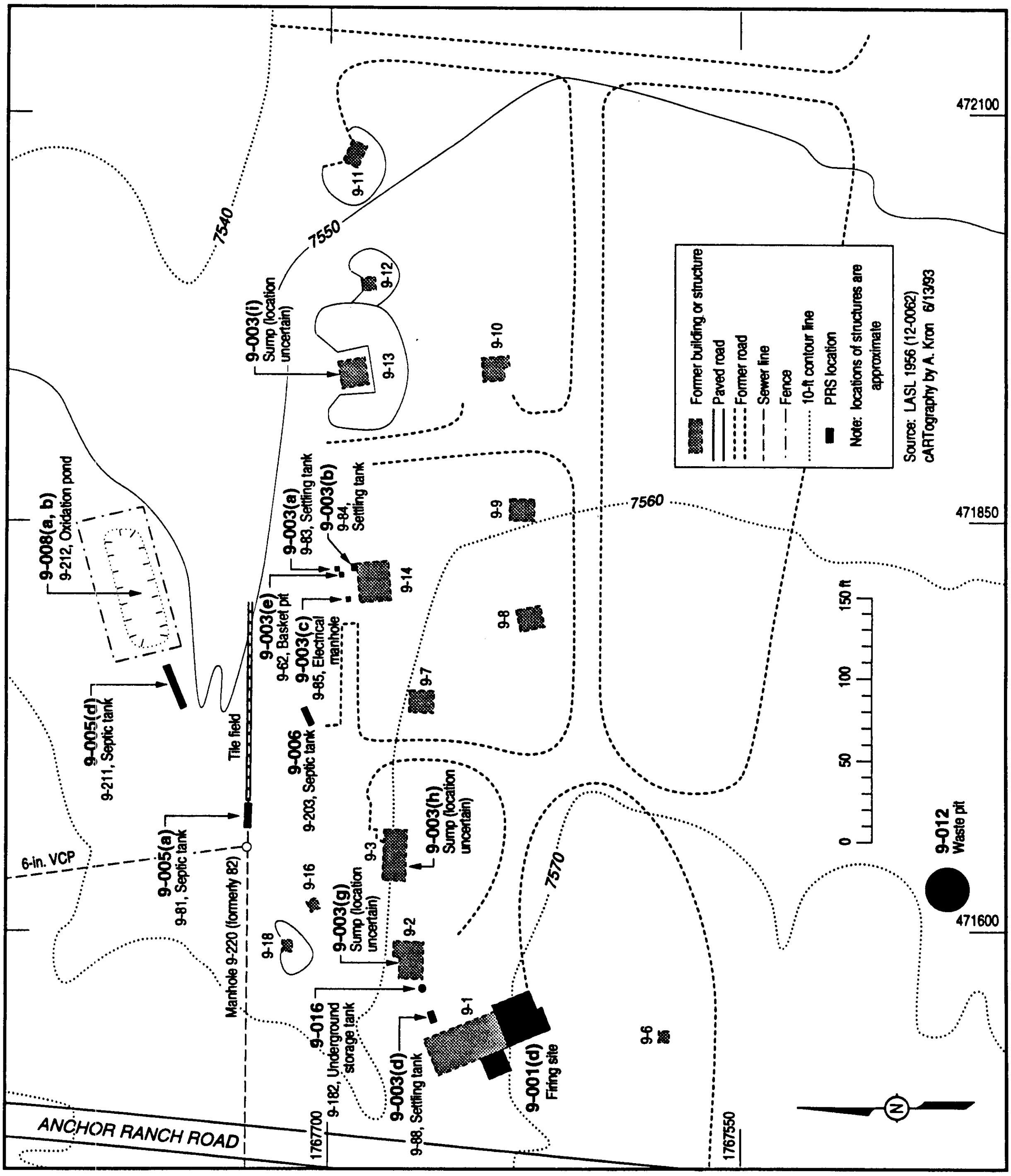
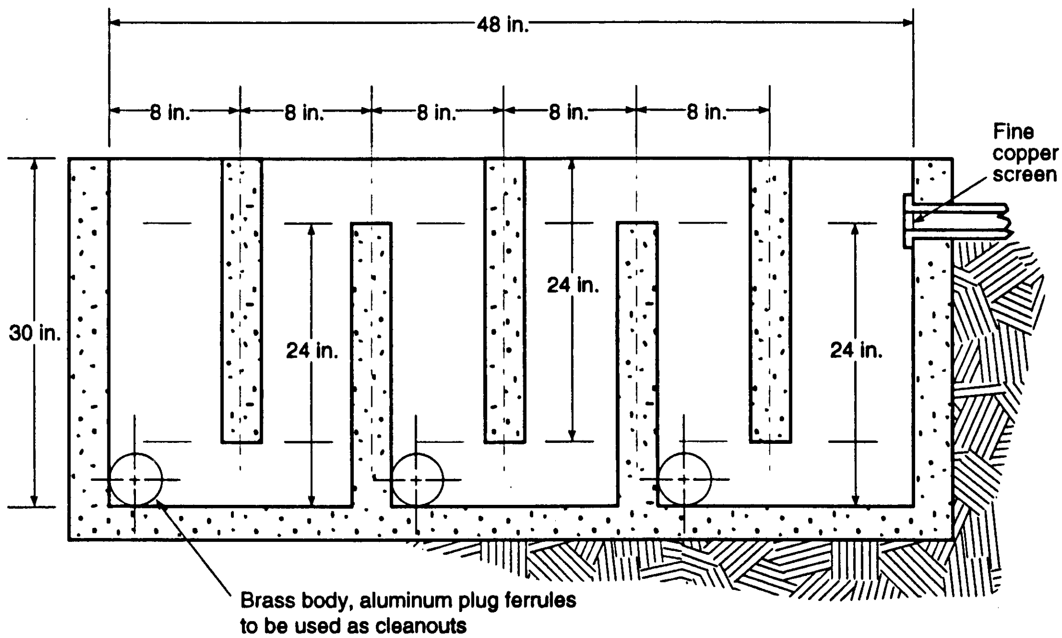


Figure 5-10. Location of PRSs in Group 5, decommissioned TA-9.



Source: LASL 1944 (12-0063)
cARTography by A. Kron 6/13/93

Figure 5-11. TA-9 Anchor Ranch East settling tank detail.

Most of the structures in Old Anchor East were removed during D&D of the area in 1965. During D&D, the area was regraded, and since then several underground utilities have been installed across the area. The whole area where the structures once stood will be sampled as part of the Phase I investigation.

5.5.1.1 Potential Release Site 9-001(d)—Firing Chamber

Building TA-9-1, formerly A-2, was an x-ray facility (flash photography laboratory) built in 1943 of reinforced-concrete and wood-frame construction (60-ft wide by 25-ft long by 16-ft high plus an addition 25-ft wide by 15-ft long by 16-ft high) (LANL 1944 to present, 12-0003) It was used to study implosions of small spherical charges. Associated with the facility were two firing areas, one open and the other enclosed. The open firing chamber was constructed of steel-faced concrete. The size of the shots in this chamber was probably 1-1/2 to 2 lb. The chamber is believed to have had a 3 lb limit for explosives in test shots. The chamber tested positive (about 15,000 cpm alpha and 7 mr per hr beta) for radioactive contamination (^{238}U) in the walls, ceiling, and floors (LASL 1965, 12-0025; Harris 1993, 12-0024). The closed chamber was constructed of wood and was probably used to test smaller shots. Both chambers were roofed. The control room portion of Building TA-9-1 was faced with sheet copper.

Building TA-9-1 was flashed, the open firing chamber was loaded onto a truck and taken to Mesita del Buey and buried.

5.5.1.2 Potential Release Site 9-003(a)—Decommissioned Settling Tank served Building TA-9-14

Potential Release Site 9-003(a) is a settling tank listed on engineering drawings as an acid drain manhole, TA-9-83 (LANL 1944 to present, 12-0003) It served Building TA-9-14, a heavily used HE process and development laboratory, that was destroyed by burning in 1965. The tank was abandoned in place per memorandum from W.F. Jenike (LASL 1959, 12-0017) and removed in 1965 (LASL 1965, 12-0025). Settling Tank TA-9-83 was taken to Mesita del Buey, TA-54, for burial in July 1965. Industrial waste contaminants were probably depleted uranium, beryllium, barium, and HE (Harris 1993, 12-0024).

5.5.1.3 Potential Release Site 9-003(b)—Decommissioned Settling Tank served Building TA-9-14

Potential Release Site 9-003(b) is a settling tank (TA-9-84) that served Building TA-9-14, a heavily used HE process and development laboratory, that was destroyed by burning in 1965. The tank was abandoned in place according to a memorandum from W.F. Jenike (LASL 1959, 12-0017) and removed in 1965 (LASL 1965, 12-0025). Industrial waste contaminants were probably depleted uranium, beryllium, barium, and HE (Harris 1993, 12-0024)

5.5.1.4 Potential Release Site 9-003(c)—Electrical Control Manhole served Building TA-9-14

This PRS is being recommended for no further action. See Section 7.2.5.1 for details specific to this PRS.

5.5.1.5 Potential Release Site 9-003(d)—Decommissioned Settling Tank served Building TA-9-1

Potential Release Site 9-003(d) is a settling tank (TA-9-88) that served Building TA-9-1. The SWMU Report (LANL 1990, 0145) incorrectly states that this tank served Building TA-9-14, but engineering drawings (LASL 1956, 12-0062) show that TA-9-88 was associated with Building TA-9-1. Building TA-9-1 was a firing chamber used for small shots of HE. The settling tank was removed and taken to Mesita del Buey, TA-54, for burial. The adjacent soil was sampled after removal, and no contamination was found (LANL 1944 to present, 12-0003; Baytos 1965, 12-0028).

5.5.1.6 Potential Release Site 9-003(e)—Basket Pit served Building TA-9-14

Reports from employees during the mid 1940s indicate that all washing operations involving a basket pit were done at S Site, Building 400 (Harry 1992, 12-0029). However, the Engineering Facility List (LANL 1944 to present, 12-0003) shows this structure (TA-9-62) did exist, and it was located south of the covered walkway and very near TA-9-83 and TA-9-84. This PRS, 9-003(e), served Building TA-9-14, a heavily used HE process and development laboratory. The pit was abandoned in place, as stated in a memo from A.B. Holder (Hill 1965, 12-0034), and demolished and removed in July 1965. It was taken to Mesita del Buey, TA-54, and buried.

5.5.1.7 Potential Release Site 9-003(g)—Decommissioned Sumps and Pipes served Building TA-9-2

Building TA-9-2 (formerly Building AE-2A) was a dark room and boiler plant built in September 1943 and was used until 1947. It was a wood-frame structure 18-ft long by 24-ft wide by 9-ft high. The building was declared clean of HE, toxic chemicals, and radioactivity, and was decommissioned in 1959 (Hodler 1959, 12-0031). However, Edwin Wingfield in his memo on Demolition of Buildings by Fire, dated 29 January 1960, listed this building as HE contaminated (Wingfield 1960, 12-0032). The building was destroyed by fire in January 1960, and the associated sumps and pipes were removed in 1965.

5.5.1.8 Potential Release Site 9-003(h)—Decommissioned Sump and Pipes served Building TA-9-3

Building TA-9-3 and the associated sump and pipes were completed in September 1943. The facility consisted of two sections, 17-ft wide by 29-ft 6-in. long by 8-ft high; and 12-ft wide by 12-ft long by 9-ft high, with three reinforced-concrete walls and one wood-frame wall, plus a wood-frame addition, 9-ft 5-in. wide by 9-ft 5-in. long by 8-ft 6-in. high (LANL 1944 to present, 12-0003) It was surrounded on three sides and the top by an earth berm and joined by wood-frame corridors. The building was used as an HE-casting facility that contained a hydraulic press. It was also used as a magazine; to store solvents; to process, press and machine explosives; and as a chemical power plant. Hazardous materials used included solvents, cyanogen, acid baths, plasterizer, depleted uranium, and organics. It was used between 1943 and 1957 (LANL 1990, 0145). For a period of time, it was used to store radioactive-contaminated equipment. The building was abandoned in place on 18 December 1959, destroyed, and removed in January 1965. The concrete floors, sump, drains, and walls of TA-9-3 A, B, and C were included in the removal. All were contaminated (LASL 1965, 12-0025).

5.5.1.9 Potential Release Site 9-003(l)—Decommissioned Sump and Pipes served Building TA-9-13

Building TA-9-13 (formally A-19) has been referred to as the machine shop on the original engineering drawings, as the Press Building by W. C Courtright in his February 1961 memorandum (Courtright 1961, 12-0033), and the Charge Preparation Building by R. C. Hill in his memorandum to renumber buildings for clarity (Hill 1965, 12-0034). It was built in July 1945 and was constructed of wood, 17-ft wide by 20-ft long by 9-ft high. It was used from 1945 to 1956 in HE research and development and was considered HE-contaminated. The sump and drains were also contaminated. The building was scheduled for destruction by flashing (quick burn at high temperature to eliminate the HE) in 1960, but it did not flash. Instead it was burned in 1965, and its associated sump and drains removed, cleaned, and disposed of at Mesita del Buey, TA-54 (LASL 1965, 12-0025).

5.5.1.10 Potential Release Site 9-005(a)—Decommissioned Sanitary Septic Tank served Buildings TA-8-20, -21, -22, -23, and -24

Structure TA-9-81 is a decommissioned septic tank that was built in 1950 (LANL 1944 to present, 12-0003) It served Buildings TA-8-20, -21, -22, -23, and -24 until a new system was installed in 1970 (LASL 1958, 12-0035; LASL 1962, 12-0036). The waste from TA-8 was then routed into Septic Tank TA-9-211 and oxidation pond TA-9-212 in 1970. Septic Tank TA-9-81 was abandoned in place in 1970, filled with dirt, and later removed during a sewage system upgrade in 1985 (LASL 1969, 12-0067; LANL 1985, 12-0038). Although this was a sanitary system, due to the ^{90}Sr spill in Building TA-8-24, the location of the septic tank may be contaminated.

5.5.1.11 Potential Release Site 9-005(d)—Abandoned Sanitary Septic Tank

Structure TA-9-211 is 4,000 gal. septic tank built in 1970, as part of the sanitary system upgrade (LASL 1969, 12-0067). It is located adjacent to an inactive oxidation pond, and both structures are northeast of manhole AE-82. The septic tank is a concrete structure with dimensions 4-ft wide by 30-ft long by 6-ft deep. It is divided into four compartments each with a 3-ft 6-in. diameter by a 4-ft length with a steel plate cover (LASL 1969, 12-0067; LASL 1969, 12-0071). This structure was abandoned in place in 1988 (EPA 1990, 0432). It served the same sewer line from Building TA-8-24 that received the ^{90}Sr spill and, therefore, may also be contaminated.

5.5.1.12 Potential Release Site 9-006—Decommissioned Sanitary Septic Tank

Structure TA-9-203 was a sanitary septic tank that served Building TA-9-2, the boiler plant and dark room facility. It was built in July 1943 and made of reinforced concrete (4-ft wide by 9-ft long by 4-ft deep) with a wood cover (LANL 1944 to present, 12-0003). It was used between 1943 and early 1950. In September 1959 an inspection of vacated LASL structures revealed that TA-9-203 was contaminated with HE and radionuclides. It was removed in 1965 and taken to Mesita del Buey, TA-54, for burial (EPA 1990, 0432).

5.5.1.13 Potential Release Site 9-008(a)—Lagoon

This PRS is being recommended for no further action. See Section 7.2.5.2 for details specific to this PRS.

5.5.1.14 Potential Release Site 9-008(b)—Oxidation Pond

This oxidation pond received sanitary waste from septic tank TA-9-211 [PRS 9-005(d)]. The pond was abandoned in place on 5 December 1988. It measures 65-ft long by 15-ft wide by 6-ft deep and is located 15 ft east of the septic tank and about 250 ft east of Anchor Ranch Road (LASL 1969, 12-0071). The oxidation pond was used to treat sanitary waste from Old Anchor Site East and West. Due to the ^{90}Sr spill in Building TA-8-24 and the fact that the drain from that building connected to this oxidation pond, it will be investigated as part of the Phase I sampling.

5.5.1.15 Potential Release Site 9-012—Waste Pit

Very little is known about the location and/or wastes in this pit. A logical assumption is that this waste pit is located within the vicinity of TA-9. One possible location is an area where 15 circular, nonvegetated sites have been found. The circles are each about 6 ft in diameter and 5 ft apart. They begin about 100 yds north of Building TA-9-29 and continue north, in a straight line, ending in the TA-9 decommissioned area. Because these circles may be related to the waste pit or to other waste disposal practices or explosives testing activities in Old Anchor East, they will be investigated under PRS 9-012.

5.5.1.16 Potential Release Site 9-016—Decommissioned Underground Storage Tank

This PRS is being recommended for no further action. See Section 7.2.5.3 for details specific to this PRS.

5.5.2 Remediation Decisions and Investigation Objectives

5.5.2.1 PRSs Recommended for NFA

The following PRSs in this group will be recommended for NFA:

PRS 9-003(c)
PRS 9-008(a)
PRS 9-016

The justification for this designation can be found in Chapter 7.

5.5.2.3 PRSs to be Investigated under Phase I Investigation

The remaining PRSs in this group will be the focus of a Phase I investigation to sample surface and subsurface soils throughout the Old Anchor East decommissioned area. The rationale for both surface and subsurface sampling is that the PRSs were largely below-ground structures that were excavated and removed. The mixing of soil on replacement of fill and the possibility that contaminated soil might not have been fully removed resulted in the decision to sample surface and subsurface soil. If contamination above background and threshold levels is detected during Phase I, it will be followed by a Phase II investigation of the nature and extent of this contamination. Any remediation indicated as a result of Phase II is likely to consist of stabilization in place and/or soil removal.

The specific decisions to be addressed during Phase I are as follows:

> If concentrations of any constituents of concern exceed background and threshold levels in surface soils in the Old Anchor East decommissioned area, then proceed to Phase II to define the nature and extent of contamination throughout the area.
>
> If concentrations exceed background and threshold levels in subsurface soils associated with specific former structures at this site, then proceed to Phase II to define the nature and extent of contamination for those PRSs.
>
> If no concentrations above both background and threshold levels are found, then recommend these PRSs for NFA.

5.5.3 Data Needs and Data Quality Objectives

Source characterization data will be required to make the Phase I decision. Data quality objectives specifications for Group 5 PRSs are as follows:

- **Inputs:** Concentrations of constituents of concern (see Table 6-21) in surface or subsurface soils.
- **Boundaries:** Sampling boundaries have been defined for the following specific categories:
    - Settling tanks [PRSs 9-003(a), (b), (d), and (e)]—Sampling will take place within a 7- or 9-ft diameter boundary around the estimated settling tank center (see Figures 6-9 and 6-

10). Vertical boundaries will extend to 3 ft below the estimated bottom of the former structures (see Table 6-22).

- Septic tanks ([PRSs 9-005(a) and (d), PRS 9-006, and PRS 9-008(b)]—For PRSs 9-005(a) and 9-006, boundaries will consist of the first 5 ft of soil beneath the bottom of the former structures as well as subsurface soil in the tile field associated with PRS 9-005(a). For PRS 9-005(d), boundaries will consist of the tank structure and contents as well as the first 5 ft of underlying soil. For PRS 9-008(b), boundaries will consist of pond sediments (see Figure 6-11).

- Waste pit (PRS 9-012—The approximate location of thus former structure will be determined by means of a geophysical survey (see Figure 6-13). Vertical boundaries will consist of the upper 5 ft of soil in this area.

- Bulk soils (remaining PRSs in this group)—Boundaries consist of approximately 100,000 sq ft of disturbed soils in the TA-9 Decommissioned Area (see Figure 6-12). Vertical boundaries will extend to 1 ft.

- **Decision Logic:** For each of the boundary areas described above, if the maximum concentration from any sample exceeds both background and threshold levels for any constituent of concern, then proceed with a Phase II investigation for those PRSs. Otherwise, recommend NFA for the PRSs associated with that boundary area.

- **Design Criteria:** Sampling of former structures will be designed so that there is at least a 95 percent probability of sampling within their true location. Sampling of bulk soils will be designed so that if 25 percent of the area is contaminated, there is at most a 5 percent probability of failing to detect the contamination.

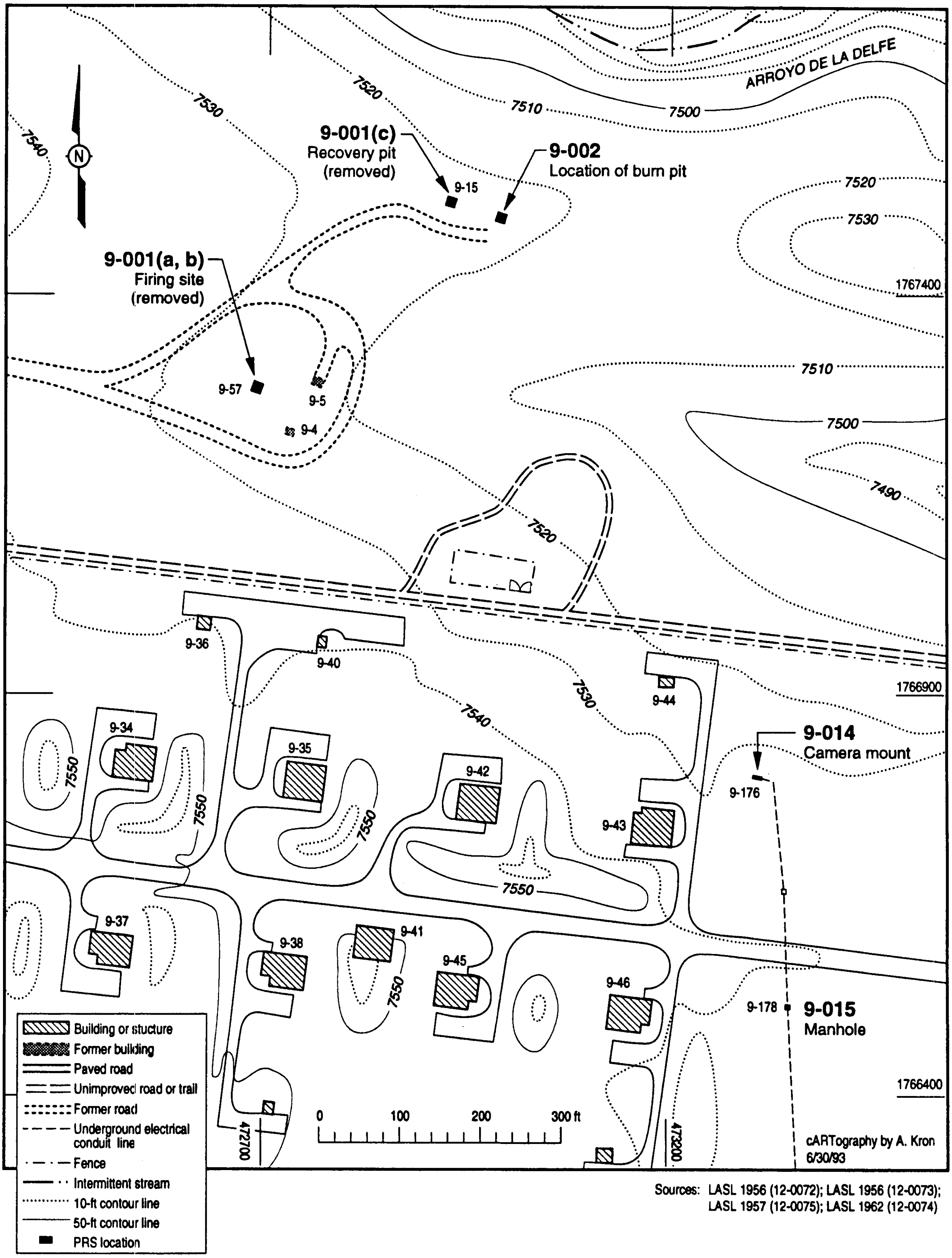
5.6 GROUP 6: TECHNICAL AREAS 9 and 23—FAR POINT FIRING SITE AND TA-23 FIRING SITE

5.6.1 Group 6 General Description and History

Four test-firing sites, one burn pit, and one manhole identified as PRSs were a part of the TA-23 Nu Site and the TA-9 Far Point Firing Site. Located within the present TA-9 was TA-23, also called Nu Site, a firing site constructed in 1945. This firing site was located between present Buildings TA-9-43 and TA-9-48 and used by X-Division (X-8). The performance of explosive charges was tested at Far Point and Nu Site. Two control chambers/personnel shelters [PRSs 9-001(a) and (b)] associated with one firing site at Far Point were located several hundred yards to the east of Anchor Ranch Road and slightly north of the present Building TA-9-40 in an open meadow. Another firing site [PRS 9-001(c)] consisted of an underground steel-lined pit with a heavy roof. The pit (referred to as a recovery pit) was originally used for recovery of metals from shots but was abandoned in the spring of 1945 in favor of a similar but larger chamber at TA-12 (L-Site outside of OU 1157). This structure was northeast of Far Point as was a burn pit (PRS 9-002) used to destroy classified documents. Two other PRSs are located in the TA-23 firing site, a manhole (PRS 9-015), and one other firing location (PRS 9-014). See Figure 5-12 for the locations of the PRSs in this group.

5.6.1.1 Potential Release Site 9-001(a)—Far Point Firing Chamber

Far Point firing site is located north of Building TA-9-40. One of the Far Point firing control chambers, Building TA-9-4 (formerly Building A-6), is PRS 9-001(a). It was completed in January 1944. It had heavy reinforced-concrete walls and measures 8-ft wide by 10-ft long by 8-ft high, with metal doors and an earth berm on three sides (LANL 1944 to present, 12-0003) The building was used as a personnel shelter between 1944 to 1956 to control tests of large explosive charges such as the Mark IV, which contained about 125 lb of HE (James 1959, 12-0039; Jones 1993, 12-0078) The explosive shots were conducted in an open meadow between control chambers TA-9-4 and TA-9-5. The SWMU Report (LANL 1990, 0145) states that Building TA-9-4 is a SWMU. The building would not have been contaminated because no potential contaminants would



Sources: LASL 1956 (12-0072); LASL 1956 (12-0073); LASL 1957 (12-0075); LASL 1962 (12-0074)

Figure 5-12. Locations of PRSs in Group 6, firing sites in TA-9 and former TA-23.

have been present; however, the area between Buildings TA-9-4 and TA-9-5 will be investigated as part of Phase I.

Several materials were used for shots fired at Far Point. Among them were steel, torpex, tamped tetryl, composition B, pentolite, aluminum, depleted uranium, beryllium, and tungsten carbide. The active components of the aforementioned high explosives are as follows: hexahydro-1,3,5-trinitro-1,3,5-triazine and trinitrotoluene in torpex; N-methyl-N,2,4,6-tetranitrobenzamine in tetryl; trinitrotoluene and hexahydro-1,3,5-trinitro-1,3,5-triazine in composition B; and trinitrotoluene and pentaerythritol tetranitrate in pentolite. Major contaminants expected to be present in the soil are depleted uranium, HE, and beryllium (CEARP Phase 1 Report). Building TA-9-4 also housed rotary prism cameras for fast photography of implosion tests carried out in the open meadow (DOE 1987, 0264).

In 1957, Building TA-9-4 was among several considered "excess real property" by the Laboratory. The building was abandoned in place on 18 December 1959 and removed in 1965 (Hodler 1959, 12-0031). Although no contamination is associated with this building, contaminants may have been spread over the area from the firing site, TA-9-57.

5.6.1.2 Potential Release Site 9-001(b)—Far Point Firing Chamber

Building TA-9-5 (formerly Building A-7) is PRS 9-001(b). It was completed in November 1947 and was used between 1947 and 1957 as a personnel shelter to control tests of HE charges conducted in an open meadow between Buildings TA-9-4 and TA-9-5. Building TA-9-5 was constructed of reinforced concrete and measured 10-ft wide by 12-ft long by 8-ft high, with metal doors and an earth berm on three sides. A plastic bonded explosive (PBX), which contained barium and RDX, polystyrene, and dioctyl phthalate was developed in 1952 and tested in this area.

The SWMU Report (LANL 1990, 0145) identifies Building TA-9-5 as a SWMU. The building would not have been contaminated; however, the area between Buildings TA-9-4 and TA-9-5 will be investigated as part of Phase I.

In 1957, Building TA-9-5 was among several considered "excess real property" by the Laboratory. The building was abandoned in place on 18 December 1959 and removed in 1965 (Hodler 1959, 12-0031). Although no contamination is associated with this building, contaminants may have been spread over the area from the firing site, TA-9-57.

5.6.1.3 Potential Release Site 9-001(c)—Recovery Pit

Structure TA-9-15 (formerly A-23) was a firing pit completed in March 1943 and modified in January 1951. The "pit" was 12-ft wide by 12-ft long by 8-ft deep with timbered sides. It was lined with 3/4-in. steel plate and had a metal cover (LASL 1949, 12-0041). Designated a recovery pit, it was used during 1943 for only a short period of time because it did not accomplish what was expected. It was originally designed to recover metal (probably uranium) from misfired shots; however, the idea was abandoned for a better design (LANL 1944 to present, 12-0003). In 1959, the recovery pit was certified clean of radiation and toxic materials (Hyatt 1959, 12-0042); however, the soil was contaminated with byproducts from HE detonation. This structure was listed as property returned to the Atomic Energy Commission (AEC) (Hodler 1959, 12-0031).

5.6.1.4 Potential Release Site 9-002—Decommissioned Burn Pit

This burn pit is 10-ft wide by 10-ft long by 3-ft deep and was used to burn classified documents, possibly including numerous photographs, film, and other materials unfit for use. Fragments of mirrors used in high-speed photography of experimental blasts litter the ground near the site. The burn pit can be seen and is distinguished as a pit with rocks lining the sides. The rocks are blackened as a result of the burning. There is no documented evidence of contamination associated with this facility. However, based on concerns with the potentially high concentrations of metals in the accumulated ash, the burn pit will be investigated as part of Phase I.

5.6.1.5 Potential Release Site 9-014—Camera Mount

Structure TA-9-176 is a camera mount associated with the TA-23 (Nu Site) firing site. This firing area is north of the present road running through TA-9 and is between Buildings TA-9-43 and TA-9-48. It was associated with two irregularly shaped firing pits in a concrete apron, 3-ft 6-in. wide by 12-ft long by 12-in. thick. The site was used in the testing of lens charges of up to 135 lb of HE. The camera mount was removed 19 August 1952 (LANL 1944 to present, 12-0003)

The actual PRS is listed as a camera mount 15-ft wide by 15-ft long by 8-ft high with an earth barricade on three sides and a roof. The soil in the area where the shots were fired is likely to be contaminated with HE, depleted uranium, lead, mercury, and beryllium.

5.6.1.6 Potential Release Site 9-015—Electrical Manhole

This PRS is being recommended for no further action. See Section 7.2.6.1 for details specific to this PRS.

5.6.2 Remediation Decisions and Investigation Objectives

Potential Release Site 9-015 is a candidate for no further action. The remaining PRSs in this group will be the focus of a Phase I investigation to determine the presence or absence of contaminants. Surface soil was selected as the medium for Phase I sampling at PRSs 9-001(a) and (b) and 9-014 (the firing sites) because of the greater likelihood that any contamination from test firings at these sites would have been deposited on the surface. The remaining PRSs were constructed into the subsurface soil. Any residual contamination in the subsurface PRSs would most likely be located in the bottom of the PRSs. If contamination above background and threshold levels is detected at a site during Phase I, it will be followed by a Phase II investigation of the nature and extent of contamination at that site. Otherwise, the PRSs in this group will be recommended for no further action.

5.6.3 Data Needs and Data Quality Objectives

Source characterization data will be required to make the Phase I decision. Data quality specifications are as follows:

- **Inputs:** Concentrations of constituents of concern (see Table 6-27) in surface and subsurface soil.

- **Boundaries:** Sampling boundaries have been defined as follows:

  - PRS 9-001(a) and (b)—Surface soil (0-6 in.) within a 25-yd radius of the former location of these firing sites (see Figure 6-14).

  - PRS 9-001(c)—A 10-ft diameter boundary around the estimated center of the former pit. Vertical boundaries extend from 9 to 14 ft (see Figure 6-15).

  - PRS 9-002—The area within the boundaries of the pit. Vertical boundaries extend from 0 to 5 ft (see Figure 6-14).

  - PRS 9-014—Surface soil (top 12 in.) within a 25-yd radius of the former firing site location (see Figure 6-15).

- **Decision Logic:** If the maximum concentration from any soil sample at a PRS exceeds both background and threshold levels for any constituent of concern, then proceed to Phase II to determine the nature and extent of contamination for that PRS. Otherwise, recommend these PRSs for NFA.

- **Design Criteria:** For PRSs 9-001(a) and (b) and 9-014, sampling will be designed so that there is a 95 percent probability of detecting contamination if as much as 30 percent of the area is contaminated. For PRS 9-001(c), sampling will be designed so that there is at least a 95 percent probability of sampling within the true former location. For PRS 9-002, sampling will be biased to the bottom of the pit because the boundaries of the pit are well defined.

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5.7 GROUP 7: TECHNICAL AREA 9—MATERIAL DISPOSAL AREA M

5.7.1 Group 7 General Description and History

Material Disposal Area M has been identified as PRS 9-013 and is located southeast of Guard Station 502 and northeast of Old Anchor East near a power line running through the area. Metal and debris, generated during the removal of Old Anchor Sites East and West and the construction of the new and present TA-8 and TA-9 facilities (1948-65), have been flashed and deposited over the surface of this 3-acre area. Nonhazardous waste from the construction of other sites within the Laboratory was also dumped here from about 1960 to 1965. This MDA has a satellite area about 700 ft northwest, and both sites may contain hazardous waste. There is an earth berm built around the main disposal area for containment. In some places, the berm has been eroded through by surface water run-off.

Material Disposal Area M contains many noncombustibles and has been suspected of being contaminated with radioactive materials (LANL 1990, 0145). However, in an October 1992 general radiation survey no areas registered above background. A variety of glass containers and broken glass, some of it from camera lenses, has been identified at MDA M. Electrical wires and cables are scattered throughout the area. Equipment from laboratories and bathrooms, such as refrigerators, doors, sinks, ovens, and toilets, are also visible. A large concrete structure that appears to be a manhole and a white fibrous substance believed to be asbestos are also present. Figure 5-13 shows the locations of MDA M and its satellite area in TA-9. Both areas will be investigated as part of the Phase I characterization.

5.7.2 Remediation Decisions and Investigation Objectives

The objective of the Phase I investigation is to screen debris and surface soils at and in the vicinity of PRS 9-013 to determine the presence of any constituents of concern. The Phase I sampling effort is limited to investigation of surface soil only because the PRS is a surface disposal area. If contamination above background and threshold levels is detected during Phase I, then it will be followed by a

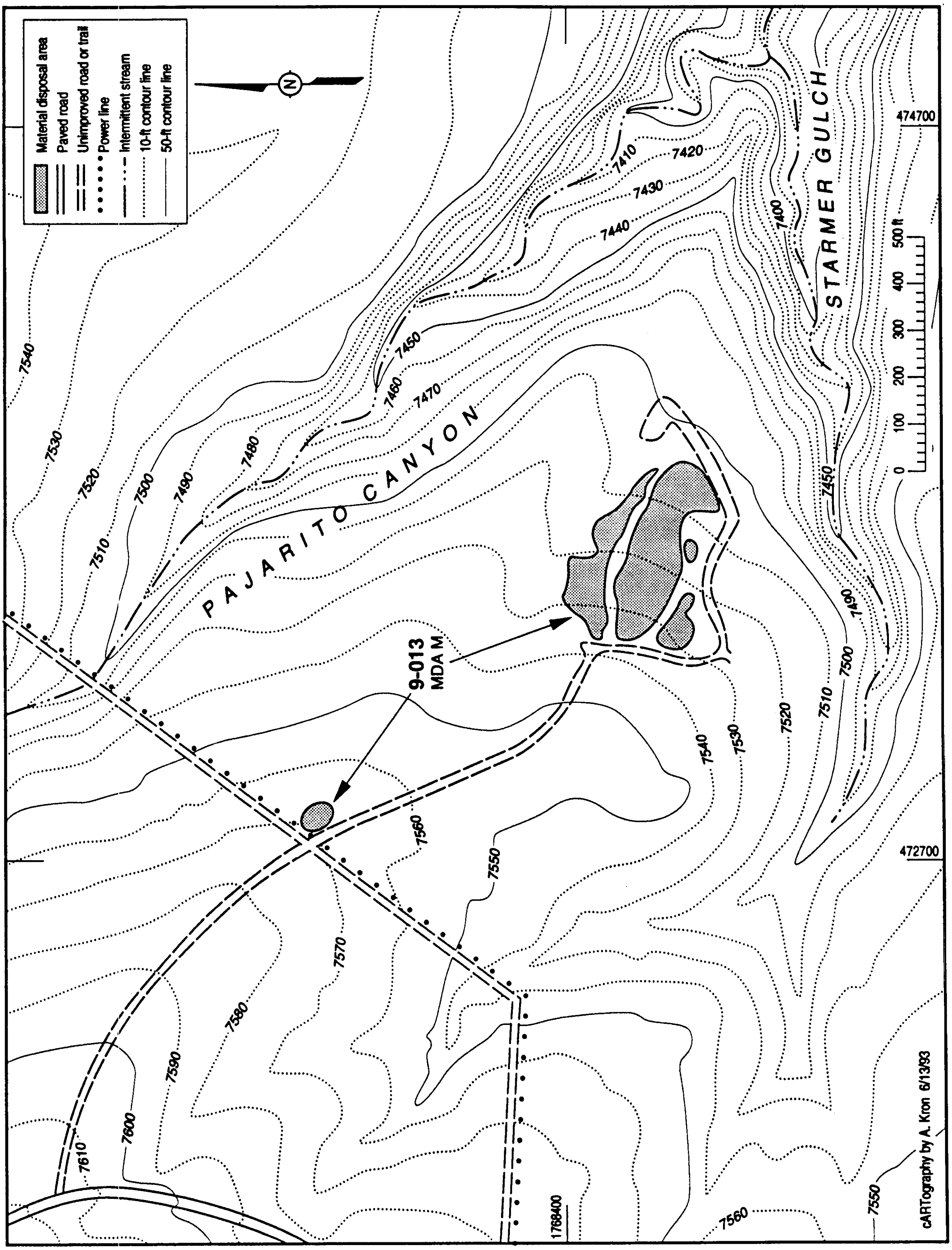

Figure 5-13. Location of PRS 9-013, MDA M (Group 7).

Phase II investigation of the nature and extent of this contamination. Otherwise efforts to stabilize the landfill can proceed without concerns about release of contaminants.

5.7.3 Data Needs and Data Quality Objectives

Source characterization data will be required to make the Phase I decision. Data quality objectives specifications for this PRS are as follows:

- **Inputs:** Concentrations of constituents of concern (see Table 6-31) in debris and surface soils associated with MDA M and in the nearby springs.

- **Boundaries:** The boundaries for the Phase I investigation include the debris contained within MDA M as well as surface soils underneath this debris and nearby springs. Specific boundary areas include the following:

    - Piles of what appear to be asbestos fibers at various locations on the surface of MDA M.

    - Selected surface soils, metals, sludges, and residual liquids at MDA M. Specific sampling points will be selected based upon a detailed waste inventory that will be conducted at the site.

    - Surface soil (0-12 in.) throughout the 65,000 sq ft area (see Figure 6-16).

    - Sediments in stream beds downstream of MDA M (see Figure 6-16).

    - Water in three adjacent springs (see Figure 6-17).

- **Decision Logic:** This PRS is a likely candidate for a VCA. Most of the sampling undertaken for this PRS will support design of an appropriate landfill cover. In addition, if any sediment or spring samples are found to exceed both background and threshold levels, Phase I will be followed by a Phase II investigation to determine the nature and extent of contamination in the surrounding area.

- **Design Criteria:** All apparent asbestos piles will be sampled judgmentally. There will be approximately 38 other judgmental samples based upon the detailed waste inventory. Random surface soil sampling will be designed so that if 10 percent of the area is contaminated there will be a 95 percent probability of detecting the contamination.

5.8 GROUP 8: TECHNICAL AREA 69

5.8.1 Group 8 General Description and History

In September 1989, TA-69 was designated as the technical area for structures that were located at the intersection of Anchor Ranch Road and Two-Mile Mesa Road and for structures in the northwest section of TA-6. Until that time, the structures were assigned structure numbers in TA-0 or TA-6 (LANL 1944 to present, 12-0003). The area includes the following structures: TA-69-1 (Guard Station 502), the oldest structure in the area (beneficial occupancy date of January 1955); TA-69-2, an M-Division office trailer; TA-69-3, the incinerator building; TA-69-4, a 22-sq-ft guard station; TA-69-5, an Engineering-5 office trailer; TA-69-6 and -7, water tanks; TA-69-8, a back-flow preventor building; TA-69-9, septic holding tank to support TA-69-1; and TA-69-10 and -11, septic tank and seepage pit to support TA-69-2 (LANL 1989, 12-0044). Only three PRSs were identified for this group. One, the inactive incinerator (69-001), will be investigated as part of Phase I. The other two are sanitary septic systems, which are being recommended for NFA. Figure 5-14 shows the locations of these PRSs within TA-69.

5.8.1.1 Potential Release Site 69-001—Two-Mile Mesa Incinerator

The Two-Mile Mesa incinerator consists of two inactive incineration units located in Building TA-69-3 (formerly TA-0-139), just outside the gate leading to the Two-Mile Mesa Site, TA-6 (LANL 1990, 0145). Engineering records state that this building is a 20- by 28- by 15-ft metal structure erected by Armco Drainage and Metal Products, Inc. in 1959 (LANL 1944 to present, 12-0003) The incinerator was used to destroy classified documents.

The Two-Mile Mesa incinerator replaced an older document incinerator located at the airport. The DOE protective force operated the TA-69-3 incinerator until the late 1970s when a shredder at TA-52 assumed the destruction function. Protective force employees were responsible for classified destruction until 1988 when Pan Am World Services assumed responsibility. Currently, classified

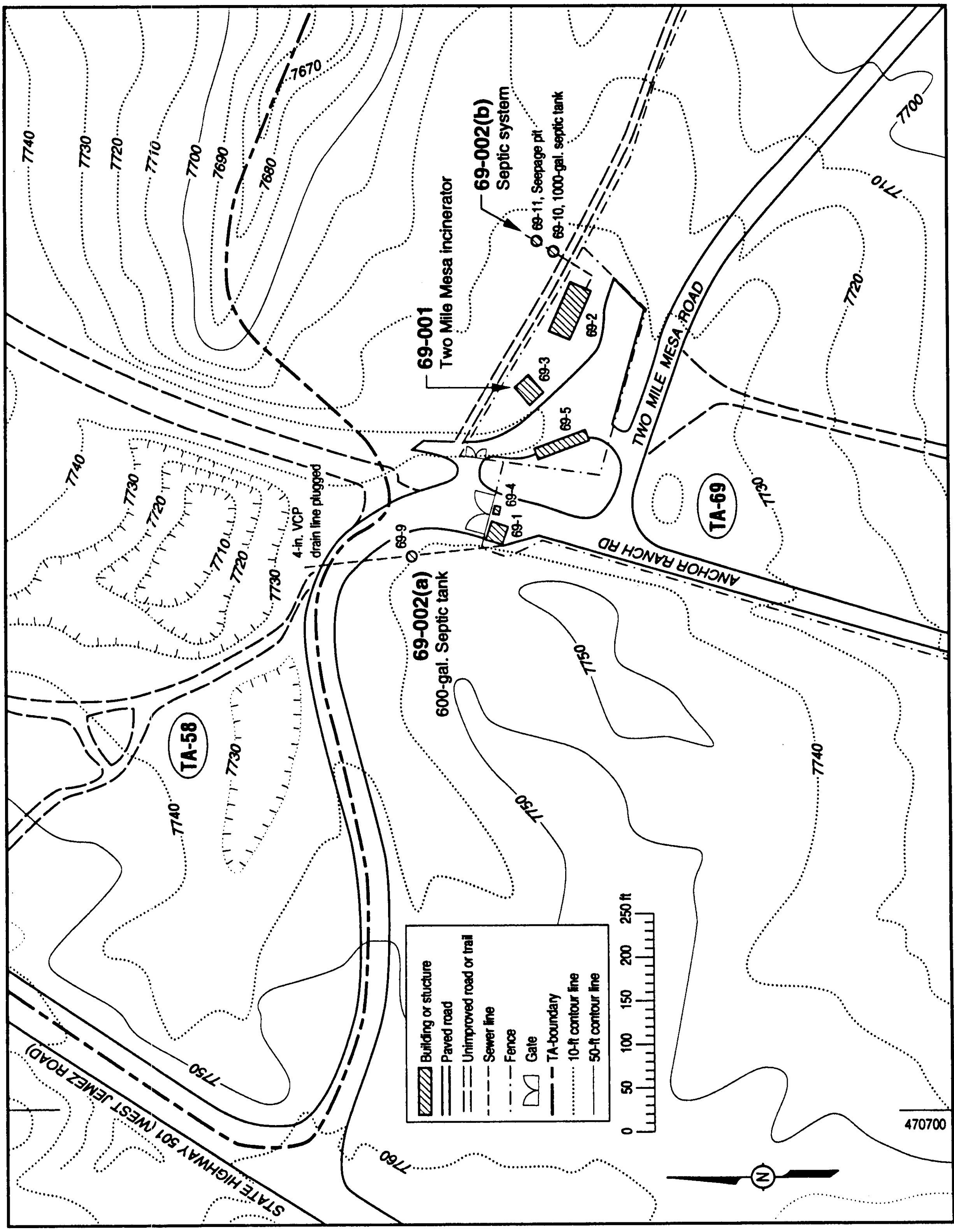

Fig. 5-14. Location of PRSs in TA-69, Group 8.

documents continue to be destroyed by shredding at TA-52 under the direction of JCI (Harry 1992, 12-0045; Harry 1992, 12-0053).

Only protective force security personnel used this building while it was in use as an incinerator, and it was never under the Laboratory's jurisdiction in the years it was in operation. Ownership passed from the Atomic Energy Commission (AEC), to the Energy Research Development Agency (ERDA), to the DOE. Only classified documents were incinerated in this building, and there is no reason to assume radioactive or hazardous waste was taken there (Harry 1992, 12-0029; Harry 1992, 12-0046). The building continues to be under the jurisdiction of DOE-LAAO.

Operations at the incinerator involved burning secret documents. Stacks of computer paper and other documents were manually fed into the incinerator units to ensure complete combustion. Two incinerator units were installed in the building. During a site visit in November 1992, the inside of the building was toured (Wilson 1993, 12-0048). Instructions were still present that specified that the ash in the primary burn chamber of the older incinerator be removed daily. It was apparent that ash was manually removed from the primary burn chamber of each incinerator unit and carried outside the building.

For security purposes, the ashes carried from the building were wet down behind the building in a small pond (Harry 1992, 12-0045; Harry 1992, 12-0053). A pipe protrudes from the northeast side of the building and is part of a drain for the secondary chamber cleanout system of the older incinerator. Cleanout water from this pipe discharged into the aforementioned pond. The newer incinerator unit did not have a secondary chamber. Pieces of glass from old classified viewgraphs, metal paper fasteners, and other small noncombustible debris have been found in the former pond area behind the building. The soil dike that once contained the pond has been breached by erosion, and no standing water now remains.

Employees of X Division and its predecessors recall that there was a great volume of classified computer paper output during the period that the incinerator was in operation. Another employee who worked in the Computer Operations group through the 1970s remembers that the daily production of secret computer listings was enough to fill a standard four-drawer safe and that the daily production of Protect as Restricted Data (PARD) was enough to fill a New Mexico State vehicle pickup truck (Jones 1992, 12-0010).

The incinerator itself will be deferred until decommissioning for characterization. The pond site behind the incinerator will be investigated in Phase I because this was the location of disposal of the ash and waste generated inside the building.

5.8.1.2 Potential Release Site 69-002(a)—Septic System serving Building TA-69-9

This PRS is being recommended for no further action. See Section 7.2.8.1 for details specific to this PRS.

5.8.1.2 Potential Release Site 69-002(b)—Septic System serving Building TA-69-10

This PRS is being recommended for no further action. See Section 7.2.8.2 for details specific to this PRS.

5.8.2 Remediation Decisions and Investigation Objectives

Potential Release Site 69-001 will be the focus of a Phase I investigation whose objective will be to sample surface soils where incinerator debris is likely to have been deposited. If contamination above background and threshold levels is detected, it will be followed by a Phase II investigation of the nature and extent of contamination. If no contaminants exceed both background and threshold levels, PRS 69-001 will be recommended for no further action. Any remediation indicated as a result of Phase II is likely to consist of stabilization in place and/or soil removal.

Potential Release Sites 69-002(a) and 69-002(b) will be recommended for no further action. See Chapter 7 for a justification of this designation.

5.8.3 Data Needs and Data Quality Objectives

Source characterization data will be required to make the Phase I decision for PRS 69-001. Data quality objectives specifications are as follows:

- **Inputs:** Concentrations of constituents of concern (see Table 6-36) in surface soils.

- **Boundaries:** Surface soil (0-6 in.) in areas near TA-69-3 where incineration debris is likely to have accumulated: specifically, soils adjacent to the building discharge pipe as well as soils at the former location of the pond into which incinerator ash was discarded. Judgmental samples will be taken at those locations most likely to contain contaminants (see Figure 6-18).

- **Decision Logic:** If the maximum concentration from any surface soil samples exceeds both background and threshold levels for any constituent of concern, then proceed to Phase II. Otherwise, recommend PRS 69-001 for no further action.

- **Design Criteria:** Because visual inspection and historical process information provide a solid basis for judgmental sampling at PRS 69-001, sampling points will be selected on this basis. At least three samples will be taken.

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5.9 GROUP 9: AREAS OF CONCERN AT TA-8 AND TA-9

5.9.1 Areas of Concern

Areas of concern are PRSs that have not been identified as SWMUs in the SWMU Report (see p. 2 of Executive Summary) (LANL 1990, 0145). There are 20 AOCs in TA-8 and 11 AOCs in TA-9. Most are less prominent sites, and after further investigation 29 AOCs were found to require no further action. The AOCs include gun test buildings, storage facilities, a carpenter shop, stained ground, and original Anchor Ranch buildings. Figures 5-15 and 5-16 show the locations of AOCs in TA-8 and TA-9, respectively.

The following AOCs are recommended for no further action. The full description for each AOC can be found in Chapter 7.

C-8-001	Field Test Bldg	C-8-017	Storage
C-8-002	Field Test Bldg	C-8-018	Storage
C-8-003	Carpenter Shop	C-8-019	Storage
C-8-004	Ranch House	C-8-020	Disposal area
C-8-005	Guest House	C-9-002	Buildings
C-8-006	Guest House	C-9-003	Pump building
C-8-007	Bunk House	C-9-004	Oven building
C-8-008	Ranch Barn	C-9-005	X-unit chamber
C-8-009	Ranch Barn	C-9-006	Magazines
C-8-011	HE Storage	C-9-007	Storage
C-8-012	Storage	C-9-008	UST
C-8-013	Storage	C-9-009	Oil stains
C-8-015	HE Magazine	C-9-010	Burning Pit
C-8-016	HE Magazine	C-9-011	Burn area

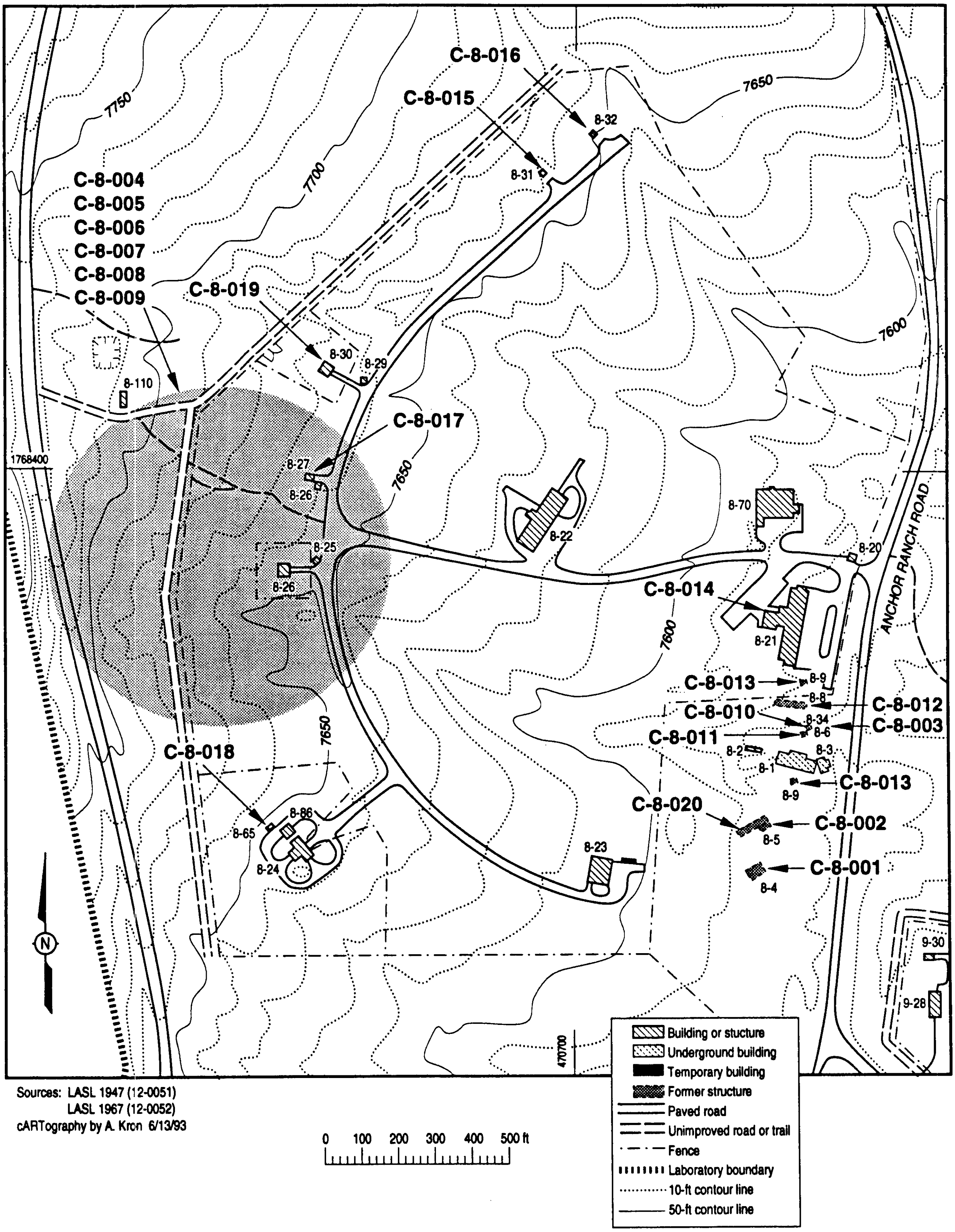

Figure 5-15. Locations of AOCs in TA-8.

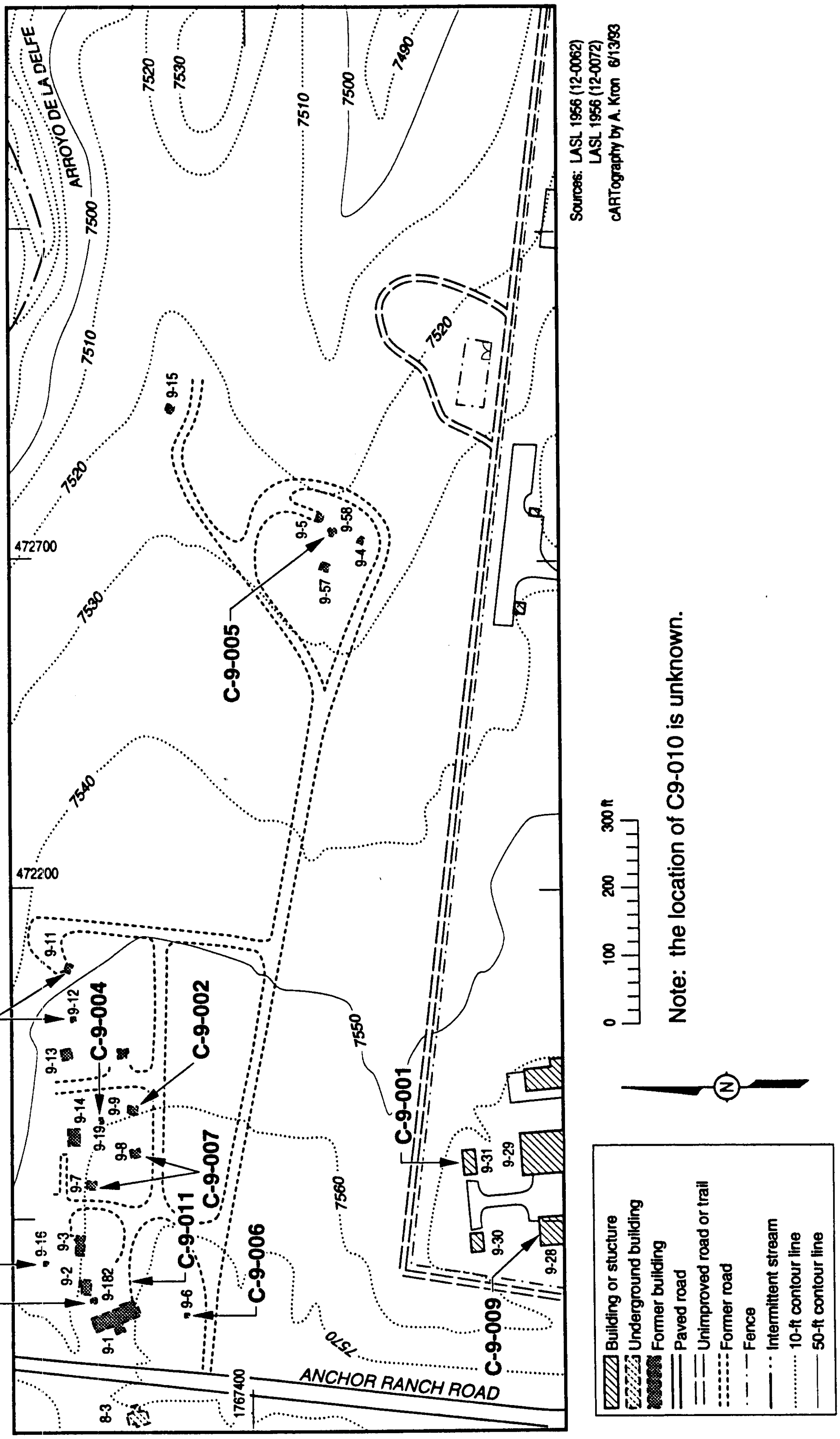

Figure 5-16. Locations of AOCs in TA-9.

5.9.1.1 C-8-010—Associated Structure, TA-8-34

The SWMU Report (LANL 1990, 0145) states that this AOC is the location of a drum storage building, which was removed in 1947. The SWMU Report refers to a Weston Report (Weston 1989, 12-0049) that indicated the possibility of a release to the environment if the drums leaked and/or contained hydrocarbons or solvents. A 31 October 1983 memo from HSE-8, states that no known hazardous materials were used in Building TA-8-34 (Blackwell 1983, 12-0118); however, if the drums leaked, semivolatile organic compounds may have remained in the soil.

5.9.1.2 C-8-014—Associated Structure, TA-8-21

This AOC is in a laboratory and administrative building that was associated with the TA-8 radiography facilities. These facilities were used for studies of HE, plutonium, uranium, and other materials, including arsenic, lithium hydride, and titanium oxide (Weston 1989, 12-0049). Decaborane, diborane, pentaborane, and other boron compounds, along with fluorine and hydrazoic acid, were used in a bench hood at TA-8-21 in Room 117, which was removed and sent to TA-54 in October 1979 (LASL 1979, 12-0108). Because this building is in active use, sampling at this AOC will be deferred until the building is decommissioned.

5.9.1.3 C-9-001—Associated Structure, TA-9-31

The SWMU Report (LANL 1990, 0145) states that this AOC was identified on the basis of stained ground associated with the outfall from a chemical storage area, and that the chemicals could have included organics.

5.9.2 Remediation Alternatives and Evaluation Criteria

Areas of Concern C-8-010 and C-9-001 will be the focus of a Phase I investigation to determine the presence or absence of constituents of concern. Because both PRSs are surface-related, only the surface soils will be sampled. If contamination above background and threshold levels is detected during Phase I, then these AOCs will move on to a Phase II investigation. Otherwise, they will be recommended for no further action.

Area of Concern C-8-014 will be deferred to D&D.

The remaining AOCs will be recommended for no further action on the basis of historical information.

5.9.3 Data Needs and Data Quality Objectives

Source characterization data will be needed to make the Phase I decision for AOCs C-8-010 and C-9-0001. Data quality specifications are as follows:

5.9.3.1 Area of Concern C-8-010

- **Inputs:** Concentrations of SVOCs and TPH in surface soil.

- **Boundaries:** The 12- to 24-in. depth interval at the location of the former drum storage building (see Figure 6-19).

- **Decision Logic:** If the maximum concentration of soil samples drawn for AOC C-8-010 exceeds background and threshold levels for VOCs, SVOCs, or TPH, then this AOC will be recommended for a Phase II investigation. Otherwise, it will be recommended for no further action.

- **Design Criteria:** Two sampling points located on a judgmental basis will be adequate to make a Phase I decision because of the tight boundary conditions at the site.

5.9.3.2 Area of Concern C-9-001

- **Inputs:** Concentrations of constituents of concern (see Table 6-40) in surface soil.

- **Boundaries:** The top 12 in. of soil adjacent to the southern side of the building.

- **Decision Logic:** If the maximum concentration of a single soil sample drawn for AOC C-9-001 exceeds both background and threshold levels for any constituent of concern, then this AOC will be recommended for a Phase II investigation. Otherwise, it will be recommended for no further action.

- **Design Criteria:** Due to the tight boundary conditions applicable to the Phase I investigation, two judgmental samples will be adequate to make the Phase I decision.

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Chapter 6

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6.0 SAMPLING AND ANALYSIS PLANS

The plans presented in this chapter were written to support field implementation of the sampling and analysis activities at OU 1157. Each subsection addresses one of the PRS sampling groups and presents the sampling actions and the rationale for those actions. Each subsection has been written as an essentially complete plan to minimize the burden on the user to refer to multiple sections of the work plan for the specific information needed to conduct field sampling. Although an effort has been made to minimize repetition, because of similarities from group to group in sampling strategies and types of sites, similar text appears in a number of subsections.

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6.1 GROUP 1: TECHNICAL AREA 8 ACTIVE SITES

6.1.1 Group 1 Background

The TA-8 active sites comprise 14 PRSs and include building drains, a resin bed, transformer storage areas, process waste water outfalls, and waste container storage areas. None of these facilities have been decommissioned, and most are currently in use. The locations of these sites are shown in Figure 5-2.

6.1.2 Group 1 Sampling Strategy and Objectives

A variety of sampling actions will be taken on the TA-8 active sites and are summarized in Table 6-1. Of the 14 PRSs in this group, five will be sampled, and the remaining nine will not be sampled. The rationale for these actions is summarized in the table and discussed in further detail in this plan.

It is not known whether environmental contamination has occurred at any of the Group 1 PRSs planned for sampling. The objective of this sampling is therefore to determine whether a release has occurred that exceeds the background and threshold levels described in Chapter 4 for the types of waste constituents that are likely to have been present. Most of the outfalls have NPDES permits, are regularly monitored, and meet permit standards; therefore, the waste water presently being discharged from the outfalls will not be sampled under this work plan. The Phase I sampling effort will focus primarily on potential soil contamination at the outfalls that may have occurred from early waste disposal practices. The soil samples will be analyzed for representative indicator parameters that would be expected to have been retained in the soil. Because of the limited surface areas and known locations of the potentially contaminated sites, judgmental sampling will be conducted at all locations. If contaminants of concern attributable to present waste management practices are found, action will be taken to correct those practices.

Phase II sampling activities would be triggered if any sample is found to exceed both background and threshold levels as described in Chapter 4. If Phase II sampling in the TA-8 active sites is triggered, additional samples will be taken as required to characterize the release and provide sufficient information to complete a risk assessment and support analysis of alternative corrective measures. If the need is indicated, Phase II sampling may

TABLE 6-1
Group 1 Sampling Actions

PRS No.	Type of PRS	Sampling Action	Rationale for Sampling Action
8-004(d)	Drain	Sample	Strontium-90 spill; potential environmental release
8-007	Resin bed	No sample	No environmental release
8-008(a)	Storage Area	No sample	No environmental release
8-008(b)	Storage Area	No sample	No environmental release
8-008(c)	Storage Area	No sample	No environmental release
8-008(d)	Storage Area	No sample	No environmental release
8-009(b)	Outfall	No sample	No sources of contamination
8-009(c)	Outfall	Sample	Potential PCB release
8-009(d)	Outfall	Sample	Potential environmental release
8-009(e)	Outfall	Sample	Potential environmental release
8-009(f)	Outfall	Sample	Potential environmental release
8-010(a)	Storage Area	No sample	Permitted under RCRA
8-010(b)	Storage Area	No sample	Permitted under RCRA
8-010(c)	Storage Area	No sample	Permitted under RCRA

include background sampling and may address other media such as surface water run-off, sediment transport, and perched water.

The nine PRSs that will not be sampled are the PRS 8-007 resin bed, the PRS 8-009(b) outfall, the 8-008(a), (b), (c), and (d) transformer storage areas, and the 8-010(a), (b), and (c) storage areas. The PRS 8-007 resin bed was used for silver recovery from a film processing facility prior to release of process waste water to a permitted outfall. The resin bed was housed in Building TA-8-22 and could not itself have resulted in direct environmental contamination. However, the soil at the outfall that discharged waste water from the resin bed has been designated PRS 8-009(d) and will be sampled for silver. The

PRSs 8-008(a), (b), (c), and (d) transformer storage areas were used for only a few days and have no record of contamination. The areas were inspected by the work plan authors, and no stained soils, stressed vegetation, or other evidence of environmental contamination was found. The PRS 8-009(b) permitted outfall discharges noncontact cooling water. There is no record of contamination, and the equipment cooled by the water does not produce soluble hazardous waste. The water quality at the outfall meets permit requirements, and no further actions will be taken at this PRS. The facilities for which no further actions are planned are described in detail in Chapter 7.

Potential Release Sites 8-010(a), (b), and (c) are waste container storage areas operated under the Laboratory's RCRA Part B permit. These are RCRA-permitted storage facilities controlled under a separate program.

The five remaining PRSs have a potential for environmental contamination and are further addressed in the following paragraphs.

6.1.3 Group 1 Indicator Parameters

The indicator parameters for the TA-8 active sites are listed in Table 6-2. The waste constituents potentially in the process waste streams will vary depending upon the facility operations and the types of waste materials produced.

The drain in Building TA-8-24 was identified as PRS 8-004(d) because of a ^{90}Sr spill and will be sampled only for that radioisotope. Similarly, the PRS 8-009(c) outfall was identified as a PRS because of potential PCB contamination and will be sampled only for PCBs. The outfall at PRS 8-009(d) served a film-processing laboratory in Building TA-8-22. Silver, chromium, and pentachlorophenol are commonly used waste constituents from film processing that are relatively stable in the environment and will be used as indicators of environmental contamination from that source.

The outfall at PRS 8-009(e) served Building TA-8-21, which had several uses including film processing, a metallography laboratory, and radioactive fuel element polishing. The soil at this outfall will be analyzed for gross alpha and beta, for pentachlorophenol, and for a variety of metals including silver, chromium, arsenic, and thallium. The outfall at PRS 8-009(f) discharges process waste water from fluorescent penetration experiments in

TABLE 6-2

Group 1 Indicator Parameters

PRS 8-004(d) Drain

Strontium-90

PRS 8-009(c) Floor Drain Outfall

PCBs

PRS 8-009(d) Process Waste Water Outfall

Silver
Chromium
Pentachlorophenol

PRS 8-009(e) Process Waste Water Outfall

Inorganic Parameters
Chapter 4 Extended Analyte List Inorganic Compounds

Organic Parameters
Pentachlorophenol

Radionuclides
Gross Alpha
Gross Beta

PRS 8-009(f) Process Waste Water Outfall

Organic Parameters
Chapter 4 Extended Analyte List VOCs
Chapter 4 Extended Analyte List SVOCs
TPH

Inorganic Parameters
Nitrate
Nitrite

Building TA-8-22. It will be sampled for the Chapter 4 extended analyte list VOCs, SVOCs, total petroleum hydrocarbons (TPH), nitrate, and nitrite.

Although a wide variety of compounds was used at the TA-8 active sites facilities, those that were used or produced in the greatest quantity, would pose a potential health hazard, and would be good indicators of a release were selected for analysis during Phase I sampling. If a Phase II investigation is triggered, sampling would be performed for a broader range of analytes.

6.1.4 PRS 8-004(d)-Drain

6.1.4.1 Sampling and Analysis Strategy at PRS 8-004(d)

The quantity of ^{90}Sr released into the Building TA-8-24 drain is not known but is not expected to be extensive. The sink drain leads to a sewer pipe that, at the time of release, emptied into a septic tank [PRS 9-005(a)] and then into a leach field. This septic tank was later replaced, [PRS 9-005(d)], and the leach field by an oxidation pond [PRS 9-008]. Each of these facilities is an identified PRS and will be sampled separately as part of the Group 5 TA-9 Decommissioned Area. The latter septic tank and oxidation pond were later replaced by the sewage lagoon and sand filter system [PRS 9-009], which has been replaced by a site-wide interceptor sewer system. The lagoon and filter will be sampled as part of the Group 4 TA-9 active sites. The sink drain in Building TA-8-24 that received the spill and the sewer pipe within TA-8 that received discharge from the sink drain will not be sampled as part of another PRS group and is addressed here. The potential for contamination of the new interceptor system will be investigated if the older parts of the system are found to be contaminated.

Samples will be taken from the sink drain trap in Building TA-8-24 and from the downstream sewer line. Although there is no evidence that a release to the environment has occurred through the sewer system, the system is still in use and any residual waste constituents in the pipes could continue to be transported downstream to the ultimate point of environmental release.

6.1.4.2 Sampling and Analysis Approach at PRS 8-004(d)

Chip or wipe samples will be taken from the inside of both the sink trap and the sewer pipe. Samples will also be taken of any sludge or sediments that may be present. Chip samples are preferred for materials with porous surfaces such as vitreous clay pipes, and wipe samples will be taken only if chip samples cannot be taken. The samples and sampling locations will be field-screened with hand-held instruments for evidence of radioactive or volatile organic waste constituents. The information obtained during this screening will be used to provide worker protection and an initial indication of the presence of waste constituents and may be used as appropriate to help interpret the sampling results. However, the data obtained from this screening are not expected to have quantitative value.

6.1.4.3 Selection of Sampling Sites at PRS 8-004(d)

The sink trap will be removed and directly sampled. This sink trap is within Building TA-8-24 and is expected to be near Manhole TA-8-55. The sewer line will be sampled at Manhole TA-8-53, which is located upstream of a connection with a branch line from another source. Building TA-8-24 is the only source of waste water for the sewer line at this sampling point. The locations of these sampling points are shown in Figure 6-1.

6.1.4.4 Sampling Activity at PRS 8-004(d)

The samples will be analyzed for ^{90}Sr using the method listed on Table II-1 of the QAPjP in Annex II of this work plan. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the minimum numbers of samples are summarized in Table 6-3. Sludge samples will only be taken if sufficient volumes of sludge or sediment are present. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The chip or wipe samples will be analyzed to a detection level equal to or lower than the screening action level. The sampling procedures to be used are listed in Table 6-4. These procedures are drawn from the generic lists presented in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the quality assurance requirements presented in the QAPjP and with the ER Program SOPs providing general sampling instructions. A field log will be maintained during the trap and sewer sampling activities as described in Chapter 4. Long-term archival research is not expected to be required for any samples produced under this work plan. Any sample residuals and all waste decontamination solutions produced during the sampling operations will be disposed of in accordance with LANL-ER-SOP-01.6 (LANL 1992, 0688).

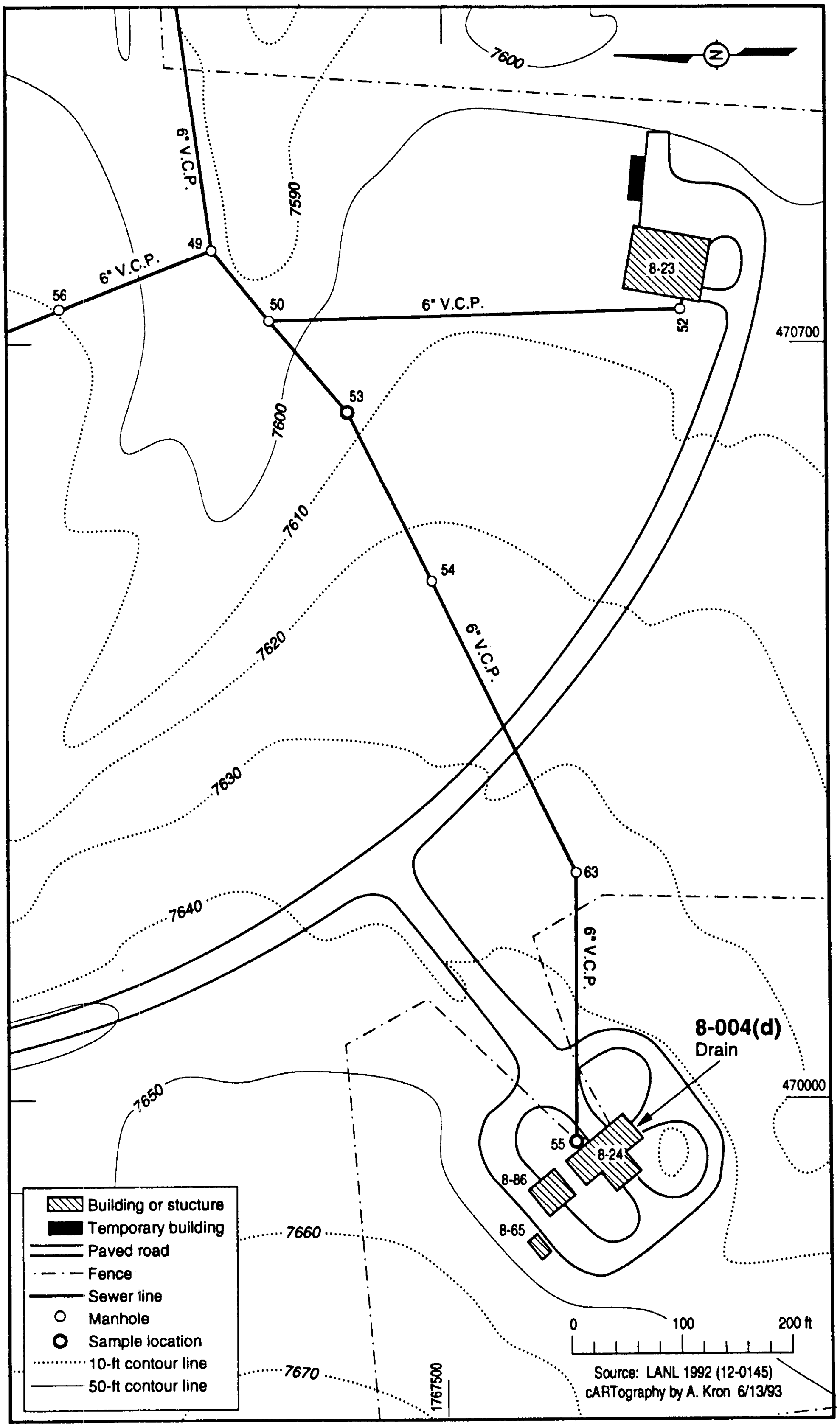

Figure 6-1. Sample locations for PRS 8-004(d), drain.

TABLE 6-3

Group 1 Sampling Types

Medium	Number of Site Samples	Expected Number of QA Samples[a]	Total Samples
PRS 8-004(d) Drain			
Wipe or Chip	2	2	4
Sludge	2	3	5
PRS 8-009(c) Floor Drain Outfall			
Soil	2	3	5
PRS 8-009(d) Process Waste Water Outfall			
Soil	2	3	5
PRS 8-009(e) Process Waste Water Outfall			
Soil	2	3	5
PRS 8-009(f) Process Waste Water Outfall			
Soil	2	4	6

a Field Blank: One for each medium.
Duplicate Sample: One for each medium.
Trip Blank: One per analytical laboratory shipping container, for VOC analysis only
Equipment (Rinsate) Blank: One for each medium except wipe sample where no reusable equipment is expected.

TABLE 6-4

PRS 8-004(d) Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-6.09
Sediment Material Collection	LANL-ER-SOP-6.14
Trier Samples for Sludge and Moist Powders or Granules	LANL-ER-SOP-6.17
Wipe Sampling of Solid Surfaces	TBD[a]
Chip Sampling of Porous Surfaces	TBD[a]
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

6.1.4.5 Analysis of Sampling Results at PRS 8-004(d)

The results of the sampling will be compared with screening action levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result from any sample is found to exceed both the background and threshold levels for ^{90}Sr. If Phase II is triggered, additional sampling may be performed to determine whether a release to the environment has occurred from the drain or sewer pipe. If the threshold level is not exceeded, no further actions will be taken.

6.1.5 PRS 8-009(c)-Floor Drain Outfall

6.1.5.1 Sampling and Analysis Strategy at PRS 8-009(c)

The PRS 8-009(c) outfall discharges water entering floor drains in Building TA-8-23 and possibly also storm water run-off from a French drain that surrounds the building. One of the floor drains is located near several electrical transformers that have leaked oil containing PCBs, and some of this oil may have entered the drain. The outfall pipe discharges at the bank of a nearby gully. Samples will be taken of the soil adjacent to the end of the outfall pipe and analyzed for PCBs.

6.1.5.2 Sampling and Analysis Approach at PRS 8-009(c)

Shallow surface soil samples will be taken. The samples and sampling sites will be field-screened with hand-held instruments for the presence of VOCs or radioactive materials.

6.1.5.3 Selection of Sampling Sites at PRS 8-009(c)

Two samples will be taken of the soil approximately 6 in. and 24 in. from the end of the outfall pipe. These sampling locations were selected near the end of the pipe because of the significant accumulations of sediment in that area and because the lack of erosional evidence suggests very low discharge rates from the pipe. The sampling locations will be documented in the field log by photographs showing their locations relative to the outfall and by noting their distances and directions from the end of the pipe. The approximate sampling locations are shown in Figure 6-2.

6.1.5.4 Sampling Activity at PRS 8-009(c)

Because of the strong sorptive properties of PCBs on soils and because they would have originally been deposited on the ground surface, samples will be taken from the top 6 in. of soil. Hand sample collection techniques will be used, and the samples will be analyzed for PCBs using the method listed on Table II-1. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-3. If samples from PRS 8-009(c) are collected in the same sampling round as those from the PRS 8-008 sites, the same QA samples may be used for all locations. The sampling

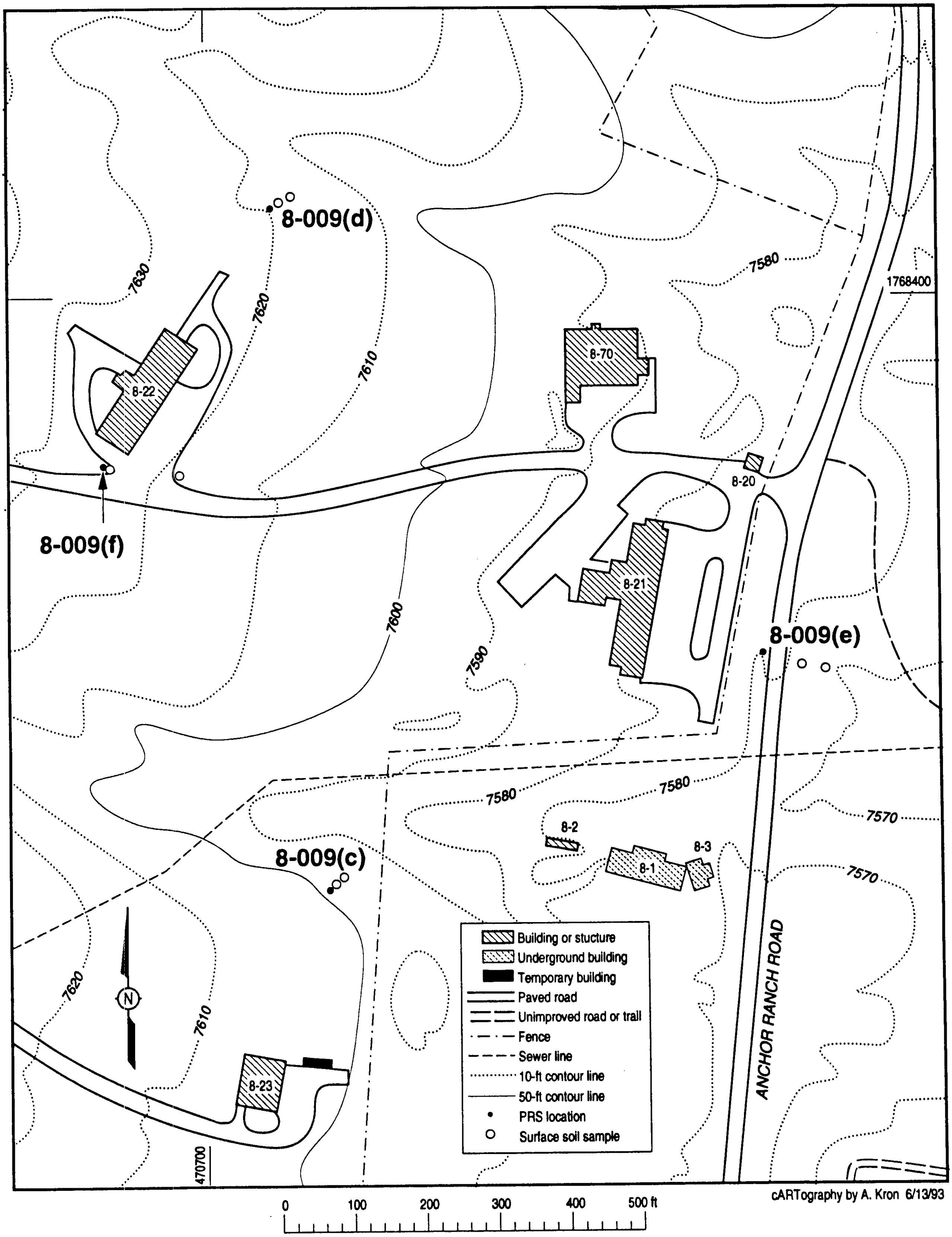

Figure 6-2. Sample locations for PRSs 8-009(c), (d), (e), and (f).

locations for the quality assurance samples will be determined by the Field Team Leader. Additional QA samples may be taken at the discretion of the Field Team Leader.

The sampling procedures to be used are listed in Table 6-5. Although the outfall was not discharging waste water at the time of a field inspection in November 1992 and is not expected to be discharging at the time of sampling, the Field Team Leader may choose the most appropriate sampling method for the field conditions at the time of sampling. The collected soil will be homogenized by mixing, and a final sample representative of average conditions at the sampling site will be drawn from the homogenized mixture. The soil samples will be handled in the same manner as described above for sediment samples. A field log will be maintained as previously described. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

TABLE 6-5

PRS 8-009(c) Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Spade and Scoop Method for Collection of Soil Sample	LANL-ER-SOP-6.09
Stainless Steel Surface Soil Sampler	LANL-ER-SOP-6.11
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

6.1.5.5 Analysis of Sampling Results at PRS 8-009(c)

The results of the sampling will be compared with the screening action level for PCBs as described in Chapter 4. Phase II sampling activities will be triggered if any validated result is found to exceed the screening action and background levels for PCBs. If these levels are exceeded, additional sampling may be conducted to determine the extent of contamination in the outfall pipe and downstream from the outfall. Analyses may be performed for a broader suite of analytes than during Phase I to determine if any additional chemicals are present. If the screening action level is not exceeded, no additional sampling will be performed.

6.1.6 PRS 8-009(d)–Process Waste Water Outfall

6.1.6.1 Sampling and Analysis Strategy at PRS 8-009(d)

The PRS 8-009(d) outfall discharges process waste water from a film-processing laboratory in Building TA-8-22. The waste solutions discharged at the outfall are expected to contain photo-processing and photo-development solutions, which contain silver salts and potentially also chromium and pentachlorophenol. These constituents have been selected as indicator parameters because of their potential presence in the waste stream, their toxicity, and their persistence in the environment. The outfall pipe discharges at the bank of a nearby gully. Samples will be taken of the soil downstream of the end of the outfall pipe.

6.1.6.2 Sampling and Analysis Approach at PRS 8-009(d)

Shallow surface soil samples will be taken. Hand-held instruments will be used to screen samples and sampling sites for VOCs and radioactive materials. The present process waste water stream meets the NPDES water quality criteria and will not be sampled.

6.1.6.3 Selection of Sampling Sites at PRS 8-009(d)

Two samples will be taken of the soil in the bottom of the outfall run-off ditch approximately 3 ft and 6 ft from the end of the outfall pipe. These sampling locations were selected because of accumulations of sediment in the ditch bottom in those areas and to check for potential downstream constituent migration. The sampling locations will be documented in the field log by photographs showing their locations relative to the outfall and by noting their distances and directions from the end of the pipe. The approximate sampling locations are shown in Figure 6-2.

6.1.6.4 Sampling Activity at PRS 8-009(d)

Samples will be taken of the top 6 in. of sediment because waste constituents in the waste stream would have originally been deposited on and sorbed to the upper surface of the sediments. The samples will be taken using hand sample collection techniques and will be analyzed for the aforementioned indicator parameters using the methods listed on Table II-1. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-3. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The sampling procedures to be used are listed in Table 6-6. The outfall was flowing at about 1 gpm during a field inspection in November 1992 and may be flowing at the time of sampling. The Field Team Leader may choose the most appropriate sampling method for the field conditions at the time of sampling. The collected soil will be homogenized by mixing, and a final sample representative of average conditions at the sampling site will be drawn from the homogenized mixture.

The soil samples will be handled in the same manner as described above for sediment samples. A field log will be maintained as previously described. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.1.6.5 Analysis of Sampling Results at PRS 8-009(d)

The results of the sampling will be compared with threshold levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result is found to exceed both background and threshold levels. If these levels are exceeded, additional sampling will be conducted during Phase II to determine the extent of contamination in the outfall pipe and downstream from the outfall. Analyses would be performed for a broader suite of analytes than during Phase I to determine if any additional chemicals are

TABLE 6-6

PRSs 8-009(d), 8-009(e), and 8-009(f) Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Sampling for Volatile Organics	LANL-ER-SOP-6.03
Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-6.09
Hand Auger and Thin-Wall Tube Sampler	LANL-ER-SOP-6.10
Stainless Steel Surface Soil Sampler	LANL-ER-SOP-6.11
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

present. If the threshold levels are not exceeded, no additional sampling will be performed.

6.1.7 PRS 8-009(e)-Process Waste Water Outfall

6.1.7.1 Sampling and Analysis Strategy at PRS 8-009(e)

The PRS 8-009(e) outfall discharges process waste water from Building TA-8-21, which has housed a film-processing laboratory, a metallography laboratory, and a radioactive fuel element polishing facility. The waste water from this building may have been contaminated by each of these activities, and the soils at the outfall will be analyzed for radionuclides, key film processing analytes, and the Chapter 4 extended analyte list metals. The outfall pipe discharges into a small concrete cleanout/drainage basin on the west side of Anchor Ranch Road, drains through a metal culvert beneath the road, and discharges to the soil on the east side of the road. Samples will be taken of the soil downstream at the end of the culvert on the east side of the road.

6.1.7.2 Sampling and Analysis Approach at PRS 8-009(e)

Shallow surface soil samples will be taken. Hand-held instruments will be used to screen samples and sampling sites for VOCs and radioactive materials. The present process waste water stream meets the NPDES water quality criteria and will not be sampled.

6.1.7.3 Selection of Sampling Sites at PRS 8-009(e)

Two samples will be taken of the sediment in the bottom of the culvert run-off ditch approximately 4 ft and 8 ft from the end of the culvert. These sampling locations were selected because of the significant accumulations of sediment in those areas. The sampling locations will be documented in the field log by photographs showing their locations relative to the outfall and by noting their distances and directions from the end of the culvert. The approximate sampling locations are shown in Figure 6-2.

6.1.7.4 Sampling Activity at PRS 8-009(e)

Samples will be taken of the top 6 in. of soil because waste constituents in the waste stream would have originally been deposited on and sorbed to the upper surface of the sediments. Samples will be taken using hand sample collection techniques and analyzed for the parameters listed in Table 6-2 using the methods listed on Tables II-1 and II-2. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-3. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The sample volumes for the analytes at PRS 8-009(e) are given in Tables II-1 and II-2. The sampling procedures to be used are the same as those for PRS 8-009(d) and are listed in Table 6-6. Although the outfall was not flowing during a field inspection in November 1992, it may be flowing at the time of sampling. The Field Team Leader may choose the most appropriate sampling method for the field conditions at the time of sampling. The collected soil will be homogenized by mixing, and a final sample representative of average conditions at the sampling site will be drawn from the homogenized mixture.

The soil samples will be handled in the same manner as described above for sediment samples. A field log will be maintained as previously described. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.1.7.5 Analysis of Sampling Results at PRS 8-009(e)

The results of the sampling will be compared with threshold levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result is found to exceed both background and threshold levels. If these levels are exceeded, additional sampling may be conducted during Phase II to determine the extent of contamination in the outfall pipe, cleanout/drainage basin, culvert, and downstream from the culvert. If the threshold levels are not exceeded, no additional sampling will be performed.

6.1.8 PRS 8-009(f)-Process Waste Water Outfall

6.1.8.1 Sampling and Analysis Strategy at PRS 8-009(f)

The PRS 8-009(f) outfall discharges process waste water from fluorescent penetration experiments performed in Building TA-8-22. This waste water may have been contaminated by these experiments, and the soils at the outfall will be analyzed for the Chapter 4 extended analyte list VOCs and SVOCs, TPH, nitrate, and nitrite. The outfall pipe discharges directly into a small drainage ditch beside a paved road passing the building. Surface run-off collected in the ditch flows directly past the end of the outfall pipe. Samples will be taken of the soil in the bottom of the ditch immediately downstream of the outfall.

6.1.8.2 Sampling and Analysis Approach at PRS 8-009(f)

Shallow surface soil samples will be taken. Hand-held instruments will be used to screen samples and sampling sites for VOCs and radioactive materials.

6.1.8.3 Selection of Sampling Sites at PRS 8-009(f)

Two samples will be taken of the soil in the bottom of the roadside ditch. The first sample will be taken approximately 2 ft downstream from the end of the outfall, just upstream of a culvert beneath an access road to Building TA-8-22. The second sample will be taken approximately 2 ft downstream of the downstream end of the aforementioned culvert. These sampling locations were selected because they provide the only opportunity for sampling near the outfall. No sediment traps were present at these locations. The sampling locations will be documented in the field log by photographs showing their locations relative to the outfall and culvert and by noting their distances and directions from the end of the outfall pipe. The approximate sampling locations are shown in Figure 6-2.

6.1.8.4 Sampling Activity at PRS 8-009(f)

Samples for SVOCs, TPH, nitrate, and nitrite analyses will be taken of the top 6 in. of soil because waste constituents would have originally been deposited on and sorbed to the upper surface of the soil. Samples for VOC analysis will be taken from a depth of about 12 in. All samples will be taken using hand sample collection techniques and analyzed for the parameters listed in Table 6-2 using the methods listed on Tables II-1 and II-2. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-3. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The sample volumes for the analytes at PRS 8-009(f) are given in Tables II-1 and II-2. The sampling procedures to be used are the same as those for PRS 8-009(d) and are listed in Table 6-6. The outfall was flowing at a rate of about 1 gpm during a field inspection in November 1992, and it may be flowing at the time of sampling. The Field Team Leader may choose the most appropriate sampling method for the field conditions at the time of sampling.

The soil samples will be handled in the same manner as described above for sediment samples. A field log will be maintained as previously described. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.1.8.5 Analysis of Sampling Results at PRS 8-009(f)

The results of the sampling will be compared with threshold levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result is found to exceed both threshold and background levels. If threshold levels and background levels are exceeded, additional sampling may be conducted during Phase II to determine the extent of contamination in the outfall pipe and ditch. This outfall is unpermitted, and the discharged water is not routinely sampled. Water samples may therefore also be taken during Phase II, and the waste water disposal practices of the facility will be reviewed. If the threshold levels are not exceeded, no additional sampling will be performed.

6.1.9 Phase II Sampling

Phase II sampling activities will be triggered at a PRS if any sample is found to contain waste constituents exceeding background levels and concentration thresholds based on screening action levels as described in Chapter 4. The specific Phase II sampling activities will be determined based upon the Phase I sampling results and will be described in future documents relating to this OU.

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6.2 GROUP 2: TECHNICAL AREA 8 GUN-FIRING SITE

6.2.1 Group 2 Background

The TA-8 Gun-Firing Site contains PRS 8-002, an experimental firing site for specially designed naval guns used in developing the Little Boy weapon, and PRS 8-006(a), a burial ground for the naval guns, called MDA Q. Two concrete anchor pads for the gun mounts and two target sand butts remain on the ground surface. Also included in this group is PRS 8-006(b), originally thought to be a second waste material disposal area associated with the Gun-Firing Site but now considered to be the same as MDA Q. The locations of these sites are shown in Figure 5-3.

6.2.2 Group 2 Sampling Strategy and Objectives

Fragments of targets and projectiles were scattered in the vicinity of the firing sites during the gun-firing experiments, resulting in potential contamination of the surface soils and sand butts. Any fragments of potentially hazardous metals on or near the ground surface may be of concern because they pose a potential health hazard if ingested. In addition, the naval guns, used projectiles, and possibly other materials associated with the gun-firing experiments were buried in a pit immediately northwest of the northern gun mount.

The most abundant waste constituents at the TA-8 Gun-Firing Site are depleted uranium, lead, and copper. These metals may be present in sizes ranging from powders to centimeter-size chunks. These metals have low mobility, and their vertical migration to deeper soil horizons is not expected to have been significant. The site is well vegetated with grasses, and no evidence of surface erosion or lateral constituent migration was seen in site investigations. No hazardous liquid releases are associated with this site.

Two sizes of waste constituents are considered in designing the field sampling plan: the larger metallic chunks and waste metal objects left lying on or near the ground surface and the small granular or particulate metallics or their salts remaining within the surface soils. A geophysical survey will be conducted to detect the larger chunks of metal, and chemical analyses will be performed on random soil samples to detect the smaller metallic particles. Objects that are buried at depths greater than 2 ft are not considered by EPA to be generally available to surface dispersal mechanisms but may be of environmental concern if their leachate is hazardous (EPA 1989, 0088). However, the solubility of uranium, lead, and copper in their metallic form is very low. Any such items would be expected to be relatively chemically stable in the alkaline soils at the site, and there is little potential for appreciable downward movement with infiltrating precipitation. Objects buried deeper than 2 ft will, therefore, be left in place and will not be addressed further in this sampling plan.

Phase I activities will include a geophysical survey to detect larger metallic objects in the surface soils and random sampling to determine whether the concentrations of the finer-grained materials exceed established threshold levels described in Chapter 4. The survey and the sampling will be conducted within the area surrounding the firing sites that could have been contaminated by flying debris, within the sand butts, and within MDA Q. Any larger chunks of potentially hazardous metals found during the geophysical survey will either be collected for proper disposal or left in place and addressed during Phase II. Phase II sampling activities would be triggered if any sample is found to exceed the threshold levels described in Chapter 4.

6.2.3 Group 2 Indicator Parameters

The indicator parameters are listed in Table 6-7. All soil and sand samples will be analyzed for copper, lead, and beryllium from the projectiles and targets, each of which could pose a potential health hazard and would be good indicators of a release. Although beryllium was not present in quantity, it is included as an indicator because of its low screening action level. Low levels of radioactive waste constituents may also have been present from the reported use of depleted ^{238}U and will be checked with gross alpha and gross beta scans.

TABLE 6-7

Group 2 Indicator Parameters

Inorganic	
	Copper
	Lead
	Beryllium
Radionuclides	
	Gross Alpha
	Gross Beta

6.2.4 Geophysical Survey of Surface Soils

A geophysical survey employing electromagnetic techniques will be performed within an area extending 225 ft in all directions from the two firing sites. This distance was selected based upon the historical observation that the larger pieces of metal were scattered over distances of up to 75 yds from the firing sites (see Section 5.2.1). Because the two firing sites were fairly close together, their sampling areas overlap and will be treated as a single area. This survey area is shown in Figure 6-3 and includes the areas of the sand butts and MDA Q.

It is anticipated that the survey will be conducted with a portable terrain conductivity meter (Geonics EM-31 or equivalent) in a predetermined pattern, with traverses spaced to provide adequate overlap in accordance with the capabilities of the instrument at the site. The survey will not include existing roads, concrete pads, exposed building roofs, and other sites where flying debris from the gun-firing experiments would no longer be expected to be present.

The traverses are expected to be about 10-ft wide and will be designed to detect metallic chunks down to about 1 cm^3 in size. The anticipated traverse pattern is shown in Figure 6-3. Field tests of instrument detection capability will be conducted *in situ* prior to the survey to determine the final traverse width. Smaller pancake-type metal detectors may be used to help locate any objects detected by the larger instrument and to distinguish between single objects and higher concentrations of finer particulate metals. Locations with higher concentrations of particulate metals will be identified as potential sites for judgmental soil sampling.

Metallic objects visible on the ground surface will be removed for proper disposal; however, any objects within the boundary of the MDA Q site, including the projectiles and other waste materials visible on the ground surface, will be left in place undisturbed for possible *in situ* stabilization. Locations of any potentially hazardous metallic chunks that are not immediately retrieved but left in place will be identified during the survey. The method of identification will be selected by the Field Team Leader and may consist of flagging, location coordinates, or other appropriate means. The procedures, implementation, and results of the survey will be documented in the field log.

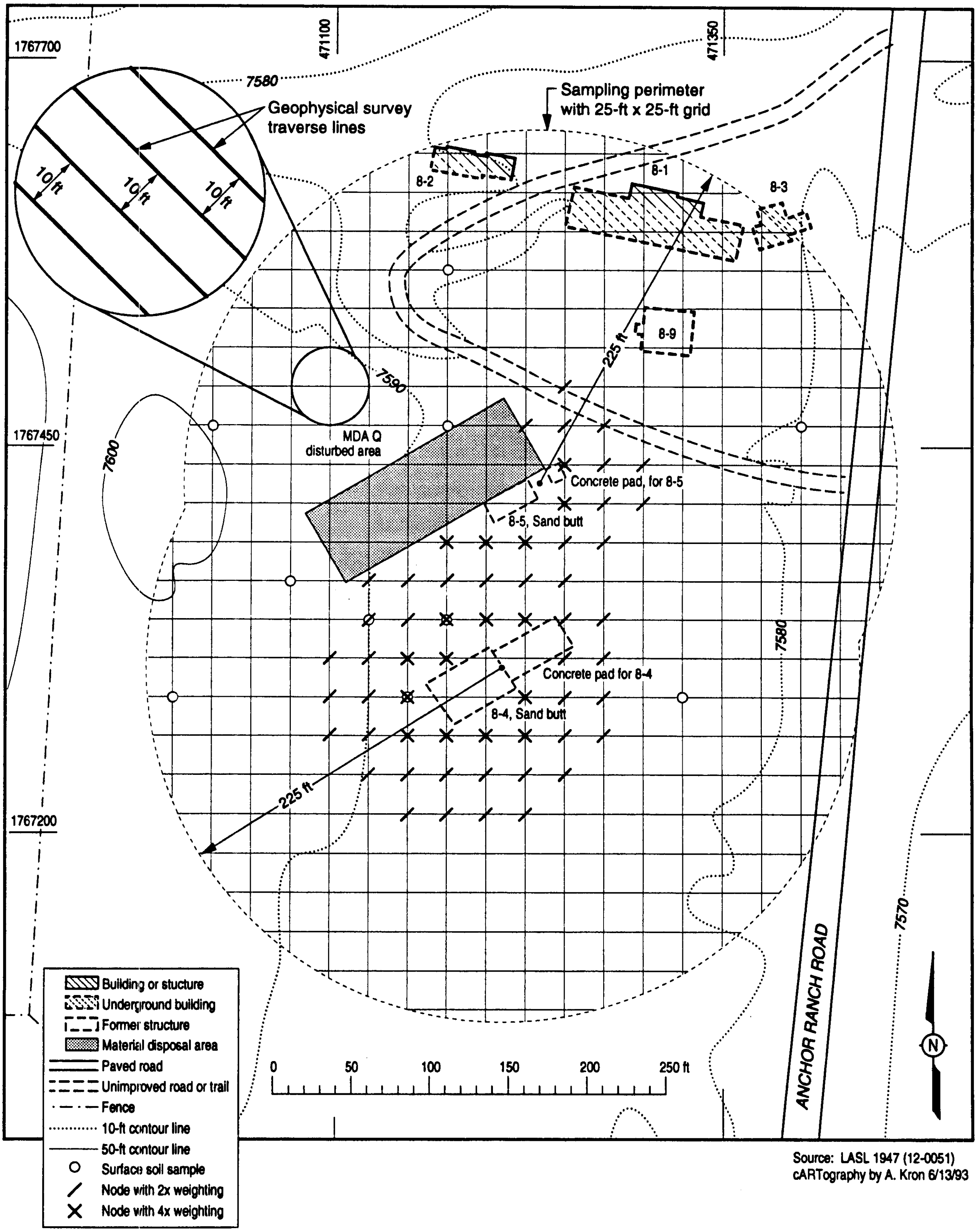

Figure 6-3. Sample locations for PRS 8-002, former gun-firing sites.

6.2.5 Sampling of Surface Soils

This section discusses sampling of surface soils in the general vicinity of the firing sites that could have been contaminated by flying debris.

6.2.5.1 Sampling and Analysis Strategy for Surface Soils

Samples will be taken in the vicinity of the TA-8 Gun-Firing Site to determine whether the concentration of any residual particulates in the soil exceed threshold levels. Because of their initial deposition on the ground surface and in view of the low solubility of their metallic form in water, this sampling will be limited to surface soils.

In addition to any judgmental samples selected on the basis of the geophysical survey results, surface soil samples will also be taken at locations selected randomly throughout the Gun-Firing Site, with the following exceptions: 1) The areas of the sand butts and MDA Q are excluded and will be sampled separately. 2) Soil samples will not be taken beneath paved roads, buildings, the cement gun pads, or any other structures that were present at the time of the gun-firing experiments and would have shielded the soil from contamination.

6.2.5.2 Sampling and Analysis Approach for Surface Soils

The sampling program was designed with the help of statistical methods as described in Chapter 4. A goal of the design was to take a sufficient number of samples so that there would be at most a 5 percent probability of failing to detect any waste constituents that have been released to the soil. In considering the size and potential hazard posed by the site and the approximately random dispersal of waste constituents from the shots, a design was adopted calling for 10 randomly placed samples biased toward the firing pads. With 10 samples, the aforementioned 5 percent probability would be achieved if 30 percent of the area had above background constituent levels. Considering that well over 100 shots were probably fired from the two gun mounts and considering the descriptions of flying debris described in archival records, this value appeared to be conservative, particularly at locations near the firing sites.

6.2.5.3 Selection of Sampling Sites for Surface Soils

A map of the surface soil sampling area is presented in Figure 6-3. The sampling area extends 225 ft in all directions from lines drawn from each of the firing sites and is the same as the area to be geophysically surveyed.

The surface soil sampling area covers approximately 250,000 ft^2. The soil sampling locations were determined by laying a 25-ft by 25-ft grid over the area and randomly selecting grid nodal points. The grid is oriented north-south and may be referenced to a corner of the northernmost gun mount pad. The grid and selected random sampling points are shown on Figure 6-3. Selection of sampling locations was biased as indicated on the figure to increase the number of samples taken near the firing sites, where the greatest waste constituent concentrations would be expected to be found.

6.2.5.4 Sampling Activity for Surface Soils

Samples will be taken of the top 6 in. of soil because waste constituents would have originally been deposited on the upper surface of the soil, which has since remained essentially undisturbed. Samples will be taken using hand sample collection techniques. Prior to taking the sample, the soil will be screened, and any metallic objects larger than 1 cm in length will be manually removed.

The soil samples will be analyzed for the analytes listed in Table 6-7 using the methods listed on Table II-1 of the QAPjP in Annex II of this work plan. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-8. Additional samples may also be taken at judgmental locations identified by the Field Team Leader based upon the results of the geophysical survey. Any such locations will be identified in the field log by documenting the location coordinates. Sample sizes for the surface soils are indicated in Table II-1.

The sampling procedures to be used in the Phase I surface soil sampling activity are listed in Table 6-9. These procedures are drawn from the generic lists presented in Chapter 4. The sample collection technique may be selected by the Field Team Leader from the alternatives provided. Health and safety procedures for field activities are listed in Chapter

TABLE 6-8
Group 2 Sampling Types

Sampling Type	Number of Site Samples	Expected Number of QA Samples[a]	Total Samples
Surface Soil	10	3	13
Sand Butt	4	3	7
MDA Q	5	3	8

a Field Blank: One during each sampling activity
Duplicate Sample: One during each sampling activity
Equipment (Rinsate) Blank: One during each sampling activity
Note: The surface soil, sand butt, and MDA Q sampling may share the same QA samples if all samples are collected during the same sampling round.

TABLE 6-9
Group 2 Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
General Surface Geophysics	LANL-ER-SOP-3.02
Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-6.09
Hand Auger and Thin-Wall Tube Sampler	LAND-ER-SOP-6.10
Stainless Steel Surface Soil Sampler	LANL-ER-SOP-6.11
Field Surveying of Sample Location	TBD[a]
Hand-Held Instruments for Field Screening for Metallic Objects	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

4 and should be reviewed prior to any sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the QAPjP for OU 1157 and with the ER Program SOPs providing general sampling instructions.

A field log will be maintained during the surface soil sampling activities as described in Chapter 4. All soil samples will be shipped to a Laboratory-contracted analytical laboratory and analyzed for the indicator parameters.

6.2.5.5 Analysis of Sampling Results for Surface Soils

The results of the sampling will be compared with threshold levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result is found to exceed background and threshold levels. If threshold levels are exceeded, additional sampling for a broader suite of analytes may be conducted to determine the nature and extent of contamination. If the threshold levels are not exceeded, no additional sampling will be performed.

6.2.6 Sampling of Sand Butts

6.2.6.1 Sampling and Analysis Strategy for Sand Butts

The two target sand butts at the TA-8 Gun-Firing Site will be sampled to determine whether the concentration of any residual particulates in the sand exceeds established threshold levels. All samples from the sand butts will be analyzed for the indicator parameters listed in Table 6-7.

6.2.6.2 Sampling and Analysis Approach for Sand Butts

Because of the relatively small areas of the butts and the expected greater constituent concentrations along their centerlines where the targets were located, samples will be taken at judgmental locations along the long axis of each butt.

6.2.6.3 Selection of Sampling Sites for Sand Butts

A map of the sand butt sampling area is shown in Figure 6-4. The sampling area perimeter was drawn to enclose the present areas of the sand piles. The total sampling area for both butts is approximately 2,000 ft^2. Two samples will be taken in each butt, one at the northeast end where the targets would have been placed and the other at the southwest end where waste constituents may have been transported when the sand was regraded following each target retrieval. The approximate sampling locations are shown in Figure 6-4.

6.2.6.4 Sampling Activity for Sand Butts

The present maximum height of the sand butts is about 3 ft. The samples will therefore be taken using hand sample collection techniques to a maximum depth of 3 ft. A sampling depth of greater than the 2-ft depth of "surface soils" was adopted because the butts may eventually be eroded to the approximate level of the surrounding soil. The samples will be homogenized by thorough mixing, and a final sample will be drawn from the homogenized mixture for analysis. This approach is expected to yield representative samples because the sand surrounding the target was excavated and repacked following each firing and should already be fairly homogeneous. Prior to drawing the final sample, any metallic objects larger than approximately 1 cm in length will be manually removed.

The samples will be taken using a thin-wall tube sampler, the spade and scoop method, or other similar techniques at the discretion of the Field Team Leader. Samples will be taken only of the sand that was once used in the butts, rather than the native soil beneath the sand. If an insufficient thickness of sand is available at the selected sampling location to achieve the necessary sample volume, additional sand will be taken from the immediate vicinity of that location.

The sand samples will be analyzed for the analytes listed in Table 6-7 using the methods listed on Table II-1. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-8. Sample sizes for the sand butts are the same as for the surface soils and are indicated in Table II-1.

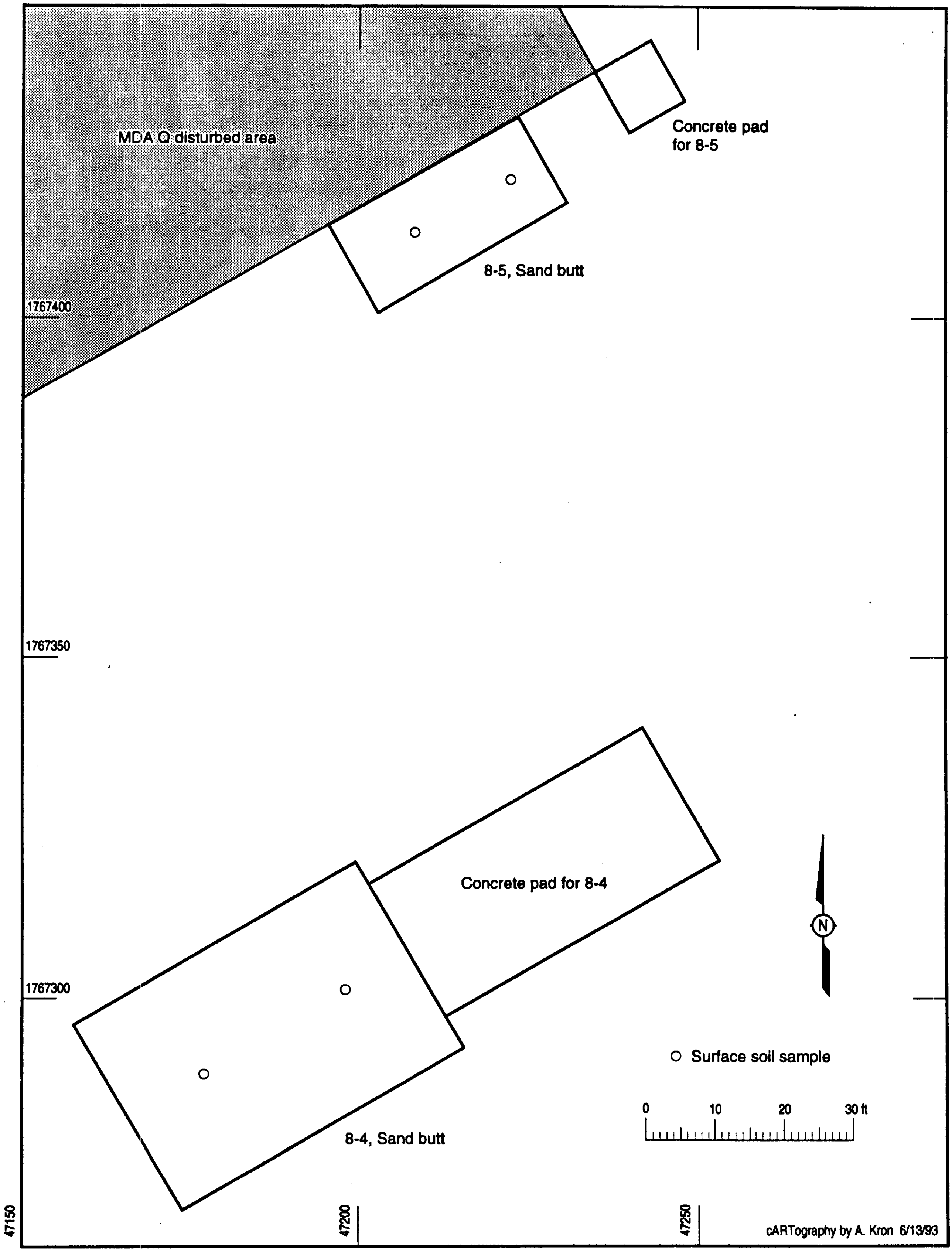

Figure 6-4. Sample locations for PRS 8-002, sand butts.

The sampling procedures to be used in the Phase I sand butt sampling activity are also the same as for the surface soils and are listed in Table 6-9. The sand butt samples will be handled in the same manner as previously described for the surface soil samples. A field log will also be maintained as previously described in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.2.6.5 Analysis of Sampling Results for Sand Butts

The results of the sampling will be compared with threshold levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result is found to exceed background and threshold levels. If threshold levels are exceeded, additional sampling for a broader suite of analytes may be conducted to determine the nature and extent of contamination. If the threshold levels are not exceeded, no additional sampling will be performed.

6.2.7 Sampling of MDA Q

6.2.7.1 Sampling and Analysis Strategy for MDA Q

Material Disposal Area Q will be sampled to determine whether the concentration of any residual particulates in the soil exceeds established threshold levels. Most of the waste constituents potentially in the soil would have come from debris scattered over the area from the adjacent gun-firing sites before the waste pit was excavated. These potential waste constituents would not include explosives, which would have been consumed during firing and would not have been scattered over the area. Only used equipment is reported to have been disposed of at MDA Q (see Section 5.2.1.2), and no explosive hazard is expected. Nevertheless, the results of the geophysical surveys discussed in Section 6.2.4 will be used to guide the sampling, and samples will not be taken in the vicinity of any buried metallic objects.

This sampling strategy does not address the more deeply buried wastes, which are assumed to be stabilized *in situ*. A consequence of this strategy is that the site may require long-term institutional control. The same metals addressed in the surface sampling are the only buried waste constituents of potential concern and, as previously noted, their solubility is so low that they would be essentially immobile and pose no risk to human health or the environment. The projectiles visible on the ground surface at MDA Q did not contain explosives, but rather were propelled by explosive charges placed behind them. The exposed projectiles will not be disturbed by the geophysical surveys or by sampling under this work plan, but will be addressed in designing *in situ* stabilization for the site.

All samples will be analyzed for the indicator parameters listed in Table 6-7. Surface soil samples will be taken at locations selected randomly throughout the MDA Q area and will be used to evaluate the general concentrations of the indicator parameters within that area. Surface samples are considered appropriate for this site because any waste constituents originally in the soils at the burial ground site would have been thoroughly mixed during the excavation and backfilling process. These waste constituents would have originated from the gun-firing experiments.

6.2.7.2 Sampling and Analysis Approach for MDA Q

The sampling program was designed with the help of statistical methods as described in Chapter 4. A goal of the design was to take a sufficient number of samples so that there would be at most a 5 percent probability of failing to detect any waste constituents that have been released to the soil. In considering the size and potential hazard posed by the site and the indication from past surveys that most of the waste was buried at the site's northeastern end, a design was adopted calling for 5 randomly placed samples biased toward that end. With 5 samples, the aforementioned 5 percent probability would be achieved if 50 percent of the area had above background constituent levels. Considering the mixing that would have occurred when the soils at the site were excavated and replaced, this value appeared to be conservative.

6.2.7.3 Selection of Sampling Sites for MDA Q

A map of the MDA Q sampling area is shown in Figure 6-5. The sampling area perimeter was drawn to enclose the approximately 50 by 150 ft area of evident surface disturbance and partially buried debris indicative of the burial ground. The total sampling area covers approximately 7,500 ft^2 and is larger than the 30 by 30 ft area identified at the northeast end of the site in earlier pipe detector surveys. The sampling locations were determined by laying a 12- by 12-ft grid over the area and randomly selecting grid nodal points. The grid is oriented parallel to the sides of the site and may be referenced to a corner of the

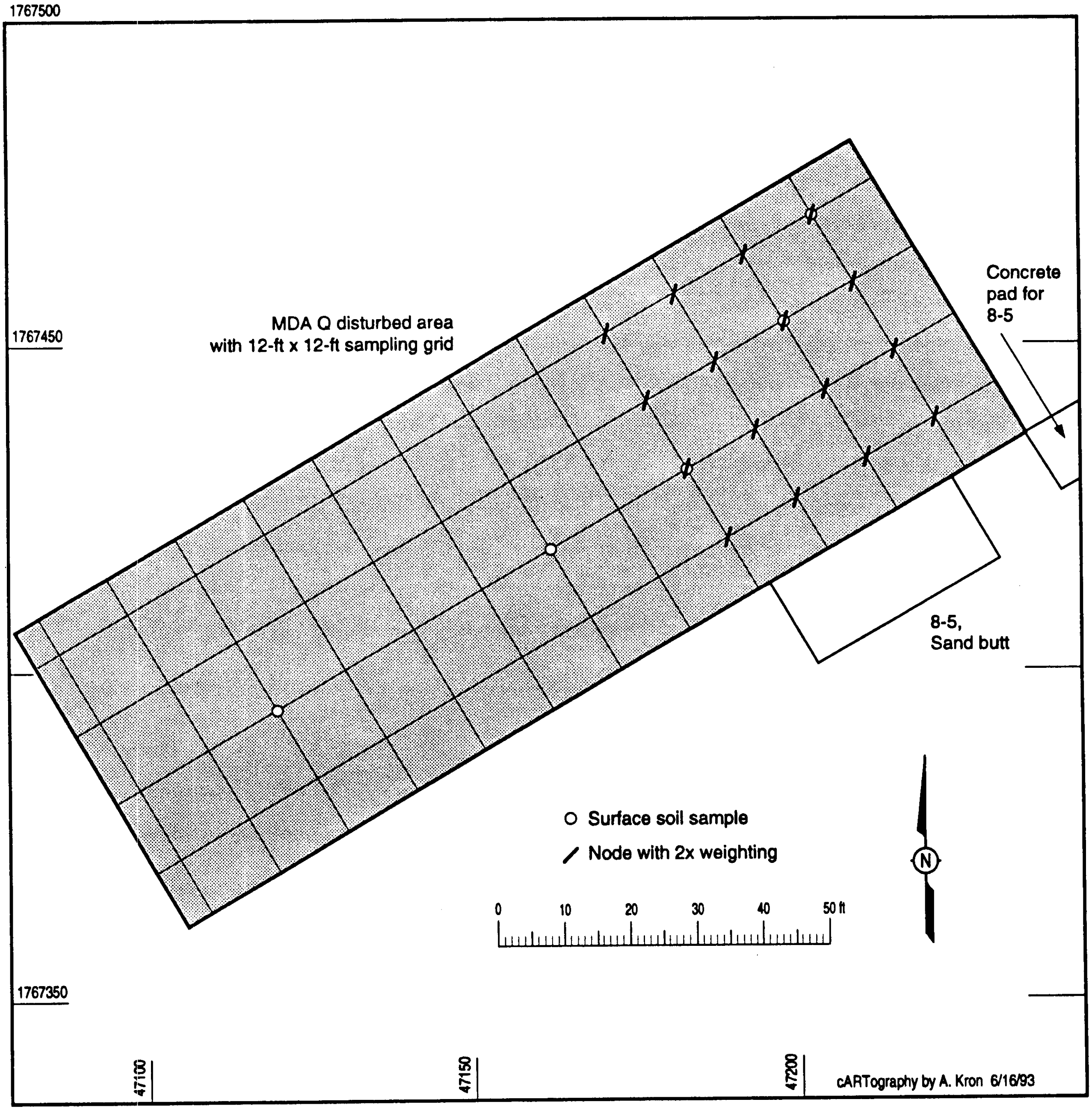

Figure 6-5. Sample locations for PRS 8-006, MDA Q disturbed area.

northernmost gun mount pad. The grid and selected random sampling points are shown on Figure 6-5. Selection of sampling locations was biased as indicated on the figure to increase the number of samples taken at the northeast end of the site, where most of the waste materials are expected to have been buried.

6.2.7.4 Sampling Activity for MDA Q

Prior to sampling, the results of the geophysical survey discussed in Section 6.2.4 will be analyzed to confirm the boundary of MDA Q. Based upon the results of this analysis, the sampling area and sampling locations may be modified as needed to obtain appropriately representative data.

Samples will be taken of the top 2 ft of soil using hand sample collection techniques. This sampling depth was selected because the soil at the site was disturbed and mixed during the excavation and backfilling process, but a thin layer of clean soil may have been placed on the site after backfilling. However, the 2-ft depth is the maximum required because 2 ft is the EPA-defined depth of "surface soils" (EPA 1989, 0088). Prior to packaging the sample, any metallic objects larger than 1 cm in length will be manually removed. If any objects are found that preclude sampling at a given location, an alternate sampling site will be selected within a 3-ft radius of the original location and documented in the field log by noting the revised location coordinates.

The soil samples will be analyzed for the analytes listed in Table 6-7 using the methods listed on Table II-1. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-8.

Sample sizes are the same as for the surface soils and are indicated in Table II-1. The sampling procedures to be used in the Phase I MDA Q sampling activity are also the same as for the surface soils and are listed in Table 6-9. The MDA Q samples will be handled in the same manner as previously described for the surface soil samples. A field log will also be maintained as previously described. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.2.7.5 Analysis of Sampling Results for MDA Q

The results of the MDA Q sampling will be used to help design *in situ* stabilization for the site. The metals buried at the site are expected to pose no contamination hazard to groundwater, and the results of the surface soil sampling will be used to determine whether a clean soil cover is needed for the site.

6.2.8 Phase II Sampling

Phase II sampling activities will be triggered in any sampling area where a soil sample is found to contain waste constituents exceeding both background levels and thresholds based on screening action levels as described in Chapter 4. Phase II activities may also be triggered if unexpected buried objects are found that could pose significant health risks.

If Phase II sampling is triggered, the analytical results obtained from the Phase I sampling will be reviewed to determine their adequacy in assessing risk and evaluating alternative corrective measures. If these data are found to be adequate, no additional field sampling will be performed. If these data are not adequate, additional sampling will be performed as required within the affected sampling area to characterize the release and provide sufficient information to complete a risk assessment and support analysis of alternative corrective measures. The specific Phase II sampling activities will be determined based upon the Phase I sampling results and will be described in a future document relating to this OU.

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6.3 GROUP 3: TECHNICAL AREA 8 ABANDONED BUNKER SITE

6.3.1 Group 3 Background

The TA-8 Abandoned Bunker Site contains 12 PRSs that fall into six type groupings. These consist of a process waste water outfall, two off-gas ventilation systems, three septic systems, three floor drains, a waste storage vessel, and two underground storage tanks. Most of these facilities remain in place, but all are no longer used and have been abandoned. The locations of these sites are shown in Figure 5-4.

6.3.2 Group 3 Sampling Strategy and Objectives

The sampling actions that will be taken on the TA-8 Abandoned Bunker Site PRSs are summarized in Table 6-10. With the exception of minor releases of petroleum products around the fill stems of the underground storage tanks that were cleaned when the tanks were removed, no documented releases of hazardous or radioactive wastes have occurred to the environment within the TA-8 Abandoned Bunker Site. As discussed below in greater detail, only a few of the PRSs in this group will be sampled as part of this work plan. Potential contamination at five of the PRSs is contained within buildings or other facilities, and there is no evident pathway for a significant release to the environment; sampling of these facilities will be deferred to the D&D process. Two of the PRSs are septic tanks where there is no history of the presence of hazardous or radioactive materials, nor is there any reason to believe that such materials could be present based on the piping systems within the buildings that the septic tanks served; no further actions are planned at these PRSs. The two underground storage tanks have been removed, their sites investigated for contamination, and minor amounts of waste constituents were removed; no further action is planned at these sites. Hazardous or radioactive wastes may have been released at the three remaining facilities, and these will be sampled.

Phase I sampling will be conducted at PRS 8-003(a), a septic tank that served several buildings where hazardous and possibly radioactive materials were used and may have entered the septic system; at PRS 8-009(a), the outfall for the sewer pipe discharging the aforementioned septic tank; and at PRS 8-005, an abandoned waste storage vessel that was used for experiments with potentially hazardous chemicals. Both the septic tank and waste storage vessel are believed to contain hazardous materials and both are planned to

TABLE 6-10

Group 3 Sampling Actions

PRS No.	Type of PRS	Sampling Action	Rationale for Sampling Action
8-001(a)	Off-Gas System	No sample	Defer to D&D
8-001(b)	Off-Gas System	No sample	Defer to D&D
8-003(a)	Septic System	Sample	Potential environmental release
8-003(b)	Septic System	No sample	No hazardous materials present
8-003(c)	Septic System	No sample	No hazardous materials present
8-004(a)	Drain Line	No sample	Defer to D&D
8-004(b)	Drain Line	No sample	Defer to D&D
8-004(c)	Drain Line	No sample	Defer to D&D
8-005	Storage Vessel	Sample	Potential environmental release
8-009(a)	Outfall	Sample	Potential environmental release
8-011(a)	Storage Tank	No sample	No hazardous material remaining
8-011(b)	Storage Tank	No sample	No hazardous material remaining

be removed as part of Phase I activities. Samples will be taken within the septic tank and vessel to characterize the wastes prior to removal and disposal. Samples will also be taken of the soil beneath the septic tank and at the tank outfall to determine whether a release has occurred that exceeds established action levels. The soil beneath the storage vessel will be inspected after the vessel is removed, and a sample will be taken if evidence of a release is found. The samples will be analyzed for representative indicator parameters that would be expected to have been retained in the tank or vessel and in the underlying soil. Phase II sampling activities would be triggered if any sample is found to exceed both background levels and the threshold levels described in Chapter 4.

The approaches to implementing this sampling strategy and evaluating the results are described in the following paragraphs. The sampling requirements for the septic tank are presented in Section 6.3.4, and the requirements for the storage vessel are presented in Section 6.3.5. Judgmental sampling will be favored for these PRSs because their locations are known and any associated environmental contamination is expected to be immediately beneath the septic tank or vessel.

Sampling of PRSs 8-001(a) and 8-001(b) will be deferred to D&D. The potentially hazardous contamination at these sites is in existing exhaust ventilation ducts and fans in two abandoned buildings that are planned for decontamination and decommissioning. The waste constituents would be in solid form, and with the buildings closed and locked, there is no mechanism for their transport to the environment. Given the lack of a potential for environmental contamination, the sampling of these facilities will be tailored to the needs of D&D for proper demolition and disposal.

Sampling of PRSs 8-004(a), 8-004(b), and 8-004(c) will also be deferred to D&D. These are all building drains that are potentially contaminated with hazardous chemicals. These drains are within and beneath abandoned buildings planned for demolition, and because they are no longer used, no significant quantities of liquids are present to mobilize any waste constituents that may have leaked from the drain pipes. These drain pipes will be sampled during the D&D process to assure their safe handling and disposal. The soils beneath the buildings and surrounding the drain pipes will be sampled for hazardous and radioactive contamination as part of the demolition process.

Potential Release Sites 8-003(b) and 8-003(c) are septic tanks that served a building used primarily for office purposes. Because no drains that could have received hazardous or radioactive materials were ever connected to these tanks, no further actions are planned. Also, no further actions are planned for the two underground petroleum product storage tanks PRS 8-011(a) and 8-011(b). Both of these tanks were removed in 1987, and the tanks and surrounding soils were inspected for leaks and contamination. At each tank, soil contamination was noted around the fill stem, and the contaminated soil was removed from the site. Additional discussion of these facilities for which no further actions are planned are presented in Chapter 7.

6.3.3 Group 3 Indicator Parameters

The indicator parameters for Group 3 PRSs are listed in Table 6-11. The waste constituents potentially in the waste streams serving the septic tank, [PRS 8-003(a)], and outfall, [PRS 8-009(a)], were from operations involving explosives and photo-processing as well as normal sanitary waste. In addition, small quantities of uranium were used in one

TABLE 6-11

Group 3 Indicator Parameters

PRS 8-003(a)- Contents Sampling in Septic Tank TA-8-59

Organic and Inorganic Parameters
- Chapter 4 Extended Analyte List VOCs
- Chapter 4 Extended Analyte List SVOCs
- Chapter 4 Extended Analyte List Inorganics

High Explosives
- TNT
- RDX
- HMX
- PETN
- Tetryl
- 2,4-Dinitrotoluene
- 1,3,5-Trinitrobenzene
- Explosive D

Radionuclides
- Gross Alpha
- Gross Beta

TCLP Analysis
Corrosivity
Reactivity
Ignitability
Compatibility

PRSs 8-003(a) and 8-009(a) - Soil and Sediment Sampling for Septic Tank TA-8-59

Inorganic
- Barium
- Beryllium
- Cadmium
- Chromium
- Cyanide
- Lead
- Mercury
- Nitrate
- Silver

TABLE 6-11 (continued)

Group 3 Indicator Parameters

PRSs 8-003(a) and 8-009(a) - Soil and Sediment Sampling for Septic Tank TA-8-59 (continued)

Organic
  Acetone
  Benzene
  Carbon Tetrachloride
  Chloroform
  Methylethylketone
  Toluene

High Explosives
  TNT
  RDX
  HMX
  PETN
  Tetryl
  2,4-Dinitrotoluene
  1,3,5-Trinitrobenzene
  Explosive D

Radionuclides
  Gross Alpha
  Gross Beta

PRS 8-005 - Contents Sampling in Waste Storage Vessel

Organic Parameters
  Chapter 4 Extended Analyte List SVOCs

TCLP Analysis
Corrosivity
Reactivity
Ignitability
Compatibility

PRS 8-005 - Soil Sampling Beneath Waste Storage Vessel

Organic Parameters
  Chapter 4 Extended Analyte List SVOCs

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of the buildings and may have entered the septic tank. The principal types of hazardous or radioactive materials that may have entered the tank include explosive compounds, organic solvents, acids, toxic metals, and uranium. The waste constituents potentially associated with the waste storage vessel at PRS 8-005 are limited to SVOCs because of the use of the vessel in experiments with organic chemicals.

The parameters that must be sampled in support of the removal actions are those that would pose a potential health hazard during removal and those that must be known for safe disposal. The information needs in support of the removals are greater than those required for Phase I sampling and include a broad suite of analytes from the Chapter 4 extended analyte list, selected HE, and gross alpha and beta scans for radionuclides. Analyses are also included for the waste characteristics of toxicity, corrosivity, reactivity, ignitability, and compatibility required by EPA prior to disposal of RCRA wastes. In addition, radioisotope assays may be required prior to disposal under DOE regulations if gross alpha or beta emissions exceed background levels.

The indicator parameters for the subsequent Phase I soil sampling beneath the facilities are those that would pose a potential health hazard and would be good indicators of a release. Such waste constituents would be relatively toxic, potentially present in quantity, would be relatively nondegradable in the environment, and would be retained in the soil.

Because the septic tank at PRS 8-003(a) could have received liquid waste discharges from a chemical laboratory, the contents samples from that tank will be analyzed for a broad suite of parameters from the Chapter 4 extended analyte list that could reasonably be expected to be present. The only exclusions from this analysis will be pesticides, herbicides, and PCBs, which were not used in the buildings served by the tank. Although a wide variety of explosive compounds were used and could have entered the septic tank, the eight basic explosives listed in Table 6-11 were most commonly used, and several of those are relatively persistent in the environment. Other explosives, such as dinitropropanol, NQ, and EDNA, were used in much smaller quantities, and may degrade rapidly in the environment. The principal components of the indicator explosives are identified in Chapter 4. Low quantities of radioactive waste constituents may also have been present in the waste from the reported presence of uranium in the laboratory and will be checked with gross alpha and gross beta scans.

The Phase I soil samples from beneath the PRS 8-003(a) septic tank and from the PRS 8-009(a) tank outfall will be taken only for the purpose of determining if a release has occurred and will therefore be analyzed for a more restricted set of parameters that would serve as good indicators of a release. If concentrations exceeding background and threshold levels are detected by the Phase I sampling, a more comprehensive sampling and analysis program will be conducted during Phase II. The Phase I soil indicator parameters are listed in Table 6-11. The soil samples will be analyzed for the same suite of eight basic explosives as the tank contents sample. The metals, anions, and organic solvents in the table are those that were used in the greatest quantity, would pose a potential health hazard, and would be good indicators of a release. Analyses for volatile organic solvents will be performed on the soils because they were covered by the tank and residual amounts may remain. The soil samples will also be checked for radioactivity with gross alpha and beta scans.

The waste storage vessel at PRS 8-005 is believed to contain a residue of SVOCs. The contents samples will be analyzed for the Chapter 4 extended analyte list SVOCs and for a variety of RCRA waste characteristics to provide information needed for disposal. In addition, analytical results will also be reported for the five greatest additional peaks (tentatively identified compounds not representing the Chapter 4 extended analyte list parameters). Analyses will not be performed for the remaining extended list parameters because only SVOCs are of primary concern; however, the TCLP leachate will be analyzed for both SVOCs and metals.

If evidence of a release from the storage vessel is found, the soil beneath the vessel will be sampled and analyzed for the same Chapter 4 extended analyte list of SVOCs as the vessel contents. High explosives and radionuclides were not used in the experiments and will not be sampled for in either the contents or the soil.

6.3.4 PRS 8-003(a)-Septic Tank and PRS 8-009(a)Outfall Sampling

6.3.4.1 Sampling and Analysis Strategy at PRSs 8-003(a) and 8-009(a)

Samples will be taken of the tank contents and associated soils at PRS 8-003(a). The contents will be sampled because of the likelihood of hazardous and possibly radioactive waste constituents, as previously described. The underlying soils will be sampled because reinforced-concrete basins of the type used for this facility may crack and leak. Also, the soil downstream of the outfall of the sewer line from the tank will be sampled because some waste constituents may have been transported to the outfall. This septic tank remains in place but is no longer used. The results of the contents sampling will be used in planning and executing removal and disposal of the tank; the results of the soil sampling will be used in determining whether additional environmental sampling will be required under a Phase II program. The tank may contain mixed hazardous and radioactive waste and will be removed only when adequate storage or disposal capacity is available. The soil beneath the tank will not be sampled until the tank is removed. A delay in sampling the underlying soil is not expected to result in an increased environmental risk because the tank and sewer line are no longer used and there is no large-volume source of liquids that could mobilize any waste constituents that may be present.

6.3.4.2 Sampling and Analysis Approach at PRSs 8-003(a) and 8-009(a)

The contents samples will be obtained from a sampling tube vertically bored or driven into the approximate center of the septic tank. It is anticipated that access to the 6-ft deep tank may be attained by removing the tank's cover and that the samples may be readily obtained by hand methods without entering the tank. If the tank must be entered, confined space entry procedures must be followed. The radioactivity levels in the tank are expected to be low, but the HE content or the possible presence of flammable gases may be sufficient to create an explosive hazard. The first action of the sampling crew will be to evaluate the explosive, chemical, and radioactive hazards of the tank. The tank will be opened by personnel with experience in handling explosives, under assumed explosive hazard conditions. This normally involves wetting the tank contents and surrounding area, using remote handling methods and nonsparking tools, and wearing appropriate protective clothing. The opening procedures adopted for this tank will be described in the field log book. The sampling approach presented in this work plan assumes that the tank will not present an explosive hazard. However, if the tank is found to present an explosive hazard, alternative sampling procedures will be implemented and described in the field log book.

The contents of the tank will be field-screened with hand-held instruments for evidence of radioactive or volatile organic waste constituents. The information obtained during this screening will be used to provide worker protection and an initial indication of the presence of waste constituents and may be used as appropriate to help interpret the sampling results. However, the data obtained from this screening are not expected to have quantitative value for the decisions required under this work plan.

The primary contents samples will be taken from the bottom part of the tank, to be representative of the sludge within the tank exclusive of any soils that may have been placed in the tank. In taking the samples, the bottom of the tank will not be pierced. Upon opening the top of the tank, the hole will be advanced by hand-driven sampling tubes, hollow-stem augering or equivalent method. The sides of the tank will be inspected for crystal growth, and a separate sample will be taken of any crystals that may be present. If feasible, the crystal growth sample will be of the same volume and analyzed for the same parameters as the sludge samples. The contents samples will be analyzed for the indicator parameters listed in Table 6-11. Any free liquids that may remain in the tank will be removed and separately sampled for the same parameters as the solid contents.

Upon removing the septic tank, the tank and underlying soil will be visually inspected and screened with the aforementioned field instruments for evidence of waste constituent release. Judgmental sites will then be selected for soil sampling at the most likely locations of a release. If no likely location for a release can be determined, the soil samples will be taken beneath the approximate center of the tank.

A surface soil sample will be taken at each selected sampling site using hand-sampling techniques. A soil gas sample will then be taken from a hollow probe driven approximately 3 ft into the ground at the same location as the surface sampling site. The soil gas sample will be analyzed in the field using a portable gas chromatograph to identify any VOCs that may be present. Organic materials would have been present in the septic tank, and organic solvents are reported to have been present in the waste stream that passed through the tank, but the organic solvents would be expected to have volatilized and dissipated during the 20 or more years since the tank was last used. The soil gas sample is expected to be drawn from a radius several feet larger than the radius of the soil sample and should provide information representative of a larger soil volume than would the soil samples.

After the soil gas sample is taken, an approximately 8-ft deep hole will be bored by augering or equivalent method at the sampling site, and a sample of the lower 5 ft of that hole will be taken using a 5-ft long, split-barrel sampler inside the auger stem. These samples are expected to be taken within the area of a contaminant plume beneath the tank that would have resulted from a significant release of waste water and should provide representative information on the concentrations of any indicator parameters that are retained in the soil. Following sampling, each borehole will be filled to ground surface in accordance with LANL-ER-SOP-1.06. However, the hole remaining from excavation of the septic tank will not be filled until it is determined whether the underlying soil was contaminated.

Discharge from the septic tank was conducted by an underground pipe to a storm sewer system that discharged to the environment at an outfall located on the east side of Anchor Ranch Road. Surface soil samples will be taken at the point of discharge of this outfall and analyzed for the same parameters as the soil beneath the tank. Soil gas samples will not be taken at this location because VOCs would not be expected to remain in the surface soils.

6.3.4.3 Selection of Sampling Sites at PRSs 8-003(a) and 8-009(a)

The locations of the PRS 8-003(a) septic tank and the PRS 8-009(a) outfall are shown in Figure 6-6. Two contents samples will be taken from the tank, and soil gas and soil samples will be taken at two judgmental locations beneath the bottom of the tank, as previously described. In addition, two surface samples will be taken of the upper foot of sediments in the bottom of the former discharge ditch approximately 3 and 6 ft downstream from the easternmost toe of the gravel road embankment. The gravel road embankment presently covers the end of the outfall pipe, which cannot be seen.

6.3.4.4 Sampling Activity at PRSs 8-003(a) and 8-009(a)

The soil gas samples will be analyzed in the field for VOCs using a portable gas chromatograph, and the results will be documented in the field log book. The soil and sediment samples will be analyzed for the indicator parameters listed in Table 6-11 using the methods listed on Table II-1 in Annex II of this work plan. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP for OU 1157. The types of quality assurance samples and the minimum numbers of samples are summarized in Table 6-12. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

Sample size requirements are presented in Table II-1 for the indicator parameters identified in Table 6-11. Because of the potential presence of VOCs and HE, the contents samples will be given minimum handling prior to sealing in sample jars and will not be homogenized by mixing.

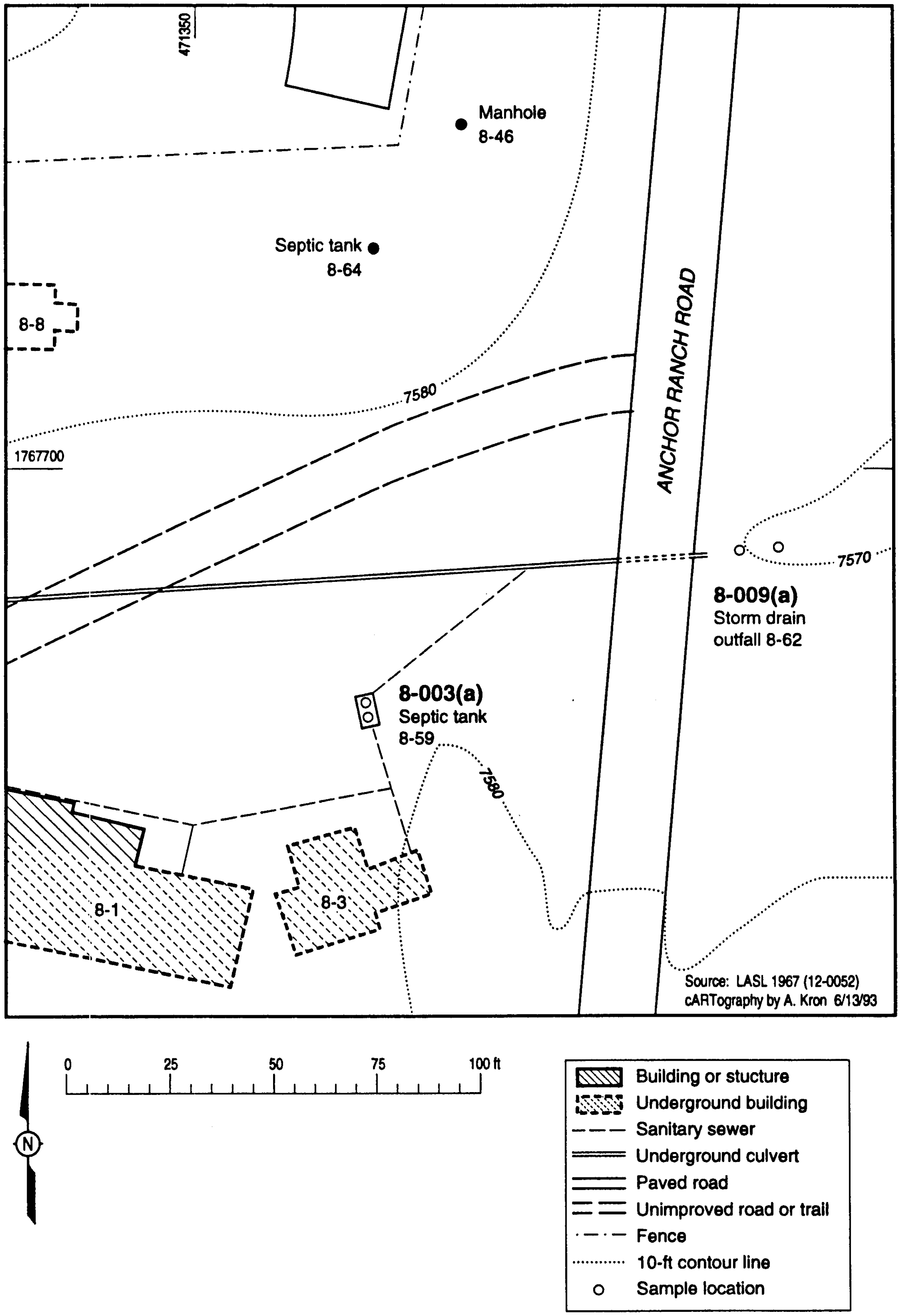

Figure 6-6. Sample locations for PRSs 8-003(a), septic tank, and 8-009(a), storm drain outfall.

TABLE 6-12

Group 3 Sampling Types

PRS	Number of Site Samples	Expected Number of QA Samples[a]	Total Samples
PRS 8-003(a) Septic Tank Contents Sample			
Sludge	2		
Wall Crystals	2	4[b]	8[b]
PRSs 8-003(a) and 8-009(a) Septic Tank Soil and Sediment Samples			
Soil Gas	2	3	5
Soil	4	4[c]	8
Sediment	2	3[c]	5
PRS 8-005 STORAGE VESSEL Contents Sample			
Sludge	1	3	4
PRS 8-005 STORAGE VESSEL Soil Sample			
Soil	2	3	5

a Sampling sites to be selected by Field Team Leader.
Field Blank: One during each sampling activity for each medium.
Trip Blank: One per analytical laboratory shipping container, for VOC analysis only.
Duplicate Sample: One during each sampling activity for each medium.
Equipment (Rinsate) Blank: One during each sampling activity for each medium.
b Aggregate number of QA samples for both wall and sludge samples.
c The same QA samples may be used for both soil and sediment samples if collected during the same sampling round.

A sufficient volume of soil for both samples and duplicates should be readily obtainable from hand sampling and from the 5-ft-long soil columns that will be collected with the split-barrel sampler beneath the septic tank. Because the required sample size is expected to be considerably smaller than the soil volume available from the sampler, the soil selected for laboratory analysis will be taken from the part of the sampler soil column with the greatest concentration of waste constituents, as determined from direct field observation and screening methods. The methods used to select the sampled interval and its depth below ground surface will be documented in the field log. Because of the potential presence of VOCs and HE, the surface soil sample will be taken within 24 hours following tank removal. All soil samples will be given minimum handling prior to sealing in sample jars and will not be homogenized by mixing.

The procedures to be used in the contents and Phase I soil sampling activities for the septic tank are listed in Table 6-13. Some procedures may only apply to the contents sampling, and others may only apply to the soil or sediment sampling. Alternative sampling procedures are provided on the table, and those most appropriate for the observed field conditions will be selected by the Field Team Leader. These procedures are drawn from the generic lists presented in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any drilling or sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the quality assurance requirements presented in the QAPjP for OU 1157 and with the ER Program SOPs providing general sampling instructions.

A field log will be maintained during the septic tank contents and soil sampling activities as described in Chapter 4. In addition to the standard contents, the log will present a geologic log of the soil sampling hole based upon the drill cuttings. Any borehole cuttings, sample residuals, or fluids suspected to be contaminated and all waste decontamination solutions produced during the drilling and sampling operations will be disposed of in accordance with LANL-ER-SOP-01.6 (LANL 1992, 0688).

6.3.4.5 Analysis of Sampling Results at PRSs 8-003(a) and 8-009(a)

The results of the contents analyses will be used to plan and implement removal and proper disposal of the septic tank. The specific elements of that plan, and the manner in which the sampling results are used to develop the plan, will be separately described in the removal plan for the tank. The results of the contents sample analyses will not be indicative of environmental contamination and will not be used in triggering Phase II activities.

The results of the soil and sediment analyses will be compared with background and threshold levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated soil or sediment sampling result is found to exceed both background and threshold levels. The results of the soil gas analyses are intended to provide a general indication of the presence of volatile organics and will not be used to trigger Phase II activities.

TABLE 6-13

PRSs 8-003(a) and 8-009(a) Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Soil Gas Sampling	LANL-ER-SOP-3.03[a]
Drilling Methods and Drill Site Management	LANL-ER-SOP-4.01
General Borehole Logging	LANL-ER-SOP-4.04
Spill Control During Drilling	TBD[b]
Sampling for Volatile Organics	LANL-ER-SOP-6.03
Soil Water Samples	LANL-ER-SOP-6.05
Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-6.09
Hand Auger and Thin-Wall Tube Sampler	LANL-ER-SOP-6.10
Soil and Rock Borehole Logging and Sampling	LANL-ER-SOP-6.12[a]
Trier Samples for Sludges and Moist Powders or Granules	LANL-ER-SOP-6.17
Portable GC for Field Screening of VOCs	LANL-ER-SOP-10.02[a]
Hand-Held Instruments for Field Screening of VOCs	TBD[b]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[b]
Field Logging, Handling, and Documentation of Borehole Materials	LANL-ER-SOP-12.01[a]
Curatorial Sample Management	See Chapter 4

a Procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

b Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

6.3.5 Potential Release Site 8-005-Waste Storage Vessel

6.3.5.1 Sampling and Analysis Strategy at PRS 8-005

Samples will be taken of the storage vessel contents for characterization prior to disposal. This vessel has been removed from its original location, which may have been in a building, and abandoned in an unused outside area west of Building TA-8-2. The vessel is standing upright and shows no evidence of having leaked any of its contents to the underlying soil. The vessel and underlying soil will be closely inspected for potential releases when it is removed, and judgmental soil samples will be taken if evidence of a release is found. The results of the contents sampling will be used in planning and executing removal and disposal of the vessel; the results of the soil sampling will be used in determining whether additional environmental sampling will be required under a Phase II program.

6.3.5.2 Sampling and Analysis Approach at PRS 8-005

The contents sample will be obtained by manually removing residual material from the interior of the vessel. The sample will be taken from the wax-like substance on the bottom of the vessel. The material will be visually inspected for evidence of zonation during sampling, and the sample will be composited in proportion to the relative volumes of material from any zones of different apparent composition that may be present. The contents sample will be analyzed for the indicator parameters listed in Table 6-11. Any free liquids that may be present in the tank at the time of sampling will be removed and separately sampled for the same parameters as the solid contents.

The contents of the vessel will be field-screened with hand-held instruments for evidence of radioactive or volatile organic waste constituents as they are retrieved. No radioactive or volatile waste constituents are expected; however, if significant levels of such waste constituents are indicated by the field screening, the indicator parameters listed in Table 6-11 will be modified. The information obtained during this screening will be used to provide worker protection and an initial indication of the presence of waste constituents and may be used as appropriate to help interpret the sampling results. However, the data obtained from the screening are not expected to have quantitative value for the decisions required under this work plan.

Upon removing and examining the storage vessel for leaks, the underlying soil will be visually inspected and screened with the aforementioned field instruments for evidence of waste constituent release. The inner vessel liner appears to have been made of nonferrous materials and appears to be intact. The lack of a release is supported by the condition of the vegetation beneath and around the vessel, which is continuous and does not appear to have been stressed. However, if evidence of a release is found upon closer inspection, two judgmental sites will be selected for surface soil sampling at the most likely locations of that release. The soil will be homogenized by mixing prior to sampling to help assure a more representative sample. If no evidence of a release is found, the soil beneath the vessel will not be sampled.

Surface soil samples will be taken rather than borehole samples because of the lack of continuous, large volumes of liquids in contact with the vessel that could have caused deep migration of waste constituents. Soil gas samples will not be taken because VOCs are not expected, and any that would have been present would have volatilized during the approximately 20 years since the vessel was last used. Hand methods will be used to collect the samples.

6.3.5.3 Selection of Sampling Sites at PRS 8-005

The present location of the waste storage vessel is shown in Figure 5-4. One contents sample will be taken from the vessel, and two soil samples of the upper 6 in. of soil may be taken at a judgmental location beneath the vessel, as previously described. The volume of waste materials in the vessel appears to be insufficient to support a second sample.

6.3.5.4 Sampling Activity at PRS 8-005

The samples will be analyzed for the parameters listed in Table 6-11 using the methods listed on Table II-1. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the minimum numbers of samples are summarized in Table 6-12. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader. Sample size requirements are presented in Table II-1 for the analytes identified in Table 6-11.

The procedures to be used in the contents and Phase I soil sampling activities for the waste storage vessel are listed in Table 6-14. Alternate procedures are provided for both the contents and soil sampling, to provide for flexibility in the field. The procedures to be followed will be selected by the Field Team Leader and documented with selection rationale in the field logbook. These procedures are drawn from the generic lists presented in Chapter 4. The storage vessel samples will be handled in the same manner as described above for the septic tank samples. A field log will be maintained as described in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

TABLE 6-14

PRS 8-005 Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-6.09
Stainless Steel Surface Soil Sampler	LANL-ER-SOP-6.11
Trier Samples for Sludges and Moist Powders or Granules	LANL-ER-SOP-6.17
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

6.3.5.5 Analysis of Sampling Results at PRS 8-005

The results of the contents analyses will be used to plan and implement removal and proper disposal of the storage vessel. The specific elements of that plan and the manner in which the sampling results are used in developing the plan will be separately described in the removal plan for the storage vessel. The results of the contents sample analyses will not be indicative of environmental contamination and will not be used in triggering Phase II activities.

The results of the soil analyses will be compared with background and threshold levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated soil sampling result is found to exceed background and threshold levels.

6.3.6 Phase II Sampling

Phase II sampling activities will be triggered at a site if any validated soil sample from that site is found to contain waste constituents exceeding both background levels and threshold levels based on screening action levels as described in Chapter 4. The specific Phase II sampling activities will be determined based upon the Phase I sampling results and will be described in future documents relating to this OU.

6.4 GROUP 4: TECHNICAL AREA 9 ACTIVE SITES

6.4.1 Group 4 Background

The TA-9 active sites comprise 30 PRSs and include process waste water sumps, septic systems, a lagoon and sand filter, and waste container storage areas. None of these facilities have been decommissioned and most are in current use. The locations of these sites are shown in Figure 5-6.

6.4.2 Group 4 Sampling Strategy and Objectives

A variety of sampling actions will be taken on the TA-9 active sites and are summarized in Table 6-15. Of the 30 PRSs in this group, five [9-009; 9-010 (a) and (b); and 9-011(b) and (c)] will be sampled under this work plan. Of the remaining sites, 15 will be deferred to D&D, and 10 have no waste constituents present. The rationale for these actions is summarized in the table and discussed in further detail in this sampling and analysis plan.

It is not known whether environmental contamination has occurred at the PRSs planned to be sampled. The objective of this sampling is therefore to determine whether a release has occurred that exceeds established threshold levels for the types of chemical waste constituents that are likely to have been present. The Phase I sampling effort will generally focus on potential soil contamination from early site practices. The outfall at PRS 9-009 has an NPDES permit, is regularly monitored, and meets the permit standards. The waste water presently being discharged from this outfall will therefore not be sampled under this work plan. Soil samples will be taken at the outfall and at the PRS 9-010(a) and (b) and 9-011(b) and (c) storage areas and will be analyzed for representative indicator parameters that would be expected to have been retained in the soil. Because of the limited surface areas and known locations of the potentially contaminated sites, judgmental sampling will be conducted at these locations. Phase II sampling activities would be triggered if any sample is found to exceed the threshold levels described in Chapter 4.

Potential Release Site 9-003(f) is a settling tank that served Building TA-9-51 for a two-year period from 1948 to 1950 before it was removed. No hazardous or radioactive waste materials were used in this building that could have resulted in environmental

TABLE 6-15

Group 4 Sampling Actions

PRS No.	Type of PRS	Sampling Action	Rationale for Sampling Action
9-003(f)	Settling Tank	No sample	No contaminants present
9-004(a)	Settling Tank	No sample	Defer to D&D
9-004(b)	Settling Tank	No sample	Defer to D&D
9-004(c)	Settling Tank	No sample	Defer to D&D
9-004(d)	Settling Tank	No sample	Defer to D&D
9-004(e)	Settling Tank	No sample	Defer to D&D
9-004(f)	Settling Tank	No sample	Defer to D&D
9-004(g)	Settling Tank	No sample	Defer to D&D
9-004(h)	Settling Tank	No sample	Defer to D&D
9-004(i)	Settling Tank	No sample	Defer to D&D
9-004(j)	Settling Tank	No sample	Defer to D&D
9-004(k)	Settling Tank	No sample	Defer to D&D
9-004(l)	Settling Tank	No sample	Defer to D&D
9-004(m)	Settling Tank	No sample	Defer to D&D
9-004(n)	Settling Tank	No sample	Defer to D&D
9-004(o)	Settling Tank	No sample	Defer to D&D
9-005(b)	Septic System	No sample	No contaminants present
9-005(c)	Septic System	No sample	No contaminants present
9-005(e)	Septic System	No sample	No contaminants present
9-005(f)	Septic System	No sample	No contaminants present
9-005(g)	Septic System	No sample	No contaminants present
9-005(h)	Septic System	No sample	No contaminants present
9-007	Waste Water Sump	No sample	No sources of contamination
9-009	Lagoon and Sand Filters	Sample	May be contaminated
9-010(a)	Storage Area	Sample	May be contaminated
9-010(b)	Storage Area	Sample	May be contaminated
9-010(c)	Storage Area	No sample	9-010(c) is same as 9-010(a)
9-011(a)	Storage Area	No sample	Permitted under RCRA
9-011(b)	Storage Area	Sample	May be contaminated
9-011(c)	Storage Area	Sample	May be contaminated

contamination, and no such materials could therefore have entered the settling tank. No further action is required for this PRS.

The 15 PRSs, 9-004(a) through (o), are active settling tanks for process waste water streams. All are reinforced concrete basins with internal, watertight aluminum liners that are expected to be contaminated with HE, metals, and possibly other waste constituents. The purpose of the liners is to contain the waste water and prevent its contact with the concrete basins. The liners are periodically cleaned and checked. Three of these liners [in PRSs 9-004(a), (b) and (e)] have been found to leak and were replaced. None of the liners are currently leaking, thus there is no driving force to mobilize any waste constituents that may have been released by the earlier leaks. These settling tanks will be decommissioned at a later date when they are no longer needed. The soils beneath each of them will be checked for contamination at that time.

The seven PRSs, 9-005 (b), (c), (e), (f), (g), and (h), and PRS 9-007, are septic tanks or sumps that served parts of buildings where no hazardous or radioactive materials were used or generated. Although parts of these buildings were also used for laboratories, the labs had separate process waste water disposal systems and were physically separated from the sanitary facilities and office portions of the buildings. Only sanitary wastes would have been present in these tanks, and no further action is required. Septic Tanks PRS 9-005(a) and (d) are being sampled with the Group 5 sites. The facilities for which no further actions are planned are described in detail in Chapter 7.

Potential Release Site 9-010(c) is a waste container storage area that was identified as being at the same location as PRS 9-010(a). These two PRSs have been determined to be the same facility, and only PRS 9-010(a) will be addressed in this work plan.

Potential Release Site 9-011(a) is operated under the Laboratory's RCRA permit as a satellite waste storage area and is, therefore, being monitored under a separate program.

6.4.3 Group 4 Indicator Parameters

The indicator parameters for Group 4 PRSs are listed in Table 6-16. The waste constituents potentially in the process waste stream and at the storage sites vary depending upon the facility operations and the types of waste materials handled. The lagoon and sand filters at PRS 9-009 were used to treat sanitary waste waters from TA-8 and TA-9 but may have received hazardous materials from a ^{90}Sr spill in TA-8. Strontium-90 will be used as an indicator parameter for potential contaminants from this source. Potential Release Site 9-010(a) was a storage rack for organic solvents. Potential Release Site 9-011(c) includes a similar storage rack site, as well as where HE-contaminated equipment was stored and steam-cleaned. Some solvents may have been released to the underlying soils, and the sites of these facilities will be sampled for HE and the Chapter 4 extended analyte list VOCs and SVOCs. Potential Release Site 9-010(b) is similar in construction to 9-010(a) and served buildings with similar uses; all of these

TABLE 6-16

Group 4 Indicator Parameters

PRS 9-009 Lagoon and Sand Filters

Radionuclides
- Strontium-90

PRSs 9-010(a) and (b) and PRS 9-011(c) Storage Areas

Organic Parameters
- Chapter 4 Extended Analyte List SVOCs
- Chapter 4 Extended Analyte List VOCs

High Explosives
- TNT
- RDX
- HMX
- PETN
- Tetryl
- 2,4-Dinitrotoluene
- 1,3,5-Trinitrobenzene
- Explosive D

PRS 9-011(b) Storage Area

High Explosives
- TNT
- RDX
- HMX
- PETN
- Tetryl
- 2,4-Dinitrotoluene
- 1,3,5-Trinitrobenzene
- Explosive D

facilities will be assumed to have stored the same types of chemicals. The dimensions of the storage rack at PRS 9-011(c) are not known but are assumed to be approximately the same as those for PRSs 9-010(a) and 9-010(b) because the purpose of the structure was similar. Potential Release Site 9-011(b) is an area used to store HE-contaminated equipment. Some releases to the underlying soil may have occurred, and the site of this facility will be sampled for HE contamination.

Although a wide variety of compounds was used or stored at the TA-9 active area facilities, those that were used or produced in the greatest quantity would pose a potential health hazard and would be good indicators of a release. These compounds were selected for analysis during Phase I sampling. Other compounds may also be present and would be sampled during site characterization if the indicator parameters are found to be present in sufficiently high concentrations to trigger Phase II sampling.

6.4.4 Potential Release Site 9-009-Lagoon and Sand Filters

6.4.4.1 Sampling and Analysis Strategy at PRS 9-009

Before the connection to the sanitary wastewater systems consolidation line in December 1992, waste water flowed first into the lagoon, then into the sand filters, and finally to a permitted outfall where it was released to the environment. In September 1992, the discharge from this outfall was observed to combine with that of other TA-9 outfalls to support a live stream in the canyon immediately north of the outfalls. For reference purposes, this canyon will be called Arroyo de LaDelfe in this work plan. This arroyo is a tributary to Pajarito Canyon, and the stream was observed to flow at a rate of about 4 gpm from the area of the outfalls to Pajarito Canyon, where it commingled with water originating in upstream springs. The upstream springs are further described in Section 6.7 of this work plan. The lagoon has a bentonite bottom that minimizes losses to the underlying soil and provides good sorptive capacity for many parameters. The sorptive capacity of the sand in the filters would not be expected to be as good, and the filters are downstream from the lagoon. If waste constituents had entered the system, they would be expected to be present in greatest concentrations in the lagoon, and traces would be expected to be present at all locations in the lagoon bottom sediments. Phase I sampling will therefore address the sediments in the lagoon.

6.4.4.2 Sampling and Analysis Approach at PRS 9-009

Samples will be taken of the top 6 in. of the clay and sludge at the bottom of the lagoon. The samples will be field-screened with hand-held instruments for evidence of radioactive or volatile organic waste constituents. The information obtained during this screening will be used to provide worker protection and an initial indication of the presence of waste constituents and may be used as appropriate to help interpret the sampling results. However, the data obtained from this screening are not expected to have quantitative value for the decisions required under this work plan.

6.4.4.3 Selection of Sampling Sites at PRS 9-009

Two samples will be taken on the long axis of the lagoon, one near the inlet pipe and one at the center of the lagoon. The locations of the sampling points will be documented in the field log book by photographs showing their locations relative to the inlet pipe, and by noting their distances and directions from the end of the pipe. The sampling locations are shown in Figure 6-7.

6.4.4.4 Sampling Activity at PRS 9-009

The samples will be analyzed for ^{90}Sr using the method listed in Table II-1 in Annex II of this work plan. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the minimum numbers of samples are summarized in Table 6-17. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The required sample volume is shown in Table II-1. The sampling procedures to be used are listed in Table 6-18. Waste water may be present in the lagoon at the time of sampling. The Field Team Leader may choose the most appropriate sampling method for the field conditions at the time of sampling. The collected samples will be homogenized by mixing, and final samples representative of average conditions at the sampling sites will be drawn from the homogenized mixtures.

The procedures are drawn from the generic lists presented in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the quality assurance requirements presented in the QAPjP for OU 1157 and with the ER Program SOPs providing general sampling instructions.

A field log will be maintained during the lagoon sampling activities as described in Chapter 4. Any sample residuals and all waste decontamination solutions produced during the sampling operations will be disposed of in accordance with LANL-ER-SOP-1.06 (LANL 1992, 0688).

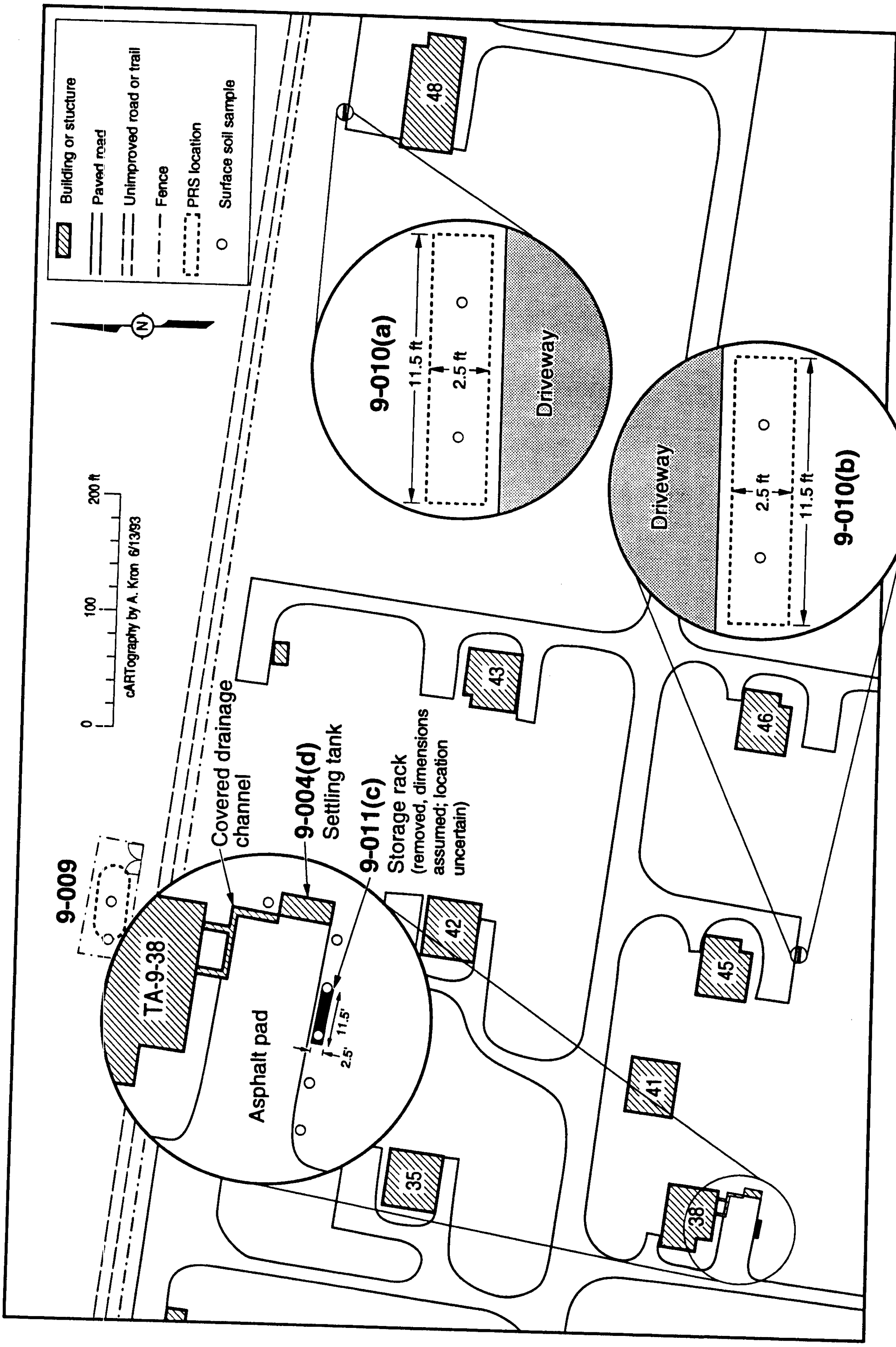

Figure 6-7. Sampling locations for PRSs 9-009, 9-010(a) and (b), and 9-011(c).

TABLE 6-17

Group 4 Sampling Types

Medium	Number of Site Samples	Expected Number of QA Samples[a]	Total Samples
PRS 9-009 LAGOON			
Clay/Sludge	2	3	5
PRS 9-010 (a) and (b) and PRS 9-011(c) STORAGE AREAS			
Soil	10	4[b]	14
PRS 9-011(b) STORAGE AREA			
Soil	2	3[b]	5

a Field Blank: One per sampling group.
Duplicate Sample: One per sampling group.
Trip Blank: One per analytical laboratory shipping container, for VOC analysis only.
Equipment (Rinsate) Blank: One per sampling group.

b The QA samples for the storage areas may be shared if all samples are collected in the same sampling round.

6.4.4.5 Analysis of Sampling Results at PRS 9-009

The results of the sampling will be compared with background and threshold levels as described in Chapter 4. Phase II activities will be triggered if any validated sampling result is found to exceed both background and threshold levels for ^{90}Sr and additional sampling will be conducted to determine the extent of contamination in the lagoon, sand filters, and soils at the point of release. If the threshold level is not exceeded, no additional actions will be taken.

TABLE 6-18

PRS 9-009 Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-6.09
Hand Auger and Thin-Wall Tube Sampler	LANL-ER-SOP-6.10
Sediment Material Collection	LANL-ER-SOP-6.14
Trier Samples for Sludges and Moist Powders or Granules	LANL-ER-SOP-6.17
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

6.4.5 Potential Release Sites 9-010(a) and (b) and PRS 9-011(c)-Storage Areas

6.4.5.1 Sampling and Analysis Strategy at PRS 9-010(a) and (b) and PRS 9-011(c)

Potential Release Sites 9-010(a) and (b) and PRS 9-011(c) have similar potential contaminants and will be sampled in the same manner. All are storage areas where HE and organic solvents may have been released to the soil. The storage racks at PRS 9-010(b) and 9-011(c) have been removed, and the rack at PRS 9-010(a) is still in place. Although two of these racks have been removed, the underlying soil may be contaminated and will be sampled for HE, VOCs, and SVOCs as indicator parameters. Because the remaining storage rack is on short legs, soil samples may be collected beneath it. In addition, soil samples will be taken around the downslope perimeter of the asphalt pad at PRS 9-011(c) and analyzed for the same suite of parameters.

6.4.5.2 Sampling and Analysis Approach at PRSs 9-010(a) and (b) and PRS 9-011(c)

Samples will be taken of the upper 6-in. of soil at each PRS and analyzed for HE and SVOCs. In addition, samples will be taken for VOCs from a depth of about 12 in. These sampling depths were selected because the waste constituents would have originally been deposited on and sorbed to the upper surface of the soil. If contamination is found, the surface soil will be removed from the site to a minimum depth and width of 3 ft, and three additional random samples will be taken to confirm that the site is clean. The samples and sampling sites will be field-screened with hand-held instruments for the presence of VOCs or radioactive materials.

6.4.5.3 Selection of Sampling Sites at PRSs 9-010(a) and (b) and PRS 9-011(c)

Two samples will be taken at the sites of the storage racks at PRSs 9-010(a) and (b). The samples will be preferentially taken at locations showing soil staining, detection by field-screening instruments, or other evidence of a release. If no evidence of a release is found, the samples will be taken at approximately equally spaced distances along the length of the rack. The approximate sampling locations are shown in Figure 6-7. The final sampling locations will be documented in the field log.

At PRS 9-011(c), the soil may have been contaminated by runoff from the asphalt pad used as an equipment cleaning and storage area, as well as by leakage from the solvent storage rack. Because of this and because the rack has been removed and its location is uncertain, samples will be taken along the entire downslope perimeter of the asphalt pad. One sample will be taken at the eastern end of the pad in a shallow depression immediately north of an existing settling tank. Five additional samples will be taken at 10 ft intervals along the south side of the pad, beginning about 3 ft west of the settling tank. This spacing will assure that at least one sample will be taken beneath the former site of the solvent storage rack. No stained soil was observed at this PRS to serve as a basis for judgmental sampling. Also, no significant fractures were evident in the asphalt pad, and the bulk of any constituents that may have been released would be expected to have migrated laterally to the adjacent soil rather than vertically through the pad.

6.4.5.4 Sampling Activity at PRSs 9-010(a) and (b) and PRS 9-011(c)

Samples will be taken of potentially contaminated soils using hand sample collection techniques and analyzed for HE, VOCs, and SVOCs using the methods listed in Table II-1. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-17. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The sampling procedures to be used are listed in Table 6-19. The Field Team Leader may choose the most appropriate sampling method for the field conditions at the time of sampling. The collected samples for HE and SVOCs will be homogenized by mixing, and a final sample representative of average conditions at the sampling site will be drawn from the homogenized mixture. The samples for VOCs will not be homogenized by mixing and will be handled so as to minimize volatilization of any waste constituents present. The soil samples will be handled in the same manner as previously described for the lagoon samples. A field log will be maintained as previously described. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.4.5.5 Analysis of Sampling Results at PRSs 9-010(a) and (b) and PRS 9-011(c)

The results of the soil analyses will be compared with background and threshold levels as described in Chapter 4. If the established background and threshold levels are exceeded, the contaminated soils will be collected and removed for proper disposal as a VCA. Any removal actions will be documented in a VCA Report. If the threshold levels are not exceeded, no additional sampling will be performed.

TABLE 6-19

PRSs 9-010(a) and (b) and PRSs 9-011(b) and (c) Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Sampling for Volatile Organics	LANL-ER-SOP-6.03
Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-6.09
Hand Auger and Thin-Wall Tube Sampler	LANL-ER-SOP-6.10
Stainless Steel Surface Soil Sampler	LANL-ER-SOP-6.11
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

6.4.6 Potential Release Site 9-011(b)-Storage Area

6.4.6.1 Sampling and Analysis Strategy at PRS 9-011(b)

Potential Release Site 9-011(b) was a 10-ft square, fenced corner of an asphalt-paved, outdoor parking lot used to store HE-contaminated equipment prior to flashing. Although the area is no longer used for storage, the soil at the edge of the asphalt may have been contaminated and will be sampled for the eight basic explosives as indicator parameters. These explosives are those most commonly used at the Laboratory, and some are relatively persistent in the environment. The threshold level of a single constituent is equal to its screening action level. The threshold level for multiple constituents is determined as described in Appendix J of the IWP.

6.4.6.2 Sampling and Analysis Approach at PRS 9-011(b)

The site was visually inspected at the time the fence was removed, and no evidence of contamination was seen. Two surface samples will be taken of the upper 6 in. of soil along the sides of the asphalt pad at the location of the storage area. This sampling depth was selected because waste constituents from the storage area would have originally been deposited on and sorbed to the upper surface of the soil. If HE contamination is found, the surface soil will be removed for a 20-ft distance along each side of the affected parking lot corner to a minimum depth and width of 3 ft, and three additional random samples will be taken to confirm that the site is clean. The samples and sampling sites will be field-screened with hand-held instruments for the presence of VOCs or radioactive materials.

6.4.6.3 Selection of Sampling Sites at PRS 9-011(b)

The two sampling sites are located along the two sides of the parking lot, each 5 ft from the affected corner. Their locations are shown in Figure 6-8. Alternative sampling sites in the vicinity of those shown in the figure may be selected by the Field Team Leader if unanticipated field conditions arise. The sampling locations will be documented in the field log.

6.4.6.4 Sampling Activity at PRS 9-011(b)

Samples will be taken of potentially contaminated soils using hand sample collection techniques and analyzed for HE using the method listed on Table II-1. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-17. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The sampling procedures to be used are listed in Table 6-19. The Field Team Leader may choose the most appropriate sampling method for the field conditions at the time of sampling. The collected sample will be homogenized by mixing, and a final sample representative of average conditions at the sampling site will be drawn from the homogenized mixture. The soil samples will be handled in the same manner as described above for the lagoon samples. A field log will be maintained as previously described in

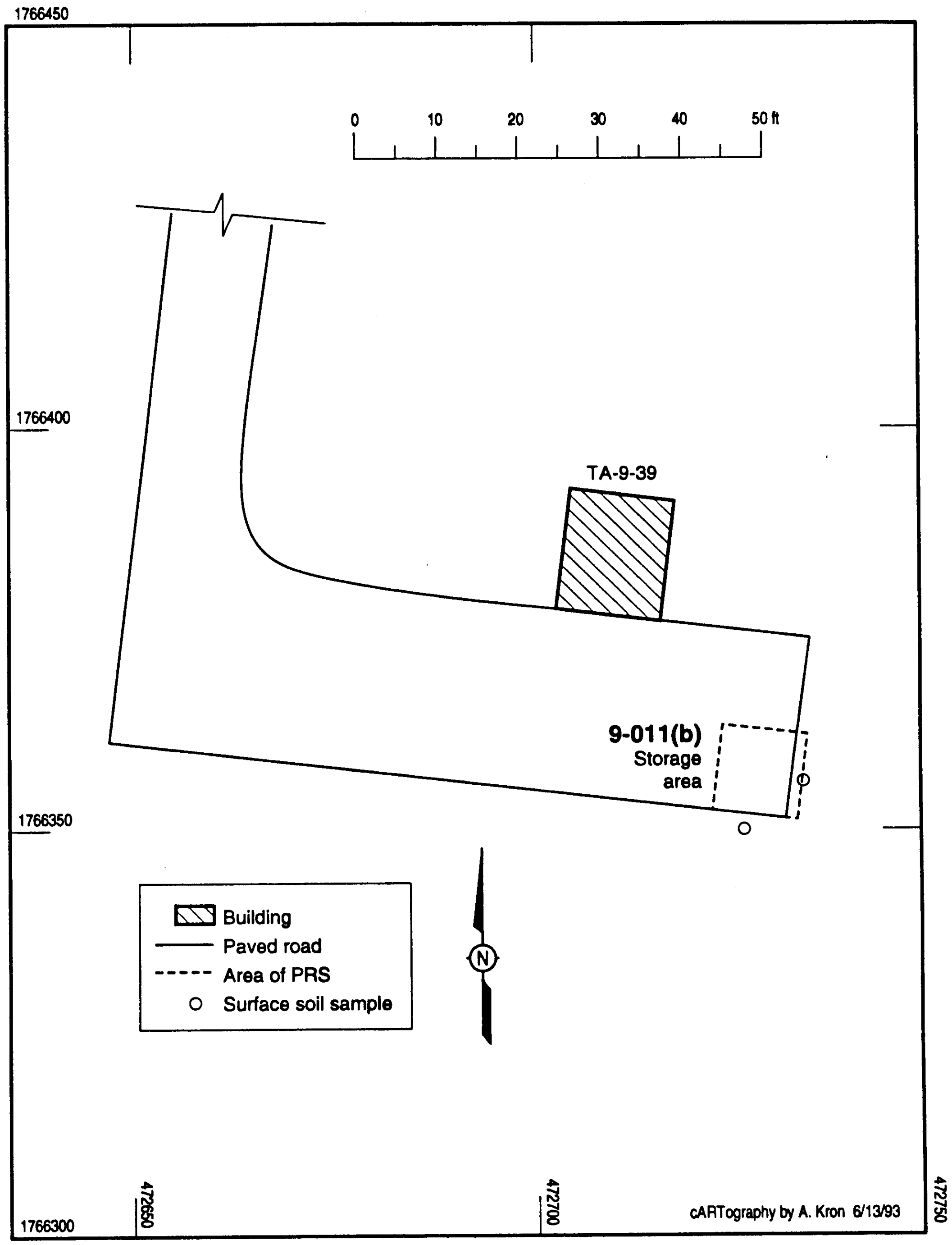

Figure 6-8. Sample locations for PRS 9-011(b), storage area.

Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.4.6.5 Analysis of Sampling Results at PRS 9-011(b)

The results of the soil analyses will be compared with background and threshold levels as described in Chapter 4. If the established background and threshold levels are exceeded, the contaminated soils will be collected and removed for proper disposal as a VCA. Any removal actions will be documented in a VCA Report. If the threshold levels are not exceeded, no additional actions will be taken.

6.4.7 Phase II Sampling

Phase II sampling activities will be triggered at PRS 9-009 if any sample is found to contain waste constituents exceeding both background levels and thresholds based on screening action levels as described in Chapter 4. The specific Phase II sampling activities will be determined based upon the Phase I sampling results and will be described in future documents relating to this OU. Any indicator parameters exceeding background and threshold levels will trigger VCAs at PRSs 9-010(a) and (b) and at PRSs 9-011(b) and (c); no Phase II sampling at these sites is anticipated.

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6.5 GROUP 5: TECHNICAL AREA 9 DECOMMISSIONED AREA

6.5.1 Group 5 Background

The TA-9 Decommissioned Area contains 16 PRSs, of which seven are settling tanks and sumps for industrial process waste streams, three are septic systems primarily associated with sanitary wastes, two refer to an oxidation pond for sanitary wastes, one is a reported waste pit of which very little is known, one is a firing site, one is an electrical control manhole, and one is an underground petroleum product storage tank. Most of the structures associated with these facilities were removed during decontamination and decommissioning of the area in 1965. The locations of these sites are shown in Figure 5-10.

6.5.2 Group 5 Sampling Strategy and Objectives

A summary of the sampling actions for the Group 5 PRSs is presented in Table 6-20. The waste water lagoon designated as PRS 9-008(a) is the same as the oxidation pond [PRS 9-008(b)] addressed in this sampling plan. No documented releases of hazardous or radioactive wastes have occurred to the environment within the TA-9 Decommissioned Area, and the probability of a significant release is considered to be small. With the exception of the septic tanks, oxidation pond, and possibly the waste pit, the remaining PRSs were designed to contain rather than release liquids. The objective of this sampling is therefore to determine whether a release has occurred that exceeds established action levels for the types of chemical waste constituents that are likely to have been present. The Phase I sampling effort will focus on potential soil contamination. Samples will be analyzed for representative indicator parameters that would be expected to have been retained in the soil. Phase II sampling activities would be triggered if any sample is found to exceed both background levels and the threshold levels described in Chapter 4.

Two sampling strategies will be implemented in the TA-9 Decommissioned Area, each intended to address a specific release condition associated with historic activities. The first consists of sampling at locations where deeper soils may have been contaminated and may have remained undisturbed following decommissioning and structural demolition or where contaminated soils may remain beneath existing structures. The second consists of sampling at locations where shallower soils may have been contaminated and

TABLE 6-20
Group 5 Sampling Actions

PRS No.	Type of PRS	Sampling Action	Rationale for Sampling Action
9-001(d)	Firing site	Sample	Potential environmental release; soils likely to have been disturbed during demolition; include in bulk soil sampling
9-003(a)	Settling Tank	Sample	Served heavily used lab; contaminant encrustation observed inside tank during removal; potential environmental release
9-003(b)	Settling Tank	Sample	Contaminant encrustation observed inside tank during removal; potential environmental release
9-003(c)	Manhole	No sample	Provided access to electric controls; no sources of contamination present
9-003(d)	Settling Tank	Sample	Residual soil contamination may be present
9-003(e)	Settling Tank	Sample	Served heavily used lab; contaminant encrustation observed inside tank during removal; potential environmental release
9-003(g)	Waste Water Sump	Sample	Probable shallow sump; served small building; potential environmental release; soils likely to have been disturbed during demolition; include in bulk soil sampling
9-003(h)	Waste Water Sump	Sample	Probable shallow sump; served small building; potential environmental release; soils likely to have been disturbed during demolition; include in bulk soil sampling
9-003(i)	Waste Water sump	Sample	Probable shallow sump; served small building; potential environmental release; soils likely to have been disturbed during demolition; include in bulk soil sampling

TABLE 6-20 (continued)
Group 5 Sampling Actions

PRS No.	Type of PRS	Sampling Action	Rationale for Sampling Action
9-005(a)	Septic system	Sample	Septic tank and leach field potentially contaminated with ^{90}Sr; tank structure has been removed
9-005(d)	Septic tank	Sample	Potentially contaminated with ^{90}Sr; structure remains in place
9-006	Septic system	Sample	Septic tank and outfall reported contaminated with HE and radionuclides; tank structure has been removed
9-008(a)	Lagoon	No sample	PRS 9-008(a) is same as PRS 9-008(b)
9-008(b)	Oxidation pond	Sample	Potentially contaminated with ^{90}Sr; structure remains in place
9-012	Waste pit	Sample	Potential environmental release
9-016	Storage tank	No sample	No environmental release

are likely to have been disturbed by mixing with uncontaminated soils during the demolition and regrading processes.

Contaminated soils may remain undisturbed beneath the deeper settling tank sites because the concrete tank structures were lifted out intact after excavating around their sides and it is unlikely that the soil directly beneath those tanks would have been disturbed during the removal and backfilling process. The soils at the sites of the settling tanks will therefore be sampled to check for the presence of contaminants. Similarly, samples will also be taken of the soils beneath the sites of the septic tanks and related facilities that may have received hazardous or radioactive wastes and are either still in place or were sufficiently deep that the underlying soils are not likely to have been disturbed during demolition and regrading. Because the locations of most of these facilities are not known with sufficient precision to support judgmental sampling at specific sites, multiple samples will be taken to provide a level of assurance that at least one of the sampling locations will be at the actual facility site.

Other former waste-handling facilities in the TA-9 Decommissioned Area, such as the pipelines and the building sumps, were either not deeply buried or were on the ground surface, and any locally contaminated soils are likely to have been disturbed and mixed with uncontaminated soils during the process of decontamination, demolition, and subsequent surface regrading. Further, the locations of most of these facilities are not known with sufficient precision to support sampling at specific sites, and no records of any kind are available identifying the location or content of the waste pit. The potential for releases from these facilities will be checked by random sampling of the bulk disturbed soils and by judgmental sampling of a series of unvegetated circular spots that may have been associated with the waste pit.

The approaches to implementing these sampling strategies and evaluating the sampling results are described in the following paragraphs. Facility-specific sampling will be performed on the waste pit, settling tanks, and septic systems that may have released hazardous or radioactive wastes to the environment. Potential releases from the shallow building sumps, pipe lines, and other facilities will be addressed by randomly sampling the bulk soils within the decommissioned area. No further action is planned for PRS 9-003(c), an electrical control manhole with no sources of contamination, and for the underground storage tank (PRS 9-016) because of its small volume, low age, and the lack of reported leaks or soil contamination when it was removed. The facilities requiring no further actions are described in more detail in Chapter 7.

6.5.3 Group 5 Indicator Parameters

The indicator parameters for Group 5 are listed in Table 6-21. The waste constituents in the process waste streams from the operations involving explosives were generally similar and included a variety of explosive compounds, organic solvents, acids, and toxic metals. The indicator parameters for the Phase I sampling program are those that would pose a potential health hazard and would be good indicators of a release. Such waste constituents would be relatively toxic, formerly present in quantity, relatively nondegradable in the environment, and retained in the soil.

Although a wide variety of explosive compounds were used, the eight basic explosives listed in Table 6-21 were most commonly used, and several of those are relatively persistent in the environment. Other explosives, such as dinitropropanol, NQ, and EDNA, were used in much smaller quantities and may degrade rapidly in the environment. The

TABLE 6-21

Group 5 Indicator Parameters

PRSs 9-003(a), (b), (d), and (e) Process Settling Tanks; 9-005(a) Leach Field;
9-006 Septic Tank

Inorganic
- Barium
- Beryllium
- Cadmium
- Chromium
- Lead
- Mercury
- Nitrate

Organic
- Acetone
- Benzene
- Carbon Tetrachloride
- Chloroform
- Methylethylketone
- Toluene

High Explosive
- TNT
- RDX
- HMX
- PETN
- Tetryl
- 2,4-Dinitrotoluene
- 1,3,5-Trinitrobenzene
- Explosive D

Radionuclides
- Gross Alpha
- Gross Beta

PRSs 9-005(a) and (d) Septic Tanks; 9-008(b) Oxidation Pond

Radionuclides
- Strontium 90

PRSs 9-001(d) Firing Site; 9-003(g), (h), and (i) Sumps and Drains

Inorganic
- Barium
- Beryllium
- Cadmium
- Chromium
- Lead
- Mercury
- Nitrate

TABLE 6-21 (continued)

Group 5 Indicator Parameters

PRSs 9-001(d) Firing Site; 9-003(g), (h), and (i) Sumps and Drains (continued)

High Explosives
- TNT
- RDX
- HMX
- PETN
- Tetryl
- 2,4-Dinitrotoluene
- 1,3,5-Trinitrobenzene
- Explosive D

Radionuclides
- Gross Alpha
- Gross Beta

PRS 9-012 Waste Pit

Inorganic Parameters
- Chapter 4 Extended Analyte List Metals

Organic Parameters
- Chapter 4 Extended Analyte List VOCs
- Chapter 4 Extended Analyte List SVOCs
- Chapter 4 Extended Analyte List Pesticides and PCBs
- Herbicides

High Explosives
- TNT
- RDX
- HMX
- PETN
- Tetryl
- 2,4-Dinitrotoluene
- 1,3,5-Trinitrobenzene
- Explosive D

Radionuclides
- Gross Alpha
- Gross Beta
- Gross Gamma

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metals, anions, and organic solvents in the table are also those that were used in the greatest quantity, would pose a potential health hazard, and would be good indicators of a release. Analyses for volatile organic solvents will be performed on soils collected from boreholes but not on surface soil samples where the solvents would be expected to have volatilized and dissipated during the 30-year period since the site was decommissioned. Low levels of radioactive waste constituents may also have been present in the waste stream from the reported disposal of depleted ^{238}U, and will be checked with gross alpha and gross beta scans.

Except for the ^{90}Sr spill in Building TA-8-24, Septic Tanks TA-9-81 and TA-9-211 [PRSs 9-005(a) and (d)] and the oxidation pond [PRS 9-008(b)] have received only sanitary wastes and will be sampled only for ^{90}Sr. The area of the leach field associated with PRS 9-005(a) will be sampled for the same suite of parameters as the TA-9 Decommissioned Area process waste sumps because the surrounding soils may have also received waste constituents from the TA-9 waste waters passing through Septic Tank TA-9-203 (PRS 9-006). The bulk soil [PRSs 9-001(d); 9-003(g), (h), and (i)] will be sampled for the same parameters as the TA-9 settling tanks, except for the organic compounds, which would have volatilized during the more than 30 years since the facilities were removed. The contents of the waste pit are unknown, but the series of unvegetated spots may include a wide variety of metals and residual organic compounds as well as radioactive materials. The waste pit samples will be analyzed for the Indicator Parameters listed in Table 6-21. Because the series of unvegetated spots is so unusual, the normal range of indicator parameters has been expanded to include pesticides and herbicides that would not normally be expected to be found at the Laboratory.

6.5.4 Settling Tanks

6.5.4.1 Sampling and Analysis Strategy for Settling Tanks

Soil gas and soil samples will be taken at the sites of the settling tanks that may have received HE and other waste constituents. This sampling addresses PRSs 9-003(a), (b), (d), and (e). Sampling of these sites is planned because reinforced-concrete basins of the type used for these tanks may crack and leak and because these facilities once contained waste HE, solvents, and other chemicals that are expected to have been hazardous. In developing the sampling strategy, it was assumed that if a major leak had occurred, the area potentially contaminated would, at a minimum, have included the soil directly underlying the bottom of the tank.

Photographs taken during demolition suggest that the settling tanks were lifted out of the ground after excavating around the sides. This method would have left the soils beneath the tanks and any waste constituents that may have been in the soils relatively undisturbed. The bottoms of the settling tanks were at least 3 ft deep and may not have been significantly disturbed by the final site grading operations following demolition. All of these tanks have been removed. Because the depths of the bottoms of the original tanks exceed 2 ft, all samples will be taken from boreholes.

6.5.4.2 Sampling and Analysis Approach for Settling Tanks

Multiple sampling sites are required for each tank to compensate for uncertainty in its location. At each tank site, sampling locations were arranged in a pattern based on the size of the tank to optimize the sampling design. A sufficient number of samples will be taken to achieve a minimum 95 percent coverage of the area within which the center of the tank is expected to lie. The soils produced from the boreholes will be field-screened with hand-held instruments for evidence of radioactive or volatile organic waste constituents as the holes are bored. The information obtained during this screening will be used to provide worker protection and an initial indication of the presence of waste constituents and may be used as appropriate to help interpret the sampling results and select sampling horizons. However, the data obtained from this screening are not expected to have quantitative value for the decisions required under this work plan.

Each hole will be bored to approximately the bottom of the original settling tank as determined from available construction specifications. This depth may be somewhat uncertain because the tanks have been removed. The original ground surface within the TA-9 Decommissioned Area was relatively level, and large quantities of soil were not reported to have been brought to the site following D&D. It is therefore assumed that the depths from the present ground surface to the bottoms of the original structures are approximately the same as the reported depths of the original structures. It is expected that the uncertainty in this assumption is approximately plus or minus one foot, which will be accommodated by selecting conservatively large sampling intervals.

6.5.4.3 Selection of Sampling Sites for Settling Tanks

The approximate locations of the four settling tanks to be sampled are shown in Figure 5-10. The locations of these tanks are fairly accurately known relative to the sites of the buildings they served but are not well known relative to landmarks that still exist today. The nearest existing landmarks that can be correlated with the tank locations are about

100 to 150 ft away, and based upon an evaluation of the accuracy of historic site schematics and construction drawings, it is estimated that the tanks can be located today with a measurement accuracy of about ±3 percent. Based upon the distances to the nearest existing landmarks, the location accuracy is estimated to be about ±3 ft 6 in. for PRSs 9-003(a), (b), and (e), and ±4 ft 6 in. for PRS 9-003(d). The sampling target is the center of each tank. A 7- or 9-ft diameter boundary has been drawn around the center of each tank to delineate the area within which the center is expected to be located and therefore also the area that will be sampled.

The settling tanks, originally accessed by Manholes TA-9-83 and TA-9-62 [PRSs 9-003(a) and 9-003(e)], are each approximately 4 ft by 4 ft in plan, the tank associated with Manhole TA-9-84 [PRS 9-003(b)] is 4 ft by 5 ft in plan, and that associated with Manhole TA-9-88 [PRS 9-003(d)] is 4 ft by 7 ft in plan. The sampling patterns were established by recognizing that if waste stream waste constituents were present throughout the area underlying a tank, no two sampling points need be closer to one another than one-half the length of the shortest distance across the tank's footprint. Under this constraint, there would be no location within the sampling area where the center of the structure could lie without some part of the structure's footprint being intersected by a sampling point. Using this approach, six samples were found to be required at PRSs 9-003(a) and (e), of which two are shared, six samples at PRS 9-003(b), and six samples at PRS 9-003(d). In all cases the coverage of the sampling area is virtually 100 percent. The locations of these sampling sites are shown in Figures 6-9 and 6-10. The depths of the holes at time of sampling are summarized on Table 6-22.

6.5.4.4 Sampling Activity for Settling Tanks

The sample holes will be installed using a hollow-stem auger with a split-barrel sampler, or equivalent method. Upon boring to the approximate level of the original bottom of the tank, a soil gas sample will be taken from a hollow probe driven approximately 3 ft into the bottom of the hole or until probe refusal. The soil gas sample will be analyzed in the field using a portable gas chromatograph to identify any VOCs that may be present. Organic materials would have been present in the septic tanks, and organic solvents are reported to have been present in the process waste streams that passed through the settling tanks, but the solvents may have volatilized and dissipated during the 30 or more years since most of the settling tanks were last used. The soil gas sample is expected to be

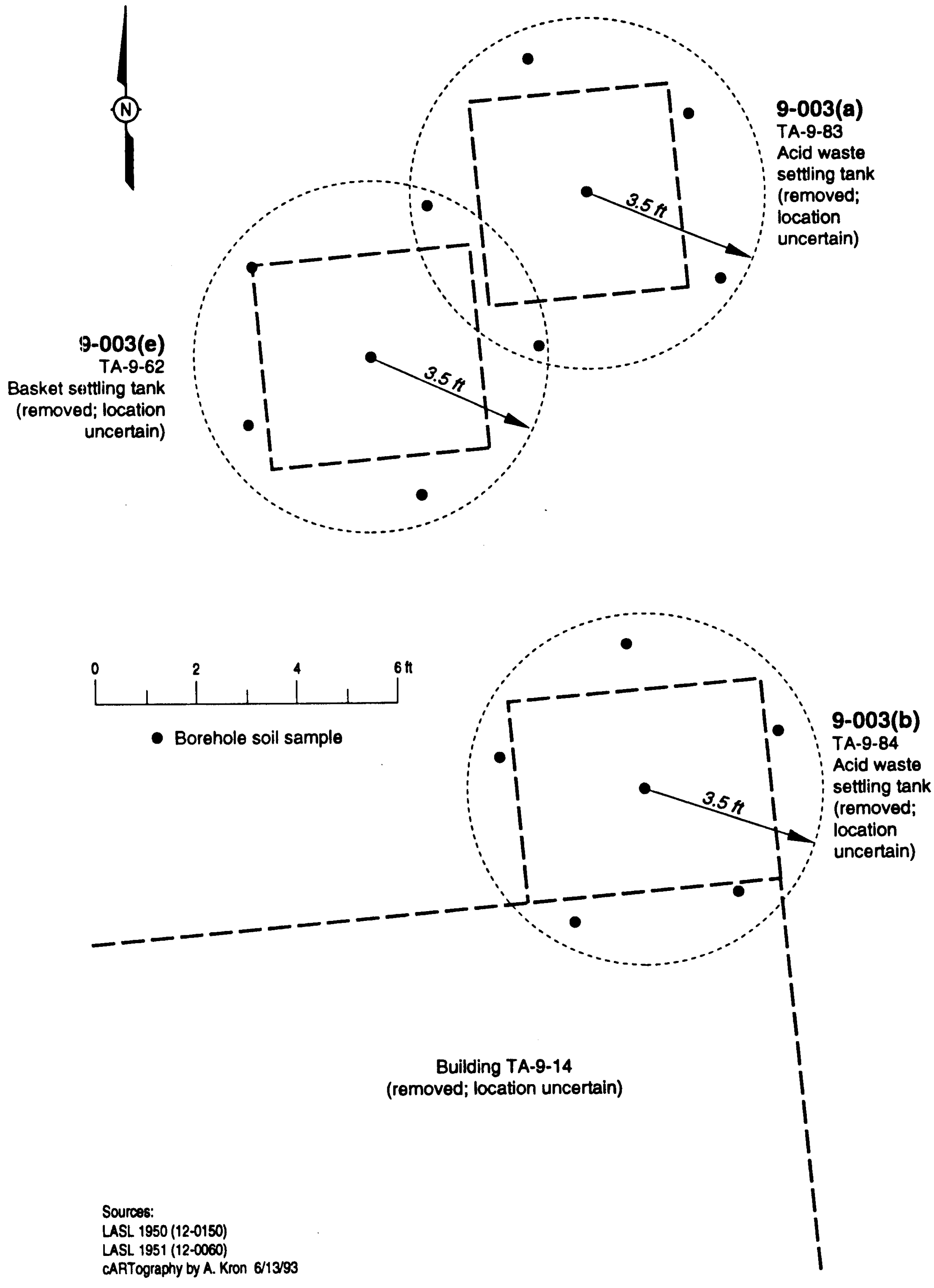

Figure 6-9. Sampling locations for PRSs 9-003(a), (b), (e).

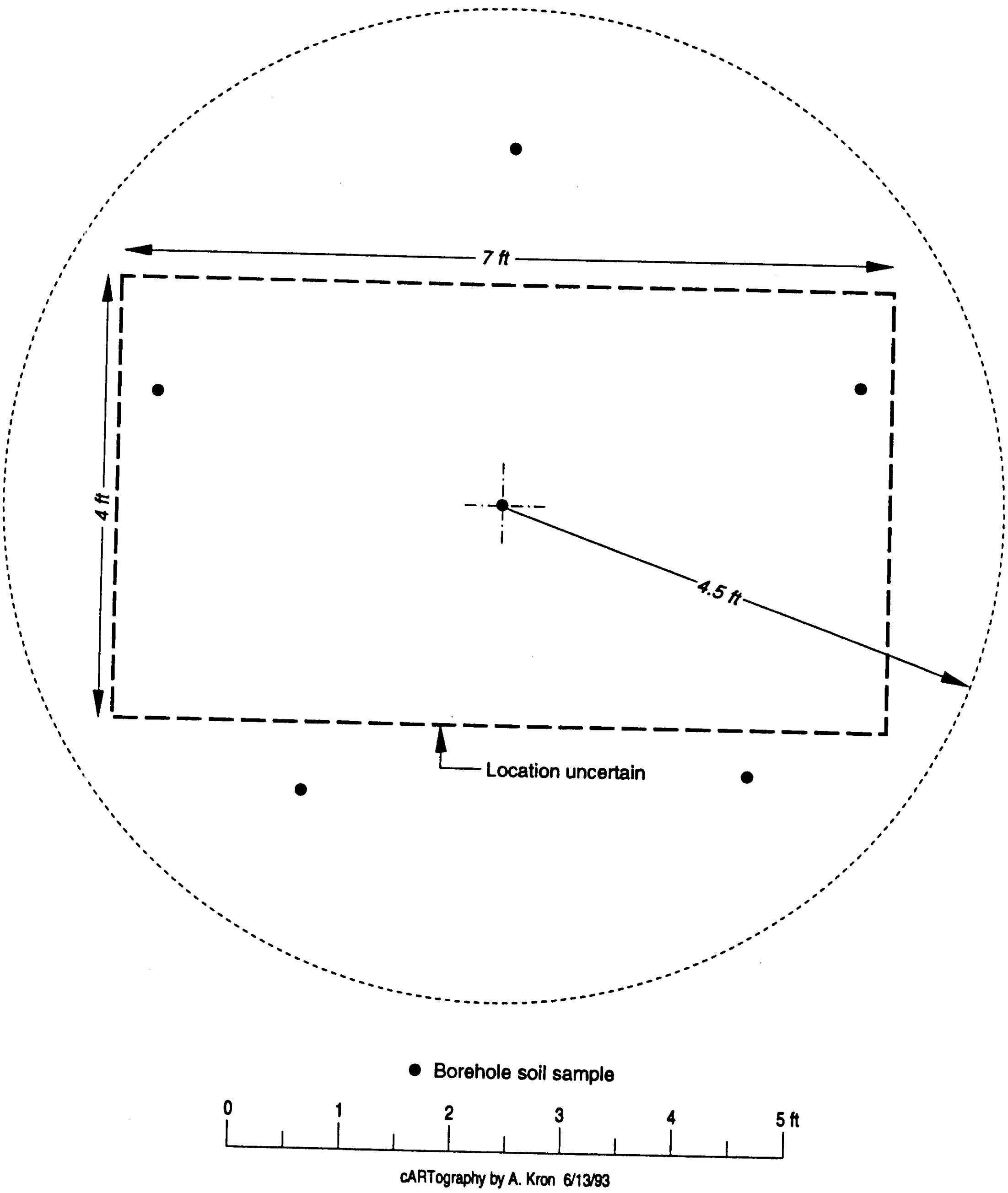

Figure 6-10. Sampling locations for PRS 9-003(d), settling tank TA-9-88.

TABLE 6-22

Group 5 Settling Tank and Septic Tank Sampling Depths

PRS No.	Depth to Original Sump Bottom[a] (ft)	Soil Gas Sample Depth (ft)	Soil Sample Depth (ft)
9-003(a)	4	7	7 to 12
9-003(b)	3	6	6 to 11
9-003(d)	7	10	10 to 15
9-003(e)	5	8	8 to 13
9-005(a) Tank	2[b]	–	2 to 7
Leach	3[b]	–	3 to 8
9-005(d)	0	–	0 to 5
9-006	5[c]	–	5 to 10

a Estimated depth is the reported depth of the original tank structure.
b Value estimated based on reported internal tank depth of 1 ft.
c Value estimated based on typical depth of similar tanks built by the same contractor.

drawn from a radius several feet larger than the radius of the split-barrel sampler and should provide information representative of a larger soil volume than would a soil sample.

After the soil gas sample is taken, the auger hole will be deepened by 8 ft and a 5-ft core sample will be taken. These samples are expected to be taken within the area of a waste constituent plume beneath the facility that would have resulted from a significant release of waste water from the settling tank and should provide representative information on the concentrations of any indicator parameters that were retained in the soil. Following sampling, each borehole will be filled to ground surface in accordance with LANL-ER-SOP-1.06.

All soil gas samples will be analyzed in the field for VOCs using a portable gas chromatograph, and the results will be documented in the field logbook. All soil samples will be analyzed for the indicator parameters listed in Table 6-21 using the methods listed on Table II-1 of the QAPjP in Annex II of this work plan. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the minimum numbers of samples are summarized in Table 6-23. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

TABLE 6-23

Group 5 Sampling Types

Medium	Number of Site Samples	Expected Number of QA Samples[a]	Total Samples
PRSs 9-003(a), (b), (d), and (e) Settling Tanks			
Soil Gas	22	6	28
Soil	22	7	29
PRS 9-005(a) Leach Field and PRS 9-006 Septic Tank			
Soil	4	(b)	4
PRSs 9-005(a) and (d) Septic Tanks; 9-008(b) Oxidation Pond			
Contents	2	3	5
Soil	6	(c)	6
Chip	2	(c)	2
PRSs 9-001(d) Firing Site; 9-003(g), (h), and (i) Sumps and Drains (Bulk Soil Sampling)			
Soil	13	3	16
PRS 9-012 Waste Pit			
Surface Soil	8	4[d]	12
Borehole	2		2

a Field Blank: One for each 20 samples.
Trip Blank: One per analytical laboratory shipping container, for VOC analysis only.
Duplicate Sample: One for each 20 samples.
Equipment (Rinsate) Blank: One for each 20 samples.

b The same QA samples may be used for all PRS 9-003(a), (b), (d), and (e), PRS 9-005(a), and PRS 9-006 samples that are collected in the same sampling round.

c The same QA samples may be used for all PRS 9-005(a) and (d) and PRS 9-008(b) samples that are collected in the same sampling round.

d The same QA samples may be used for all PRS 9-012 surface soil and borehole samples that are collected in the same sampling round.

Sample size requirements are presented in Table II-1 for the analytes identified in Table 6-21. Because the required sample size is expected to be considerably smaller than the soil volume available from the sampler, the soil selected for laboratory analysis will be taken from the part of the sampler soil column with the highest waste constituent concentrations as determined from direct field observation and screening methods for HE, volatile organics, and radionuclides. The methods used to select the sampled interval and its depth below ground surface will be documented in the field log. Because of the potential presence of VOCs, the sample will be minimally handled prior to sealing in sample jars and will not be homogenized by mixing.

The drilling and sampling procedures to be used in the Phase I sampling activity for the TA-9 Decommissioned Area are listed in Table 6-24. These procedures are drawn from the generic lists presented in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any drilling or sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the LANL ER SOPs providing general sampling instructions.

A field log will be maintained during the drilling and sampling of each borehole as described in Chapter 4. Any borehole cuttings or fluids suspected to be contaminated and all waste decontamination solutions produced during the drilling and sampling operations will be disposed of in accordance with LANL-ER-SOP-01.6.

6.5.4.5 Analysis of Results for Settling Tanks

The results of the soil analyses will be compared with background and threshold levels as described in Chapter 4. Phase II sampling activities will be triggered for a PRS if any validated sampling results from any borehole or surface samples taken at that PRS are found to exceed both background and threshold levels. The results of the soil gas analyses are intended to provide a general indication of the presence of volatile organics and will not be used to trigger Phase II activities.

TABLE 6-24
Group 5 Borehole Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Soil Gas Sampling	LANL-ER-SOP-3.03[a]
Drilling Methods and Drill Site Management	LANL-ER-SOP-4.01
General Borehole Logging	LANL-ER-SOP-4.04
Spill Control During Drilling	TBD[b]
Sampling for Volatile Organics	LANL-ER-SOP-6.03
Soil Water Samples	LANL-ER-SOP-6.05
Soil and Rock Borehole Logging and Sampling	LANL-ER-SOP-6.12[a]
Portable GC for Field Screening of VOCs	LANL-ER-SOP-10.02[a]
Hand-Held Instruments for Field Screening of VOCs	TBD[b]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[b]
Field Logging, Handling, and Documentation of Borehole Materials	LANL-ER-SOP-12.01[a]
Curatorial Sample Management	See Chapter 4

a Procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.
b Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

6.5.5 Septic Tanks

6.5.5.1 Sampling and Analysis Strategy for Septic Tanks

Potential Release Sites 9-005(a) and (d), PRS 9-006, and PRS 9-008(b) are addressed in this section. These PRSs include three septic tanks, a tile field for one of the septic tanks, and an oxidation pond. Two of the septic tanks (PRSs 9-005(a) and 9-006) have been removed; the rest of these facilities remain in place but are no longer used. No D&D activities are currently planned for the facilities that have not been removed, which will therefore be addressed under the ER Program.

Soil gas, soil, and tank contents samples will be taken at selected locations where releases may have occurred. Sampling of these sites is planned because reinforced-concrete basins of the type used for the tanks may crack and leak and because these facilities once contained waste HE, solvents, or other waste constituents that may have been hazardous or radioactive.

Although the septic system at PRS 9-005(a) was intended only for sanitary wastes, it may have received ^{90}Sr from a 1954 spill. Both the tile field and the soils beneath this tank may therefore be radioactively contaminated. Potential Release Site 9-005(d) was installed to replace PRS 9-005(a) but was connected to the same sewer line and may have received residual ^{90}Sr that was retarded in its migration through the pipes. The septic tank, [PRS 9-005(d)], did not have a tile field; it discharged into the oxidation pond, [PRS 9-008(b)], which in turn discharged into the adjacent stream bed. Both the pond and the stream bed may also have received radioactive waste constituents. Another septic tank, [PRS 9-006], is reported to have had HE and radionuclide contamination, which may have also been discharged at its outfall. Potential Release Site 9-006 did not have a tile field and is thought to have discharged directly into the same stream bed as the oxidation pond. Because of the potential for environmental release, each of these facilities will be sampled. Samples may be taken from boreholes where sampling depths exceed 2 ft.

6.5.5.2 Sampling and Analysis Approach for Septic Tanks

The locations of the removed septic tanks [PRSs 9-005(a) and 9-006] are known with sufficient certainty that judgmental sample locations may be selected. Judgmental sample locations will also be selected for the facilities that have not been removed. The soils produced from the boreholes will be field-screened with hand-held instruments for evidence of radioactive or volatile organic waste constituents as the holes are bored. The information obtained during this screening will be used to provide worker protection and an initial indication of the presence of waste constituents and may be used as appropriate to help interpret the sampling results. However, the data obtained from this screening are not expected to have quantitative value for the decisions required under this work plan.

Each hole will be bored to approximately the bottom of the original septic tank or tile field, as determined from available construction specifications. This depth may be somewhat uncertain for those facilities that have been removed, and it will be assumed that the depths from the present ground surface to the bottoms of the original structures are approximately the same as the reported depths of the original structures. It is expected that the uncertainty in this assumption is approximately plus or minus one foot, which will be accommodated by selecting conservatively large sampling intervals.

The contents of the septic tank that has not been removed [PRS 9-005(d)] will be sampled. If no waste constituents are found exceeding threshold levels, no further actions will be taken. However, if waste constituents are found exceeding both background and threshold levels, the tank will be removed as an interim action, and additional sampling will be performed on the underlying soils.

6.5.5.3 Selection of Sampling Sites for Septic Tanks

The approximate locations of the three septic tanks, oxidation pond, and tile field to be sampled are shown in Figure 6-11. Septic Tank TA-9-211 [PRS 9-005(d)] and the oxidation pond are still in place and their locations are therefore known exactly. Two samples will be taken of the tank contents, and two chip samples will be taken of the tank bottom. These samples will be taken at the inlet end and center of PRS 9-005(d). If, as previously mentioned, waste constituents are found in excess of background and threshold levels and the PRS 9-005(d) tank is removed as an interim action, soil samples will also be taken at two locations beneath the bottom of the tank after it is removed. The soil sample locations will be biased toward any site showing evidence of a release based on visual inspection or hand-held screening instruments. If no basis for biased sampling is identified, the samples will be taken at sites directly beneath the sampling locations selected for the tank contents.

Two samples will be taken at the bottom of the oxidation pond [PRS 9-008(b)], approximately 3 ft from the end of the inlet pipe and in the center of the pond. Because the oxidation pond is upstream of the stream bed and would be expected to have more

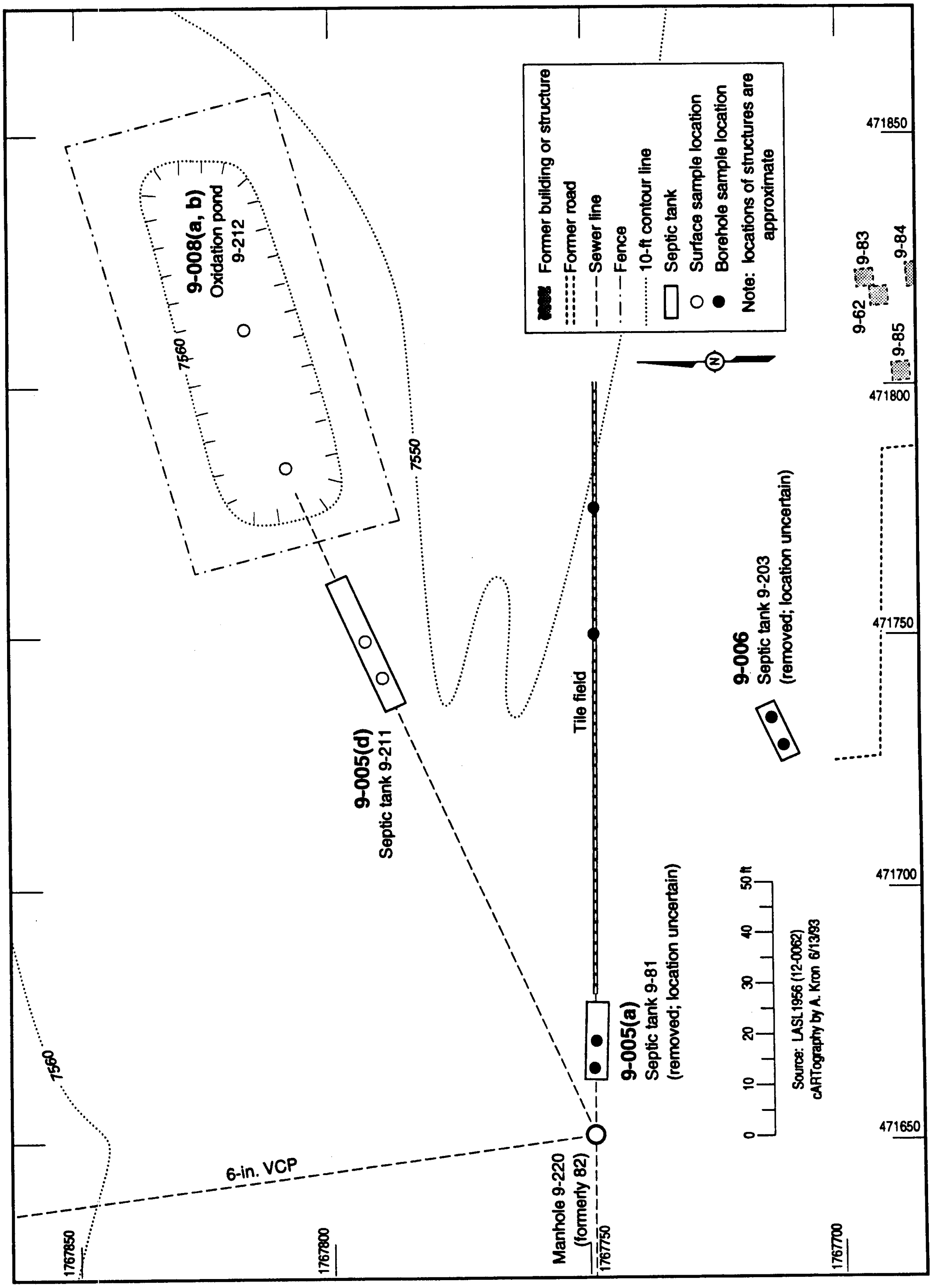

Figure 6-11. PRS Group 5 septic tank sampling locations.

significant constituent levels, the stream bed downstream of the oxidation pond will not be sampled during Phase I but will be sampled during Phase II, if waste constituents exceeding established background and threshold levels are found in the pond sediments.

Although the two other septic tanks have been removed and their locations are only approximately known, existing landmarks to which their locations can be tied are a maximum of about 50 ft away. Using the aforementioned location accuracy of ±3 percent, it is estimated that the two remaining tanks can be located with an accuracy of at least ±2 ft. Because these tanks were fairly large compared with the location accuracy [PRS 9-005(a) was 11 by 3.6 ft and PRS 9-006 was 4 by 9 ft in surface area], only two boreholes will be needed at each site for sampling. Two holes will be bored at the locations of each of the septic tanks, one near the inlet end and one near the center of the tank.

Two additional holes will be bored at the site of the tile field for PRS 9-005(a), at the approximate locations shown in Figure 6-11. The outfall for PRS 9-006 is not shown on any available drawing but is assumed to have been near the tank, discharging into the adjacent stream bed where the tile field for PRS 9-005(a) is located. Samples taken in the tile field are expected to provide information on waste constituents discharged from both septic tanks. The approximate locations of all boreholes associated with the aforementioned septic systems are shown in the Figure 6-11.

6.5.5.4 Sampling Activity for Septic Tanks

At PRSs 9-005(a) and 9-006, where the tanks have been removed, and when sampling the tile field, the sample holes will be installed using a hollow-stem auger with a split-barrel sampler, or equivalent. Soil samples will be taken in each hole of the first 5 ft beneath the bottom of the original structure. Following sampling, each borehole will be filled to ground surface in accordance with LANL-ER-SOP-1.06.

At PRS 9-005(d), where the tank is still in place, the contents will be sampled by hand methods from outside the tank. Confined space entry health and safety requirements must be met if the tank is entered. Samples will be taken of the materials immediately overlying the bottom of the tank, which are expected to contain residual sludge. Chip samples will also be taken of the concrete in the bottom of the tank. If additional samples are taken beneath the tank, they will be collected from holes bored into the first 5 ft of soil using the same sampling techniques as for the other septic tanks in this group. The hole remaining from excavation of the septic tank will not be filled until it is determined whether the underlying soil was contaminated.

Surface soil samples will be taken by hand methods at the PRS 9-008(b) oxidation pond. The pond bottom sediments are exposed and may be directly sampled.

All of the aforementioned facilities will be analyzed for the indicator parameters listed in Table 6-21 using the methods listed on Table II-1. Samples from PRSs 9-005(a) and (d) and PRS 9-008(b) will be analyzed only for ^{90}Sr, as previously described. Potential Release Site 9-006 and the PRS 9-005(a) tile field may have received waste constituents from Old Anchor East HE experiments, and samples from these sites will be analyzed for the same suite of indicator parameters as the Old Anchor East settling tanks. Any analyses may be performed in mobile field laboratories if, as described in Chapter 4, the required detection limits can be routinely met. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the minimum numbers of samples are summarized in Table 6-23. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

Sample size requirements are presented in Table II-1 for the analytes identified in Table 6-21. The required maximum sample volume will be readily accommodated by the soil volume available from the split-barrel sampler, and the soil selected for laboratory analysis will be taken from the most highly contaminated part of the sampler soil column. The methods used to select the sampled interval and its depth below ground surface will be documented in the field log. Because of the potential presence of VOCs, the sample will be minimally handled prior to sealing in sample jars and will not be homogenized by mixing.

The drilling and borehole sampling procedures to be used for the septic tanks are listed in Table 6-24. The surface soil sampling in the oxidation pond will use the same procedures as shown in Table 6-25 for the bulk soil sampling. These procedures are drawn from the generic lists presented in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any drilling or sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the

TABLE 6-25

Group 5 Surface Soil Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
General Surface Geophysics	LANL-ER-SOP-3.02
Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-6.09
Stainless Steel Surface Soil Sampler	LANL-ER-SOP-6.11
Field Surveying of Sample Locations	TBD[a]
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

QAPjP for OU 1157 and with the ER Program SOPs providing general sampling instructions.

A field log will be maintained during the drilling and sampling of each borehole as described in Chapter 4. Any borehole cuttings or fluids suspected to be contaminated and all waste decontamination solutions produced during the drilling and sampling operations will be disposed of in accordance with LANL-ER-SOP-01.6 (LANL 1992, 0688).

6.5.5.5 Analysis of Results for Septic Tanks

The results of the soil analyses will be compared with background and threshold levels as described in Chapter 4. Phase II sampling activities will be triggered for a PRS if any validated sampling results from any boreholes or surface samples taken at that PRS are found to exceed both background and threshold levels.

6.5.6 Sampling of Bulk Cover Soils

6.5.6.1 Sampling and Analysis Strategy for Bulk Cover Soils

The bulk cover soil sampling addresses potential releases to shallow soils from the firing site associated with PRS 9-001(d), and the sumps and drains associated with PRSs 9-003(g), (h), and (i). Following decommissioning and demolition of the TA-9 Decommissioned Area facilities, the soils excavated to retrieve building sumps, pipelines, and other underground facilities were spread across the area to achieve a final, smoothly graded surface. Because of the potential of releases from pipeline leaks, sump leaks, or accidental spills, some waste constituents from site operations may be present in the bulk cover soils. However, during the processes of excavation and subsequent spreading, any contaminated soils would have been mixed with uncontaminated soils and distributed more widely than if left undisturbed. Because of this mixing process and because of the lack of documentation on how the soils were excavated, stockpiled, and subsequently spread across the site, a random approach will be used to sample those soils for potential contamination.

6.5.6.2 Sampling and Analysis Approach for Bulk Cover Soils

The sampling program was designed with the help of statistical methods as described in Chapter 4. A goal of the design was to take a sufficient number of samples so that there would be at most a 5 percent probability of failing to detect any waste constituents that may have been released to the soil. In considering the size and potential hazard posed by the decommissioned area and the approximately random dispersal of waste constituents expected following demolition and regrading, a design was adopted calling for 13 randomly placed samples. With 13 samples, the aforementioned 5 percent probability would be achieved if 25 percent of the area had above background constituent levels. Considering the mixing that would have occurred during the excavation and regrading process, this value appeared to be conservative.

6.5.6.3 Selection of Sampling Sites for Bulk Cover Soils

A map showing the extent of disturbed soils within the TA-9 Decommissioned Area is shown in Figure 6-12. The disturbed area is approximately 100,000 ft^2. Assuming that

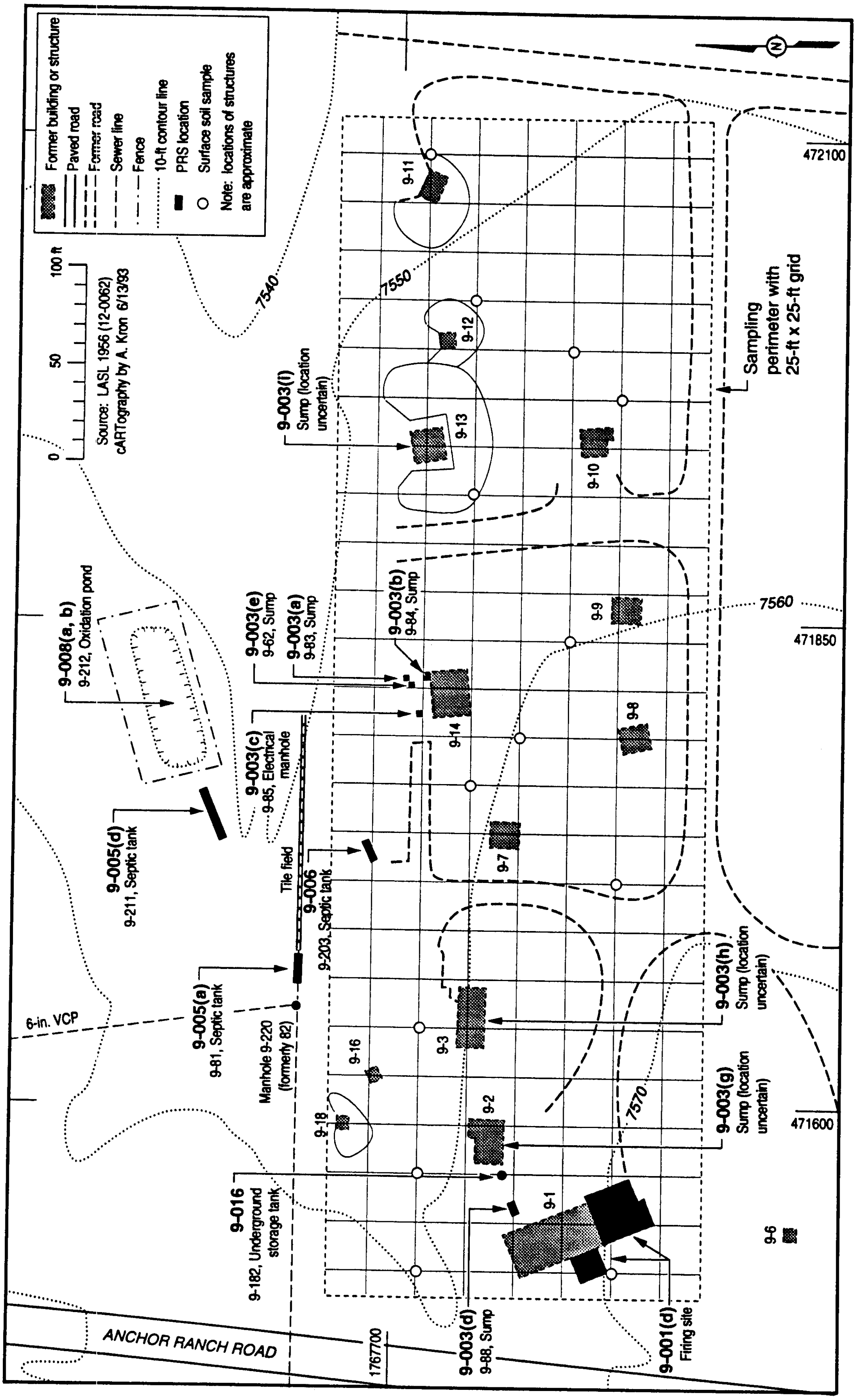

Figure 6-12. Bulk soil sampling locations for PRS Group 5.

soils containing waste constituents have equal probability of occurring anywhere within that area, 13 soil samples will be needed to achieve the design constraints described above for the sampling program. These points were determined by laying a 25- by 25-ft grid over the area and randomly selecting grid nodal points. Sampling points that fell on roads or other locations where waste constituents were unlikely to be present were rejected. The sampling grid and selected sampling points are shown on the figure. The grid is oriented north-south and may be referenced to the center of Manhole TA-9-220. The grid and selected random sampling points are shown in the figure.

6.5.6.4 Sampling Activity for Bulk Cover Soils

Samples will be taken of the upper 12 in. of soil because the soil would have been mixed during the regrading process, and this sampling depth is expected to provide a reasonably representative sample. Samples will be taken using hand sample collection techniques and will be analyzed for the indicator parameters listed for PRS 9-001(d) and PRSs 9-003(g), (h), and (i) on Table 6-21. With the exception of VOCs, which would not be expected to remain in the near-surface soils, the bulk soil samples will be analyzed for the same indicator parameters as the Decommissioned Area settling tanks using the methods listed on Table II-1.

In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-23. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader. Sample sizes for the bulk soils are shown in Table II-1.

The sampling procedures to be used in the Phase I bulk soil sampling activity are listed in Table 6-25. Each sample will be representative of the average constituent concentrations in the upper 12 in. of soil. The bulk soil samples will be handled in the same manner as previously described in Section 6.5.4.4 for the borehole samples. A field log will also be maintained as previously described in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.5.6.5 Analysis of Sampling Results for Bulk Cover Soils

The results of the soil analyses will be compared with background and threshold levels as described in Chapter 4. Phase II sampling activities will be triggered for a PRS if any validated sampling results from any boreholes or surface samples taken at that PRS are found to exceed both background and threshold levels.

6.5.7 Potential Release Site 9-012-Waste Pit

6.5.7.1 Sampling and Analysis Strategy at PRS 9-012

The location of the decommissioned area waste pit identified as PRS 9-012 is not specifically known but may have been in an area south of the location of Building TA-9-1. The presence of contaminated soil in that area may be evidenced by a regular series of small bald spots where native plants do not grow. A geophysical survey using electromagnetic techniques will be performed to determine the extent to which metals are present in the near-surface soils. In addition, surface soil samples will be taken at several of the bald spots for a wide range of indicator parameters.

6.5.7.2 Sampling and Analysis Approach at PRS 9-012

A geophysical survey employing electromagnetic techniques will be performed within an area extending 150 ft from either side of the row of bald spots and 400-ft long. This survey area is shown in Figure 6-13. The survey is expected to employ the same techniques as those used at the Group 2 Gun-Firing Site. It is anticipated that the primary survey will be conducted with a portable terrain conductivity meter (Geonics EM-31 or equivalent), with possible additional support using a smaller, pancake-type metal detector. The surveys will be made in a predetermined pattern, with traverses spaced to provide adequate overlap in accordance with the capabilities of the instrument at the site. The survey will include all locations within the survey area.

The traverses are expected to be about 10-ft wide and will be designed to detect metallic chunks or elevated concentrations of metal particles to depths of about 10 ft. The actual traverse width will be determined by *in situ* instrument testing prior to conducting the survey. Smaller pancake-type metal detectors may be used to help precisely locate any

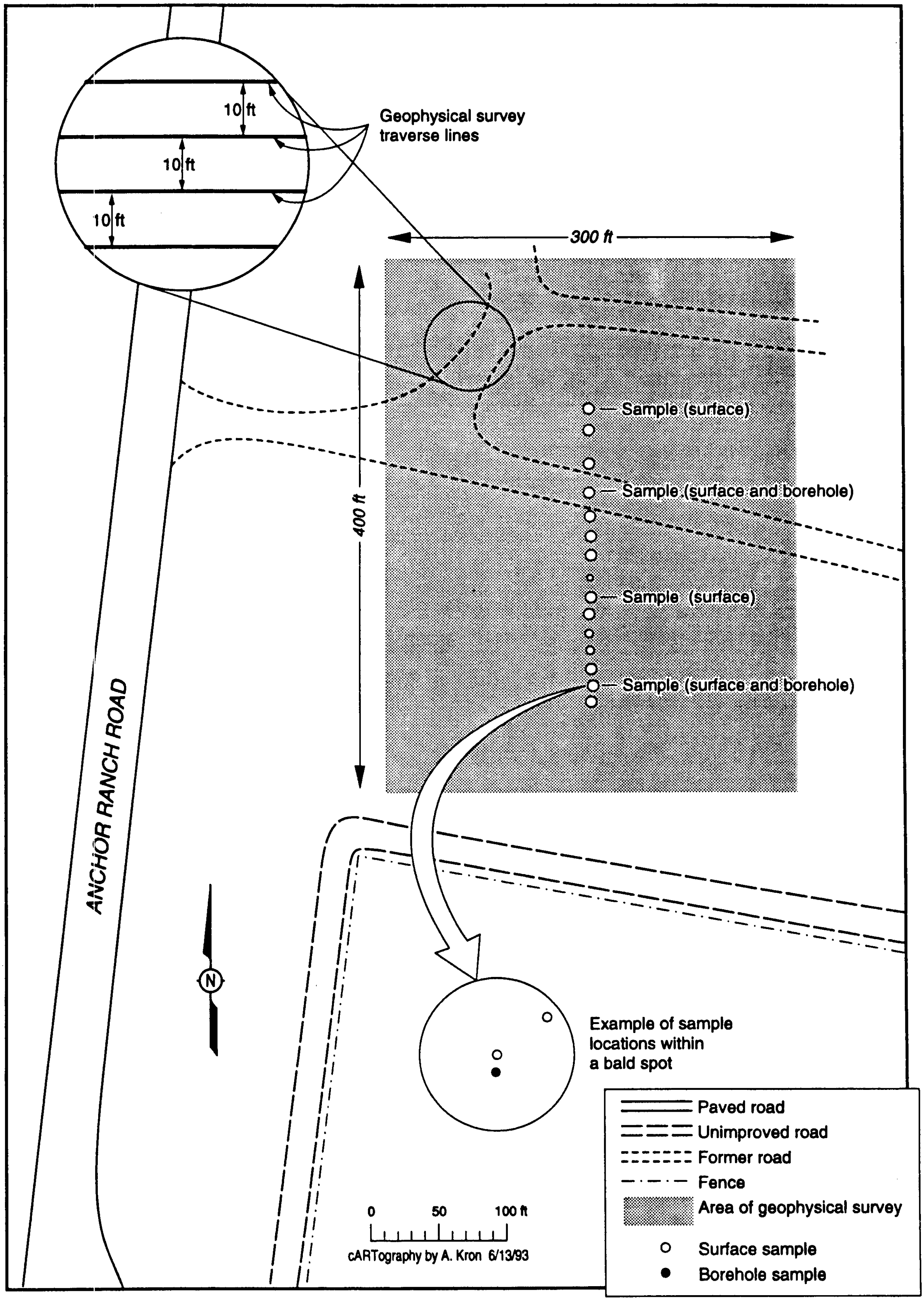

Figure 6-13. Sample locations for PRS 9-012, waste pit.

objects detected by the larger instrument and to distinguish between single objects and higher concentrations of finer particulate metals. Locations with high metal content will be identified during the survey and may be selected by the Field Team Leader as sites for judgmental soil sampling and/or borehole drilling. If feasible, pieces of potentially hazardous metals identified during the survey within the upper 2 ft of soil will be retrieved during the survey for proper disposal. Locations of potentially hazardous metallic chunks that are not immediately retrieved but left in place for later retrieval will also be identified during the survey. The procedures, implementation, and results of the survey will be documented in the field log.

The geophysical survey will be followed by surface and borehole sampling. Samples will be taken at selected bald spots or at alternate locations selected based upon the survey results.

6.5.7.3 Selection of Sampling Sites at PRS 9-012

Approximately 15 roughly circular bald spots have been identified at the site. Surface and borehole samples will be taken at the four particularly prominent bald spots identified in Figure 6-13. Two surface samples will be taken at judgmental locations at each of the four selected bald spots, one in the approximate center of the spot and one at a location near the edge of the spot at a location determined by the Field Team Leader. Two borehole samples will be taken near the surface sampling locations at two of the aforementioned bald spots, as shown in Figure 6-13. Additional sampling locations, or modifications to the aforementioned locations, may be selected at the discretion of the Field Team Leader, based upon the results of the geophysical survey. The survey coordinates of all sampling locations and the rationale for the location selections will be documented in the field log.

6.5.7.4 Sampling Activity at PRS 9-012

The surface soil samples will be taken of the upper 12 in. of soil. This depth of sampling was selected because it approximates the root zone of the grasses surrounding the bald spots, where any waste constituents suppressing plant growth would be expected to be found. In addition, borehole samples will be taken of the upper 5 ft of soil. The samples and sampling sites will be field-screened with hand-held instruments for the presence of VOCs or radioactive materials.

Surface samples will be taken using hand sample collection techniques and analyzed for the indicator parameters on Table 6-21 using the methods listed in Tables II-1 and II-2. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-23. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The borehole sampling procedures to be used are listed in Table 6-24, and the surface soil sampling procedures are listed in Table 6-25. The Field Team Leader may choose the most appropriate sampling method for the field conditions at the time of sampling. The borehole samples will be taken from the part of the core that is likely to have the highest constituent levels, as determined from visual inspection and field-screening instruments. Both borehole and surface samples will be analyzed for VOCs and will be subjected to minimum handling prior to sealing in sample jars. The soil samples will be handled in the same manner as previously described in Section 6.5.4.4 for the borehole samples. A field log will be maintained as described in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.5.7.5 Analysis of Sampling Results at PRS 9-012

The results of the soil analyses will be compared with background and threshold levels as described in Chapter 4. Phase II sampling activities will be triggered for a PRS if any validated sampling results from any boreholes or surface samples taken at that PRS are found to exceed both background and threshold levels.

6.5.8 Phase II Sampling

Phase II sampling activities will be triggered as described above, based on comparison of validated sampling results with background and threshold levels as described in Chapter 4. The specific Phase II sampling activities will be determined based upon the Phase I sampling results, and will be described in future documents relating to this OU.

6.6 GROUP 6: TECHNICAL AREA 9 FAR POINT FIRING SITES AND TA-23 FIRING SITES

6.6.1 Group 6 Background

The Far Point and TA-23 Firing Sites contain six PRSs, of which four are sites where experimental explosives were detonated (firing sites); one is a burn pit for classified documents and other combustible materials, and one is an electrical control manhole. These sites have been decontaminated and decommissioned, and all of the structures associated with these facilities have been removed. The locations of these sites are shown in Figure 5-12.

6.6.2 Group 6 Sampling Strategy and Objectives

Several of the firing sites were ground-surface, outdoor facilities that could have scattered hazardous materials over wide areas, whereas other sites were confined within structures designed to contain the debris from the shots. A summary of the sampling actions at these sites is provided in Table 6-26. Residual surface and near-surface soil contamination may be present at the firing sites, and all firing sites will be sampled. The burn pit, PRS 9-002, will be sampled for the presence of metals remaining in the ash. The manhole, PRS 9-015, provided access to underground electrical controls; this facility has no contaminant sources and will not be sampled.

Because it is not known whether any residual soil contamination is present at the sites to be sampled, sampling will be performed to determine whether any remaining concentrations of key waste constituent concentrations exceed established action levels. The Phase I sampling effort will focus on potential soil contamination. Samples will be analyzed for representative indicator parameters that would be expected to have been retained in the soil.

All structures associated with the Group 6 PRSs have been removed (except the burn pit), and the potentially contaminated surface and near-surface soils were disturbed during the demolition processes. Because the specific locations of some of the facilities are now uncertain and there is no remaining evidence for selecting specific judgmental sampling locations, all sites except the burn pit will be randomly sampled. Phase II sampling activities would be triggered if any sample is found to exceed the threshold levels described in Chapter 4.

TABLE 6-26
Group 6 Sampling Actions

PRS	Type of Facility	Sampling Action	Rationale for Sampling Action
9-001(a)	Firing Site	Sample	Potential residual contamination from unconfined, ground-surface shots
9-001(b)	Firing Site	Sample	Potential residual contamination from unconfined, ground-surface shots
9-001(c)	Recovery Pit	Sample	Potential residual contamination from open bottom of firing chamber
9-002	Burn Pit	Sample	Potential residual metals contamination
9-014	Firing Pit	Sample	Potential residual contamination from unconfined, ground-surface shots
9-015	Manhole	No sample	Provided access to electrical controls; no sources of contamination present

6.6.3 Group 6 Indicator Parameters

The indicator parameters for Group 6 are listed in Table 6-27. The waste constituents at the firing sites are expected to be the same as in the process waste streams and will be sampled for the same indicator parameters as the Group 5 bulk surface soils. Hazardous wastes from the operations involving explosives were generally similar and included a variety of explosive compounds, organic solvents, acids, and toxic metals. The indicator parameters for the Phase I sampling program are those that would pose a potential health hazard and would be good indicators of a release. Such waste constituents would be relatively toxic, formerly present in quantity, relatively nondegradable in the environment, and retained in the soil. The rationale for selecting these parameters as indicators is presented in Section 6.5.3. The PRS 9-002 burn pit will be sampled for a group of metals commonly found in inks, film, and photographs.

TABLE 6-27

Group 6 Indicator Parameters

9-001(a), (b), (c) and 9-014 Firing Sites

Inorganics
- Barium
- Beryllium
- Cadmium
- Chromium
- Lead
- Mercury
- Nitrate

High Explosives
- TNT
- RDX
- HMX
- PETN
- Tetryl
- 2,4-Dinitrotoluene
- 2,6-Dinitrotoluene
- 1,3,5-Trinitrobenzene
- Explosive D

Radionuclides
- Gross Alpha
- Gross Beta

9-002 Burn Pit

Inorganics
- Antimony
- Cadmium
- Chromium
- Lead
- Silver

6.6.4 Potential Release Sites 9-001(a) and (b)-Firing Sites

6.6.4.1 Sampling and Analysis Strategy at PRSs 9-001(a) and (b)

Surface soil samples will be taken in the vicinity of the firing pad associated with PRSs 9-001(a) and (b) for waste constituents that may have been scattered during the firing experiments. The associated buildings, TA-9-4 and TA-9-5, were used for controlling and photographing the shots and sheltering personnel during the shots but were not potential sources of environmental contamination. Both buildings were small structures without drains or water sources, and no activities that could have released hazardous materials were conducted in them. The sampling associated with these PRSs will, therefore, focus on the debris scattered from the firing pad during shots.

6.6.4.2 Sampling and Analysis Approach at PRSs 9-001(a) and (b)

The sampling program was designed with the help of statistical methods as described in Chapter 4. A goal of the design was to take a sufficient number of samples so that there would be at most a 5 percent probability of failing to detect any waste constituents that may be present above background concentrations. In considering the size and potential hazard posed by the site and the approximately random dispersal of waste constituents from the shots, a design was adopted calling for 10 randomly placed samples biased toward the firing pad. With 10 samples, the aforementioned 5 percent probability would be achieved if 30 percent of the area had above background constituent levels. The level of activity at this site is expected to have been similar to that at the Gun-Firing Site, and the same sampling design was adopted.

The samples will be taken by hand methods. The samples and sampling sites will be field-screened with hand-held instruments for evidence of radioactive or volatile organic waste constituents. The information obtained during this screening will be used to provide worker protection and an initial indication of the presence of waste constituents and may be used as appropriate to help interpret the sampling results. However, the data obtained from this screening are not expected to have quantitative value for the decisions required under this work plan.

6.6.4.3 Selection of Sampling Sites at PRSs 9-001(a) and (b)

The firing pad sampling sites were randomly selected within a 25-yd radius of the firing pad associated with the two PRSs. Because the barricade at the pad would have permitted debris to be ejected only toward the southeast, the surface sampling will be restricted to this direction. Although debris from the shots is expected to have traveled farther than 25 yd, the greatest concentrations are expected to lie near the pad. The Phase I sampling will be performed in this area of expected greatest concentration, and if threshold levels are exceeded, additional sampling at greater distances and for a broader range of parameters is expected to be conducted during the Phase II program. The 10 sampling locations were randomly selected from a 10- by 10-ft grid, and are shown in Figure 6-14. Selection of sampling locations was biased as indicated on the figure to

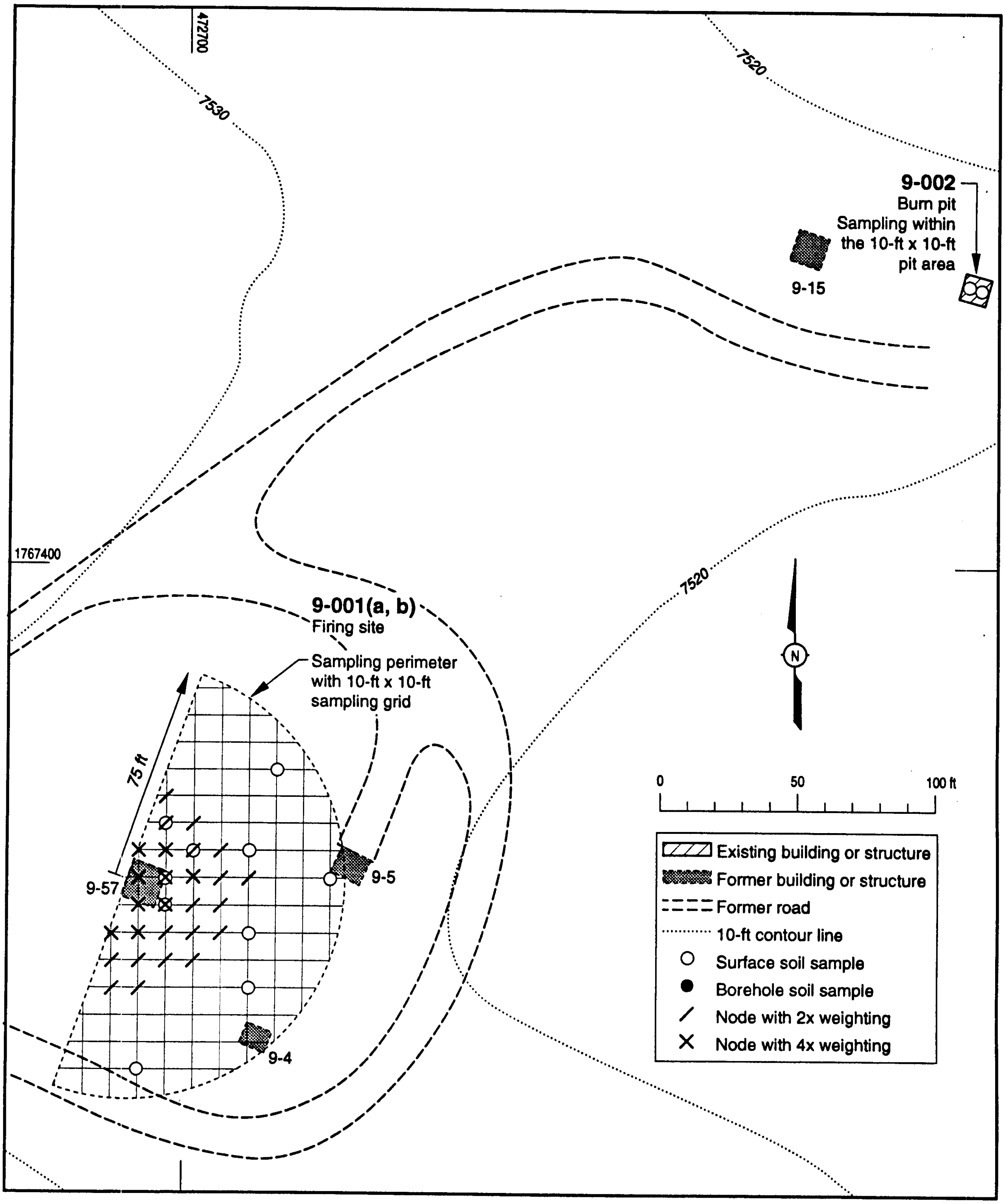

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Figure 6-14. PRSs 9-001(a) and (b) and 9-002 sampling locations.

increase the number of samples taken near the firing site, where the greatest contaminant concentrations would be expected.

6.6.4.4 Sampling Activity at PRSs 9-001(a) and (b)

All soil samples will be analyzed for the indicator parameters listed in Table 6-27 using the methods listed on Table II-1. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the expected total numbers of samples are summarized in Table 6-28. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

TABLE 6-28

Group 6 Sampling Types

PRS	Number of Site Samples	Expected Number of QA Samples[a]	Total Samples
9-001(a) and (b) Firing Sites			
Firing Pad Soil	10	3	13
9-001(c) Recovery Pit			
Sand and Soil	6	3	9
9-002 Burn Pit			
Soil	2	3	5
9-014 Firing Pit			
Soil	10	3	13

a Field Blank: Expected number = 1 for each sampling type and PRS.
Duplicate Sample: Expected number = 1 for each sampling type and PRS.
Equipment (Rinsate) Blank: Expected number = 1 for each sampling type and PRS.
Note: Because of similar indicator parameters, the same QA samples may be used for all firing site samples that are taken within the same week of sampling activity.

The samples will be taken of the top 6 in. of soil because debris scattered from the firing would have been deposited on the upper surface of the sediments. Sample size requirements are presented in Table II-1.

The procedures to be used in the Phase I sampling activity are listed in Table 6-29. These procedures are drawn from the generic lists presented in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any drilling or sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the quality assurance requirements presented in the QAPjP for OU 1157 and with the ER Program SOPs providing general sampling instructions.

TABLE 6-29

Surface Soil Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Spade and Scoop Method for Collection of of Soil Sample	LANL-ER-SOP-6.09
Stainless Steel Surface Soil Sampler	LANL-ER-SOP-6.11
Field Surveying of Sample Locations	TBD[a]
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

A field log will be maintained during the sampling activities as described in Chapter 4. Any disposable sampling equipment suspected to be contaminated and all waste decontamination solutions produced during the drilling and sampling operations will be disposed of in accordance with LANL-ER-SOP-01.06 (LANL 1992, 0688).

6.6.4.5 Analysis of Sampling Results at PRSs 9-001(a) and (b)

The results of the sampling will be compared with background and threshold levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result is found to exceed both background and threshold levels.

6.6.5 Potential Release Site 9-001(c)-Firing Site

6.6.5.1 Sampling and Analysis Strategy at PRS 9-001(c)

The shots at the PRS 9-001(c) firing site were performed in a recovery pit that was steel lined on its four vertical sides, was covered during shots, but had an unlined sand bottom. Although no debris could have been ejected vertically or laterally during the shots, some waste constituents could have entered the sand bottom and the underlying soil. Samples will therefore be taken of the sand and soil at the bottom of the former pit.

6.6.5.2 Sampling and Analysis Approach at PRS 9-001(c)

Multiple sampling sites are required for the recovery pit to compensate for uncertainty in its location. The sampling locations were arranged in a pattern based on the size of the pit to optimize the sampling design. A sufficient number of samples will be taken to achieve a minimum 95 percent coverage of the area within which the center of the pit is expected to lie. The samples will be taken using a hollow-stem auger or equivalent. The samples, sampling sites, and auger core will be field-screened with hand-held instruments for evidence of radioactive or volatile organic waste constituents. The information obtained during this screening will be used to provide worker protection and an initial indication of the presence of waste constituents and may be used as appropriate to help select the sampling intervals and interpret the sampling results. However, the data obtained from this screening are not expected to have quantitative value for the decisions required under this work plan.

6.6.5.3 Selection of Sampling Sites at PRS 9-001(c)

The location accuracy of the pit must be estimated from existing drawings and from the locations of nearby access roads. The recovery pit is near PRS 9-001(a) and (b), relies upon the same drawings, and therefore has a location measurement accuracy of about ±2 percent. The distances to the nearest access roads and other remaining landmarks range from 60 to over 600 ft, and the location accuracy is estimated to be about ±10 ft. The sampling target is the center of the 12-ft by 12-ft pit. A 10-ft diameter boundary has been drawn around the center of the pit to delineate the area within which the center is expected to be located, and therefore also the area that will be sampled. This sampling area is shown in Figure 6-15.

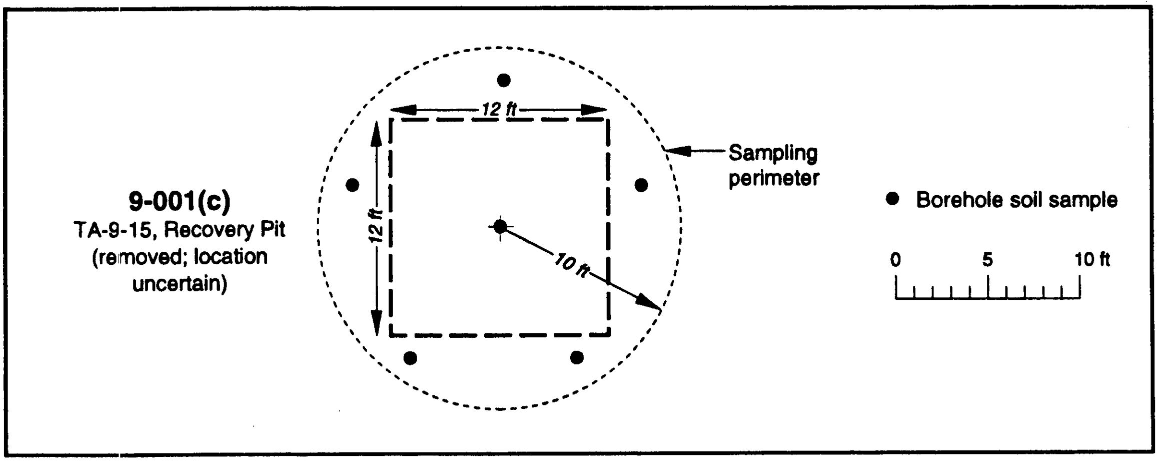
The sampling design is based upon the same considerations as described in Section 6.5.4.2 for sampling the decommissioned area settling tanks. The bottom of the recovery pit was relatively small, and virtually all of the sand would be expected to have received debris from the shots and therefore be potentially contaminated. In considering the 6-ft minimum half-width of the pit, 6 samples were found to be required and would give a coverage of 100 percent. The six sampling locations are shown in Figure 6-15.

The recovery pit was 8-ft deep, but as previously mentioned, the construction drawings show that the pit bottom was 10 ft below grade. Allowing for the 2-ft thickness of the sand and uncertainty in the elevation of the existing grade relative to that of the original grade, the samples will be taken over the depth interval of 9 to 14 ft.

6.6.5.4 Sampling Activity at PRS 9-001(c)

All soil samples will be analyzed for the indicator parameters listed in Table 6-27 using the methods listed on the table. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP for OU 1157. The types of quality assurance samples and the expected total numbers of samples are summarized in Table 6-28. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The samples will be taken using a 5-ft long, split-barrel sampler inside the auger stem. Sample size requirements are presented in Table II-1. Because the required sample size is considerably smaller than the soil volume available from the sampler, the soil selected for laboratory analysis will be taken from the most highly contaminated part of the sampler



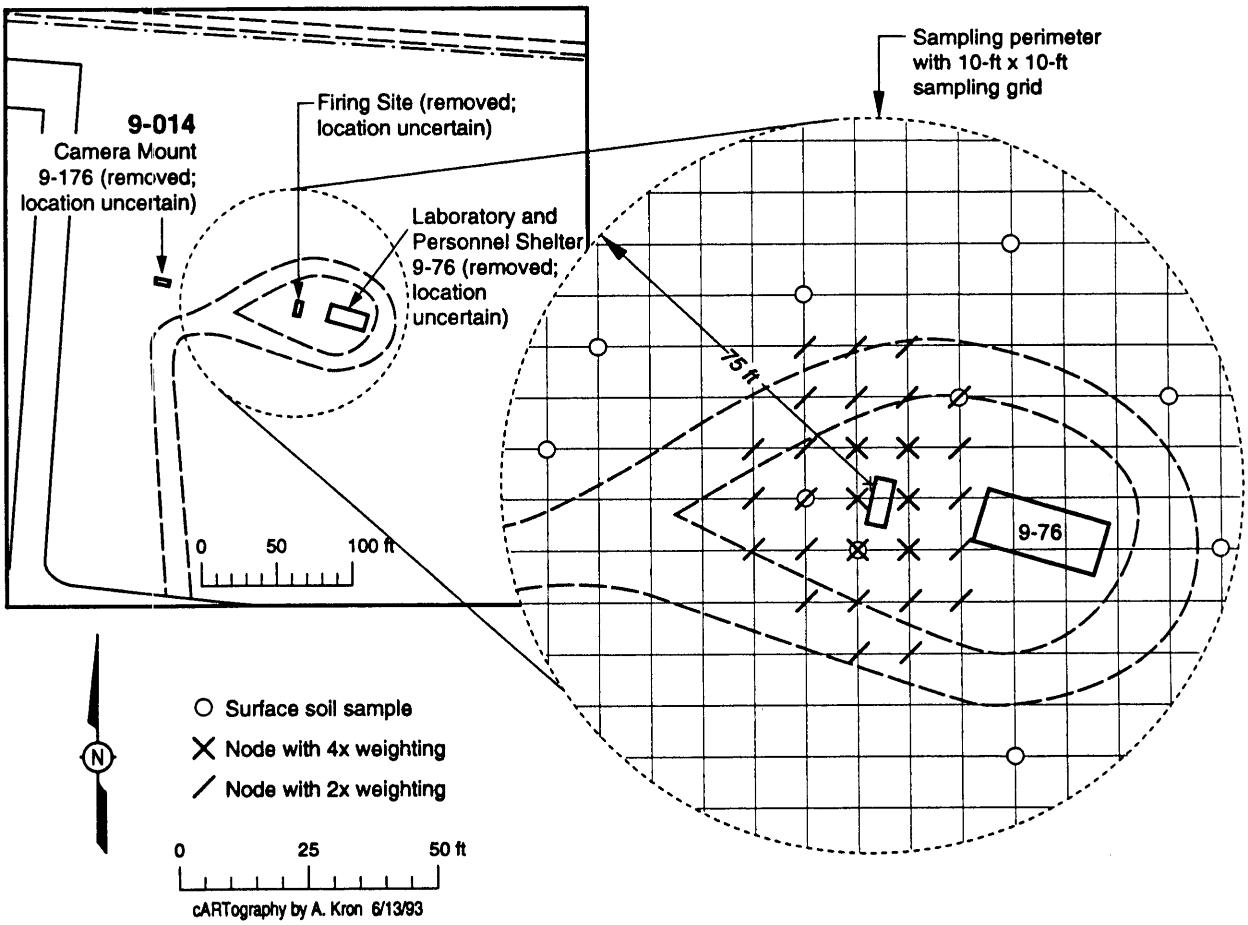


Figure 6-15. Sample locations for PRS 9-001(c), recovery pit and PRS 9-014, camera mount.

soil column as determined from direct field observation and screening methods. Each sample will also be reviewed for the presence of the 2-ft layer of sand that once blanketed the pit bottom. Unless otherwise directed by the screening results, samples for laboratory analysis will be preferentially taken from this sand.

The procedures to be used in the Phase I sampling activity are listed in Table 6-30. These procedures are drawn from the generic lists presented in Chapter 4. These samples will be handled in the same manner as described for the 9-001(a) and (b) firing site samples. A field log will be maintained as previously described in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any drilling or sampling activity.

TABLE 6-30

Borehole Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Drilling Methods and Drill Site Management	LANL-ER-SOP-4.01
General Borehole Logging	LANL-ER-SOP-4.04
Soil and Rock Borehole Logging and Sampling	LANL-ER-SOP-6.12[a]
Spill Control During Drilling	TBD[b]
Field Surveying of Sample Locations	TBD[b]
Hand-Held Instruments for Field Screening of VOCs	TBD[b]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[b]
Field Logging, Handling, and Documentation of Borehole Materials	LANL-ER-SOP-12.01[a]
Curatorial Sample Management	See Chapter 4

a Procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.
b Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

6.6.5.5 Analysis of Sampling Results at PRS 9-001(c)

The results of the sampling will be compared with background and threshold screening action levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result is found to exceed both background and threshold levels.

6.6.6 Potential Release Site 9-002-Burn Pit

6.6.6.1 Sampling and Analysis Strategy at PRS 9-002

Potential Release Site 9-002 was a shallow pit used primarily to burn classified documents, probably including film and photographs. The location of the burn pit is obvious. Biased sampling will be conducted in the bottom of the pit because potentially contaminated ash may remain.

6.6.6.2 Sampling and Analysis Approach at PRS 9-002

Any ash remaining within the burn pit is expected to be relatively homogeneous. This site did not lend itself to the design approach previously used for removed structures because the pit has been located and is apparently unchanged.

Two samples will be collected from the bottom of the 10- by 10-ft burn pit. Surface samples will be taken using hand-held sampling tools. The samples and sampling sites will be field-screened with hand-held instruments for evidence of radioactive or volatile organic waste constituents. The information obtained during this screening will be used to provide worker protection and an initial indication of the presence of waste constituents, and may be used as appropriate to help interpret the sampling results. However, the data obtained from this screening are not expected to have quantitative value for the decisions required under this work plan.

6.6.6.3 Selection of Sampling Sites at PRS 9-002

The 10- by 10-ft burn pit was located so that it partially incorporated the TA-9-15 recovery pit [PRS 9-001(c)]. Because the burn pit's location is precisely known, biased samples will be taken within the bottom of the pit.

The two sampling locations were selected from the 10- by 10-ft area of the pit bottom.

6.6.6.4 Sampling Activity at PRS 9-002

All soil samples will be analyzed for the indicator parameters listed in Table 6-27 using the methods listed on Table II-1 of the QAPjP in Annex II of this work plan. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the expected total numbers of samples are summarized in Table 6-28. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

Samples will be taken of the top 6 in. of soil because waste constituents would have originally been deposited on the upper surface of the soil, which has since remained essentially undisturbed. Samples will be taken using hand sample collection techniques. Sample size requirements are presented in Table II-1. Each sample will be reviewed for the presence of ash. Unless otherwise directed by the screening results, samples for laboratory analysis will be preferentially taken from this ash.

The procedures to be used in the Phase I sampling activity are listed in Table 6-29. These procedures are drawn from the generic lists presented in Chapter 4. These samples will be handled in the same manner as described for the 9-001(a) and (b) firing site samples. A field log will be maintained as previously described. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.6.6.5 Analysis of Sampling Results at PRS 9-002

The results of the sampling will be compared with background and threshold levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result is found to exceed both background and threshold levels.

6.6.7 Potential Release Site 9-014-Firing Site

6.6.7.1 Sampling and Analysis Strategy at PRS 9-014

The smaller shots at the PRS 9-014 firing site were performed in two small pits within a 3.5-ft wide by 12-ft long by 1-ft thick concrete slab. The slab (also called an apron) was on the side of an earth mound and sloped toward Building TA-9-176 to the west, which housed cameras that photographed the shots. To the east of the slab and partially buried within the same earth mound was Building TA-9-76, which served as a personnel shelter during shots. Larger shots that could damage the concrete slab were also occasionally fired at this site at unspecified locations within camera range but outside the slab. It is presumed that these larger shots were fired within the nonforested areas immediately to the north and south of the slab. The aforementioned earth mound and all structures associated with this firing site have been removed. The sampling associated with this PRS will focus on the debris scattered from the firing site during shots.

6.6.7.2 Sampling and Analysis Approach at PRS 9-014

The sampling program was designed with the help of statistical methods as described in Chapter 4. A goal of the design was to take a sufficient number of samples so that there would be at most a 5 percent probability of failing to detect any waste constituents that may be present above background concentrations. In considering the size and potential hazard posed by the site and the approximately random dispersal of waste constituents from the shots, a design was adopted calling for 10 randomly placed samples biased toward the firing pad. With 10 samples, the aforementioned 5 percent probability would be achieved if 30 percent of the area had above-background constituent levels. The level of activity at this site is expected to have been similar to that at the Gun-Firing Site, and the same sampling design was adopted.

The samples will be taken using hand-sampling techniques. The samples and sampling sites will be field-screened with hand-held instruments for evidence of radioactive or volatile organic waste constituents. The information obtained during this screening will be used to provide worker protection and an initial indication of the presence of waste constituents and may be used as appropriate to help interpret the sampling results. However, the data obtained from this screening are not expected to have quantitative value for the decisions required under this work plan.

6.6.7.3 Selection of Sampling Sites at PRS 9-014

The firing pit sampling sites were randomly selected within a 25-yd radius of the approximate location of the concrete slab. Most debris from the smaller shots would be expected to be found within this radius as well as the greatest concentrations of debris from the larger shots. This sampling radius is the same as was adopted for the firing site at PRSs 9-001(a) and (b). Although the location of the firing slab is not shown on available engineering drawings, it is known to have been on the west side of the earth mound, within a loop access road that is still visible on aerial photographs. The approximate location of the slab is shown on Figure 6-15 and is accurate to within an estimated +/-10 ft. This potential error is small compared with the 150-ft diameter sampling area.

The 10 sampling locations were randomly selected from a 10- by 10-ft grid, and are shown in Figure 6-15. Selection of sampling locations was biased as indicated on the figure to increase the number of samples taken near the firing site, where the greatest contaminant concentrations would be expected.

6.6.7.4 Sampling Activity at PRS 9-014

All soil samples will be analyzed for the indicator parameters listed in Table 6-27 using the methods listed on Table II-1. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the expected total numbers of samples are summarized in Table 6-28. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The samples will be taken of the top 12 in. of soil. This sampling depth is greater than at other firing sites because the soil in the vicinity of the firing apron was disturbed when the associated structures were removed and the earth mound was leveled. Sample size requirements are presented in Table II-1, and the required total sample volume is about 390 cm^3.

The procedures to be used in the Phase I sampling activity are listed in Table 6-29. These procedures are drawn from the generic lists presented in Chapter 4. These samples will be handled in the same manner as described for the 9-001(a) and (b) firing site samples. A field log will be maintained as previously described. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any drilling or sampling activity.

6.6.7.5 Analysis of Sampling Results at PRS 9-014

The results of the sampling will be compared with background and threshold levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result is found to exceed both background and threshold levels. Phase I sampling will be performed within the area of greatest potential contaminant concentrations, and if Phase II activities are triggered, additional sampling at greater distances and for a broader range of parameters is expected to be conducted.

6.6.8 Phase II Sampling

Phase II sampling activities will be triggered if any sample is found to contain waste constituents exceeding both background levels and thresholds based on screening action levels as described in Chapter 4. The specific Phase II sampling activities will be determined based upon the Phase I sampling results and will be described in future documents relating to this OU.

6.7 GROUP 7: TECHNICAL AREA 9 MATERIAL DISPOSAL AREA M

6.7.1 Group 7 Background

Material Disposal Area M is a former ground-surface disposal area consisting of the single PRS 9-013. A wide variety of materials including objects made of potentially hazardous metals, chemical laboratory waste, HE test laboratory waste, organic waste, construction debris, and demolition debris was disposed of at this site. This disposal area was used until about 1965. The location of MDA M is shown in Figure 5-13.

6.7.2 Group 7 Sampling Strategy and Objectives

Material Disposal Area M was used for disposal of a wide variety of waste materials. Most of what is known about the potential waste constituents at the site is based on anecdotal information and inferences from present-day observations of the disposed materials rather than from historical disposal records. Materials that would be considered hazardous under present regulations are expected to be present. In addition, smaller quantities of disposed materials dating to approximately the same period as MDA M, some of which may be hazardous, are found in the surrounding forest. These outlying materials are considered to also be part of PRS 9-013.

A multilevel strategy involving interim actions, judgmental and random sampling, and a proposed corrective measure of covering in place are planned for MDA M. This strategy involves the following steps:

1. Collect isolated, potentially hazardous waste materials from the surrounding forest within a distance of at least 3,000 ft from the main disposal area and consolidate them within the main MDA M disposal area; this activity also constitutes an interim action.

2. Sample what appears to be asbestos found as loose mounds of fibers or as intact insulating materials at several places in the main MDA M disposal area and surrounding forest. If asbestos is found to be present, stabilization would be performed in accordance with applicable regulations; this activity would constitute an interim action.

3. Prepare a detailed mapped inventory of the visible contents of the main disposal area including items brought in from outlying areas, with particular attention to items that could have either presently or formerly been associated with hazardous materials. This inventory will also include a detailed radioactive field survey of the disposed wastes. The locations of potentially hazardous or radioactive materials will be identified for future sampling.

4. Select priority judgmental sampling locations based upon the results of the contents inventory and conduct judgmental sampling. Samples are expected to be taken of surface soils, metals, fibers, sludge, and the remaining liquid contents of intact containers. Wipe samples will also be taken of ventilation ducts and other nonporous surfaces potentially contaminated with high explosives. Chip samples will be taken of porous surfaces.

5. Conduct limited random sampling of soils beneath the disposal area to help assure that no unobserved contamination is overlooked.

6. Conduct judgmental sampling of sediments at downstream locations in the vicinity of the main disposal area, where local storm water run-off could have transported waste constituents.

7. Regrade the existing trench surrounding the main MDA M disposal area to keep surface storm water run-off from crossing the site and construct a sedimentation basin at the downslope end of the area to trap sediment eroded from direct precipitation on the site; this activity constitutes an interim action. The run-off control trench is considered to form the outer boundary of the main disposal area.

8. If warranted by the results of the foregoing sampling activities, install a fence around the main disposal area with appropriate warning signs to control human and animal access; this activity would also constitute an interim action.

9. Collect water samples from three springs located downslope from the main disposal area and from Pajarito Creek.

The foregoing activities are designed to provide information needed to confirm the appropriateness of stabilization in place for MDA M. The results of the disposal area sampling will be used to support a risk assessment and help design an appropriate cover system for the disposal area. The results of the sediment, spring, and creek samples will help determine whether any further actions should be taken regarding waste constituents that may have migrated from the site and contaminated local surface or subsurface water resources or canyon bottom sediments. If stabilization in place is adopted as a corrective measure for this site, long-term institutional control would be required.

A Phase II sampling program will be initiated if the results obtained from the Phase I sampling are not sufficient to achieve the program goals or if the Phase I sediment and spring samples indicate the need for further sampling activities away from the MDA M site. Phase II sampling may also be required to support investigation of alternative remedial measures, if the Phase I results indicate that stabilization in place is not feasible.

6.7.3 Group 7 Indicator Parameters

The indicator parameters for Group 7 are listed in Table 6-31 for the five types of media to be sampled: asbestos-like fibers; soils and solid materials; spring water; residual liquids in containers; and wipe samples of solid surfaces. Each of these media will be sampled for the types of waste constituents likely to be present.

Asbestos-like fibers will be analyzed only for the presence of asbestos. Other potentially hazardous substances are not expected to be present in these materials.

The soils will be analyzed for all Chapter 4 extended analyte list parameters, and the solid materials will be analyzed for all extended analyte list parameters except VOCs, which would have volatilized during the nearly 30-year period since the disposal area was last used. The soils and solid material samples will also be analyzed for the eight most commonly used high explosives, several of which are relatively persistent in the environment. Other explosives, such as dinitropropanol, NQ, and EDNA, were used in much smaller quantities, and may degrade rapidly in the environment. Low levels of radioactive waste constituents may also be present in the disposal area and will be checked with gross alpha and gross beta scans.

TABLE 6-31

Group 7 Indicator Parameters

Sampling of Asbestos-Like Fibers

Asbestos

Sampling of Soils and Solid Materials

Organic and Inorganic Parameters
- Chapter 4 Extended Analyte List SVOCs
- Chapter 4 Extended Analyte List VOCs (soils only)
- Chapter 4 Extended Analyte List Inorganic Compounds
- Chapter 4 Extended Analyte List Organochlorine Pesticides & PCBs

High Explosives
- TNT
- RDX
- HMX
- PETN
- Tetryl
- 2,4-Dinitrotoluene
- 1,3,5-Trinitrobenzene
- Explosive D

Radionuclides
- Gross Alpha
- Gross Beta

Sampling of Springs and Creek

Organic and Inorganic Parameters
- Chapter 4 Extended Analyte List VOCs
- Chapter 4 Extended Analyte List SVOCs
- Chapter 4 Extended Analyte List Inorganic Compounds (filtered and unfiltered)
- Chapter 4 Extended Analyte List Organochlorine Pesticides & PCBs

Major Ions and Other Parameters
- Calcium
- Sodium
- Magnesium
- Potassium
- Iron (filtered and unfiltered)
- Uranium (total)
- Chloride
- Fluoride
- Carbonate
- Bicarbonate
- Nitrate (as N)
- Sulfate

TABLE 6-31 (continued)

Group 7 Indicator Parameters

Sampling of Springs and Creek (continued)

- Silicate
- TDS
- Temperature (field)
- pH (field)
- Alkalinity (field)
- Conductivity (field)
- Dissolved Oxygen (field)
- Hardness (total)
- Fecal coliform

High Explosives
- TNT
- RDX
- HMX
- PETN
- Tetryl
- 2,4-Dinitrotoluene
- 1,3,5-Trinitrobenzene
- Explosive D

Radionuclides
- Gross Alpha
- Gross Beta
- Gross Gamma
- Tritium

Sampling of Residual Liquids in Containers

Organic and Inorganic Parameters
- Chapter 4 Extended Analyte List VOCs
- Chapter 4 Extended Analyte List SVOCs
- Chapter 4 Extended Analyte List Inorganic Compounds
- Chapter 4 Extended Analyte List Organochlorine Pesticides & PCBs

Radionuclides
- Gross Alpha
- Gross Beta

Wipe Sampling of Solid Surfaces

High Explosives
- TNT
- RDX
- HMX
- PETN
- Tetryl

TABLE 6-31 (continued)
Group 7 Indicator Parameters

Wipe Sampling of Solid Surfaces (continued)

High Explosives (continued)
- 2,4-Dinitrotoluene
- 1,3,5-Trinitrobenzene
- Explosive D

Water samples from Pajarito Creek and from the three springs in the vicinity of MDA M will be analyzed for all of the Chapter 4 extended analyte list parameters. The water samples will also be analyzed for the eight basic high explosives, gross alpha, gross beta, major ions, and selected water quality parameters such as temperature, conductance, pH, and tritium. The source of water for these springs is uncertain, and these latter parameters will help identify their origin through comparison with the quality of waters from various potential sources. At least some of the spring water may originate from a shallow perched-water zone flowing beneath MDA M, and if waste constituents traceable to Laboratory operations are found to be present, MDA M may be a potential source.

Selected residual liquids remaining in intact or partially intact containers at MDA M will be sampled for all of the Chapter 4 extended analyte list parameters. These liquids will also be checked for low levels of radioactive waste constituents with gross alpha and gross beta scans. The residual liquids are expected to be primarily nonradioactive laboratory reagents, and the analyses will include both VOCs and SVOCs. Also, PCBs may be present in electrical apparatus, but high explosives are not expected to be present in residual liquids and will not be a constituent for analysis.

Residual high explosives may be present in solid form on ventilation ducts and fans that were disposed of at MDA M but may not have been adequately flashed prior to disposal. Such ducts, fans, and other potentially contaminated surfaces will be inspected. Wipe samples will be taken and analyzed for high explosives on surfaces that show evidence of chemical residue or inadequate burning.

6.7.4 Consolidate Waste Materials

Isolated, potentially hazardous waste materials from the surrounding forest will be collected and consolidated within the main MDA M disposal area. It is expected that these waste materials will be collected up to a distance of about 3,000 ft from the main disposal area; however, the boundaries of the outlying area will be established by the Field Team Leader based upon the results of the waste inventory described in Section 6.7.5 and will include any significant accumulations of potentially hazardous waste materials found in the vicinity of the main MDA M disposal area. This constitutes an interim action and is also described in Chapter 4.

Any outlying waste materials that have been identified in previous judgmental sampling to be hazardous will be handled with appropriate care, and any underlying soil that shows evidence of contamination will also be removed and placed within the main MDA M disposal area. Additional soil sampling may be determined to be required in the outlying area by the Field Team Leader after the obvious waste materials have been removed. Any such soil sampling will be conducted in the same manner and for the same indicator parameters as previously described for the judgmental soil samples.

It is assumed that the waste consolidation effort will not change the status of the disposal area. Material Disposal Area M does not fall under RCRA regulations and does not have to be closed as a permitted RCRA facility. Potential Release Site 9-013, constituting the MDA M, has been defined in this work plan as an area including the outlying waste materials, and it is therefore considered that consolidation of those materials into a smaller area does not constitute waste placement under RCRA. If such waste consolidation is determined by the regulatory authorities to constitute placement, any outlying RCRA hazardous materials will be disposed of elsewhere in RCRA-permitted facilities.

6.7.5 Asbestos Sampling

6.7.5.1 Sampling and Analysis Strategy for Asbestos

Judgmental samples will be taken of asbestos-like fibers in PRS 9-013 that are visually apparent in loose piles, as pipe insulation, and potentially as other forms of insulation. These samples will be analyzed for the presence of asbestos. If asbestos is found to be present, the fibers will be stabilized in accordance with applicable regulations to eliminate airborne transport. The asbestos fibers found within the main disposal area will be left in place, and the stabilization will be performed with a minimum of disturbance to the asbestos. The asbestos fibers found outside the main disposal area will also be stabilized in place and relocated to the main disposal area at a later date (see Section 6.7.10). If asbestos is not present in hazardous quantities, the fibers will be left in place without stabilization.

At the option of the OUPL, all asbestos-like fibers found in the disposal area may be assumed to contain asbestos and directly stabilized without conducting the aforementioned sampling. This option may be taken if, after further inspection, the presence of asbestos is considered to be likely and if the elimination of sampling would be cost-effective.

6.7.5.2 Sampling and Analysis Approach for Asbestos

Samples will be obtained by hand methods. Special respiratory protection will be provided during sampling, as described in the Health and Safety Project Plan presented in Annex III of this work plan.

6.7.5.3 Selection of Sampling Sites for Asbestos

Candidate sampling sites will be identified by the Field Team Leader from a visual inspection of the disposal area. These sites will include the locations of asbestos-like materials both inside and outside the main disposal area. Approximately 10 samples are expected to be taken, representing the variety of types of asbestos-like materials found. Fiber piles and disposed insulation products that appear to be similar may be assumed to be similar, and each occurrence of asbestos-like fibers need not be individually sampled. More than 10 samples may be taken at the discretion of the Field Team Leader, if needed, to obtain representative information. The candidate sampling sites, the selected sampling locations, and the rationale for their selection will be documented in the field log.

6.7.5.4 Sampling Activity for Asbestos

All samples will be analyzed for asbestos using the method listed on Table II-1 of the QAPjP in Annex II of this work plan. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the minimum numbers of samples are summarized in Table 6-32. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

All locations where asbestos is found or suspected will be visually inspected, photographed, and field-screened for the presence of VOCs and radioactivity. Any indication of contamination other than asbestos will be noted in the field log. At the discretion of the Field Team Leader, such sites may be prepared for sampling of these contaminants by moving the asbestos materials.

The procedures to be used in the Phase I asbestos sampling activity are listed in Table 6-33. These procedures are drawn from the generic lists presented in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any drilling or sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the quality assurance requirements presented in the QAPjP for OU 1157 and with the ER SOPs providing general sampling instructions.

A field log will be maintained during the sampling program as described in Chapter 4. Any waste sampling equipment and all waste cleaning solutions produced during the sampling operations will be disposed of in accordance with LANL-ER-SOP-01.06.

6.7.5.5 Analysis of Sampling Results for Asbestos

The results of the asbestos sampling will be used to determine whether stabilization of the asbestos-like fibers observed at MDA M is required. No additional Phase II asbestos sampling is anticipated.

6.7.6 Material Disposal Area M Waste Inventory

Following stabilization of any fibrous asbestos materials found in PRS 9-013, a detailed mapped inventory of the visible contents of the area will be prepared. The results of this inventory will be used to identify and prioritize judgmental locations for soil, solid, liquid, and wipe sampling of the disposal area contents. The inventory will include the main

TABLE 6-32

Group 7 Sampling Types

Sampling Type	Number of Site Samples	Expected Number of QA Samples[a]	Total Samples
Asbestos-Like Fibers			
Fibers	10[b]	1[c]	11
Judgmental Waste Material Sampling			
Soils	18[b]	4[e]	22
Solids	5[b]	3	8
Residual Liquids	10[b]	4	14
Wipes	5[b]	3[d]	8
Random Soil Sampling			
Soil	14	4[e]	18
Sediment Sampling			
Sediment	3	3[e]	6
Spring and Creek Sampling			
Water	12[f]	8	20

a Field Blank: One for each sampling medium
Trip Blank: One per analytical laboratory shipping container, for VOC analysis only.
Duplicate Sample: One for each sampling medium.
Equipment (Rinsate) Blank: One for each sampling medium.

b The expected number of site samples is given; this number may be modified at the discretion of the Field Team Leader.

c Only duplicate samples will be taken for asbestos analysis.

d No equipment blanks will be required for wipe samples if all sampling equipment is disposable.

e Because the indicator parameters and sampling methods are identical, the same QA samples may be used for all soil sampling conducted within any week of sampling activity, provided that at least one QA sample is collected for every 20 soil samples.

f Two sampling rounds will be conducted for the springs, and one set of four QA samples will be prepared during each round.

TABLE 6-33
Asbestos Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Sampling for Asbestos	TBD[a]
Field Surveying of Sample Locations	TBD[a]
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I sampling activity.

area, the satellite disposal area to the northwest of the main disposal area, as well as any waste materials found in the surrounding forest up to a distance of about 3,000 ft from the main disposal area. The boundaries of the outlying area will be established by the Field Team Leader based upon the results of this inventory and will include any significant accumulations of waste materials found in the vicinity.

The inventory will identify the nature and locations of the principal disposed materials and will emphasize any materials that may be hazardous or radioactive. The inventory will be based on visual observations and on data obtained from hand-held VOC and radioelement field-screening instrumentation. A photographic record of the disposal area contents will be prepared as part of the inventory.

Special care will be taken to identify any hazardous metals, residual liquids in containers, electrical apparatus that may contain PCBs, residual sludge, stained soils, unusual odors, and potentially hazardous residual deposits in pipes and on ventilation system components. It is expected that this inventory will be conducted with little or no moving of waste materials; however, such materials may be relocated at the discretion of the Field Team Leader to access any suspected sources of contamination.

A field log will be maintained during the waste inventory activity as described in Chapter 4. Any potentially hazardous sites found within the disposal area will be described in sufficient detail to provide a basis for ranking locations for subsequent sampling. Any waste sampling equipment and all waste cleaning solutions produced during the sampling operations will be disposed of in accordance with LANL-ER-SOP-01.06.

6.7.7 Judgmental Soil, Solid, Residual Liquid, and Wipe Sampling

6.7.7.1 Sampling and Analysis Strategy for Judgmental Locations

Judgmental sampling will be performed at the locations of potentially hazardous waste materials identified in the aforementioned waste inventory. Samples are expected to be taken of surface soils, metals, sludge, and the residual liquid contents of any containers found at the site. If the number of potentially hazardous waste sites identified in the inventory is large, the sites will be prioritized by the Field Team Leader, and sampling will be limited to selected representative, higher priority sites. The results of the judgmental sampling will be used to support a risk assessment and help design an appropriate cover system for the disposal area.

6.7.7.2 Sampling and Analysis Approach for Judgmental Locations

Samples will be obtained by hand methods. The waste inventory is expected to identify potential sources of contamination primarily based upon the types of waste materials observed to have been disposed. Field screening tests for HE, radionuclides, and volatile organics may be used to help identify sampling locations. At each selected sampling site, solid, liquid, or wipe samples of the waste materials may be taken at the discretion of the Field Team Leader. Samples of the top 12 in. of underlying soil may also be taken at each selected sampling site at the discretion of the Field Team Leader, depending upon the likelihood that waste constituents could have migrated from the potential waste material source to the soil. Any waste constituents released at the site would be expected to be present within this sampling depth. The ground surface is covered by waste materials over much of the main disposal area, and some relocation of waste materials will generally be necessary to expose the soil for sampling. Any relocated

6.7 GROUP 7: TECHNICAL AREA 9 MATERIAL DISPOSAL AREA M

6.7.1 Group 7 Background

Material Disposal Area M is a former ground-surface disposal area consisting of the single PRS 9-013. A wide variety of materials including objects made of potentially hazardous metals, chemical laboratory waste, HE test laboratory waste, organic waste, construction debris, and demolition debris was disposed of at this site. This disposal area was used until about 1965. The location of MDA M is shown in Figure 5-13.

6.7.2 Group 7 Sampling Strategy and Objectives

Material Disposal Area M was used for disposal of a wide variety of waste materials. Most of what is known about the potential waste constituents at the site is based on anecdotal information and inferences from present-day observations of the disposed materials rather than from historical disposal records. Materials that would be considered hazardous under present regulations are expected to be present. In addition, smaller quantities of disposed materials dating to approximately the same period as MDA M, some of which may be hazardous, are found in the surrounding forest. These outlying materials are considered to also be part of PRS 9-013.

A multilevel strategy involving interim actions, judgmental and random sampling, and a proposed corrective measure of covering in place are planned for MDA M. This strategy involves the following steps:

1. Collect isolated, potentially hazardous waste materials from the surrounding forest within a distance of at least 3,000 ft from the main disposal area and consolidate them within the main MDA M disposal area; this activity also constitutes an interim action.

2. Sample what appears to be asbestos found as loose mounds of fibers or as intact insulating materials at several places in the main MDA M disposal area and surrounding forest. If asbestos is found to be present, stabilization would be performed in accordance with applicable regulations; this activity would constitute an interim action.

3. Prepare a detailed mapped inventory of the visible contents of the main disposal area including items brought in from outlying areas, with particular attention to items that could have either presently or formerly been associated with hazardous materials. This inventory will also include a detailed radioactive field survey of the disposed wastes. The locations of potentially hazardous or radioactive materials will be identified for future sampling.

4. Select priority judgmental sampling locations based upon the results of the contents inventory and conduct judgmental sampling. Samples are expected to be taken of surface soils, metals, fibers, sludge, and the remaining liquid contents of intact containers. Wipe samples will also be taken of ventilation ducts and other nonporous surfaces potentially contaminated with high explosives. Chip samples will be taken of porous surfaces.

5. Conduct limited random sampling of soils beneath the disposal area to help assure that no unobserved contamination is overlooked.

6. Conduct judgmental sampling of sediments at downstream locations in the vicinity of the main disposal area, where local storm water run-off could have transported waste constituents.

7. Regrade the existing trench surrounding the main MDA M disposal area to keep surface storm water run-off from crossing the site and construct a sedimentation basin at the downslope end of the area to trap sediment eroded from direct precipitation on the site; this activity constitutes an interim action. The run-off control trench is considered to form the outer boundary of the main disposal area.

8. If warranted by the results of the foregoing sampling activities, install a fence around the main disposal area with appropriate warning signs to control human and animal access; this activity would also constitute an interim action.

9. Collect water samples from three springs located downslope from the main disposal area and from Pajarito Creek.

The foregoing activities are designed to provide information needed to confirm the appropriateness of stabilization in place for MDA M. The results of the disposal area sampling will be used to support a risk assessment and help design an appropriate cover system for the disposal area. The results of the sediment, spring, and creek samples will help determine whether any further actions should be taken regarding waste constituents that may have migrated from the site and contaminated local surface or subsurface water resources or canyon bottom sediments. If stabilization in place is adopted as a corrective measure for this site, long-term institutional control would be required.

A Phase II sampling program will be initiated if the results obtained from the Phase I sampling are not sufficient to achieve the program goals or if the Phase I sediment and spring samples indicate the need for further sampling activities away from the MDA M site. Phase II sampling may also be required to support investigation of alternative remedial measures, if the Phase I results indicate that stabilization in place is not feasible.

6.7.3 Group 7 Indicator Parameters

The indicator parameters for Group 7 are listed in Table 6-31 for the five types of media to be sampled: asbestos-like fibers; soils and solid materials; spring water; residual liquids in containers; and wipe samples of solid surfaces. Each of these media will be sampled for the types of waste constituents likely to be present.

Asbestos-like fibers will be analyzed only for the presence of asbestos. Other potentially hazardous substances are not expected to be present in these materials.

The soils will be analyzed for all Chapter 4 extended analyte list parameters, and the solid materials will be analyzed for all extended analyte list parameters except VOCs, which would have volatilized during the nearly 30-year period since the disposal area was last used. The soils and solid material samples will also be analyzed for the eight most commonly used high explosives, several of which are relatively persistent in the environment. Other explosives, such as dinitropropanol, NQ, and EDNA, were used in much smaller quantities, and may degrade rapidly in the environment. Low levels of radioactive waste constituents may also be present in the disposal area and will be checked with gross alpha and gross beta scans.

TABLE 6-31

Group 7 Indicator Parameters

Sampling of Asbestos-Like Fibers

Asbestos

Sampling of Soils and Solid Materials

Organic and Inorganic Parameters
- Chapter 4 Extended Analyte List SVOCs
- Chapter 4 Extended Analyte List VOCs (soils only)
- Chapter 4 Extended Analyte List Inorganic Compounds
- Chapter 4 Extended Analyte List Organochlorine Pesticides & PCBs

High Explosives
- TNT
- RDX
- HMX
- PETN
- Tetryl
- 2,4-Dinitrotoluene
- 1,3,5-Trinitrobenzene
- Explosive D

Radionuclides
- Gross Alpha
- Gross Beta

Sampling of Springs and Creek

Organic and Inorganic Parameters
- Chapter 4 Extended Analyte List VOCs
- Chapter 4 Extended Analyte List SVOCs
- Chapter 4 Extended Analyte List Inorganic Compounds (filtered and unfiltered)
- Chapter 4 Extended Analyte List Organochlorine Pesticides & PCBs

Major Ions and Other Parameters
- Calcium
- Sodium
- Magnesium
- Potassium
- Iron (filtered and unfiltered)
- Uranium (total)
- Chloride
- Fluoride
- Carbonate
- Bicarbonate
- Nitrate (as N)
- Sulfate

TABLE 6-31 (continued)

Group 7 Indicator Parameters

Sampling of Springs and Creek (continued)

Silicate
TDS
Temperature (field)
pH (field)
Alkalinity (field)
Conductivity (field)
Dissolved Oxygen (field)
Hardness (total)
Fecal coliform

High Explosives
TNT
RDX
HMX
PETN
Tetryl
2,4-Dinitrotoluene
1,3,5-Trinitrobenzene
Explosive D

Radionuclides
Gross Alpha
Gross Beta
Gross Gamma
Tritium

Sampling of Residual Liquids in Containers

Organic and Inorganic Parameters
Chapter 4 Extended Analyte List VOCs
Chapter 4 Extended Analyte List SVOCs
Chapter 4 Extended Analyte List Inorganic Compounds
Chapter 4 Extended Analyte List Organochlorine Pesticides & PCBs

Radionuclides
Gross Alpha
Gross Beta

Wipe Sampling of Solid Surfaces

High Explosives
TNT
RDX
HMX
PETN
Tetryl

TABLE 6-31 (continued)
Group 7 Indicator Parameters

Wipe Sampling of Solid Surfaces (continued)

High Explosives (continued)
- 2,4-Dinitrotoluene
- 1,3,5-Trinitrobenzene
- Explosive D

Water samples from Pajarito Creek and from the three springs in the vicinity of MDA M will be analyzed for all of the Chapter 4 extended analyte list parameters. The water samples will also be analyzed for the eight basic high explosives, gross alpha, gross beta, major ions, and selected water quality parameters such as temperature, conductance, pH, and tritium. The source of water for these springs is uncertain, and these latter parameters will help identify their origin through comparison with the quality of waters from various potential sources. At least some of the spring water may originate from a shallow perched-water zone flowing beneath MDA M, and if waste constituents traceable to Laboratory operations are found to be present, MDA M may be a potential source.

Selected residual liquids remaining in intact or partially intact containers at MDA M will be sampled for all of the Chapter 4 extended analyte list parameters. These liquids will also be checked for low levels of radioactive waste constituents with gross alpha and gross beta scans. The residual liquids are expected to be primarily nonradioactive laboratory reagents, and the analyses will include both VOCs and SVOCs. Also, PCBs may be present in electrical apparatus, but high explosives are not expected to be present in residual liquids and will not be a constituent for analysis.

Residual high explosives may be present in solid form on ventilation ducts and fans that were disposed of at MDA M but may not have been adequately flashed prior to disposal. Such ducts, fans, and other potentially contaminated surfaces will be inspected. Wipe samples will be taken and analyzed for high explosives on surfaces that show evidence of chemical residue or inadequate burning.

6.7.4 Consolidate Waste Materials

Isolated, potentially hazardous waste materials from the surrounding forest will be collected and consolidated within the main MDA M disposal area. It is expected that these waste materials will be collected up to a distance of about 3,000 ft from the main disposal area; however, the boundaries of the outlying area will be established by the Field Team Leader based upon the results of the waste inventory described in Section 6.7.5 and will include any significant accumulations of potentially hazardous waste materials found in the vicinity of the main MDA M disposal area. This constitutes an interim action and is also described in Chapter 4.

Any outlying waste materials that have been identified in previous judgmental sampling to be hazardous will be handled with appropriate care, and any underlying soil that shows evidence of contamination will also be removed and placed within the main MDA M disposal area. Additional soil sampling may be determined to be required in the outlying area by the Field Team Leader after the obvious waste materials have been removed. Any such soil sampling will be conducted in the same manner and for the same indicator parameters as previously described for the judgmental soil samples.

It is assumed that the waste consolidation effort will not change the status of the disposal area. Material Disposal Area M does not fall under RCRA regulations and does not have to be closed as a permitted RCRA facility. Potential Release Site 9-013, constituting the MDA M, has been defined in this work plan as an area including the outlying waste materials, and it is therefore considered that consolidation of those materials into a smaller area does not constitute waste placement under RCRA. If such waste consolidation is determined by the regulatory authorities to constitute placement, any outlying RCRA hazardous materials will be disposed of elsewhere in RCRA-permitted facilities.

6.7.5 Asbestos Sampling

6.7.5.1 Sampling and Analysis Strategy for Asbestos

Judgmental samples will be taken of asbestos-like fibers in PRS 9-013 that are visually apparent in loose piles, as pipe insulation, and potentially as other forms of insulation. These samples will be analyzed for the presence of asbestos. If asbestos is found to be present, the fibers will be stabilized in accordance with applicable regulations to eliminate airborne transport. The asbestos fibers found within the main disposal area will be left in place, and the stabilization will be performed with a minimum of disturbance to the asbestos. The asbestos fibers found outside the main disposal area will also be stabilized in place and relocated to the main disposal area at a later date (see Section 6.7.10). If asbestos is not present in hazardous quantities, the fibers will be left in place without stabilization.

At the option of the OUPL, all asbestos-like fibers found in the disposal area may be assumed to contain asbestos and directly stabilized without conducting the aforementioned sampling. This option may be taken if, after further inspection, the presence of asbestos is considered to be likely and if the elimination of sampling would be cost-effective.

6.7.5.2 Sampling and Analysis Approach for Asbestos

Samples will be obtained by hand methods. Special respiratory protection will be provided during sampling, as described in the Health and Safety Project Plan presented in Annex III of this work plan.

6.7.5.3 Selection of Sampling Sites for Asbestos

Candidate sampling sites will be identified by the Field Team Leader from a visual inspection of the disposal area. These sites will include the locations of asbestos-like materials both inside and outside the main disposal area. Approximately 10 samples are expected to be taken, representing the variety of types of asbestos-like materials found. Fiber piles and disposed insulation products that appear to be similar may be assumed to be similar, and each occurrence of asbestos-like fibers need not be individually sampled. More than 10 samples may be taken at the discretion of the Field Team Leader, if needed, to obtain representative information. The candidate sampling sites, the selected sampling locations, and the rationale for their selection will be documented in the field log.

6.7.5.4 Sampling Activity for Asbestos

All samples will be analyzed for asbestos using the method listed on Table II-1 of the QAPjP in Annex II of this work plan. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the minimum numbers of samples are summarized in Table 6-32. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

All locations where asbestos is found or suspected will be visually inspected, photographed, and field-screened for the presence of VOCs and radioactivity. Any indication of contamination other than asbestos will be noted in the field log. At the discretion of the Field Team Leader, such sites may be prepared for sampling of these contaminants by moving the asbestos materials.

The procedures to be used in the Phase I asbestos sampling activity are listed in Table 6-33. These procedures are drawn from the generic lists presented in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any drilling or sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the quality assurance requirements presented in the QAPjP for OU 1157 and with the ER SOPs providing general sampling instructions.

A field log will be maintained during the sampling program as described in Chapter 4. Any waste sampling equipment and all waste cleaning solutions produced during the sampling operations will be disposed of in accordance with LANL-ER-SOP-01.06.

6.7.5.5 Analysis of Sampling Results for Asbestos

The results of the asbestos sampling will be used to determine whether stabilization of the asbestos-like fibers observed at MDA M is required. No additional Phase II asbestos sampling is anticipated.

6.7.6 Material Disposal Area M Waste Inventory

Following stabilization of any fibrous asbestos materials found in PRS 9-013, a detailed mapped inventory of the visible contents of the area will be prepared. The results of this inventory will be used to identify and prioritize judgmental locations for soil, solid, liquid, and wipe sampling of the disposal area contents. The inventory will include the main

TABLE 6-32

Group 7 Sampling Types

Sampling Type	Number of Site Samples	Expected Number of QA Samples[a]	Total Samples
Asbestos-Like Fibers			
Fibers	10[b]	1[c]	11
Judgmental Waste Material Sampling			
Soils	18[b]	4[e]	22
Solids	5[b]	3	8
Residual Liquids	10[b]	4	14
Wipes	5[b]	3[d]	8
Random Soil Sampling			
Soil	14	4[e]	18
Sediment Sampling			
Sediment	3	3[e]	6
Spring and Creek Sampling			
Water	12[f]	8	20

a Field Blank: One for each sampling medium
Trip Blank: One per analytical laboratory shipping container, for VOC analysis only.
Duplicate Sample: One for each sampling medium.
Equipment (Rinsate) Blank: One for each sampling medium.
b The expected number of site samples is given; this number may be modified at the discretion of the Field Team Leader.
c Only duplicate samples will be taken for asbestos analysis.
d No equipment blanks will be required for wipe samples if all sampling equipment is disposable.
e Because the indicator parameters and sampling methods are identical, the same QA samples may be used for all soil sampling conducted within any week of sampling activity, provided that at least one QA sample is collected for every 20 soil samples.
f Two sampling rounds will be conducted for the springs, and one set of four QA samples will be prepared during each round.

TABLE 6-33

Asbestos Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Sampling for Asbestos	TBD[a]
Field Surveying of Sample Locations	TBD[a]
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I sampling activity.

area, the satellite disposal area to the northwest of the main disposal area, as well as any waste materials found in the surrounding forest up to a distance of about 3,000 ft from the main disposal area. The boundaries of the outlying area will be established by the Field Team Leader based upon the results of this inventory and will include any significant accumulations of waste materials found in the vicinity.

The inventory will identify the nature and locations of the principal disposed materials and will emphasize any materials that may be hazardous or radioactive. The inventory will be based on visual observations and on data obtained from hand-held VOC and radioelement field-screening instrumentation. A photographic record of the disposal area contents will be prepared as part of the inventory.

Special care will be taken to identify any hazardous metals, residual liquids in containers, electrical apparatus that may contain PCBs, residual sludge, stained soils, unusual odors, and potentially hazardous residual deposits in pipes and on ventilation system components. It is expected that this inventory will be conducted with little or no moving of waste materials; however, such materials may be relocated at the discretion of the Field Team Leader to access any suspected sources of contamination.

A field log will be maintained during the waste inventory activity as described in Chapter 4. Any potentially hazardous sites found within the disposal area will be described in sufficient detail to provide a basis for ranking locations for subsequent sampling. Any waste sampling equipment and all waste cleaning solutions produced during the sampling operations will be disposed of in accordance with LANL-ER-SOP-01.06.

6.7.7 Judgmental Soil, Solid, Residual Liquid, and Wipe Sampling

6.7.7.1 Sampling and Analysis Strategy for Judgmental Locations

Judgmental sampling will be performed at the locations of potentially hazardous waste materials identified in the aforementioned waste inventory. Samples are expected to be taken of surface soils, metals, sludge, and the residual liquid contents of any containers found at the site. If the number of potentially hazardous waste sites identified in the inventory is large, the sites will be prioritized by the Field Team Leader, and sampling will be limited to selected representative, higher priority sites. The results of the judgmental sampling will be used to support a risk assessment and help design an appropriate cover system for the disposal area.

6.7.7.2 Sampling and Analysis Approach for Judgmental Locations

Samples will be obtained by hand methods. The waste inventory is expected to identify potential sources of contamination primarily based upon the types of waste materials observed to have been disposed. Field screening tests for HE, radionuclides, and volatile organics may be used to help identify sampling locations. At each selected sampling site, solid, liquid, or wipe samples of the waste materials may be taken at the discretion of the Field Team Leader. Samples of the top 12 in. of underlying soil may also be taken at each selected sampling site at the discretion of the Field Team Leader, depending upon the likelihood that waste constituents could have migrated from the potential waste material source to the soil. Any waste constituents released at the site would be expected to be present within this sampling depth. The ground surface is covered by waste materials over much of the main disposal area, and some relocation of waste materials will generally be necessary to expose the soil for sampling. Any relocated waste materials will be left in the general vicinity of their original site but need not be restored to their original locations after sampling.

6.7.7.3 Selection of Sampling Sites for Judgmental Locations

Candidate sampling sites will be identified by the Field Team Leader from the inventory of the disposal area. These sites are expected to include locations both inside the main disposal area, in the satellite disposal area, and in the surrounding forest. A total of approximately 38 judgmental samples are expected to be taken, representing the variety of solid and liquid waste materials found. A breakdown of the expected number of samples of each type is shown in Table 6-32. Sampling will be focused on the locations that have the potential to have higher concentrations of waste constituents, as determined by the Field Team Leader. Although not all sites are expected to require individual sampling, additional samples may be taken at the discretion of the Field Team Leader if needed to obtain representative information. The candidate sampling sites, the selected sampling locations, and the rationale for their selection will be documented in the field log.

6.7.7.4 Sampling Activity for Judgmental Locations

The analyses to be performed on the various types of samples are listed in Table 6-31. The sampling results are intended to be used to support a risk assessment and help design a waste stabilization system for the disposal area. As discussed in Section 6.7.3, different indicator parameter suites are provided for the soils and solids, residual liquids, and wipe samples. Soil samples for VOC analysis will be taken from a depth of about 12 in., and soil samples for all remaining analytes will be taken from the top 12 in. below the ground surface.

Quality assurance samples will be taken in accordance with the requirements of the QAPjP for OU 1157. The types of quality assurance samples and the minimum numbers of samples are summarized in Table 6-32. Because the indicator parameters and sampling methods for judgmental soil samples are identical to those for random soil sampling and sediment sampling, the same QA samples may be used for all soil sampling conducted within any week of sampling activity. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader. All samples and sampling locations will be photographed and field-screened for the presence of VOCs and radioactive substances.

The sample size requirements for the Phase I waste material sampling indicator parameters are listed in Table II-1. A more focused analysis program may be suitable for certain solids, whose chemistry may be closely approximated by the packaging, use, or shape of the material, or for certain liquids whose chemistry may be judged by the packaging. Any potential waste constituent that is present in unsampleable amounts would not be expected to be a high priority for sampling. Any modifications to the indicator parameter list for selected samples will be documented and justified in the field log.

The procedures to be used in the Phase I waste material sampling activities are listed in Table 6-34. The procedures on the table are drawn from the generic lists presented in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any drilling or sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the quality assurance requirements presented in the QAPjP for OU 1157 and with the ER SOPs providing general sampling instructions.

A field log will be maintained during the sampling program as previously described in Chapter 4. The field log will document and provide justification for any modifications to this sampling plan approved by the Field Team Leader. Any waste sampling equipment and all waste decontamination solutions produced during the sampling operations will be disposed of in accordance with LANL-ER-SOP-01.06.

6.7.7.5 Analysis of Sampling Results for Judgmental Locations

The results of the waste material sampling will be used to support a risk assessment and help design an appropriate cover system for the disposal area. No additional Phase II waste material sampling is anticipated.

TABLE 6-34

Judgmental Waste Material and Random Soil Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Sampling for Volatile Organics	LANL-ER-SOP-6.03
Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-6.09
Stainless Steel Surface Soil Sampler	LANL-ER-SOP-6.11
Surface Water Sampling	LANL-ER-SOP-6.13
Weighted Bottle Sampler for Liquids and Slurries in Tanks	LANL-ER-SOP-6.19
Wipe Sampling of Solid Surfaces	TBD[a]
Field Surveying of Sample Locations	TBD[a]
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

6.7.8 Random Soil Sampling

6.7.8.1 Sampling and Analysis Strategy for Random Locations

Random sampling will be conducted on soils underlying the waste materials within the main MDA M disposal area to supplement the judgmental soil sampling activities. Sampling locations will be randomly selected within the parts of the disposal area that contain waste materials. The results of the random sampling will be used to support a risk assessment and help design an appropriate cover system for the disposal area.

6.7.8.2 Sampling and Analysis Approach for Random Locations

Shallow surface soil samples will be taken at random locations within the main disposal area of MDA M. A sufficient number of samples will be taken for a range of analytes so that, when aggregated with the judgmental soil samples, sufficient confidence will be attained that the site is adequately characterized to support a risk assessment and cover system design. Samples and sample locations will be field-screened for the presence of VOCs and radionuclides.

6.7.8.3 Selection of Sampling Sites for Random Locations

A map showing the extent of waste disposal within the MDA M main disposal area is shown in Figure 6-16. The waste disposal areas cover approximately 65,000 ft^2. If it is assumed that soils that may have received waste constituents have equal probability of occurring anywhere within that area, 29 soil samples would be needed to achieve at least a 95 percent probability of detecting an area where waste constituent concentrations are above-background levels, assuming that 10 percent of the area may have waste constituents above background levels. This fraction of the area potentially above background is considered to be appropriate, given that most of the waste materials at the site appear from visual inspection to be nonhazardous. Of the 18 judgmental soil samples expected to be taken at MDA M (see Table 6-32), at least one is expected to be taken at the satellite disposal area (see Figure 6-17), two at sites in the surrounding forest, and 15 in the main MDA M disposal area. If the approximately 15 judgmental soil samples in the main disposal area are included in the aforementioned 29 samples, then about 14 additional random soil samples would be required.

Although the assumptions underlying a purely statistical argument are not strictly met, this approach does provide insight into the relative adequacy of 29 soil samples within the MDA M main disposal area. In reality, the 15 judgmental soil samples would be expected to have a better chance of detecting soil contamination than 15 random samples because of the added value of the judgmental sampling location process. Based upon this reasoning, an additional 14 random soil samples should provide adequate characterization of the MDA M main disposal area. These 14 random sampling locations

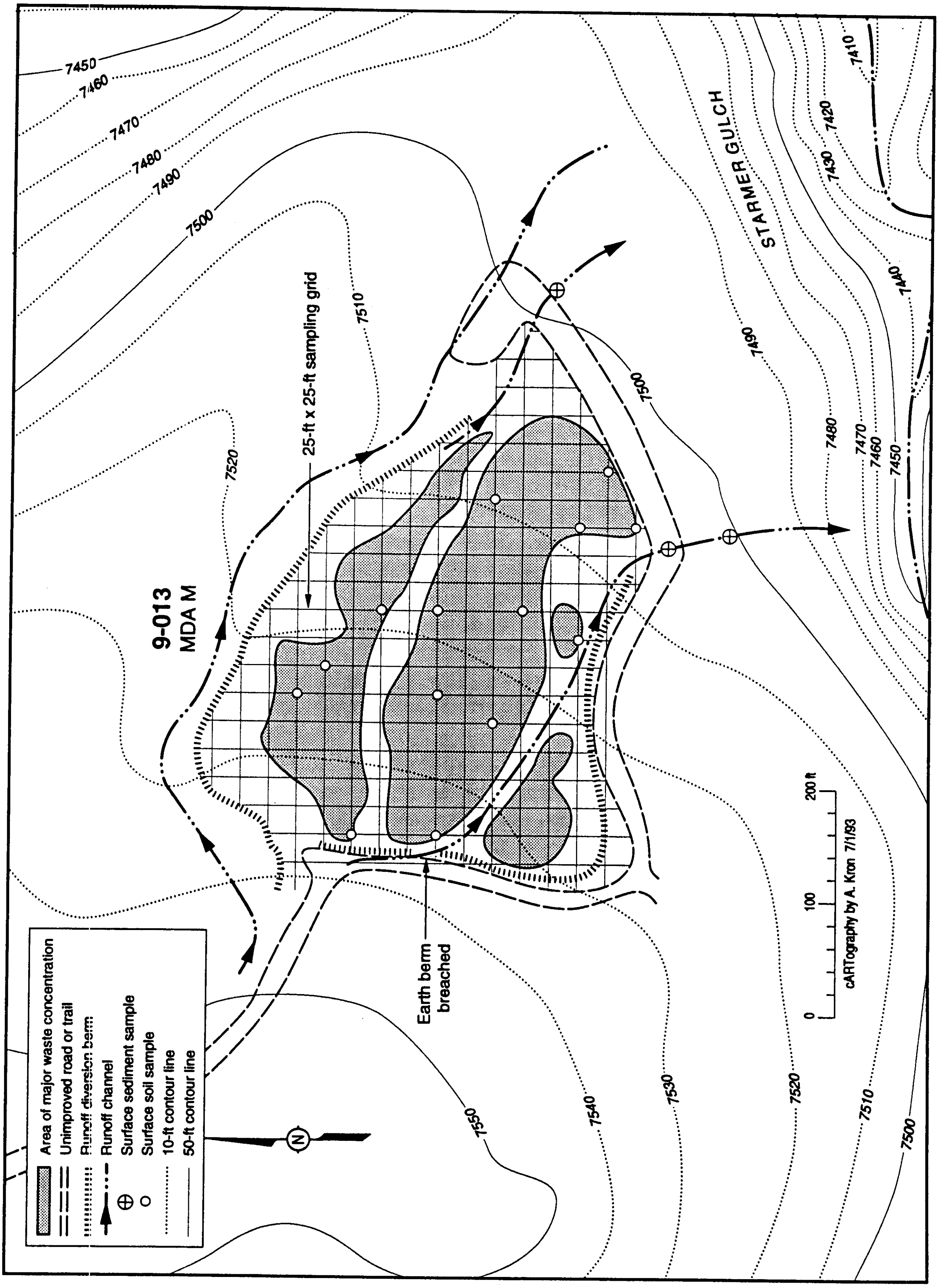


Figure 6-16. MDA M sediment and random soil sampling locations.

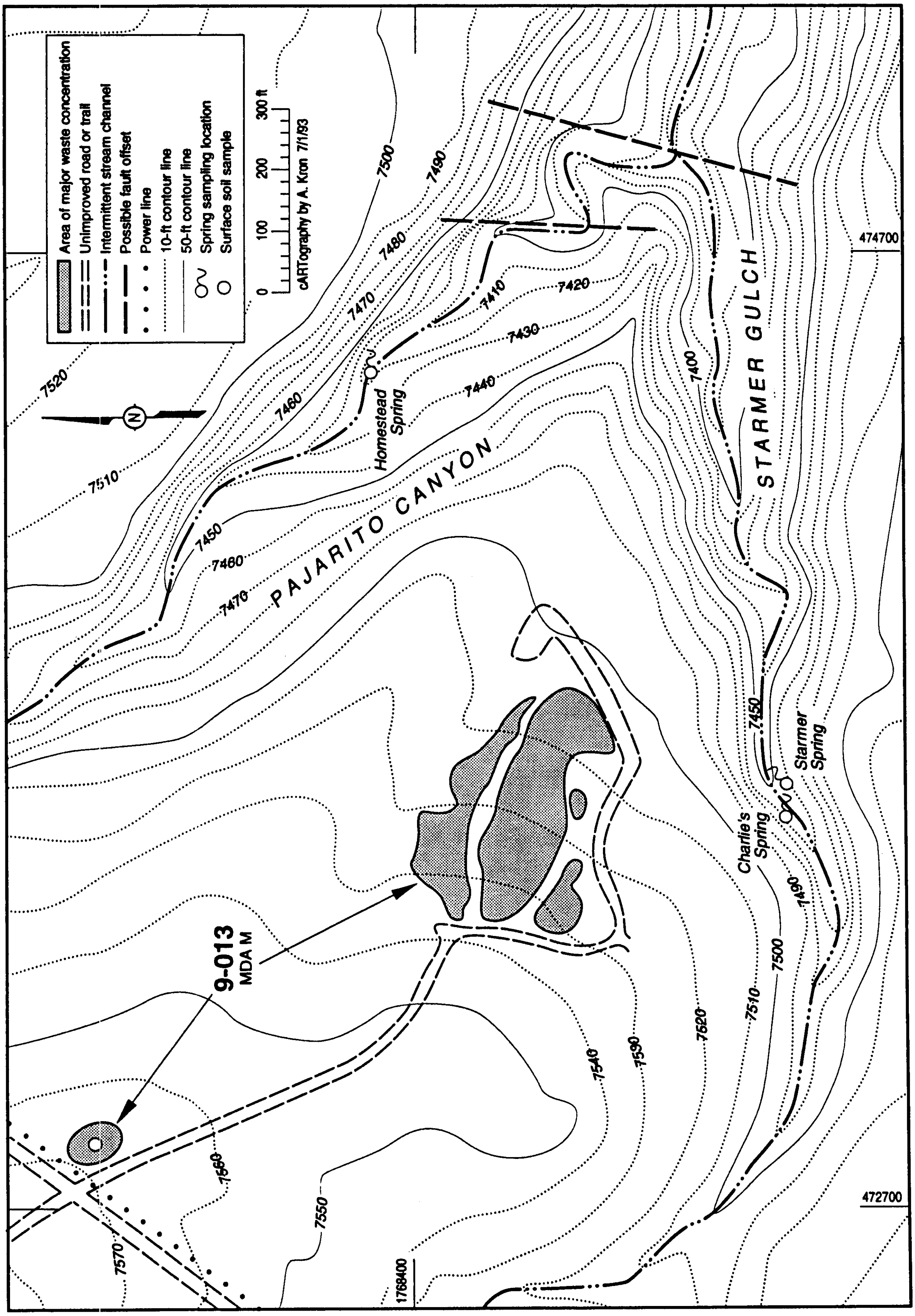


Figure 6-17. Sampling locations near MDA M.

were determined by laying a 25- by 25-ft grid over the area and randomly selecting grid nodal points. The sampling grid and sample locations are shown on Figure 6-16.

6.7.8.4 Sampling Activity for Random Locations

Samples will be taken using hand sample collection techniques. Soil samples for VOC analysis will be taken from a depth of about 12 in., and soil samples for all remaining analytic will be taken from the top 12 in. below the ground surface. Although waste constituents in the waste stream would have originally been deposited on and sorbed to the upper surface of the sediments as at many other sites in OU 1157, a greater than usual sampling depth is proposed because of the possibility that the ground surface at MDA M could have been disturbed during waste disposal.

If a sample location is found to be exceptionally difficult to access because of the overlying waste materials, an alternate location may be selected in the immediate vicinity by the Field Team Leader. The random soil samples will be analyzed for the same suite of indicator parameters as the judgmental soil samples. The analytical methods and practical quantification limits for these indicator parameters are shown in Table II-1. The sampling results are intended to be used to support a risk assessment and help design a waste stabilization system for the disposal area.

Quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-32. Because the indicator parameters and sampling methods are identical, the same QA samples may be used for all soil sampling conducted within any week of sampling activity. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader. The sizes of the random soil samples are shown in Table II-1 and will be the same as for the judgmental soil samples.

The sampling procedures to be used in the Phase I random soil sampling activity are the same as those for the judgmental soil sampling and are included in Table 6-34. The random soil samples will be handled in the same manner as previously described for the judgmental samples. A field log will be maintained as previously described. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.7.8.5 Analysis of Sampling Results for Random Locations

The results of the random soil sampling will be used to support a risk assessment and help design an appropriate cover system for the disposal area. No additional Phase II random soil sampling is anticipated.

6.7.9 Judgmental Sampling of Downstream Sediments

6.7.9.1 Sampling and Analysis Strategy for Sediments

Judgmental sampling will be performed on potentially contaminated surface sediments that appear to have been eroded from the MDA M main disposal area and washed downstream by surface run-off. The trench installed to channel such run-off around the disposal area has been breached, and additional sediments may have been eroded from direct precipitation on the disposal area. Two intermittent stream channels leave the site, and sediments will be sampled in both. Both streams lead to the mesa edge on the south side of the site, and sediments from the site may have been transported into the canyon. The results of the sediment sampling will be used to determine if unacceptable concentrations of waste constituents have been eroded from the MDA M main disposal area toward the mesa edge.

6.7.9.2 Sampling and Analysis Approach for Sediments

Samples will be obtained by hand methods at locations where stream bed sediments have collected.

6.7.9.3 Selection of Sampling Sites for Sediments

Three sampling sites have been identified: two in the westernmost stream bed and one in the easternmost stream bed. The approximate locations of these sampling sites are shown in Figure 6-16. The westernmost stream bed is the larger of the two and drains approximately two-thirds of the site. One sample will be taken from a sediment accumulation just east of the MDA M main disposal area in the approximate center of the dirt track that circles the site, and the second sample will be taken in a bedrock sediment trap approximately 50 ft downstream of the first sample. The easternmost stream bed is the smaller of the two and extends only a short distance from the site. This stream bed will be sampled at a sediment accumulation approximately 20 ft from the edge of the MDA M main disposal area. The final sampling locations will be identified by field survey and documented in the field log by location coordinates. Samples will not be taken of the sediments in the bottom of the trench excavated around the site because the trench is only present around the upgradient sides of the disposal area, where sediments or leachate from the disposal area could not have migrated.

6.7.9.4 Sampling Activity for Sediments

Samples will be taken of the stream bed sediments at the sampling site using hand sample collection techniques. With the exception of VOCs, the sediment samples will be analyzed for the same suite of indicator parameters as the soil samples taken from the MDA M main disposal area. Sediment samples will not be taken for VOC analysis because any such constituents would have volatilized as the sediment was transported from the disposal area. The analytical methods, the screening action levels, and the practical quantification limits are shown in Table II-1. Quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-32. Because the indicator parameters and sampling methods are essentially the same, the same QA samples may be used for all soil and sediment sampling conducted within any week of sampling activity. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader. All samples and sampling locations will be field-screened for the presence of radioactive substances. The sizes of the sediment soil samples are shown in Table II-1 and will be essentially the same as for the MDA M main disposal area soil samples.

The sampling procedures to be used in the Phase I sediment sampling activity are the same as those for the main disposal area soil sampling and are included in Table 6-34. Because of the possibly limited depth of the sediments, particularly in the bedrock sediment trap, the necessary sample volume may be collected from a wide surface area and, if necessary, sediments from adjacent traps may be composited. The sediments to be sampled will be thoroughly homogenized by mixing, and a final sample representative of average conditions at the sampling site will be drawn from the homogenized mixture for analysis. The sediment samples will be handled in the same manner as previously described for the main disposal area soil samples. A field log will be maintained as previously described. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.7.9.5 Analysis of Sampling Results for Sediments

The results of the sediment analyses will be compared with background and threshold concentration levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling results from any sampling site are found to exceed both background and threshold levels. In a Phase II program, additional investigations may be conducted on potential contaminant transport into the neighboring canyons. If no samples are found to contain waste constituents exceeding background and threshold levels, the sediments will be considered clean and no additional investigations will be conducted regarding sediments transported from the site.

6.7.10 Regrade Existing Trench

Following completion of the foregoing activities, the existing trench surrounding the MDA M main disposal area will be regraded to close existing breaches and route surface run-off around the site. In addition, a temporary sedimentation basin will be constructed at the downslope edge of the disposal area to trap sediment eroded from direct precipitation on the site. This activity constitutes an interim action and is also described in Chapter 4.

6.7.11 Fence Main Disposal Area

If hazardous or radioactive materials are found within the main MDA M disposal area, a fence will be installed with appropriate warning signs to control human and animal access. This activity constitutes an interim action and is also described in Chapter 4.

6.7.12 Creek and Spring Sampling

6.7.12.1 Sampling and Analysis Strategy for Springs and Creek

Three springs located in the canyons south and east of MDA M will be sampled as part of the PRS-9-013 sampling effort. The locations of these springs are shown in Figure 6-17.

The spring to the east is on the west side of Pajarito Canyon and issues from the mesa where MDA M is located. This spring is variously called Homestead Spring and TA-22 Spring. However, because it is on the opposite side of the canyon from TA-22, it is referred to as Homestead Spring in this work plan. This spring was observed to flow at a rate of about 5 gpm in March 1992 and about 2 gpm in September 1992. The creek bed upstream of the spring was dry in September. The riparian vegetation near the spring suggests that it is perennial. The water issues from the side of the canyon and appears to come from a shallow perched-water zone beneath the mesa top. The water discharging at Homestead Spring could flow beneath MDA M and may have been contaminated from that disposal area. However, because the source of the perched water is not known, any waste constituents and very likely the water itself could have originated from sources farther upslope, possibly within TA-8 or the Jemez Mountains. No potential sources for the spring water lie in the vicinity of MDA M.

The other two springs are located in the canyon south of MDA M and were discovered during a site reconnaissance in September 1992. For ease of reference, the canyon and springs were tentatively named Starmer Gulch, Starmer Spring, and Charlie's Spring, after the members of the discovery party. Charlie's Spring is the smaller of the two, flowing at only about 1 gpm in September, but may be more significant to this sampling plan because it issues from the north side of the gulch beneath MDA M. Starmer Spring issues from the south side of the gulch approximately 30-ft downstream of Charlie's Spring and was flowing at about 4 gpm in September. The creek bed upstream of these springs was dry in September; however, the vegetation and algal growth downstream suggest that one and possibly both springs are perennial.

The two springs in Starmer Gulch are only about 30-ft higher in elevation than Homestead Spring, and the water may come from the same perched zone. Water issuing from Charlie's Spring and possibly also Starmer Spring could flow beneath MDA M and may have been contaminated from that disposal area or from sources farther upslope. Most of the active TA-8 outfalls addressed in Group 1 discharge into upstream tributaries of Starmer Gulch and are potential sources for these springs. Other potential but less likely sources are the outfalls at TA-9. These discharge into the next downstream canyon tributary to Pajarito Canyon, which for ease of reference was tentatively named Arroyo de LaDelfe. During a field inspection in September 1992 the downstream flow in the arroyo (about 5 gpm) was approximately the same as the aggregate discharge of the outfalls, and it appeared that little of the outfall discharge percolated into the bedrock.

Because the origin and flow directions of the perched water body are not well understood, any waste constituents in the spring water could have come from a variety of sources. Sampling will therefore be conducted for the dual purposes of chemically characterizing the water to help determine its source and determining whether the water is contaminated. If waste constituents traceable to MDA M are present, the waste materials would have been mobilized from the disposal area and would have migrated vertically through the underlying soil and bedrock to the perched water zone, suggesting that an enhanced cover design may be needed to mitigate further migration. For comparative purposes, Pajarito Creek will be sampled west of State Road 501 and analyzed for the same parameters as the springs. Other potential water sources in TA-8 and TA-9 are routinely sampled in compliance with NPDES permitting requirements.

Consideration was given to also sampling the perched water zone from boreholes drilled in the vicinity of MDA M. It was decided not to pursue this option during Phase I sampling because of the uncertainty of whether waste constituents have reached the perched zone from MDA M and because of the low likelihood of encountering sampleable quantities of water in the perched zone. Percolation of natural precipitation to the perched water is expected to be low at the site because of high evaporation rates and moderate precipitation. If waste constituents are reaching the perched water, some constituents are expected to be present in the springs because of the relatively short distances from the main disposal area to the springs. Also, the low volumetric flow rates of Homestead and Charlie's Springs, coupled with the fracture control of the flow paths, suggest that any reasonable number of boreholes would be unlikely to intersect the key fractures controlling flow. For these reasons, during Phase I the perched water will be sampled only at the springs where it becomes accessible to humans and animals. If unacceptable waste constituent levels are encountered at the springs, consideration will be given to additional investigations of the perched water zone during Phase II. The results of the spring sampling will be used to determine if unacceptable concentrations of waste constituents are present in the spring water and to help determine the source of the water and the waste constituents.

6.7.12.2 Sampling and Analysis Approach for Springs and Creek

One sample will be obtained at each spring and from Pajarito Creek during each sampling round by hand methods. Three sampling rounds will be conducted: one in the spring following the period of rapid snow melt, one in the summer during the period of occasional thunderstorms, and one in the fall during the dry season, to determine if there are any seasonal differences. Care will be taken to assure that the spring water samples are not diluted by water from other sources, such as direct precipitation, overland run-off, or flow in the adjacent stream. Few problems are anticipated at Homestead Spring because water discharges high on the stream bank. Starmer and Charlie's springs, however, are both at approximately stream bed level and may not be sampleable during periods of high stream flow.

6.7.12.3 Selection of Sampling Sites for Springs and Creek

Each of the springs discharges from multiple but adjacent points within an area of about 10 sq ft. Because of their close proximity, the water source and quality are expected to be the same for all discharge points at a given spring, and the water samples will be taken at the most convenient, high-volume discharge point. Samples of Pajarito Creek will be taken west of State Road 501, a minimum of 100 ft upstream of the western limit of the Pajarito fault zone. The samples will be taken at a location of live stream flow; stagnant creek water will not be sampled. The selected sampling locations and the rationale for their selection will be documented in the field log.

6.7.12.4 Sampling Activity for Springs and Creek

The analyses to be performed on the spring and creek samples are listed on Table 6-31. Quality assurance samples will be taken in accordance with the requirements of the QAPjP for OU 1157. The types of quality assurance samples and the minimum numbers of samples are summarized in Table 6-32. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader. All sampling locations will be photographed, and all samples and sampling locations will be field-screened for the presence of VOCs and radioactive substances.

The sample size requirements for the Phase I spring and creek sampling indicator parameters are listed in Table II-1. The spring flow rates are expected to be sufficiently high so that no problems should be encountered in obtaining a sufficient sample volume.

The procedures to be used in the Phase I spring and creek sampling activity are listed in Table 6-35. The procedures on the table are drawn from the generic lists presented in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any drilling or sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the quality assurance requirements presented in the QAPjP for OU 1157 and with the ER Program SOPs providing general sampling instructions.

A field log will be maintained during the sampling program as described in Chapter 4. The field log will also document and provide justification for any modifications to this sampling plan approved by the Field Team Leader. Any waste sampling equipment and all waste decontamination solutions produced during the sampling operations will be disposed of in accordance with LANL-ER-SOP-01.06 (LANL 1992, 0688).

TABLE 6-35

Spring and Creek Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Field Analytical Measurements of Groundwater Samples	LANL-ER-SOP-6.02
Sampling for Volatile Organics	LANL-ER-SOP-6.03
Surface Water Sampling	LANL-ER-SOP-6.13
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I sampling activity.

6.7.12.5 Analysis of Sampling Results for Springs and Creek

The results of the spring water analyses will be compared with threshold and background levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling results from any spring sampling site are found to exceed both threshold and background levels. Phase II sampling will not be triggered by creek sampling results. The creek samples will be taken at an upstream location and will only be used for comparative purposes. Under a Phase II study, additional investigations may be conducted to determine if waste constituents are also present in the downstream sediments and stream water and if MDA M is a likely source for the waste constituents. If no samples are found to contain waste constituents exceeding threshold levels, the water will be considered clean, and no additional investigations of the spring or creek water quality will be conducted.

6.7.13 Phase II Sampling

Phase II sampling activities will be triggered if any sediment sample taken pursuant to Section 6.7.8 or any spring water sample taken pursuant to Section 6.7.12 is found to contain waste constituents exceeding both threshold and background levels. A Phase II sampling program may also be initiated if the results obtained from the Phase I sampling are not sufficient to support a risk assessment and cover design or if additional data are required to support investigation of alternative remedial measures. Phase II sampling will not be triggered by sample results from Pajarito Creek, which is upgradient of OU 1157, nor will Phase II sampling be triggered by sample results from inside the main MDA M disposal area. Any contamination found in the main disposal area is planned to be addressed by stabilizing the site. The specific Phase II sampling activities will be determined based upon the Phase I sampling results and will be described in future documents relating to this OU.

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6.8 GROUP 8: TECHNICAL AREA 69 INCINERATOR AND SEPTIC TANKS

6.8.1 Group 8 Background

Technical Area 69 contains three PRSs, of which one is an incinerator and two are septic tanks. The facilities remain in place at each of these sites, and the two septic tanks remain in active use. The locations of these sites are shown in Figure 5-14.

6.8.2 Group 8 Sampling Strategy and Objectives

The incinerator, (PRS 69-001), was designed for burning classified documents but is no longer used. Waste ash from the incinerator was disposed of in an ash pond behind the incinerator building. The ash may contain hazardous metals from inks and photographs, therefore, the ash pond site will be sampled. The two septic tanks, PRS 69-002(a) and (b), serve buildings with only office uses. The septic tanks have received only sanitary wastes, and because no hazardous materials are present, no further actions are required. Additional discussion of these tanks is presented in Chapter 7.

Because it is not known whether waste constituents are present at the incinerator ash pond site, sampling will be performed to determine whether any remaining waste constituent concentrations exceed both background and threshold levels for the types of chemical waste constituents that may have been present. The Phase I sampling effort will focus on potential soil contamination. Samples will be analyzed for representative indicator parameters that would be expected to have been retained in the soil. Phase II sampling activities would be triggered if any sample is found to exceed both the background and threshold levels described in Chapter 4.

6.8.3 Group 8 Indicator Parameters

The indicator parameters for Group 8 are listed in Table 6-36. The principal analytes that would be expected to remain after incineration are metals. The metals selected for the Phase I sampling program are those that would pose a potential health hazard and would be good indicators of a release. These metals are relatively toxic, potentially present in measurable quantity, and would be retained in the soil.

TABLE 6-36

Group 8 Indicator Parameters

Inorganic
- Antimony
- Cadmium
- Chromium
- Lead
- Silver

6.8.4 Potential Release Site 69-001 Incinerator

6.8.4.1 Sampling and Analysis Strategy at PRS 69-001

Two incinerators were used at the facility, and both remain in place. Ash was removed from the first incinerator and transferred to the ash pond in two ways. The primary combustion chamber that contained most of the ash and all of the noncombustible materials, such as metal fasteners and glass plates was cleaned manually by shoveling the ash into a separate container that was carried to the edge of the ash pond where the ash was dumped into the water. The secondary combustion chamber contained only powder ash, which was periodically flushed with water directly into the pond. The second (newer) incinerator had only a primary combustion chamber, and all the ash was collected in a tray that could be removed and emptied. All waste ash from both incinerators was deposited on the surface of the pond bottom, and none was buried.

The pond site has remained relatively undisturbed except at the far end where the surrounding earth berm has been eroded away. Although ash is not visibly apparent on the ground surface, the noncombustible components of the burning process are readily apparent. Surface soil samples will therefore be taken at judgmental locations at the former pond site.

6.8.4.2 Sampling and Analysis Approach at PRS 69-001

Visual inspection of the pond site in November 1992 indicated that most of the noncombusted glass shards, fused glass, and metal fasteners were located approximately halfway up the pond bank on the west side. Samples will be taken along the side of the pond at locations where an accumulation of incineration products is apparent and from sediments at the bottom of the pond near the outlet from the secondary burn chamber washout system.

The samples will be taken by hand methods. The samples and sampling sites will be field-screened with hand-held instruments for evidence of radioactive or volatile organic waste constituents. The information obtained during this screening will be used to provide worker protection and an initial indication of the presence of waste constituents and may be used as appropriate to help interpret the sampling results. However, the data obtained from this screening are not expected to have quantitative value for the decisions required under this work plan.

A single lead brick was observed on the ground surface at the downstream end of the pond. This brick will be field-screened for radioactivity during the sampling effort and removed for proper disposal.

6.8.4.3 Selection of Sampling Sites at PRS 69-001

Two sampling sites were selected along the west side of the pond at locations where accumulations of debris were apparent, and one sampling site was selected in the sediments at the bottom of the pond. The approximate locations of these sites are shown in Figure 6-18. The southernmost of the two sampling sites is marked with a small red flag, and the northernmost is located on a semi-isolated pile of debris. These locations were selected to sample waste ash from the primary burn chamber. The sampling site in the pond bottom sediments was selected to sample ash from the secondary chamber and is located approximately 3 ft north of the end of the secondary chamber drain pipe.

6.8.4.4 Sampling Activity at PRS 69-001

All soil samples will be analyzed for the indicator parameters listed in Table 6-36 using the methods listed on Table II-1 of the QAPjP in Annex II of this work plan. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the expected total numbers of samples are summarized in Table 6-37. The sampling locations for the quality assurance samples will

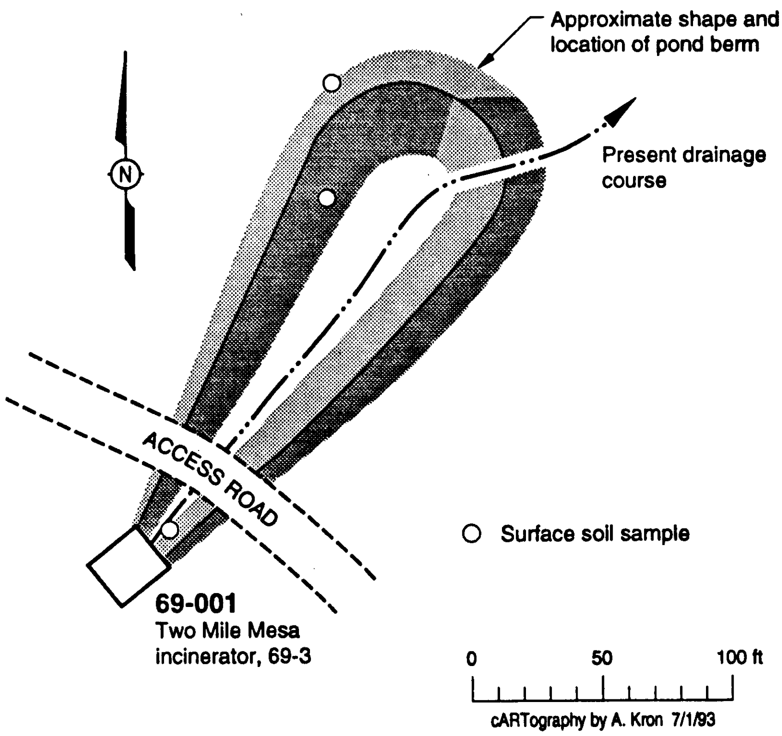

Figure 6-18. Sample locations for PRS 69-001, Two Mile Mesa incinerator.

TABLE 6-37

Group 8 Sampling Types

Medium	Number of Site Samples	Expected Number of QA Samples[a]	Total Samples
Soil	3	3	6

a Field Blank: One per sampled medium.
Duplicate Sample: One per sampled medium.
Equipment (Rinsate) Blank: One per sampled medium.

be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The samples will be taken of the top 6 in. of soil because the ash was originally deposited on the upper surface of the sediments. Sample size requirements are presented in Table II-1.

The procedures to be used in the Phase I sampling activity are listed in Table 6-38. These procedures are drawn from the generic lists presented in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any drilling or sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the quality assurance requirements presented in the QAPjP for OU 1157 and with the ER Program SOPs providing general sampling instructions.

A field log will be maintained during the sampling activities as described in Chapter 4. Any disposable sampling equipment suspected to be contaminated and all waste decontamination solutions produced during the sampling operations will be disposed of in accordance with LANL-ER-SOP-01.06 (LANL 1992, 0688).

TABLE 6-38

Ash Pond Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-6.09
Stainless Steel Surface Soil Sampler	LANL-ER-SOP-6.11
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

6.8.4.5 Analysis of Sampling Results at PRS 69-001

The results of the sampling will be compared with threshold and background levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result is found to exceed both background and threshold levels.

6.8.5 Phase II Sampling

Phase II sampling activities will be triggered if any sample is found to contain waste constituents exceeding both background levels and thresholds based on screening action levels as described in Chapter 4. The specific Phase II sampling activities will be determined based upon the Phase I sampling results and will be described in future documents relating to this OU.

6.9 GROUP 9: AREAS OF CONCERN

6.9.1 Group 9 Background

Areas of concern are PRSs that were not identified as SWMUs. There are 20 AOCs in TA-8 and 11 AOCs in TA-9. Most are less prominent sites, and after further investigation many were found to require no further action. The AOCs include gun test buildings, storage facilities, a carpenter shop, stained ground, and original Anchor Ranch buildings. The locations of these sites are shown in Figures 5-15 and 5-16.

6.9.2 Group 9 Sampling Strategy and Objectives

The sampling actions that will be taken on the AOCs are summarized in Table 6-39. Of the 31 AOCs that have been identified, two will be sampled, and the remaining 29 either will not be sampled or will be sampled as part of another sampling group or sampling program. The rationale for these actions is summarized in the table and discussed in further detail in this sampling and analysis plan.

Sampling is planned for AOCs C-8-010, where soil contamination may have occurred from hydrocarbon and solvent spills, and C-9-001, where soil contamination may have occurred from solvent spills. It is not known whether environmental contamination has occurred at either of the AOCs planned to be sampled. The objective of this sampling is therefore to determine whether a release has occurred that exceeds established action levels for the types of chemical waste constituents that are likely to have been present. The Phase I sampling effort will generally focus on potential soil contamination from early site practices. The soil samples will be analyzed for representative indicator parameters that would be expected to have been retained in the soil. Phase II sampling activities would be triggered if any sample is found to exceed the threshold levels described in Chapter 4.

The AOCs that will not be sampled are briefly reviewed in the following paragraphs. Those for which no further actions are planned are discussed in more detail in Chapter 7.

Areas of Concern C-8-001 and C-8-002 are the sites of removable sheds used to cover the naval guns at the Group 2 Gun-Firing Site between firing exercises. These sites are included in the Group 2 sampling plan.

TABLE 6-39
Group 9 Sampling Actions

AOC No.	Type of AOC	Sampling Action	Rationale for Sampling Action
C-8-001	Gun test building site	No sample	Site included in Group 2 sampling
C-8-002	Gun test building site	No sample	Site included in Group 2 sampling
C-8-003	Carpenter shop site	No sample	No hazardous materials present
C-8-004	Main Ranch House	No sample	No hazardous materials present
C-8-005	Guest house site	No sample	No hazardous materials present
C-8-006	Guest house site	No sample	No hazardous materials present
C-8-007	Bunk house site	No sample	No hazardous materials present
C-8-008	Ranch barn site	No sample	No hazardous materials present
C-8-009	Ranch barn site	No sample	No hazardous materials present
C-8-010	Drum storage site	Sample	Possible environmental release
C-8-011	Storage building site	No sample	No hazardous materials present
C-8-012	Carpenter shop	No sample	No hazardous materials present
C-8-013	Office Building Site	No sample	No hazardous materials present
C-8-014	Laboratory building	No sample	Defer to D&D
C-8-015	HE magazine	No sample	No hazardous materials present
C-8-016	HE magazine	No sample	No hazardous materials present
C-8-017	Storage vault	No sample	No hazardous materials present
C-8-018	Storage building	No sample	No hazardous materials present
C-8-019	Storage building	No sample	No hazardous materials present
C-8-020	Disposal area	No sample	Site is the same as MDA Q and is sampled under Group 2
C-9-001	Stained soil	Sample	Possible environmental release
C-9-002	HE facility site	No sample	Site included in Group 5 sampling

TABLE 6-39 (continued)

Group 9 Sampling Actions

AOC No.	Type of AOC	Sampling Action	Rationale for Sampling Action
C-9-003	Pump building site	No sample	Site included in Group 5 sampling
C-9-004	HE oven	No sample	Site included in Group 5 sampling
C-9-005	HE facility site	No sample	Site included in Group 6 sampling
C-9-006	Structure sites	No sample	Sites included in Group 5 sampling
C-9-007	Storage building site	No sample	Site included in Group 5 sampling
C-9-008	UST site	No sample	Site is same as PRS 9-016 and is proposed for NFA under Group 5
C-9-009	Stained loading dock	No sample	No environmental release
C-9-010	Burn pit	No sample	Site is same as PRS 9-002 and is sampled under Group 6
C-9-011	Burn pile	No sample	Site included in Group 5 sampling

Area of Concern C-8-003 is the site of a carpenter shop that may have been used for explosives development or storage. Areas of Concern C-8-004 through C-8-009 are the sites of former Anchor Ranch buildings that were possible alternative locations for a machinist's equipment decontamination site and, in some instances, possible storage areas for radioactive materials. Area of Concern C-8-011 is the site of a storage building that may have been used for explosives development or storage. However, there is no specific evidence for this use or that the use contaminated the site. Area of Concern C-8-012 was a carpenter shop and C-8-013 was an office building. Both were moved off-site to the New Mexico State Penitentiary in 1968, and there is no evidence that any hazardous or radioactive materials were used in either building. The former uses of each of these sites was reviewed in a 1983 report by C. Blackwell (Blackwell 1983, 12-0118), and in each case the author concluded that no known hazardous materials were used at the site. In view of the vagueness of the reports of potential contamination, NFAs are planned at these sites.

Areas of Concern C-8-014 through C-8-019 address potential contamination within existing facilities. Area of Concern C-8-014 is a potentially contaminated bench hood exhaust duct where there is no pathway for significant environmental release; sampling will be deferred to D&D. Areas of Concern C-8-015 and C-8-016 are potentially contaminated HE magazines, and C-8-017 through C-8-019 are potentially contaminated storage facilities for radioactive materials. However, in each case there is no evidence for current contamination, and no further actions are planned under this work plan. Area of Concern C-8-020 is MDA Q and is addressed in the Group 2 Gun-Firing Site sampling program.

Areas of Concern C-9-002 through C-9-007 are potentially contaminated sites of buildings and other facilities that have been decommissioned and demolished. All of these facilities were in either the Group 5 TA-9 Decommissioned Area or the Group 6 TA-9 Far Point Firing Site, and any significant releases would be detected in the general soil sampling programs for those groups. Area of Concern C-9-008 is the PRS 9-016 underground storage tank site. This site is proposed for no further action under Group 5. Area of Concern C-9-009 is a concrete loading dock stained by oils from a permanently mounted air compressor. This release has resulted in no environmental contamination, and future spills will be addressed by site maintenance.

Area of Concern C-9-010 is the PRS 9-002 burn pit, which is sampled under Group 5. Area of Concern C-9-011 is the site where combustible materials from the TA-9 Far Point Firing Site were piled and burned during area demolition in 1965. Although the location of this burn pile is not known, it is expected to be within the area of general surface soil sampling planned for the TA-9 Decommissioned Area and the TA-9 Far Point Firing Site.

6.9.3 Group 9 Indicator Parameters

The indicator parameters for Group 9 are listed in Table 6-40. The waste constituents potentially spilled at AOC C-8-010 are petroleum hydrocarbons and organic solvents. This site will be analyzed for TPH, VOCs, and SVOCs. VOCs and SVOCs are associated with the AOC C-9-001 spill, and this site will be sampled for both types of compounds.

Although other chemicals could also be present at the AOC sampling sites, those that were used or produced in the greatest quantity would pose a potential health hazard and would be good indicators of a release. These chemicals were selected for analysis during

TABLE 6-40
Group 9 Indicator Parameters

AOC C-8-010 Storage Site

Organic Parameters
- Chapter 4 Extended Analyte List VOCs
- Chapter 4 Extended Analyte List SVOCs
- TPH

AOC C-9-001 Stained Soil

Organic Parameters
- Chapter 4 Extended Analyte List VOCs
- Chapter 4 Extended Analyte List SVOCs

Phase I sampling. If Phase II sampling is triggered by the concentrations of these indicator parameters, the samples would be analyzed for a broader range of analytes to provide a sufficient basis for a risk assessment and an evaluation of alternative corrective measures.

6.9.4 Area of Concern C-8-010-Drum Storage Site

6.9.4.1 Sampling and Analysis Strategy at AOC C-8-010

Surface soil sampling will be performed at the site of the AOC C-8-010 drum storage building for possible soil contamination from leaking drums. The building was located at the foot of a stairway that once connected Building TA-8-8 with TA-8-1 and other buildings at the abandoned bunker site. Although the drum storage building (TA-8-34) was removed in 1947, its location, immediately east of the stairway, (traces of which can be seen on recent aerial photographs), and immediately north of an existing storm sewer, should make its site relatively easy to identify. Up to 12 in. of sediments have been deposited on the site of this building since its removal, potentially preserving any volatile or semivolatile compounds that may have been released.

6.9.4.2 Sampling and Analysis Approach at AOC C-8-010

Near-surface soil samples will be taken from two locations at the building site by hand methods. The samples and sampling sites will be field-screened with hand-held instruments for evidence of radioactive or volatile organic waste constituents. The information obtained during this screening will be used to provide worker protection and an initial indication of the presence of waste constituents and may be used as appropriate to help interpret the sampling results. However, the data obtained from this screening are not expected to have quantitative value for the decisions required under this work plan.

6.9.4.3 Selection of Sampling Sites at AOC C-8-010

The samples will be taken along the long axis of the storage building, as shown in Figure 6-19. Although the location of the building is not precisely known, because of its close proximity to existing landmarks its location accuracy is estimated from existing drawings to be about +/-2 ft. Because this uncertainty is about the same as the approximately 6- by 12-ft floor dimensions of the building, only judgmental samples need be taken.

6.9.4.4 Sampling Activity at AOC C-8-010

All soil samples will be analyzed for the indicator parameters listed in Table 6-40 using the methods listed on Table II-1 of the QAPjP in Annex II of this work plan. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the expected total numbers of samples are summarized in Table 6-41. If samples from AOC C-9-001 are collected in the same sampling round as those from AOC C-8-010, the same QA samples may be used for all locations, provided that the QA samples are analyzed for TPH, VOCs, and SVOCs. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The samples to be analyzed for TPH and SVOCs will be taken from a depth interval of 12 to 24 inches, and the samples to be analyzed for VOCs will be taken from a depth of about 24 inches. Samples will not be taken from the upper 12 inches of soil because this interval may contain sediments deposited on the site since the building was removed. Sample size requirements are presented in Table II-1.

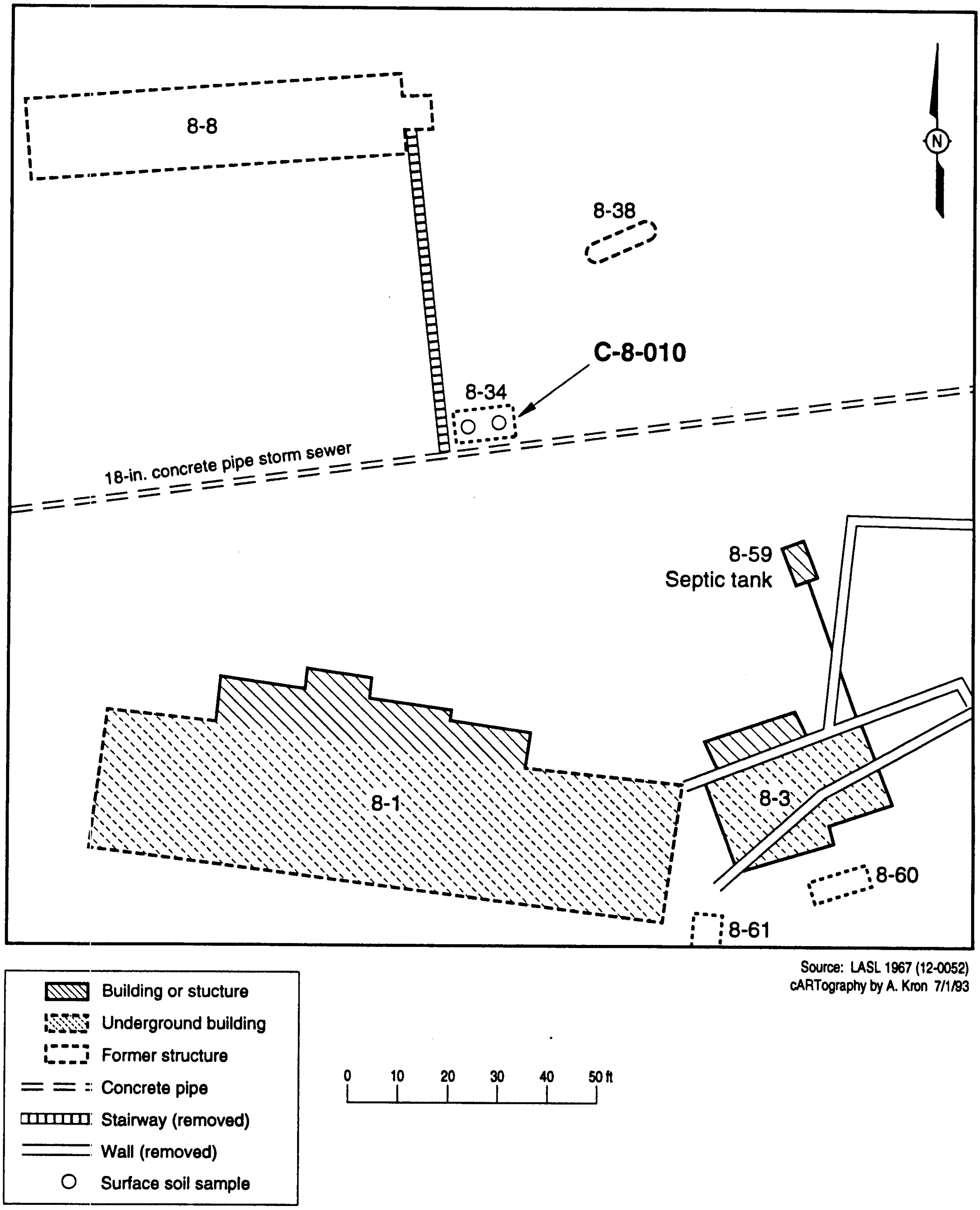

Figure 6-19. Sample locations at AOC C-8-010.

TABLE 6-41

Group 9 Sampling Types

AOC	Number of Site Samples	Expected Number of QA Samples[a]	Total Samples
C-8-010 Storage Building Site			
Soil	2	4	6
C-9-001 Stained Soil			
Soil	2	4	6

a Field Blank: Expected number = 1 for each site.
Duplicate Sample: Expected number = 1 for each site.
Trip Blank: One per analytical laboratory shipping container, for VOC analysis only.
Equipment (Rinsate) Blank: Expected number = 1 for each site.
Note: Because of the use of similar indicator parameters and sampling techniques, the same QA samples may be used for all AOC sampling occurring within the same sampling round.

The procedures to be used in the Phase I sampling activity are listed in Table 6-42. These procedures are drawn from the generic lists presented in Chapter 4. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any drilling or sampling activity. Samples will be identified, labeled, documented, and handled in accordance with the quality assurance requirements presented in the QAPjP for OU 1157, and with the ER SOPs providing general sampling instructions.

A field log will be maintained during the sampling activities as described in Chapter 4. Any disposable sampling equipment suspected to be contaminated and all waste decontamination solutions produced during the drilling and sampling operations will be disposed of in accordance with LANL-ER-SOP-01.06.

6.9.4.5 Analysis of Sampling Results at AOC C-8-010

The results of the sampling will be compared with background and threshold levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result is found to exceed both background and threshold levels.

TABLE 6-42

Group 9 Sampling Procedures

Activity	Procedure
General Sampling Instructions	See Chapter 4
Field Health and Safety	See Chapter 4
Sampling for Volatile Organics	LANL-ER-SOP-6.03
Spade and Scoop Method for Collection of Soil Samples	LANL-ER-SOP-6.09
Hand Auger and Thin-Wall Tube Sampler	LANL-ER-SOP-6.10
Stainless Steel Surface Soil Sampler	LANL-ER-SOP-6.11
Field Surveying of Sample Locations	TBD[a]
Hand-Held Instruments for Field Screening of VOCs	TBD[a]
Hand-Held Instruments for Field Screening of Radioactive Substances	TBD[a]
Curatorial Sample Management	See Chapter 4

a Procedure number to be determined; procedure is in preparation and will be finalized prior to initiation of Phase I drilling and sampling activity.

6.9.5 Area of Concern C-9-001-Stained Soil

6.9.5.1 Sampling and Analysis Strategy at AOC C-9-001

Sampling will be performed where stained soil was observed near an outfall from a chemical storage area.

6.9.5.2 Sampling and Analysis Approach at AOC C-9-001

Near-surface soil samples will be taken. The samples and sampling sites will be field-screened with hand-held instruments for the presence of VOCs or radioactive materials. The approximate sampling locations are shown in Figure 6-20.

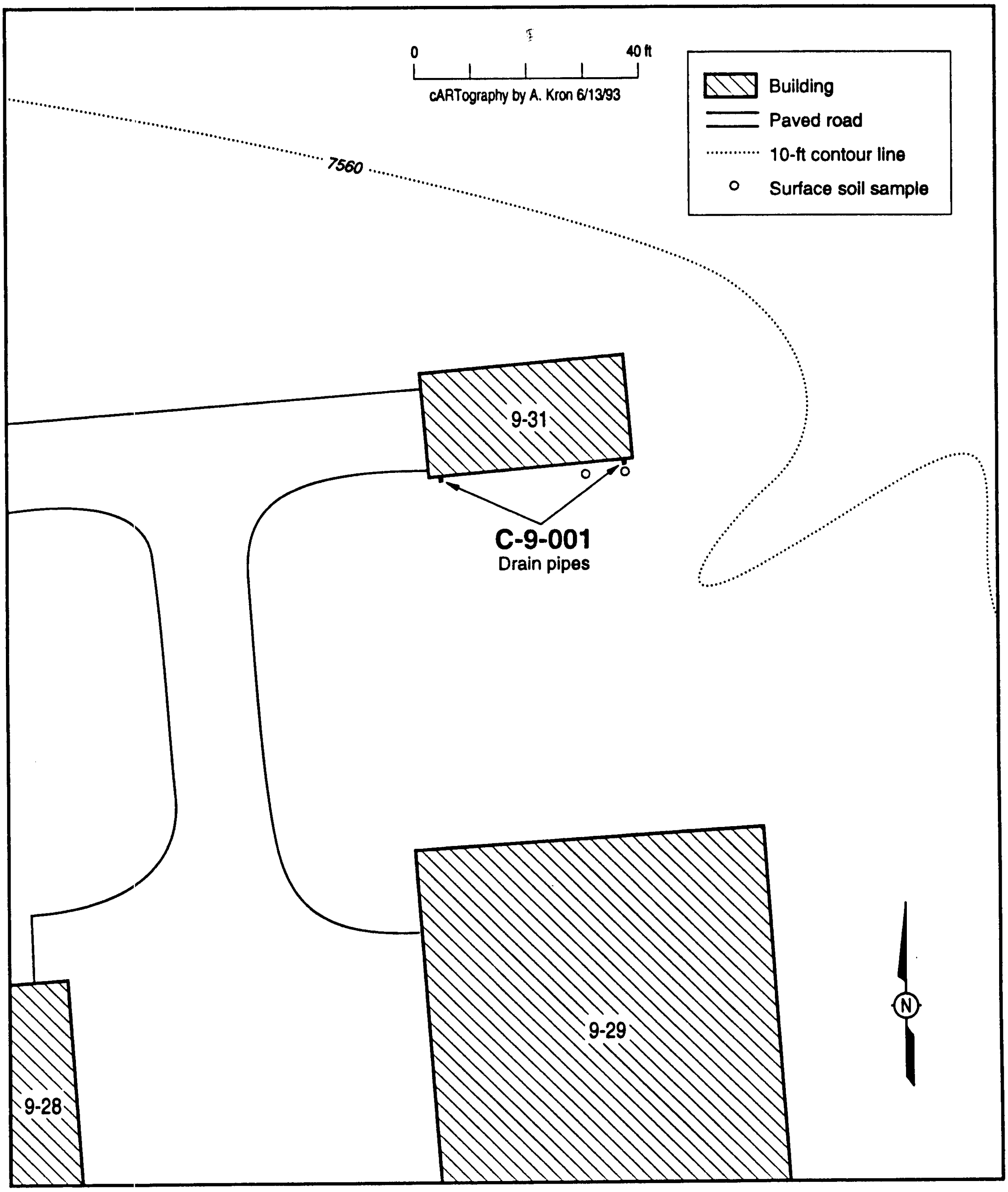

Figure 6-20. Sample locations for AOC C-9-001.

6.9.5.3 Selection of Sampling Sites at AOC C-9-001

Soil samples will be taken at two locations on the south side of building TA-9-31 where staining is evident. One set of samples will be taken of soil below a drain pipe near the southeast corner of the building. The other set of samples will be taken of soil adjacent to the building foundation, approximately 3 ft to the west of the first sampling location. No staining is evident near a second drain pipe near the southwest corner of the building, and no Phase I samples will be taken at that location. The two pipes both drain onto a grassy area where no evidence of a runoff channel was observed, indicating that discharges from the pipes have been low. The sampling locations will be documented in the field log by photographs showing their locations relative to the drain and by noting their distances and directions from the end of the pipe.

6.9.5.4 Sampling Activity at AOC C-9-001

The samples to be analyzed for SVOCs will be taken from the top 6 in. of soil because waste constituents would have originally been deposited on and sorbed to the upper surface of the soil. Samples to be analyzed for VOCs will be taken from a depth of about 12 in. All samples will be taken using hand sample collection techniques and analyzed for the Chapter 4 extended analyte list VOCs and SVOCs using the methods listed on Table II-2. In addition, quality assurance samples will be taken in accordance with the requirements of the QAPjP. The types of quality assurance samples and the total numbers of samples are summarized in Table 6-41. If samples from AOC C-9-001 are collected in the same sampling round as those from AOC C-8-010, the same QA samples may be used for all locations provided that the QA samples are analyzed for TPH, VOCs, and SVOCs. The sampling locations for the quality assurance samples will be determined by the Field Team Leader. Additional quality assurance samples may be taken at the discretion of the Field Team Leader.

The sampling procedures to be used are the same as those for AOC C-8-010 and are listed in Table 6-42. The soil samples will be handled in the same manner as described above for AOC C-8-010 samples. A field log will be maintained as previously described. Health and safety procedures for field activities are listed in Chapter 4 and should be reviewed prior to any sampling activity.

6.9.5.5 Analysis of Sampling Results at AOC C-9-001

The results of the sampling will be compared with background and threshold levels as described in Chapter 4. Phase II sampling activities will be triggered if any validated sampling result is found to exceed both threshold and background levels. Under a Phase II program, additional sampling may be conducted to determine the extent of contamination in the drain pipe and along the southern side of the building. If the threshold levels are not exceeded, no additional sampling will be performed.

6.9.6 Phase II Sampling

Phase II sampling activities will be triggered at an AOC if any sample is found to contain waste constituents exceeding both background and thresholds levels based on screening action levels as described in Chapter 4. The specific Phase II sampling activities will be determined based upon the Phase I sampling results and will be described in future documents relating to this OU.

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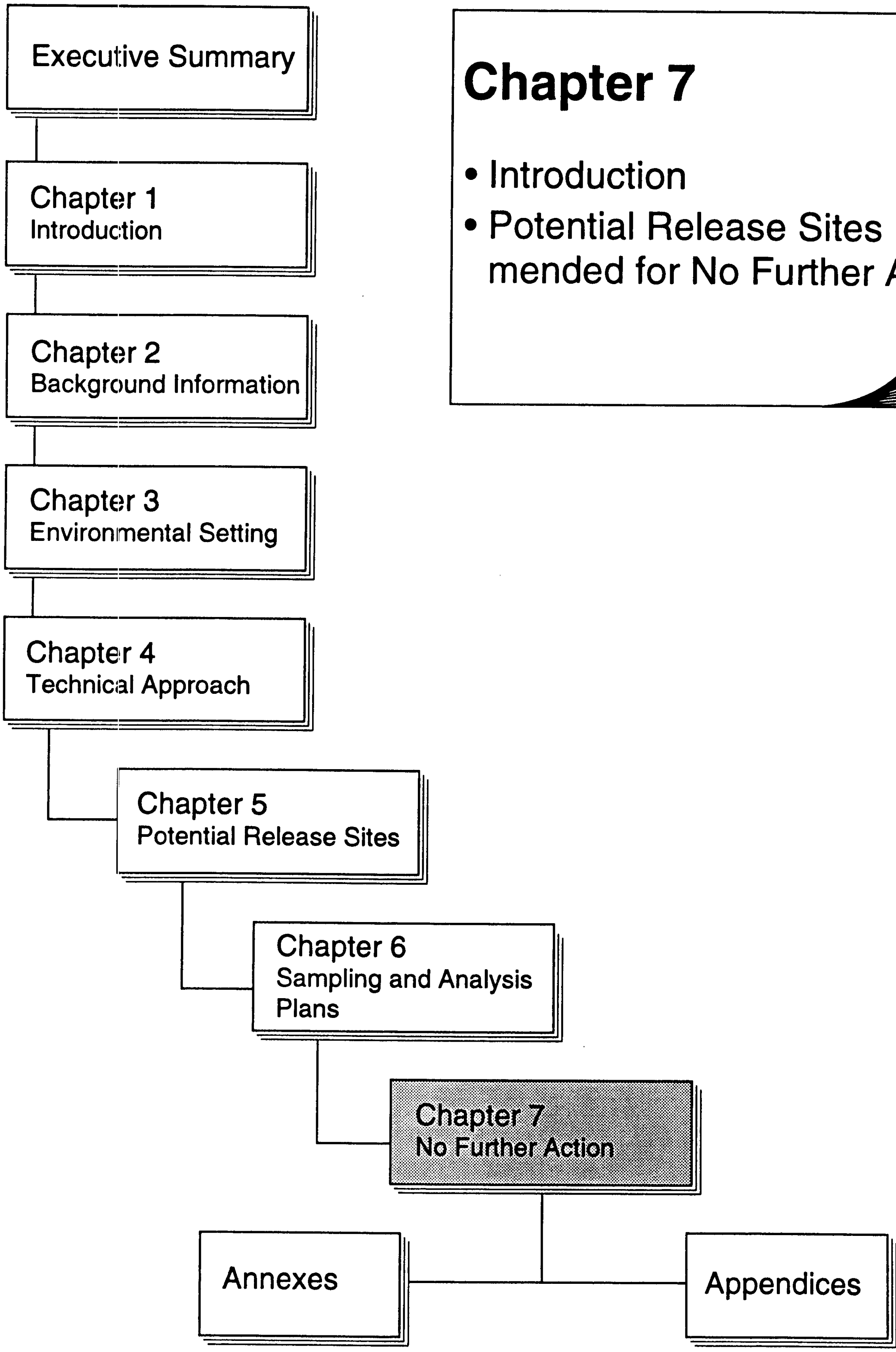
Chapter 7

- Introduction
- Potential Release Sites Recommended for No Further Action



7.1 INTRODUCTION

This chapter presents information on PRSs listed in the 1990 Laboratory SWMU Report (LANL 1990, 0145) that are proposed for no further action. The PRSs described below are considered suitable for unrestricted Laboratory use based on archival information and application of one or more of the four NFA criteria presented below. These criteria are based on criteria in proposed Subpart S and the 23 May 1990 HSWA Module of the Laboratory RCRA permit (EPA 1989, 0088). Table 7-1 lists all PRSs in OU 1157 that are proposed for no further action. Potential release sites starting with a number, i.e., 8-XXX, are SWMUs and those starting with the letter C are AOCs, as currently listed in the 1990 SWMU Report (LANL 1990, 0145).

•**NFA Criterion 1.** The PRS has never been used for the management (that is, generation, treatment, storage, or disposal) of RCRA hazardous wastes, radionuclides, or other CERCLA hazardous substances.

Units falling under Criterion 1 may, for example, have been mistakenly identified in an earlier study. Upon review of available information, no evidence of a release is found. The unit will not be investigated if there has been no release of hazardous wastes or constituents.

A number of chemicals might appear to be hazardous but are not listed in Appendix VIII of CFR Part 261 and do not exhibit hazardous characteristics as defined in the regulation. Common industrial chemicals used at the Laboratory might have led to the identification of a PRS; however, these chemicals have no basis for RCRA corrective action. For example, ethylene glycol is commonly used as antifreeze but is not listed in Appendix VIII and has no RCRA hazardous characteristics. Some non-RCRA-regulated constituents such as radionuclides and toxic substances, including PCBs, may be addressed in the work plan and investigated, as appropriate, as a result of being present in SWMUs cited in the permit, as the result of internal DOE requirements, or within the scope of CERCLA.

Sanitary sewer systems and their downstream appurtenances would not be considered as PRSs if it is unlikely that hazardous wastes or hazardous

TABLE 7-1

PRSs In OU 1157 Proposed For No Further Action

PRS Number	Title	NFA Criterion	Section
8-007	Silver Recovery Resin Bed	2	7.2.1.1
8-008(a)	Transformer Storage Area	2	7.2.1.2
8-008(b)	Transformer Storage Area	2	7.2.1.3
8-008(c)	Transformer Storage Area	2	7.2.1.4
8-008(d)	Transformer Storage Area	2	7.2.1.5
8-009(b)	Outfall	1	7.2.1.6
8-010(a)	Waste Container Storage Area	3	7.2.1.7
8-010(b)	Waste Container Storage Area	3	7.2.1.8
8-010(c)	Waste Container Storage Area	3	7.2.1.9
8-006(b)	Possible Disposal Area	1	7.2.2.1
8-003(b)	Inactive Septic Tank	1	7.2.3.1
8-003(c)	Inactive Septic Tank	1	7.2.3.2
8-011(a)	Decommissioned UST	4	7.2.3.3
8-011(b)	Decommissioned UST	4	7.2.3.4
9-003(f)	Settling Tank	1	7.2.4.1
9-005(b)	Inactive Sanitary Septic Tank	1	7.2.4.2
9-005(c)	Inactive Sanitary Septic Tank	1	7.2.4.3
9-005(e)	Inactive Sanitary Septic Tank	1	7.2.4.4
9-005(f)	Inactive Sanitary Septic Tank	1	7.2.4.5
9-005(g)	Active Sanitary Septic Tank	1	7.2.4.6
9-005(h)	Inactive Sanitary Septic Tank	1	7.2.4.7
9-007	Inactive Basket Pit	1	7.2.4.8
9-010(c)	Waste Can Shelter	1	7.2.4.9
9-011(a)	Waste Container Storage Area	3, 4	7.2.4.10
9-003(c)	Electrical Control Manhole	1	7.2.5.1
9-008(a)	Lagoon	1	7.2.5.2
9-016	Decommissioned UST	4	7.2.5.3
9-015	Electrical Control Manhole	1	7.2.6.1
69-002(a)	Septic System	1	7.2.8.1
69-002(b)	Septic System	1	7.2.8.2
C-8-001	Gun Building	n/a	7.2.9.1
C-8-002	Gun Building	n/a	7.2.9.1
C-8-003	Carpenter Shop	1	7.2.9.1
C-8-004	Main Ranch House	1	7.2.9.1
C-8-005	Guest House	1	7.2.9.1
C-8-006	Guest House	1	7.2.9.1
C-8-007	Bunk House	1	7.2.9.1
C-8-008	Ranch Barn	1	7.2.9.1
C-8-009	Ranch Barn	1	7.2.9.1
C-8-011	Storage Building	1	7.2.9.1
C-8-012	Carpenter Shop	1	7.2.9.1
C-8-013	Office Building	1	7.2.9.1
C-8-015	HE Magazine	1	7.2.9.1
C-8-016	HE Magazine	1	7.2.9.1
C-8-017	Storage Vault	2	7.2.9.1

TABLE 7-1 (continued)

PRSs In OU 1157 Proposed For No Further Action

PRS Number	Title	NFA Criterion	Section
C-8-018	Storage/Radiation Laboratory	2	7.2.9.1
C-8-019	Storage/Radiation Laboratory	2	7.2.9.1
C-8-020	Disposal Area	1	7.2.9.1
C-9-002	Trimming Buildings	n/a	7.2.9.2
C-9-003	Pump House	n/a	7.2.9.2
C-9-004	Oven Building	n/a	7.2.9.2
C-9-005	X-unit Chamber	n/a	7.2.9.2
C-9-006	Magazines	n/a	7.2.9.2
C-9-007	Storage Buildings	n/a	7.2.9.2
C-9-008	UST	1	7.2.9.2
C-9-009	Mechanical Machine Shop	2	7.2.9.2
C-9-010	Burning Pit	n/a	7.2.9.2
C-9-011	Burn Area	n/a	7.2.9.2

n/a = No specific criteria are applicable to these PRSs. They are proposed for NFA because they will be investigated under other sampling plans discussed in Chapter 6.

constituents were disposed into the sewer system. For laboratory sinks and floor drains in areas where chemicals were used, stored, or handled, and drains within secondary containment, one can logically assume that chemicals were disposed into the sewers, and further investigation may be necessary.

•**NFA Criterion 2.** Site design, conditions, or institutional controls prohibit releases from the PRS that would pose a threat to human health or the environment.

For certain waste storage areas, even though the unit has been designated as a PRS, releases are contained and therefore, without a release, there is no significant effect on human health or the environment. Release of any hazardous wastes or constituents may also be unlikely due to engineering (such as secondary containment or overflow prevention) or management (such as inspection or inventory) controls. Impacts to human health (excluding on-site workers) or the environment (outside of a building or other containment) would not be discernible above background levels for potential contaminants. Inspection of the unit will indicate if there should be concern over penetration of the containment by contaminants.

•**NFA Criterion 3.** The PRS is part of a process operating under the Laboratory's current RCRA Part B permit, NPDES, or other applicable discharge permit. Potential release sites that fall under other regulatory programs may be exempt from further action under RCRA corrective action but may undergo corrective action under CERCLA.

Non land-based RCRA TSD facilities (such as containers or tanks) should not be considered under RCRA corrective action, because requirements under interim status and HSWA permits should adequately address releases from these units.

Temporary storage areas (less than 90 days and satellite storage areas), while often listed in RCRA permits, do not have the same regulatory coverage as permitted units. To avoid further consideration, engineering and management controls must be applied. If there is evidence of a possible release, whether visual staining, vapor releases, or analytical data indicating a release has occurred (and remediation has not been accomplished), and if the unit qualifies under the HSWA Module, or under CERCLA, it may undergo corrective action measures under the ER Program.

Discharges from waste water systems should not be considered for corrective action. A number of types of discharges (points of discharge) can be eliminated from consideration. Discharges to municipal sanitary sewers are not RCRA releases to the environment, and if operated under a pretreatment permit, should have no significant impact.

Releases to surface water through a storm sewer are regulated under the NPDES storm water program, and releases through other NPDES-permitted outfalls are also exempt from RCRA permitting.

Potentially contaminated sediments downstream of a surface water outfall are subject to consideration for corrective action, and attention should be focused on the impacts of potential contaminants in the sediment as a source of release, not the water.

Releases to the air are not normally a factor in corrective action. Past releases to the atmosphere are not a factor, except in the rare event that data to quantify the impacts were collected. Ongoing releases are usually monitored under other programs. Permitted releases should be not considered for corrective action, and neither should releases that would only result in occupational exposures (which would be managed under other programs). Windblown dust, if a PRS is not vegetated or covered, will be a concern under RCRA, and further investigation may be necessary.

If surface soil contamination is known, some simple modeling may show that the pathway will not result in unacceptable exposures to off-site receptors. Because uncontained gases are not hazardous wastes, only releases of hazardous constituents will be of interest.

Releases to groundwater from land-based RCRA TSD units should be addressed under detection and compliance monitoring programs. However, under HSWA corrective action, EPA can address releases from a PRS to other media, such as soil, air, or surface water. Even though it may be more expedient and convenient to address all release pathways under corrective action, the State of New Mexico will ultimately have to approve the closure plan for the regulated unit. The EPA can also require corrective action beyond closure, if warranted.

•**NFA Criterion 4.** The PRS has been characterized or remediated in accordance with current applicable state or federal regulations, and the available data indicate that contaminants of concern are either not present or are present in concentrations near background levels.

Cleanups under other programs, if essentially remediated to approximate background, should not be re-evaluated under corrective action. Groundwater and soil cleanups, if successful so that no significant impact can be detected, need not be re-evaluated. If cleanup is in progress, no additional evaluation is necessary if done under agency approval and the cleanup levels are comparable to those under RCRA.

A one-time spill of a raw material would not normally result in a release that is to be considered under RCRA corrective action. The RCRA process is specifically concerned with routine and systematic releases of hazardous wastes and constituents. However, unless there is documentation that the spill was cleaned up to levels that would be acceptable under RCRA or other applicable standards, the possible area of impact may be an AOC and would remain under consideration in this work plan. In addition, possible future releases are not to be considered under RCRA corrective action. The RCRA corrective action program is not a spill prevention program and should focus on past or continuing releases. Voluntary corrective action measures will reduce the time and cost required to cleanup many PRSs. If a release has occurred and it will eventually be cleaned up, it can be addressed voluntarily, and the work plan can be implemented to show that the PRS is clean.

7.2 POTENTIAL RELEASE SITES RECOMMENDED FOR NO FURTHER ACTION

7.2.1 Group 1: Technical Area 8—Active Site

7.2.1.1 Potential Release Site 8-007—Silver Recovery Resin Bed at Building TA-8-22

Description and History of PRS 8-007

Building TA-8-22 was built in 1950 to house several x-ray machines that are used to radiograph various items. Radiography is used to produce an image on a radiosensitive surface, such as photographic film, by radiation such as x-rays. After an object is radiographed, the silver halide film is sent through a developer and then a fixer solution (Harris 1993, 12-0001). Some excess silver, in the form of soluble salts, was left behind in the fixer solution and was reclaimed in resin recovery beds that were located inside the building. The silver recovery beds, which consisted of 5-gal. plastic cans filled with iron/carbon fibers (steel wool), are no longer in place. The cans were fitted with inlet and outlet valves for receiving and dispelling the fixer solution. Fixer solution flowed from the film bath through the steel wool where the silver replaced some of the iron and remained behind. The delivered fixer solution then flowed into a dedicated drain and then into EPA-permitted outfall 06A074. The fixer solution is currently being discharged directly to the outfall [PRS 8-009(d)], which is monitored bimonthly by the Laboratory's Environmental Surveillance Group (EM-8) and has been continuously in compliance. A visual inspection of the area where the beds were located showed no signs of spills or leaks, and none have been recorded.

Basis for Recommending No Further Action

The silver recovery resin bed, PRS 8-007, is recommended for NFA under Criterion 2. The beds no longer exist, and there were no reported spills or leaks associated with the plastic cans used for storage of the silver.

7.2.1.2 Potential Release Site 8-008(a)—Transformer Storage Area

Description and History of PRS 8-008(a)

Structure TA-8-38 was installed 80 ft southwest of Building TA-8-22 between 1949 and 1950 and consisted of three electrical transformers mounted on a pole-supported platform. At some point during 1986 or 1987, the transformers and the supporting platform were removed and were replaced with a set of three modern transformers mounted on a single pole (LANL 1944 to present, 12-0003). According to G. Brooks, who was working at the site daily during the time that these and other transformers at TA-8 were replaced, the old transformers sat on the ground for several days before being removed from the site. He further stated that all of the transformers were in good working order and showed no sign of leakage (Jones 1992, 12-0157). A visual inspection of the area around the pole revealed no signs of leakage from the transformers.

Basis for Recommending No Further Action

This transformer storage area, PRS 8-008(a), is recommended for NFA under Criterion 2. There is no evidence the transformers ever leaked and, therefore, would not be a PRS.

7.2.1.3 Potential Release Site 8-008(b)—Transformer Storage Area

Description and History of PRS 8-008(b)

Structure TA-8-77, a single transformer mounted on a pole, was installed 250 ft west of building TA-8-21 between 1949 and 1950. At some point in 1987, the transformer was removed from the site. According to G. Brooks, who was working at the site daily during the time that this and other transformers at TA-8 were removed and/or replaced, the old transformers sat on the ground for several days before being removed from the site (Jones 1992, 12-0157). He further stated that all of the transformers were in good working order and showed no sign of leakage. A visual inspection of the area around the pole revealed no signs of leakage from the transformers.

Basis for Recommending No Further Action

This transformer storage area, PRS 8-008(b) is recommended for NFA under Criterion 2. There is no evidence the transformers ever leaked and, therefore, would not be a PRS.

7.2.1.4 Potential Release Site 8-008(c)—Transformer Storage Area

Description and History of PRS 8-008(c)

Structure TA-8-79, two transformers mounted on a single pole, was installed 125 ft northeast of Building TA-8-24. At some point during 1986 or 1987, the transformers and the original pole were removed and were replaced with a set of three modern transformers mounted on a single pole. According to G. Brooks, who was working at the site daily during the time that this and other transformers at TA-8 were replaced, the old transformers sat on the ground for several days before being removed from the site (Jones 1992, 12-0157). He further stated that all of the transformers were in good working order and showed no sign of leakage. A visual inspection of the area around the pole revealed no signs of leakage from the transformers.

Basis for Recommending No Further Action

This transformer storage area, PRS 8-008(c) is recommended for NFA under Criterion 2. There is no evidence the transformers ever leaked and, therefore, would not be a PRS.

7.2.1.5 Potential Release Site 8-008(d)—Transformer Storage Area

Description and History of PRS 8-008(d)

Structure TA-8-38, three transformers mounted on a pole-supported platform, was installed in 1944 directly north of TA-8-1. At some point during 1968, the transformers and the platform were removed from the site. As with the removal/replacement of other transformers at TA-8, these transformers may have been placed on the ground for a short period prior to removal from the site, although no specific information on this transformer was found. A visual inspection of the area around the pole revealed no signs of leakage from these transformers.

Basis for Recommending No Further Action

This transformer storage area, PRS 8-008(d) is recommended for NFA under Criterion 2. There is no evidence the transformers ever leaked and, therefore, would not be a PRS.

7.2.1.6 Potential Release Site 8-009(b)—Outfall Serving Building TA-8-70

Description and History of PRS 8-009(b)

Building TA-8-70 was built in 1960 and houses a tomographic system with an attached x-ray unit and a small machine shop (LANL 1944 to present, 12-0003; Harris 1993, 12-0097). Tomography is used to make x-ray pictures of a predetermined plane section of a solid object by blurring out the images of other planes. Water is used to cool an oil chiller which, in turn, cools the x-ray head of the instrument. The water does not come into contact with any material inside the equipment. This noncontact cooling water is discharged into Pajarito Canyon through EPA-permitted outfall 04A NPDES No. 115-076. The nature of the operations performed in this building has not changed over the years and does not result in the production of hazardous waste (Harris 1993, 12-0097). There are no records of spills or other sources of contamination that could have reached the outfall.

Basis for Recommending No Further Action

The outfall serving Building TA-8-70, PRS 8-009(b), is recommended for NFA under Criterion 1. The outfall has never been used for disposal of any hazardous constituents.

7.2.1.7 Potential Release Site 8-010(a)—Waste Container Storage Area

Description and History of PRS 8-010(a)

This PRS is a 55-gal. drum containing solid waste on a dock at the southeast end of TA-8-70. Building TA-8-70 houses a small machine shop for machining nonhazardous materials such as steel, plastics, metals, etc., and a tomographic system. As a result of cleaning the parts of the machining equipment and the x-ray unit of the tomography system, paper and rags contaminated with organic solvents are produced. These are packaged in plastic bags and stored in the drum until the container is emptied by the Waste Management Group (EM-7). Chemicals such as acetone, butyl acetate, freon, trichloroethylene, and ethyl alcohol have been used. There have been no reported spills associated with this container (Harris 1993; 12-0097). A visual inspection of the area where the drum is located showed no signs of spills or leaks.

Basis for Recommending No Further Action

This PRS, 8-010(a), is a satellite storage area (SSA) operated under RCRA generator requirements. A recommendation of NFA is based on Criterion 3.

7.2.1.8 Potential Release Site 8-010(b)—Waste Container Storage Area

Description and History of PRS 8-010(b)

This PRS is a 5 gal. container for liquid waste, mostly ammonium hydroxide, from a diazo printer located in the south hallway of Building TA-8-21 (Harris 1993, 12-0101). The waste is generated as a result of the photo-processing and development activities in that building. The waste is collected periodically by EM-7 for proper disposal. There are no reported spills or leaks from this container. A visual inspection was conducted, and no signs of spills or leaks were observed.

Basis for Recommending No Further Action

This PRS, 8-010(b), is a SSA operated under RCRA generator requirements. A recommendation of NFA is based on Criterion 3.

7.2.1.9 Potential Release Site 8-010(c)—Waste Container Storage Area

Description and History of PRS 8-010(c)

From December 1950 until recently, Building TA-8-30 was used as a radiation nondestructive test laboratory. The primary work involved the x-ray analysis of weapons components. In July 1991, Building TA-8-30 was converted into a Macro Statistical Hydrodynamics Research (MASH) laboratory (Harris 1993, 12-0102). Presently, studies are performed on the fluid dynamics of suspensions using cameras as tracking devices for the particles in the liquids. Used liquids from these studies are the source of the waste generated. Polyalkynated glycol (poly-antifreeze), surfactants, and tetrabromoethylene are presently used in this building.

The spent liquid at this waste container storage area is collected in a 55 gal. drum and stored on a solvent rack, equipped with a secondary container for spill control, in a shed near Building TA-8-30. The drums are collected periodically and the contents disposed of by Group EM-7. The solid waste, made up of paper and plastic, is collected in another 55 gal. drum and stored until it is also collected and disposed of by Group EM-7 (Harris 1993, 12-0102). This SSA was previously located (from July to September 1991) on an asphalt pad on the south side of the building. A visual inspection of this area showed signs of rust from the 55 gal. drums but no signs of leakage or spills of hazardous constituents. There have been no reported leaks or spills associated with the current arrangement of the waste container storage area.

Basis for Recommending No Further Action

This PRS, 8-010(c), is a SSA operated under RCRA generator requirements. A recommendation of NFA is based on Criterion 3.

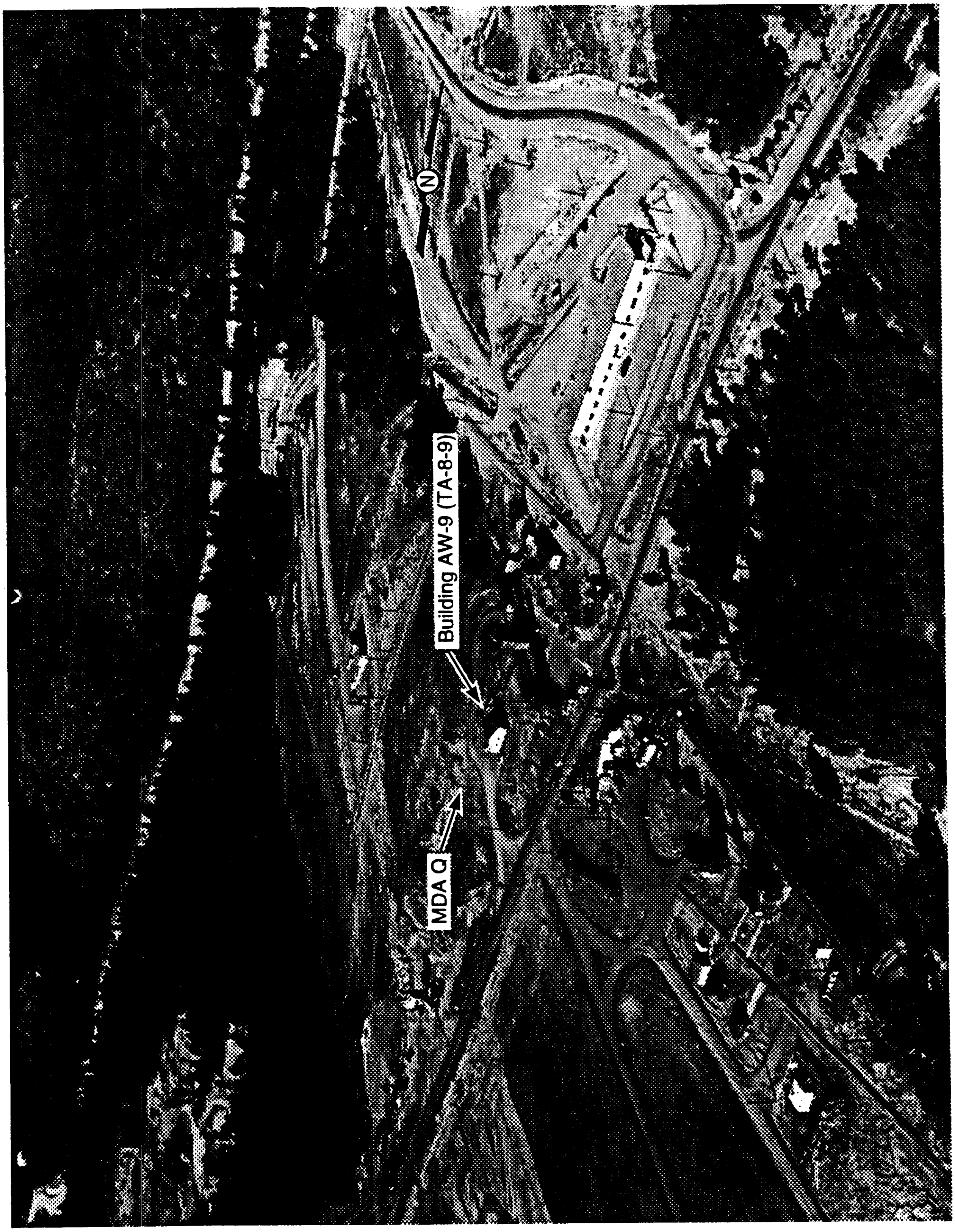
7.2.2 Group 2: Technical Area 8—Gun-Firing Site

7.2.2.1 Potential Release Site 8-006(b)—Possible Disposal Area near Building TA-8-21

Description and History of PRS 8-006(b)

Potential Release Site 8-006(b) is described in the SWMU Report (LANL 1990, 0145) as a disposal area near Building TA-8-21. There is a material disposal area known as MDA Q [PRS 8-005(a)] located south of Building TA-8-21. The postulated existence of a second burial site arises from an erroneous Weston interpretation of a 14 June 1956 memo from G. H. Tenney to D. D. Meyer (Tenney 1956, 12-0009). Tenney's memo was a response to an 11 June 1956 inquiry from Meyer about the location of contaminated waste burial grounds (Tenney 1956, 12-0009). Tenney replied that, although he knew of no official burial ground at TA-8, he had a distinct recollection that the construction crews who built the modern TA-8 buildings in 1949 and 1950 discovered buried material that they then immediately covered up. Tenney then stated that, having checked with people who had worked at the site during the war, the crews had stumbled upon "junk collected by the old gun crew located at Anchor Ranch." He enclosed a map with his memo, indicating the location of the burial to the best of his knowledge. An interpretation of this information is that the construction crew had partially uncovered MDA Q [PRS 8-006(a)]. Unfortunately, Tenney's map has disappeared and that fact, coupled with the following subtleties about construction of TA-8 (GT Site), led to a misinterpretation by Weston.

The critical point about the construction of GT Site is that, although, as Weston states, the new buildings were erected north of the Gun-Firing Site and, hence, north of MDA Q, in December 1949 wartime office Building AW-9 (TA-8-9) was moved onto the Gun-Firing Site in order to make way for new Building TA-8-21. As part of the move, a parking lot was cleared to the south and west of the new location, and a vehicle track was created that bypassed the abandoned bunker area and the old access road that climbed up from the bunker area onto the Gun-Firing Site. Both the new parking lot and, in particular, the new vehicle track passed very close to MDA Q. A LANL photograph (see Figure 7-1), taken in 1950, shows the relevant features of the area (LASL 1950, 12-0104). Currently,



Source: LASL 1950 (12-0104)

Figure 7-1. 1950 Aerial photograph showing location of MDA Q (photo LASL 16337).

four inert projectiles can be seen on the surface at MDA Q. A memo from W. C. Courtright (Courtright 1964, 12-0008) refers to two exposed projectiles. These are either evidence of disturbance by the construction crews or evidence of the prior 1947 excavation to remove one of the buried guns, evidence which was then noticed by the 1949-50 crews. In Courtright's draft memo detailing the prior day's visit to the site with Thurman Hargett to locate the gun-site burial, there is no suggestion of a second burial. Hargett worked at the site during World War II and was present at the time the guns were buried, and it seems likely that he would have mentioned a second burial of "junk collected by the old gun crew" had there been one (Courtright 1964, 12-0008). It is concluded that PRS 8-006 (a) and 8-006(b) are both MDA Q.

Basis for Recommending No Further Action

The possible disposal area near TA-8-21, PRS 8-006(b), is recommended for NFA under Criterion 1. This MDA is the same as PRS 8-006(a) which is discussed in Section 5.2.1.2.

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7.2.3 Group 3: Technical Area 8—Abandoned Bunker Site

7.2.3.1 Potential Release Site 8-003(b)—Inactive Septic Tank TA-8-64

Description and History of PRS 8-003(b)

Septic Tank TA-8-64 was installed in early 1949 to serve an office building, TA-8-9, also known as Building 11 and AW-9. These alternate designations caused some confusion on the part of the authors of the SWMU Report (LANL 1990, 0145), and the association of this septic tank with Building AW-11 in that report is in error. At the time that the tank was installed, Building AW-9 (TA-8-9) was located north of the now-abandoned TA-8 bunkers. In December 1949, the building was moved onto the Gun-Firing Site to make way for the construction of Building TA-8-21. Septic tank TA-8-64 was abandoned in place at that time. According to H. Milton Peek, who worked in Building AW-9 in 1950, it then housed offices for administrative and drafting work (Jones 1992, 12-0105). The original engineering drawings do not show any floor drains or sinks that would be associated with photo-processing or other activities involving the use of chemicals and, in fact, indicate that, from the time the building was erected until the time it was moved, it only housed offices (LASL 1964, 12-0106).

Basis for Recommending No Further Action

Inactive Septic Tank TA-8-64, PRS 8-003(b), is recommended for NFA under Criterion 1. There is no reason to believe that hazardous or radioactive constituents ever existed in this septic tank.

7.2.3.2 Potential Release Site 8-003(c)—Inactive Septic Tank TA-8-67

Description and History of PRS 8-003(c)

Septic Tank TA-8-67 was installed in early 1950 to serve office Building AW-9 (TA-8-9) when it was moved onto the TA-8 Gun-Firing Site. Early in 1968, the tank was filled with tamped earth and abandoned in place. Although a 28 September 1971 memo, from the Engineering Department to F. C. Sander, (LASL 1971, 12-0107) suggests the possibility of chemical and radionuclide contamination, there are two reasons for believing that such contamination could not have occurred. First, it is known that, in 1950, AW-9 was used solely as an office building, and there is no indication that it was later modified to house any other activities. Second, an 18 April 1967 memo from Barnett to Russo (Barnett 1967, 12-0013) indicates that the alleged contamination of Septic Tank TA-8-67 (if any) would have been due to "small amounts of uranium which were used in TA-8-1 and which might have reached the septic system." There is no indication of any connection between Building TA-8-1 and Septic Tank TA-8-67 and, even if there were any connection, the septic tank is uphill from Building TA-8-1.

Basis for Recommending No Further Action

Inactive Septic Tank TA-8-67, PRS 8-003(c), is recommended for NFA under Criterion 1. There is no reason to believe that hazardous or radioactive constituents ever existed in this septic tank.

7.2.3.3 Potential Release Site 8-011(a)—Decommissioned Underground Storage Tank TA-8-60

Description and History of PRS 8-011(a)

Structure TA-8-60 was a 2000 gal. stainless-steel UST for diesel oil that served Building TA-8-1 (LANL 1990, 0145). The tank was installed in 1943 and removed as part of the Laboratory's underground storage tank removal program in 1987 (LANL 1944 to present, 12-0003). There were no reported spills or leaks, and there was no contamination of the soil from the diesel oil (Harris 1993, 12-0117).

Basis for Recommending No Further Action

The UST TA-8-60, PRS 8-011(a), is recommended for NFA under Criterion 4. It has been properly removed and remediated under the Laboratory's UST removal program.

7.2.3.4 Potential Release Site 8-011(b)—Decommissioned Underground Storage Tank TA-8-61

Description and History of PRS 8-011(b)

Structure TA-8-61 was a 2000 gal. stainless steel, underground storage tank for diesel oil, that served Building TA-8-1. The tank was installed in 1943 and removed as part of the Laboratory's underground storage tank removal program in 1987 (LANL 1990, 0145; LANL 1944 to present, 12-0003). There were no reported spills or leaks, and there is no contamination of the soil from the diesel oil (Harris 1993, 12-0117).

Basis for Recommending No Further Action

The UST TA-8-61, PRS 8-011(b), is recommended for NFA under Criterion 4. It has been properly removed and remediated under the Laboratory's UST removal program.

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7.2.4 Group 4: Technical Area 9—Active Site

The PRSs in Group 4 are comprised primarily of buildings and structures that are currently in use by Laboratory personnel. Many of the PRSs that are in this section are active and inactive sanitary septic tanks that are being recommended for no further action based on knowledge of past and current operations.

The buildings in the active area of TA-9 were purposely designed so that the toilets and sanitary sinks are located in the nonhazardous area (out of the industrial work places) of the facility. Each laboratory with the potential to generate hazardous waste has its own industrial waste drain and/or sink for the disposal of hazardous materials. To pour a hazardous material into the toilet or sinks located outside of the Laboratory areas would violate the Standard Operating Procedures (SOPs) of the site, (Harris 1993, 12-0139) and it would require the worker to exhibit a considerable amount of effort to access the area with the sanitary systems. It would be much easier and, in the past, acceptable, to discard hazardous materials in the industrial waste sinks, sumps, or drains provided within each laboratory.

Figures 7-2 through 7-4 are process diagrams that show the actual sanitary lines from the various buildings in the active area of TA-9. These diagrams were prepared from a series of Engineering Drawings (LASL 1956, 12-0073; LASL 1956, 12-0109; LASL 1956, 12-0110; LASL 1975, 12-0111; LASL 1973, 12-0057; LANL 1991, 12-0112). It is important to note that in every instance the industrial waste lines do not intercept any sanitary waste line prior to discharge into the outfall.

The full descriptions of PRSs 9-005(b), 9-005(c), 9-005(e), 9-005(f), 9-005(g), and 9-005(h), the active and inactive sanitary septic tanks, can be found in Sections 7.2.4.2 through 7.2.4.7. Given the information provided here, these PRSs are being recommended for no further action. Descriptions of the other PRSs in this group being recommended for no further action can also be found below.

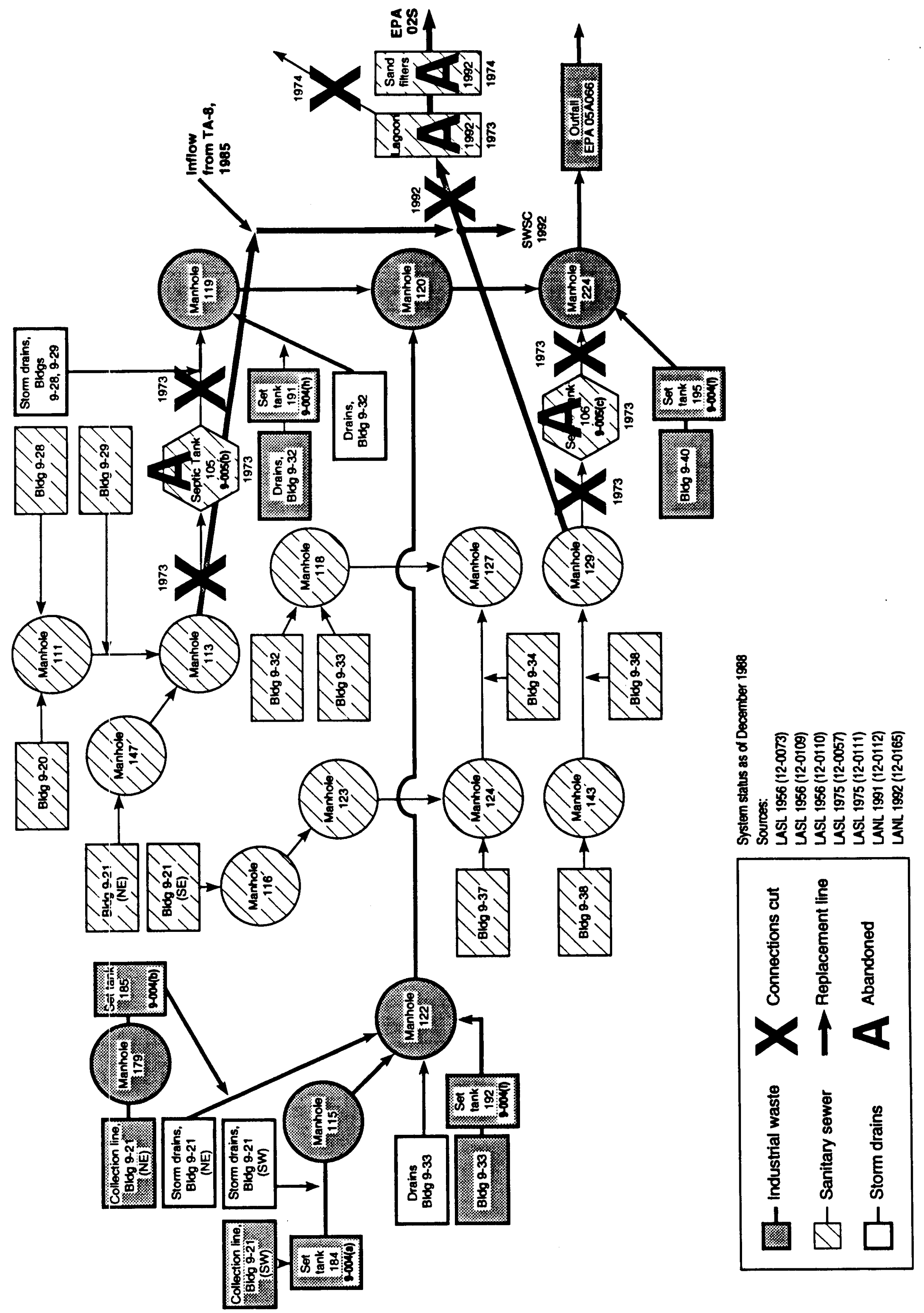

Figure 7-2. Process diagram for Group 4 sewage system outfalls 05A066 and 02S.

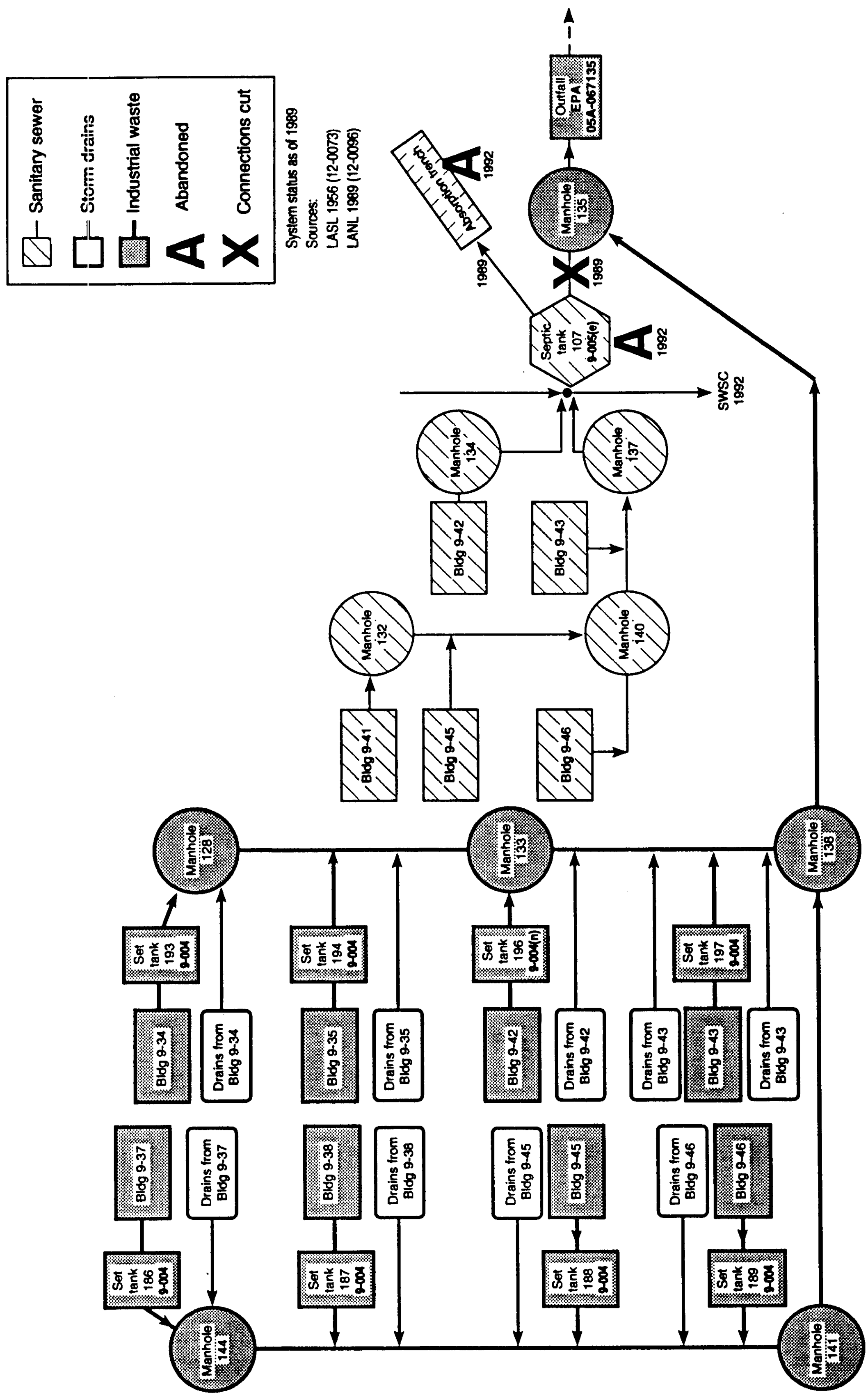

Figure 7-3. Process diagram for Group 4 sewage system from Septic Tank 107 and Manhole 135.

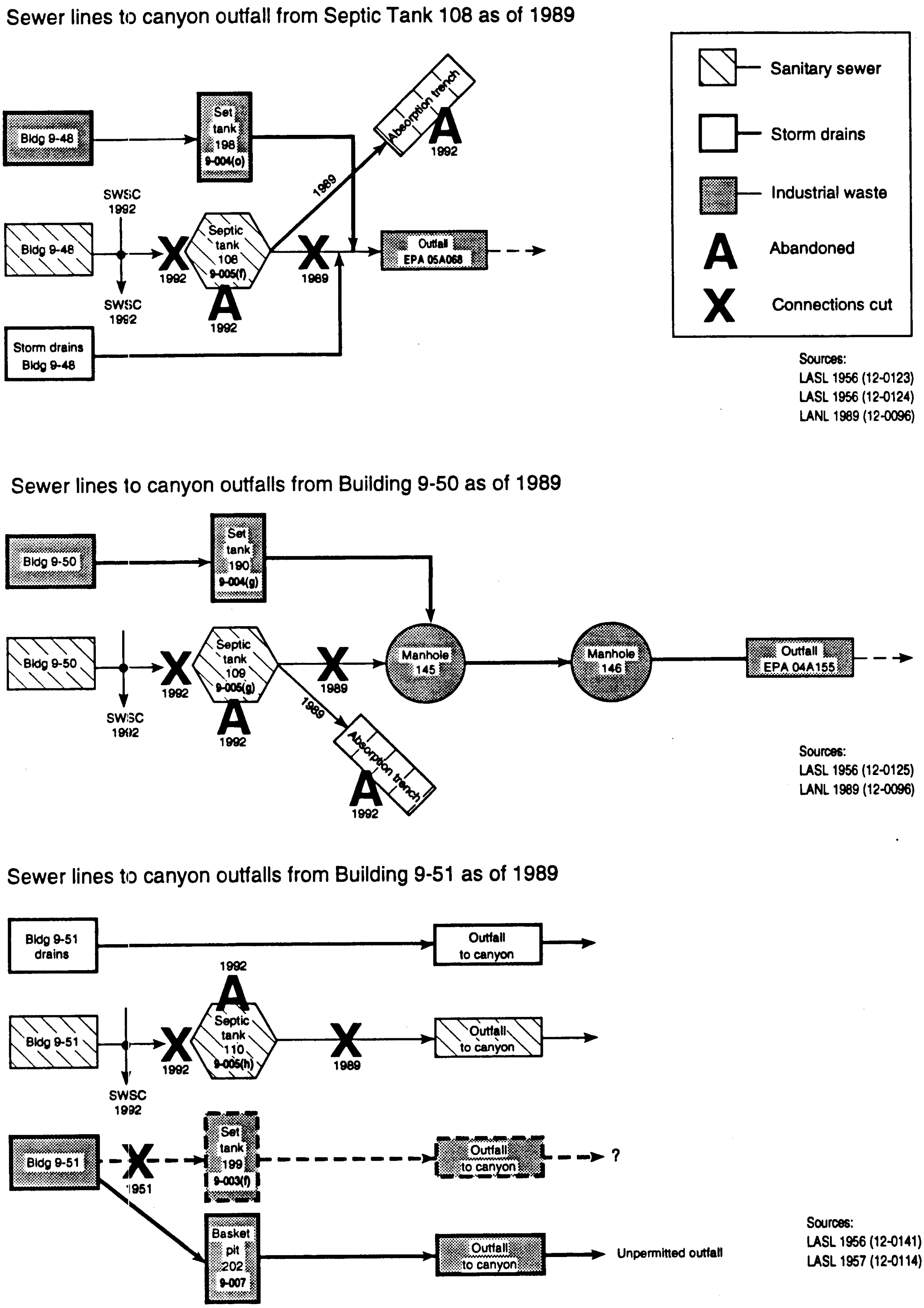

Figure 7-4. Process diagrams for miscellaneous Group 4 septic systems.

7.2.4.1 Potential Release Site 9-003(f)—Settling Tank served Building TA-9-51

Description and History of PRS 9-003(f)

Structure TA-9-199 was a settling tank, not a sump, as was stated in the SWMU Report (LANL 1990, 0145). It was installed in 1950 to serve Building TA-9-51 and was removed when the building was modified later that year (LASL 1950, 12-0113). The SWMU Report also incorrectly states that this structure served Building TA-9-2. Building TA-9-51 is an environmental test chamber containing ovens in which sealed weapons' components are cycled. There is no laboratory work or hazardous waste generated in this building. The use and operations in this building have not changed since its construction. Therefore, this settling tank would not have been contaminated (Harris 1993, 12-0140).

Basis for Recommending No Further Action

Settling Tank TA-9-199, PRS 9-003(f), is recommended for NFA under Criterion 1. There is no reason to believe hazardous or radioactive wastes were ever generated or disposed of in this settling tank.

7.2.4.2 Potential Release Site 9-005(b)—Inactive Sanitary Septic Tank served Buildings TA-9-21, -28, and -29

Description and History of PRS 9-005(b)

Structure TA-9-105 is an inactive, 1500-gal. reinforced-concrete sanitary septic tank (11-ft long by 3.5-ft wide by 4-ft deep) that received only sanitary liquid waste from Buildings TA-9-21, -28, and -29 (LASL 1957, 12-0115). It was constructed in August 1952 and abandoned in place in 5 December 1988. This septic tank has a concrete slab cover and is located northwest of Building TA-9-32. There are no documented records of contamination of this tank. Figure 7-2 shows that this tank was connected only to sanitary lines from these buildings.

Basis for Recommending No Further Action

Inactive sanitary Septic Tank TA-9-105, PRS 9-005(b), is recommended for NFA under Criterion 1. There is no reason to believe hazardous or radioactive wastes were ever generated, treated, or disposed of in this septic tank.

7.2.4.3 Potential Release Site 9-005(c)—Inactive Sanitary Septic Tank served Buildings TA-9-21, -33, -34, -37, and -38

Description and History of PRS 9-005(c)

Structure TA-9-106, a 750-gal. inactive septic tank estimated to be 5-ft wide by 8-ft long by 3-ft 6-in. deep, is located slightly north of Building TA-9-40 on the other side of a fence and near a road that runs behind and around the present TA-9 (LASL 1956, 12-0073). It was installed in August 1952 and abandoned in place in December 1988 (LANL 1944 to present, 12-0003). This septic tank received only sanitary waste from Buildings TA-9-21, -33, -34, -37, and -38. Figure 7-3 shows that this tank was connected only to sanitary waste lines from these buildings.

Basis for Recommending No Further Action

Inactive sanitary Septic Tank, TA-9-16, is recommended for NFA under Criterion 1. There is no reason to believe hazardous or radioactive wastes were ever generated, treated, or disposed of in this septic tank.

7.2.4.4 Potential Release Site 9-005(e)—Inactive Sanitary Septic Tank, TA-9-107, served Buildings TA-9-41, -42, -43, -45, and -46

Description and History of PRS 9-005(e)

Structure TA-9-107, a reinforced-concrete 750-gal. sanitary septic tank, estimated to be 5-ft wide by 8-ft long by 3-ft 6-in. deep, was installed in 1952 (Santa Fe Engineering 1991, 12-0019) and became inactive in December 1992 when the site-wide sanitary wastewater systems consolidation line was installed. This tank received only sanitary waste from Buildings TA-9-41, -42, -43, -45, and

-46. Water from this tank flowed to NPDES outfall LA-03. Figure 7-3 shows that this tank was connected only to sanitary waste lines from these buildings (LASL 1956, 12-0073; LASL 1956, 12-0109; LASL 1956, 12-0110; LASL 1975, 12-0111; LASL 1973, 12-0057; LANL 1991, 12-0112).

Basis for Recommending No Further Action

Sanitary Septic Tank TA-9-107, PRS 9-005(e), is recommended for NFA under Criterion 1. There is no reason to believe hazardous or radioactive wastes were ever generated, treated, or disposed of in this septic tank.

7.2.4.5 Potential Release Site 9-005(f)—Inactive Sanitary Septic Tank serving Building TA-9-48

Description and History of PRS 9-005(f)

Structure TA-9-108, a reinforced-concrete 750-gal. sanitary septic tank, estimated to be 5-ft wide by 8-ft long by 3-ft 6-in. deep, was installed in 1952 (Santa Fe Engineering 1991, 12-0019) and became inactive in December 1992 when the site-wide sanitary wastewater systems consolidation line was installed. This tank received only sanitary waste from Building TA-9-48. Water from the tank flowed to EPA outfall 05A068. Figure 7-4 shows that this tank was connected only to sanitary waste lines from these buildings.

Basis for Recommending No Further Action

Sanitary Septic Tank TA-9-109, PRS 9-005(f), is recommended for NFA under Criterion 1. There is no reason to believe hazardous or radioactive wastes were ever generated, treated, or disposed of in this septic tank.

7.2.4.6 Potential Release Site 9-005(g)—Active Sanitary Septic Tank serving Building TA-9-50

Description and History of PRS 9-005(g)

Structure TA-9-109, a reinforced-concrete 750-gal. sanitary septic tank, estimated to be 5-ft wide by 8-ft long by 3-ft 6-in. deep, was installed in 1952. It is located northeast of Building TA-9-50 (LASL 1956, 12-0123) and receives only sanitary waste from that building. Outflow from this tank formerly combined with the industrial sewer from Building TA-9-50 at manhole TA-9-145. However, the sanitary drain line was rerouted in 1989 to bypass the industrial waste line, and it now flows to unpermitted buried outfall LA-05 (Santa Fe Engineering 1991, 12-0019). Figure 7-4 shows that this tank was connected only to sanitary waste lines from this building.

Basis for Recommending No Further Action

Sanitary Septic Tank TA-9-109, PRS 9-005(g), is recommended for NFA under Criterion 1. There is no reason to believe hazardous or radioactive wastes were ever generated, treated, or disposed of in this septic tank.

7.2.4.7 Potential Release Site 9-005(h)—Inactive Sanitary Septic Tank serving Building TA-9-51

Description and History of PRS 9-005(h) TA-9-110

Structure TA-9-110, a 320-gal. steel prefabricated septic tank, was installed in 1951 and became inactive in December 1992 when the site-wide sanitary wastewater systems consolidation line was installed. It is located northeast of TA-9-51 (LASL 1956, 12-0141). This tank received only sanitary waste from Building TA-9-51. Building TA-9-51 is an environmental test chamber containing ovens in which sealed weapons' components were cycled. These operations did not produce any laboratory work or hazardous waste. The building is currently used only for storage of nonhazardous materials. Figure 7-4 shows that this tank was connected only to sanitary waste lines from this building.

Basis for Recommending No Further Action

Sanitary Septic Tank TA-9-110, PRS 9-005(h), is recommended for NFA under Criterion 1. There is no reason to believe hazardous or radioactive wastes were ever generated, treated, or disposed of in this septic tank.

7.2.4.8 Potential Release Site 9-007—Basket Pit

Description and History of PRS 9-007

Structure TA-9-202 is an inactive basket pit, made of reinforced concrete with a hinged steel lid 4-ft 3-in. long by 3-ft 8-in. wide by 7-ft deep. It was built in 1952 as a replacement to a settling tank [TA-9-199, PRS 9-003(f)], which was removed to accommodate the addition of a bathroom to Building TA-9-51. The building, an environmental test chamber, houses ovens in which weapons' components were cycled at various temperatures. Operations in this building did not employ hazardous materials and would not have created liquid or solid hazardous waste. The use and operation of this building did not change since its construction, other than the fact that it is currently used only for storage of nonhazardous materials. This structure would not have the potential for contamination (LANL 1944 to present, 12-0003; Harris 1993, 12-0140).

Basis for Recommending No Further Action

Basket Pit TA-9-202, PRS 9-007, is recommended for NFA under Criterion 1. There is no reason to believe hazardous or radioactive wastes were ever generated, treated, or disposed of in this structure.

7.2.4.9 Potential Release Site 9-010(c)--Waste Can Shelter

This waste can shelter was listed in the SWMU Report as being north of Building TA-9-48. Another PRS, 9-010(a) , was the only waste can shelter found near this building. There is no evidence of two shelters in the area. It is concluded that waste can shelters PRS 9-010(a) and 9-010(c) are the same structure.

Basis for Recommending No Further Action

This container storage area, PRS 9-010(c) is recommended for NFA under Criterion 1. This storage area is the same as PRS 9-010(a).

7.2.4.10 Potential Release Site 9-011(a)—Waste Container Storage Area at TA-9-21

Description and History of PRS 9-011(a)

This was a waste container storage area at the end of the north corridor of Building TA-9-21. The two cans that comprised this storage area were removed and the area thoroughly cleaned in 1991. Each laboratory in Building TA-9-21 has now been declared a satellite storage area. Prior to the removal of the original SSA, waste (HE, chemicals, radioactive and nonhazardous) was collected in heavy plastic bags and stored in separate metal containers until it could be picked up and disposed of by the appropriate team—Group WX-3 (HE-contaminated), Group EM-7 (radioactive and chemical), Q-Site personnel (uncharacterized HE), or the janitorial service if the waste was known to be nonhazardous. The packaging requirement prevented the area from becoming contaminated. Note that only small laboratory quantities of materials are used in Building TA-9-21.

Basis for Recommending No Further Action

Waste Container Storage Area PRS 9-011(a) is recommended for NFA under Criteria 3 and 4. The original SSA was maintained and removed under current RCRA regulation.

7.2.5 Group 5: Technical Area 9—Old Anchor East Decommissioned Area

7.2.5.1 Potential Release Site 9-003(c)—Electrical Control Manhole served Building TA-9-14

Description and History of PRS 9-003(c)

Structure TA-9-85 was an electrical control manhole built in 1943. The SWMU Report misidentified this as a sump (LANL 1990, 0145). The manhole was made of brick and served Building TA-9-14, a laboratory. The manhole was abandoned in place in September 1962. In 1965, the top was removed 24 in. below the surface and the structure was filled and covered with dirt. During a utility upgrade in 1985, this structure was found and removed.

Basis for Recommending No Further Action

Electric Control Manhole TA-9-85, PRS 9-003(c), is recommended for NFA under Criterion 1. The PRS is no longer in place, and was never used as a site for the generation, treatment, or disposal of hazardous or radioactive wastes.

7.2.5.2 Potential Release Site 9-008(a)—Lagoon

Description and History PRS 9-008(a)

This PRS is described in the SWMU Report (LANL 1990, 0145) as a waste water lagoon near Old Anchor East. In the same area is the waste water oxidation pond (Structure TA-9-212), which has been separately identified in the SWMU Report as PRS 9-008(b); however, there is only one such pond/lagoon facility in this area. This pond has been described as a lagoon in some archival materials, which is believed to have led the authors of the SWMU Report to the erroneous conclusion that two separate facilities had existed. Potential Release Site 9-008(a) did not exist as a separate facility and is the same as PRS 9-008(b).

Basis for Recommending No Further Action

The lagoon, PRS 9-008(a), is recommended for NFA under Criterion 1. This lagoon is the same as PRS 9-008(b) which is discussed in Section 5.5.1.14.

7.2.5.3 Potential Release Site 9-016—Decommissioned Underground Storage Tank

Description and History of PRS 9-016

Structure TA-9-182 was a 1000-gal. petroleum storage tank built in July 1945, abandoned in place in December 1959, and removed in 1965 (LANL 1944 to present, 12-0003). There is no reported evidence of a spill from this structure. Personal communication about the condition of the older tanks revealed that they were much more substantially built than some of the present tanks on Laboratory property. This tank was not corroded, and the only leaks were those found at joints in pipes. The soil beneath these leaks was removed and disposed of with the structures (Harris 1993, 12-0117).

Basis for Recommending No Further Action

The storage tank, PRS 9-016, is recommended for NFA under Criterion 4. The tank has been removed. Any contaminated soil that may have been a result of spills or leaks from the UST were removed with the tank.

7.2.6 Group 6: Technical Areas 9 and 23—Far Point Firing Site and TA-23 Firing Site

7.2.6.1 Potential Release Site 9-015—Electrical Control Manhole

Description and History PRS of 9-015

This PRS is listed in the SWMU Report (LANL 1990, 0145) as Structure TA-9-178, an industrial waste manhole. Structure TA-9-178 is an electrical control manhole that served Building TA-9-21 and is not contaminated.

Basis for Recommending No Further Action

This PRS is recommended for NFA under Criterion 1. It was never used for the management of hazardous waste or radionuclides.

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7.2.7 Group 7: Technical Area 9—Material Disposal Area M

No PRSs are recommended for NFA in this group.

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7.2.8 Group 8: Technical Area 69

7.2.8.1 Potential Release Site 69-002(a)—Septic System serving Building TA-69-9

Description and History of PRS 69-002(a)

The 1990 SWMU Report (LANL 1990, 0145) states that this system includes Septic Tank TA-69-9 (formerly TA-0-69), supporting Guard House TA-69-1 (formerly TA-0-68) for sanitary waste. Both the SWMU Report and Engineering records (LANL 1990, 0145; Weston 1989, 12-0049) state that the tank measures 5-ft 4-in. wide by 5-ft 4-in. long by 3-ft deep, and is built of reinforced concrete. Engineering records indicate that the tank was built as part of the guard house project for Station 502 located on Anchor Ranch Road near the TD Site turnoff in 1954.

The tank overflows to a 90-ft long drain line that discharges to an outfall. The system is registered as an unpermitted individual Liquid Waste System with EID Registration Number LA-08. The Active Septic Tank System data base indicates that the drain line was plugged in 1988 and that the waste is now collected in a holding tank and pumped (LANL 1990, 0145; Weston 1989, 12-0049). There have been no known releases of hazardous substances from this tank, which is believed to contain only sanitary waste.

Basis for Recommending No Further Action

Sanitary Septic Tank TA-69-9, PRS 69-002(a), is proposed for NFA under Criterion 1. No hazardous materials were used in the guard house and none could have entered the septic system.

7.2.8.2 Potential Release Site 69-002(b)—Septic System serving Building TA-69-10

Description and History of PRS 69-002(b)

The SWMU Report and Engineering records state that PRS 69-002(b) includes a 1000-gal. septic tank, TA-69-10, and a seepage pit, TA-69-11 (LANL 1990, 0145;

Weston 1989, 12-0049). They were constructed in 1986 and presently serve Trailer TA-69-2, which was put in by M Division in May of 1987 for use as an office trailer. Trailer TA-69-2 contains one restroom. Another trailer, TA-69-5, was moved into the area in March of 1989 by ENG-5 for use as an office trailer. This trailer has no restroom.

No known hazardous releases have been reported for this septic system. The buildings it supports are for office use only (which only produces sanitary waste), and it has been operating during a period when Utilities Operating Instructions for Waste Water Operations have been in place.

Basis for Recommending No Further Action

This PRS is proposed for NFA based on Criterion 1. Sanitary waste was the only waste present here.

7.2.9 Group 9: Areas of Concern at TA-8 and TA-9

7.2.9.1 Technical Area 8 Areas of Concern

Areas of Concern C-8-005 through C-8-008 and C-8-018 have been erroneously associated with a reported decontamination of machinists' equipment, and background information on this incident is included in these introductory remarks. The OU 1157 team extensively reviewed LANL archives and previous studies such as the CEARP (DOE 1987, 0264) and Weston Reports (Weston 1989, 12-0049) as part of the investigation into PRSs. The Weston Report covered the AOCs under Tasks 36 and 37. This report cited information from the CEARP Report that refers to a 1950 report that stated that decontamination measures were taken to clean a machinist's equipment at Anchor Ranch West (TA-8). The contaminant was assumed to be a radionuclide because Group H-1 was concerned with radioactive contamination, but the actual contaminant and the extent of contamination were not known. Areas of Concern C-8-005 through C-8-008 and C-8-018 had a blanket statement about this incident included in their summary descriptions. The OU 1157 team's investigation revealed that the only building associated with machining was Building TA-8-3, which is not an AOC. Building TA-8-3 is investigated under Group 3, the Abandoned Bunker Site. The information presented in this work plan relative to each AOC does not include the Weston Report statement about the machinists' equipment.

The location of the AOCs in TA-8 are shown on Figure 5-15.

C-8-001 Associated Structure: TA-8-4

This AOC is the former location of one of two moveable gun buildings mounted on rails used to cover gun mounts at the old Anchor West (TA-8) Gun-Firing Site. It was built before 1947 and removed in 1950 (DOE 1989, 0078;Weston 1989, 12-0049). Depleted uranium, lead, and copper were determined to be potential contaminants in this area (Jones 1992, 12-0047).

Basis for Recommending No Further Action

The sampling strategy for PRS 8-002 (see Section 5.2.1.1) will include AOC C-8-001. The gun building, C-8-001, is proposed for no further action.

C-8-002 Associated Structure: TA-8-5

This AOC is the former location of the second moveable gun building mounted on rails used to cover gun mounts at the old Anchor West (TA-8) Gun-Firing Site. It was built before 1947 and removed in 1950 (DOE 1987, 0264; Weston 1989, 12-0049). Depleted uranium, lead, and copper were determined to be potential contaminants in this area (Jones 1992, 12-0047).

Basis for Recommending No Further Action

The sampling strategy for PRS-8-002 will include AOC C-8-002. The gun building, C-8-002, is proposed for no further action.

C-8-003 Associated Structure: TA-8-6

This AOC is the former location of the carpenter's shop, Building TA-8-6. The carpenter's shop was built before 1947, moved in 1948 to T Site (outside of OU 1157), and later removed from that location (DOE 1987, 0264; Weston 1989, 12-0049). T Site is the former TA-24, which became part of TA-16 (LANL 1944 to present, 12-0003). While at TA-8, this building was in the area of the Gun-Firing Site. No known hazardous materials were used in Building TA-8-6 (Blackwell 1983, 12-0118). The OU 1157 team's investigation did not reveal evidence of any contamination associated with this building; however, the sampling strategy for PRS-8-002 will also include the location of this AOC.

Basis for Recommending No Further Action

No further action is proposed for AOC C-8-003 based on the fact that the area will be sampled under PRS 8-002 and based on Criterion 1. There is no evidence of the management of hazardous or radioactive waste in this building.

C-8-004 Associated Structure: TA-8-10

This AOC is the former main ranch house, which had an ice storage vault in the basement. The building and vault were removed in 1950. (DOE 1987, 0264; Weston 1989, 12-0049) The site is located west of the main Anchor Site West (TA-8) facility. No known hazardous materials were used in Building TA-8-10 (Blackwell 1983, 12-0118). An association with an ice house at TA-1, which stored radioactive materials, has been made with this former ranch house. However, there is no evidence that any radioactive materials were ever stored here, and storage of radioactive materials in an ice house in one area of the Laboratory does not justify the assumption that all ice houses were used to store radioactive materials. Radioactive screening data were collected at this location and did not reveal any activity above background levels (19,000 cpm was recorded where background in Los Alamos ranges from 16,000 to 20,000 cpm) (Weston 1989, 12-0049).

It has been remarked that the aforementioned activity values are high for the beta-gamma instrument cited in the Weston report. An interview was conducted with P. Zelle, who was responsible for the radiological survey work performed for the ER Program (Starmer 1993, 12-0142). Mr. Zelle stated that the value of 19,000 cpm was typical background for a 2 in by 2 in Sodium Iodide (NaI) scintillation counter which was their measurement instrument of choice. He also stated that a reading of 19,000 cpm beta-gamma, measured with a pancake GM probe, would have required immediate corrective action. Beta-gamma background at the Laboratory, measured with an Eberline pancake GM probe is usually on the order of a few hundred cpm.

Basis for Recommending No Further Action

The former main ranch house, AOC C-8-004, is proposed for NFA based on Criterion 1. There is no evidence of any contamination associated with this building.

C-8-005 Associated Structure: TA-8-11

This AOC is the location of a guest house at Anchor Ranch, which was removed in 1950. The site is located west of the main Anchor Site West (TA-8) facility (DOE 1987, 0264; Weston 1989, 12-0049). No known hazardous or radioactive materials were used in Building TA-8-11 (Blackwell 1983, 12-0118).

Basis for Recommending No Further Action

This former guest house, AOC C-8-005, is proposed for NFA based on Criterion 1. There is no evidence of any contamination associated with this building.

C-8-006 Associated Structure: TA-8-12

This AOC is the location of a guest house at Anchor Ranch, which was removed in 1950. The site is located west of the main Anchor Site West (TA-8) facility (DOE 1987, 0264; Weston 1989, 12-0049). No known hazardous or radioactive materials were used in Building TA-8-12 (Blackwell 1983, 12-0118).

Basis for Recommending No Further Action

This former guest house, AOC C-8-006, is proposed for NFA based on Criterion 1. There is no evidence of any contamination associated with this building.

C-8-007 Associated Structure: TA-8-13

This AOC is the location of a bunk house at Anchor Ranch, which was removed in 1950. The site is located west of the main Anchor Site West (TA-8) facility (DOE 1987, 0264; Weston 1989, 12-0049). No known hazardous or radioactive materials were used in Building TA-8-13 (Blackwell 1983, 12-0118).

Basis for Recommending No Further Action

The former bunk house, AOC C-8-007, is proposed for NFA based on Criterion 1. There is no evidence of any contamination associated with this building.

C-8-008 Associated Structure: TA-8-15

This AOC is the location of a ranch barn at Anchor Ranch, which was removed in 1950. The site is located west of the main Anchor Site West (TA-8) facility (DOE 1987, 0264; Weston 1989, 12-0049). No known hazardous or radioactive materials were used in Building TA-8-15 (Blackwell 1983, 12-0118).

Basis for Recommending No Further Action

This former ranch barn, AOC C-8-008, is proposed for NFA based on Criterion 1. There is no evidence of any contamination associated with this building.

C-8-009 Associated Structure: TA-8-18

This AOC is the location of another ranch barn at Anchor Ranch, which was removed in 1950. The site is located southwest of the main Anchor Site West (TA-8) facility (DOE 1987, 0264; Weston 1989, 12-0049). No known hazardous or radioactive materials were used in Building TA-8-18 (Blackwell 1983, 12-0118).

Basis for Recommending No Further Action

This former ranch barn, AOC C-8-009, is proposed for NFA based on Criterion 1. There is no evidence of any contamination associated with this building.

C-8-011 Associated Structure: TA-8-7

This AOC is the location of a storage building, TA-8-7, associated with the Gun-Firing Site. The building was located north of Building TA-8-1. It was built before 1947 and sent to T Site and later removed (DOE 1987, 0264; Weston 1989, 12-0049). T Site is the former TA-24, which became part of TA-16 (LANL 1944 to present, 12-0003). No known hazardous or radioactive materials were used in Building TA-8-7 (Blackwell 1983, 12-0118).

Basis for Recommending No Further Action

Storage Building TA-8-7 (AOC C-8-011) is proposed for NFA based on Criterion 1. There is no evidence of any contamination associated with this building.

C-8-012 Associated Structure: TA-8-8

This AOC is the location of a carpenter shop, Building TA-8-8, associated with the Gun-Firing Site. The building, which was built before 1947, was located north of Building TA-8-1. In 1968, it was transferred to the Zia Company and moved to the New Mexico State Penitentiary (DOE 1987, 0264; Weston 1989, 12-0049). All debris was cleaned up, and the work was completed 22 March 1968 (LASL 1968, 12-0119). No known hazardous or radioactive materials were used in Building TA-8-8 (Blackwell 1983, 12-0118).

Basis for Recommending No Further Action

Building TA-8-8 (AOC C-8-012) is proposed for NFA based on Criterion 1. There is no evidence of any contamination associated with this building.

C-8-013 Associated Structure: TA-8-9

This AOC is the location of an office building, TA-8-9. This building, built before 1947, was originally located northeast of TA-8-2 and was relocated north of the former gun building, TA-8-5, when Building TA-8-21 construction began. This building and Building TA-8-8 were transferred to the Zia Company on 25 January 1968, and later moved to the New Mexico State Penitentiary (Weston 1989, 12-0049). All debris was cleaned up and work was completed 22 March 1968. (LASL 1968, 12-0119). No known hazardous materials were used in Building TA-8-9 (Blackwell 1983, 12-0118).

Basis for Recommending No Further Action

Building TA-8-9, AOC C-8-013, is proposed for NFA based on Criterion 1. There is no evidence of any contamination associated with this building.

C-8-015 Associated Structure: TA-8-31

This AOC is an HE magazine. Currently, the building is in the possession of WX-3 but is not being used and is empty. There is no indication that HE contamination ever occurred in this structure. Standard Operating Procedures, currently and historically, have required that no production take place in HE storage areas.

Basis for Recommending No Further Action

Structure TA-8-31, AOC C-8-015, is proposed for NFA based on Criterion 1. There is no evidence of any contamination associated with this building.

C-8-016 Associated Structure: TA-8-32

This AOC is an HE magazine. Currently, Protective Technology of Los Alamos (PTLA) is using the building for ammunition storage. There is no indication that HE contamination ever occurred in this structure. Standard Operating Procedures, currently and historically, have required that no production take place in HE storage areas.

Basis for Recommending No Further Action

Structure TA-8-32, AOC C-8-016, is proposed for NFA based on Criterion 1. There is no evidence of any contamination associated with this building.

C-8-017 Associated Structure: TA-8-27

This AOC was once a storage vault for fissionable materials associated with the radiography facility (Weston 1989, 12-0049). Currently, it is being used by Group WX-3. Radioactive material used for radiography is sealed and is not released to the environment unless the container is broken (Harry 1993, 12-0120). No documentation pertaining to spills or releases of source material related to this building has been found.

Basis for Recommending No Further Action

Building TA-8-27, AOC C-8-017, is proposed for NFA based on Criterion 2. There is no evidence of any contamination associated with this building.

C-8-018 Associated Structure: TA-8-65

This AOC was once a storage/radiation laboratory used primarily to store contained radioactive sources for radiography (Weston 1989, 12-0049). Currently, WX-3 is using this building for storage. Radioactivity has never been released in this building, and radiation has not been detected inside or outside the building. As of October 1991, one projector was empty and the other source was almost totally depleted (LANL 1991, 12-0121). Radioactive material used for radiography is sealed and is not released to the environment unless the container is broken (Harry 1993, 12-0120). No documentation pertaining to spills or releases of source material related to this building has been found.

Basis for Recommending No Further Action

Building TA-8-65, AOC C-8-018, is proposed for NFA based on Criterion 2. There is no evidence of any contamination associated with this building.

C-8-019 Associated Structure: TA-8-30

This AOC was once a storage/radiation laboratory and was built to perform ^{60}Co radiography (Weston 1989, 12-0049). Currently the building is being used by MEE-9 as a macrostatistical hydrodynamics laboratory and has no radioactive materials associated with it. Radioactive material used for radiography is sealed and is not released to the environment unless the container is broken. No documentation pertaining to spills or releases of source material related to this building has been found (Harry 1993, 12-0120).

Basis for Recommending No Further Action

Building TA-8-30, AOC C-8-019, is proposed for NFA based on Criterion 2. There is no evidence of any contamination associated with this building.

C-8-020 No Associated Structure

The SWMU Report states that this is buried material in Old Anchor West (TA-8) (Weston 1989, 12-0049). A 14 June 1956 memo from G. H. Tenney to D. D. Meyer gave rise to an erroneous Weston interpretation that more than one burial site exists at TA-8 (Tenney 1956, 12-0009). This AOC is the same as PRS 8-006(a), and is discussed in Section 5.2.1.2.

Basis for Recommending No Further Action

The possible disposal area, AOC C-8-020, is recommended for NFA under Criterion 1. There is no evidence to assume that this disposal area was ever present.

7.2.9.2 Technical Area 9 Areas of Concern

Several of the TA-9 AOCs (C-9-002, C-9-003, C-9-004, C-9-006, C-9-007, and C-9-010) were included in an extensive cleanup in 1965. During a September 1992 interview with W. C. Courtright, the Safety Officer involved with the TA-9 cleanup, details of the step-by-step process of the cleanup were discussed, and pictures were made available (Courtright 1965, 12-0091; Harry 1993, 12-0094; Harry 1992, 12-0029). He said that the cleanup philosophy at TA-9 was to make it "safe for grandchildren to play there" (Harry 1992, 12-0029). Because no validated analytical data have been found on the cleanup of this area, the area will be thoroughly sampled as part of the Phase I investigation. These AOCs have been designated no further action only because, as discussed in Chapter 6, they will not be investigated individually. They do not fall under any specific NFA criteria. The locations of the AOCs in TA-9 are shown in Figure 5-16.

C-9-002 Associated Structure: TA-9-9

This AOC, C-9-002, is the former location of two trimming buildings, a personnel shelter, and any associated soil contaminated with HE. In 1959, these buildings were reported to be contaminated with HE. These buildings were burned in January 1960, and in 1965 unburned residues were removed. Debris was taken to TA-54 and also to the burning ground at TA-16. The remaining combustibles were burned. Examination of barren soils at TA-9 in 1987 did not reveal elevated concentrations of either barium nitrate or explosives (Weston 1989, 12-0049).

Basis for Recommending No Further Action

This AOC, C-9-002, is proposed for NFA. The site will be included under the Group 5, TA-9 Decommissioned Area, Phase I sampling of surface and subsurface soils throughout the Old Anchor East decommissioned area.

C-9-003 Associated Structure: TA-9-16

This AOC is the former location of a pump house, TA-9-16, and any associated soil contaminated with HE. In 1959, this building was reported to be contaminated with HE. This building was burned in January 1960, and in 1965 unburned residues were removed. Debris was taken to TA-54 and also to the burning ground at TA-16. The remaining combustibles were burned. Examination of barren soils at TA-9 in 1987 did not reveal elevated concentrations of either barium nitrate or explosives (Weston 1989, 12-0049).

Basis for Recommending No Further Action

Building TA-9-16, AOC C-9-003, is proposed for NFA. The site will be included under the Group 5, TA-9 Decommissioned Area, Phase I sampling of surface and subsurface soils throughout the Old Anchor East decommissioned area.

C-9-004 Associated Structure: TA-9-19

The SWMU Report states that this AOC is the former location of a building, TA-9-19, that contained an oven and was used by Group X-6, responsible for studies in detonation physics. It was removed in 1952. Other buildings in this area were burned in 1960. Examination of barren soils at TA-9 in 1987 did not reveal elevated concentrations of either barium nitrate or explosives (Weston 1989, 12-0049).

Basis for Recommending No Further Action

Building TA-9-19, AOC C-9-004, is proposed for NFA. The site will be included under the Group 5, TA-9 Decommissioned Area, Phase I sampling of surface and subsurface soils throughout the Old Anchor East decommissioned area.

C-9-005 Associated Structure: TA-9-58

This AOC is the former location of an x-unit chamber, Building TA-9-58, at Far Point Firing Site. The structure was removed in 1965. The x-unit chamber performed experiments involving ^{137}Cs (Weston 1989, 12-0049).

Basis for Recommending No Further Action

Building TA-9-58, AOC C-9-005, is proposed for NFA. The site will be included under the Group 6, PRSs 9-001(a) and (b), Phase I sampling of surface and subsurface soils in the Far Point area.

C-9-006 Associated Structures: TA-9-6, -11, -12, and -16

This AOC is the former location of structures TA-9-6, -11, -12, and -16. In 1959, these buildings were reported to be contaminated with HE. These buildings were burned in January 1960, and in 1965 unburned residues were removed. Debris was taken to TA-54 and also to the burning ground at TA-16. The remaining combustibles were burned. Examination of barren soils at TA-9 in 1987 did not reveal elevated concentrations of either barium nitrate or explosives (Weston 1989, 12-0049).

Basis for Recommending No Further Action

This AOC, C-9-006, is proposed for NFA. The site will be included under the Group 5, TA-9 Decommissioned Area, Phase I sampling of surface and subsurface soils throughout the Old Anchor East decommissioned area.

C-9-007 Associated Structures: TA-9-7 and -8

This AOC is the former location of storage buildings AE-7 and AE-8 (TA-9-7 and -8). In 1959, these buildings were reported to be contaminated with HE. The buildings were burned in 1960, and unburned building debris was removed in 1965. Debris was taken to TA-54 and also to the burning ground at TA-16. The remaining combustibles were burned. Examination of barren soils at TA-9 in 1987 did not reveal elevated concentrations of either barium nitrate or explosives (Weston 1989, 12-0049).

Basis for Recommending No Further Action

Buildings TA-9-7 and TA-9-8, AOC C-9-007, are proposed for NFA. The site will be included under the Group 5, TA-9 Decommissioned Area, Phase I sampling of surface and subsurface soils throughout the Old Anchor East decommissioned area.

C-9-008 Associated Structure: TA-9-182

The SWMU Report states that this AOC is an UST that stored petroleum products. The SWMU Report indicates the same structure number (TA-9-182) and physical description as that of PRS 9-016, and it is concluded that this AOC is the same as PRS 9-016.

Basis for Recommending No Further Action

This AOC is the same as PRS 9-016 (see Section 7.2.5.4) and, therefore, is proposed for NFA under Criterion 1.

C-9-009 Associated Structure: TA-9-28

The SWMU Report states that this AOC results from oil stains found on the northeast loading dock of TA-9-28 and refers to an ER Program site visit in November 1988 when several 3-ft diameter oil stains were found (Weston 1989, 12-0049). This building contains a mechanical machine shop. Oil has run off of equipment onto the concrete floor. Also, corrosion was discovered on the concrete floor beneath several storage containers. The oil and corrosion have only contacted the concrete and have not affected the soil around the building (Harry 1993, 12-0081). A memo has been written to the operating group (Group M-1) to ensure that appropriate measures will be taken to guarantee that there will be no releases to the environment in the future (Glatzmaier 1993, 12-0077).

Basis for Recommending No Further Action

Because no releases have been made to the environment in the past, this AOC is proposed for NFA under Criterion 2.

C-9-010 Associated Structure: TA-9-2b

The SWMU Report states that this AOC is a burning pit within Old Anchor East but at an unknown location. Potential contaminants are HE and radionuclides. Attempts to locate this site have been unsuccessful (Weston 1989, 12-0049).

Basis for Recommending No Further Action

Due to the unlikelihood of ever finding the exact location of this site and the fact that the site will be included under the Group 5, TA-9 Decommissioned Area, Phase I sampling of surface and subsurface soils throughout the Old Anchor East decommissioned area, AOC C-9-010 is proposed for NFA.

C-9-011 Associated Structure: TA-9-2c

This AOC is a burn area associated with decommissioning of Building TA-9-1 at Anchor Site East (TA-9). Weston stated that the combustible parts of the site were piled up and burned in an area east of the site (Weston 1989, 12-0049).

Basis for Recommending No Further Action

Because the exact location of the AOC is not known but will also be included under the Group 5, TA-9 Decommissioned Area, Phase I sampling of surface and subsurface soils throughout the Old Anchor East decommissioned area, AOC C-9-011 is proposed for NFA.

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652301 old Anchor East
652306
652307 Pipes showing asbestos wrap
652308 old Anchor East, pipes wrapped in asbestos
652309 old Anchor East
652310 TA 9-1, old Anchor East
652785 TA-16, Burning Ground Canyon
653832 TA-9, old Anchor East pipes being dug out
654572 basket inside concrete sump
654576 old Anchor East sump
654577 old Anchor East sump
654782 sump
654783
654849 sump
654850 old Anchor East sump
654851 old Anchor East sump
654852 crane lifting HE contaminated sump
655062
655062 old Anchor East, TA-9-1
655063
655064
655067
656610 firing chamber
656611
664254 basket
664259 HE
665240 TA-16 pipes wrapped to be transported to 16-400 for washing
665241 TA 16-400 washing out pipes
665371 old anchor pressing bay
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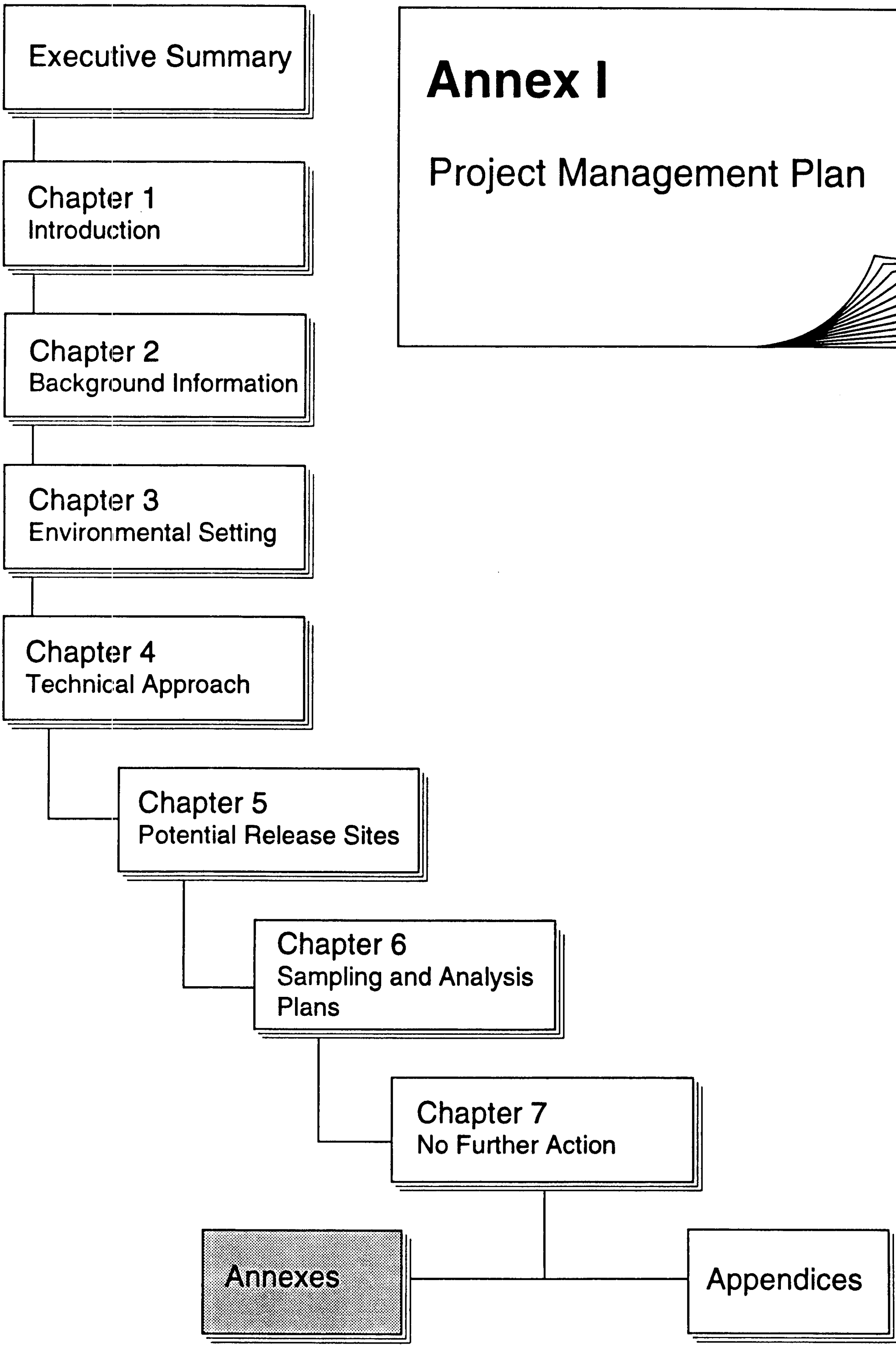
Annex I

Project Management Plan



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1.0 INTRODUCTION

This annex presents the technical approach, schedule, reporting milestones, budget, and management structure for the implementation of the RCRA Facility Investigation (RFI) for Operable Unit (OU) 1157. This project management plan is an extension of the Los Alamos National Laboratory (LANL) Environmental Restoration (ER) Program Management Plan described in Annex I of the Installation Work Plan (IWP) (LANL 1992, 0768). It contains no significant departures from IWP guidelines. This annex discusses the elements required of project management plans set forth in Module VIII (the HSWA Module) of the Laboratory's RCRA permit (EPA 1990, 0306) as they apply to OU 1157. Figure 1-1 (in Chapter 1) locates the OU and Table 1-5 provides the list of potential release sites (PRSs) addressed by this work plan.

1.1 Technical Approach

The approach used for OU 1157 is based on the ER Program's overall technical approach to the RFI/CMS process as described in Chapter 3 of the IWP (LANL 1992, 0768). The following key features characterize the ER Program approach:

- use of guidelines for cleanup derived from health-based risk assessments utilizing realistic but conservative exposure scenarios;
- a phased approach to site assessment;
- the application of the "observational" approach to the RFI/CMS process as a general philosophical framework.

The technical approach employed for the OU 1157 RFI is described in Chapter 4 of this work plan. Figure 4-2 in Chapter 4 contains a logic diagram for OU 1157 RFI investigations.

The technical objectives of the OU 1157 RFI are as follows:

- for those PRSs not proposed for no further action (NFA) and not eligible for deferred action (DA), identify contaminants present at each PRS;

- determine the vertical and lateral extent of the contamination at each PRS;

- identify contaminant migration pathways;

- acquire sufficient information to allow quantitative migration pathway modeling and site specific risk assessment;

- provide data necessary for the assessment of potential remedial alternatives; and

- provide the basis for detailed planning of corrective measures studies (CMSs) or if immediate action is required, the corrective action is obvious and does not require further study, and the action can be accomplished in an efficient and cost-effective manner, recommend a VCA.

The approach to investigations at OU 1157 started with activities necessary to write this work plan. The PRSs identified in the SWMU Report (LANL 1990, 0145) were located and visited in the field, and a preliminary investigation was conducted at the OU to determine its physical and ecological nature. An archival record was developed for each PRS based on Laboratory records, on-site observations, and interviews with cognizant Laboratory and contractor staff.

Based on these investigations, PRSs were combined into nine groups based on location and similarity of expected investigation and corrective actions. For example, all areas of concern (AOCs) were combined because only two are considered to require further action. In addition, a large group of PRSs that have been decommissioned but have inadequate records to confirm that any contaminants remaining are below acceptable cleanup levels will be investigated as a group and remediated if necessary. Other groups were formed of PRSs related to active areas, because these will require special coordination of site investigation and any cleanup activities with ongoing operations, a critical consideration for those areas involved in ongoing high explosives research and development.

Important to project management is the phased approach adopted for the OU 1157 RFI activities. This approach sets up a series of decision points (see Figure 4-2 in Chapter 4), that require the design of specific investigations at each stage. These investigations develop adequate information on which to base decisions. The investigations include provisions to remove PRSs from further consideration or to initiate interim action at each stage of the investigation as information becomes available. The approach incorporates the concepts for reducing uncertainty due to sampling and analysis presented in Appendix H of the IWP (LANL 1992, 0768). This process has already identified over half of the OU 1157 PRSs as candidates for no further action or as appropriate for deferred action under other Laboratory programs (Chapters 5 and 7 of this work plan).

1.2 Schedule

General schedule requirements for the Laboratory's ER program are described in Annex I (Program Management Plan) of the IWP. Appendix N of the IWP contains a project RFI/CMS schedule for the RFI/CMS process for OU 1157, through the completion of the final CMS report. A revised version of this schedule has been completed for Activity Data Sheet (ADS) 1157 for incorporation in the DOE Environmental Restoration and Waste Management Five-Year Plan. This plan is a key budget planning document for the DOE-wide ER Program. The projected RFI/CMS schedule, milestone schedule, and baseline (unconstrained) budget summary submitted to DOE for OU 1157 are provided in Figure ES-1 and in Table ES-1 in the Executive Summary of the OU 1157 RFI Work Plan.

Implementation of RFI activities is contingent upon regulatory review and approval of the OU 1157 RFI Work Plan and upon the availability of funding. If the detailed costing of this OU work plan exceeds the planned budget, budgetary resolution will have to be accomplished either by a petition to DOE for additional funding through a change-control procedure or by extension of the RFI schedule, which may require negotiations with the EPA to modify the HSWA permit. Schedules and costs will be updated through the DOE change control process as appropriate, with revisions submitted to EPA for approval. The assumptions used to generate this schedule include the following:

- Review and approval of the OU 1157 RFI Work Plan and supporting project plans by the EPA will be completed by October 1993.

- Certain low-risk tasks may be initiated before the EPA grants final approval of the work plan.

- The schedule assumes that an adequate number of support personnel (e.g., health and safety technicians and trained drilling contractors) will be available.

- EPA approval of work plan modifications (including EPA comments, Laboratory revision, and final EPA approval) is assumed to take two months, of which one month is allowed for EPA review and comment and one month for revisions.

- Phase II investigations are expected to be required only at a limited number of PRSs.

- The Phase I work scheduled in the first investigation year (1994) is constrained by the current planned DOE budget.

- Where possible, extensive field work will not be scheduled between November 15 and March 15 each year, to allow for inclement weather.

1.3 Reporting

Results of RFI field work will be presented in three principal documents: technical progress reports, phase reports and the RFI report. The purpose of these reports is detailed in the following discussion. A schedule of future documents associated with implementation of this OU work plan, which are deliverable to EPA and DOE, is summarized in the following list.

Document	EPA	DOE	Date Due
Monthly	x	x	25th of the following month
Quarterly	x	x	Feb. 14, May 15, & August 15
Annual	x	x	November 15
Phase Reports	x	x	As in baseline; EPA milestones

1.3.1 Technical Progress Reports

As the OU 1157 RFI is implemented, technical progress will be summarized in technical progress reports, as required by the HSWA Module. Detailed technical assessments will be provided in phase reports.

1.3.2 Phase Reports

Phase reports will be submitted for work conducted on OU 1157 PRSs. These documents will function as interim reports on portions of the RFI effort because of the multiyear time-frame that will be required for completion of RFI field work. They will summarize the results of initial site characterization activities and describe the follow-on activities being planned including any modifications to field sampling plans suggested by initial findings and any Phase II work.

1.3.3 RFI Report

The RFI report for OU 1157 will summarize all field work conducted during the RFI. As required by the HSWA Module, the Laboratory will submit an RFI report within 60 days of completion of the RFI. As stated in Chapter 3 of the IWP (LANL 1992, 0768), the RFI report will describe the procedures, methods, and results of field investigations and will include information on the type and extent of contamination, sources and migration pathways, and actual and potential receptors. The report also will contain adequate information to support delisting of sites that require no further corrective action.

1.4 Budget

The current schedule for ADS 1157 is based on a constrained budget for the first years of the RFI and preliminary cost analysis that is subject to significant uncertainties. The projected budget in FY 94 is based on expected DOE funding levels and is subject to change depending upon funding allocations actually made. A change control petition to DOE is required to augment these funding levels. Because DOE funding requests are set two years in advance, the first year in which the OU 1157 RFI is not constrained by previous budget estimates will be FY 95. Funding requests for FY 95 and beyond will reflect the cost and schedule that most efficiently complete the RFI plans.

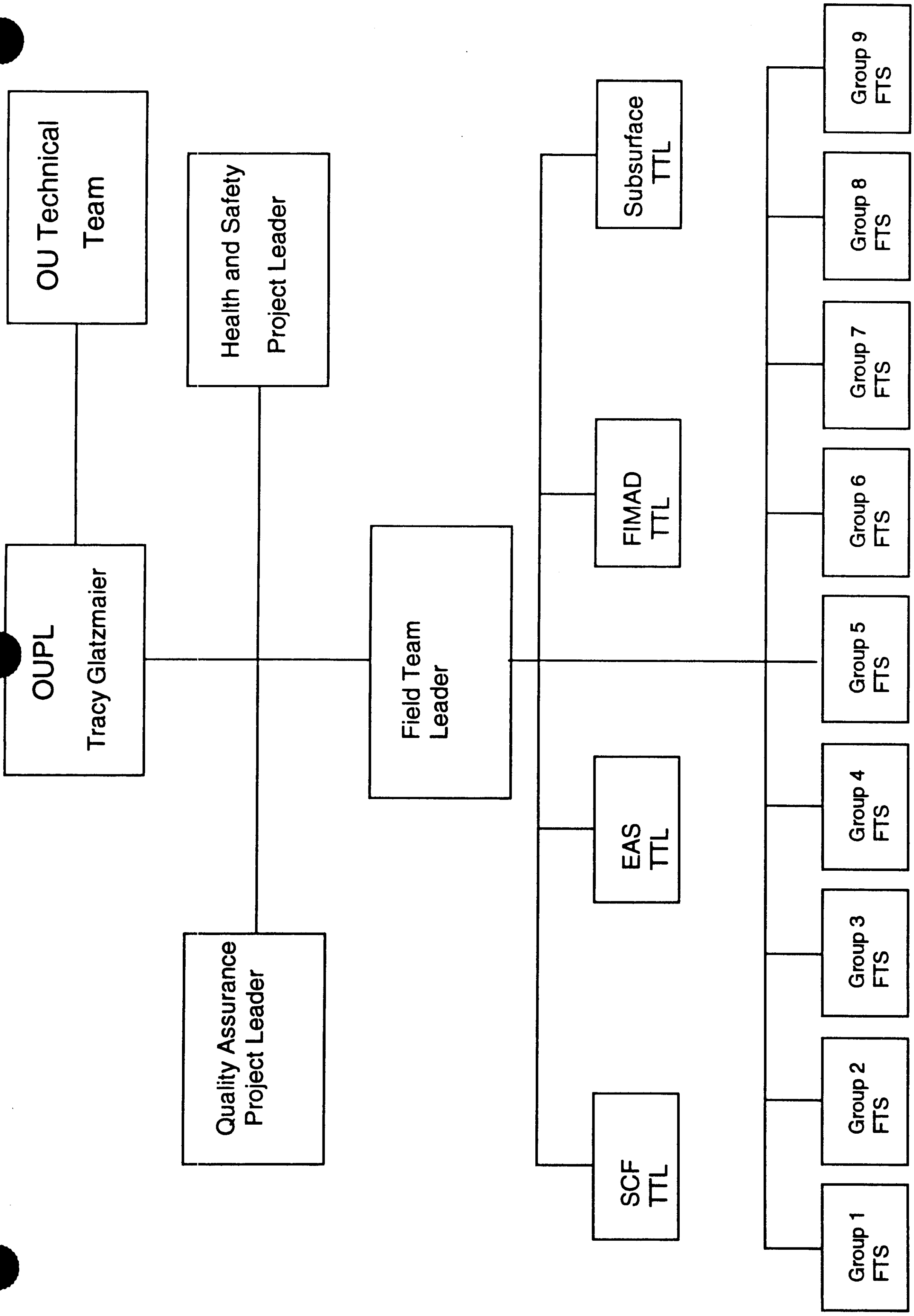
The RFI costing is being refined and is subject to considerable uncertainties at the present time. In particular, uncertainties regarding the cost of drilling through potentially contaminated areas could impact RFI costs substantially and thus potentially affect the RFI schedule.

1.5 Project Organization and Responsibility

The organizational structure for the ER Program is presented in Chapter 3 of the IWP (LANL 1992, 0768) and in Figure I-1 as applied to OU 1157. The ER Program lines of authority and responsibilities are identified in those figures. The responsibilities of the Technical Team Leaders are as described in the IWP. They are identified in Figure I-1 to show lines of authority.

Records of qualifications and training of all field personnel working on the RFI for OU 1157 will be kept as ER Records (see Annex IV of the IWP, Records Management Plan). Technical contributors to the OU 1157 work plan are listed in Appendix A of this OU work plan.

The responsibilities of the Operable Unit positions identified in Figure I-1 are summarized in the following subsections.



EAS = Earth Sciences
FIMAD = Facility for Information Management and Display
FTS = Field Team Supervisor
OU = Operable Unit
OUPL = Operable Unit Project Leader
SCF = Sample Coordination Facility
TTL = Technical Team Leader

Figure I-1: Organizational Structure

1.5.1 OU Project Leader

Responsibilities of the OU 1157 Project Leader are as follows:

- oversees day-to-day RFI operations, including planning, scheduling, and reporting of technical and administrative activities;
- ensures preparation of scientific investigation planning documents and procedures;
- prepares monthly and quarterly reports for the EPA, DOE and the ER Program Manager (PM);
- oversees subcontractors, as appropriate;
- coordinates with technical team leaders;
- conducts technical reviews of the milestones and final reports;
- interfaces with the ER Quality Program Project Leader (QPPL) to resolve quality concerns and to coordinate with the QA staff for audits;
- complies with LANL ER Program Health and Safety (HS), records management, and community relations requirements;
- oversees RFI field work and manages the field team leader; and
- complies with the Laboratory's technical and QA requirements for the LANL ER Program.

1.5.2 Technical Team Members

Technical team members are responsible for providing technical input for their disciplines throughout the RFI/CMS process. Technical team members have participated in the development of the OU 1157 work plan and the individual field sampling plans and will continue to participate in the field work, data analysis, report preparation, work plan modifications, and planning of subsequent investigations as necessary.

The primary disciplines currently represented on the OU 1157 technical team are chemistry, geology, hydrology, geochemistry, statistics, biology, archaeology, and health physics. The composition of the technical team may change with time as the technical expertise needed to implement the OU 1157 RFI changes.

1.5.3 Field Team Leader

Responsibilities of the OU 1157 Field Team Leader include the following:

- conducts detailed planning and scheduling for the implementation of the RFI activities;
- coordinates field activities with the technical team leaders;
- oversees day-to-day field operations; and
- manages field team activities.

1.5.4 Field Team Supervisor(s)

The Field Team Leader will assign field work to Field Team Supervisors for implementation of the RFI in the field. Each Field Team Supervisor will direct the execution of field sampling activities, using crews of field team members as appropriate for the activity. Field Team Supervisors may be Laboratory or contractor personnel.

1.5.5 Field Team Member(s)

Field Team Members may include the following, as appropriate:

- sampling personnel,

- site safety officer,
- geologists,
- hydrologists,
- health physicists, and
- representatives of other applicable disciplines.

All teams will have, at a minimum, a site safety officer and a qualified field sampler. They are responsible for conducting the work detailed in field sampling plans, under the direction of the field team supervisor. Field team members may be Laboratory or contractor personnel.

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Annex II

Quality Assurance Project Plan

Executive Summary

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Introduction

Chapter 2
Background Information

Chapter 3
Environmental Setting

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1.0 INTRODUCTION

This quality assurance (QA) project plan (QAPjP) provides specific instructions to Los Alamos National Laboratory (LANL) and its contractors to help assure that the work performed during the Operable Unit (OU) 1157 Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) will be of the quality required to satisfy project objectives. This plan addresses the 16 essential elements presented in the US Environmental Protection Agency (EPA) document "Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans" (QAMS-005/80) (EPA 1980, 0552). This document is tiered to LANL's Generic Quality Assurance Project Plan for RFIs (LANL 1991, 0412).

1.1 Facility Description

A facility description of LANL and descriptions of individual areas are presented in Section 2.0 of the LANL ER Program Installation Work Plan (IWP) (LANL 1992, 0768).

1.2 Environmental Restoration Program

A description of the ER Program is presented in Section 3.0 of the IWP (LANL 1992, 0768).

1.3 Project Description

Operable Unit 1157 incorporates Technical Areas (TAs) -8, -9, -23, and -69. Research activities have been conducted within OU 1157 since 1943, primarily in the areas of explosives development and testing and the application of various x-ray techniques. In addition, during World War II, gun-firing experiments were performed as part of the gun-assembled nuclear weapon known as Little Boy. Specific past and present activities conducted at each of the TAs are discussed in more detail in Chapter 2 of this OU 1157 RFI work plan.

Preliminary investigations of the OU conducted in 1987 revealed 116 PRSs that warranted more detailed investigation. Some of these PRSs are drains, sumps, septic tanks, and other structures associated with ongoing, permitted activities in the OU. The remaining PRSs are associated with activities that were discontinued after

World War II or were conducted in the area known as Old Anchor East (TA-9), which was cleaned up and decommissioned in the early 1960s. In most cases, potential contaminants in OU 1157 include various explosives, photo-processing chemicals, solvents, metals such as copper and lead, and, in the case of a few PRSs, small amounts of uranium, plutonium, strontium, and other radioactive materials. More complete descriptions of OU 1157 are included in this RFI work plan.

1.3.1 Project Objectives

The comprehensive project objectives are described in Chapter 4 of the OU 1157 RFI Work Plan. Specific project objectives for each group of sites to be investigated are presented in Chapter 5 of the work plan.

1.3.2 Project Schedule

The anticipated project schedule is provided in the Executive Summary of the work plan.

1.3.3 Project Scope

The scope of the OU 1157 RFI is given in Chapter 4 of the work plan.

1.3.4 Background Information

The background information is given in Chapter 2 and the environmental setting is given in Chapter 3 of the work plan.

1.3.5 Intended Data Uses

The intended data uses are described in Chapters 4 and 5 of the work plan.

2.0 PROJECT ORGANIZATION AND RESPONSIBILITY

The overall organizational structure of the of the Environmental Restoration (ER) Program is presented in Section 2 of the LANL QPP (Annex II of the IWP) (LANL 1992, 0768). The organizational structure of the OU 1157 work activities is summarized in Figure I-1 in Annex I of this work plan. A complete description of the responsibilities under this organizational structure can also be found in Annex I. Primary project assignments and telephone contact numbers are as follows:

- Operable Unit Project Leader (OUPL): Tracy Glatzmaier; (505) 665-2613
- Acting Quality Program Project Leader (QPPL): Ted Norris; (505) 665-4677
- Health and Safety Technical Leader (HSPL): Susan Alexander; (505) 667-5722 or (505) 104-3283
- Field Team Leader (FTL): To be determined
- Earth Sciences (ES) Technical Team Leader (TTL): Jamie Gardner; (505) 667-1799
- Sample Coordination Facility (SCF) TTL: John Miglio; (505) 665-5415
- Subsurface Studies (SS) TTL: Sue Goff; (505) 667-7200
- Facility for Information Management, Analysis, and Display (FIMAD) TTL: Greg Cole; (505) 667-1858

The QA responsibilities of OU 1157 project team members are described in the following subsections. Brief desriptions of the education and relevant experience of the OU 1157 RFI personnel are provided in Appendix A of this work plan. The responsibilities described for each team member can be delegated by that team member to other qualified individuals as required to meet project demands.

2.1 Operable Unit Project Leader

The OUPL for OU 1157:

- oversees day-to-day operations, including planning, scheduling and implementation of the field activities for OU 1157, and reporting on various aspects of implementing the ER Program;

- ensures preparation of planning documents and procedures for conducting scientific investigations;
- ensures that the OU 1157 project complies with applicable environmental regulations, DOE orders, University of California and LANL policy, and applicable New Mexico laws and regulations;
- prepares monthly and quarterly reports for the EPA, DOE and the LANL ER Program Manager;
- oversees subcontractors, as appropriate;
- coordinates with TTLs;
- conducts technical reviews of milestones and final reports;
- interfaces with the QPPL to resolve quality concerns and to coordinate audits with the QA staff;
- complies with the ER Program's health and safety, field sampling, and records management procedures;
- oversees the OU 1157 field work, manages the FTL and other field team members, and issues programmatic guidance to team members;
- complies with the technical and QA requirements for the LANL ER Program;
- ensures development of standard operating procedures as appropriate; and
- designates QA representatives as appropriate.

The OUPL will assign work for the OU 1157 RFI through the use of specific written scopes of work for both subcontractors and internal LANL personnel and groups. The assignment of work to subcontractors will be controlled through the LANL procurement procedures. The assignment of work within LANL will be controlled though the use of the internal statement of work (SOW) procedures.

As required by the internal SOW procedure, internal work will only be assigned after a completed SOW is provided either by or to the OUPL in response to the detailed scope of work. Section II of the SOW provides documentation of responsibilities for the OU 1157 RFI activities. Copies of the completed SOW will be provided to the OUPL, and Section II of the SOW will be provided to the people to which the work has been assigned. If any additional personnel are assigned after the SOW has been completed, Section II of the SOW must be completed for each additional person.

2.2 Quality Program Project Leader

The QPPL functions independently from the OU 1157 project. The QPPL reports directly to the ER Program Manager on day-to-day activities when necessary to resolve QA issues.

The QPPL, in support of, OU 1157:

- ensures that the quality program is properly implemented;
- ensures that independent organizations adequately and effectively evaluate the quality program;
- verifies that ER Program personnel and subcontractors properly implement the ER Quality Program;
- oversees the OU 1157 QA staff;
- resolves disputes and issues stop-work orders regarding quality;
- reviews and approves quality-related plans and implementing procedures;

- conducts QA audits, reviews, and surveillance;
- coordinates QA audits with the OUPL; and
- prepares monthly QA reports to the ER Program Manager.

2.3 Health and Safety Project Leader

The HSPL for OU 1157

- ensures that the OU 1157 Health and Safety Plan is properly implemented;
- reviews and approves site-specific Health and Safety Plans prepared for OU 1157;
- informs the OUPL and FTL of health and safety issues;
- ensures that the OU 1157 project complies with applicable health and safety aspects of environmental regulations, DOE orders, University of California and LANL policy, and applicable New Mexico laws and regulations; and
- oversees the OU 1157 Health and Safety staff.

2.4 Field Team Leader

The FTL for OU 1157

- oversees the field operations for all PRS groups, including planning, scheduling, and implementing field activities for OU 1157;
- manages field team supervisors (including acting as field team supervisor, if necessary, for certain PRS groups);

- coordinates field activities with the OUPL and TTLs; and
- reviews the quality and completeness of field deliverables.

2.5 Technical Team Leaders

The TTLs for OU 1157:

- provide technical support for team activities under the coordination of the FTL, OUPL, QPPL, and HSPL;
- issue programmatic and technical guidance to field team members;
- review the quality and completeness of team deliverables;
- ensure the development of Standard Operating Procedures (SOPs), as appropriate; and
- designate appropriate QA representatives.

The TTLs for OU 1157 may delegate any of their responsibilities to their staff personnel as needed to meet the project schedule and QA requirements. The OU 1157 Phase I activities are anticipated to require the services of the ES, SCF, and SS TTLs. Additional TTLs may be added to the project as needed.

2.6 Field Team Supervisor

The Field Team Supervisors for OU 1157:

- oversee daily field operations for a particular PRS group including planning, scheduling, and implementing field activities for OU 1157;
- manage field team members;
- coordinate field team activities with the FTL; and

- ensures the quality and completeness of field team deliverables.

2.7 Field Team Members

The field team members will include, depending on the activity being conducted, a site safety officer, appropriate subcontractors, sampling personnel, and staff members with technical knowledge of geology, hydrology, statistics, chemistry, and other applicable disciplines. The field team members comply with the ER Program's technical, administrative, and QA procedures as described in this QAPjP and with the TTLs, FTL, and OUPL.

3.0 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The QA objectives for measurement data are expressed in terms of the precision, accuracy, representativeness, completeness, and comparability of the data. The precision, accuracy, and completeness objectives for the OU 1157 RFI are based on the criteria specified in Chapter 5 of the Generic QAPjP (REF). The analytical methods that will be used for the OU 1157 analyses are based on EPA methods, or equivalent when available, or the methods of generally recognized and accepted institutions such as the American Public Health Association or American Society for Testing and Materials.

The overall QA objective is to develop and implement procedures that will help ensure quality in field sampling, field testing, chain-of-custody, laboratory analysis, data validation, data analysis, and data reporting. Specific procedures for sampling, chain-of-custody, audits, preventive maintenance, and corrective action are described in other sections of this QAPjP or in specific procedures referenced by this QAPjP. This section defines the goals for accuracy, precision, completeness, representativeness, and comparability. Quality Assurance goals for field measurements are also discussed.

3.1 Level of Quality Control

The levels of quality control (QC) described in Section 5.1 and Tables V.1 and V.2 of the Generic QAPjP will be used for the OU 1157 RFI with one exception; reagent blanks will not be collected as field QC samples because the use of reagents in the field will be limited to preservation reagents that will also be added to the rinsate blanks. The Data Quality Objectives (DQOs) for the OU 1157 RFI can be met without the use of reagent blanks.

3.2 Precision, Accuracy, and Sensitivity of Analyses

The precision, accuracy, and sensitivity of the laboratory analytical data will meet or exceed the limits provided in Tables V.3 through V.12 of the Generic QAPjP. The sensitivity requirements provided in the Generic QAPjP have been changed for selected OU 1157 RFI analytes in order to address the screening action levels specified in Appendix J of the IWP (LANL 1992, 0768). These screening action levels and the required sensitivity (or practical quantitation limit) for each analyte included in the OU 1157 RFI are listed in Tables II-1and II-2 of this QAPjP. The anlaytical methods used for the OU 1157 RFI must meet the ER Program requirements for sensitivity that are specified at the time of sampling. Tables II-1 and II-2 also list suggested analytical methods capable of meeting the present screening action levels. Several alternate methods are listed in Table II-3 that may be required to meet the screening action levels. The precision and accuracy for these methods are discussed in the following sections.

3.3 Quality Assurance Objectives for Precision

The QA objectives for precision for the OU 1157 RFI will be taken from SW-846 (EPA 1987, 0518) as described in Sections 5.3, 5.3.1, 5.3.2, and Table V.11 of the Generic QAPjP. All of the precision requirements described in the Generic QAPjP will apply to the OU 1157 RFI with the following additions:

- for the additional metal analytical methods specified in Table II-3, the relative percent difference (RPD) limits specified for metals in Section 5.3.1 of the Generic QAPjP will be applied; and

- for the additional organic analytical methods specified in Table II-3, the QA objectives for precision are provided in Table II-4.

TABLE II-1
Operable Unit 1157 RFI Sampling Parameters

Contaminant	Present Screening Action Level[a]	Practical Quantitation Limit[c]	Analytical Method[e]	Required Sample Size (ml)
Radionuclides				
Soil Sampling				
Gross Alpha	TBD[b]	4 to 10[g]	(f)	10[v]
Gross Beta	TBD[b]	5 to 12[g]	(f)	10[v]
Gross Gamma	TBD[b]	TBD[d]	(f)	100
Strontium-90	TBD[b]	2	(f)	100
Water Sampling				
Gross Alpha	15[t]	3 to 5[ll]	(f)	1000
Gross Beta	50[t]	3 to 6[ll]	(f)	(kk)
Gross Gamma	TBD[b]	TBD[d]	(f)	(kk)
Tritium	20000[t]	400	(f)	(kk)
Organic Parameters				
Soil Sampling				
PCBs	TBD[b]	0.02	8080	100
Acetone	8000	0.1	8240	120[w,ff]
Benzene	0.67	0.005	8240	120[w,ff]
Carbon Tetrachloride	0.21	0.005	8240	120[w,ff]
Chloroform	0.21	0.005	8240	120[w,ff]
Methylethyl Ketone	2100	0.1	8240	120[w,ff]
Toluene	890	0.005	8240	120[w,ff]
Total Petroleum Hydrocarbons	TBD[b]	TBD[d]	8015M[mm]	120[w]
Inorganic Parameters				
Soil Sampling				
Antimony	32	12	6010	120[w,ff]
Barium	5600	100[h]	6010	120[w,ff]
Beryllium	0.16	1	6010	120[w,ff]
Cadmium	80	4[h]	6010	120[w,ff]
Chromium	400	4[h]	6010	120[w,ff]
Copper	3000	5	6010	120[w,ff]
Cyanide	1600	0.2	9012	120[w,ff]
Lead	TBD[b]	20[h]	6010	120[w,ff]
Mercury	24	0.025[h]	7470	120[w,ff]
Nitrate	TBD[b]	1 to 10[k]	300.0	20[x]
Nitrite	TBD[b]	1 to 10[k]	300.0	20[x]
Silver	400	0.5[h]	6010	120[w,ff]

Table II-1 (Continued)

Contaminant	Present Screening Action Level[a]	Practical Quantitation Limit[c]	Analytical Method[e]	Required Sample Size (ml)
Major Ions and Other Parameters				
Water Sampling				
Calcium	TBD[b]	0.1	6010	(gg)
Sodium	TBD[b]	0.1	6010	(gg)
Magnesium	TBD[b]	0.1	6010	(gg)
Potassium	TBD[b]	0.1	6010	(gg)
Iron	TBD[b]	0.1	6010	(gg)
Uranium (total)	100	0.001	(h)	...
Chloride	TBD[b]	TBD[d]	300.0	200
Fluoride	4.0[t]	TBD[d]	300.0	(hh)
Carbonate	TBD[b]	TBD[d]	310.1	200
Bicarbonate	TBD[b]	TBD[d]	310.1	(ii)
Nitrate (as N)	10[t]	TBD[d]	300.0	(hh)
Sulfate	TBD[b]	TBD[d]	300.0	(hh)
Silicate	TBD[b]	TBD[d]	6010	200
TDS	NA	TBD[d]	160.1	500
Temperature (°C)	NA	TBD[d]	170.1	(jj)
pH (standard units)	NA	TBD[d]	150.1	(jj)
Hardness (total)	NA	TBD[d]	215.1	500
Fecal Coliform (Colonies/100 ml)	NA	TBD[d]	SM908C	250
Dissolved Oxygen	NA	TBD[d]	360.2	(jj)
Alkalinity	NA	TBD[d]	310.1	(jj)
Conductivity (mS/m)	NA	TBD[d]	120.1	(jj)

Organic Parameters
Extended Analyte List[m]

Inorganic Parameters
Extended Analyte List[m]

Table II-1 (Continued)

Contaminant	Present Screening Action Level[a]	Practical Quantitation Limit[c]	Analytical Method[e]	Required Sample Size (ml)
High Explosives				
Soil Sampling				10[aa]
TNT	TBD[b]	0.1[j]	(i)	
RDX	TBD[b]	0.1[j]	(i)	
HMX	TBD[b]	0.1[j]	(i)	
PETN	TBD[b]	0.1[j]	(i)	
Tetryl	TBD[b]	0.1[j]	(i)	
2,4-Dinitrotoluene	1.0	0.1[j]	(i)	
1,3,5-Trinitrobenzene	TBD[b]	0.1[j]	(i)	
Explosive D	TBD[b]	0.1[j]	(i)	
Water Sampling				10[aa]
TNT	TBD[b]	0.8[y]	(i)	
RDX	TBD[b]	0.6[y]	(i)	
HMX	TBD[b]	1.3[y]	(i)	
PETN	TBD[b]	TBD[y]	(i)	
Tetryl	TBD[b]	0.7[y]	(i)	
2,4-Dinitrotoluene	5.1E-5[ee]	0.6[y]	(i)	
1,3,5-Trinitrobenzene	TBD[b]	0.6[y]	(i)	
Explosive D	TBD[b]	TBD[y]	(i)	
TCLP Analysis	NA	NA	(n)	1625[n]
Corrosivity	NA	NA	1110[o]	50[bb]
Reactivity	NA	NA	7.3[p]	100[cc]
Ignitability	NA	NA	1010[q]	50[dd]
Compatibility	NA	NA	(r)	100[cc]
Asbestos	TBD[b]	NA	PLM[s]	TBD[u]

a Source: LANL 1992, 0768, Appendix J. Action level criteria in effect at the time of sampling will be used in analyzing the data from Phase I activities. Units are mg/kg for soils and mg/L for water, except for radionuclides, which are pCi/g for soils and pCi/l for water.

b To be determined. Action level criteria were not available at the time of Work Plan preparation.

c Source: (LANL 1991, 0553), Appendix T. Units are mg/kg for soils and mg/L for water, except for radionuclides, which are pCi/g for soils and pCi/l for water.

d To be determined. PQLs vary for different sample matrices and will be determined for the OU 1157 matrices as part of the Phase I sampling effort under this Work Plan.

e Source: (LANL 1991, 0553), Appendix O. Methods are from EPA SW-846 (EPA 1987, 0518) unless otherwise indicated. Alternative analytical methods may be used if the alternatative methods meet all of the requirements in this QAPjP. In addition, alternative analytical methods will be required if the PQL for EPA SW-846 methods are greater than the screening action level in effect at the time of sampling.

Table II-1 (Continued)

f Source: (DOE 1983, 0516)

g A typical range of method detection limits is given; lower limits can be achieved with larger samples and extended counting times.

h Source: (LANL 1992, 0552) , Appendix G.

i Analytical procedures developed at LANL employing liquid chromatography will be used for HE analytes (Harris et al. 1989, 12-0155); these procedures were adapted from high-performance liquid chromatography (HPLC) methods used by the Pollution Monitoring and Abatement Program of the U.S. Army Toxic and Hazardous Materials Agency (U.S. Army, no date, 0522).

j Personal communication from T. Spontarelli, LANL M-1, October 1992 (Wilson 1992, 12-0166).

k A typical range of method detection limits is given; PQLs vary for different sample matrices and will be determined for the OU 1157 soils as part of the Phase I sampling effort under this Work Plan.

m The extended analyte list was selected as described in Chapter 4 of the RFI Work Plan. The extended analyte list analytes, analysis methods, and practical quantitation limits are given in Table II-2.

n Toxicity Characteristics Leaching Procedure; Source: Federal Register, June 29, 1990, and 40 CFR 261.

o Corrosivity is tested by measuring pH.

p Cyanide/sulfide reactivity test.

q Source: (EPA 1990, 0093) 40 CFR 261.21

r Compatibility testing will address phase, flashpoint, flammability, reactivity, solubility and other issues pertinent to these waste materials. This testing will make use of the results of the other waste characteristic tests and will be tailored to the type of waste present at the PRS.

s Polarized light microscopy as described in (EPA 1992, 12-0156) 40 CFR Part 763, subpart F, appendix A

t Maximum contaminant level (MCL) promulgated under the Safe Drinking Water Act.

u (EPA 1992, 12-0156) 40 CFR 763, Subpart E.

v Based on 10 g sample mass; Source: (DOE 1983, 0516)

w Based on 4 oz sample volume; Source: SW 846 - (EPA 1987, 0518)

x Based on 20 g sample mass; Source: (Gulf States Analytical, Inc. 1992, 12-0154)

y Personal communication from B. W. Harris, LANL M-1, December 1992. (Wilson 1992, 12-0151).

z Modified method for aqueous solutions; source: (Gulf States Analytical, Inc. 1992, 12-0154)

Table II-1 (Continued)

aa One 10 g sample (soils) or one 10 ml sample (water) required for all HE component analyses.

bb Based on 50 g sample mass; corrosivity is tested by measuring pH.

cc Based on 100 g sample mass.

dd Based on 50 g sample mass; **Source**: 40 CFR 261.21. (EPA 1990, 0093)

ee The screening action level for this parameter is less than the practical quantitation limit and an alternate analytical method will be identified prior to sampling.

ff Only one 120 ml sample to be taken when multiple parameters using the same analytical method are analyzed.

gg Volume included in the 500 ml volume for metals.

hh Volume included in the 200 ml volume for chloride.

ii Volume included in the 200 ml volume for carbonate.

jj Field measurement.

kk Volume included in the 1000 ml volume for gross alpha.

ll A typical range of method detection limits is given for water with total dissolved solids content of 200 ppm or less; higher limits apply to higher TDS water.

mm California modified version of SW-846 Method 8015, GC/FID method for Total Petroleum Hydrocarbons.

TABLE II-2
Extended Analyte List Sampling Parameters

Contaminant	Present Screening Action Level[a]		Practical Quantitation Limit		Analytical Method[b]		Required Sample Size	
	Water (mg/l)	Soil (mg/kg)	Water (mg/l)	Soil (mg/kg)	Water	Soil	Water (ml)	Soil (ml)
Volatile Compounds							240[c]	180[d]
Acetone	3.5	8000	0.10	0.10	8240	8240		
Acetonitrile	TBD	TBD	0.10	0.10	8240	8240		
Acrolein	TBD	TBD	0.005	0.005	8240	8240		
Acrylonitrile	TBD	TBD	0.005	0.005	8240	8240		
Benzene	0.001	0.67	9.0E-5	9.0E-5	8021	8021		
Bromoform	0.0044[h]	89	0.005	0.005	8240	8240		
Carbon disulfide	3.5	7.4	0.10	0.10	8240	8240		
Carbon tetrachloride	2.7E-4	0.21	1.0E-4	1.0E-4	8021	8021		
Chlorobenzene	0.1	67	0.005	0.005	8240	8240		
Chloroethane	TBD	3300	0.01	0.01	8240	8240		
Chloroform	0.0057	0.21	2.0E-4	2.0E-4	8021	8021		
Dichlorodifluoromethane	TBD	TBD	5.0E-4	5.0E-4	8021	8021		
1,1-Dichloroethene	5.8E-4[h]	0.59	7.0E-4	7.0E-4	8021	8021		
1,2-Dichloroethane	3.8E-4	0.2	3.0E-4	3.0E-4	8021	8021		
1,1-Dichloroethane	3.5	410	0.005	0.005	8240	8240		
trans-1,2-Dichloroethene	0.1	800	0.005	0.005	8240	8240		
1,2-Dichloropropane	5.1E-4	10	6.0E-5	6.0E-5	8021	8021		
cis-1,3-Dichloropropene	1.9E-4[h]	0.17	0.005	0.005	8240	8240		
trans-1,3-Dichloropropene	1.9E-4[h]	0.17	0.005	0.005	8240	8240		
1,4-Dioxane	TBD	TBD	0.15	0.15	8240	8240		
Ethylbenzene	0.7	3100	0.005	0.005	8240	8240		
Ethyl methacrylate	TBD	TBD	0.005	0.005	8240	8240		
Hexachlorobutadiene	4.5E-3	90.0	6.0E-4	4.0E-2	8021	8021		
2-Hexanone	TBD	TBD	0.05	0.05	8240	8240		
Isobutyl alcohol	TBD	TBD	0.10	0.10	8240	8240		
Methacrylonitrile	TBD	TBD	0.10	0.10	8240	8240		
Methyl chloride	0.027	6.4	0.010	0.010	8240	8240		
Methylene bromide	TBD	TBD	0.005	0.005	8240	8240		
Methylene chloride	0.0047	5.6	2.0E-4	2.0E-4	8021	8021		
Methyl ethyl ketone	1.7	2100	0.1	0.1	8240	8240		
Methyl iodide	TBD	TBD	0.005	0.005	8240	8240		
Methyl methacrylate	TBD	TBD	0.005	0.05	8240	8240		
4-Methyl-2-pentanone	1.7	510	0.05	0.05	8240	8240		
Pentachloroethane	TBD	TBD	0.01	0.01	8240	8240		
Pyridine	TBD	TBD	0.005	0.005	8240	8240		
Styrene	0.1	16000	1.0E-4	1.0E-4	8240	8240		
1,1,1,2-Tetrachloroethane	TBD	TBD	0.005	0.005	8240	8240		
1,1,2,2-Tetrachloroethane	0.0018	3.9	1.0E-4	1.0E-4	8240	8240		
Tetrachloroethene	6.7E-4	5.9	4.0E-4	4.0E-4	8021	8021		
Toluene	0.75	890	0.005	0.005	8240	8240		

Table II-2 (Continued)

Contaminant	Present Screening Action Level[a]		Practical Quantitation Limit		Analytical Method[b]		Required Sample Size	
	Water (mg/l)	Soil (mg/kg)	Water (mg/l)	Soil (mg/kg)	Water	Soil	Water (ml)	Soil (ml)
1,1,1-Trichloroethane	0.06	1000	0.005	0.005	8240	8240		
1,1,2-Trichloroethane	0.0061	6.3	0.005	0.005	8240	8240		
Trichloroethene	0.0032	3.2	2.0E-4	2.0E-4	8021	8021		
Tricholorofluoromethane	TBD	TBD	3.0E-4	3.0E-4	8021	8021		
1,2,3-Trichloropropane	TBD	TBD	0.005	0.005	8240	8240		
Vinyl acetate	TBD	TBD	0.05	0.05	8240	8240		
Vinyl chloride	1.8E-5[h]	0.013	4.0E-4	4.0E-4	8021	8021		
Xylenes (total)	0.62	1.6E+5	0.005	0.005	8240	8240		
Semi-Volatile Compounds							2000[e]	120[f]
Acetophenone	TBD	TBD	0.01	NA	8270	8270		
Aniline	TBD	TBD	NA	NA	8270	8270		
Anthracene	10.0	24000	0.01	0.66	8270	8270		
Aramite	TBD	TBD	0.01	0.66	8270	8270		
Benzyl alcohol	TBD	TBD	0.20	1.30	8270	8270		
p-Chloro-m-cresol	70	1.6E+5	0.02	1.3	8270	8270		
2-Chloronaphthalene	2.8	6400	0.01	0.66	8270	8270		
2-Chlorophenol	0.17	400	0.01	0.66	8270	8270		
o-Cresol	1.7	4000	0.01	NA	8270	8270		
m-Cresol	1.7	4000	0.01	NA	8270	8270		
p-Cresol	1.7	4000	0.01	NA	8270	8270		
Dibenzofuran	TBD	TBD	0.01	0.66	8270	8270		
o-Dichlorobenzene	0.6	1600	0.01	0.66	8270	8270		
m-Dichlorobenzene	TBD	TBD	0.01	0.66	8270	8270		
p-Dichlorobenzene	0.015	290	0.01	0.66	8270	8270		
2,4-Dichlorophenol	0.10	240	0.01	0.66	8270	8270		
2,6-Dichlorophenol	TBD	TBD	0.01	0.66	8270	8270		
Diethyl phthalate	28.0	6.4E+4	0.01	0.66	8270	8270		
2,4-Dimethylphenol	0.7	1600	0.01	0.66	8270	8270		
Dimethyl phthalate	35.0	8.0E+4	0.01	0.66	8270	8270		
m-Dinitrobenzene	TBD	TBD	0.02	1.3	8270	8270		
4,6-Dinitro-o-cresol	TBD	TBD	0.05	3.3	8270	8270		
2,4-Dinitrophenol	0.07	200	0.05	3.30	8270	8270		
2,4-Dinitrotoluene	5.1E-5[h]	1.0	2.0E-4	0.66	8090	8270		
2,6-Dinitrotoluene	5.1E-5[h]	1.0	0.01	0.66	8270	8270		
Di-n-octyl phthalate	0.7	1600	0.01	0.66	8270	8270		
Diphenylamine	TBD	TBD	0.01	0.66	8270	8270		
Fluoranthene	1.4	3200	0.01	0.66	8270	8270		
Fluorene	1.4	3200	0.01	0.66	8270	8270		
Hexachlorocyclo-pentadiene	0.24	560	0.01	0.66	8270	8270		
Hexachloroethane	0.025	500	0.01	0.66	8270	8270		

Table II-2 (Continued)

Contaminant	Present Screening Action Level[a]		Practical Quantitation Limit		Analytical Method[b]		Required Sample Size	
	Water (mg/l)	Soil (mg/kg)	Water (mg/l)	Soil (mg/kg)	Water	Soil	Water (ml)	Soil (ml)
Hexachlorophene	TBD	TBD	0.05	3.3	8270	8270		
Naphthalene	0.03	3200	0.01	0.66	8270	8270		
1-Naphthylamine	TBD	TBD	0.01	0.66	8270	8270		
2-Naphthylamine	TBD	TBD	0.01	0.66	8270	8270		
o-Nitroaniline	0.0021[h]	4.8	0.05	3.30	8270	8270		
m-Nitroaniline	TBD	TBD	0.05	3.30	8270	8270		
p-Nitroaniline	TBD	TBD	0.20	1.3	8270	8270		
Nitrobenzene	0.018	5.3	0.01	0.66	8270	8270		
o-Nitrophenol	TBD	TBD	0.01	0.66	8270	8270		
p-Nitrophenol	TBD	TBD	0.05	3.30	8270	8270		
Pentachloronitrobenzene	TBD	TBD	0.02	1.3	8270	8270		
Pentachlorophenol	2.9E-4[h]	5.8	0.05	3.30	8270	8270		
Phenol	21.0	48000	0.01	0.66	8270	8270		
p-Phenylenediamine	TBD	TBD	0.01	0.66	8270	8270		
1,2,4,5-Tetrachloro-benzene	TBD	TBD	0.01	0.66	8270	8270		
2,3,4,6-Tetrachlorophenol	TBD	TBD	0.01	0.66	8270	8270		
1,2,4-Trichlorobenzene	0.35	160	0.01	0.66	8270	8270		
2,4,5-Trichlorophenol	3.5	8000	0.01	0.66	8270	8270		
2,4,6-Trichlorophenol	0.0032[h]	64	0.01	0.66	8270	8270		
sym-Trinitrobenzene	TBD	TBD	0.01	0.66	8270	8270		
Organochlorine Pesticides and PCBs							2000[e]	120[f]
Aldrin	TBD	TBD	4.0E-5	2.68E-3	8080	8080		
alpha-BHC	TBD	TBD	3.0E-5	2.01E-3	8080	8080		
beta-BHC	TBD	TBD	6.0E-5	4.02E-3	8080	8080		
delta-BHC	TBD	TBD	9.0E-5	6.03E-3	8080	8080		
Lindane	TBD	TBD	4.0E-5	2.68E-3	8080	8080		
Chlordane	TBD	TBD	1.4E-4	9.38E-3	8080	8080		
4,4-DDD	TBD	TBD	1.1E-4	7.37E-3	8080	8080		
4,4-DDE	TBD	TBD	4.0E-5	2.68E-3	8080	8080		
4,4-DDT	TBD	TBD	1.2E-4	8.04E-3	8080	8080		
Dieldrin	TBD	TBD	2.0E-5	1.34E-3	8080	8080		
Endosulfan I	TBD	TBD	1.4E-4	9.38E-3	8080	8080		
Endosulfan II	TBD	TBD	4.0E-5	2.68E-3	8080	8080		
Endosulfan sulfate	TBD	TBD	6.6E-4	4.42E-2	8080	8080		
Endrin	TBD	TBD	6.0E-5	4.02E-3	8080	8080		
Endrin aldehyde	TBD	TBD	2.3E-4	1.54E-2	8080	8080		
Heptachlor	TBD	TBD	3.0E-5	2.01E-3	8080	8080		
Heptachlor epoxide	TBD	TBD	8.3E-4	5.56E-2	8080	8080		

Table II-2 (Continued)

Contaminant	Present Screening Action Level[a]		Practical Quantitation Limit		Analytical Method[b]		Required Sample Size	
	Water (mg/l)	Soil (mg/kg)	Water (mg/l)	Soil (mg/kg)	Water	Soil	Water (ml)	Soil (ml)
Methoxychlor	TBD	TBD	1.7E-3	0.118	8080	8080		
Toxaphene	TBD	TBD	2.4E-3	0.161	8080	8080		
Aroclor 1016	TBD	TBD	5.0E-4	2.0E-2	8080	8080		
Aroclor 1221	TBD	TBD	5.0E-4	2.0E-2	8080	8080		
Aroclor 1232	TBD	TBD	5.0E-4	2.0E-2	8080	8080		
Aroclor 1242	TBD	TBD	6.5E-3	4.36E-2	8080	8080		
Aroclor 1248	TBD	TBD	5.0E-4	2.0E-2	8080	8080		
Aroclor 1254	TBD	TBD	0.001	3.0E-2	8080	8080		
Aroclor 1260	TBD	TBD	0.001	3.0E-2	8080	8080		
Inorganic Compounds[i]							1000[g]	120[f]
Antimony	0.014	32.0	0.003	0.6	7041	7041		
Arsenic	2.0E-5[h]	0.4	0.005	1.0	7060	7060		
Barium	1.0	5600	0.002	0.4	6010	6010		
Beryllium	8.1E-5[h]	0.16[h]	3.0E-4	0.06	6010	6010		
Cadmium	0.005	80	0.004	0.8	6010	6010		
Chromium	0.05	400	0.007	1.4	6010	6010		
Cobalt	TBD	TBD	0.007	1.4	6010	6010		
Copper	1.3	3000	0.006	1.2	6010	6010		
Lead	0.05	TBD	0.001	1.2	7421	7421		
Mercury	0.002	24	2.0E-4	0.2	7470	7471		
Nickel	0.70	1600	0.015	3.0	6010	6010		
Selenium	0.05	400	0.002	0.4	7740	7740		
Silver	0.05	400	0.007	1.4	6010	6010		
Thallium	0.0028	6.4	0.001	0.2	7841	7841		
Tin	TBD	TBD	0.8	160	7870	7870		
Vanadium	0.24	560	0.008	1.6	6010	6010		
Zinc	10.0	24000	0.002	0.4	6010	6010		
Cyanide	0.20	1600	0.02	4.0	9012	9012		
Sulfide	TBD	TBD	0.4	10	9030	9030		

The Extended Analyte List was selected as described in Section 4 of the RFI work plan.

TBD = To be determined, screening action levels for these analytes were not available at the time of work plan preparation.

NA = Not applicable or not available.

a Source: LANL 1992, 0768, Appendix J. Action level criteria in effect at the time of sampling will be used in analyzing the data from Phase I activities.

Table II-2 (Continued)

b Methods are from EPA SW-846 (EPA 1987, 0518) unless otherwise indicated. Alternative analytical methods may be used if the alternative method meets all of the requirements specified in this QAPjP. In addition, alternative methods will be sought if the PQL is greater than the screening action level in effect at the time of sampling.

c Only one 240 ml water sample is required for analysis of all volatile organics. The 240 ml sample should be taken using six 40 ml glass bottles with Teflon lined septa.

d Only one 180 ml soil sample is required for analysis of all volatile organics. The 180 ml sample should be taken using three 2 oz. glass bottles with Teflon lined caps.

e Semi-volatile organics, organochlorine pesticides and PCBs, herbicides, and organophosphate pesticides each require 2000 ml of water sample for analysis of all constituents within each category . The 2000 ml sample should be taken using two 1 liter amber glass bottles with Teflon lined caps.

f Semi-volatile organics, organochlorine pesticides and PCBs, herbicides, organophosphate pesticides and metals each require 120 ml of soil sample for analysis of all constituents within each category. The 120 ml sample should be taken using one 4 oz. glass bottle with a Teflon lined cap. For metals analysis a plastic (high density polyethylene) 4 oz. bottle may be used.

g Only one 1000 ml water sample is required for analysis of all metals. The 1000 ml sample should be taken using one 1 liter plastic (high density polyethylene) bottle.

h Current EPA methodology is unable to detect these compounds at the required screening action level. Special analytical methods equivalent to EPA level 5 methods will be developed to achieve the required screening action levels. The methods suggested for these compounds are the most appropriate standard methods in use on this project.

i The practical quantitation limits given for the inorganic compounds are the method detection limits for water samples. The method detection limits for soil samples depend on the sample matrix and digestion technique. The soil sample detection limits are estimated on teh basis of the sample preparation methods listed in the cited methods.

TABLE II-3
Additional Analytical Methods for Operable Unit 1157

Method Number[a]	Description
Organic Methods	
SW-846 Method 8021	Volatile holgenated and aromatic compounds in water and soil
To be determined	Bromoform in water
To be determined	1,1-Dichloroethene in water
To be determined	cis-1,3-Dichloropropene in water
To be determined	trans-1,3-Dichloropropene in water
To be determined	Vinyl chloride in water
To be determined	2,4-Dinitrotoluene in water
To be determined	2,6-Dinitrotoluene in water
To be determined	o-Nitroaniline in water
To be determined	Pentachlorophenol in water
To be determined	2,4,6-Trichlorophenol in water
Inorganic Methods	
SW-846 Method 7470	Mercury in soil and water
SW-846 Method 7041	Antimony in soil and water
SW-846 Method 7421	Lead in soil and water
SW-846 Method 7740	Selenium in soil and water
SW-846 Method 7841	Thallium in soil and water
SW-846 Method 7870	Tin in soil and water
SW-846 Method 7060	Arsenic in soil
To be determined	Arsenic in water
To be determined	Beryllium in soil

[a] The method numbers given are from SW-846 Test Methods for Evaluating Solid Waste (EPA 1987, 0518). Some methods are listed as "to be determined" because standard EPA methodology is unable to attain the screening action level indicated in Table II-2. These methods will be developed as part of the OU 1157 Laboratory QA Program prior to the initiation of field sampling.

TABLE II-4
Accuracy and Precision Limits for the Additional Methods for OU 1157

Analyte of Interest	Soil Method	Water Method	Soil Accuracy RPD	Soil Precision %	Water Accuracy RPD	Water Precision %
Volatiles						
Benzene	8021	8021	25	25	25	25
Carbon tetrachloride	8021	8021	25	25	25	25
Chloroform	8021	8021	25	25	25	25
Dichlorodifluoromethane	8021	8021	25	25	25	25
1,2-Dichloroethane	8021	8021	25	25	25	25
1,2-Dichloropropane	8021	8021	25	25	25	25
Hexachlorbutadiene	8021	8021	25	25	25	25
Methylene chloride	8021	8021	25	25	25	25
Tetrachloroethene	8021	8021	25	25	25	25
Trichloroethene	8021	8021	25	25	25	25
Tricholorofluoromethane	8021	8021	25	25	25	25
Other Analytes[a]						
Bromoform	TBD	TBD	25	25	25	25
1,1-Dichloroethene	TBD	TBD	25	25	25	25
cis-1,3-Dichloropropene	TBD	TBD	25	25	25	25
trans-1,3-Dichloro-propene	TBD	TBD	25	25	25	25
Vinyl chloride	TBD	TBD	25	25	25	25
2,4-Dinitrotoluene	TBD	TBD	25	25	25	25
2,6-Dinitrotoluene	TBD	TBD	25	25	25	25
o-Nitroaniline	TBD	TBD	25	25	25	25
Pentachlorophenol	TBD	TBD	25	25	25	25
2,4,6- Trichlorophenol	TBD	TBD	25	25	25	25

All limits listed are plus or minus the indicated amount.

a Analytical methods for these analytes are to be determined as described in the text.

3.4 Quality Assurance Objectives for Accuracy

The QA objectives for accuracy for the OU 1157 RFI will be from SW-846 (EPA 1987, 0518) as described in Sections 5.4, 5.4.1, and 5.4.2 and Tables V.11 and V.12 of the Generic QAPjP. All of the accuracy requirements described in the Generic QAPjP will apply to the OU 1157 RFI with the following additions:

- for the additional metal analytical methods specified in Table II-3, the percent recovery limits specified for metals in Section 5.4.1 of the Generic QAPjP will be applied; and

- for the additional organic analytical methods specified in Table II-3, the QA objectives for accuracy are provided in Table II-4.

3.5 Representativeness, Completeness, and Comparability

The representativeness of the analytical data will be attained through the technical approach described in Chapter 4 of this work plan and the specific sampling plans described in Chapter 6. Additional information to be used to attain representativeness is included in the discussions of site-specific data needs and DQOs in Chapter 5 and in the list of site-specific SOPs given in Table II-5.

The completeness goal of 90% set for the ER Program will apply overall to the OU 1157 RFI as described in Section 5.5 of the Generic QAPjP. However, a completeness goal of 100% will apply for critical samples, such as for sites where fewer than 5 samples will be collected. Additional actions will be required when the completeness goals are not achieved for critical samples.

Comparability will be achieved through the use of the standard methods listed in Tables II-1 and II-2 as well as through the use of the LANL-ER-SOPs listed in Table II-5. The comparability requirements specified in Chapter 5 of the Generic QAPjP will apply to the OU 1157 RFI.

3.6 Field Measurements

The primary DQOs for field measurements described in Section 5.6 of the Generic QAPjP apply to the OU 1157 RFI. These DQOs will be achieved through the use of appropriate methodologies described in the LANL-ER-SOPs for each site activity.

3.7 Data Quality Objectives

The qualitative and quantitative statements that specify the quality of the data required to support the OU 1157 RFI decision process are described in the work plan. The analyte-specific precision and accuracy requirements presented in Tables II-1, II-2, and II-4 of this QAPjP describe the QA objectives for the measurement data that were selected to provide for the collection of analytical data with acceptable levels of uncertainty. The decision process and acceptable levels of uncertainty are presented in Chapters 4 and 5. Site-specific decisions and investigation objectives are described in Chapter 5. The sampling and analysis strategies and approaches as well as the required sampling and analyses for each site are described in Chapter 6.

3.8 Quality Improvement

The OU 1157 Phase I project will be conducted following the quality improvement guidelines described in Chapter 20 of the QPP. The quality improvement activities to be conducted as part of the project include the following:

- A project kickoff meeting where all project participants will meet to discuss the responsibilities of each participant, the project schedules and how they impact the overall project, nonconformance reporting, health and safety requirements, and to get feedback on the project plans.

- Readiness reviews prior to commencing each major field activity to cover the same topics discussed at the project kickoff meeting and how these topics relate to the field activity to be conducted.

- Daily tailgate meetings to review the daily sampling objectives and health and safety aspects of the work to be conducted by the field crew that day.

TABLE II-5
Standard Operating Procedures for Operable Unit 1157

Standard Operating Procedure	
Number	**Description**
General Instructions	
LANL-ER-SOP-01.01	General Instructions for Field Investigations
LANL-ER-SOP-01.02	Sample Containers and Preservation
LANL-ER-SOP-01.03	Handling, Packaging, and Shipping of Samples
LANL-ER-SOP-01.04	Sample Control and Field Documentation
LANL-ER-SOP-01.05	Field Quality Control Samples
LANL-ER-SOP-01.06	Management of RFI-Generated Wastes
TBD[b]	Data Validation Procedures
Health and Safety in the Field	
LANL-ER-SOP-02.01[a]	Personal Protective Equipment
LANL-ER-SOP-02.02[a]	Respirators
LANL-ER-SOP-02.03[a]	Pre-Entry Briefings for Site Personnel
LANL-ER-SOP-02.04[a]	Pre-Entry Briefings for Visitors
LANL-ER-SOP-02.05[a]	Safety Meetings and Inspections
LANL-ER-SOP-02.06[a]	Heat and Cold Stress and Natural Hazards
LANL-ER-SOP-02.07[a]	General Equipment Decontamination
LANL-ER-SOP-02.08[a]	Personnel Decontamination
LANL-ER-SOP-02.09[a]	Accident/Incident Reporting
LANL-ER-SOP-02.10[a]	Radiation Protection
LANL-ER-SOP-02.11[a]	Training and Medical Surveillance

TABLE II-5 (Continued)

Standard Operating Procedure	
Number	**Description**
Field Surveys	
LANL-ER-SOP-03.03[a]	Soil Gas Sampling
TBD[b]	Hand-held Instruments for Field Screening of VOCs
TBD[b]	Hand-held Instruments for Field Screening of Radioactive Substances
Drilling, Excavating, and Soil Sampling Techniques	
LANL-ER-SOP-04.01	Drilling Methods and Drill Site Management
LANL-ER-SOP-04.04[a]	General Borehole Logging
TBD[b]	Spill Control During Drilling
Sampling Techniques	
LANL-ER-SOP-06.02	Field Analytical Measurements of Ground Water
LANL-ER-SOP-06.03	Sampling for Volatile Organics
LANL-ER-SOP-06.05	Soil Water Samples
LANL-ER-SOP-06.09	Spade and Scoop Method for Collection of Soil Samples
LANL-ER-SOP-06.10	Hand Auger and Thin-Wall Tube Sampler
LANL-ER-SOP-06.11	Stainless Steel Surface Soil Sampler
LANL-ER-SOP-06.12	Soil and Rock Borehole Logging and Sampling
LANL-ER-SOP-06.13	Surface Water Sampling
LANL-ER-SOP-06.14	Sediment Material Collection
LANL-ER-SOP-06.17	Trier Samples for Sludges and Moist Powders or Granules
LANL-ER-SOP-06.19	Weighted Bottle Sampler for Liquids and Slurries in Tanks
TBD[b]	Sampling for Asbestos

TABLE II-5 (Continued)

Standard Operating Procedure	
Number	**Description**
Sampling Techniques (Continued)	
TBD[b]	Field Surveying of Sample Locations
TBD[b]	Wipe Sampling for Solid Surfaces
TBD[b]	Chip Sampling for Porous Surfaces
Curatorial Sample Management	
LANL-ER-SOP-12.01	Field Logging, Handling, and Documenting Borehole Samples
LANL-ER-SOP-12.02	Transport and Receipt of Borehole Samples by the Curatorial Management Facility
LANL-ER-SOP-12.03	Physical Processing and Storage of Borehole Samples at the Curatorial Management Facility
LANL-ER-SOP-12.04	Examination of Samples at the Curatorial Management Facility
LANL-ER-SOP-12.05	Acceptance of Non-Borehole Samples by the Curatorial Management Facility
Quality Procedures	
LANL-ER-QP-01.1Q	Audits
LANL-ER-QP-01.2Q	Surveys
LANL-ER-QP-01.3Q	Deficiency Reporting
Administrative Procedures	
LANL-ER-AP-01.3	Review and Approval of Environmental Restoration Program Plans and Reports
LANL-ER-AP-01.5	Revision or Interim Change of Environmental Program Controlled Documents
ICN-NO-002	Interim Change Notice for LANL-ER-AP-01.5, R0
LANL-ER-AP-02.1[a]	Procedure for LANL ER Records Management
LANL-ER-AP-03.2	Handling Media and Public Requests for Information During Field Work

TABLE II-5 (Continued)

Standard Operating Procedure	
Number	**Description**
Sampling Techniques (Continued)	
LANL-ER-AP-04.1	Identification, Documentation, and Reporting of Newly Discovered Potential Release Sites for the Environmental Restoration Program
LANL-ER-AP-04.2	Reporting of Newly Identified Releases from Solid Waste Management Units

[a] This procedure is in draft form

[b] This procedure is in preparation

- A close-out meeting at the end of each major sampling activity to review the performance and to suggest improvements for subsequent activities.

4.0 SAMPLING PROCEDURES

The activities to be conducted during the OU 1157 RFI will follow the procedures described in this section and in Chapter 6 of the Generic QAPjP. The SOPs to be used during the OU 1157 RFI are listed in Table II-5. These procedures cover the sample collection, handling, and shipping procedures, as well as the QA procedures that will be followed during the project. These procedures were selected from the ER Program procedures listed in Appendix L of the IWP (LANL 1992, 0768).

4.1 Quality Control Samples

Quality Control samples will be collected as described in Section 6.1 of the Generic QAPjP with the exceptions given in Section 3.1 of this QAPjP.

4.2 Sample Preservation During Shipment

All samples will be handled following the guidance in Chapter 6 of the Generic QAPjP and the appropriate LANL-ER-SOPs listed in Table II-5. The following specific SOPs will be used for sample preservation during shipment. Samples will be controlled and documented in the field following LANL-ER-SOP-01.04, Sample Control and Field Documentation. Samples will be contained and preserved following LANL-ER-SOP-01.02, Samples Containers and Preservation. The essential sample container and preservation information from LANL-ER-SOP-01.02 pertaining to the OU 1157 RFI is summarized in Table II-6. The handling, packaging, and shipping of samples will follow LANL-ER-SOP-01.03, Handling, Packaging, and Shipping of Samples.

4.3 Equipment Decontamination

Equipment will be decontaminated following the procedure described in Section 6.3 of the Generic QAPjP and LANL-ER-SOP-02.07, General Equipment Decontamination. In addition, any equipment-specific decontamination procedures specified in

TABLE II-6

Sample Container Types, Volumes, Preparation, Special Handling, Preservation, Holding Times, And Minimum Sample Quantities

Analysis	Containers	Handling and Preservation	Holding Time
Soil Samples			
Gross alpha, gross beta, gross gamma, and strontium-90	1, 250 ml plastic	Store 4 degrees C	6 months
PCBs by Method 8080	1, 120 ml amber glass with Teflon-lined cap	Store 4 degrees C, handle upwind from equipment fumes, no contact with plastic or gloves	7 days until extraction, 30 days thereafter
Volatiles by Method 8240	3, 60 ml amber glass with Teflon-lined cap	Store 4 degrees C, handle upwind from equipment fumes, no contact with plastic or gloves	14 days
High Explosives	1, 120 ml amber glass with Teflon-lined cap	Store 4 degrees C	7 days until extraction, 30 days thereafter
Metals, cyanide, nitrate, and nitrite	1, 250 ml plastic	Store 4 degrees C	6 months all metals except mercury, which is 28 days; cyanide, nitrate, and nitrite, 14 days
Extended analyte list volatiles including methods 8240 and 8021	3, 60 ml amber glass with Teflon-lined caps	Store 4 degrees C, handle upwind from equipment fumes, no contact with plastic or gloves	14 days
Extended analyte list semivolatiles and organochlorine pesticides and PCBs including methods 8270 and 8080	2, 120 ml amber glass with Teflon-lined cap	Store 4 degrees C, handle upwind from equipment fumes, no contact with plastic or gloves	7 days until extraction, 30 days thereafter
Extended analyte list metals, cyanide, and sulfide	1, 250 ml plastic	Store 4 degrees C	6 months all metals except mercury, which is 28 days; cyanide, 14 days; sulfide, 7 days
Total Petroleum Hydrocarbons	1, 250 ml plastic	Store 4 degrees C	7 days until extraction, 30 days thereafter

TABLE II-6 (continued)

Analysis	Containers	Handling and Preservation	Holding Time
Water Samples			
Radionuclides including gross alpha, gross beta, and strontium-90	1, 1 liter plastic	Store 4 degrees C	6 months
High Explosives	2, 40 ml amber glass with Teflon-lined cap	Store 4 degrees C	7 days until extraction, 30 days thereafter
Metals and total uranium	1, 500 ml plastic	Preserve with HNO_3 to pH < 2 and store at 4 degrees C	6 months uranium and all metals except mercury, which is 28 days
Anions including methods 300.0 and 370.1	1, 250 ml plastic per method	Store at 4 degrees C	28 days
Carbonate and bicarbonate and fecal coliform	1, 250 ml plastic per method	Store at 4 degrees C	14 days
Extended analyte list volatiles including methods 8240 and 8021	3, 40 ml amber glass with Teflon-lined caps per method	Store 4 degrees C, handle upwind from equipment fumes, no contact with plastic or gloves	14 days
Extended analyte list semivolatiles and organochlorine pesticides and PCBs including methods 8270 and 8080	2, 1 liter amber glass with Teflon-lined cap per method	Store 4 degrees C, handle upwind from equipment fumes, no contact with plastic or gloves	7 days until extraction, 30 days thereafter
Extended analyte list metals	1, 500 ml plastic	Preserve with HNO_3 to pH < 2 and store at 4 degrees C	6 months all metals except mercury, which is 28 days
Cyanide	1, 250 ml plastic	Preserve with NaOH to pH > 12 and store at 4 degrees C	14 days
Sulfide	1, 250 ml plastic	Preserve with zinc acetate and NaOH to pH > 9 and store at 4 degrees C	7 days

TABLE II-[illegible] (continued)

Analysis	Containers	Handling and Preservation	Holding Time
Waste Samples			
TCLP Analysis	4, 500 ml amber glass with Teflon-lined cap	None	TCLP extraction; 14 days for volatiles, semivolatiles, pesticides, and herbicides; 28 days for mercury; 180 days for all other metals
Corrosivity	1, 60 ml glass with Teflon-lined cap	None	14 days
Reactivity	1, 120 ml glass with Teflon-lined cap	Store at 4 degrees C	14 days
Ignitability	1, 60 ml glass with Teflon-lined cap	None	28 days
Compatability	1, 120 ml glass with Teflon-lined cap	None	14 days
Asbestos	See method for guidance	None	None

the sampling equipment SOPs will also be followed.

4.4 Sample Designation

Sample designation will be implemented as described in Section 6.4 of the Generic QAPjP and LANL-ER-SOP-01.04, Sample Control and Field Documentation. The sample numbers will be designated with the assistance of ER Program personnel familiar with LANL-ER-SOP-01.04 and with assistance from the SCF TTL.

5.0 SAMPLE CUSTODY

The strict chain-of-custody procedures contained in LANL-ER-SOP-01.04, Sample Control and Field Documentation, and described in Section 7.1 of the Generic QAPjP will be followed during the OU 1157 RFI. These procedures will be followed to help ensure the proper handling of samples from collection to analysis, including the final disposition of the analytical samples.

6.0 FIELD DOCUMENTATION

Field documentation activities to be conducted during the OU 1157 RFI will follow the procedures described in this section and in Chapter 7 of the Generic QAPjP. The SOPs to be used during the OU 1157 RFI are listed in Table II-5. These procedures cover the sample control and field documentation, and collection, as well as the QA procedures that will be followed during the project. These procedures were selected from the ER Program procedures listed in Appendix L of the IWP (LANL 1992, 0768).

6.1 Sample Identification

The samples will be identified following LANL-ER-SOP-01.04, Sample Control and Field Documentation, as described in Section 7.2.1 of the Generic QAPjP.

6.2 Field Logs

Field logs will be kept following the procedure described in Section 7.2.2 of the Generic QAPjP and in Chapter 4 of the OU 1157 RFI work plan.

6.3 Data Collection Forms

Data collection forms will be used following the appropriate LANL-ER-SOPs as described in Section 7.2.3 of the Generic QAPjP.

6.4 Corrections to Documentation

Incorrect entries will be crossed out with a single line and signed and dated by the person originating the entry and the appropriate LANL ER Program technical field team leader as described in Section 7.2.4 of the Generic QAPjP. The correct information will be entered and the correction signed and dated by the person making the correction. There will be no erasures or deletions from any type of data document record.

6.5 Sample Coordination Facility

All samples will initially be transported by the FTL or designated field team member to the LANL SCF. As described in Section 7.3 of the Generic QAPjP, the LANL SCF will coordinate the OU 1157 sample collection activities with the required chemical analysis. The procedures for sample handling will follow those described in Section 4 of this QAPjP.

6.6 Laboratory Documentation

The laboratory documentation procedures described in Section 7.4 and the related subsections in the Generic QAPjP will be followed for all samples collected and analyzed during the OU 1157 RFI.

6.7 Sample Handling, Packaging, and Shipping

The procedures described in Section 7.5 of the Generic QAPjP will be followed for all samples collected and analyzed during the OU 1157 RFI. As described in Section 5.3 above, all samples will initially be transported to the LANL SCF, which will handle all sample handling, packaging, and shipping following the appropriate LANL procedures described in Section 4 of this QAPjP.

6.7 Final Evidence File Documentation

All OU 1157 RFI project participants will maintain records to document the QA/QC activities and to provide support for possible evidential proceedings. All records generated during the OU 1157 RFI are the property of the LANL ER Program Office. The OU 1157 Records Management Plan (Annex IV to the OU 1157 RFI Work Plan) and the LANL Records Management Program in Annex IV of the IWP (LANL 1992, 0768) describe the procedures that will be followed to provide final evidence documentation.

7.0 CALIBRATION PROCEDURES AND FREQUENCIES

The calibration procedures and their frequencies for the OU 1157 RFI are described in Chapter 8 of the Generic QAPjP.

8.0 ANALYTICAL PROCEDURES

The analytical procedures for the OU 1157 RFI are listed in Tables II-1 and II-2. These procedures will be used for field testing and screening and laboratory analysis as described in Chapter 9 of the Generic QAPjP with the exception of those methods listed in Table II-3.

For the methods specified in Table II-3, the selected analytical laboratories will provide analytical method SOPs for the analyses to be conducted. The methods that require development will be documented to demonstrate that the appropriate level of data quality can be achieved before the methods are approved for use in the OU 1157 RFI. All analyses will be performed by an analytical laboratory with demonstrated proficiency for each parameter required.

9.0 DATA REDUCTION, VALIDATION, AND REPORTING

Data reduction, validation, and reporting will be conducted by LANL ER Program personnel and subcontractors as described in Section 10 of the Generic QAPjP. In addition, the laboratory analytical data will be validated by individuals independent from the analytical laboratory that produced the data. The validation process is intended to determine whether the data received is of acceptable quality based on the DQOs specified in this QAPjP and the OU 1157 RFI Work Plan. The data validation procedures are described in the Data Validation SOP (to be developed) and follow EPA's "Functional Guidelines for Data Validation" (EPA 1988, 0293).

10.0 INTERNAL QUALITY CONTROL CHECKS

Internal QC checks will be conducted as described in Chapter 11 of the Generic QAPjP, with the exception of the field reagent blanks described in Section 3.1 of this QAPjP.

11.0 PERFORMANCE AND SYSTEM AUDITS

Announced and unannounced performance and system audits will be conducted during the OU 1157 RFI as identified in Chapter 12 of the Generic QAPjP. Audits will be conducted at least once per year for all field and laboratory procedures used during the OU 1157 RFI. These audits will follow the ER Program procedures for audits and surveys given in Table II-5.

Audits will be initially conducted as early in the program as possible for each field and laboratory procedure. Follow-up audits will be conducted to investigate the appropriateness of all corrective measures required. Audits will also be conducted in response to recommendations from the OUPL and ER Program management (including the QPPL).

12.0 PREVENTIVE MAINTENANCE

The preventive maintenance procedures for both field and laboratory equipment specified in Chapter 13 of the Generic QAPjP will be followed during the OU 1157 RFI.

13.0 SPECIFIC ROUTINE PROCEDURES USED TO ASSESS DATA PRECISION, ACCURACY, REPRESENTATIVENESS, AND COMPLETENESS

In order to provide data that is comparable to the data produced for other OU RFIs, the OU 1157 RFI will use the procedures described in Chapter 14 of the Generic QAPjP to assess data precision, accuracy, representativeness, and completeness.

14.0 CORRECTIVE ACTION

The procedures, reporting requirements, and authority for initiating corrective action during the OU 1157 RFI will follow those defined in Chapter 15 of the Generic QAPjP and in the LANL-ER-QP-01.3Q, Deficiency Reporting.

15.0 QUALITY ASSURANCE REPORTS TO MANAGEMENT

Quality Assurance reports to management will be prepared following the guidelines provided in Chapter 16 of the Generic QAPjP.

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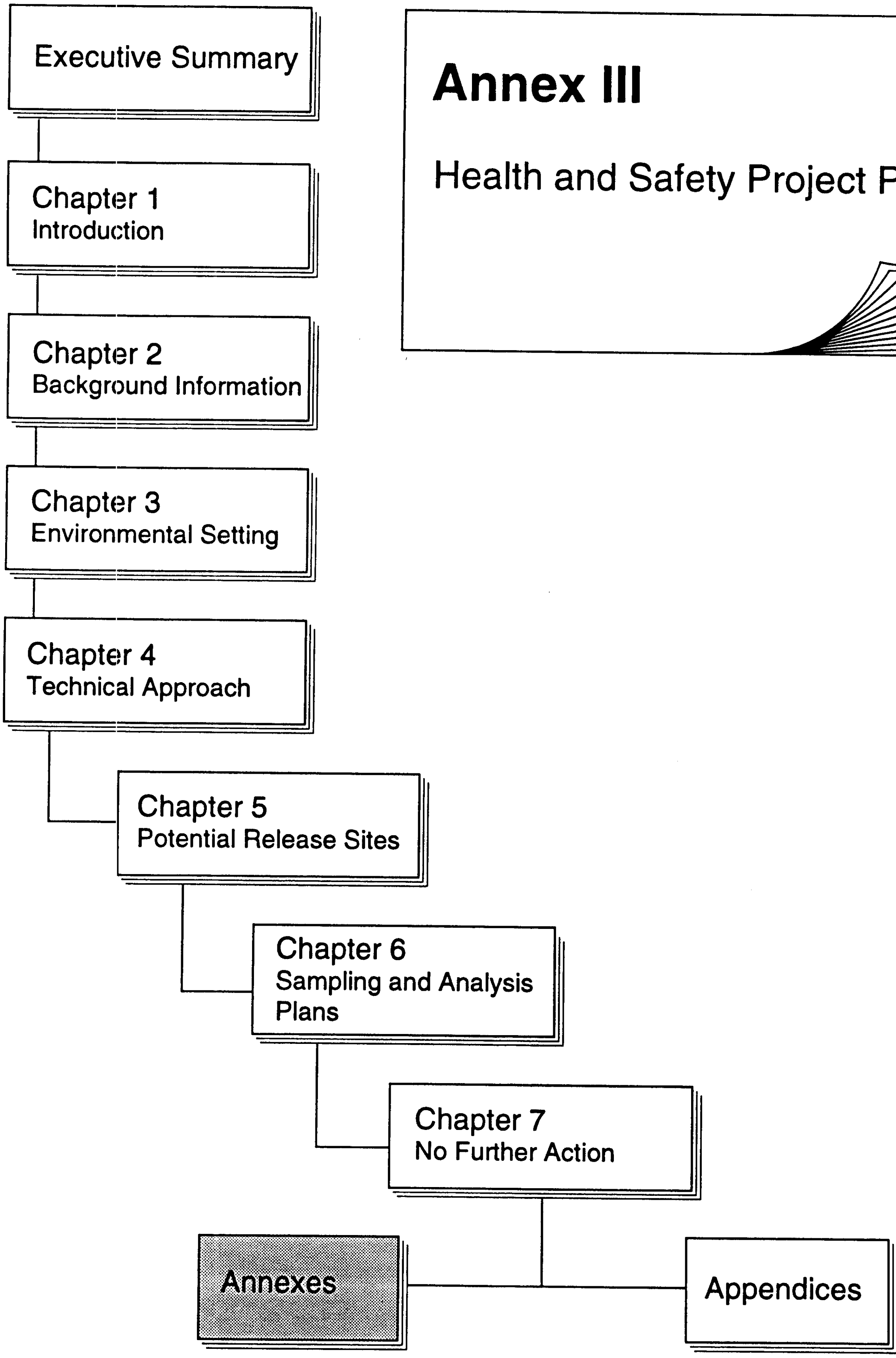
Annex III

Health and Safety Project Plan



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1.0 INTRODUCTION

1.1 Purpose

The purpose of this Operable Unit Health and Safety Plan (OUHSP) is to recognize potential safety and health hazards, describe techniques for their evaluation, and identify control methods. The goal is to eliminate injuries and illness; to minimize exposure to physical, chemical, biological, and radiological agents during environmental restoration (ER) activities; and to provide contingencies for events that may occur while these efforts are under way.

It is intended that project managers, health and safety professionals, Laboratory managers, and regulators use this OUHSP as a reference for information about health and safety programs and procedures as they relate to this operable unit (OU). Detailed Site-Specific Health and Safety plans (SSHSPs) and procedures will be prepared subsequent to this document for each field activity planned, whether it is specific to a single Potential Release Site (PRS) or a group of PRSs being investigated simultaneously.

The Health and Safety Division Hazardous Waste Operations (HAZWOP) Program establishes Laboratory policies for health and safety activities at ER sites. The hierarchy of health and safety documents for the Los Alamos National Laboratory (the Laboratory) ER Program is as follows:

- Installation Work Plan, Health and Safety Program Plan (IWPHSPP)
- OUHSP
- SSHSP

The first document is more general, whereas the others become increasingly more specific and detailed. The contents and references to these and other documents should always be considered when making decisions.

1.2 Applicability

These requirements apply to all personnel at ER sites, including Laboratory employees, supplemental work force personnel, regulators, and visitors. There are no exceptions.

1.3 Regulatory Requirements

Government-owned, contractor-operated facilities must comply with Occupational Safety and Health Administration (OSHA) regulations, U.S. Environmental Protection Agency (EPA) regulations, U.S. Department of Energy (DOE) orders, and any specific requirements from the applicable state agencies. The SSHSP will include all applicable regulatory requirements.

1.4 Required Elements of the SSHSP

OSHA 29 CFR 1910.120(b) (4) (ii) requires that the specific site health and safety plan, at a minimum, address the following elements:

- A safety and health risk or hazard analysis for each site task and operation found in the work plan.
- Employee training appropriate for the tasks to be performed.
- Appropriate personal protective equipment to be used by employees for each task and operation being conducted.
- Medical surveillance requirements for site workers.
- Frequency and types of air monitoring, personnel monitoring and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to be used.
- Site control measures to be used.

- Decontamination procedures to be used.

- The emergency response plan for safe and effective responses to emergencies.

- Confined space entry procedures, when applicable.

- A spill containment program.

2.0 ORGANIZATION, RESPONSIBILITY, AND AUTHORITY

2.1 General Responsibilities

The Laboratory's Environment, Safety, and Health (ES&H) manual delineates managers' and employees' responsibilities for conducting safe operations and providing for the safety of contract personnel and visitors. The general safety responsibilities for ER activities are summarized in the IWPHSPP. Line Management is responsible for implementing health and safety requirements.

Personnel conducting work for the ER Program will comply with the Laboratory's stop-work policy and the requirements of Laboratory Procedure (LP) 116-01.0. Forms and Documentation Logs of Stop Work Reports are included in LP 116-01.0 In addition, upon initiation of stop-work actions, ER Program personnel will notify the Site Safety Officer (SSO), the ER Program Health and Safety Project Leader (HSPL), and the Operable Unit Project Leader (OUPL).

2.1.1 Kick-Off Meeting

A health and safety kick-off meeting will be held before field work begins. The purpose of the meeting is to reach a consensus on responsibility, authority, lines of communication, and scheduling. The HSPL will organize the meeting and has the authority to delay field work until the kick-off meeting is held.

2.1.2 Readiness Review

A field readiness review must be completed by the OUPL before field activities begin. The HSPL is responsible for approving the health and safety section of the readiness review.

2.2 Individual Responsibilities

Laboratory employees and supplemental work force personnel are responsible for health and safety during ER Program activities. Figure I-1 in Annex I illustrates the OU 1157 RFI organizational chart, showing the line organization. The personnel with direct authority for implementation of SSHSPs are the HSPL, the OUPL and the SSO (works as a field team member). The responsibilities of each person are specific to health and safety for OU 1157 as described in the following subsections.

2.2.1 Health and Safety Project Leader

The HSPL helps the OUPL in identifying resources to be used for the preparation and implementation of the OUHSP and the SSHSP. Final approval of the OUHSP and SSHSP is the responsibility of the HSPL. In conjunction with the field team leaders, the HSPL oversees daily health and safety activities in the field, including scheduling, tracking deliverables, and resource utilization.

2.2.2 Operable Unit Project Leader

The OUPL is responsible for all investigation activities for OU 1157. Specific health and safety responsibilities include:

- preparing, reviewing, implementing, and revising the OUHSP and the SSHSP;
- interfacing with the HSPL to resolve health and safety concerns; and
- notifying the HSPL of schedule and project changes.

2.2.3 Site Safety Officer

An SSO other than the field team leader may be assigned depending on the potential hazards. Contractors must assign their own SSO.

The SSO is responsible for ensuring that trained and competent personnel are on-site. This includes industrial hygiene and health physics technicians and first aid/cardiopulmonary resuscitation responders. The SSO may fill any or all of these roles.

The SSO has the following responsibilities:

- advising the HSPL and OUPL of health and safety issues;
- performing and documenting initial inspections for all site equipment;
- notifying proper Laboratory authorities of injuries or illnesses, emergencies, or stop-work orders;
- evaluating the analytical results for health and safety concerns;
- determining protective clothing (PC) requirements;
- determining personal dosimetry requirements for workers;
- maintaining a current list of telephone numbers for emergency situations;
- providing an operating radio transmitter/receiver if necessary;
- maintaining an up-to-date copy of the SSHSP for work at the site;
- establishing and enforcing the safety requirements to be followed by visitors;
- briefing visitors on health and safety issues;
- maintaining a logbook of workers entering the site;
- determining whether workers can perform their jobs safely under prevailing weather conditions;
- controlling emergency situations in collaboration with Laboratory personnel;
- ensuring that all personnel are trained in the appropriate safety procedures and are familiar with the SSHSP and that all requirements are followed during OU activities;
- conducting daily health and safety briefings for field team members;
- stopping work when unsafe conditions develop or an imminent hazard is perceived; and
- maintaining first aid supplies.

2.3 Visitors

Site access will be controlled so that only verified team members and previously approved visitors will be allowed in work areas or areas containing potentially hazardous materials or conditions. Special passes or badges may be issued. Any visitors who are on-site to collect samples or split samples must meet all the health and safety requirements of any field sampling team for that site. Visitors present for purposes other than sample collection will not be permitted to enter the contaminated areas of the site.

2.4 Supplemental Work Force

All supplemental work force personnel performing site investigations will be responsible for developing health and safety plans that cover their specific project assignments. At a minimum, the plans will conform to the requirements of the SSHSP governing all site activities. The HSPL has the ultimate authority to accept or reject SSHSPs prepared by supplemental work force personnel for specific project assignments.

Contractors will adhere to the requirements of all applicable health and safety plans. Laboratory personnel will monitor activities to ensure that this is done. Failure to adhere to these requirements can cause work to stop until compliance is achieved.

Contractors will provide their own health and safety functions unless other contractual agreements have been arranged. Such functions may include, but are not limited to, providing qualified health and safety officers for site work; imparting a corporate health and safety environment to their employees, providing calibrated industrial hygiene and radiological monitoring equipment, enrolling in an approved medical surveillance program, supplying approved respiratory and personal protective equipment (PPE), providing safe work practices, and training hazardous waste workers.

2.5 Personnel Qualifications

The HSPL will establish minimum training and competency requirements for on-site personnel. These requirements will meet or exceed 29 CFR 1910.120 regulations.

2.6 Health and Safety Oversight

Oversight will be maintained to ensure compliance with regulatory requirements. The Health and Safety Division is responsible for developing and implementing the oversight program. The frequency of field verifications will depend on the characteristics of the site, the equipment used, and the scope of work.

3.0 SCOPE OF WORK

3.1 Comprehensive Work Plan

The IWPHSPP for ER targets OU 1157 for investigation. The initial phase is investigation and characterization, involving environmental sampling and field assessment of the areas. This OUHSP addresses the tasks in the Phase I study. Tasks for additional phases will be addressed in revisions to this OUHSP or in future SSHSPs.

3.2 Operable Unit Description

Operable Unit 1157 consists of 116 potential release sites (PRSs). Thorough descriptions and histories of these sites can be found in Chapter 5 of the OU work plan. Table III-1 summarizes the PRSs, the potential chemical hazards, and the work planned at this time.

4.0 HAZARD IDENTIFICATION AND ASSESSMENT

The SSO or designee will monitor field conditions and personnel exposure to physical, chemical, biological, and radiological hazards. If a previously unidentified hazard is discovered, the SSO will contact the field team leader and the HSPL and assess the hazard. A hazard assessment will be performed to identify the potential harm, the likelihood of occurrence, and the measures to reduce risk.

TABLE III-1

SUMMARY OF POTENTIAL CONTAMINANTS AT OU 1157

Description	Potential Contaminants of Concern	Tasks
Firing Sites	High explosives, radionuclides, metals	Soil sampling
Drains and Outfalls from Research Facilities	High explosives, radionuclides, metals, organic substances	Soil and sediment sampling
Waste Storage Areas	Metals, organic substances	Soil sampling, waste container sampling
Landfills and Waste Pits	Metals, radionuclides, asbestos, organic substances	Soil sampling, sampling of landfill/waste pit contents
Septic Systems, Chemical Waste Systems	High explosives, radionuclides, metals, organic substances	Soil sampling, sampling of septic systems, chemical waste systems

4.1 Physical Hazards

Injuries caused by physical hazards are preventable. Some physical hazards such as open trenches, loud noise, and heavy lifting are easily recognized. Others, such as heat stress and sunburn, high altitude, rock slides, very irregular terrain, lightning, and other hazards prevalent at Los Alamos, are less apparent. Physical hazards will be addressed thoroughly in the SSHSP.

4.1.1 High Explosives

Operable Unit 1157 includes some areas that may contain high explosives that will be clearly identified in the SSHSP. Materials will not be handled without proper authorization from an explosives safety expert who will be identified in the SSHSP.

4.2 Chemical Hazards

A variety of chemical contaminants are known or are suspected to be present at OU 1157.

The SSHSP will provide information for known or suspected contaminants that will include:

- American Conference of Governmental Industrial Hygienist (ACGIH) threshold limit values (TLV) for concentrations immediately dangerous to life and health ,
- exposure symptoms,
- ionization potential, and
- relative response factors for commonly used instruments (re-evaluated when the particular instrument is selected), and the best instrument for screening.

4.3 Radiological Hazards

A limited number of radionuclides are known or are suspected to be present. The SSHSP will provide information for known or suspected radionuclides that will include the type of radiation emitted, the permissible exposure concentrations, and the monitoring instruments recommended for detection under field conditions.

4.4 Biological Hazards

There are several biological hazards found at Los Alamos that are not common in other parts of the country. These include, but are not limited to: rattlesnakes, wild animals, ticks, plague, giardia lamblia, and black widow spiders. The SSHSP will provide specific instructions on appropriate actions relating to each of these hazards.

4.5 Task-by-Task Risk Analysis

A task-by-task risk analysis is required by 29 CFR 1910.120 and will be included with each SSHSP. This process analyzes the operations and activities for specific hazards by task. The major tasks that should be analyzed and documented in the SSHSP are:

- drilling,
- hand augering,
- septic and chemical waste system sampling,
- high explosive sampling, and
- canyon side sampling.

Other tasks should be considered for inclusion by the SSO.

The task analysis will include a general characterization of the health and safety concerns at an individual PRS or group of PRSs and an evaluation of risks posed when performing individual tasks such as drilling, hand augering, etc. When chemical hazards are known, they will be identified in the SSHSP and categorized with regard to the relative degree of hazard posed to site workers. Physical hazards at each PRS or group of PRSs included in the SSHSP will be identified and evaluated so that workers may take precautions against the often overlooked physical hazards at a site.

5.0 SITE CONTROL

5.1 Initial Site Reconnaissance

Initial site reconnaissance may involve surveyors, archaeologists, biological resource personnel, etc. Health and safety concerns that may be present must be addressed to protect personnel. The OUPL and HSPL will identify these concerns and institute measures to protect environmental impact assessment personnel.

5.2 Site-Specific Health and Safety Plans

Each field event within an OU requires an SSHSP. Planning, special training, supervision, protective measures, and oversight needs are different for each event, and the SSHSP addresses this variability. The SSHSP will address the safety and health hazards of each phase of site operations and include requirements and procedures for employee protection.

The standard outline for the SSHSP will follow OSHA requirements and will serve as a guide for best management practice. Those performing the field work are responsible for completing the plan.

Changes to the SSHSP will be made in writing. The HSPL will approve changes, and site personnel will be updated through daily tailgate meetings. Records of SSHSP approvals and changes will be maintained by the SSO.

5.3 Work Zones

Maps identifying work zones will be included with each SSHSP. Markings used to designate each zone boundary (red or yellow tape, fences, barricades, etc.) will be discussed in the plan. Evacuation routes will be upwind or crosswind of the exclusion zone. A muster area will be designated for each evacuation route. Discrete zones are not required for every field event. The SSO will determine work zones.

5.4 Secured Areas

Secured areas will be identified and shown on the site maps. Procedures and responsibilities for maintaining secured areas will be described. Standard Laboratory security procedures will be followed for accessing secure areas. All contractors and visitors must be processed through the badge office before entering secure areas.

5.5 Communications Systems

Portable telephones, CB radios, and two-way radios may be used for most on-site communications. This type of equipment may not be allowed in some areas where there may be high explosives. Hand signals and verbal communication may have to be used in these areas.

5.6 General Safe Work Practices

Workers will be instructed on safe work practices to be followed when performing tasks and operating equipment needed to complete the project. Daily safety tailgate meetings will be conducted at the beginning of the shift to brief workers on proposed activities and special precautions to be taken. General safe work practices will be included in the SSHSP. Topics will include use of the buddy system; eating, drinking, smoking at the site; housekeeping at the site; contingency planning, worker conduct while on-site and other practices that may be appropriate at the site.

5.7 Specific Safe Work Practices

5.7.1 Electrical Safety-Related Work Practices

The most effective way to avoid accidental contact with electricity is to de-energize the system or maintain a safe distance from the energized parts/line. OSHA regulations require minimum distances from energized parts. An individual working near power lines must maintain at least a 10-ft clearance from overhead lines of 50 kilovolts (kV) or less. The clearance includes any conductive material the individual may be using. For voltages over 50 kV, the 10-ft clearance must be increased 4 in. for every 10 kV over 50 kV.

5.7.2 Grounding

Grounding is a secondary form of protection that ensures a path of low resistance to ground if there is an electrical equipment failure. A properly installed ground wire becomes the path for electrical current if the equipment malfunctions. Without proper grounding, an individual could become the path to ground if he/she touches the equipment. An assured electrical grounding program or ground fault circuit interrupters is required.

5.7.3 Lockout/Tagout

All site workers must follow a standard operating procedure for control of hazardous energy sources (Laboratory Administrative Requirement (AR) 8-6, 106-01.1). Lockout/tagout procedures are used to control hazardous energy sources, such as electricity, potential energy, thermal energy, chemical corrosivity, chemical toxicity, or hydraulic and pneumatic pressure.

5.7.4 Confined Space

Entry and work to be conducted in confined spaces will adhere to procedures proposed in the Laboratory Confined Space Entry Program. These procedures require that a Confined Space Entry Permit be obtained and posted at the work site. Prior to entry, the atmosphere will be tested for oxygen content, flammable vapors, carbon monoxide, and other hazardous gases. Continuous monitoring for these constituents will be performed if conditions or activities have the potential to adversely affect the atmosphere.

5.7.5 Handling Drums and Containers

Drums and containers used during the clean up of a site will meet U.S. Department of Transportation, OSHA, and EPA regulations. Work practices, labeling requirements, spill containment measures, and precautions for opening drums and containers will be in accordance with 29 CFR 1910.120. Drums and containers that contain radioactive material must also be labeled in accordance with AR 3-5, Shipment of Radioactive Materials; AR 3-7; Radiation Exposure Control; and Article 412, Radioactive Material Laboratory, DOE Radiological Control Manual. Provisions for these activities will be clearly outlined in the SSHSP, if applicable.

5.7.6 Illumination

Illumination will meet the requirements of Table H-120.1, 29 CFR 1910.120.

5.7.7 Sanitation

An adequate supply of potable water will be provided at the site. Nonpotable water sources will be clearly marked as not suitable for drinking, washing, or washing purposes.

At remote sites, at least one toilet facility will be provided, unless the crew is mobile and has transportation readily available to nearby toilet facilities.

5.7.8 Packaging and Transport

The OUPL will contact the Waste Management Group, EM-7, to determine requirements for storing and transporting hazardous waste to ensure that practices for storage, packaging, and transportation comply with ARs 10-2 and 10-3.

5.7.9 Government Vehicle Use

Only government vehicles can be driven onto contaminated sites. No personal vehicles are allowed.

5.7.10 Extended Work Schedules

Scheduled work outside normal work hours will have the prior approval of the OUPL and SSO.

5.8 Permits

The following permits may be required for field activities:

- Excavation Permits
- Radiation Work Permits
- Special Work Permit for Spark/Flame-producing Operations

- Confined Space Entry Permits
- Lockout/Tagout Permits

The SSO and OUPL are responsible for obtaining permits and maintaining documentation. Permits will be specifically addressed in the SSHSP.

6.0 PERSONAL PROTECTIVE EQUIPMENT

6.1 General Requirements

If engineering controls and work practices do not provide adequate protection against hazards, personal protective equipment (PPE) may be required. For each operation included in the SSHSP, appropriate PPE will be designated. Use of PPE is required by OSHA regulations in 29 CFR Part 1910 Subpart I. Subcontractors are responsible for supplying PPE to their workers.

In addition, the use of PPE for radiological protection will be governed by the Radiation Work Permit (or Safety Work Permits/Radiation Work). AR 3-7 and Article 325, Article 461, Table 3.1, and Appendix 3C of the DOE Radiological Control Manual contain guidelines for the use of protective clothing (PC) during radiological operations.

6.2 Protective Equipment

Protective equipment, including protective eyewear and shoes, head gear, hearing protection, splash protection, lifelines, and safety harnesses, must meet American National Standards Institute standards.

6.3 Respiratory Protection Program

When engineering controls cannot maintain airborne contaminants at acceptable levels, appropriate respiratory protective measures will be used. The Health and Safety Division administers the respiratory protection program, which defines respiratory protection requirements; verifies that personnel have met the criteria for training, medical surveillance, and fit testing; and maintains the appropriate records.

All supplemental workers will submit documentation of participation in an acceptable respiratory protection program to the Industrial Hygiene Group (HS-5) for review and signature approval before using respirators on-site.

7.0 HAZARD CONTROLS

7.1 Engineering Controls

OSHA regulations state that when possible engineering controls should be used as the first line of defense for protecting workers from hazards. Engineering controls are mechanical means for reducing hazards to workers, such as guarding moving parts on machinery and tools or using ventilation during confined space entry. Specific engineering controls appropriate for site conditions will be described in the SSHSP.

7.2 Administrative Controls

Administrative controls are necessary when hazards are present and engineering controls are not feasible. Administrative controls are a method for controlling the degree of exposure (e.g., how long or how close to the hazard the worker remains). Worker rotation will not be used to achieve compliance with permissible exposure limits (PELs) or dose limits. Specific administrative controls will be presented in the SSHSP.

8.0 SITE MONITORING

A monitoring program or plan that meets the requirements of 29 CFR 1910.120 will be implemented for OU 1157. Laboratory-approved sampling, analytical, and record keeping methods must be used. A detailed monitoring strategy will be incorporated into each SSHSP. The strategy will describe the frequency, duration, and type of samples to be collected.

8.1 Chemical Air Contaminants

DOE has adopted OSHA PELs and ACGIH TLVs as standards for defining acceptable levels of exposure. The more stringent of the two limits applies.

8.1.1 Measurement

Measurements of chemical contaminants can be performed using direct or indirect sampling methods. Direct methods provide near real-time results and are often used as screening tools to determine levels of PPE, the need for additional sampling, etc. Indirect sampling involves collecting a sample in the field and transporting it to a laboratory for analysis. It will be the responsibility of the SSO to determine the most appropriate sampling method for each situation. If there are any questions about sampling methodology, the SSO should consult with the HSPL or a certified industrial hygienist.

8.1.2 Personal Monitoring

The site history should be used to determine the need for monitoring for specific chemical agents. Initial air monitoring will be performed to characterize the exposure levels at the site and to determine the appropriate level of personal protection needed. Monitoring strategies will emphasize worst-case conditions if monitoring each individual is inappropriate.

8.1.3 Perimeter Monitoring

Perimeter monitoring will be performed to characterize airborne concentrations in adjoining areas. If results indicate that contaminants are moving off-site, control measures must be re-evaluated. The perimeter is defined as the boundary of the OU site.

8.2 Radiological Hazards

When radiological hazards are known or suspected, workplace monitoring will be performed as necessary to ensure that exposures are within the requirements of DOE 4380.11 and are as low as reasonably achievable (ALARA). Workplace monitoring consists of monitoring for airborne radioactivity, external radiation fields, and surface contamination. The Laboratory's workplace monitoring program is described in AR 3-7, Radiation Exposure Control.

8.3 Other Hazards

Other hazards, such as noise hazards, will be monitored as appropriate. Monitoring for other hazards will be included in the SSHSP when those hazards are anticipated.

9.0 MEDICAL SURVEILLANCE AND MONITORING

9.1 General Requirements

A medical surveillance program will be instituted to assess and monitor the health and fitness of workers engaged in hazardous waste operations. Medical surveillance is required for personnel who are or may be exposed to hazardous substances at or above established PELs for 30 days in a 12-month period, as detailed in 20 CFR 1910.120. Medical surveillance is also required for personnel with duties that require the use of respirators or with symptoms indicating possible overexposure to hazardous substances.

Contractors are responsible for medical surveillance of their employees. The Health and Safety Division will audit contractor programs.

9.2 Medical Surveillance Program

All field team members who participate in ER Program investigations must participate in a medical surveillance program. The program will conform to DOE Order 5480.10,29 CFR 1910.120, AR 2-1, and any criteria established by the Occupational Medicine Group (HS-2) at the Laboratory. The program will provide for initial medical evaluations to determine fitness for duty and subsequent medical surveillance of individuals engaged in hazardous waste operations.

9.3 Emergency Treatment

In the event of an on-the-job injury, HS-2 will implement required reporting and record keeping procedures. The SSHSP describes the actions to be taken by the employee at the time of the injury/illness.

10.0 BIOASSAY PROGRAM

The OU site field characterization efforts will include intrusive investigations of areas of unknown but probable contamination potential. Given the uncertainties associated with this type of field work, the project internal exposure monitoring program is based on the assumption that personnel will be exposed to radioactive and/or hazardous chemical contaminants. Accordingly, the bioassay program will be conducted in accordance with the provisions of the Health Physics Policy and Procedures Group, HS-12.

11.0 DECONTAMINATION

11.1 Decontamination Plan

Decontamination is the process of removing or neutralizing contaminants that have accumulated on personnel and equipment and is critical to health and safety at hazardous waste sites. Decontamination protects workers from hazardous substances that may contaminate protective clothing, respiratory protection equipment, tools, vehicles, and other equipment used on-site. It minimizes the transfer of harmful materials into clean areas, helps prevent mixing of incompatible chemicals, and prevents uncontrolled transportation of contaminants from the site into the community. The site decontamination plan is mandatory and will be part of the SSHSP. At a minimum the plan will include the step-by-step decontamination procedure and diagrams showing how the decontamination station will be arranged.

The plan should be revised whenever the type of personal protective clothing or equipment changes, the site conditions change, or the site hazards are reassessed based on new information.

11.1.2 Facilities

Clean areas will be separate from contaminated areas and materials. The SSO will verify that decontamination facilities are maintained in acceptable condition and that supplies of decontaminating agents and other materials are available.

11.2 Personnel

The SSO is responsible for enforcing the decontamination plan. All personnel leaving the exclusion zone must be decontaminated to remove any chemical, radiological, or infectious agents that may have adhered to them.

11.2.1 Radiological Decontamination

Personnel exiting contamination areas, high contamination areas, airborne radioactivity areas, or radiological buffer areas established for contamination control will be frisked for contamination.

11.2.2 Chemical Decontamination

The decontamination of chemically contaminated personnel will be detailed in the site decontamination plan.

11.3 Equipment Decontamination

Prior to release from the site, tools and equipment contaminated with removable radioactive and chemical materials in excess of applicable limits will be manually decontaminated at the field location.

11.4 Waste Management

Fluids and materials resulting from decontamination processes will be contained, sampled, and analyzed for contaminants. Those materials determined to be contaminated in excess of appropriate limits are packaged in approved containers and disposed of in accordance with EM Division procedures.

The Laboratory will be responsible for characterization and disposal of chemical wastes generated by its subcontractors during site work under the ER Program.

12.0 EMERGENCIES

Emergency response, as defined by 29 CFR 1910.120, will be handled by Laboratory personnel. ER contractors are responsible for developing and implementing their own emergency action plans as defined in 29 CFR 1910.38. All emergency action plans will be consistent with Laboratory emergency response plans and will include specific procedures for dealing with site emergencies in an efficient manner. The emergency response plans also must contain the following elements, as required by OSHA (29 CFR 1910.120 (e) (2)):

- pre-emergency planning including map of site to show layout;
- personnel roles, lines of authority, and communication;
- emergency recognition and prevention;
- safe distances and refuge;
- site security and control;
- evacuation routes and procedure;
- decontamination procedures not covered in the SSHSP;
- emergency medical treatment and first aid;
- emergency alerting and response procedures;
- critique of response and follow-up;
- PPE and emergency equipment; and
- procedures for reporting incidents to local, state, and federal

governmental agencies, both for personnel injuries and property (including vehicle damage).

The SSO, with assistance from the field team leader, will have the responsibility and authority for coordinating all emergency response activities until the proper authorities arrive and assume control.

When an emergency occurs at the Laboratory, the Laboratory emergency response organization is responsible for all elements of response throughout the duration of the emergency.

The Laboratory Emergency Response Plan is designed to be compatible with emergency plans developed by local, state, tribal, and federal agencies through establishment of communications channels with these agencies and by setting criteria for the notification of each agency.

12.1 Emergency Action Plan

An emergency action plan provides emergency information for contingencies that may arise during the course of field operations. It provides site personnel with instructions for the appropriate sequence of responses in the event of either site emergencies or off-site emergencies. The emergency action plan will be attached to the SSHSP.

12.2 Provisions for Public Health and Safety

Emergency planning for public health and safety is presented in the Laboratory's ES&H Manual.

12.3 Notification Requirements

Field team members will notify the SSO of emergency situations; the SSO will notify the appropriate emergency assistance personnel (e.g., fire, police, and ambulance), the OUPL, the HSPL, the Laboratory Health and Safety Division according to DOE Order 5500.2, and DOE Albuquerque Operations Office (AL) Order 5000.3. The Laboratory Health and Safety Division is responsible for implementing notification and reporting requirements according to DOE Order 5484.1.

12.4 Documentation

An unusual occurrence is any deviation from the planned or expected behavior or course of events in connection with any DOE or Doe-controlled operation if the deviation has environment, safety, or health protection significance. All unusual occurrences must be reported and documented in accordance with Laboratory AR 1-1.

The HSPL will work with the OUPL and the field team leader to ensure that health and safety records are maintained with the appropriate Laboratory group, as required by DOE orders.

13.0 PERSONNEL TRAINING

13.1 General Employee Training and Site Orientation

All Laboratory employees and contractors must successfully complete Laboratory general employee training (GET), or equivalent training.

Several types of additional training are required, including:

- OSHA-mandated,
- facility-specific,
- site-specific or pre-entry, and
- daily safety briefings.

Site workers will receive each type of training during the course of field activities.

13.2 Site-Specific Training

Prior to granting site access, personnel must be given site-specific training. Attendance at and understanding of the site-specific training must be documented.

13.3 Radiation Safety Training

Basic radiation worker training is required for all site workers (1) whose job assignments involve operation of radiation-producing devices, (2) who work with radioactive materials, (3) who are likely to be routinely occupationally exposed above 0.1 rem (0.001 sievert) per year, or (4) who require unescorted entry into a radiological area.

Radiation protection training is required for all Laboratory employees, contractors, visiting scientists, and DOE and Department of Defense personnel who will be working on-site.

13.4 Hazard Communication

Laboratory employees will be trained in hazard communication in accordance with Health and Safety Division requirements. Contractors will provide training to their employees in compliance with 29 CFR 1910.120.

13.5 High Explosives Training

At PRSs where high explosives are known or suspected to be present, additional safety training may be required.

13.6 Facility-Specific Training

Certain areas of the Laboratory (e.g., firing sites) require additional facility specific training before personnel can enter.

13.7 Records

Records of training will be maintained by the Health and Safety Division and in the project file to confirm that every individual assigned to a task has had adequate training for that task and that every employee's training is up-to-date. The SSO or his designee is responsible for ensuring that persons entering the site are properly trained.

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Annex IV

Records Management Project Plan

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ANNEX IV RECORDS MANAGEMENT PROJECT PLAN

This work plan will follow the records management program plan provided in Annex IV of Revision 2 of the Installation Work Plan (LANL 1992, 0768). (This sentence is the complete text of Annex IV.)

Annex V

Community Relations Project Plan

Executive Summary

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ANNEX V COMMUNITY RELATIONS PROJECT PLAN

This work plan will follow the community relations program plan provided in Annex V of Revision 2 of the Installation Work Plan (LANL 1992, 0768). (This sentence is the complete text of Annex V.)

Appendix A

List of Contributors

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Appendices

Name and Affiliation	Education/Expertise	ER Program Assignment
Larry J. Dziuk (ERM/Golder)	Ph.D. Entomology (Pesticide Technology) 20 years' experience in human and environmental toxicology, multimedia risk assessment, hazardous waste site investigation and characterization, site health and safety, project and office management.	Chapter 4, 5, and Annex 3
Tracy Glatzmaier (EES-5)	B. S. Chemical Engineering, M.S. Industrial Engineering (Engineering Management Option) 8 years' experience in engineering and project management; data acquisition and analysis in atmospheric transport and diffusion; 4 years' management experience.	Operable Unit Project Leader
Betty W. Harris (M-1)	Ph.D. Chemistry 30 years' experience in research chemistry. 18 years' experience in the synthesis and chemistry of explosives. 5 years experience in environmental restoration of explosive contaminated sites.	Chapters 2 and 5
Janet Harry (EES-5)	B.U.S. (Bachelor of University Studies) Biology 16 years' experience in administrative and technical support including office management, writing and editing, and archival and technical searches.	Chapters 5 and 7
Kevin J. Hull (MAC Technical Services Co.)	M.A. History (United States) 14 years' experience in environmental project management, quality assurance and total quality management applications, and human resources development.	Chapters 4 and 5
Eric M. Jones (EES-5)	Ph.D. Astronomy 24 years' experience in theoretical research of nuclear explosion phenomenology, containment and design of underground nuclear tests, nuclear test detection, astrophysics, and space development.	Chapters 2 and 5
Andrea Kron (cARTography by Andrea Kron)	B. A. Geology 17 years' experience in cartography, geology, and technical illustration.	Figures and Cartography

Carol M. La Delfe (EES-1)	M.S. Geology 18 years' experience in geosciences, including environmental restoration, geologic/geographical review, site characterization, quality assurance liaison, geophysical analysis, and computer modeling.	Chapter 3 and Figure Management
Janice Lynn (IS-1)	M.A. English 18 years' experience writing and editing. 7 years' experience as environmental liaison involving publications, writing and editing, and public relations.	Technical Editor
Alan MacGregor (ERM/Golder)	M.S. Civil Engineering Professional Engineer 16 years' experience in environmental protection including planning, design, operation, and closure of facilities; and permitting and site remediation; and involved with hazardous and solid waste management.	Chapter 4
Robin Roybal (EM-13)	A.A.S. (Associate of Applied Science) 10 years' experience in word processing/ document development. 3 years' experience in document development as applied to Environmental Restoration	Word Processor
R. John Starmer (ERM/Golder)	Ph.D. Geology 18 years' experience in geology, geochemistry, and nuclear waste management regulation. Extensive experience in the DOE Low Level Waste Disposal program acting as liaison to EPA, DOE, and USGS on behalf of Nuclear Regulatory Commission.	Chapters 3, 4, 7, Annex 1
Bart Vanden Plas (ERM/Golder)	M.S. Organic Chemistry 8 years' experience in chemistry including environmental industrial hygiene analysis, managing quality assurance programs, and development of sampling and analytical plans for environmental and industrial hygiene.	Chapter 4 and Annex II

Tami Wiggins (ERM/Golder)	B. S. Sociology M.S. Applied Geography (concentration Environmental Studies) 8 years' experience editing, researching, and writing environmental and technical documents and reports including environmental impact assessments, corridor analyses, transportation studies, noise surveys, disaster response plans, and mapping.	Editorial Support
Charles R. Wilson (ERM/Golder)	Ph.D. Civil Engineering (Hydrogeology) Professional Engineer 26 years' experience managing hydrogeologic aspects of environmental restoration projects. Extensive experience in ground water monitoring and radioactive and hazardous waste management.	Chapters 4, 6, and Annex II

GLOSSARY

Analytical levels Five levels describing the analytical options available to support data collection activities by distinguishing the types of technology and documentation used and their degree of sophistication.

Archival data Available information collected from published and unpublished records pertaining to the history or processes of potential release sites (PRSs). Records can include written communication such as reports, memoranda, letters, notes, or calculations. Verbal communication, if substantiated in writing or other independent testimony, can be considered as archival data.

Area of concern (AOC) A potential release site (PRS) that does not meet the HSWA Module's definition of a solid waste management unit (SWMU). These sites may contain radioactive materials and other substances not addressed by RCRA.

Background level The distribution of concentrations of naturally occurring or widely distributed constituents in environmental media.

Baseline risk assessment A risk assessment conducted using an appropriate site-specific exposure scenario but assuming no mitigating or corrective measures beyond those already in place. See also risk assessment.

Betatron A fixed radius electron accelerator.

CEARP (Comprehensive Environmental Assessment and Response Program) Created as an environmental cleanup program to fulfill DOE's obligations under several statutes and regulations.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act of 1980 as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986) A federal law developed to clean up the nation's most hazardous abandoned waste sites. Because the Environmental Protection Agency (EPA) has determined that current conditions at the Laboratory do not pose an imminent threat to human health, the Laboratory is not listed on the National Priorities List (NPL) of abandoned facilities which require priority cleanup treatment.

Composite sample Formed by mixing a number of discrete samples taken at periodic points in time.

Conceptual exposure model A description of who might be exposed to contaminants of concern present at a PRS and how that exposure might occur.

Constituent Any compound or element present in environmental media, including both naturally occurring and anthropogenic elements.

Contaminant of concern (COC) Any constituent present in environmental media at a concentration above both its background level and its threshold level. COCs are organic, inorganic, or radioactive solids, liquids, or gases that, because of quantity, concentration, or physical/chemical characteristics, may cause or contribute to a threat to human health or the environment. Contaminants of concern may consist of one or more RCRA- or CERCLA-regulated constituents or of radioactive elements/daughter products.

Corrective measures implementation (CMI) A process that effects the chosen remedy, verifies its efficacy, and establishes ongoing control and monitoring requirements.

Corrective measures study (CMS) A process that evaluates the alternative remedies that might be reasonably implemented.

Corrosivity One of the four characteristics of hazardous waste. A hazardous waste is corrosive if it is aqueous and exhibits a pH less than 2 or greater than 12.5 or if it is a liquid which corrodes steel at a rate greater than 0.25 in. per year at 130^{o}F.

Data quality objectives (DQOs) Qualitative and quantitative statements developed before sampling begins to identify the quality of data that must be collected. DQOs define the specific role to be played by data in Phase I and Phase II decision making.

Decision logic A clear statement of what decision will be made about a PRS, of what actions will be taken as a result of this decision, and of exactly how data will be used to make the decision.

Decontamination and decommissioning (D&D) The removal of unwanted material (especially radioactive material) from the surface of or from within another material, and the removal from service of surface facilities and components necessary for preclosure activities only, after facility closure, in accordance with regulatory requirements and environmental policies.

Design criteria A statement of key factors that will be used in creating the sampling and analysis plan, including qualitative or quantitative criteria for limiting uncertainty in the decision.

Duplicate samples Two aliquots from one field sample submitted for laboratory analysis to demonstrate the reproducibility of the sampling procedure.

EPA SW-846 lab methods Test procedures which may be used to evaluate those properties of solids which determine whether the solids are hazardous wastes within the definition of Section 3001 of RCRA. These methods are approved for obtaining data to satisfy the requirement of 40 CFR Part 261, Identification and Listing of Hazardous Waste.

Exposure scenario A hypothetical situation describing how a receptor (a human) might be exposed to contaminants of concern present at a PRS.

Field blank Empty sample bottles prepared in the field using contaminant-free water following the general sampling procedures used in the field for collection of all waste samples and returned to the laboratory for analysis. Field blanks identify any contamination problems with the field sampling procedures.

Flash The process whereby an item is placed upon a pack with a material called Excelsior. The complete assembly is then coated with a flammable solvent such as grade 1 or grade 2 kerosene and ignited remotely using a commercially available low-voltage ignitor.

Fluorescent penetrants Mixtures of dyes and surfactants used to detect cracks in parts being prepared for installation into a weapons assembly.

French drain Used where the amount of water to be drained is small and flow velocities are low.

Gas chromatography (GC) Method of trace analysis for organics.

Gross alpha radiation Total of alpha particle activities, normally measured for those emitters having energies above 3.9 megaelectronvolts, including background and any contribution from contamination.

Gross beta radiation Total of beta particle activities, normally measured for those emitters having energies above 0.1 megaelectronvolts, including background and any contribution from contamination.

Hazardous waste A solid waste, or combination of solid wastes, which, because of its quantity, concentration, or physical, chemical, or infectious characteristics, may cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible, illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed.

Hollow-stem auger drilling Drilling method utilizing auger flights welded to hollow pipes with a cutting head attached to the lead auger. The method allows rapid advancement into unconsolidated materials to moderate depths. Samplers and drill pipe may be passed through the hollow pipe for sampling at discrete depths. Hollow stem augers may also be used as a temporary casing for rotary drilling or well construction.

HSWA RCRA's Hazardous and Solid Waste Amendments mandate that permits for treatment, storage, and disposal facilities include provisions for corrective action to mitigate releases from facilities currently in operation and to clean up contamination in areas designated as solid waste management units (SWMUs).

HSWA Module Prescribes a specific corrective action program for the Laboratory and provides the primary guidance for implementation of the Laboratory's Environmental Restoration Program. It defines the principal requirements with which DOE/UC must comply in implementing the ER Program at the Laboratory.

Human health risk Risk pertaining specifically to the health of the general public, as determined in accordance with RCRA guidance. Occupational exposures to Laboratory employees are addressed under other applicable or relevant and appropriate requirements (ARARs), not under the Environmental Protection Agency's (EPA's) guidelines for the general public.

Ignitability One of the four characteristics of hazardous waste. A hazardous waste is ignitable if it is a liquid which is less than 24% alcohol by volume, liquid which exhibits a flash point less than 140^{o} or a nonliquid which can cause a fire.

Indicator parameters Organic, inorganic, or radioactive solids, liquids, or gases that are characteristic of and provide a reliable indication of the presence of contamination. Indicator parameters are generally a subset of the potential contaminants of concern that may be present and are selected on the basis of their quantity, toxicity, mobility, and ease of detection.

Installation Work Plan (IWP) A Laboratory-wide master plan describing the system by which the Environmental Restoration Program will accomplish all RFIs and CMSs.

Isotope any two or more species of atoms of a chemical element with the same atomic number and position in the periodic table and nearly identical chemical behavior but with differing atomic mass or mass number and different physical properties.

Judgmental sampling An approach to sampling design which takes advantage of known factors (e.g., visible evidence of contamination, information about historical processes) to improve selection of the location and number of sampling points.

Little Boy Gun-assembled nuclear weapon.

Magazine Storage Units for high explosives

Maximum contaminant level (MCL) The highest concentration of a contaminant allowed in drinking water under the Safe Drinking Water Act (1986).

Metallography The study of the structure of metals and alloys by various methods, especially by optical and electron microscopes and by X-ray diffraction.

Metallurgy The science and technology of metals and alloys.

Method detection limit (MDL) The minimum concentration of a substance in the environmental medium of interest that can be identified, measured, and reported with 99 percent confidence that the concentration is greater than zero.

Mixed waste Waste that either is listed in Subpart D of 40 CFR Part 261 or exhibits any of the hazardous waste characteristics identified in Subpart C of 40 CFR Part 261.

No further action (NFA) One of the possible end points of the corrective action process: a decision that no further investigation or remediation is warranted for a PRS. NFA may be proposed during the RFI of a PRS if it is determined that no release with potentially significant risk to human health or the environment has occurred.

NPDES (National Pollutant Discharge Elimination System) Legislated by the Clean Water Act of 1977 to set forth and enforce effluent discharge limitation guidelines and standards. Permits are issued to municipal and industrial dischargers to ensure that pollutant discharges do not result in a violation of water quality standards.

Operable Unit (OU) Aggregates of SWMUs that will be addressed together for purposes of implementing cleanup.

Operable Unit Project Leader (OUPL) Responsible for managing the corrective action process for an operable unit.

Outfall The point of discharge of a pipe or drain to the environment.

Perched (water) Groundwater existing under saturated, unconfined conditions and separated from the main underlying groundwater body by an interval of unsaturated material.

Phase I The initial sampling phase of site assessment work intended to collect adequate information to confirm the presence or absence of contaminants of concern in environmental media. Phase I investigations may also include the gathering of geological, geophysical, and geochemical data considered necessary for modeling and other data analysis needs. Information collected during Phase I sampling and analysis will determine if Phase II sampling is necessary or may provide the basis for recommendations for NFA, DA, or VCA.

Phase II The second sampling phase of site assessment at PRSs that are known to have contaminants of concern, or that are known to require corrective measures, as determined on the basis of compelling historical information or site conditions or Phase I sampling investigations. Phase II sampling and analysis will help to determine the physical-chemical characteristics of the site and attempt to delineate the nature and extent of contamination. Data collected will be used for contaminant fate and transport modeling, risk assessments, treatability studies, and corrective measures studies, as required.

Pig Heavily shielded metal container.

Potential release site (PRS) A location where contaminants of concern may have been released to environmental media. PRSs include both solid waste management units (SWMUs) and areas of concern (AOCs).

Practical quantitation limit (PQL) The lowest concentration of a substance in the environmental medium of interest that can be reliably determined within specified limits of precision and accuracy during routine laboratory operating conditions. PQLs are based on what is achievable for the average sample of a given type, such as soil, under average conditions.

RCRA (Resource Conservation and Recovery Act) A federal law that established a structure to track and regulate hazardous wastes from the time of generation to disposal. The hazardous waste provisions of RCRA govern the day-to-day operations of hazardous waste management, treatment, storage, and disposal (TSD) facilities. Under this law, the Laboratory qualifies as a treatment and storage facility and must have permits to operate.

RCRA facility investigation (RFI) Identifies the nature and extent of contamination at sources and in environmental pathways that could lead to exposure of human and environmental receptors.

RFI work plan to determine the nature and extent of releases of hazardous waste and hazardous constituents from PRSs.

RCRA wastes Waste that either is listed in Subpart D of 40 CFR Part 261 or exhibits any of the hazardous waste characteristics identified in Subpart C of 40 CFR Part 261. Characteristic or listed wastes defined in RCRA.

Reactivity One of the four characteristics of hazardous waste. a hazardous waste is reactive if it: is normally unstable; reacts violently with water; forms potentially explosive mixtures with water; when mixed with water, generates toxic gases, vapors, or fumes in quantity sufficient to present a danger to human health or the environment; is any chemical which will produce toxic gases between pH 2 and 12.5; or can detonate or is capable of an explosive reaction.

Risk assessment An assessment of the potential human health or environmental risk associated with contamination of environmental media. Risk assessment includes hazard identification, exposure assessment, and dose response analysis. For human health risk assessments, two endpoints are generally estimated: (1) excess lifetime cancer risk, and (2) noncarcinogenic toxicological impacts. See also baseline risk assessment.

Screening action level (SAL) Media-specific concentration levels for constituents derived using conservative criteria. The derivation of SALs is most often based on low risk under a very restrictive exposure scenario, but if an existing regulatory standard is lower than the value derived by this risk-based computation, it will be used for the SAL.

Settling tanks Concrete, metal-lined rectangular structures that are reservoirs for liquid waste once it has exited a building through a sump.

Site characterization The process of attaining a qualitative and quantitative understanding of the physical, chemical, and radiological environment at a site in sufficient detail to support risk assessments and evaluations of alternative remedial measures. Site characterization includes waste characterization, and may include performance assessments if radioactive contaminants of concern are present.

Solid waste management unit (SWMU) Any discernible unit at which solid wastes have been placed at any time, irrespective of whether it was intended for the management of solid or hazardous waste. Such units include any area at or around a facility at which solid wastes have been routinely and systematically released.

Source characterization Process by which hazardous constituents are identified and quantified.

Subsurface soil Soils more than 2 feet below the surface as specified in the EPA's interim final RFI guidance.

Sump A concrete depression trough at the lowest level in process and development building at Technical Area 9 (TA-9), and it facilitates drainage. It is located within the laboratory and receives liquid waste from experimental operations. At explosives facilities, drain lines and sumps are specially engineered to prevent settling of explosives in the drain system before reaching the settling tank. Large solids are collected before entering the waste system, while small solids are filtered out.

Surface soil For risk assessment purposes, soil in the upper 2 ft of earth as specified in the EPA's interim final RFI guidance.

Threshold level A concentration of single or multiple waste constituents that, when exceeded, triggers a Phase II site investigation.

Toxicity One of four waste characteristics (ignitability, corrosivity, reactivity, toxicity) that causes wastes not specifically identified by the EPA as hazardous to become classified as hazardous under RCRA.

Toxicity characteristic leaching procedure (TCLP) A method to identify wastes that are hazardous and thus subject to regulation under RCRA due to their potential to leach significant concentrations of specific toxic constituents.

Trip blank A contaminant-free sample prepared in the laboratory which travels with the empty sample bottles to the sampling site and returns to the laboratory with the samples. Trip blanks identify any problems of contamination in the preparation of the sample containers and shipping procedures.

Voluntary corrective action (VCA) Selection and implementation of an obvious and effective corrective action during or following the RCRA field investigation (RFI).

Waste can storage area A designated area or structure in which containers, usually metal cans or drums, are kept until they are collected and their contents disposed of according to established regulations.

Waste characterization The process of determining the qualitative and quantitative nature, magnitude, and extent of contamination by contaminants of concern at a site.