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Date: March 7, 1996
Refer to: EM/ER:96-112

MAR 1996 RECEIVED

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

SUBJECT: FINAL VOLUNTARY CORRECTIVE ACTION (VCA) PLAN FOR REMEDIATION ACTIVITIES AT TECHNICAL AREA (TA) 16

Dear Ted:

Enclosed for your records please find a copy of the final VCA plan for remediation activities in TA-16 to be completed in Fiscal Year 1996.

Your Field Project Coordinator participated in developing and reviewing this plan. The VCA Checklist and Field Authorization Form have been completed and signed. Authorization for field work to proceed has been granted and is included with the plan.

Informational copies are being distributed to the attendant list. If you have any questions, please call Dave McInroy at 667-0819 or David Bradbury at 665-6208.

Thank you very much for your participation in this matter.

Sincerely,

Jorg Jansen, Program Manager
Environmental Restoration

JJ/rfr

Enclosures: Final VCA Plan Remediation activities in TA-16
Field Work Approval Form

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Voluntary Corrective Action Plan for

Solid Waste Management Units

16-026(m), TA-16-92 drain line and outfall
16-026(n), TA-16-91 drain line and outfall
16-026(o), TA-16-90 drain line and outfall
16-026(p), TA-16-89 drain line and outfall
16-029(k), TA-16-93 sump, drain line, and outfall
16-029(l), TA-16-92 sump
16-029(q), TA-16-99 sump, drain line, and outfall
16-029(s), TA-16-91 sump
16-029(t), TA-16-90 sump
16-029(u), TA-16-89 sump

Field Unit 3

Environmental Restoration Project

February 1996

A Department of Energy
Environmental Cleanup Program

Los Alamos
NATIONAL LABORATORY

LA-UR-96-623

ACRONYMS

AP	Administrative procedure
BMP	Best Management Practice
COPC	Chemical of potential concern
CSF	Characterization strategy form
D&D	Decontamination and decommissioning
DNB	Dinitrobenzene
DNT	2,4 Dinitrotoluene; 2,6 Dinitrotoluene
DOE	US Department of Energy
EPA	US Environmental Protection Agency
ER	Environmental Restoration
FIMAD	Facility for information management & display
FPC	Field project coordinator
FPL	Field project leader
FTM	Field team manager
FY	Fiscal year
HAZWOPER	Hazardous waste operations and emergency response
HE	High explosive
HMX	Cyclotetramethylenetetranitramine
HSWA	Hazardous and Solid Waste Amendments
LANL	Los Alamos National Laboratory
MDA	Material disposal area
NMED	New Mexico Environment Department
NOD	Notice of deficiency
OU	Operable unit
PAH	Polycyclic aromatic hydrocarbons
PE	Performance evaluation
PID	Photo-ionization detector
QA	Quality assurance
QAPP	Quality assurance project plan
RCRA	Resource Conservation and Recovery Act

RDX	Cyclotrimethylenetrinitramine
RFI	RCRA facility Investigation
SAL	Screening action level
SOP	Standard operating procedure
SSHASP	Site-specific health and safety plan
SVOC	Semivolatile organic compound
SWMU	Solid waste management unit
TA	Technical area
TCLP	Toxicity characteristic leaching procedure
TNB	1,3,5 Trinitrobenzene
TNT	2,4,6 Trinitrotoluene
UCL	Upper confidence limit
UTL	Upper tolerance limit
VOC	Volatile organic compound
WAC	Waste acceptance criteria
XRF	X-ray fluorescence

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Appendix A Statement of Work for the D&D activities

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1.0 INTRODUCTION

This voluntary corrective action (VCA) plan addresses solid waste management units (SWMUs) 16-026(m-p) and 16-029 (k,l,q,s,t,u), which are designations for building sumps, drain lines, and outfalls. These sumps and outfalls are associated with structures Technical Area (TA)-16-89, -90, -91, -92, -93, and -99. Building 99 was part of high explosives (HE) processing operations at the 20s-Line. The other buildings are part of what is collectively referred to as the 90s-Line. For the purposes of this VCA, all of the buildings will be referred to as the 90s-Line. The 90s-Line is located at TA-16, S-Site, south of Cañon de Valle, within the southwestern portion of Los Alamos National Laboratory (LANL), Los Alamos, New Mexico (Figure 1.0-1). This VCA plan is being proposed as part of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) process described in Addendum I to the RFI Work Plan for Operable Unit (OU) 1082 (LANL 1994, 1160). This VCA will be closely coordinated with decommissioning efforts scheduled for the 90s-Line during fiscal year (FY) 1996. The decommissioning efforts are outlined in the Decommissioning Management Plan for HE-Contaminated Buildings at TA-16 (August 1995, D&D-EM/ER-95-001).

These SWMUs are included in Table C of the Hazardous and Solid Waste Amendments (HSWA) permit. SWMUs in this VCA are listed in Table 1.0-1. Four of the 90s-Line structures have separate SWMUs for the sumps and drain line/outfall whereas two structures have a single SWMU that contains sumps, drain lines, and outfalls. Sampling and analysis plans, soil removal strategies, and verification sampling are similar for each building's sumps, drain lines, and outfalls.

TABLE 1.0-1

90s-LINE POTENTIAL RELEASE SITES

STRUCTURE	SUMP SWMU	DRAIN LINE/ OUTFALL SWMU
TA-16-89	16-029(u)	16-026(p)
TA-16-90	16-029(t)	16-026(o)
TA-16-91	16-029(s)	16-026(n)
TA-16-92	16-029(l)	16-026(m)
TA-16-93	16-029(k)	16-029(k)
TA-16-99	16-029(q)	16-029(q)

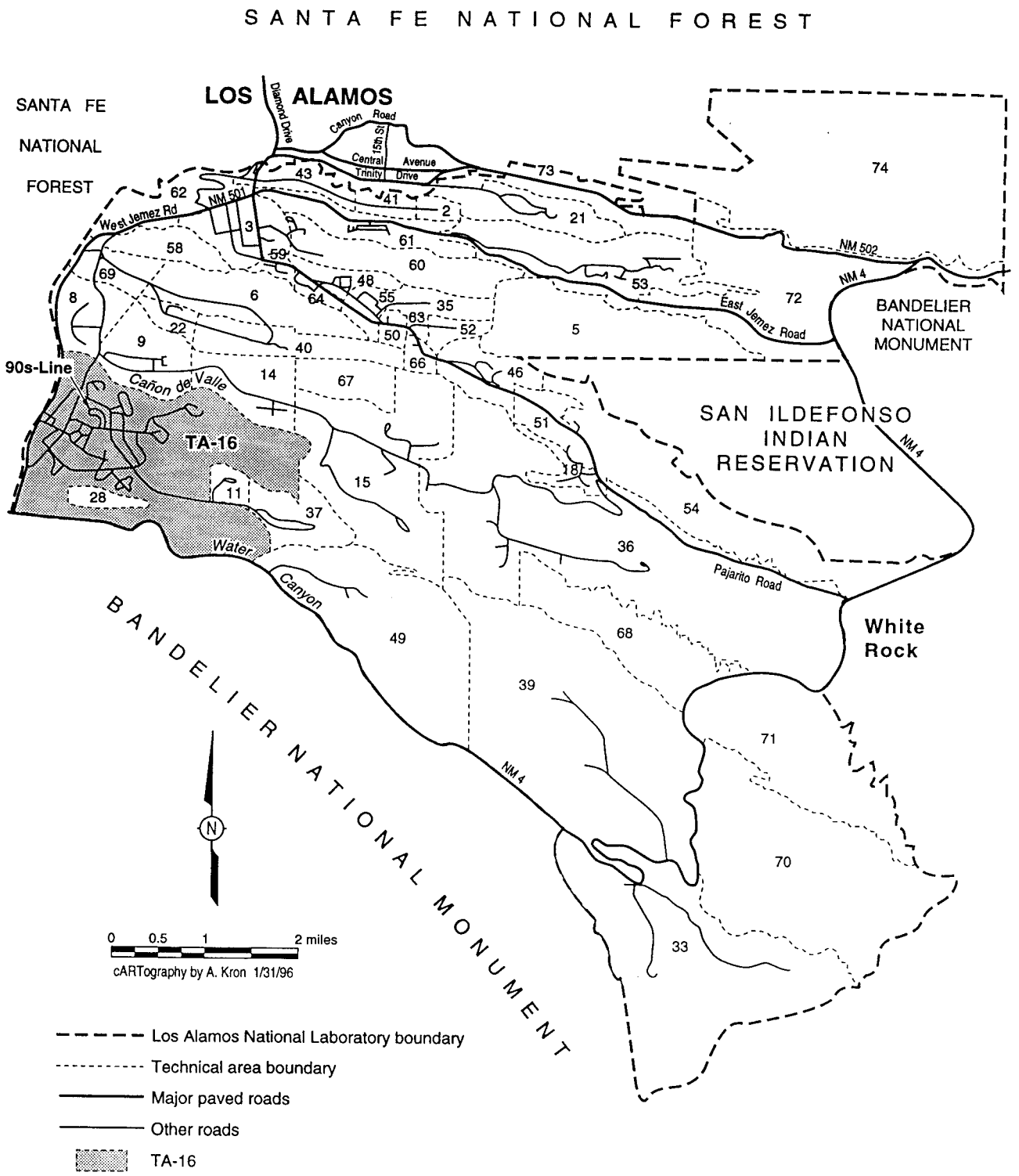


Figure 1.0-1. Location of Technical Area 16 with respect to Laboratory technical areas and surrounding landholdings.

Operations in all of these structures were initially part of HE processing activities in the post-World War II era S-Site complex. Five of these six buildings were used for machining HE charges and one was used for electroplating HE. These processes involved large quantities of HE and may have contaminated the 90s-Line buildings and their associated sumps, drain lines, and outfalls. HE production operations at post-World War II era S-Site are discussed in greater detail in Subsection 5.18 of Addendum I to the OU 1082 work plan (LANL 1994, 1160). The 90s-Line is discussed in Subsection 5.23 of that document. All buildings associated with the SWMUs of this aggregate were originally completed in March 1950. Shortly after completion of these buildings, LANL began using HE pressing techniques rather than HE casting methods, reducing the volume of HE removed by machining. As a result, HE machining in the 90s-Line was at a smaller, more experimental, scale than in earlier World War II HE machining buildings. Machining operations continued in some of these buildings for several years.

When TA-16-260 opened in 1951, many machine tools were transferred to that building. Some time after this transition, TA-16-89 and TA-16-90 were converted into storage facilities, and TA-16-91 was converted for cleaning and refurbishing HE-contaminated equipment. TA-16-92 was converted to a facility for cleaning machine tools and weapons disassembly. After 1970 all of these buildings were used for storage. They were totally abandoned by 1991.

This VCA will be coordinated with the decontamination and decommissioning (D&D) activities scheduled to begin in February 1996 at the 90s-Line. The D&D activities include removal of all structures, buildings, roads, sumps, and drain lines, and clean up of soils within two ft of these fixtures. The D&D plan does not include cleanup of the surface soil downgradient from outfalls beyond the sumps and subsurface drain lines or the remaining soils surrounding the sumps and the buried drain lines. The primary rationale for accelerating the VCAs for these SWMUs is that the D&D contractors will remove all buildings and excavate all sumps and drain lines in the 90s-Line, which will expose potentially contaminated soils. The D&D program will also coordinate health and safety activities, heavy equipment deployment, and waste management at the 90s-Line. The VCA activities will use the deployed equipment, field crews, and open excavations

provided by D&D, resulting in significant cost savings. Significant cost savings occur by coordinating D&D with characterization and cleanup activities. VCA activities include: 1) HE spot testing and field immunoassay analysis to determine the extent of HE contaminated soils; 2) field x-ray fluorescence (XRF) analyses to determine extent of barium and other metals contamination; 3) laboratory analyses of both contaminated and bounding samples to define nature and extent of contamination; 4) removal of contaminated soils based on field screening as required; and 5) confirmatory sampling and laboratory analyses to verify achievement of cleanup standards. During a field visit to TA-16 in October 1996, US Environmental Protection Agency (EPA) Region 6 representatives indicated that LANL could proceed with this cleanup.

Although not part of the VCA described in this plan, portions of sampling and voluntary corrective action (if needed) for four PRSs, C-16-064, C-16-067, 16-029(h2), and 16-017, in the vicinity of the 90s-Line will be performed. Drum storage area PRSs C-16-064 and C-16-067 are adjacent to buildings TA-16-99 and TA-16-90. Their approved work plan sampling will be implemented during D&D because of the likelihood that the soil within the PRS boundaries will be disturbed by D&D activities. Portions of the drain line for SWMU 16-029(h2) may underlie TA-16-89 and its berm. Engineering drawings suggest that this is where the drain line was originally located and it is not known whether the drain line was removed when TA-16-89 was constructed. If that drain line is located, then it will be removed as part of the D&D activities and the excavated trench will be sampled as detailed in the approved sampling plan. All of these RFI sampling plans are described in Addendum I to the RFI work plan for OU 1082(LANL 1994, 1160). Finally, the building footprints for TA-16-89, -90,-91,-92 and -93 and TA-16-99 are part of SWMU 16-017. Each footprint will be field screened on eight localities, and sampled in three locations for laboratory analysis.

1.0.1 Assumptions

This VCA plan identifies the level of effort required from planning, transmittal of the plan to DOE, through implementation, to the completion of the final report as identified in the schedule. A three-stage approach is needed because the nature and extent of chemicals

of potential concern (COPCs) in the surface and near-surface soils are unknown. In the development of this VCA plan, the following assumptions were made.

- The levels of HE COPCs and volumes of anticipated waste are consistent with historical data on material removed at World War II-era sumps and drain lines. Information on other wastes, particularly amounts of RCRA wastes, are uncertain.

- The D&D contractor will provide logistical and field support, operate heavy equipment, and coordinate waste disposal of all contaminated media, including soils. Field Unit 3 will provide personnel to complete field screening of soils and will collect laboratory samples from the exposed soils.

- Based on current Laboratory land use planning, future land use at the location of the SWMUs will continue to be for continued laboratory operations (industrial) purposes.

- Minimal delays in VCA operations will be experienced as a result of inclement weather and site access problems. Delays that may result from difficulties with acceptance of waste at permitted disposal facilities cannot be anticipated. Therefore, such delays are not considered in this plan.

- A site-specific health and safety plan (SSHASP) and waste characterization strategy form (CSF) have been developed specifically to address COPCs identified in this VCA plan. The D&D contractor has developed these plans in close collaboration with Field Unit 3 personnel. Deviations from the anticipated concentrations and locations of contaminants of concern may necessitate adjustments to both plans.

- If there are field conditions that necessitate adjustments to the scope of this plan, they will be discussed in the VCA Final Report.

1.1 Site type and description

SWMUs 16-026(m-p) and 16-029(k,l.q,s,t,u) are the sumps, drain lines, and associated inactive outfalls from HE-machining buildings TA-16-89, TA-16-90, TA-16-91, TA-16-92,

and TA-16-99, and HE electroplating building TA-16-93. They are in the northernmost portion of the World War II-era S-Site complex (Figure 1.1-1). The 90s-Line is on level ground. The drain lines discharge north of the 90s-Line into shallow drainages that flow northward.

Each sump SWMU (16-029 l,s,t,u) consists of two 5 ft wide x 15 ft long x 5 ft deep concrete HE sumps and potentially contaminated soil. The sumps are in place, filled with gravel, and have no lids. Outfall SWMUs [16-029 (m,n,o,p)] consist of buried vitreous-clay pipes and associated potentially contaminated soils that extend from the sumps to the road, potentially contaminated soils in depressions next to the road where the pipes daylight, additional vitrified-clay pipe beneath the road, and potentially contaminated soil in an open-air drainage channel. SWMUs 16-029(k) and 16-029(q) include sumps, drain lines, outfalls, and drainages. In addition to effluent from the sumps, runoff from driveways, roof drains, and building environs wash into the drainages.

1.1.0 Physical Setting

SWMUs 16-026(m-p) and 16-029(k,l,q,s,t,u) are located in TA-16 at the western edge of the Pajarito Plateau in Los Alamos County. Los Alamos County has a semiarid, temperate mountain climate. Rainfall at the site (approximate elevation is 7 600 ft above mean sea level) averages about 22 in. per year. High extremes include 2.51 in. per day of precipitation and 153 in. per year of snowfall. Average snowfall is about 55 in. per year.

The 90s-Line lies on a mesa located between Cañon de Valle on the north and Water Canyon on the south. The site is entirely on US Department of Energy (DOE)-owned land. All of these SWMUs lie in the northernmost portion of the World War II-era S-Site complex. Drainage from these SWMUs is to the north. TA-16-89, TA-16-90, and TA-16-91 sumps and drain lines discharge to a pond [SWMU 16-008(a)]. TA-16-92, TA-16-93, and TA-16-99 sumps and drain lines discharge to a northeast-flowing drainage that empties into Cañon de Valle 600 ft north of the 90s-Line. SWMU 16-008(a), a pond, is not part of this VCA. It will be characterized during FY97 RFI sampling campaign at TA-16. The pond

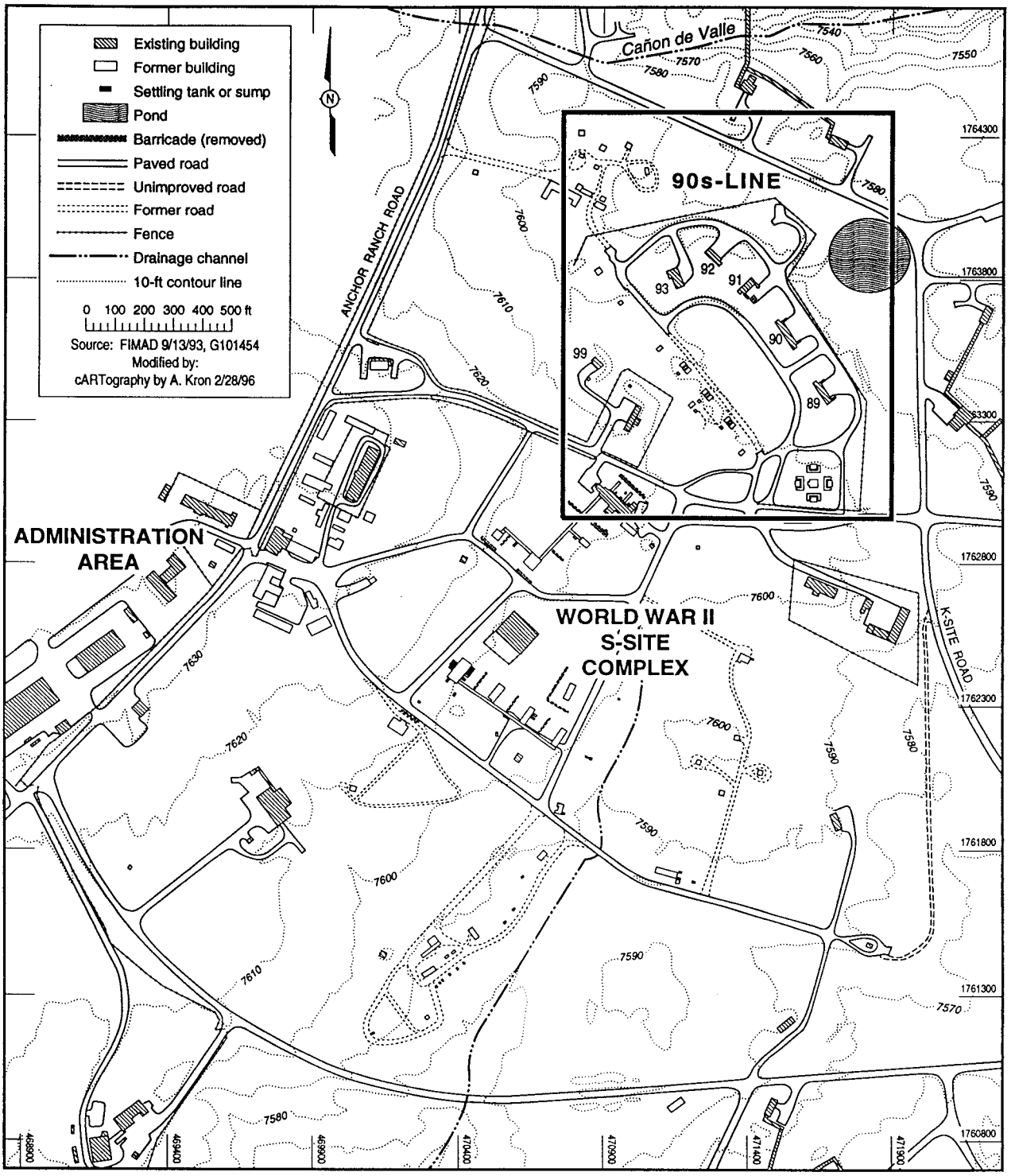


Figure 1.1-1. Location of the 90s-Line in the World War II S-Site complex.

contains standing water during most of the year, but occasionally dries up during the dry summer months. The area surrounding the 90s-Line is relatively open grassland.

The mesa top of this area overlies up to an estimated 1 100 ft of unsaturated volcanic tuff and sediments of the Bandelier and Puye Formations. However, no wells to the main aquifer have been completed at TA-16. This thick, unsaturated zone may potentially inhibit groundwater recharge by unsaturated flow of surface water. The regional aquifer, which lies beneath the Laboratory and serves as the municipal water supply for the Los Alamos area, is in the lower Puye Formation and Santa Fe Group sediments. The depth to the regional aquifer is estimated to be between 800 and 1 100 ft at the site. Perched water exists at TA-16. Seismic hazards drill hole SHB-3, which extends to a depth of 860 ft roughly 4 000 ft southwest of the 90s-Line, contained perched water derived from a depth greater than 365 ft and less than 750 ft (Gardner et al. 1993, 15-16-423). There are at least five springs/seeps located in and around TA-16 (Figure 1.1.0-1). Several of these springs contain COPCs above background levels for barium and organics, including HE. Two springs contain the HE RDX at levels above screening action levels (SALs). The source of these perched-aquifer contaminants is not known. It is likely that SWMU 16-021(c), the highly contaminated outfall from HE machining building TA-16-260, contributes to some of these springs. Localized saturated zones or fractures are the most likely pathways for contaminant migration.

This VCA assumes that contamination will be bounded in a vertical direction by characterization sampling. If characterization sampling provides evidence that COPCs above background were mobilized into the vadose zone at depths of more than several feet, the VCAs for individual SWMUs with such vadose-zone contamination will be reevaluated and additional deep-vadose-zone characterization will be proposed.

A soil map presented in the RFI Work Plan for OU 1082 (LANL 1993, 1094) defines the soil types present within the 90s-Line area. These comprise the Typic Eutroboralfs and Tocal very fine sandy loam soil types as described by Nyhan et al. (1978, 0161). The soils adjacent to the sumps and drain lines consist of disturbed fill.

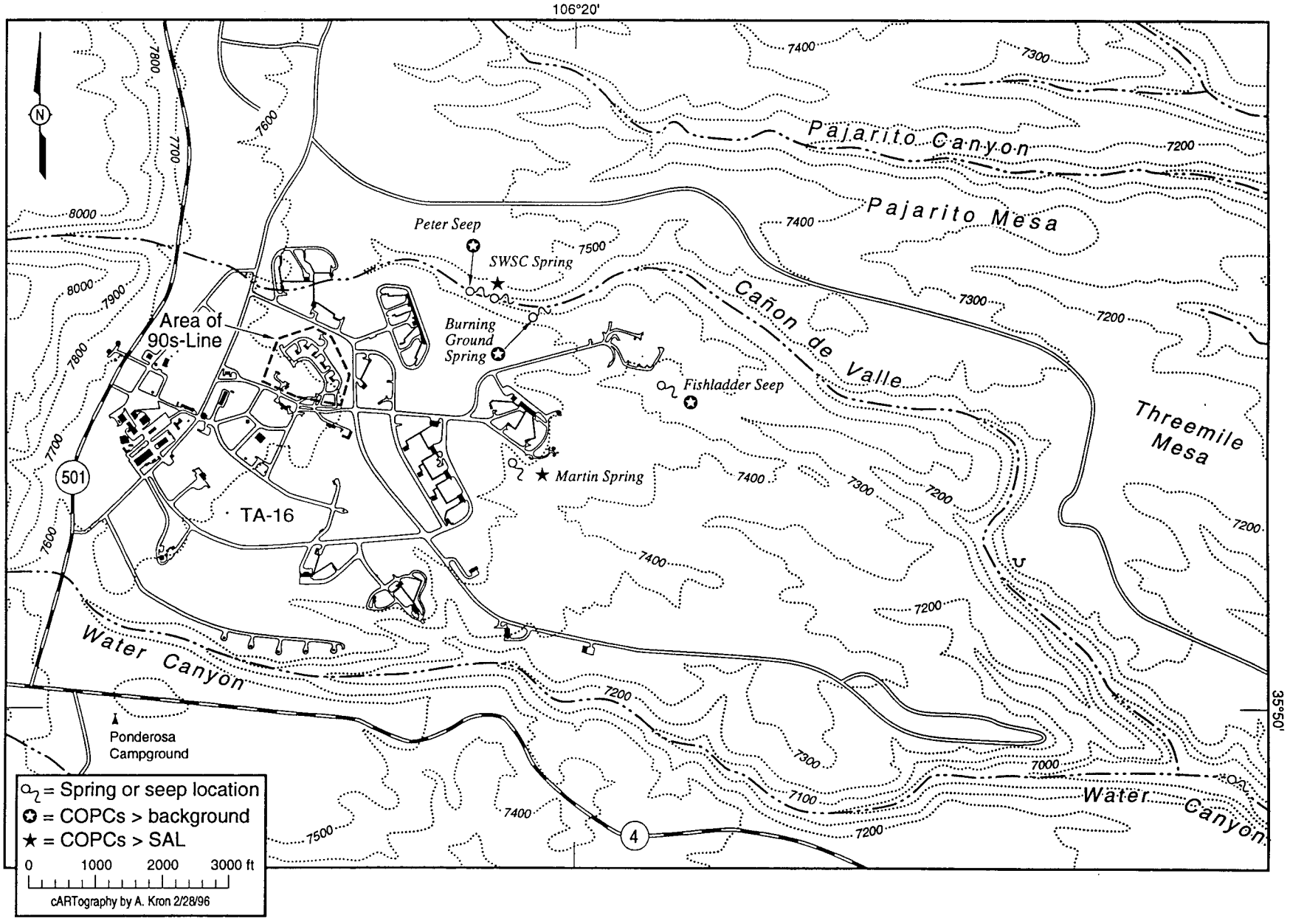


Figure 1.1.0-1. Approximate locations of seeps and springs at TA-16.

Access to the 90s-Line SWMUs is via State Road 501 to TA-16 and along paved roads within that site. Two security fences restrict access with entry limited to Laboratory personnel with a security clearance and site-specific HE training. One fence delineates the secured area; the second fence defines the HE exclusion zone boundary. Visitors without security clearances or site-specific training must be escorted at all times.

1.1.1 Operational History

SWMUs' 16-029(k,l,q,s,t,u) sumps received HE-contaminated wash water from HE machining and electroplating activities in buildings TA-16-89, -90, -91, -92, -93, and -99 (Figure 1.1.1-1). Sump operations and history at TA-16 are provided in Subsection 5.2 of the RFI work plan for OU 1082 (LANL 1993, 1094). Electroplating activities occurred only in TA-16-93. HE machining activities in the other facilities were at maximum levels between March 1950, when the 90s-Line buildings were completed and mid-1951, when the modern HE machining building, TA-16-260, was completed. Low levels of HE machining continued in the 90s-Line building from the early-1950s to the late-1950s. During the early 1950s the principal HE used at TA-16 were the cast explosives Comp-B, which contains TNT and RDX, and baratol, which contains TNT and barium nitrate. It is not known how long electroplating activities continued in TA-16-93. At some time during the late 1950s or early 1960s TA-16-89 and TA-16-90 were converted to storage facilities, TA-16-91 was converted to a facility for cleaning and refurbishing HE-contaminated equipment, and TA-16-92 was converted to a machine tool and weapons disassembly building. By 1970 all of the 90s-Line buildings were devoted entirely to storage. At some point, probably in the mid- to late-1960s, the HE sumps were filled with gravel. All buildings were totally abandoned by 1991. All are scheduled for D&D during FY96.

1.1.2 COPCs and Rationale for Proposed Remedial Action

Soils associated with 90s-Line sumps, drain lines, outfalls, and drainages are likely to be moderately contaminated with HE and barium. Other HE-machining buildings of similar vintage were contaminated with HE at levels up to several weight percent (Martin and Hickmott 1993, 15-16-497). The principal HE of concern are TNT and RDX, which were used in the explosives baratol and Composition B. Barium nitrate was also used in

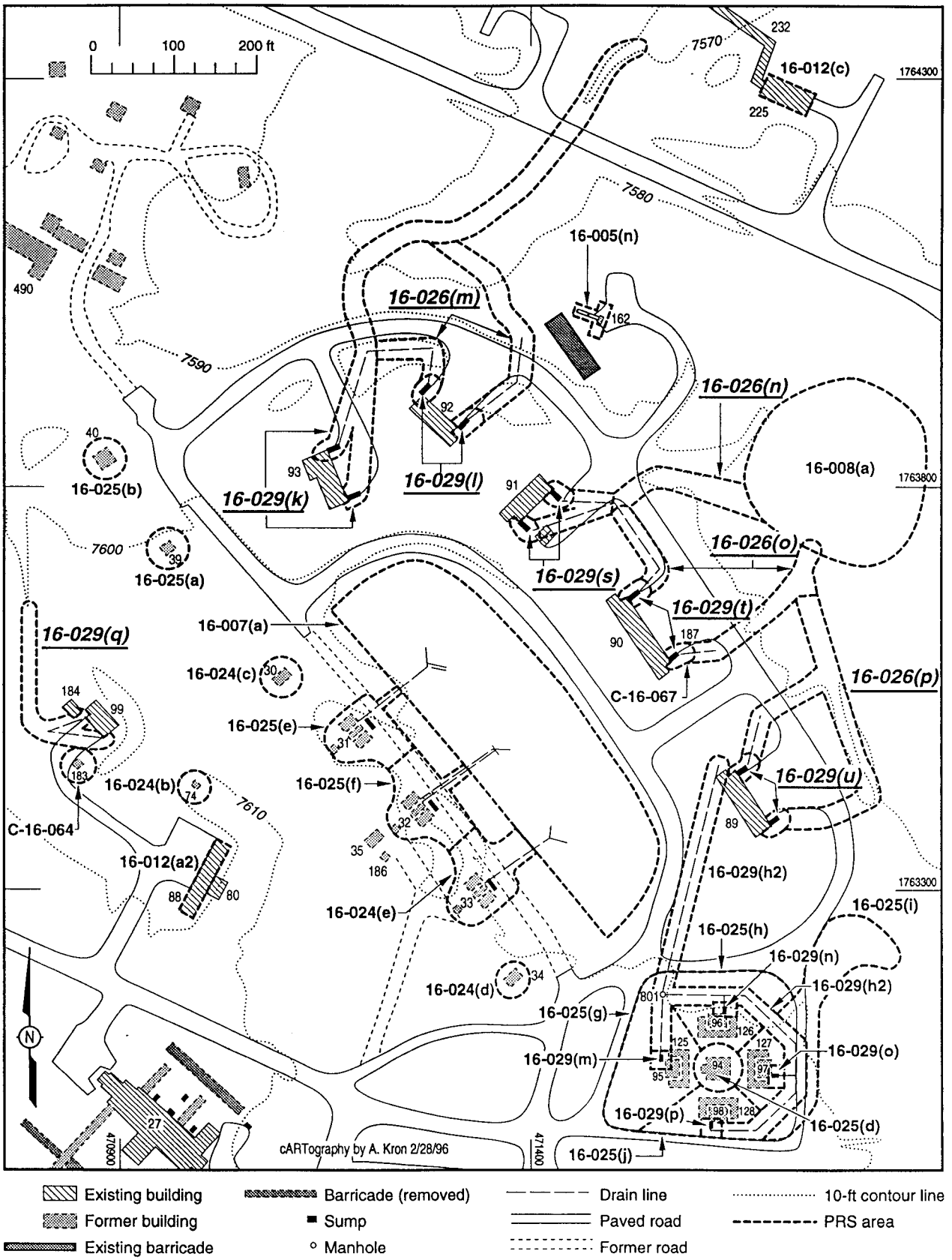


Figure 1.1.1-1. Locations of PRSs in the vicinity of the 90s-Line. PRSs addressed in this VCA plan are shown in italics, bold, and underlined.

baratol. Composition B and baratol were the principal components of the Fat Man nuclear weapon and its stockpile equivalents the Mark III and Mark IV. The HE HMX and the compounds DNT, TNB, amino-DNT, and DNB are the most likely HE impurities and breakdown products at the 90s-Line. Nickel and other metals were used in HE-plating operations in TA-16-93 (Martin and Hickmott 1993, 15-16-498). It is also likely that cyanides, volatile organic compounds (VOCs), and semivolatile organic compounds (SVOCs) were used in the plating operation. Dimethylsulfoxide (DMSO) was used during disassembly operations in TA-16-92 (Martin and Hickmott 1993, 15-16-497). These disassembly operations contaminated TA-16-92 with low levels of uranium.

2.0 SITE CHARACTERIZATION

2.1 RFI Information/Other Decision Data

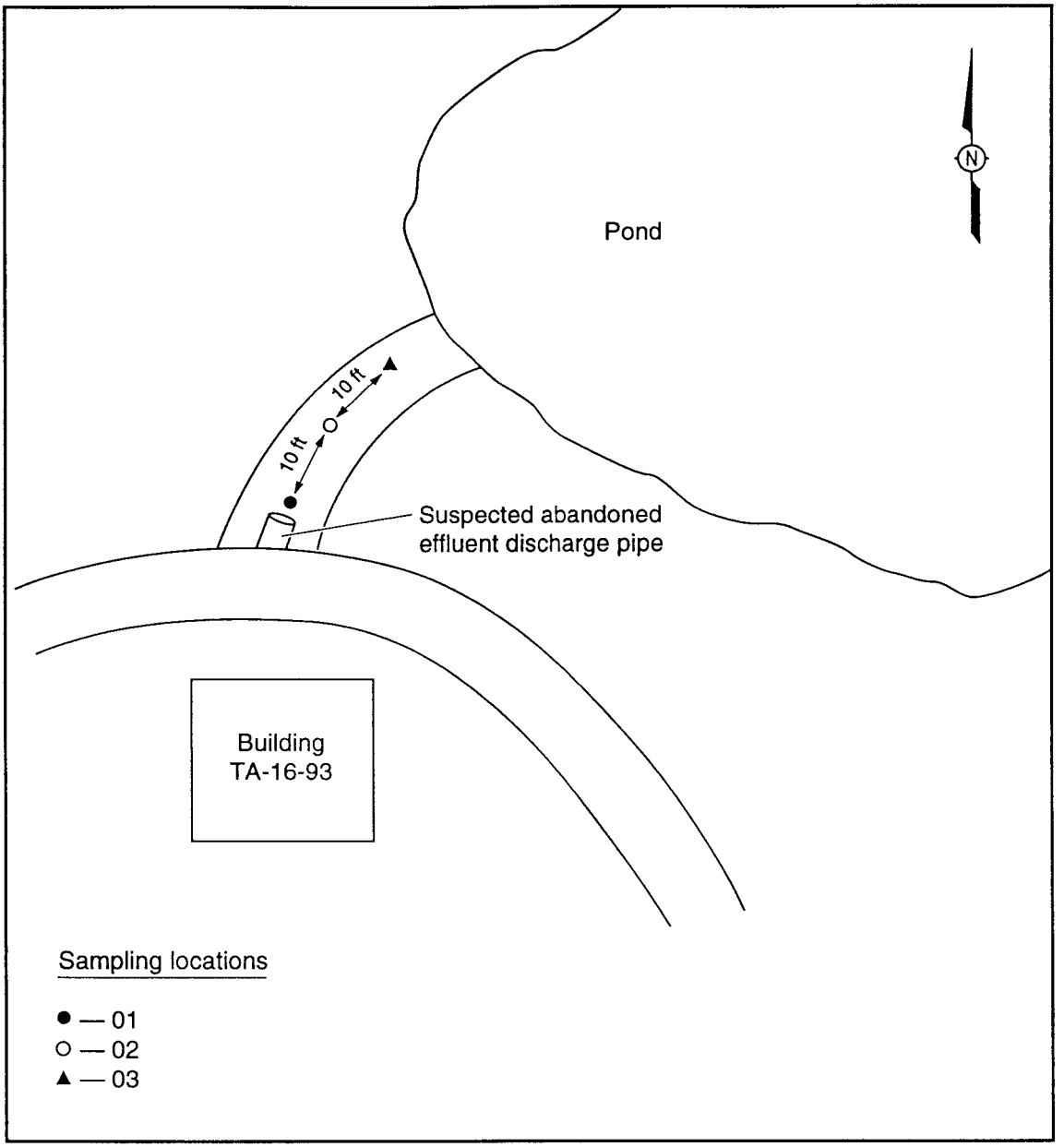
2.1.1 Investigations Prior to RFI

The DOE sampled several potentially contaminated sites during the late 1980s. Their Environmental Problem #24 reports surface soil data for the plating outfall draining TA-16-93 (LANL 1989, 0425). These data are summarized in Table 2.1.1-1 and the sampling locations are shown schematically in Figure 2.1.1-1. The authors of the report state that the outfall could not be located with certainty and that the sample locations were based on utility drawings. All samples were analyzed for HE, cyanide, metals, and VOCs. Field measurements were made for HE, radionuclides, and organic vapors. Metals detected in these samples above LANL background upper tolerance limits (UTLs) included barium (420 to 1 590 ppm), beryllium (1.7-1.8 ppm), cadmium (1.7 ppm to 5.6 ppm), lead (332 ppm), and zinc (130 to 234 ppm). Cyanide was found in two samples at 0.4 ppm. None of these values exceeds SALs. Surprisingly, no HE were found in these samples.

TABLE 2.1.1-1
INORGANICS WITH CONCENTRATIONS GREATER THAN BACKGROUND UPPER TOLERANCE LIMITS FOR PRS 16-029(k) FROM ENVIRONMENTAL PROBLEM # 24 (LANL 1989, 0425)

SAMPLE ID	DEPTH	BARIUM mg/kg	BERYLLIUM mg/kg	CADMIUM mg/kg	LEAD mg/kg	ZINC mg/kg	CYANIDE mg/kg
LANL UTL[a]	Na[b]	315	1.41	1.4	28.4	50.8	NA
SAL[c]	NA	5 340	NA	38	400	23 004	1 300
824-1		420	1.8	1.8	ND[d]	130	0.39
824-2		1120	1.7	1.7	332	206	ND
824-3		1590	1.8	5.6	ND	234	0.40

a. UTL = upper tolerance limit
b. NA = Not applicable
c. SAL = Screening action level
d. ND = Not detected



Source: LANL 1989, 0425
Modified by: cARTography by A. Kron 2/28/96

Figure 2.1.1-1. Sampling locations at TA-16-93 outfall from Environmental Problem #24 (LANL 1989, 0425).

e.
No previous analyses for samples from within the boundaries of SWMUs associated with TA-16-99, TA-16-89, TA-16-90, TA-16-91, and TA-16-92 were found. However, samples from the pond [SWMU 16-008(a)] into which the drain lines for TA-16-89, TA-16-90, and TA-16-91 discharge may be representative of COPCs from those buildings. These data are reported in Subsection 5.12.1.2.1 of the RFI Work Plan for OU 1082 (LANL 1993, 1094). To summarize those data, barium, nickel, cadmium, and acetone were at levels above background but below SALs in soils. Barium in water and HE in soils exceeded SALs within the pond.

2.1.2 RFI Information

The Phase I RFI investigation for the 90s-Line, as described in Addendum I to the RFI Work Plan for OU 1082 and approved with modifications by EPA Region 6, has not been implemented. LANL is proceeding with these VCAs because of the cost savings that will occur by coordinating the RFI cleanup with the D&D activities.

2.2 Nature and Extent of Contamination

The nature and extent of contamination at these PRSs has not been determined. Significant portions of the sampling and analysis plan described below in Subsection 3.1 are designed to determine nature and extent of contamination.

3.0 PROPOSED REMEDY

3.1 Description of the Proposed Remedial Action

3.1.1 Overview and Rationale

Historical data suggest that several constituents are present at levels above background. Additionally, discussions with site workers involved with the 1960s cleanup of the TA-16 World War II area suggest that HE contamination near decommissioned sumps and drain lines was common (Martin and Hickmott 1993, 15-16-497). The proposed D&D plan and this VCA plan (described in Section 3.1) will be implemented to remove the subsurface fixtures in these SWMUs, the sumps and drain lines, and any hot spots of high explosives or other contamination.

This VCA will proceed in three stages.

- Stage I: Characterization sampling will immediately follow the D&D removal of the fixtures, and will be an implementation of the field-screening portion of the approved work plan for the 90s-Line with minor modifications to reflect that this investigation is no longer reconnaissance sampling. This stage includes some laboratory sampling.

- Stage II: Following these activities, contaminated soils will be removed to cleanup levels based on lateral and vertical field screening and laboratory sampling adjacent to contaminated soils. This stage of the VCA will also include waste management sampling.

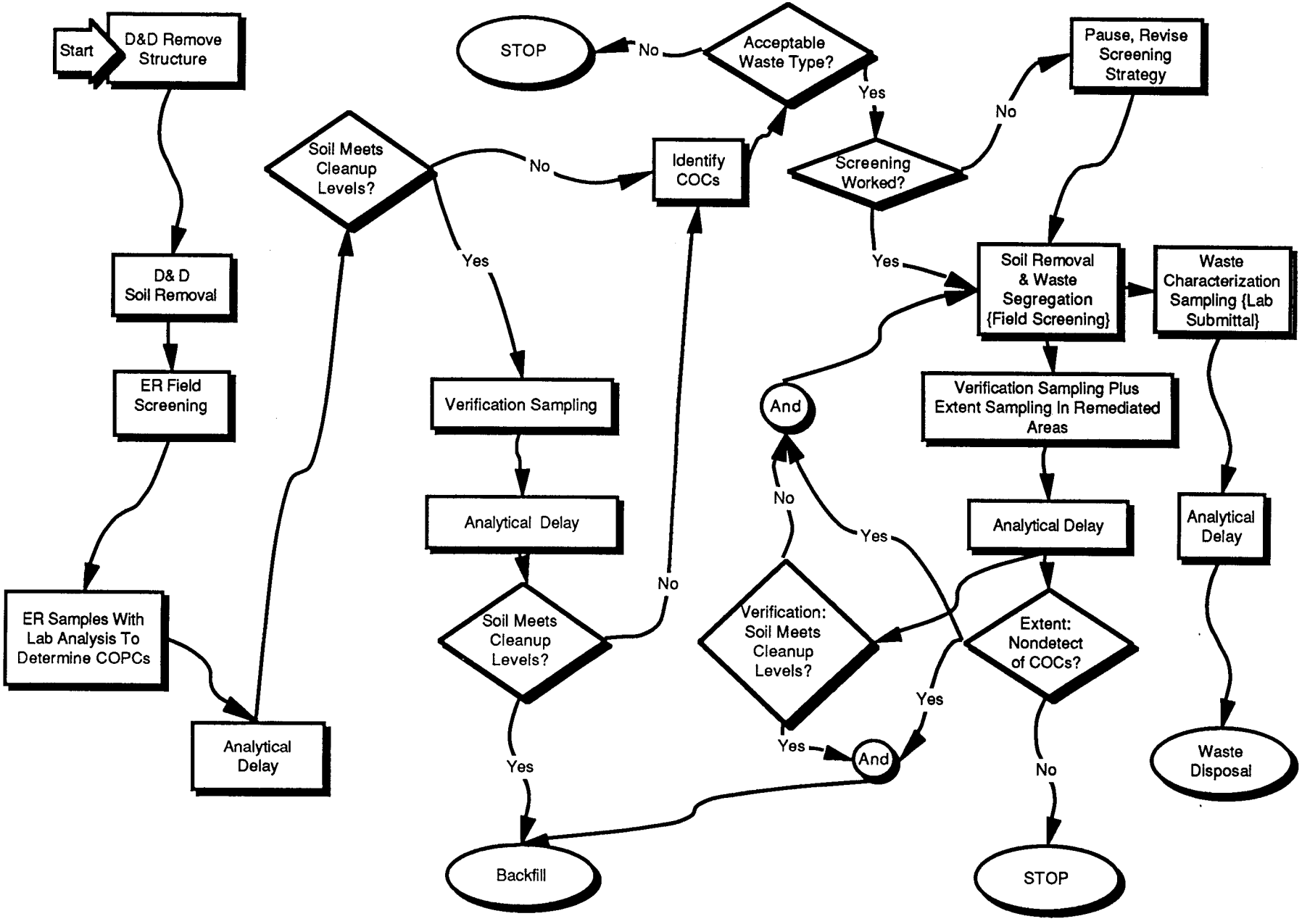
- Stage III: Stage III sampling will consist of verification which will confirm that the cleanup standards were achieved. This sampling encompasses all of the laboratory sampling in the approved work plan.

A decision flow diagram illustrating activities and decisions associated with this VCA is presented in Figure 3.1.1-1.

3.1.2 Permitting, Approval, and Notification Requirements

An excavation permit has been prepared by the D&D team and submitted for approval. Soil removal activities are included in the excavation permit. Documentation will be prepared in accordance with LANL Environmental Restoration (ER) Administrative Procedure (AP) LANL-ER-AP-05.1, Rev. 0, Readiness Review for Environmental Restoration Program Field Activities. Key documents to be prepared include a SSHASP, and waste CSF. Site workers must have received all training required for this project as specified in the SSHASP.

Field Unit 3 TA-16 90's Line VCA
Fig. 3.1.1-1



3.1.2.1 Regulatory Notification/Permit Modifications

SWMUs 16-026(m-p) and 16-029(k,l,q,s,t,u), are included in Table C of the HSWA Module. Finalization of this VCA will require a Class III modification to the HSWA Module. EPA and the New Mexico Environment Department (NMED) will be notified of this project. Class III Permit Modification will follow approval of the VCA Report. Implementation of this VCA will proceed in coordination with the D&D activities. Although LANL suggests conservative cleanup levels, LANL recognizes that some re-excavation may be required following receipt of an NOD from EPA or NMED.

3.1.2.2 DOE Approval

DOE approval will be documented in a signed Voluntary Corrective Action Checklist (Annex 7.8)..

3.1.3 Cleanup Activities

The cleanup of these SWMUs will be performed in three stages. The first stage is designed to remove the surface and subsurface structures within the SWMUs and perform the Stage I characterization sampling. The structure removal will be performed by the D&D contractor. Stage I sampling will be performed by Field Unit 3 personnel. The second stage will determine lateral and vertical extent of contamination and remove subsurface soil contamination to achieve cleanup levels. The final stage, verification sampling, ensures that cleanup standards are met. The sampling and analysis plans for Stage I and II are described in Subsection 3.1.3.2.1 , the sampling and analysis plan for Stage III is in Subsection 5.0

3.1.3.1 D&D Activities (Stage I)

The D&D contractor will perform the following activities relevant to the sump and drain line SWMUs as part of Stage I. The full statement of work for the D&D activities is provided as Appendix A to this document.

- Decontaminate sumps and drain lines using steam or other approved methods for HE decontamination.

- Remove concrete sumps intact and drain lines to the outfall. Transport these to the TA-16 open burn pit for flashing prior to disposal at TA-54.

- After removal of all concrete and underground utilities, obtain a soil sample from near the center of each building footprint and at the bottom of sump and drain line excavations in accordance with the Laboratory's remedial action sampling plan for HE analysis before backfilling.

- Backfill, compact, and reseed each demolition site as indicated on the demolition plan drawings. Additional clean fill material will be obtained on site.

It is important to note that these activities may not occur in the order written and that, whenever possible, they will occur in parallel for several SWMUs to expedite the cleanup process for potentially contaminated soils.

The sampling and voluntary corrective action of soil associated with these SWMUs will occur prior to the backfilling and site restoration activities. During the voluntary corrective action activities, the excavations will be fenced and covered with plastic to ensure that run-on and runoff are minimized. Other BMPs, such as hay bales in drainages, will be implemented as appropriate to minimize COPC transport from the SWMUs.

3.1.3.2 Soil Characterization activities (Stages I & II)

Following removal of the sumps and drain lines Stage I and Stage II soil characterization and soil removal activities will occur. The following tasks are proposed.

- Implement the field screening portion of the approved Phase I RFI work plan for SWMUs 16-026(m-p) and 16-029(k,l,q,s,t,u) as described in Addendum I to the RFI Work Plan for OU 1082(LANL 1994, 1160). Proposed modifications to the approved plan are described below. These reflect the fact that cleanup will occur in parallel with characterization activities.

- Implement additional Stage I characterization sampling that is designed: 1) to determine nature and extent of contamination; 2) to ensure that cleanup levels are achieved.

- Identify and flag soil locations for excavation based on the analytical results and cleanup levels.

- Ensure that the derived waste is adequately characterized for shipment to an approved offsite treatment, storage, and disposal facility.

3.1.3.2.1 Sampling and analysis plan

RFI Phase I sampling as described in the work plan was designed to determine whether a release has occurred at levels above SALs. The sampling plans for PRSs 16-026(m-p) and 16-029(k,l,q,s,t,u) are in Subsection 5.23 of Addendum I to the RFI Work plan for OU 1082,. Modifications to those sampling plans are outlined in the response to notice of deficiency (NOD) to EPA dated November 1994.

The sampling and analysis plan proposed here includes modifications to the approved RFI Phase I screening sampling plans, reflecting the differences between reconnaissance sampling and cleanup sampling.

- Not all HE positive samples will be submitted for laboratory analysis, although all samples that are HE positive by the spot test will be analyzed by an on-site laboratory to determine if the HE content exceeds 5%. Decisions to clean up HE-contaminated soils will be based on Draft EPA Method 4050 for TNT and Draft EPA Method 4051 for RDX field screening methods. (Final confirmatory samples will be submitted for laboratory analysis, as described in Section 5.0.)

- Additional screening, by immunoassay for polycyclic aromatic hydrocarbons (PAHs), and for metals by XRF, is also proposed to guide soil removal to achieve cleanup levels and to screen for COPCs that are not expected based on knowledge of process but that may be present.

- Subsurface locations will be sampled using backhoes and other heavy equipment operated by the D&D contractor rather than by core drilling.

- Waste management samples have been added to the sampling plans to support disposal of soil wastes generated during this voluntary corrective action.

3.1.3.2.1.1 Problem Definition

This sampling and analysis plan has the following goals and objectives:

1) Biased screening sampling needs to be completed to determine whether environmental releases have occurred that are of concern to human health and the environment. LANL anticipates that such releases have occurred at SWMUs within the 90s-Line.

   Such sampling will focus both on COPCs that are expected to be present at levels above cleanup standards, such as RDX, TNT, and barium, and COPCs that may be present, such as additional metals, PAHs, and VOCs. Laboratory analyses of soils are needed to determine if the proposed COPC list is adequate or whether additional COPCs may be present at these locations.

2) At those locations where releases have occurred, the vertical and lateral extent of contamination must be determined. Delineation of contamination must encompass both definition of cleanup boundaries to guide soil removal, and determination of the extent of releases at levels below cleanup levels. Sampling must extend both downgradient and vertically below observed releases.

3) The soils that exceed cleanup standards must be identified and segregated by waste type.

A history of activities in the 90s-Line buildings, listings of structure-specific COPCs, and site descriptions are provided in detail in Subsections 1.1.1, 2.0, and 1.1.0.1, respectively. The principal COPCs for all of these SWMUs are TNT, RDX, and barium. LANL

anticipates that releases of these COPCs are likely to be found above proposed cleanup levels at many of the SWMUs in the 90s-Line.

Building-specific information relevant to this sampling and analysis plan is provided in Table 3.1.3.2.1.1-1.

TABLE 3.1.3.2.1.1-1

SUMARY OF INFORMATION ON 90s-LINE PRSs

BUILDING	SWMUS	LIKELY COPCS	USE/NOTES
TA-16-89	16-026(p), 16-029(u)	HE, Barium	HE machining, storage
TA-16-90	16-026(o), 16-029(t)	HE, Barium	HE machining, storage
TA-16-91	16-026(n), 16-029(s)	HE, Barium	HE machining, disassembly, storage
TA-16-92	16-026(m), 16-029(l)	HE, Barium, Uranium contamination possible	HE machining, disassembly, storage
TA-16-93	16-029 (k)	HE, Barium, plating metals. Barium, Beryllium, Cadmium, Lead, Zinc > background	Electroplating. Low HE use.
TA-16-99	16-029(q)	HE, Ba	HE machining. High HE use.

Regulatory drivers for activities described in this sampling and analysis plan are DOE and EPA RCRA guidance documents for the corrective action process (DOE 1089, 0078; EPA 1989, 0088). All of these PRSs are include in Table C to the HSWA Module. Cleanup levels are calculated according to guidance in EPA documents (EPA 1991, 0302), as described in Section 3.2. Waste characterization sampling is designed to comply with waste acceptance criteria based on 40 CFR 261.

A summary of Stage I through III sampling is provided in Table 3.1.3.2.1.1-2.

TABLE 3.1.3.2.1.1-2

SUMMARY OF VCA SAMPLING

BUILDING	SWMUS	FIELD SCREENING	LAB (STAGE I)	LAB (STAGE II)	LAB (STAGE III)
TA-16-89	16-026(p), 16-029(u)	10 Drainage 6 Sumps	2[1]	2[1]	10[2]
TA-16-90	16-026(o), 16-029(t)	10 Drainage 6 Sumps	2[1]	2[1]	10[2]
TA-16-91	16-026(n), 16-029(s)	10 Drainage 6 Sumps	2[1]	2[1]	10[2]
TA-16-92	16-026(m), 16-029(l)	10 Drainage 6 Sumps	2[1]	2[1]	10[2]
TA-16-93	16-029(k)	13 Drainage 6 Sumps	2[1]	2[1]	10[2]
TA-16-99	16-029(q)	14 Drainage 6 Sumps	2[1]	2[1]	10[2]

1. These are the minimum numbers of samples.
2. Stage I or Stage II samples for clean zones may substitute for some of these 10 samples.

3.1.3.2.1.2 Sampling and Analysis Plan Design - Stage I & Stage II sampling

Although the 90s-Line SWMUs include sump-only SWMUs, drain line/outfall SWMUs, and sump/drain line/outfalls SWMUs, the sump/drain line/outfall SWMU systems for each building will be handled similarly for the purposes of sampling. Although the processes that occurred in these buildings differed slightly, the similar broad-spectrum analyte suites will be used in this VCA. The only exception is that samples with TA-16-92 will be analyzed for Uranium.

STAGE I

Stage I measurements address the first objective outlined in Section 3.1.3.2.1.1. Laboratory results will be examined to determine whether additional COPCs exist, beyond those that are outlined in Table 2.3.4-1. This decision will be based on comparison of all measured analyte concentrations with LANL residential SALs. Any analyte that is above SAL in any sample will be added to the COPC list, cleanup levels will be calculated using methodologies outlined in Annex 7.1, and soil contaminated above the calculated cleanup levels will be identified for removal. Both laboratory analyses and field screening will be used to determine the locations of each waste type that requires excavation.

Activities during D&D

Engineering surveys will be performed during D&D excavations of each sump/drain line system. Joints, cracks, and other leak points in the vitrified-clay pipe and sumps will be flagged.

Activities following D&D

For each sump/drain line/drainage system, which typically consists of two sumps, two drain lines joining to feed an outfall, and an associated drainage, the following activities will occur.

- A minimum of ten locations in the drain line excavations and outfall drainages will be field screened, with particular focus on leak points and vitrified-clay pipe joints (Figure 3.1.3.2.1.2-1). Four additional screening points in the drainages for SWMUs 16-029(q) and three additional screening points in the drainage for 16-029(k) will also be taken (Figure 3.1.3.2.1.2-1) following a geo-morphological investigation of these drainages. These additional screening locations will be biased to clay-rich sediment traps or other obvious sediment collection points.

  Three locations will be field screened in each excavated sump for a total of six for the two sumps associated with each building. Sump screening locations will be biased to areas containing visible HE or soils adjacent to leak points.

  Initial screening will be for HE using the HE spot test, for volatiles using a photoionization detector (PID) with an 11.7 eV bulb, for barium and other metals using field-based XRF, for radionuclides using a hand-held beta-gamma detector, and for PAHs using immunoassay methods. Screening sample locations yielding negative HE spot test results will be re-screened using immunoassay methods for RDX and TNT.

  All field screening results will be noted in the field logs.

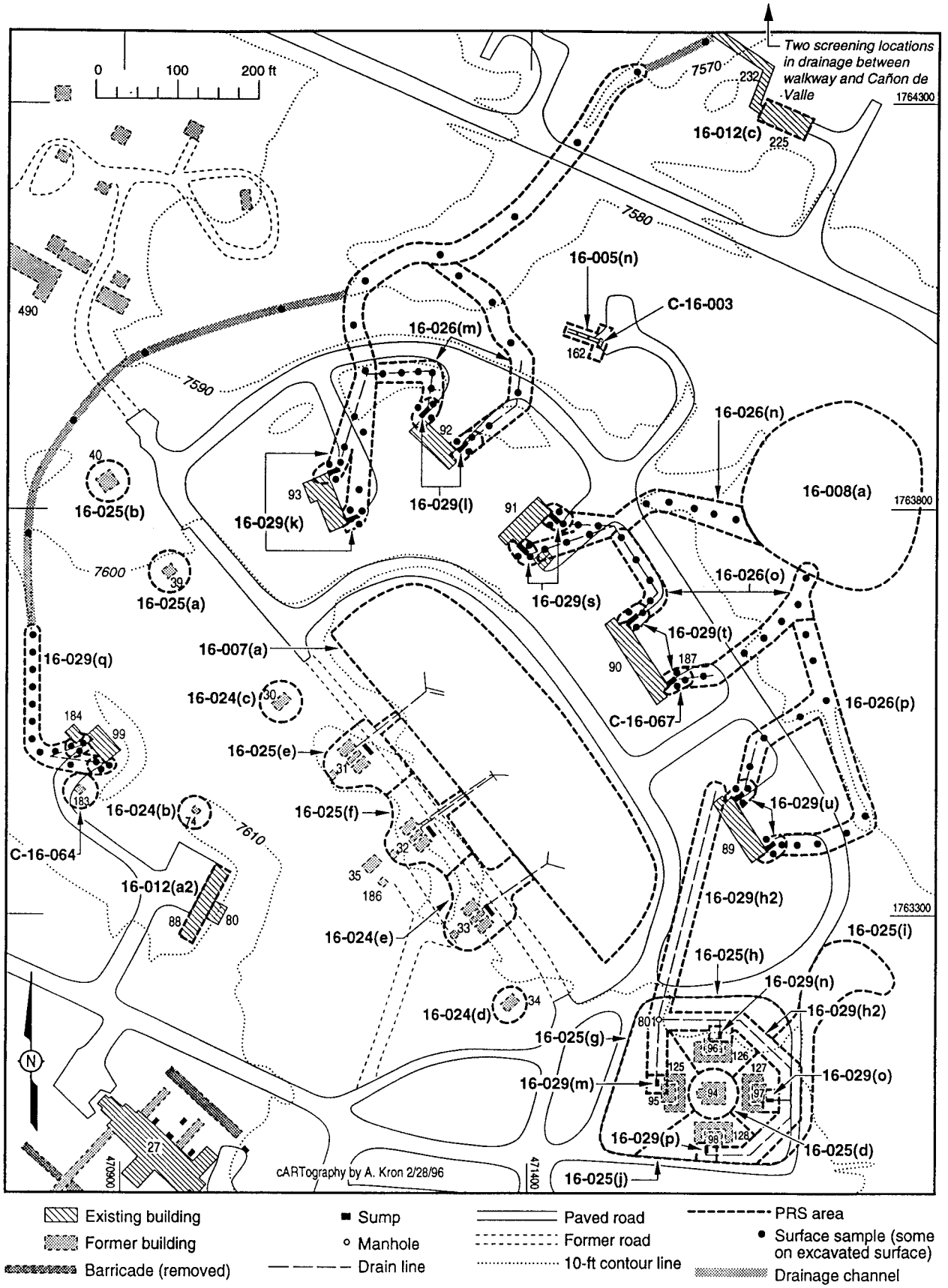


Figure 3.1.3.2.1.2-1. Screening sampling locations at the 90s-Line.

- A minimum of two samples for each sump/drain line/outfall will be submitted for laboratory analysis for volatiles, metals, uranium, semivolatiles, and high-explosives. Uranium analyses will only be from samples within SWMUs associated with TA-16—92 or any samples that yield positive field readings. These will be biased to locations that screen positive by field screening methods. The soils containing the highest level of each COPC, other than HE, at a level above background based on the screening methods will be submitted for laboratory analysis. In the absence of field-screening hits, the laboratory samples will be biased to obvious leak points in the sumps and drain lines or to clay-rich sediment traps.

  All laboratory analyses in Stage I will be submitted for two-week turnaround.

- All samples that yield positive results on the HE spot test will be submitted to an on-site laboratory for total HE-content analysis to determine if they are classed as RCRA reactive wastes and must be shipped according to Department of Transportation regulations governing the shipment of explosive materials. Samples containing greater than 5 wt % HE are considered to be reactive by the operating group at TA-16.

- All locations that contain any COPC above cleanup levels based on field-screening results will be flagged as locations in which cleanup is required. Soil will also be flagged as to expected waste types. Potential RCRA metal waste will be identified based on XRF screening, potential RCRA organic waste will be identified based on PID screening, potential radionuclide or mixed waste will be identified based on hand-held beta-gamma screening, and potential reactive waste will be identified based on HE spot test and on-site laboratory analysis.

- Samples from any locations designated for cleanup that include areas where greater than 5 wt % HE has been observed will be submitted for laboratory analysis for VOCs, metals, and uranium to ensure that minimal wastes are generated containing F-listed (Code of Federal Regulations 40 Part 261)

wastes (either volatile or cyanide bearing) or radionuclide wastes combined with reactive wastes. Treatment, storage, and disposal facilities to handle these types of waste are expensive.

STAGE II

During the voluntary corrective action, the D&D contractor will remove soil in twelve in. lifts at locations with COPCs at levels of one-half the cleanup levels proposed in Table 3.2.3-1 base on field screening. Removed waste will be segregated and placed in containers. Stage II sampling addresses the second and third objectives stated in Section 3.1.3.2.1.1. In particular, analyses will be examined to determine whether the vertical and lateral extent of contamination have been bounded, or whether a stopping rule should be invoked because the vertical extent cannot be bounded within the scope of this VCA. The waste management sample analyses will be examined to confirm that all waste types have been identified and to segregate wastes for disposal in the most cost-effective manner.

Activities concurrent with VCA

- Each lift will be field screened for all COPCs above the proposed cleanup levels at an individual site. All locations with COPCs above 50% of the cleanup levels (based on field instruments) will be excavated in both vertical and lateral directions until a clean zone is determined and extent of contamination is verified.

- However, if screening reveals contamination extending to more than 3 ft into the tuff, then work will be halted at this location and the site will be re-evaluated. Excavated material will be screened on 12-in. intervals for metals by XRF, HE by spot test, volatiles by PID, and radionuclides by hand-held beta-gamma detector.

- A laboratory sample will be submitted from the interval directly beneath the deepest cleanup interval from each remediated area to ensure that contamination has been bounded in the vertical direction.

If any bounding samples contains a COPC above proposed cleanup levels, then that location will be resampled at a depth 2 ft greater than the contaminated sample, and that sample will be analyzed by the laboratory for the COPCs that have not been bounded. If these results still suggest that contamination has not been bounded, then stop work at the location in which contamination has not been bounded.

- In addition, whether or not material is removed from beneath a sump based on field screening criteria, one sample location will be excavated and sampled 3 ft beneath the bottom of each removed HE sump. It is anticipated that this sample will extend into the underlying tuff. These samples will be submitted for laboratory analysis for VOCs, SVOCs, metals, HE, and uranium. Uranium analyses will be limited to samples associated with TA-16-92 and to any other samples exhibiting positive indicators for radionuclides on hand-held instruments.

  All laboratory analyses in Stage II will be submitted for two-week turnaround.

- At least two waste management samples will be composited from each segregated waste type defined by field screening. LANL anticipates that these waste types will be: 1) industrial (low-level HE wastes), 2) RCRA metals; 3) RCRA organics; 4) RCRA electroplating; and 5) radioactive waste. Reactive waste and mixed wastes are also possible. The actual number of waste management samples will be selected to meet the waste acceptance criteria of the selected treatment, storage, and disposal facility.

  These waste management samples will be analyzed for high explosives, VOCs, SVOCs, and toxicity characteristic leaching procedure (TCLP) metals. Additional waste management analytes may be added to this list if required by the waste acceptance criteria (WAC) of the treatment, storage, and disposal facility.

  All waste management samples will be submitted for two-week turnaround.

Assumptions

Some assumptions underlie the design of these plans. These, together with their significance and handling, are as follows.

- Assumption: RDX, TNT and barium are the COPCs most likely to require cleanup. Other COPCs, some of which are listed in Table 3.2.3-1, may be present, but it is unlikely that they will be present above cleanup levels.

  This assumption dictates the main field screening methods to be used. The field screening methods available for TNT, RDX, and barium are adequate at levels at least an order of magnitude better than proposed cleanup levels. Performance of these methods, as outlined in the manufacturer's specifications, and relative to proposed cleanup levels and SALs, are presented in Table 3.1.3.2.1.2-1.

  Volatile screening and sampling will be completed only within excavations, and will occur as soon as possible following excavation.

  All identified COPCs, including specific HE and PAHs, will be included in verification samples (Section 5.0).

TABLE 3.1.3.2.1.2-1

PERFORMANCE OF FIELD SCREENING METHODS FOR PRINCIPAL COPCs

COPC	METHOD (EPA ?)	DETECTION LIMIT (MG/KG)	RESIDENTIAL SAL (MG/KG)	INDUSTRIAL CLEANUP LEVEL (MG/KG)	NOTES
Barium	XRF	16	2 000	10 000	60 second run time
RDX	Immunoassay (SW-846 Method 4050)	0.5	4	17	Partial HMX cross-reactivity
TNT	Immunoassay (SW-846 Method 4051)	0.5	48.4	64	DNT and other aromatic HE crossreactivity

- Assumption: The principal release points of COPCs to the environment are: cracks in the sumps or drain lines, the sump/drain line join, the vitrified-clay pipe joints, and the outfalls.

This assumption is important only for biasing Stage I sampling so that all significant COPCs will be identified.

- Assumption: Significant amounts of COPCs contamination are unlikely at depths greater than 3 ft into the tuff.

  A stopping rule is provided (see Subsection 3.1.3.2.1.3) in case this assumption fails.

- Assumption: Minimal amounts of waste types that are difficult or expensive to dispose of will be present. These waste types are: mixed waste, RCRA reactive waste, particularly when combined with F-listed wastes (CFR 40 Part 261), and mixed reactive waste.

  A stopping rule is provided (see Subsection 3.1.3.2.1.3) in case this assumption fails.

Quality Assurance activities

Quality assurance (QA) will be implemented under the framework of the LANL Quality Assurance Project Plan (QAPP). Site-specific quality issues include quality assessment sampling and QA audits/surveillances, as well as contract-specified laboratory QA activities.

Quality will be ensured primarily by identifying and following appropriate SOPs. Applicable SOPs are identified in Section 3.1.3.2.1.3. One field audit/surveillance during the VCA is planned.

The principal QA activity for all field screening methods is daily calibration and performance evaluation (PE) sample checking, as specified in appropriate SOPs. One lab sample per day will be split and analyzed by the HE immunoassay methods during the first 2 weeks or until 10 such field duplicates have been analyzed, in order to provide information on the precision of these observations. Samples with positive (above detection limit) results by the screening method should be used for this purpose. In Stage

l, a number of samples will be analyzed by both field screening and standard laboratory methods, providing information on the bias and sensitivity of the field methods.

One potential QA concern with the screening methods employed is the cross-reactivity between RDX and HMX and between TNT and DNT. However, processing at the 90s-Line buildings occurred during the 1950s, when TNT and RDX were the principal explosives used in nuclear weapons and prior to the extensive use of HMX at TA-16. FY 1995 sampling at TA-16 has shown little DNT. Therefore, it is reasonable to assume that RDX predominates over HMX, TNT predominates over DNT, and false positives using the HE immunoassay kits will be minimal. This assumption is also conservative with respect to residual risk in that RDX has a low cleanup level, while HMX is less toxic and has a relatively high cleanup level. Therefore, no special QA activities are planned to address cross-reactivity concerns.

Two collocated laboratory samples will be provided during the Stage I sample collection. (The QAPP requires a minimum of four such samples per field unit per field season in order to provide information at the programmatic level.) These two samples will be collected from PRSs 16-029(k) and 16-029(n), if possible from locations with positive field screening results. Other field QA samples designed to defend against false positives, such as blank samples and rinsates, have little value in the context of a cleanup. It is extremely unlikely that low-levels of laboratory contamination or cross contamination will be of concern when decision points are at levels of tens of parts per million. Therefore, no additional field QA samples are proposed.

Contract laboratories will provide standard QC measurements (surrogates, blanks, check standards, matrix spikes, etc., as specified by the analytical procedures requested) and will supply complete analytical data packages supporting the reported results. However, due to the time constraints associated with coordination of RFI cleanup activities and D&D activities, data will be used prior to full validation and verification.

3.1.3.2.1.3 Sampling and Analysis Plan Implementation

Engineering Surveys

Engineering surveys will be performed following ER SOP 3.01, Land Surveying Practices. Sampling locations will be marked with aluminum disks inscribed with location IDs. Locations of leaks, joints and cracks will be flagged, surveyed using a global positioning system (GPS) to within < 1 ft, and photographed using a Polaroid™ camera. Soil types, including estimates of clay/sand/cobble, will be completed for each surveyed locality. Depths of the bottoms of the sumps and drain lines will be measured using tape and compass to an accuracy of approximately +/- 6 in.

Field Methods and Measurement Methods

Laboratory and field screening samples will be collected following ER SOP 6.09, Spade and Scoop Method for Collection of Soil Samples. Spade and scoop samples will be taken from the bucket of the backhoe in 12-in. lifts. Field screening methods to be used are:

- ER SOP 10.06, High Explosives Spot Test, for HE by spot test,
- Draft EPA Method SW-846 4050 for RDX (manufacturer's instructions will be followed),
- Draft EPA Method SW-846 4051 for TNT (manufacturer's instructions will be followed),
- ER HSM 1C, Direct-Reading Monitoring Method Using GCs, PIDs and FIDs, for volatiles by PID (note that flame ionization detectors (FIDs) are not allowed to be used at TA-16, because they use a flame could produce a safety hazard in the vicinity of HE),
- ER SOP 10.08, Operation of the Spectrace 9000 Field-Portable X-Ray Fluorescence Instrument, for metals by XRF,
- ER SOP 10.10, Radiation Scoping Surveys, for radionuclides by hand-held sodium iodide detector.

Calibration of field screening methods will occur daily by analysis of a check standard. Results of all field screening will be noted in the field logs following ER SOP 1.04, Sample Control and Field Documentation.

Off-site analytical laboratory methods will be EPA SW-846 methods or equivalent methods. Specific methods proposed include:

- EPA SW-846 method 8330 for HE,
- EPA SW-846 method 8260 for volatiles,
- EPA SW-846 method 8270 for semi-volatiles, and
- EPA SW-846 method 6010 for metals.
- Total Uranium by Inductively Coupled Plasma Mass Spectrometry (ICP-MS)

Field Decisions

Field screening will be used to flag areas for cleanup, waste type segregation, and extent of contamination.

Any soil sample that contains COPCs one-half the proposed cleanup levels (see Table 3.1.3.2.1.3-1) as measured by field screening, will be segregated for disposal.

TABLE 3.1.3.2.1.3-1

FIELD SCREENING CLEANUP AND WASTE SEGREGATION CRITERIA

COPC	Screening Method(s)	Screening Level - Cleanup (mg/kg)	Screening Criteria - Waste Type (mg/kg)	Potential RCRA waste type[a]
Barium	XRF	5000	2 000	D005
Cadmium	XRF	43	20	D006
Chromium	XRF	225	100	D007
Nickel	XRF	1 700	NA	Non-RCRA

Lead	XRF	500	100	D008
PAH	Immunoassay	5	NA	Non-RCRA
RDX	HE spot/immunoassay	9	50 000	D003, K044
Solvents	PID	NA	greater than detection limit if F solvents found	F001,F002, F005
TNT	HE spot/immunoassay	32	50 000	D003, K044
Uranium	Beta/gamma	142	greater than background	non-RCRA, mixed or radioactive

a.40 CFR 261

b. NA= Not applicable

The criteria for waste segregation are:

1) HE > 5% based upon on-site laboratory = potential reactive waste (D003 or K044).

2) Barium > 2000 ppm on XRF = potential RCRA metals waste (D005). This determination is made using the 20x rule between TCLP levels and soil total contaminant levels. Results of similar calculations are presented above for other metals that may be found above background levels.

3) PID > detection limits = potential RCRA organic waste (F001 or F002 are most likely),

4) All wastes from soils associated with TA-16-93 should be considered potential RCRA electroplating wastes (F006-F010).

Field screening decision levels are summarized in Table 3.1.3.2.1.3-1.

Stopping Rules

There are three principal stopping rules associated with this VCA, two concerning waste types and volumes and one concerning extent of contamination:

1) If more than two cubic yards of potential RCRA reactive waste, more than two cubic yards of potential mixed waste, or any reactive mixed waste are to be generated, then stop work.

2) If the total volume of any kind of soil waste is more than twice the volumes listed in Table 3.2.3-1, then stop work.

3) If levels of COPCs are above proposed cleanup levels at a depth of greater than 3 ft into the tuff, then stop work.

If any of these criteria are met based on field measurements, then the field team is to stop work on the VCA for an individual SWMU, contact the field project leader (FPL) or his designee, and wait for further instructions.

Sample Handling

Sample handling will be performed according to ER-SOP 1.02, Sample Container and Preservation, ER-SOP 1.03, Handling, Packaging and Shipping of Samples, and ER-SOP 1.04, Sample Control and Field Documentation. All samples containing more than 5 wt % of HE based on field screening and on-site laboratory analysis will be considered explosives for shipping purposes; if laboratory analyses are required, they will be shipped to off-site laboratories in tubular steel containers. Samples will be collected and stored in appropriate sample containers as prescribed in the QAPP. Samples for volatile organic analysis will be collected as soon as possible following excavation. All samples will be shipped in a timely fashion in order to meet prescribed analytical holding times.

Data Tracking

All field information will be recorded in the field notes following ER-SOP 1.04 "Sample Control and Field Documentation". Information will also be entered into the 4-D database by the field team. External laboratory data will include both hard-copy data and an electronic data deliverable. The data in the electronic data deliverable will be uploaded to the FIMAD.

Schedule

Sampling and analysis must be coordinated with cleanup activities. Based on the experience of the Field Unit 3 field team, 10 samples/per day can be screened for TNT, RDX, and barium. All laboratory analyses will be rapid turnaround (2 weeks or better). The detailed sampling and analysis schedule is integrated with the VCA schedule provided in Section 6.0.

3.1.3.2.1.4 Data Assessment

PE sample results for field screening instruments required by the SOPs will be reported weekly. All field screening results, including results for field splits, will be reported weekly. Stage I field screening results will be used, in conjunction with Stage I laboratory results, to evaluate the performance (sensitivity, precision, bias) of the proposed field methods before Stage II begins.

For laboratory data, a complete data package and an electronic deliverable are ultimately required. Routine data validation will be performed (possibly electronically) prior to uploading data into FIMAD. Because of the rapid turnaround time required to coordinate screening with D&D activities, initial evaluation of a cleanup location may be made based on data that is not quality assured.

3.1.3.2.1.5 Administration

Training

All members of the field team are required to have completed: HE corridor training, TA-16 site-specific training, Hazardous Waste Operations and Emergency Response (HAZWOPER) training, RAD worker II training, and all other relevant formal and read-only training as determined by the FPL. A detailed training matrix for field personnel is presented in Appendix B.

Records

Records to be generated by the field team include the field log book, sample collection logs, weekly and monthly summary reports, weekly field screening data reports

(preferably an electronic flat file such as Excel), a completed and reviewed 4-D database at the conclusion of the VCA, chain-of-custody forms, a post-field operations report, and other forms and logs as specified in LANL ER SOPs.

Oversight

Oversight activities for this VCA include a readiness review which is scheduled for 2/22/96, periodic field audits/surveillance surveys, and daily site-specific HE safety inspections.

Reports to Management

The field team will provide weekly reports on field operations to the FPL or his designee. These reports will include a summary of samples collected, field screening hits obtained, and any unusual occurrences.

The FPL will be contacted immediately if any stopping rule is invoked, if any violations of the SSHASP occur, or in the event of serious, unexpected events.

3.2 Basis for Cleanup Levels

In order to derive target cleanup levels for use during this VCA, potential impacts of residual COPCs on both human health and the environment are considered. Risk-based cleanup levels, based on an evaluation of the potential exposure pathways and scenarios described in the following sections, are proposed.

COPCs identified for this VCA are based on comparison of SWMU 16-029(k) historic data to background and SAL concentrations, and on information concerning the 1960 cleanup activities of World War II-era S-Site structures. In addition, screening and laboratory analyses will be broad spectrum in order to ensure that no previously unidentified COPCs are missed during the VCA.

3.2.1 Potential Pathways

In order to derive target cleanup levels for use during this VCA, potential impacts of residual COPCs on both human health and the environment are considered. Risk-based cleanup levels are based on an evaluation of the potential exposure pathways and scenarios described in the following sections.

3.2.1.1 PRS - In Place

Exposure pathways are the mechanisms through which an individual may come into contact with a chemical in the environment. Exposure pathways are influenced by environmental conditions, by the potential for the chemical to move from one medium (i.e. soil, water or air) to another, and by the general lifestyles and/or work activities of the potentially exposed population (i.e., construction work or residential activity). Although many potential pathways are possible, only a few may be complete and pose a potential risk to exposed populations. For a pathway to be complete, each of the following elements must exist:

- a source and mechanism for chemical release into the environment;
- a point of potential contact with the environment; and
- an exposure route at the contact point (i.e., inhalation, ingestion, and dermal contact).

Historical information and the limited results from sampling and analysis at the PRS indicate that contamination is limited to the soils associated with buildings, sumps, and outfalls at this location. If the contaminated soils remain in place, several mechanisms are available to transport contaminants from their current location which include sediment transport by surface water runoff, erosion of soil, and wind dispersion. A conceptual model for sites with surface soil contamination was present in the RFI Work Plan for OU 1082 (LANL 1993, 1094). The following potential human exposure pathways to surface soils were identified in the conceptual exposure model:

- incidental soil ingestion
- dermal contact with soil
- inhalation of particulates

These three exposure pathways are considered potentially complete, and will be considered in the derivation of cleanup levels for this PRS.

A possible shallow water-bearing zone beneath the 90s-Line may be associated with springs located near the site. The springs or consequent stream flow, if derived from this water-bearing zone, could be impacted through downward migration of contaminants 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. The vertical extent of contamination will be defined during this VCA.

3.2.1.2 PRS - Remediation

Possible exposure pathways to workers involved with remediation activities at these PRSs are generally the same as those described in Section 3.2.1.1. Excavation activities may increase the potential for sediment transport and wind dispersion. Therefore, precautions will be taken to minimize these pathways during remediation and D&D activities. Appropriate dust suppression techniques will be used to prevent contaminants from becoming airborne. Plastic sheeting will be used to cover the excavated area and excavated material to prevent rainwater and/or runoff from contacting potentially contaminated material. Best management practices (BMP), such as placement of hay bales in downstream drainage locations, will be implemented in collaboration with LANL group ESH-18 as part of stormwater prevention program activities.

3.2.2 Future Land Use

The 90s-Line SWMUs lie entirely on DOE-owned land. The area is removed from public access roads. Access to the area is limited to Q- and L-cleared personnel who have had site-specific HE training or to visitors escorted by cleared individuals with such training. In the future, the land will be used exclusively for LANL (industrial) operations, as stated in the Site Development Plan Annual Update 1994 (LANL 1994, 1171).

Exposure scenarios describe the circumstances by which an individual may come into contact with chemicals in the environment. Because TA-16 will remain dedicated to continued Laboratory operations into the future, only a continued laboratory exposure scenario (in which the receptor is a generic, long-term industrial worker) will be evaluated to derive cleanup levels.

Table 3.2.2-1 shows the average concentrations for the currently identified COPCs that are associated with various levels of risk under this scenario. The equations and assumptions used for the calculations in this table are in Annex 7.1.

TABLE 3.2.2-1

RISK LEVELS ASSOCIATED WITH COPCs FOR THE 90s-LINE SWMUs

CONTINUED LABORATORY OPERATIONS SCENARIO

CHEMICAL	CLEANUP LEVEL RANGES (MG/KG) CARCINOGENS			CLEANUP LEVEL RANGES (MG/KG) NONCARCINOGENS	
	10-6	10-5	10-4	HI[a] = 1.0	HI = 0.1
Barium				100 000	10 000
Cadmium				850	85
Chromium (total) Assumes 1/6 of total Cr is Cr(VI).	450	4 500	45 000		
Copper				63 000	6 300
Cyanide				14 000	1 400
DNB mixture				68	6.8
DNT mixture	2.8	28	280		
HMX				34 000	3 400
Lead				1 000	1 000
Nickel				34 000	3400
PAH	1	10	100		
RDX	17	170	1 700		
TNB				34	3.4
TNT	64	640	6 400		
Uranium	284 [c]	NA	NA	5 100	510

a. HI = Hazard index

b. NA = Not applicable

c. This uranium level is a dose based level. See Subsection 7.1

Ecological concerns associated with this group of SWMUs will be considered in the context of ecological exposure units. These assessments of ecological exposure units will be completed in the future.

3.2.3 Cleanup Levels

Typically, the Laboratory derives cleanup levels with a point of departure of 1E-6 for carcinogens and a hazard index of 0.1 for noncarcinogens. This conservative approach is adopted to account for the presence of multiple constituents and to be sure that residual risk will be within the EPA-acceptable risk range of 1E-4 to 1E-6 for carcinogens and less than a hazard index of 1 for noncarcinogens.

The following additional site-specific factors should be considered in establishing cleanup levels for this VCA.

1. The 90s-Line is in a remote area that has highly controlled access for personnel. Therefore, the default exposure parameters for the long-term worker are highly conservative and represent an extreme upper bound of potential risk.

2. Following remediation, most residual contamination will be at depths below two to five feet, which are the estimated depths of the drain lines and sump bases. It is difficult to envision a credible exposure scenario that would provide <u>any</u> long-term exposure to significant amounts of subsurface soil at these sites. In two plausible worst-case scenarios, either a worker excavating utilities in the area could be subject to exposure to subsurface contaminants or if a new facility were to be located in the area, then construction activities could bring a fraction of the contaminated soil to the surface. In either case the default exposure parameters outlined in Annex 7.1 would be extremely conservative. The calculated cleanup levels are therefore extremely conservative.

3. Both TNT and RDX are Class C rather than Class B carcinogens, so it is uncertain if they are carcinogenic to humans. Subpart S to RCRA recommended a 10-5 action level for Class C carcinogens (EPA 1990, 0432).

LANL, therefore, recommends the soil cleanup levels presented in Table 3.2.3-1.

TABLE 3.2.3-1

PROPOSED SOIL CLEANUP LEVELS FOR 90s-LINES SWMUs

CHEMICAL	RECOMMENDED CLEANUP LEVEL	RATIONALE/NOTES
Barium	10 000	HI[a] = 0.1
Cadmium	85	HI = 0.1
Chromium (total)	450	Risk = 10-6 Assumes 1/6 of total Cr is Cr (VI)
Copper	6 300	HI = 0.1
Cyanide	1 400	HI = 0.1
DNB mixture	6.8	HI = 0.1
DNT mixture	2.8	Risk = 10-6
HMX	3 400	HI = 0.1
Lead	1000	EPA Region 6 guidance
Nickel	3400	HI = 0.1
PAH	10	Risk = 10-5
RDX	17	Risk = 10-6
TNB	3.4	HI = 0.1
TNT	64	Risk = 10-6
Uranium	284	Dose based level of 15 mrem/year

a. HI = Hazard Index

b. NA = Not applicable

3.3 Site Restoration

Any excavation that was necessary during cleanup will be backfilled with clean fill as part of the D&D activities. The site will then be graded and compacted to prevent any undue or unnatural erosion and contoured to harmonize with the surroundings. Erosion protection such as flow diversions, berms, and revegetation may be used to minimize erosion. The area will be seeded with native grasses to return the site to its pre-Laboratory condition.

4.0 WASTE MANAGEMENT

4.1 Estimated Types and Volumes of Waste

The nature of the wastes resulting from the proposed cleanup are uncertain; best estimates are presented in Table 4.1-1. These estimates are based on the historic uses of the buildings, limited sample information from PRSs 16-008(a) (the pond) and 16-029(k), and the D&D contractor's HE experience.

All of the contaminated fixtures, buildings, sumps, and drain lines will be excavated and properly disposed of by the D&D project. The VCAs proposed in this plan will ensure that residual soil in the sump and drain line excavations reaches cleanup levels and that the extent of contamination at these units is defined. This will be accomplished by implementing extensive field screening, soil removal, and confirmatory sampling in the PRSs. LANL does not anticipate large volumes of waste. Wastes to be generated by soil removal activities are listed below. These materials will be handled in accordance with the site-specific waste CSF and segregated for appropriate treatment, storage, and disposal.

TABLE 4.1-1

ANTICIPATED WASTE TYPES AND VOLUMES

SOIL CLEANUP ACTIVITIES

ITEM	TYPE	ANTICIPATED VOLUME
Sampling waste/PPE	Solid - potential hazardous	0.3 cu. yds.
Bulk soil	Solid-low level radioactive	3 cu. yds.
Bulk soil	Solid - RCRA organics and cyanides (assorted F wastes)	24 cu. yds.
Bulk soil	Solid - RCRA metals (i.e., D005 wastes)	48 cu. yds.
Bulk soil	Solid - RCRA reactive (K044 and D003 wastes)	2 cu yds
Bulk soil	Solid - industrial (nonreactive levels of HE)	72 cu. yds.

4.2 Method of Management and Disposal

As indicated in Section 4.1 wastes to be generated during D&D and this VCA include concrete sumps, vitrified-clay drain lines, potentially contaminated soils, and

decontamination waste. The two most difficult types of waste to dispose of are reactive HE waste and reactive mixed waste. Waste management and disposal activities are the responsibility D&D project personnel. All waste will be disposed of in accordance with the site-specific CSF.

4.2.1 Characterization of Materials for Disposal

Field screening for HE, radioactivity, PAHs, metals, and organic vapors will be conducted on the waste streams generated during the VCA. Screening data will be used to segregate all wastes into distinct waste streams. This segregation will minimize the volumes of waste that have to be disposed of as RCRA hazardous waste. All waste media will be sampled consistent with the receiving treatment, storage, and disposal facility's WAC.

4.2.2 Treatment, Storage, and Disposal Plans for Waste

The majority of the waste generated from this VCA will be nonhazardous but potentially HE-contaminated debris, concrete and vitrified-clay pipe which will be flashed and disposed of at Area J at TA-54.

- Hazardous soil waste will be transported to a permitted treatment, storage, and disposal facility for final disposal.
- Nonhazardous soils waste will be disposed of in an industrial landfill.
- Low-level radionuclide-contaminated waste will be sent to TA-54 for final disposal.
- Three types of waste, RCRA reactive (D003/K044), mixed waste, and RCRA reactive/mixed deserve special attention. The former waste type must be shipped as an explosive to a treatment, storage, and disposal facility permitted for this waste type. Because off-site disposal costs of this waste are high (~ $15000 Cu/yd), if more than 2 cubic yards of this type of waste are generated, the VCA for a SWMU generating this waste will be stopped until the HE reactive character can be treated onsite, either by roasting under a RCRA burn permit, by *in-situ* bioremediation, or by other methods. If more than 2 cubic yards of mixed waste are generated, then stop work. If reactive mixed waste is found, it will be left in place until on-site treatment

options are available. All waste streams will be segregated and disposed of in accordance with the CSF. D&D representatives will coordinate all waste disposal activities.

5.0 DESCRIPTION OF CONFIRMATORY/VERIFICATION SAMPLING

5.1 Problem definition

Verification sampling will be conducted for those PRSs for which remediation can be completed during the VCA, at the point when field screening results indicate that no further remediation is needed. The goal is to ensure that the cleanup levels proposed in Table 3.2.3-1 or calculated using the methods outlined in Annex 7.1 have been achieved

5.2 SAP Design

Samples will be collected to evaluate risk due to surface and subsurface exposures under the same industrial exposure scenarios used to derive the PRGs (Figure 5.2-1). In particular, surface exposure units (EUs) for the general industrial worker occupy an area of 500 square meters, while the area occupied by a single building with its pair of sumps and associated drain lines, approximately 500 m^2, constitutes an appropriate subsurface exposure unit.

Each subsurface EU will be represented by at least six samples, collected from areas to be backfilled (Figure 5.2-1). These samples will include:

- any Stage I and Stage II laboratory samples from areas that have not subsequently been remediated,
- at least one sample from the excavated portion of any sump/drainline pair that has been remediated, and
- one sample from material excavated but designated for use in backfilling (if any).

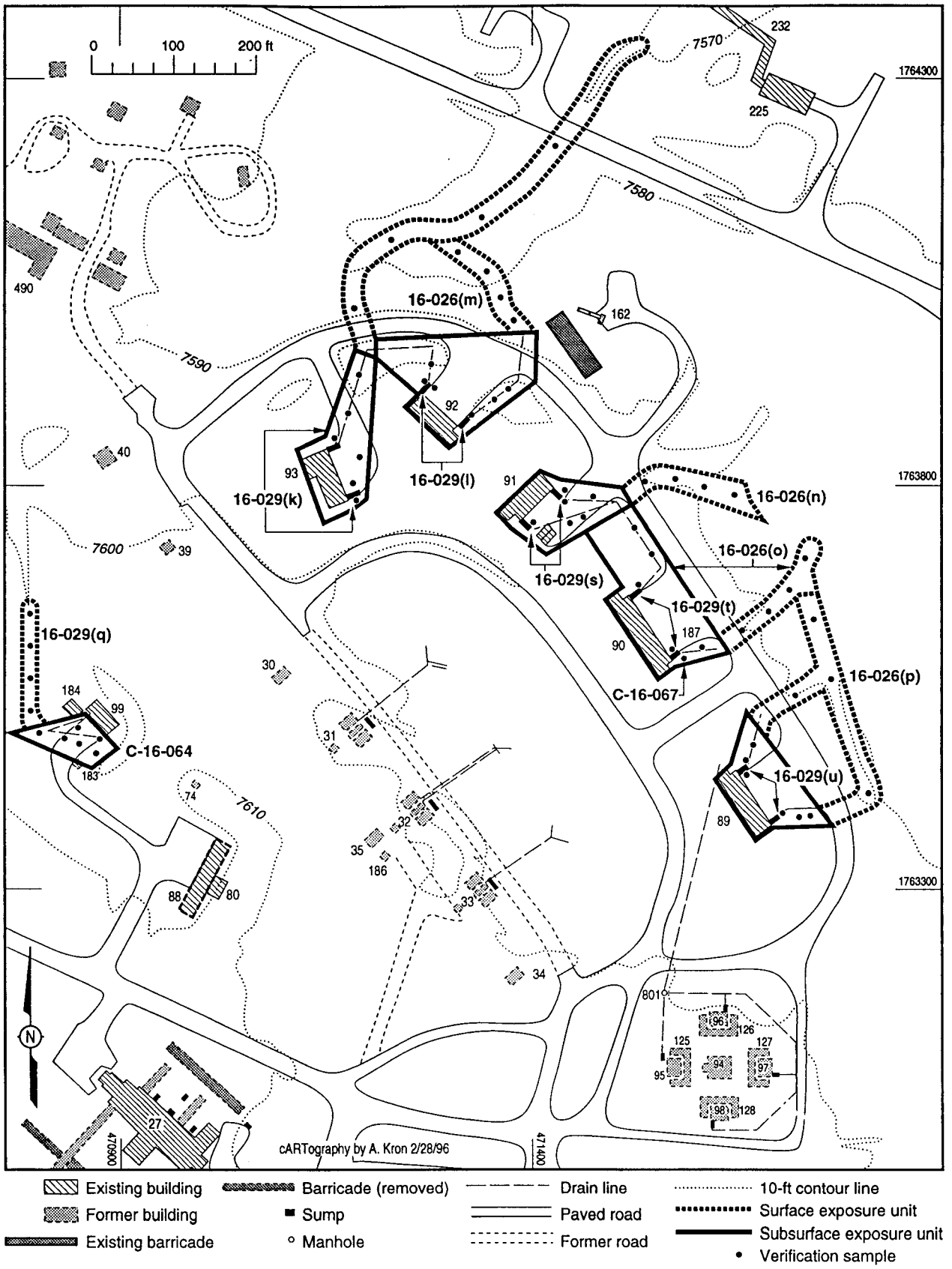


Figure 5 .2-1. Locations of Industrial Exposure Units at 90s-Line and verification sampling locations.

Laboratory samples collected in the footprint of the building (during the concurrent investigation of PRS 16-017) will be included in the calculation of the means if they represent areas not subsequently remediated. Additional samples will be collected at random in the area to be backfilled if the total number of subsurface samples collected as above is less than six per building group. All samples will be submitted for laboratory analysis for HE, metals, volatiles, semivolatiles, and uranium (uranium will only be analyzed at PRS associated with TA-16-92). 95% UCLs for within-EU means will be compared with the cleanup levels in Table 3.2.3-1 to determine whether no further action can be proposed.

The surface will be represented by at least four samples per surface exposure unit (Figure 5.2-1). These samples will include:

- any Stage I and Stage II laboratory samples located in outfall areas that will not be backfilled that were collected in areas that have not subsequently been remediated. If there are no such samples, then at least one sample from each outfall in the EU, collected downgradient from any remediated area; and
- at least one sample from the remediated areas of any outfall that was cleaned up.

Remaining samples will be selected at random from the area within the exposure unit that is not to be backfilled, to bring the total up to four per EU. All samples will be submitted for laboratory analysis for HE, metals, semivolatiles, and uranium (uranium will only be analyzed in PRSs associated with TA-16-92). 95% UCLs for within-EU means will be compared with the cleanup levels in Table 3.2.3-1 to determine whether no further action can be proposed.

The equations and assumptions used to determine the sampling frequency are contained in Annex 7.10. Coefficients of variation of one or less are assumed in the subsurface EUs, where residual contamination, if present, could increase the observed variability in the results. Smaller coefficients of variability are assumed within the surface EUs.

The verification sampling design includes no field QA samples. Quality will be ensured by identifying and following appropriate SOPs. Contract laboratories will provide standard QC measurements and will supply complete analytical data packages supporting the reported results.

5.3 SAP Implementation

SAP implementation for the verification sampling is identical to that described in Subsection 3.1.3.2.1.3.

5.4 Data Assessment

Data packages will be checked for completeness and reported deficiencies by routine data verification and validation procedures. Focused validation will be performed only if these checks indicate possible problems with the analytes for which PRGs have been calculated.

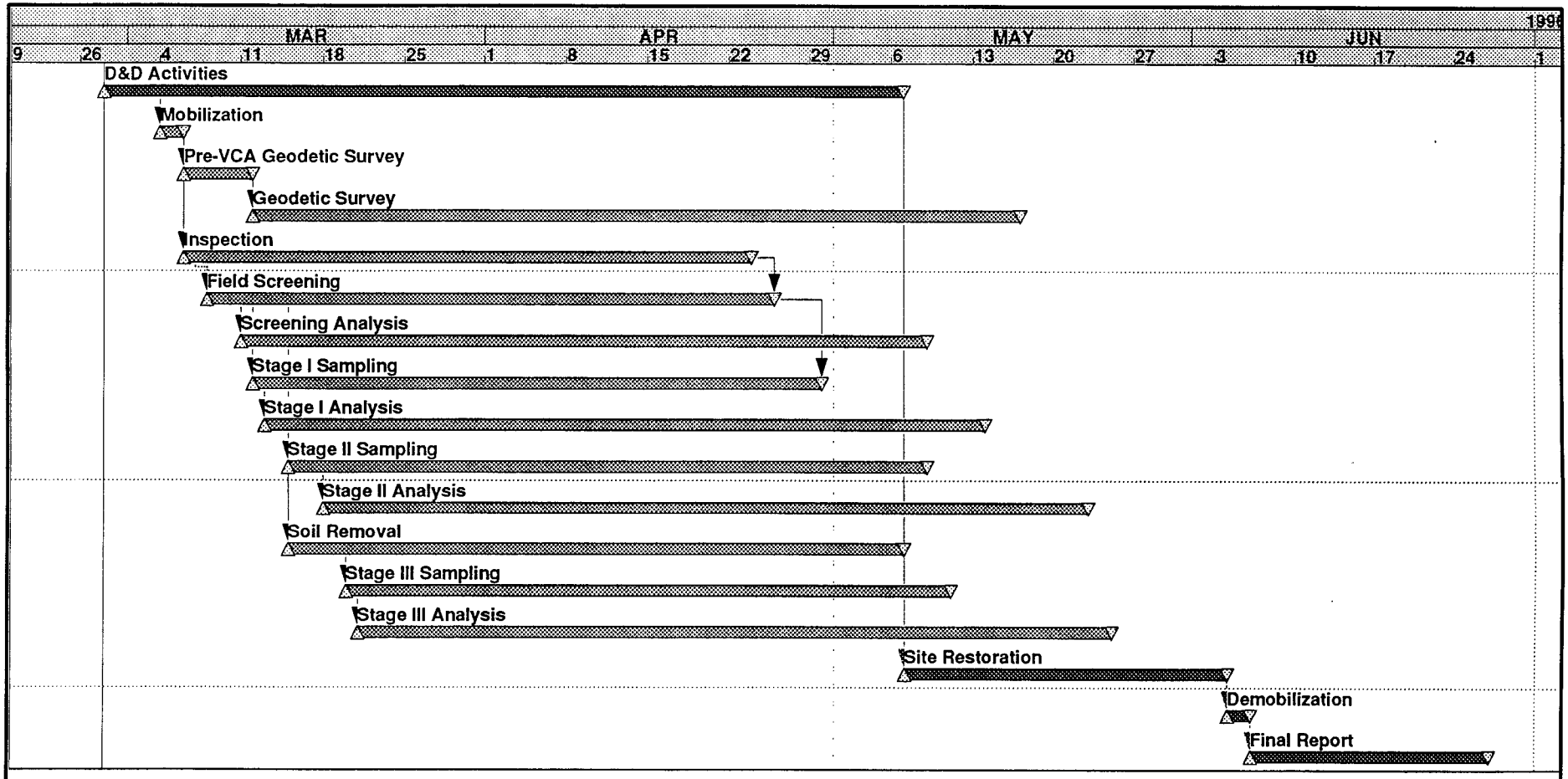
Results will be evaluated to determine whether assumptions about variability were satisfied. If not, then UCLs may exceed PRGs even when the sample mean is well below the PRG. Under these circumstances, the likelihood of incorrectly deciding that further remediation is necessary is greater, which will be noted in the final report.

5.5 Administration

Administration issues are similar to those outline in Subsection 3.1.3.2.1.5 and in Subsection 7.0.

6.0 ESTIMATED TIME TO COMPLETE THE ACTION AND UNCERTAINTIES

The proposed VCA schedule is shown in Figure 6.0-1. D&D activities are scheduled to begin on February 28, 1996. Implementation of the augmented RFI Phase I sampling will begin as soon as the D&D contractor removes sumps or drain lines. This activity will occur on or about March 4, 1996. Following receipt of initial rapid-turnaround laboratory



Project Start	20FEB98	Early Bar	
Project Finish	26JUN98	Progress Bar	
Data Date	28FEB98	Critical Activity	
Plot Date	28FEB98		

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90EC

Sheet 1 of 1

VCA at 90's Line
Classic Schedule Layout

analyses, which is estimated to occur on March 21, 1996, the D&D contractor will begin ER soil removal activities. These will be completed by May 7, 1996. Verification samples will be collected beginning roughly March 21, 1996. The open excavations will be covered with plastic and fenced. Following receipt of approval of this VCA plan, and verification that cleanup levels have been achieved, the site will be backfilled, regraded, and seeded

The final report will be submitted to DOE within 14 days of receipt of the final quality-assured data for the verification sampling.

7.0 ANNEXES

7.1 Risk-Based Cleanup Level Assumptions and Calculations

The equations and assumptions used to calculate industrial soil cleanup levels for carcinogenic and noncarcinogenic contaminants for this VCA are presented in this annex. The equations are based on three exposure routes: ingestion, skin contact and inhalation.

Equation 1 - Combined Exposures to Carcinogenic Contaminants in Industrial Soil:

$$C\ (mg/kg) = \frac{TR \times BW_a \times AT_c}{EF_o \times ED_o \left[\left(\frac{IRS_o \times CSF_o}{10^6\, mg/kg} \right) + \left(\frac{SA_a \times AF \times ABS \times CSF_o}{10^6\, mg/kg} \right) + \left(\frac{IRA_a \times CSF_i}{VF_s^a} \right) \right]}$$

Equation 2 - Combined Exposures to Noncarcinogenic Contaminants in Industrial Soil:

$$C\ (mg/kg) = \frac{THQ \times BW_a \times AT_n}{EF_o \times ED_o \left[\left(\frac{1}{RfD_o} \times \frac{IRS_o}{10^6\, mg/kg} \right) + \left(\frac{1}{RfD_o} \times \frac{SA_a \times AF \times ABS}{10^6\, mg/kg} \right) + \left(\frac{1}{RfD_i} \times \frac{IRA_a}{VF_s^a} \right) \right]}$$

[a] Note: VF_s for volatile chemicals (defined as having a Henry's Law Constant [atm-m^3/mol] greater than 10^{-5} and a molecular weight less than 200 grams/mol), or PEF for non-volatile chemicals.

The standard default exposure factors used to calculate the industrial soil cleanup levels are as follows (factors adopted from Region IX Preliminary Remediation Goals Table, Second Half 1995):

Parameter	Definition	Units	Value
C	cleanup level - chemical concentration in soil	mg/kg	---
TR	target excess individual lifetime cancer risk	unitless	10^{-6}
THQ	target hazard quotient	unitless	1
BW_a	body weight - adult	kg	70
At_c	carcinogenic averaging time	days	25,550
At_n	noncarcinogenic averaging time	days	ED x 365
EF_o	exposure frequency - occupational	days/yr	250
ED_o	exposure duration - occupational	years	25
IRS_o	soil ingestion - occupational	mg/day	50
IRA_a	inhalation rate - adult	m^3/day	20
CSF_o	cancer slope factor oral	$(mg/kg\text{-}day)^{-1}$	chemical-specific
CSF_i	cancer slope factor inhaled	$(mg/kg\text{-}day)^{-1}$	chemical-specific
RfD_o	reference dose oral	mg/kg-day	chemical-specific
RfD_i	reference dose inhaled	mg/kg-day	chemical-specific
SA_a	25% surface area - adult	cm^2/day	5,000
AF	adherence factor	mg/cm^2	0.2
ABS	skin Absorption	unitless	
	organics		0.1
	inorganics		0.01
VF_s	volatilization factor for soil	m^3/kg	chemical-specific
PEF	particulate emission factor - specific to Laboratory sites	m^3/kg	1.11×10^7

The RESRAD computer code, Version 5.60, was used to calculate cleanup levels based on committed effective dose equivalents for uranium. Contribution of daughter products is included in the dose estimates for these primary radionuclides. The calculated cleanup level is based on a 15 mrem/yr dose level, which is the annual dose limit proposed in EPA's Radiation Site Cleanup Regulation (40 CFR 196 Proposed Rule). The same exposure parameters for the long-term worker under the continued Laboratory operations industrial scenario, as were used to calculate cleanup levels for chemical constituents, were used in the RESRAD modeling. Cleanup levels for industrial soil for the isotopes for natural uranium as calculated by RESRAD are as follows:

Isotope	Relative Abundance	Cleanup Level (pCi/g)	ppm Isotope
U-234	0.0057%	220	0.03
U-235	0.71%	39	18
U-238	99.28%	220	655

The following calculation was used to convert cleanup levels for isotopic uranium to a cleanup level for total uranium.

pCi/g U isotope ÷ Specific Activity (pCi/g) = g isotope/g soil.
g isotope/g soil x 10^6 g/kg = ppm isotope.

$$C_T = \sum_1^i (F_i / C_i)$$

Where: C_T = Cleanup level for mixed isotopes
C_i = Isotope ppm
F_i = Fractional amount of isotope (relative abundance)

Therefore: C_T = (0.000057/0.03) + (0.0071/18) + (.9928/655)
C_T = 284 ppm

7.2 RFI Analytical Results

No RFI analytical results are available.

7.3 Site Map

See Figure 1.1.1-1. Note that no RFI samples have been collected.

7.4 Implementation SOPs

See Environmental Restoration Standard Operating Procedures, Volumes I and II, November 17, 1993, Los Alamos National Laboratory.

7.5 Quality Assurance Plan

See Quality Program Plan and Quality Assurance Project Plan for Environmental Restoration, February 1996 revision, Los Alamos National Laboratory.

7.6 Site Specific Health and Safety Plan (SSHASP)

See Los Alamos National Laboratory Environmental Restoration Project Health and Safety Plan, February 11, 1995 and the D&D Project SSHASP..

7.7 Waste Management Checklist

The D&D Contractor has prepared the Waste CSF for these activities and will manage all generated wastes.

7.8 VCA Checklist and Field Work Authorization Form

See next page.

Voluntary Corrective Action (VCA)
Checklist and Fieldwork Authorization Form

PRS No. 16-026(m,n,o,p) **HSWA** or **AOC**
16-029(k,l,q,s,t,u)

✓ PCOC(s) defined.

✓ Nature and extent defined or field screening method available to guide where not defined.

✓ Remedy is obvious.

✓ Time for removal is less than 6 months.

✓* Remedy is final.

✓ Land use assumptions straightforward.

✓* Treatment, Storage, Disposal Facilities are available for waste type and volume.

✓ Cleanup cost is reasonable for the planned action, and meets accelerated decision logic criterion for decision to proceed with VCA.

Explain criteria not checked above. * This VCA is being conducted as part of the Decommissioning Project. It is possible that ~~field conditions~~ (contamination) is much more extensive than predicted which may result in not achieving final Remedy for one or more PRS's, if stopping rules are initiated.

Through reviewing the above criteria associated with this site, I believe that a VCA is the appropriate Accelerated Cleanup approach.

FPL Brad Martin Date 02/29/96

FPC Joseph H. Moss Date 02/29/96

Through reviewing the VCA Plan, for site 16-026(m,n,o,p) 16-029(k,l,q,s,t,u) and believing that the above criteria have been met, I authorize the fieldwork to proceed.

DOE ER Program Manager [signature] Date 3/1/96

EM/ER:96-020

7.9 Cost Estimate

Total anticipated costs for the VCA are $514 100, as detailed below. These costs reflect only those activities that are not being completed by the D&D contractor.

Pre-Field Activities

Preparation of Waste Management Plan	NA
Preparation of Site-Specific Health and Safety Plan	NA
Field Work Preparation (400 man hours)	$ 30,000
Subtotal	$ 30,000

VCA Implementation

Pre VCA Geodetic Survey (64 man hours)	$ 4,800
Mobilization (64 man hours)	$ 4,800
Screening Biasing Survey (72 man hours)	$ 5,400
Geodetic Survey (80 man hours)	$ 6,000
Screening Sampling (360 man hours)	$ 27,000
Screening Analysis (480 man hours)	$ 36,000
Stage I Sampling (72 man hours)	$ 5,400
Stage II Sampling (432 man hours)	$ 32,400
Soil Removal (360 man hours-does not include heavy equipment & operator)	$ 27,000
Stage III Sampling (144 man hours)	$ 10,800
Site Restoration (256 man hours)	$ 19,200
Demobilization (64 man hours)	$ 4,800
Subtotal	$183,600

Analytical

Screening Samples (assumes 250 samples -TNT, RDX, PAH kits)	$ 25,000
Waste Characterization Samples (14 samples @ $1,000/samp.)	$ 14,000
Analytical Samples (70 samples including QA @ $2,000/samp.)	$140,000
Subtotal	$179,000

Waste Disposal

Industrial/Special (72 yds^3 @ $150/$yd^3$)	$ 10,800
RCRA Hazardous (55 yds^3 @ $900/$yd^3$)	$ 49,500
RCRA Reactive (3,600 lbs. @ $7.00/lbs + $5,000 shipping))	$ 30,200
Low-Level Radioactive (11 drums @ $2,000/drum)	$ 22,000
Subtotal	$112,500

Post-Field Activities

Acceptance Inspection	$.....NA
Final Report	$ 9,000
Waste Management	$ NA
Subtotal	$ 9,000
Total	**$514,100**

7.10 Statistical Sample Size Calculations

The desired result is that, if the true EU mean is 0.5 times the PRG or less, then when we calculate a 95% UCL for the mean based on n samples, we should get a result that is less than the PRG. In symbols, we want

$$m + \frac{t_{n-1,0.95}}{\sqrt{n-1}} s \leq PRG$$

where m is the sample mean and s is the sample standard deviation. If we substitute the true mean μ for m, and the true standard deviation σ for s, then when PRG=2μ, we need to choose n large enough so that

$$\frac{t_{n-1,0.95}}{\sqrt{n-1}} \leq \frac{\mu}{\sigma} = \frac{1}{\kappa}$$

where κ is the coefficient of variation. Assuming κ=1 gives n $\geq$ 6. A coefficient of variation of 1 is large for most natural constituents but not unusual where there is residual contamination. We assume κ=1 in determining an appropriate sample size for the subsurface exposure units. Assuming a slightly smaller coefficient of variation, κ=.7, leads to n $\geq$ 4 for surface exposure units.

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APPENDIX A - STATEMENT OF WORK DECOMMISSIONING OF BUILDINGS 89,90,91,92,93,99,164 and 101 at TA-16

STATEMENT OF WORK
DECOMMISSIONING OF BUILDINGS 89,90,91,92,93,99,164 and 101 AT TA-16
2310K0015-CL

1. BACKGROUND

The University of California, Los Alamos National Laboratory (Laboratory) is tasked to Decommission surplus facilities at TA-16 as directed by the Department of Energy (DOE). Tasks performed on this subcontract will be under the direction of the Laboratory's Environmental Restoration Project office(EM/ER) in compliance with DOE Order 5820.2A, Chapter V.

The facilities at TA-16 were constructed in the 1940's for use in machining, processing, handling and storage of the high explosive components of nuclear weapons. Most of these facilities have been out of service since the late 1950's and are in a state of disrepair.

The hazards at these facilities have been characterized and we are now ready to begin the remediation and demolition phase of this project.

2. Characterization Information

Physical Description:

These process buildings are all similar in construction and the hazards associated with these buildings are similar. All are of wood frame construction on a concrete slab. TA 16-89 is 1684 square feet in floor area. TA 16-90 is 2165 square feet. TA 16-91 is 1332 square feet. TA 16-92 is 1332 square feet. TA 16-93 is 1627 square feet. TA 16-99 is 892 square feet. These buildings are surrounded on three sides by an earth barricade which is placed against steel pilings. There is approximately five feet of open space between most of the structures and the earth barricade . Interviews with site personnel indicate these buildings were used to perform various HE manufacturing steps as well as inspections and cleaning of HE components. Later some of the buildings were used as storage locations for other materials. The type of material stored in these buildings is unknown.

TA16-101 is a 185 square feet abandoned guard station. It is surrounded by two layers of concrete-filled sand bags. TA16-164 is a storage shed next to building 99.

Hazards:

All of the structures except guard station 101 and shed structure 164 spot tested positive for HE. No gross HE was observed in any of the structures, but it is expected that interior vacuum lines and sump drain lines contain hazardous amounts of HE material.

All of the structures have ACM used for exterior siding and roofing. All of the structures contain piping which is insulated with ACM.

All of the structures are painted with lead based paint both on interior sheet rock and exterior wooden surfaces.

Building 16-92 was found to contain radioactive contamination. The specific isotope is unknown but is a Beta/Gamma emitter. The contamination is fixed into the concrete.
The highest level of contamination was 44,662 dpm. The remaining structures are not radioactively contaminated. The radiological controls technician has posted building 16-92 as a radiologically controlled area. Detailed surveys are included with this report.

Building 16-92 contains fume hoods in room A.. No radiological contamination was found in these hoods. The material used in the hoods (other than HE) is unknown .

Building 16-93 was used for electroplating and metals such as chromium, copper, nickel, and cadmium are likely to be present.

Several of the structures had pieces of the sheet rock ceiling laying on the floor. The insulation above this ceiling is labeled as fiberglass insulation. All of these structures have two underground sumps/basins which were used to settle HE prior to discharge through outfall piping. These sumps are covered with a steel closure with a gravel or asphalt cap over of the steel closure. All of the structures contain uninsulated HE

contaminated vacuum lines. All of the structures contain rodent feces.

Buildings 16-92 and 16-93 have transformers (three each) outside the structures. Three of the transformers are Burton style 1326B and three are Westinghouse brand. All of the transformers appear to be oil free.

The roof in building 16-99 is leaking in several places through 6 inch holes. Several of the structures contain old bench tops and cabinetry. Building 16-99 Contains several old shipping containers or storage containers which are in poor condition.

Several of the structures contain old fluorescent lighting fixtures. The ballast in many of these fixtures is still present and may contain PCB fluids. No labels were found on these ballast's to confirm or deny the presence of PCB compounds.

3. WORK DESCRIPTION

This work release is for the decontamination, demolition, waste disposal, and site restoration of seven buildings that were used for High Explosives processing. The structure numbers of the buildings are: TA16-89, TA16-90, TA16-91, TA16-92, TA16-93, TA16-99, TA16-164, and TA16-101. The contractor shall perform the work in accordance with the attached demolition drawings and the following specifications:

- The contractor will be required to demonstrate compliance with all Laboratory and site specific requirements at a formal readiness review before notice to proceed is given.

- Asbestos abatement -- Asbestos abatement includes removing, transporting, and disposing of asbestos containing material(ACM). The contractor shall be licensed as an asbestos contractor in the state of New Mexico. Remove and dispose of all Asbestos Containing Material (ACM) in a properly licensed and permitted landfill in accordance with Federal Regulation 40CFR Part 61. 140-156 and the New Mexico Environmental Department Asbestos Control Program.

• Lead-based paint abatement-- Provide an abatement plan for the lead-based paint in compliance with 29 CFR 1926.62. Characterize all waste that contains paint using Toxicity Characteristic Leaching Procedure (TCLP) to determine disposal requirements, but assume for this proposal that it will all be disposed as hazardous waste. The plan shall include methodology to minimize the volume of hazardous waste.

• Radiological contamination -- The Contractor shall prepare a radiological work plan in accordance with the LANL Radiological Control Manual for decontaminating the radiologically contaminated area in building TA16-92. The plan must be approved by the Laboratory, ESH-1, before this work can commence.

• Concrete rubble -- Break all non-contaminated concrete rubble into pieces no larger than 12 inches on a side and pile in a designated location on site for future crushing by another contractor.

• Sumps and Drain Lines --- Decontaminate sumps and drain lines using steam or other approved method for HE decontamination. Remove concrete sumps intact and remove drain lines to the outfall and transport to the TA16 open burn pit for flashing before transporting for disposal at TA-54.

• Underground utilities --- Remove all underground utilities within a 25' radius of the structure perimeter.

• Metal fixtures and piping --- Certify that all metal fixtures, piping, and equipment is free from High Explosive (HE) material contamination by using the Los Alamos National Laboratory Field Spot-Test Kit for Explosives. If the material cannot be certified to be HE free, transport it to the flash pad at the open burn pit at TA-16. Procedures for dismantling, handling and transporting HE contaminated equipment and materials must be approved by the site safety officer, and LANL ESH-5 before these operations commence.

• Unpainted wood --- Transport all unpainted wood that is not recyclable to the sanitary landfill.

• Soil Samples --- After removal of all concrete and underground utilities, obtain a soil sample from near the center of the building footprint and at the bottom of sump and drain line excavations in accordance with the Laboratory's Remedial Action sampling plan for HE analysis before backfilling..

• Blast shields --- Remove earth baricades and steel supports. grade to natural contour and stock pile excess soil in designated location on site.

• Driveways and Walkways --- Remove all asphalt and concrete driveways and walkways associated with these buildings. Do not remove through roadways.

• Electrical utility, lightening protection and steam line structures --- Remove and recycle servicible electric and lightening protection utility poles and steel structures for steam line support.

• Site Restoration --- Backfill, compact, and reseed each demolition site as indicated on the demolition drawings. Additional fill material is available on site. Stockpile any excess fill material on site in designated location.

4. Health and Safety

The contractor shall submit a site specific health and safety plan and obtain Laboratory approval before work may commence. All contractor personnel must complete site specific health and safety, HazCom, and Radiological Worker I training before gaining access to the site. Potential hazards in these structures are asbestos, Hanta virus (rodent droppings), radiological contamination(Building 92 only), HE residue, lead based paint, and structural deterioration.

5. Security

This work is entirely inside a security fenced area. Contractor personnel are required to have DOE "Q" or "L" clearances or the contractor shall provide approved security escorts.

6. Project Tracking and Reporting

The contractor shall provide a schedule for the planned work in a precedence diagram format. The schedule shall be consistent with the schedule of values submitted for progress payments. Progress status shall be updated at least weekly.
The contractor shall provide a weekly written report to the Laboratory's Project Leader. At a minimum the report shall include project schedule status; anticipated problems, delays, or changed conditions; work completed during the reporting period; work planned for the next reporting period; and status of all previous problems and their resolution.

To: Pat Osterburg, BUS-9
From: Larry Byars, EM/ER-D&D
Subject: Answers to Questions posed by IDM Envronmental , Morrison Knudsen, and NES, Inc. on Task Order B74610016-CL; Decommissioning of Buildings 89, 90, 91,92, 93, 99, 164, 101.

Questions from IDM Environmental:

1. **Q: Are stormwater and spill prevention plans required?**
   A: A stormwater and spill prevention plan is required in accordance with NPDES requirements.
2. **Q: Do we assume all painted surfaces are lead base paint?**
   A: Yes, for the purpose of this bid.
3. **Q: Is the concrete to be separated from rebar?**
   A: Rebar may be left in the concrete in lengths not exceeding 2 feet. Rebar that is separated during rubblizing shall be segregated.
4. **Q: Does a radiological survey need to be done on 19-92?**
   A: Follow standard practices. The contractor is free to conduct as many surveys as he feels necessary. Radiological data shows contamination only in Building TA16-92, but since we did not perform a 100% survey, it would be prudent to monitor as you work. Waste must be surveyed before shipping to ensure releasability.
5. **Q: Who will be the waste generator/coordinator?**
   A: The LANL Project Leader will be the waste generator/coordinator. The contractor shall prepare the waste profile forms and conduct any necessary analysis required for disposal.
6. **Q: Are recycling materials to be the property of LANL or can the contractor salvage the material and show the cost savings to LANL?**
   A: The contractor will be free to salvage any material that would otherwise be disposed as waste. We would expect any cost savings to be reflected in your bid.
7. **Q: Are the underground utilities assumed clean?**
   A: Yes, but they have not been characterized. It will be necessary to do HE spot tests and a rad survey on the sanitary waste line to verify it is clean.
8. **Q. What is the Availability and schedule of the flash pad?**
   A: The flash pad is generally available during normal working hours, but material shipments and actual burns will have to be coordinated with ESA-WMA Group.

9. **Q: We did not see the six transformers at 16-92 and 16-93. Please clarify if these units are still there.**
   A: Yes, the transformers are still there.

10. **Q: Contract drawing 1 of 8 under section 3.3, placing topsoil, Comment E. Please clarify reference to installation/coordination of sprinkler heads.**
   A: Sprinkler system is not required. Reference on the drawing is in error.

11. **Q: Do the trees in the berms need to be saved?**
   A: The contractor should make every effort to preserve as much natural vegetation as possible, but it will probably not be possible to remove the berms without destroying the trees in them.

12. **Q: Is the contractor expected to set up a site project office trailer?**
   A: This is up to the contractor.

13. **Q: What type and model of field HE tester is preferred?**
   A. LANL will provide the HE spot test kit and training in its use.

14. **Q: Does the site safety officer need to be present at all times?**
   A: The site safety officer or an authorized, qualified delegate should be on site anytime work is in progress.

15. **Q: Will LANL provide an RCT to verify rad free release levels for debris from 16-92?**
   A: Yes, a LANL RCT will be available, but the contractor is responsible for HPT personnel to do rad surveys, control access and monitor Rad work.

16. **Q: Who is responsible for transporting sumps and drain lines to the open pit for burning and to TA54 after burning?**
   A: The contractor is responsible.

17. **Q: Who is responsible for analyses of soil samples after removal of buildings and utilities? What analyses are required?**
   A: The analyses of soil samples will be done by the Laboratory's Field Unit 3 Remedial Action personnel.The contractor will perform HE spot tests and rad surveys on the soil under the building footprints.

Questions from Morrison Knudsen Corporation

1. **Q. Will personnel dealing with lead painted wood and sheetrock be required to have 40 hr. OSHA training?**
   A. No. They will be required to comply with OSHA 29 CFR 1926.62 for occupational exposure to lead.
2. **Q. Is the contractor required to dispose of radiologically contaminated waste at TA-54?**
   A. The contractor is responsible for rad waste packaging and disposal either at TA-54 or off-site. Currently there is no charge to the contractor for disposal at TA-54.
3. **Q: Is the contractor required to dispose of PCB ballasts?**
   A: Yes
4. **Q: Is the contractor required to dispose of asphalt removed from driveways, or is this material also stockpiled on site?**
   A: The contractor is required to dispose of the asphalt either at the county landfill or at an offsite recycling facility.
5. **Q: The engineering drawing, page one of eight, shows a drain line removal under the asphalt road. Is the contractor required to repair the road?**
   A: We have changed the scope to include removal of all roadways, sidewalks, drop inlets, culverts and curbing within the area. (See attached sketch)
6. **Q: Drawings indicate a planting season of April to September. Can the seeding and mulching be conducted in the winter months?**
   A: The seeding can be done earlier if the ground can be worked.
7. **Q: Will LANL disconnect Building 101 utilities?**
   A: Yes.

Questions from NES, Inc.

1. **Q: Has there been an estimate of the amounts of waste prepared for each waste stream? If not, what should be assumed for the purposes of the bid in order to allow equality between bidders?**
   A: We believe that enough information was provided to all bidders in the form of scaled drawings, assessment information, a site visit, and answers to questions to allow everyone to adequately estimate waste volumes. We realize that there is some risk involved in lump-sum bidding, but there is also greater potential for profit, and we don't think the risk involved in this project is unreasonable for the contractor to assume.

2. **Q: Is the contractor responsible for the removal and off-site disposal of all clean waste?**
   A: Yes, except as stated in the Statement of Work.
3. **Q: Will radioactive waste be disposed by LANL at TA-54? Must the contractor provide disposal boxes?**
   A: See Morrison Knudsen question number 2.
4. **Q: How far are sump drain lines to be removed? Figure 5-90 of the RFI Work Plan for OU 1882, Addendum 1 dated July 1994 provides a drawing of these drains and their outfalls. It appears that some of the outfalls are quite a distance from the buildings. Are the results of the described sampling in this document available?**
   A: The drain line distances are as shown on the contract drawings and seen in the field. RFI sampling has not yet been done.
5. **Q: Is HE Corridor training required for all workers?**
   A: Yes , it is covered under the site specific training mentioned in the SOW.
6. **Q: Do all workers (those not involved in the actual asbestos removal operation) require asbestos awareness or asbestos worker training?**
   A: No. Not unless asbestos containing material will be disturbed.
7. **Q: If material is sent to the flash pad and is flashed, is the contractor responsible for disposal of flashed material at an off site sanitary landfill?**
   A: The contractor is responsible for all waste disposal. HE contaminated waste must be disposed at TA-54 after flashing.
8. **Q: When is the project scheduled to begin? Will it start after bad weather (i.e. March)?**
   A: We plan to start as soon as possible after task award, hopefully by mid January to early February. (What bad weather?)

More Questions from NES, Inc.

1. **Q: For building TA-16-92, is "Radiological Work Plan" or is it covered by the "Radiological Work Permit?" If it is different than the Site Remediation Plan, please provide an example of its contents.**
   A: The Radiological Work plan is just the documentation required for the Radiological Work Permit. It can be a part of your Site Remediation Plan.

2. **Q: Is an HPT or RCT required to monitor the project? If required, does the individual need to be on site at all times or just when work is being performed in the middle room of TA-16-92? What are the training requirements for this individual, if required?**

   A: See IDM question number15.

3. **Q: Is it required that all buildings and surrounding areas be surveyed for radiological contamination or can we assume that only the middle room of building TA-16-92 contains radioactive material?**

   A: See IDM question 4.

4. **Q: Are direct surveys adequate for determining the presence of radiological contamination? What are the radiological survey and analytical requirements for this project?**

   A: The contractor is responsible for determining the type and extent of surveys and analyses to ensure safe operations, adequate cleanup, and waste acceptance.

5. **Q: What type of ACM sampling and analysis is required for each of the buildings? Since the material appears to be the same for each building, can one composite sample be sent for analysis?**

   A: It is up to the contractor to determine the amount of sampling required to meet NESHAPS requirements and waste acceptance criteria for disposal.

6. **Q: For disposal of waste containing paint, is full TCLP or a TCLP for lead required?**

   A: Lead is the only contaminate of concern in the paint.

7. **Q: What analysis will be required for completion of the Waste Profile Forms (WPF) for clean debris, ACM, lead debris and radioactive waste?**

   A: The contractor should be able to complete the waste profile forms from available information and knowledge of process.

8. **Q: When a positive HE spot test is discovered, will DX Division need to be notified each time to verify the positive HE Spot Test results or will the material be immediately taken to the flash pad for flashing?**

   A: ESA-WMA Group will coordinate acceptance of material at the flash pad.

9. **Q: Will DX Division be involved in the packaging and transportation requirements for material with positive HE spot Test results? Does LANL have procedures available for these activities?**

A: The contractor should assume packaging, handling, and transportation responsibility for HE contaminated waste.

10. **Q: What is LANL's policy and procedures for handling and disposing of HE Spot Test Positive, ACM and lead contaminated material? Provide copies of appropriate procedures.**

A: The SOW requires the contractor the furnish procedures and expertise for handling and disposal of hazardous and radioactive material, not LANL.

11. **Q: Will VOC and SVOC testing be required on material with HE Spot Test positive results to rule out false positives.**

A: It is the responsibility of the contractor to determine requirements to achieve confidence in all test and analytical results.

12. **Q: What permits will be required for this project? Who is responsible for obtaining these permits?**

A: The contractor is responsible for the NPDES Storm water Runoff and Spill Prevention Plan, NMED notification of asbestos removal, and burn permits (through Bill McCormick) for hot cutting or welding. LANL has requested the excavation permit and it will be in place by the time the task is awarded.

13. **Q: Will a certified industrial hygienist be required to be on-site at all times during remediation operations?**

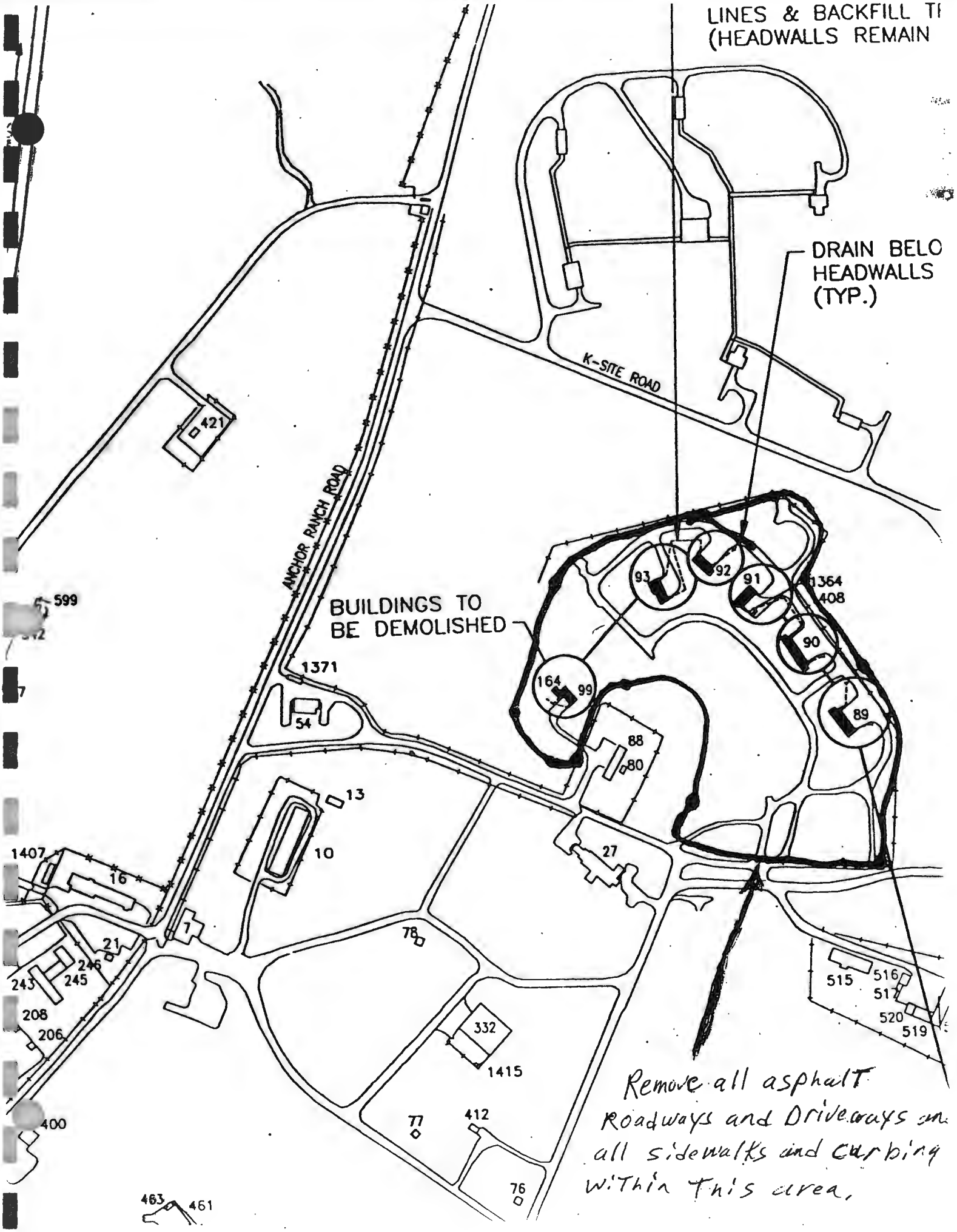
A: No

14. **Q: Since MK has performed some activities involving these facilities, will MK be allowed to bid this project or will they have a conflict of interest or an unfair advantage? Is the raw data they collected and all reports available to the other bidders? If so, where may the documents be obtained?**

A: MK provided support to ICF Kaiser to conduct a preliminary assessment of all our surplus facilities. With the exception of photographs, all results of this assessment that pertains to the buildings on this task have been provided to all the bidders. Their reports containing these photographs are available for reading in Larry Byars' office. Due to the preliminary nature and broad scope of this work, we don't believe that it should disqualify MK from bidding on this or the decommissioning of any other facilities. Also, we are open to discuss and share LANL's experience in decommissioning similar contaminated buildings. We believe that honest and

open competition is to our advantage and we will make every effort to ensure it.

Extent of asphalt removal: Remove all roadways, driveways, sidewalks, curbing, and culverts inside the area marked on the attached sketch.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BUILDINGS TO
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599
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245
243
208
206
400
463
461
78
332
1415
71
412
76
93
92
91
1364
408
90
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164
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515
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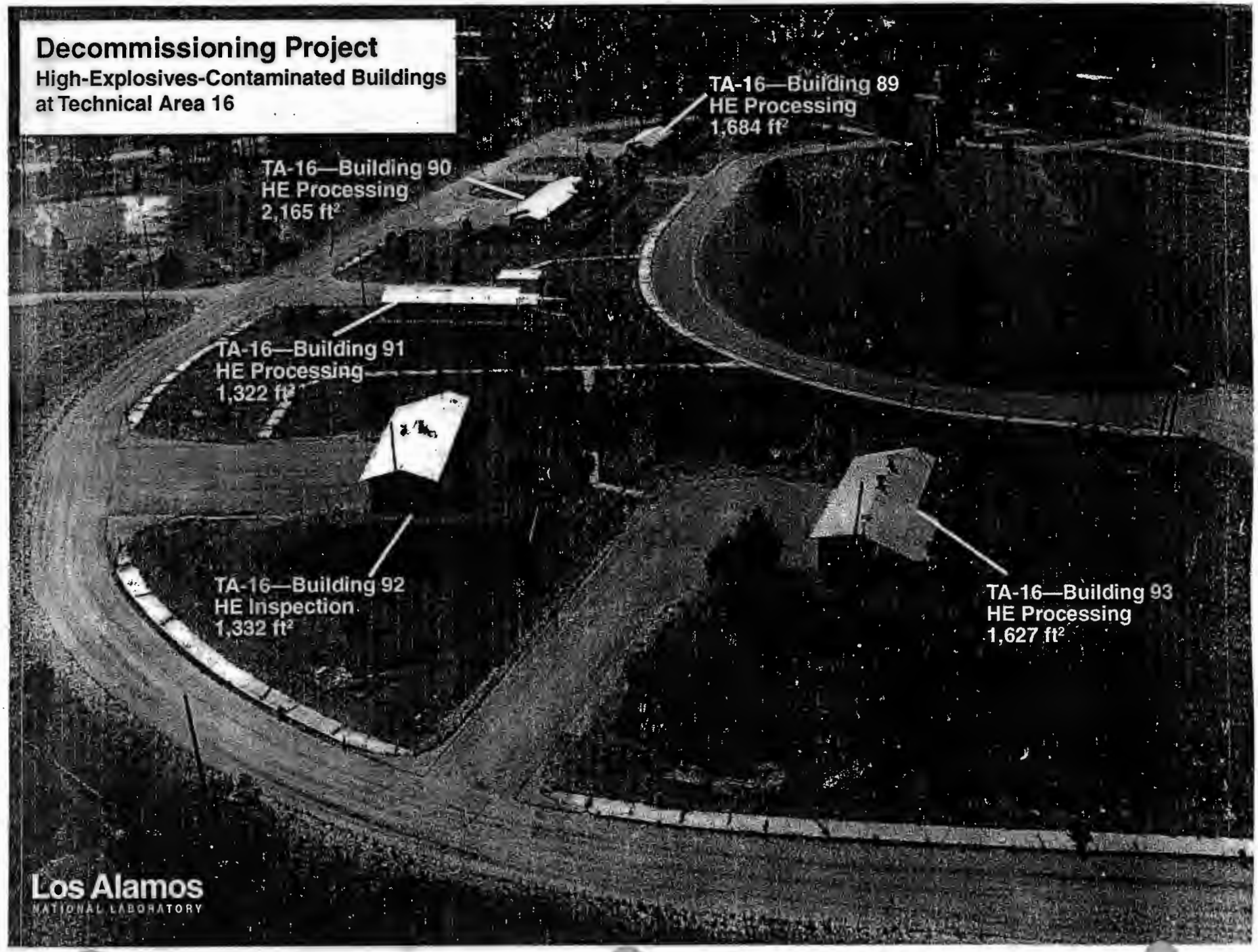
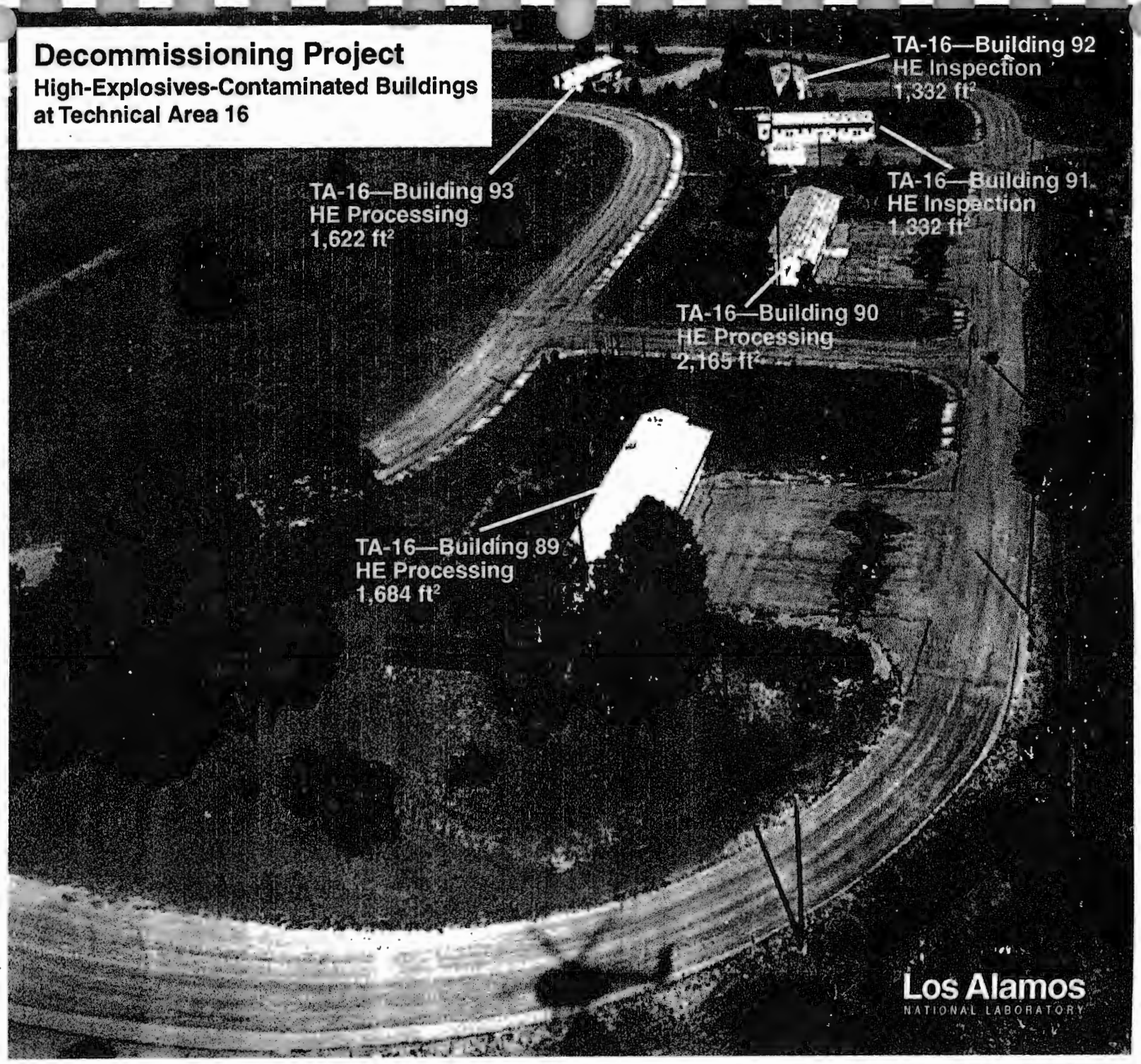
519
Remove all asphalt
Roadways and Driveways and
all sidewalks and curbing
within this area.


Decommissioning Project
High-Explosives-Contaminated Buildings
at Technical Area 16
TA-16—Building 89
HE Processing
1,684 ft²
TA-16—Building 90
HE Processing
2,165 ft²
TA-16—Building 91
HE Processing
1,322 ft²
TA-16—Building 92
HE Inspection
1,332 ft²
TA-16—Building 93
HE Processing
1,627 ft²
Los Alamos
NATIONAL LABORATORY


Decommissioning Project
High-Explosives-Contaminated Buildings
at Technical Area 16
TA-16—Building 92
HE Inspection
1,332 ft²
TA-16—Building 93
HE Processing
1,622 ft²
TA-16—Building 91
HE Inspection
1,332 ft²
TA-16—Building 90
HE Processing
2,165 ft²
TA-16—Building 89
HE Processing
1,684 ft²
Los Alamos
NATIONAL LABORATORY

APPENDIX B - TRAINING REQUIREMENTS FOR THE FIELD TEAM

Field Unit 3, OU 1082
Training Matrix

APPLICABLE TRAINING COURSES/PLANS AND PROCEDURES	Identification Number		Field Project Leader	Field Team Manager	Field Team Leader	Site Safety Officer	Geophysical Worker	Health Physics Tech.	Radiological Screener	Field Sampling Worker	Haz. Mat. Transporter	Excavation (Drilling/Backhoe) Crew	Explosives Spot Tester	Surveying Worker	Waste Coordinator	Waste Generator	Visitors	Exclusion Zone Visitors
Medical Examination			x	x	x	x	x	x	x	x		x	x	x				x
OU 1082 RFI Work Plan			x	x	x	x												
OU 1082 Site-Specific Field Implementation Plan (Sampling)			x	x	x	x				x		x						
OU 1082 Site-Specific Field Implementation Plan (Surveys)			x	x	x	x	x							x				
OU 1082 Site-Specific Health and Safety Plan			x	x	x	x	x	x	x	x		x	x	x	x	x	x	x
OU 1082 Site-Specific Quality Assurance Plan			x	x	x	x				x								
OU 1082 Site-Specific Training			x	x	x	x	x	x	x	x	x	x	x	x		x	x	x
OU 1082 Site-Specific Waste Management Plan			x	x	x	x		x	x	x		x	x		x			x
Field Spot Test for Explosives													x					
Fire Extinguisher Training	3224				x	x				x		x						
First Aid/CPR	3574					x												
Hazardous Waste Operations - 24 hr or Refresher	4465/4466		x				x											
Hazardous Waste Operations - 40 hr or Refresher	4464/4466			x	x	x		x	x	x	x	x	x	x				
Hazardous Waste Operations - Supervisor	4467		x	x	x													
Hazards Communication Introduction	2398		x	x	x	x	x	x	x	x		x	x	x				
HE Awareness Training	9154		x	x	x	x	x	x	x	x		x	x	x				
Health Physics Checklist Indoctrination	2389		x	x	x	x	x	x	x	x		x	x	x				x
HMPT: Introduction	7513										x							
Rad Worker I/Rad Worker II	4428/7454				x	x	x	x	x	x			x	x				
RCRA Personnel Training	7488				x										x	x		
Waste Document Forms (Haz)	8504				x										x	x		
Waste Document Forms (Rad)	8506				x										x	x		
Waste Generation Overview	8477/4419				x										x	x		
Surveying for Alpha and/or Beta/Gamma Contamination	ESH-	1.02 - 2		x	x	x		x	x									
Releasing Equipment and Items Standard	ESH-	1.07 - 1		x	x			x	x									
Accident and Occurrence Reporting	LANL-AR-	1 - 1	x	x	x	x												
Emergency Preparedness	LANL-AR-	1 - 2	x	x	x	x												
SOPs and Special Work Permits	LANL-AR-	1 - 3	x	x	x	x		x										
Hazard Communication	LANL-AR-	1 - 9	x	x	x	x	x	x	x	x		x	x	x				
Environmental Safety &Health Questionaire	LANL-AR-	1 - 10	x	x														
Excavation or Fill Permit Review	LANL-AR-	1 - 12		x	x													
Radiation Protection Program	LANL-AR-	3 - 1			x	x	x	x	x	x		x	x	x				
Shipment of Radioactive Materials	LANL-AR-	3 - 5	x	x	x	x		x	x									
Personnel Radiation Dosimetry **	LANL-AR-	3 - 6			x	x	x	x	x	x		x	x	x				
Radiation Exposure Control	LANL-AR-	3 - 7			x	x	x	x	x	x		x	x	x				
Chemicals	LANL-AR-	6 - 1	x	x	x	x				x								
Explosives	LANL-AR-	6 - 6	x	x	x	x				x								
Hearing Conservation	LANL-AR-	8 - 2	x	x	x	x				x								
National Environmental Policy Act	LANL-AR-	9 - 2	x	x	x													
Accidental Oil, Chemical, and Airborne Releases	LANL-AR-	9 - 4	x	x	x	x												
Cultural Resources	LANL-AR-	9 - 5	x	x	x													
Radioactive Liquid Waste	LANL-AR-	10 - 1	x	x	x				x						x			
Low-Level Radioactive Solid Waste	LANL-AR-	10 - 2	x	x	x				x						x			
Chemical, Hazardous, and Mixed Waste	LANL-AR-	10 - 3	x	x	x				x						x			
Waste Minimization	LANL-AR-	10 - 8	x	x	x	x		x	x	x		x	x		x			
Waste Profile Form	LANL-AR-	10 - 9		x	x										x			
Personal Protective Equipment	LANL-AR-	12 - 1	x	x	x	x		x	x	x		x	x					
Field Work	LANL-AR-	15 - 1	x	x	x					x								
Management of Environmental Restoration Wastes	LANL-ER-AP-	5.3	x	x	x				x	x					x			
Review and Approval of ER Program Plans and Reports	LANL-ER-AP-	1.3			x													
Approval Process for External Procedures Used in the ER Program	LANL-ER-AP-	1.6		x	x													
Procedure for LANL ER Records Management	LANL-ER-AP-	2.1	x	x	x													

APPLICABLE TRAINING COURSES/PLANS AND PROCEDURES	Identification Number		Field Project Leader	Field Team Manager	Field Team Leader	Site Safety Officer	Geophysical Worker	Health Physics Tech.	Radiological Screener	Field Sampling Worker	Haz. Mat. Transporter	Excavation (Drilling/Backhoe) Crew	Explosives Spot Tester	Surveying Worker	Waste Coordinator	Waste Generator	Visitors	Exclusion Zone Visitors
Handling Media and Public Requests for Information During Field Work	LANL-ER-AP-	3.2	x	x														
Ident., Doc., and Report Potential Release Sites	LANL-ER-AP-	4.1	x	x	x													
Reporting New Releases from SWMUs	LANL-ER-AP-	4.2	x	x	x													
Reading Review for ER Program Field Activities	LANL-ER-AP-	5.1	x	x														
Quality Assurance Objectives for Measurement Data	LANL-ER-QAPjP-	5	x	x	x													
Sampling Procedures	LANL-ER-QAPjP-	6	x	x	x					x								
Sample Custody	LANL-ER-QAPjP-	7	x	x	x					x								
Calibration Procedures and Frequency	LANL-ER-QAPjP-	8		x	x	x	x	x	x									
Analytical Procedure	LANL-ER-QAPjP-	9	x	x	x													
Data Reduction, Validation and Reporting	LANL-ER-QAPjP-	10	x	x	x													
Internal Quality Control Checks	LANL-ER-QAPjP-	11	x	x	x													
Performance and System Audits	LANL-ER-QAPjP-	12	x	x	x													
Corrective Action	LANL-ER-QAPjP-	15	x	x	x											x		
Quality Assurance Reports to Management	LANL-ER-QAPjP-	16	x	x	x													
Deficiency Reporting	LANL-ER-QP	1.3	x	x	x													
General Instructions for Field Investigations	LANL-ER-SOP-	1.01	x	x	x	x	x	x	x	x		x	x	x		x		
Sample Containers and Preservation	LANL-ER-SOP-	1.02		x	x					x								
Handling, Packaging, and Shipping of Samples	LANL-ER-SOP-	1.03		x	x					x	x					x		
Sample Control and Field Documentation	LANL-ER-SOP-	1.04		x	x					x								
Field Quality Control Samples	LANL-ER-SOP-	1.05	x	x	x					x								
Management of RFI Generated Wastes	LANL-ER-SOP-	1.06														x		
Operational Guidelines for Taking Soil and Water Samples in Explosive Areas	LANL-ER-SOP-	1.07	x	x	x	x				x		x						
Equipment Decontamination	LANL-ER-SOP-	1.08	x	x	x	x		x	x	x		x						
Land Surveying Procedures	LANL-ER-SOP-	3.01		x	x									x				
General Surface Geophysics	LANL-ER-SOP-	3.02	x	x	x		x											
Drilling Methods and Drill Site Management	LANL-ER-SOP-	4.01	x	x	x	x				x		x						
Hand Auger and Thin-wall Tube Sampler	LANL-ER-SOP-	6.1		x	x					x								
Spade and Scoop Collection of Soil Samples	LANL-ER-SOP-	6.1		x	x					x								
Sediment Material Collection	LANL-ER-SOP-	6.14		x	x					x								
Measurement of Gamma-Ray Fields Using a Sodium Iodide Detector	LANL-ER-SOP-	6.23		x	x			x	x									
Sample Collection from Split-Spoon Samplers and Shelby Tube Samplers	LANL-ER-SOP-	6.24		x	x					x		x						
Fidler Instrument Systems	LANL-ER-SOP-	10.04		x	x			x	x									
LANL Radiological Manual	LM	107 - 1.1	x	x	x			x	x									
Documenting Equipment and Items Release	LP	107 - 4		x	x			x	x									
Stop Work and Restart	LP	116 - 1	x	x	x	x	x	x	x	x		x	x	x			x	x
Radiation Dosimentry Monitoring	LS	107 - 11	x	x	x	x	x	x	x	x		x	x	x				