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

U. S. Department of Energy
Los Alamos Area Office, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
505-667-7203/FAX 505-665-4504

Date: July 6,1998
Refer to: EM/ER:98-224

LIBRARY COPY

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

SUBJECT: ADDENDUM TO THE VCM PLAN FOR TA-16 V SITE (FORMER OU 1082, FU 3)

Dear Mr. Garcia:

Enclosed please find two copies of the Addendum to the Voluntary Corrective Measures (VCM) Plan for Technical Area 16, Potential Release Sites 16-005(d), 16-006(g, h), 16-017, 16-026(q), 16-029(g2), 16-029(w), 16-029(x), 16-031(c), and C-16-074 at V Site. The other appropriate entities within the Department have been included on distribution.

Please contact Don Hickmott at (505) 665-1116 or Joe Mose at (505) 667-5808, if you have any questions regarding this addendum.

Sincerely,

Julie A. Canepa, Program Manager
LANL/ER Project

Sincerely,

Theodore J. Taylor, Program Manager
DOE/LAAO

JC/TT/DH/rfr

Enclosures: (1) Addendum to the VCM Plan for TA-16, V Site PRSs

Cy (w/ enc.):
T. George, EM/ER, MS M992
R. Hutton, SAIC, MS J521
J. Mose, LAAO, MS A316
D. Neleigh, EPA, R.6, 6PD-N
J. Newlin, CST-7, MS M992
C. Rodriguez, CIO/ER, MS M769
D. Hickmott, CST-7, MS E525
T. Taylor, LAAO, MS A316
T. Trujillo, AL-ERD, MS A906
J. White, ESH-19, MS K490
B. Garcia, NMED-HRMB
M. Leavitt, NMED-GWQB
J. Parker, NMED-OB
G. Saums, NMED-SWQB
S. Yanicak, NMED-AIP, MS J993
RPF, MS M707

Information Only (w/o enc.):
T. Baca, EM, MS J591
T. Longo, DOE-HQ, EM-453
D. McInroy, EM/ER, MS M992
J. Plum, LAAO, MS A316
S. Rae, ESH-18, MS K497
G. Rael, AL-ERD, MS A906
P. Schumann, ESH-19, MS M992
J. Vozella, LAAO, MS A316
EM/ER File, MS M992

LANL

LIBRARY COPY

Addendum to the Voluntary Corrective Measures Plan for Potential Release Sites

Potential Release Sites

16-005(d)
16-006(g, h)
16-017 [Bldg. 27]
16-026(q)
16-029(g2, w, x)
16-031(c)
C-16-074

Remedial Actions Focus Area

Environmental Restoration Project

June 1998

Los Alamos
NATIONAL LABORATORY

LA-UR-98-2780

1.0 INTRODUCTION **1**

1.1 OBJECTIVES AND SCOPE 4

1.2 APPROACH AND IMPLEMENTATION 5

1.3 BACKGROUND ISSUES 5

1.3.1 Regulatory Requirements *5*

1.3.2 Other Issues *6*

1.4 DATA QUALITY OBJECTIVES PROCESS 8

2.0 PRSs 16-006(h), PUMP PIT; 16-029(g2), SHAKE TEST PIT; AND C-16-074, FORMER DRUM STORAGE AREA **10**

2.1 CHARACTERIZATION AND SETTING 10

2.1.1 Site Description *10*

2.1.1a Current and Future Land Use 14

2.1.1b Geology 14

2.1.2 Operational History *15*

2.1.3 Waste Characteristics *16*

2.2 INVESTIGATORY APPROACH 17

2.2.1 Existing Data *17*

2.2.1.1 Nonsampling 17

2.2.1.2 Sampling 17

2.2.2 Conceptual Model *17*

2.2.2a Pathways for Residual Contamination 17

2.2.2b Pathways During Remediation 18

2.2.2.1 Nature and Extent of Contamination 18

2.2.2.2 Fate and Transport 18

2.2.2.2a Fate and Transport of Explosives and Explosives Byproducts 18

2.2.2.3 Data Gaps 19

2.2.3 Sampling Activities *19*

2.2.3.1 Contaminant Source 21

2.2.3.2 Media Characterization 21

2.2.3.2a PRS 16-006(h) 21

2.2.3.2b PRS 16-029(g2) and C-16-074 23

3.0 PERIMETER SAMPLING AT 16-017, TA-16-27 FOOTPRINT **26**

3.1 CHARACTERIZATION AND SETTING 26

3.1.1 Site Description *26*

3.1.2 Operational History *28*

3.1.3 Waste Characteristics *28*
3.2 INVESTIGATORY APPROACH 29
3.2.1 Existing Data *29*
3.2.1.1 Nonsampling 29
3.2.1.2 Sampling 29
3.2.2 Conceptual Model *29*
3.2.2.1 Nature and Extent of Contamination 29
3.2.2.2 Fate and Transport 29
3.2.2.3 Data Gaps 29
3.2.3 Sampling Activities *29*
3.2.3.1 Contaminant Source 30
3.2.3.2 Media Characterization 30
3.2.3.2a Sampling Along Perimeter 30
3.2.3.2b Sampling Beneath Shower Rooms 32

4.0 OVERBURDEN ASSOCIATED WITH TRENCHING ACTIVITIES AT 16-005(d), TA-16-27 SEPTIC TANK; 16-006(g), V-SITE SEPTIC TANK; 16-026(q), HE SUMPS AND DRAINLINE; 16-029(w), HE SUMP AND DRAINLINE; 16-029(x), HE SUMP AND DRAINLINE; AND 16-031(c), V-SITE COOLING TOWER 33

4.1 CHARACTERIZATION AND SETTING 33
4.1.1 Site Description *33*
4.1.2 Operational History *42*
4.1.3 Waste Characteristics *42*
4.2 INVESTIGATORY APPROACH 43
4.2.1 Existing Data *43*
4.2.1.1 Nonsampling 43
4.2.1.2 Sampling 43
4.2.2 Conceptual Model *43*
4.2.2.1 Nature and Extent of Contamination 43
4.2.2.2 Fate and Transport 43
4.2.2.3 Data Gaps 43
4.2.3 Sampling Activities *44*
4.2.3.1 Contaminant Source 44
4.2.3.2 Media Characterization 44
4.2.3.2a Overburden Soil Associated with Clean Areas 45
4.2.3.2b Overburden Soil Associated with HE-Contaminated Pipe or Underlying Soil 45
4.2.3.2c Overburden Soil Found to Contain Broken Clay Pipe and Other Debris 45

4.2.3.2d Overburden Soil that was Placed Back in Trenches Prior to Screening 46

5.0 DATA COLLECTION DESIGN AND PROCEDURES 47

5.1 DATA QUALITY OBJECTIVES 47

5.1a Data Management 47

5.1b Verification and Routine Validation 48

5.1c Data Quality Assessment 48

5.2 QUALITY ASSURANCE/QUALITY CONTROL 48

5.3 FIELD ACTIVITIES 50

5.3a Field Methods 50

5.3b Measurement Methods 53

5.3c Waste Management 55

6.0 PROJECT MANAGEMENT 55

6.1 PROJECT SCHEDULING AND REPORTING REQUIREMENTS 55

6.2 HEALTH AND SAFETY PLAN 55

6.3 INVESTIGATION-DERIVED WASTE PLAN (SOP) 55

6.4 COMMUNITY RELATIONS PLAN (SOP) 55

REFERENCES 56

LIST OF TABLES AND FIGURES

Figure 1.0-1. Location of TA-16 with respect to Laboratory technical areas and surrounding landholdings. 2
Figure 1.0-2. Location of the areas included in this VCM SAP....3
Figure 1.3.2-1. Springs, seeps, streams, and wetlands at TA-16....7
Figure 1.4-1. Decision Logic Flow Diagram Showing DQO Process....9
Figure 2.1.1-1. Sampling locations for V-Site PRSs....11
Figure 2.1.1-2. PRS 16-006(h), Pump Pit TA-16-525 (V-Site)....12
Figure 2.1.1-3. PRS C-16-074 and 16-029(g2)....13
Figure 3.1.1-1. Sampling locations for PRS 16-017 at building TA-16-27....27
Figure 4.1.1-1. Locations of overburden at V-Site....35
Figure 4.1.1-2. Locations of overburden at TA-16-27....36
Figure 4.1.1-3. Overburden flow diagram....37
Figure 4.1.1-4. PRSs 16-026(q) and 16-005(d)....38
Figure 4.1.1-5. PRS 16-029(x)....39
Figure 4.1.1-6. PRS 16-006(g) Septic Tank TA-16-527....40

Table 1.0-1 Summary of PRSs included in this sap addendum....4
Table 2.2.3-1 Proposed soil cleanup levels....21
Table 2.2.3.2-1 Samples and analyses needed for PRS 16-006(h)....23
Table 2.2.3.2-2 Samples and analyses needed for PRSs 16-029(g2) and c-16-074....25
Table 3.2.3.2-1 Samples and analyses needed for perimeter soil sampling at PRS 16-017....31
Table 3.2.3.2-2 Samples and analyses needed beneath the first floor....33
Table 5.2-1 QA samples submitted for laboratory analysis....49
Table 5.3-1 Summary of requirements for soil and sediment sampling methods....51
Table 5.3-2 Requirements for subsurface and core sampling methods....52
Table 5.3-3 Analyte suites and analytical methods for analysis of organic chemicals in soil, sediment, and core samples....53
Table 5.3-4 Analyte list, estimated detection limits, and analytical methods for inorganic chemicals in soil, sediment, and core samples....54

1.0 INTRODUCTION

Los Alamos National Laboratory (the Laboratory) is a multidisciplinary research facility owned by the Department of Energy and managed by the University of California. The Laboratory, located in north-central New Mexico, approximately 60 miles northeast of Albuquerque and 20 miles northwest of Santa Fe, covers 43 square miles of the Parajito Plateau.

The location of technical area 16 (TA-16) relative to all Los Alamos National Laboratory technical areas is shown in Figure 1.0-1. Figure 1.0-2 shows the location of TA-16 areas addressed in this SAP with respect to each other.

This addendum to the sampling and analysis plan (SAP) for the V-Site Voluntary Corrective Measure (VCM) presents proposed changes and additions to the approved sampling strategy documented in the V-Site VCM Plan (LANL 1997, ER ID 55512). The VCM Plan for V-Site and Building 27 was submitted to the Department of Energy (DOE) and New Mexico Environment Department (NMED) on March 25, 1997. The NMED issued a Notice of Deficiency (NOD), which was responded to on May 22, 1997. The NOD response was reviewed and the VCM Plan was approved by NMED on October 10, 1997 (NMED 1997, ER ID 58030).

This SAP addendum is being submitted to address the revised sampling approach for those buildings and structures at V-Site that will no longer be decommissioned because the buildings have been determined to be historically significant, as documented in a memorandum from Theodore J. Taylor (DOE LAAO) to J. Canepa (ER Project Manager), dated November 14, 1997 (DOE 1997, ER ID 56940). In addition, this SAP addresses the perimeter sampling around the foundation of the Building 27 footprint, PRS 16-017, and the sampling of overburden associated with trenching activities at PRSs 16-005(d), 16-006(g), 16-026(q), 16-029(w), 16-029(x), and 16-031(c). These changes were communicated to NMED in December 1997.

The perimeter sampling at PRS 16-017 and the trenching activities at PRSs 16-005(d) and 16-026(q) have been completed prior to written approval because of the need to coordinate with decomissioning and decontamination (D&D) activity.

These PRSs have been grouped because of geographic proximity and similarity of historical activities. The PRSs were associated with high explosives (HE) processing activities at former TA-25 (V-Site) and TA-16-27.

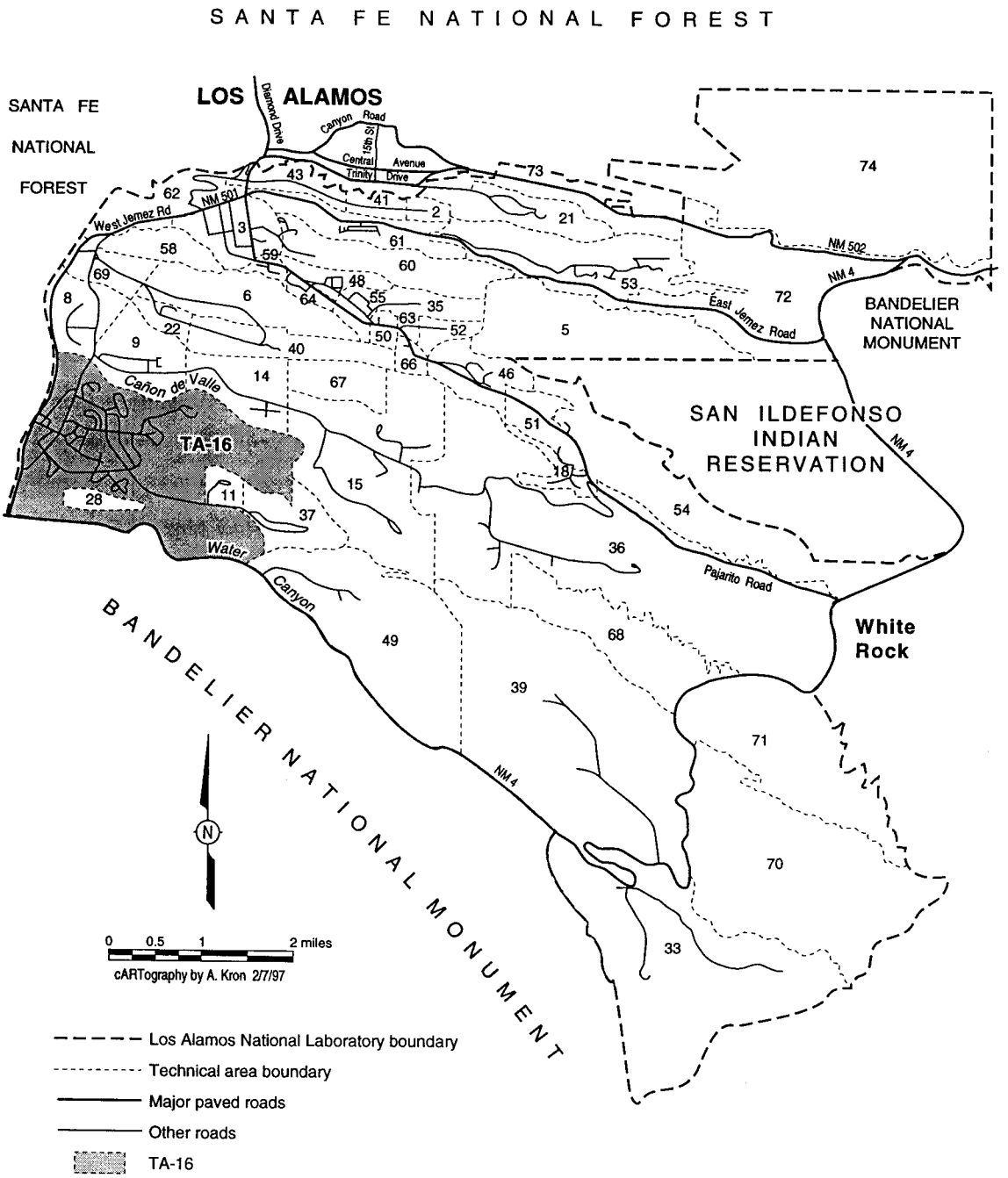

Figure 1.0-1. Location of TA-16 with respect to Laboratory technical areas and surrounding landholdings.

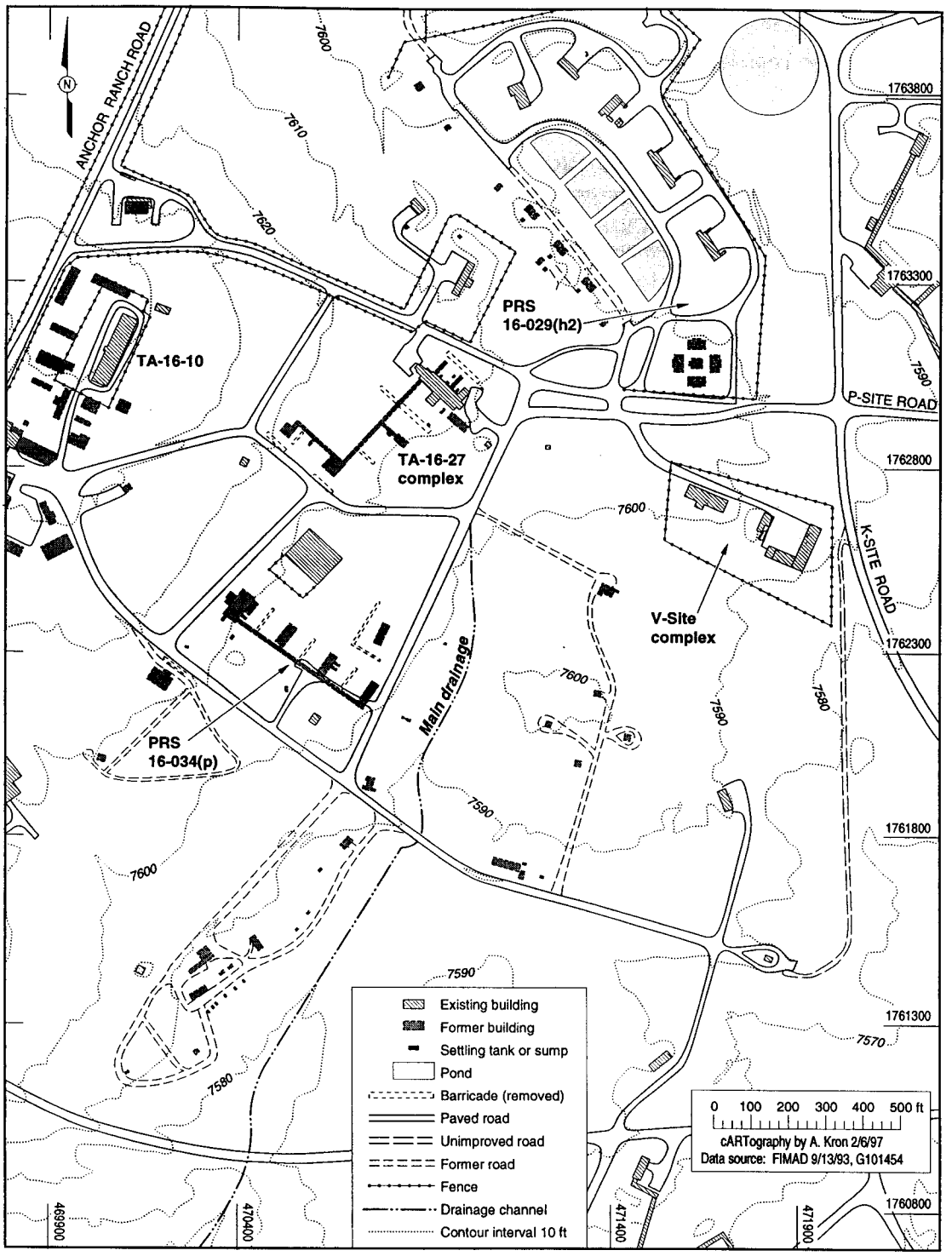

Figure 1.0-2. Location of the areas included in this VCM SAP.

Table 1.0-1 lists the descriptions, decision rationales, and the sections of this document in which detailed information can be found for each PRS.

TABLE 1.0-1

SUMMARY OF PRSs INCLUDED IN THIS SAP ADDENDUM

PRS	HSWA	DESCRIPTION	LOCATION	RATIONALE	SECTION
16-006(h)	Yes	Pump pit TA-16-526	V-Site	Characterization and soil removal, if necessary	2.0
16-029(g2)	Yes	Pit TA-16-523	V-Site	Characterization and soil removal, if necessary	2.0
C-16-074	No	Drum storage area, TA-16-517	V-Site	Characterization and soil removal, if necessary	2.0
16-017	Yes	Building foundations and structures (only the footprint of building TA-16-27 is addressed in this SAP addendum)	TA-16-27	Characterization and soil removal, if necessary	3.0
16-005(d) 16-006(g) 16-026(q) 16-029(w) 16-029(x) 16-031(c)	Yes	Overburden soils associated with trenching activities from drain lines, sumps and septic systems	V-Site and TA-16-27	Confirmatory Sampling of Removed Overburden	4.0

1.1 Objectives and Scope

The purpose of this SAP addendum is to augment the approved sampling strategy of the VCM plan by addressing the following issues:

- the characterization of potentially contaminated soil underneath V-Site PRSs with the structures still in place,
- the additional perimeter sampling at building TA-16-27, PRS 16-017, to minimize the potential spread of contamination during D&D activities, and

- the confirmatory sampling of overburden associated with trenching activities at several PRSs that was not anticipated when the VCM Plan was being developed.

The purpose of sampling V-Site PRSs is to characterize the sites and base decisions on approved cleanup levels. If soil removal is necessary, it will only be done if the integrity of the structures is not threatened.

The purpose of sampling the Building 27 perimeter is to characterize potentially contaminated soil that could otherwise be dispersed during D&D excavation work, mixed with D&D debris, or remain at the site as a potential source of future contamination.

The objective for sampling the overburden soil is to verify that the soil returned to the site is not contaminated at concentrations greater than cleanup levels.

The general approach for achieving these objectives is to collect screening samples to determine if contaminants are above 50% of the cleanup levels (see Table 2.2.3-1) established in the approved VCM Plan. If the screening results indicate that contaminants are above 50% of the cleanup level, the contaminated media will be excavated and stockpiled. This approach is necessary during work coordinated with D&D activities. Confirmatory laboratory samples will be biased to screening results for HE and metals, and will be collected beneath the excavations to confirm that the locations are clean. Bounding screening samples will be collected from locations that are a 2-ft vertical and horizontal distance from the verified clean areas. Based on these results, bounding laboratory samples will be collected at the 2-ft vertical locations.

1.2 Approach and Implementation

Field screening results will be used to bias the location of laboratory samples. Surface soil grab samples will be collected and sent to a laboratory for high explosives, metals, uranium, PCBs [for selected PRSs] semivolatiles, and volatiles organic analyses to determine verification of cleanup. The number of samples to be collected at each PRS are addressed in Sections 2.2.3.2, 3.2.3.2, and 4.2.3.2.

1.3 Background Issues

1.3.1 Regulatory Requirements

The PRSs addressed in this plan are listed in Table C of the HSWA Module of the Laboratory's Resource Conservation and Recovery Act (RCRA) Hazardous Waste Facility Permit (EPA 1990, ER ID 07947).

Sampling is driven by the Module VIII Hazardous and Solid Waste Amendments (HSWA) of the Laboratory's hazardous waste facility permit, which was issued on May 23, 1990 (EPA 1990, ER ID 07947) and modified on May 19, 1994. An additional standard for radiological contaminants is DOE Order 5400.5, "Radiation Protection of the Public and the Environment." In 1993, this DOE order was issued as a Proposed Rule in the Federal Register (58-FR-16268) and covers, among other topics, establishment of dose limits to the public from radiation and radionuclides associated with DOE operations. Radionuclides will be investigated as part of this SAP, although radiological contamination is not regulated by RCRA.

1.3.2 Other Issues

There are no underground storage tanks (USTs) present at any of these sites. Surface water issues are addressed in Sections 2.1.1., 3.1.1, and 4.1.1. The following Figure 1.3.2-1 shows drainages, wetlands, springs, and streams at TA-16.

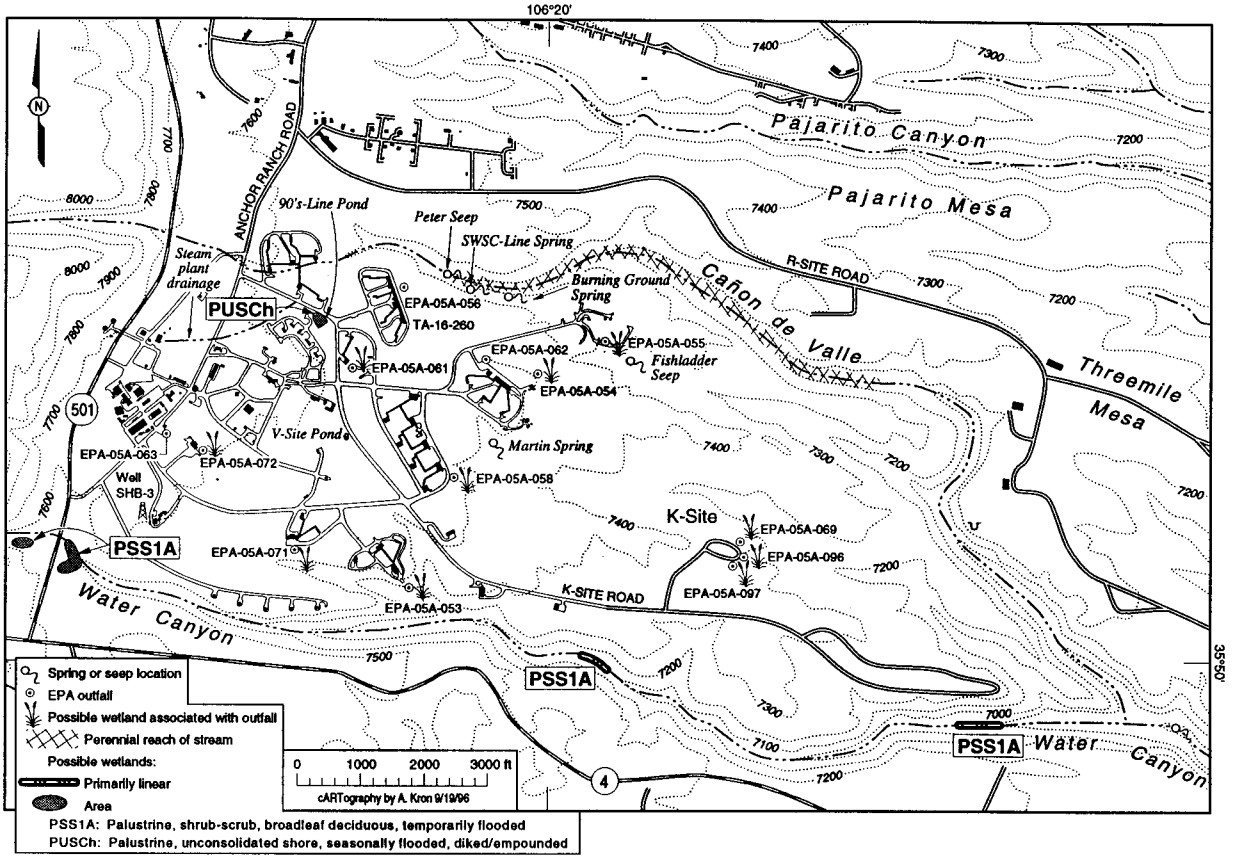

Figure 1.3.2-1. Springs, seeps, streams, and wetlands at TA-16

1.4 Data Quality Objectives Process

The DQO process that will be followed is presented in a decision logic flow diagram on the following page.

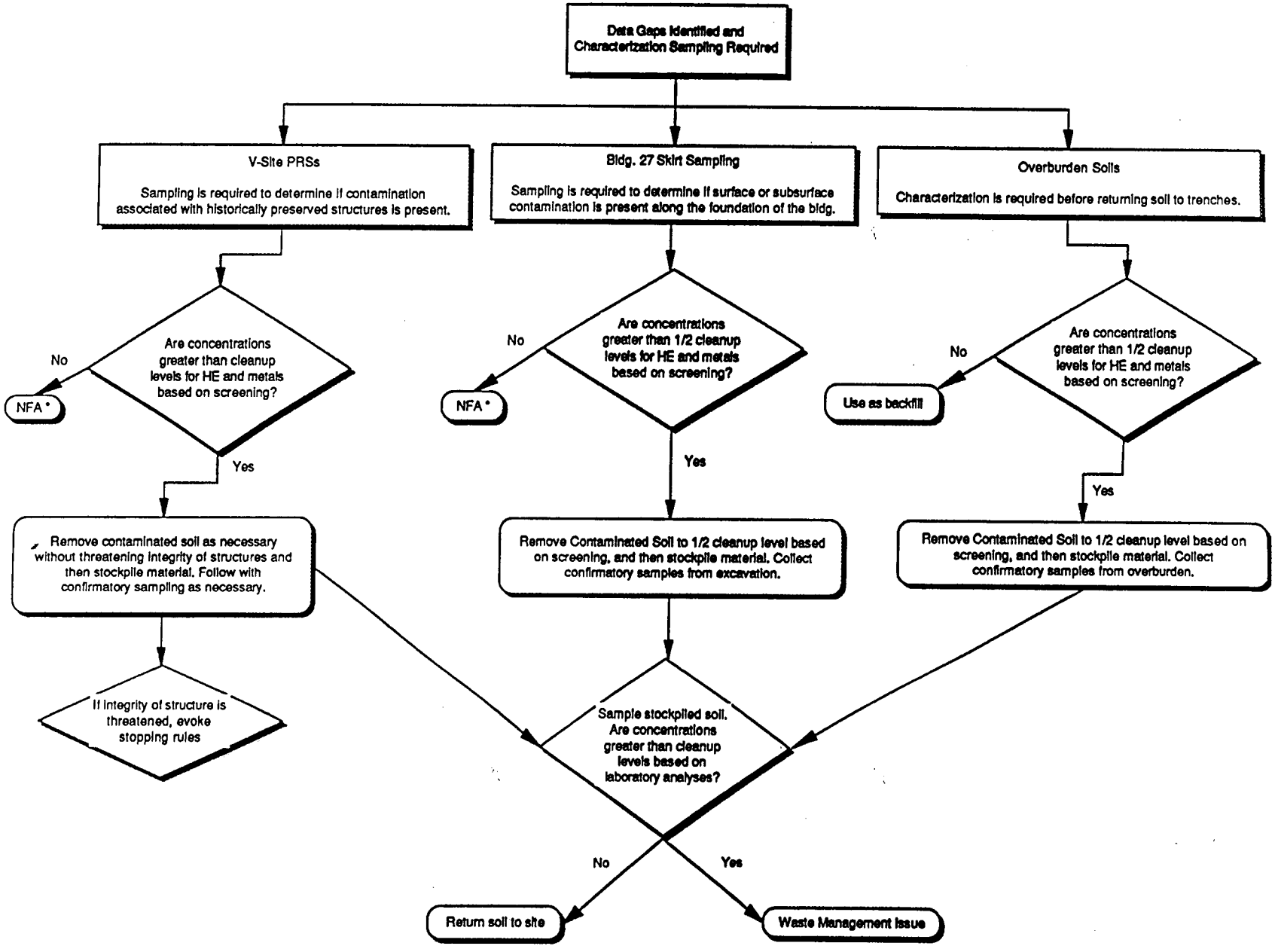

Figure 1.4-1. Decision Logic Flow Diagram Showing DQO Process

* Recommend NFA, provided the extent of contamination is constrained and the site(s) passes eco/ARAR screening assessment.

2.0 PRSs 16-006(h), PUMP PIT; 16-029(g2), SHAKE TEST PIT; AND C-16-074, FORMER DRUM STORAGE AREA

2.1 Characterization and Setting

2.1.1 Site Description

The following PRSs at V-Site are all inactive and located on the mesa top. The watershed for this region of TA-16 is Water Canyon. The size of the contaminated area is not known for these PRSs, but is expected to be small and highly localized. Figure 2.1.1-1 presents the location of the PRSs and proposed sampling locations. Photographs of these sites are presented in Figures 2.1.1-2 and 2.1.1-3.

PRS 16-006(h) is a steam-heating distribution pump pit, TA-16-526. This structure is located approximately 12 ft southeast of TA-16-517 (LANL 1990, ER ID 43827). The 6 x 6 x 6-ft pit was built in 1945 to hold a condensate pump. Condensate from the TA-16-517 boilers, as well as from the S-Site area, was routed through this pit to be returned to the source boiler. This system served TA-16-515, TA-16-516, TA-16-519, and TA-16-520. Some pipes in the pit are insulated with asbestos.

The surface water assessment Administrative Procedure (AP) 4.5 has not yet been performed for 16-006(h). However, two other PRSs located at V-Site were assessed and have erosion matrix scores of 3.6 and 10.6. Because of the proximity of 16-006(h) to the other PRSs that were assessed, the erosion matrix score would be comparable. An AP 4.5 evaluation for this site will be completed and the results included in the VCM report. The estimated ground cover at the site is 75 to 100%, with a less than 10% slope. There is no watercourse near this PRS.

PRS 16-029(g2) is pit TA-16-523. Engineering drawing ENG-C 1837 indicates an 11 ft x 16 ft x 4 ft concrete structure located directly to the east of TA-16-517. The pit was built in 1944, but abandoned in place in 1945. It is filled with soil and covered with a concrete slab. The pit held a remotely controlled vibration table used for shake tests of the Fat Man device. No radioactive materials were used in this pit and no incidents occurred here. A 1983 memo indicates that HE and beryllium were used at TA-16-523 (Blackwell 1983, ER ID 05823).

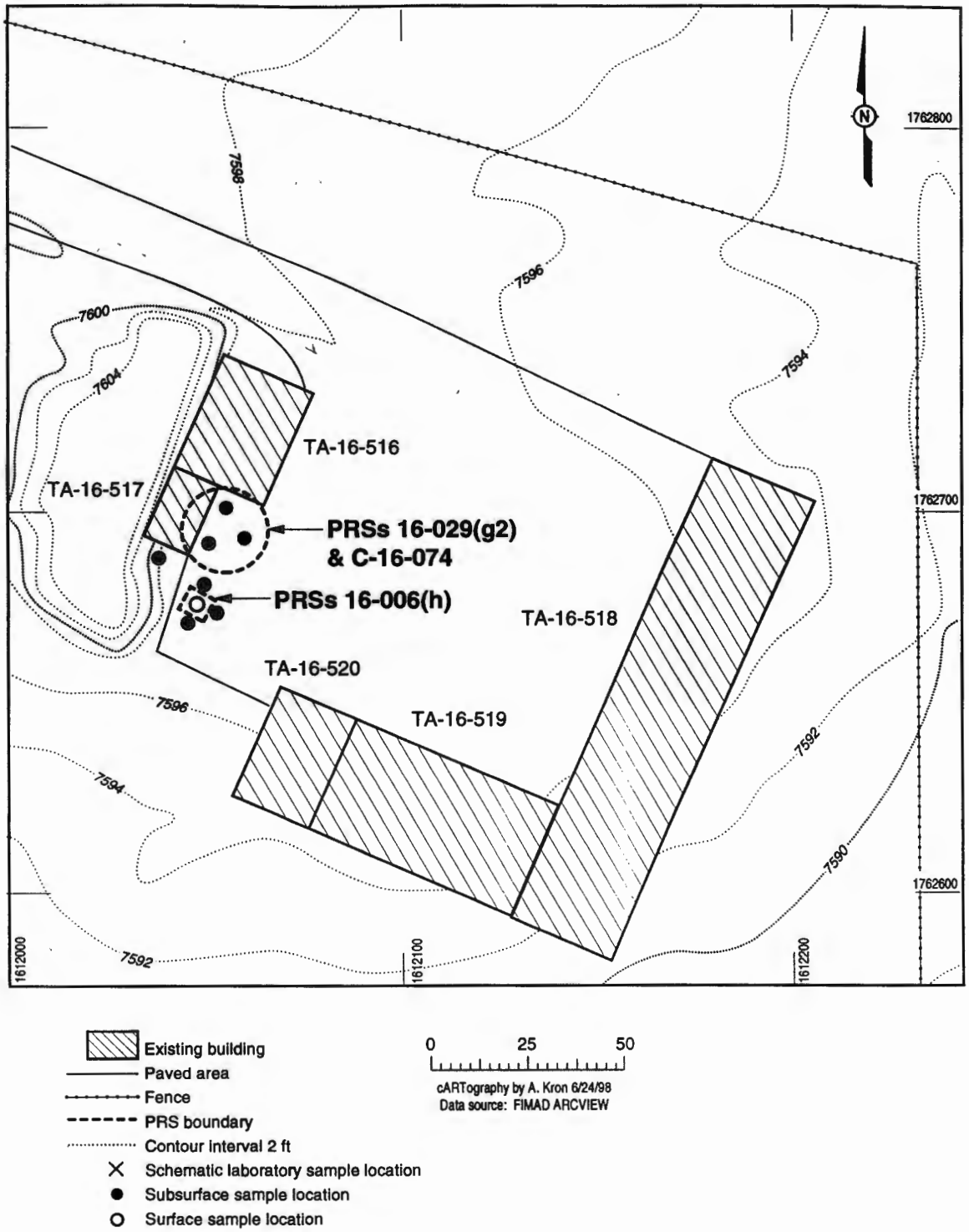

Figure 2.1.1-1. Sampling locations for V-Site PRSs

Figure 2.1.1-2 PRS 16-006(h), Pump Pit TA-16-525 (V-Site)

Figure 2.1.1-3. PRS C-16-074 and 16-029(g2)

An AP 4.5 evaluation has not yet been performed for 16-029(h2). However, other PRSs located at V-Site were assessed and have erosion matrix scores of 3.6 and 10.6. Because of the proximity of 16-029(g2) to these other PRSs, the erosion matrix score would be comparable. An AP 4.5 evaluation for this site will be completed and the results included in the VCM report. The estimated ground cover at the site is 75 to 100%, with a slope of less than 10%. There is no watercourse near this PRS.

C-16-074 is associated with a drum storage area located on the concrete pad [PRS 16-029(g2)] east of TA-16-517. The pad is level, empty, and surrounded by the asphalt paving of the adjacent courtyard. V-Site was used for many years as a general storage area for TA-16; however, no oil stains are present. Only a few rust rings remain on the concrete pad. The SWMU Report states that drums containing HE-contaminated hydraulic oil were stored in this location (LANL 1990, ER ID 43827).

The AP 4.5 evaluation for C-16-074 has been performed. The erosion matrix score is 3.6. The estimated ground cover at the site is 75 to 100%, with a slope of less than 10%. There is no watercourse near this PRS.

a. Current and Future Land Use

The PRSs in this SAP 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 1995 (LANL 1995, ER ID 57224). Although V-Site has been designated as an historical site, use of the site is not anticipated to change. 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.

b. Geology

Bedrock Stratigraphy

V-site is immediately underlain by bedrock units of the Bandelier Tuff, which consists of, in descending order, the Tshirege Member Units, the Cerro Toledo Interval, and the Otowi Member. The Bandelier Tuff Units and older bedrock units beneath the Bandelier Tuff are described in more detail in the IWP (LANL 1996, ER ID 57368). Unit 4 of the Tshirege Member of the Bandelier

Tuff is exposed in a few places on the mesa top and Units 4 and 3 of the Tshirege Member are exposed along adjacent canyon walls.

Surficial Deposits

In the vicinity of V-Site, surficial deposits on the mesa surface consist of coarse-grained colluvium on steep hillslopes in adjacent canyons and finer-grained alluvial and colluvial sediments on the mesa top. Colluvial and alluvial deposits also occur at the mouth of steep drainages and on the post-Bandelier fault escarpment located west of V-Site. Surficial deposits in the axis of major canyons adjacent to TA-16 (Cañon de Valle and Water Canyon) consist of alluvial sediment deposited by intermittent stream flow.

Soils

The mesa top deposits are sufficiently old to have significant, but highly variable, soil development. Soils in Los Alamos County (including the Laboratory) were mapped and described by Nyhan et al. (1978, ER ID 05702). The soils were all formed in a semiarid climate and include material derived primarily from Bandelier Tuff, Tschicoma Formation.

A wide variety of soil types occurs in the TA-16/V-Site area as mapped by Nyhan. These include Typic Eutroboralfs (both clayey-skeletal and fine), Tocal very fine sandy loam, Frijoles very fine sandy loam, Pogna fine sandy loam, Totavi gravelly loam, Sanjue-Arriba complex, Carjo loam, and Rabbit-Tsankawi rock outcrop.

The nature and thickness of soils at TA-16 may influence the transport of contaminants in the environment. Soil mineralogy, permeability, grain size, organic content, and other chemistry parameters are all factors that may impede or enhance the movement and concentration of contaminants.

2.1.2 Operational History

V-Site was constructed in 1944 for handling, loading, shake-testing, and cold-testing of mockups of the atomic bomb known as Fat Man. A mockup of a B-29 bomb bay was erected at V-Site for these tests (Hawkins 1946, ER ID 04704).

The first structures constructed at the site were TA-16-515 (V-1, V-2) and TA-16-517, a laboratory, all built in 1944. V-Site was expanded in spring 1945 with the construction of TA-16-516, TA-16-519, and TA-16-520. TA-16-519 and TA-16-520 were used for varnishing and assembly of Fat Man mockups. In July 1945, final fit testing of the Trinity Device was performed in TA-16-516. At that time, the site was remodeled for non-explosive testing of HE lenses and inner

charges of implosion devices, and for final machining work on explosive parts (Truslow 1973, ER ID 04967). An x-ray system was installed to inspect explosive charges (Ackerman 1945, ER ID 57746).

Drawing ENG-C 1839 suggests that building TA-16-515 was constructed as a warehouse, but that it also housed a shop and small office. By fall 1945, the building was remodeled and made into a laboratory, inspection room, and repair area for HE parts. The laboratory housed an x-ray machine and included a darkroom. Drawing ENG-C 6030 indicates that part of the walls near the x-ray machine were lead-covered; the lead panels are still in place. The inspection and repair room floors were fitted on three sides with lead-lined troughs leading outside to the trough under the porch. The floor drained toward the troughs. Drawing ENG-C 639 indicates that lead was removed from the troughs in 1950. The laboratory area was remodeled again in 1963 for a temperature cycling chamber. Former employees indicate that the building was used for multiple purposes over the years, including assembly and varnishing of HE parts, HE casting, a remotely controlled shake table, and storage (Martin 1993, ER ID 52964).

After World War II, the primary operations at V-Site were x-ray work and photoprocessing in the west end of TA-16-515, HE casting in the east end of TA-16-515, pioneering work done on plastic explosives in TA-16-516, and photoprocessing in TA-16-519 and TA-16-520. TA-16-100 was moved from TA-3 to the S-Site complex in 1949 to be used as an electroplating laboratory. TA-16-100 was destroyed by intentional burning in 1960. The sump and drain line were also removed during the 1960s.

All active work at V-Site ceased by 1980. Both the courtyard and shed TA-16-518 were used for general storage until 1993; the rest of the site was abandoned, although the buildings are still standing. Portions of the TA-16-515 drainage system were removed during the late 1960s. The rest of the sump and drainage system at TA-16-515 was scheduled for demolition and restoration programs in 1970, as were manholes TA-16-793, TA-16-794, TA-16-795, TA-16-796, TA-16-797, TA-16-798, and TA-16-799 (Thrap 1970, ER ID 05784), but the demolition never occurred. TA-16-515 is now abandoned and deteriorating. Entry is prohibited for safety reasons. The buildings at V-Site are now being preserved for historical purposes.

2.1.3 Waste Characteristics

This section addresses the potential contaminants that may be present at these PRSs, based on the information contained in Section 2.1.1, Site Description, and Section 2.1.2, Operational History. This information is potentially relevant to waste only to the extent that *solid waste*, as that term is defined under RCRA, is subsequently generated at these PRSs. This discussion of

potential contaminants in no way implies that the materials present at these PRSs are *solid waste* or *hazardous waste* as those terms are defined under New Mexico Statutes Annotated (NMSA), the New Mexico Administrative Code (NMAC), RCRA, HSWA, Solid Waste Disposal Act (SWDA), or any other statutes or regulations.

Based on the operational history of V-Site, HE (RDX, TNT, TNB), metals, uranium, and semivolatile organic compounds (SVOCs) are likely contaminants of potential concern (COPCs). The volumes and periods of discharges are not known.

2.2 Investigatory Approach

2.2.1 Existing Data

2.2.1.1 Nonsampling

No previous nonsampling investigations have been performed at V-Site.

2.2.1.2 Sampling

No analytical information is available for the PRSs located at V-Site.

2.2.2 Conceptual Model

a. Pathways for Residual Contamination

This area of TA-16 is flat, located away from steep drainages and canyon sides, and is covered with grasses and pine forest. Potential contamination at these sites is expected to be in the shallow surface soils, at low concentrations, and to be highly localized around sumps, drain lines, and other structures. This assumption is based on the voluntary corrective action (VCA) that took place at the 90s-Line PRSs at TA-16, which had the same COPCs. If contaminated soils remain in place at these PRSs, the primary mechanisms available for transport of contaminants from their current locations are erosion of soil and wind dispersion. Potential contaminants do not contact groundwater or surface water at these sites. A conceptual model for these sites with surface soil contamination was presented in the RFI Work Plan for OU 1082 (LANL 1993, ER ID 20948). The following potential human exposure pathways to surface soils were identified in the conceptual exposure model:

- incidental soil ingestion,
- dermal contact with contaminated soil, and

- inhalation of contaminated soil-derived particulates.

These three exposure pathways are conservative and were considered in the derivation of cleanup levels. Due to the site-specific conditions at this part of TA-16 (e.g., depth to groundwater is greater than 500 ft and there is no direct contact with drainage areas or surface water), effects on groundwater and ingestion of contaminated water are not evaluated as potential pathways.

b. Pathways During Remediation

Possible exposure pathways to workers involved with remediation may result from excavation activities, which could 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 (BMPs), such as placement of hay bales, will be implemented in collaboration with the Laboratory group ESH-18 as part of stormwater prevention program activities.

2.2.2.1 Nature and Extent of Contamination

The nature and extent of contamination at these sites is unknown and will be determined during the VCM exercise and documented in the VCM report.

2.2.2.2 Fate and Transport

a. Fate and Transport of Explosives and Explosives Byproducts

As described in the conceptual model, erosion from surface water runoff or wind dispersion are considered the primary mechanisms for contaminant transport from this site. Although infiltration of surface water (meteoric water and surface water runoff) into the shallow soil is considered a potential mechanism for contaminant transport, results from investigations at nearby sites suggest that the process is not sufficiently effective to mobilize contaminants along vertical or horizontal pathways. The assumptions in the conceptual model regarding fate and transport will be evaluated using the bounding sampling approach outlined in the VCM plan and this SAP. Appendix D of the 1993 OU 1082 Work Plan addresses the fate and transport of explosives extensively.

2.2.2.3 Data Gaps

Because of the preservation of V-Site structures and the lack of data, the sampling approach and data collection will need to be modified to determine if contamination is present at concentrations above the cleanup levels established in the approved VCM plan.

2.2.3 Sampling Activities

The goal of the proposed sampling design is to determine subsurface contamination. The PRS boundaries are well defined and laboratory samples will be biased to positive HE screening. The pits will be bored in three different locations, at a minimum, to determine lateral and vertical extent of contamination. Laboratory results will be compared to cleanup levels. The bounding of contamination will be addressed.

The field screening kits that will be used to bias the collection of laboratory samples include the D-Tech™, Ensys™, and HE spot test kits. The D-Tech™ kits have a detection range of 0.5 to 5 mg/kg and produce semi-quantitative results. The Ensys™ kits have a detection range of 1 to 30 mg/kg for RDX and TNT.

A comparative study of HE field screening kits indicated that at levels of approximately 1 ppm, these kits "had significant positive bias...sometimes resulting in false positives..." (Crockett et al. 1994, ER ID 57076). This positive bias has been attributed to the presence of humic substances (naturally occurring colored compounds) that are present in soil and are extracted along with the HE, interfering with visual or colorimetric evaluation of the extract. As a result, "...on-site method results are biased high as compared to laboratory results" (Crockett et al. 1996, ER ID 55840). No false negatives were reported in this comparative study. Thus, the field screening methods used in these investigations tend to err in the direction of incorrectly identifying the presence of HE. Therefore, all soil removed to 50% of the cleanup levels will be sampled and the laboratory results will be compared to cleanup levels.

In all cases, fixed laboratory data will be compared to cleanup levels listed below in Table 2.2.3-1. The cleanup levels calculated in the original VCM plan were based on human health risk, using an industrial land use exposure scenario. The equations and parameter values used in the calculations were identical to those specified in the Region IX PRG Table for industrial land use (EPA 1996, ER ID 53970)

For the purposes of this VCM, cleanup levels have been derived with a point of departure of 1E-6 level of risk for carcinogens and a hazard index of 0.1 for noncarcinogens. (The exceptions to this were the cleanup levels for beryllium and lead. The cleanup level for beryllium was based

on a 1E-5 level of risk to establish a threshold above the background concentration range for this metal. The cleanup level for lead was based on Environmental Protection Agency (EPA) Region VI guidance.) This conservative approach was adopted to account for the presence of multiple constituents and to be sure that residual risk would 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 site-specific factors have also been considered in establishing cleanup levels for this VCM.

- PRSs at TA-16 are located 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 estimate of potential risk.
- Following remediation, it is extremely difficult to envision a credible exposure scenario, based on either human health or eco-risk, that would provide any long-term exposure to significant amounts of subsurface soil at these sites.
- 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 recommends a 10-5 action level for Class C carcinogens (EPA 1990, ER ID 56034).

The Laboratory recommends that the soil cleanup levels presented in Table 2.2.3-1 be applied to this VCM. For all contaminants, cleanup of the site to these levels will result in incremental risks well below EPA's target risk range.

TABLE 2.2.3-1

PROPOSED SOIL CLEANUP LEVELS

CHEMICAL	RECOMMENDED CLEANUP LEVEL (mg/kg)	RATIONALE/NOTES
Barium	✓ 10 000	HI[a] = 0.1
Beryllium	11	Risk = 10^{-5}
Cadmium	85	HI = 0.1
Chromium (total)[b]	✓ 450	Risk = 10^{-6}
Copper	6300	HI = 0.1
Cyanide	1400	HI = 0.1
DNB mixture	6.8	HI = 0.1
DNT mixture	2.8	Risk = 10^{-6}
HMX	3400	HI = 0.1
Lead	✓ 1000	EPA Region VI guidance
Nickel	3400	HI = 0.1
RDX	17	Risk = 10^{-6}
TNB	3.4	HI = 0.1
TNT	64	Risk = 10^{-6}

a. I = Hazard Index

b. Total chromium value assumes 1/6 of total chromium is chromium (VI)

2.2.3.1 Contaminant Source

No contaminant source sampling is required at these sites because there will be no significant remaining source of contamination following the VCM, and because contamination will be bounded during the VCM. The affected soil associated with these PRSs is addressed in Section 2.2.3.2.

2.2.3.2 Media Characterization

a. PRS 16-006(h)

The strategy for sampling this pump pit has been revised to detect the presence of surface and subsurface contamination while the structure is in place. Three subsurface borings will be

advanced adjacent to the pit and 2 ft below the foundation of the pit using an auger drill rig. The depth to the bottom of the pit is estimated to be 8 ft. Boring locations are shown in Figure 2.1.1-1. Drilling will continue at each location until 2-ft clean intervals have been established below the foundation. This determination will be based on field screening for HE using the HE spot test kit, D-Tech kits, and Ensys kit (if TNB is suspected based on the D-Tech results) and field screening for metals using XRF. Soil will be collected from the boreholes at 2-ft intervals using split spoon samplers. The soil from the split spoon samplers will be placed into bowls for homogenization and then transferred to appropriate sample containers. A portion of each sample will be brought to the field trailer and analyzed for HE and metals.

Should screening results indicate that potential contaminants, specifically HE and metals, are below 50% of the cleanup levels documented in the approved VCM plan, two biased samples will be collected from one of the borings for off-site laboratory analysis. These samples will be biased to soil that screened above detection limits but below 50% of the cleanup levels for HE or metals. If no HE or metals are detected based on screening, then the samples will be collected from the downgradient location.

These two samples from one boring location will provide vertical bounding information and will result in a minimum of two subsurface laboratory samples for this PRS. In addition, one sample of the surficial soil contained inside the pit will be collected for laboratory analysis. The soil will be sampled using a modified spade and scoop (a long-handled scoop) in order to sample at depth. The laboratory samples will be analyzed for uranium, metals, HE, and SVOCs. Refer to Table 2.2.3.2-1 for a summary of screening and sampling needs.

Per the approved VCM plan, if results from the screening indicate that contaminants are above 50% of the cleanup levels, the contaminated soil will be excavated using a backhoe (or equivalent earth-moving equipment) without disturbing the integrity of the V-Site buildings. The soil will be stockpiled and sampled to determine, based on laboratory results, if the soil can be returned to the site. If the backhoe bucket is unable to remove the soil adjacent to the foundation, a Soil Vac will be used to suction the soil. The soil will be vacuumed into 55-gal. drums (or equivalent containers) and sampled to determine if the soil is greater than cleanup levels. If so, the soil will be handled as waste.

Confirmatory laboratory samples will be collected beneath the excavations to confirm that the locations are clean. Bounding screening samples will be collected from locations that are a 2-ft vertical and horizontal distance from the verified clean areas. Bounding laboratory samples will be collected at the 2-ft vertical locations. These bounding screening and laboratory samples will be

collected using a manually driven hand auger, auger drill rig, or backhoe (or equivalent earth-moving equipment).

TABLE 2.2.3.2-1

SAMPLES AND ANALYSES NEEDED FOR PRS 16-006(h)

DEPTH (ft)	MEDIUM	NUMBER OF SCREENING SAMPLES	TYPE OF SCREENING	NUMBER OF LABORATORY SAMPLES	ANALYTICAL SUITE
0–2	Soil	3 (1/boring location)	TNT, RDX, metals	TBD*	Uranium, metals, HE, SVOCs
2–4	Soil	3 (1/boring location)	TNT, RDX, metals	TBD*	Uranium, metals, HE, SVOCs
4–6	Soil/tuff	3 (1/boring location)	TNT, RDX, metals	TBD*	Uranium, metals, HE, SVOCs
6–8	Soil/tuff	3 (1/boring location)	TNT, RDX, metals	TBD*	Uranium, metals, HE, SVOCs
8–10**	Soil/tuff	3 (1/boring location)	TNT, RDX, metals	TBD*	Uranium, metals, HE, SVOCs
Inside pit	Soil	1	TNT, RDX, metals	1	Uranium, metals, HE, SVOCs

* TBD = to be determined; laboratory samples will be biased to field-screening results. At a minimum, two locations will be sampled for a total of two laboratory samples from the borings.

** Samples may be collected at deeper depths until a 2-ft clean interval is obtained.

b. PRSs 16-029(g2) and C-16-074

These two PRSs will be sampled together because the C-16-074 drum storage area is essentially on top of PRS 16-029(g2), the shake test pit. The strategy for sampling these PRSs has been revised in order to detect the presence of subsurface contamination with the structures in place. Four subsurface borings will be advanced through and adjacent to the shake test pit and 2 ft below the foundation of the pit. This will be done using an auger drill rig. The depth to the bottom of the pit is estimated to be 8 ft. Boring locations are shown Figure 2.1.1-1. Drilling will continue at each location until 2 feet of clean intervals have been established below the foundation, as determined by field screening for HE and metals. Soil will be collected from the boreholes at 2-

foot intervals using split spoon samplers. The soil from the split spoon samplers will be placed into bowls for homogenization and then transferred into appropriate sample containers. A portion of the soil from each sample location will be removed immediately from the sampler and placed into a Teflon-sealed jar for possible analysis of volatile organic compounds (VOCs), if this sample is chosen to be submitted for off-site laboratory analysis. A portion of each sample will be brought to the field trailer and analyzed for HE and metals.

Should screening results indicate that potential contaminants are below 50% of the cleanup levels, two biased samples will be collected from one of the borings for off-site laboratory analysis. The samples will be biased to soil that has screened above detection limits but below 50% of the cleanup levels for HE or metals. If no HE or metals are detected based on screening, the samples will be collected from the downgradient location.

These two samples from one boring location will provide vertical bounding information. This results in a minimum of two subsurface laboratory samples for these PRSs. The laboratory samples will be analyzed for uranium, metals, HE, VOCs and SVOCs. Refer to Table 2.2.3.2-2 for a summary of screening and sampling needs.

Per the approved VCM plan, if screening results indicate that contaminants are above 50% of cleanup levels, concrete/asphalt and contaminated soil will be excavated as necessary using a backhoe (or equivalent earth-moving equipment), without disturbing the integrity of the V-Site buildings. The soil will be stockpiled and sampled to determine, based on laboratory results, if the soil can be returned to the site. If the backhoe bucket is unable to remove the soil adjacent to foundations, then a Soil Vac will be used to suction the soil. The soil will be vacuumed into 55-gal. drums (or equivalent containers) and sampled to determine if the material is greater than cleanup levels. If so, the soil will be handled as waste.

Confirmatory laboratory samples will be collected beneath the excavations in order to confirm that the locations are clean. Bounding screening samples will be collected from locations that are a 2-ft vertical and horizontal distance from the verified clean areas. Bounding laboratory samples will be collected at the 2-ft vertical locations. These bounding screening and laboratory samples will be collected using a manually driven hand auger, auger drill rig, or backhoe (or equivalent earth-moving equipment).

TABLE 2.2.3.2-2

SAMPLES AND ANALYSES NEEDED FOR PRSs 16-029(g2) AND C-16-074

DEPTH BELOW ASPHALT (ft)	MEDIUM	NUMBER OF SCREENING SAMPLES	TYPE OF SCREENING	NUMBER OF LABORATORY SAMPLES	ANALYTICAL SUITE
0–2	Soil	4 (1/boring location)	TNT, RDX, metals	TBD*	Uranium, metals, HE, VOCs, SVOCs
2–4	Soil	4 (1/boring location)	TNT, RDX, metals	TBD*	Uranium, metals, HE, VOCs, SVOCs
4–6	Soil/tuff	4 (1/boring location)	TNT, RDX, metals	TBD*	Uranium, metals, HE, VOCs, SVOCs
6–8	Soil/tuff	4 (1/boring location)	TNT, RDX, metals	TBD*	Uranium, metals, HE, VOCs, SVOCs
8–10**	Soil/tuff	4 (1/boring location)	TNT, RDX, metals	TBD*	Uranium, metals, HE, VOCs, SVOCs

* TBD = to be determined; laboratory samples will be biased to field-screening results. At a minimum, two locations will be sampled for a total of two laboratory samples from the borings.

** Samples may be collected at deeper depths until a 2-ft clean interval is obtained.

3.0 PERIMETER SAMPLING AT 16-017, TA-16-27 FOOTPRINT

3.1 Characterization and Setting

3.1.1 Site Description

Building 27, a former HE casting building, has been removed by D&D. A detailed site description is provided in the VCM plan.

The perimeter sampling will be completed, as well as the overburden sampling (see Section 4.3.2.3) associated with trenching activities. This field work will be expedited because of the need to coordinate with D&D. The following sections document the revised approach that will be used for sampling the perimeter of the building. Figure 3.1.1-1 presents the location of the PRS and sampling locations. A photograph of this building TA-16-27 is presented in Figure 4.1.1-4.

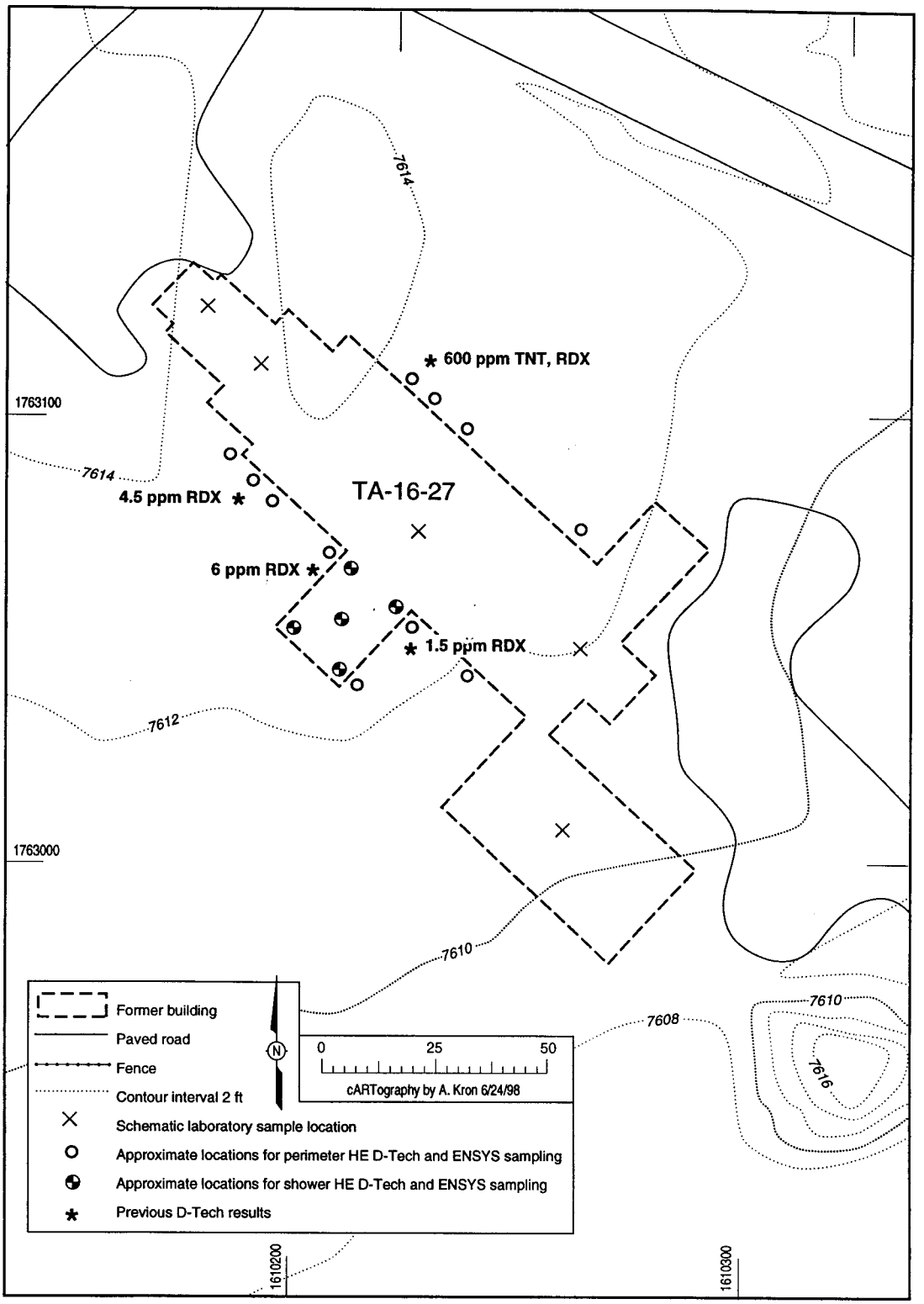

Figure 3.1.1-1. Sampling locations for PRS 16-017 at building TA-16-27

PRS 16-017 consists of the footprints associated with a group of 23 structures in the World War II-era S-Site complex. Some of these structures have been decommissioned and removed. The footprint of building TA-16-27 is part of PRS 16-017 and is the only part of 16-017 addressed in this SAP.

AP 4.5 for 16-017 has been performed. The erosion matrix score is 10.6. The estimated ground cover at the site is 75 to 100% with a less than 10% slope. There is no visible debris in a watercourse.

The current and future land use as well as the geology and soil properties of the site are addressed in Section 2.1.1.

3.1.2 Operational History

TA-16-27 and surrounding structures were used for HE processing from 1945 to the early 1950s. Construction of TA-16-27 was completed in May 1945. The building was the main production casting facility for S-Site through 1953, when TA-16-300 and TA-16-302 were completed, although casting was stopped temporarily in 1946 due to deterioration of the building. Full-scale lenses for nuclear devices were cast in this building (Ackerman 1945, ER ID 06217).

After casting operations were moved into the 300-Line in the early 1950s, TA-16-27 was used as a warehouse (Thrap 1970, ER ID 05784). The sumps and drain lines for this building were removed in 1968. In 1970, the building was abandoned. At that time, the building was surveyed for radioactive contamination (Buckland 1970, ER ID 05788; Kennedy 1970, ER ID 05789), chemical contamination (Mitchell 1970, ER ID 05790), and HE contamination (Courtright 1970, ER ID 05787). One piece of equipment was mildly contaminated with radioactivity, presumably from depleted uranium, and the building itself was extensively contaminated with HE.

3.1.3 Waste Characteristics

This section addresses the potential contaminants that may be present at this PRS, based on the information contained in Section 3.1.1, Site Description, and Section 3.1.2, Operational History. This information is potentially relevant to waste only to the extent that *solid waste*, as that term is defined under RCRA, is subsequently generated at this PRS. This discussion of potential contaminants in no way implies that the materials present at this PRS are *solid waste* or *hazardous waste* as those terms are defined under New Mexico Statutes Annotated (NMSA), the New Mexico Administrative Code (NMAC), RCRA, HSWA, SWDA, or any other statutes or regulations.

Based on the operational history of TA-16-27, HE (RDX, TNT, TNB), metals, uranium, boron, VOCs, SVOCs, and PCBs are possible COPCs. The volumes and periods of discharges are not known.

3.2 Investigatory Approach

3.2.1 Existing Data

3.2.1.1 Nonsampling

A limited study of the HE contamination associated with the TA-16-27 structure was conducted in 1945. Five soil samples locations underneath TA-16-27 were randomly selected to determine if the soils were explosive using a blowtorch flame. The soil samples did not ignite, indicating that the level of HE in the samples was not a worker safety hazard (Huselton 1945, ER ID 05546).

3.2.1.2 Sampling

No analytical information is available for the PRSs associated with TA-16-27.

3.2.2 Conceptual Model

The TA-16-27 building footprint, 16-017, has the same conceptual model as V-Site, which is addressed in Section 2.2.2.1.

3.2.2.1 Nature and Extent of Contamination

Nature and extent of contamination at PRS 16-017 is unknown and will be determined during the VCM exercise and will be included in the VCM report.

3.2.2.2 Fate and Transport

Fate and transport are addressed in Section 2.2.2.2.

3.2.2.3 Data Gaps

The soil adjacent to the foundation walls under the skirt of Building 27 requires a sampling approach that was not documented in the VCM plan. The current approach needs to ensure that contaminated soil around the building will not be dispersed during D&D activity.

3.2.3 Sampling Activities

The soil along the perimeter of the building and underneath the men's and women's rooms on the first floor was found to be HE-contaminated during reconnaissance field screening performed in

1997. Screening results will be used to bias the location of laboratory sample collection. Soil found to be greater than 50% of the cleanup level, based on field screening, will be removed according to the approved VCM plan.

3.2.3.1 Contaminant Source

No contaminant source sampling will be required at this site because there are no remaining materials considered to be a significant source of contamination and because contamination will be bounded during the VCM. The affected soil associated with this PRS is addressed in Section 3.2.3.2.

3.2.3.2 Media Characterization

The characterization, segregation, and removal of soil along the perimeter of the building and beneath the first floor of the men's and women's lavatories will be performed in coordination with the D&D contractor. D&D will remove the aboveground building structure to allow easy access to the perimeter and the soil underlying the first floor of the building. Care will be taken while removing this structure to prevent any disturbance of the underlying soil.

Once D&D personnel have removed the structures, ER Project personnel will conduct field screening and laboratory sampling to determine if COPCs are present and, if so, the extent of the contamination. Soil will be removed based on the field screening results. HE will be detected by using the HE spot test kit, D-Tech kits, and the Ensys™ kit, if trinitrobenzene (TNB) is suspected based on the D-Tech results. Metals will be detected through use of x-ray fluorescence (XRF). Positive HE results and a threshold of 50% of the cleanup level, as proposed in the approved VCM plan, will be used to determine if soil needs to be excavated.

a. Sampling Along Perimeter

Soil will first be screened along the perimeter of Building 27. Screening will be conducted (1) every foot along the perimeter of the building using the HE spot test kit, and (2) at approximately 40-ft intervals along the building (for a total of 13 screening locations) using the HE spot test kit, D-Tech kits, the Ensys kit (if TNB is suspected based on the D-Tech results), and XRF. This soil will be collected from 0- to 1-ft depth intervals and placed into bowls for homogenization and then transferred into appropriate sample containers. Refer to Figure 3.1.1-1 for field screening locations.

Per the approved VCM plan, if results from the screening are HE-positive using the HE spot test kit, or if results are above 50% of the cleanup levels using the D-Tech kits or Ensys kit, the

contaminated soil will be excavated using a backhoe (or equivalent earth-moving equipment) and stockpiled pending analyses.

HE spot testing and D-Tech analysis will be used to verify that the excavated areas are clean. Confirmatory samples will be submitted to off-site laboratories for analysis. In addition, bounding screening samples will be collected from locations that are a 2-ft vertical and horizontal distance from the areas that have been verified as clean. Bounding laboratory samples will be taken from the 2-ft vertical locations and will be submitted to laboratories for analysis. These bounding screening and laboratory samples will be collected using a manually driven hand auger, auger drill rig, or backhoe (or equivalent earth-moving equipment).

At least five locations along the perimeter of Building 27 will be sampled for off-site laboratory analysis. If more than five locations are positive for HE or contain contamination above 50% of the cleanup levels, these additional locations will be sampled. Either one or two samples will be collected from each location (depending on whether both confirmatory and bounding samples are required). This results in a minimum of five to ten laboratory samples.

If soil contamination does not exceed 50% of the cleanup levels at the five locations, laboratory samples will be biased to soil with HE- or metal-screening results above detection but below 50% of the cleanup levels. If no HE or metals are detected based on screening, the sample locations will be biased to cover the non-sampled areas around the perimeter of the building. The laboratory samples will be analyzed for HE, uranium, metals, boron, PCBs, VOCs, and SVOCs. Refer to Table 3.2.3.2-1 for a summary of screening and sampling needs.

TABLE 3.2.3.2-1

SAMPLES AND ANALYSES NEEDED FOR PERIMETER SOIL SAMPLING AT PRS 16-017

DEPTH (ft)	MEDIUM	NUMBER OF SCREENING SAMPLES	TYPE OF SCREENING	NUMBER OF LABORATORY SAMPLES	ANALYTICAL SUITE
0–1*	Soil	13**	TNT, RDX, metals	TBD***	HE, uranium, metals, boron, VOCs, SVOCs, PCBs

* Samples may be collected at deeper depths until 2-ft clean intervals are obtained.

** Every foot of the perimeter of the building will be screened using the HE spot test kit. This screening will also be used to bias the selection of laboratory samples.

*** TBD = to be determined; laboratory samples will be biased to field screening results. A minimum of five locations will be sampled for at least five to ten laboratory samples.

b. Sampling Beneath Shower Rooms

The area beneath the men's and women's shower rooms is approximately 25 ft × 25 ft. Refer to Figure 3.1.1-1. Following the removal of the aboveground structure by D&D, ER Project personnel will screen five locations at 0- to 1-ft-depth intervals. The soil will be screened for HE using the HE spot test kit, D-Tech kits, and the Ensys kit (if TNB is suspected based on the D-Tech results). The soil will also be screened for metals using XRF. Refer to Figure 3.1.1-1 for field screening locations.

The samples will be collected using a hand auger, auger drill rig, or backhoe (or equivalent earth-moving equipment) and stockpiled pending analysis. The samples will be collected from the center and from within the four quadrants of the group of former rooms. This soil will be placed in bowls for homogenization and then transferred into appropriate sample containers. A portion of each sample will be brought to the field trailer and analyzed for HE and metals.

Per the approved VCM plan, if results from the screening are either HE-positive using the HE spot test kit or above 50% of the cleanup levels using the D-Tech kits, the contaminated soil will be excavated using a backhoe (or equivalent earth-moving equipment). The soil will stockpiled pending analysis.

HE spot testing and D-Tech analysis will be used to verify that the excavated areas are clean. Confirmatory samples will be submitted to off-site laboratories for analysis. In addition, bounding screening samples will be collected at locations that are a 2-ft vertical and horizontal distance from the verified clean areas. Bounding laboratory samples from the 2-ft vertical locations will be submitted to off-site laboratories for analysis. These bounding screening and laboratory samples will be collected with a manually driven hand auger, auger drill rig, or backhoe (or equivalent earth-moving equipment).

A minimum of one location will be sampled for off-site laboratory analysis, for a total of one to two laboratory samples. If contaminant concentrations in the soil are greater than 50% of the cleanup levels, then one sample will be collected as a confirmatory sample and one sample will be collected as a bounding sample from each location (as discussed above). If soil contamination does not exceed 50% of the cleanup levels at the five locations, then one laboratory sample will be taken, with its location biased to soil with HE- or metal-screening results above detection but below 50% of cleanup levels. If, based on screening, no HE or metals are detected, the sample location will be randomly selected from the five locations. The laboratory samples will be analyzed for uranium, metals, boron, PCBs, VOCs, and SVOCs. Refer to Table 3.2.3.2-2 for a summary of screening and sampling needs.

TABLE 3.2.3.2-2

SAMPLES AND ANALYSES NEEDED BENEATH THE FIRST FLOOR

DEPTH (ft)	MEDIUM	NUMBER OF SCREENING SAMPLES	TYPE OF SCREENING	NUMBER OF LABORATORY SAMPLES	ANALYTICAL SUITE
0–1*	Soil	5	TNT, RDX, metals	TBD**	Uranium, metals, boron, VOCs, SVOCs, PCBs

* Samples may be collected at deeper depths until 2-ft clean intervals are obtained.

** Laboratory samples will be biased to field-screening results. A minimum of one location will be sampled for at least one to two laboratory samples.

4.0 OVERBURDEN ASSOCIATED WITH TRENCHING ACTIVITIES AT 16-005(d), TA-16-27 SEPTIC TANK; 16-006(g), V-SITE SEPTIC TANK; 16-026(q), HE SUMPS AND DRAINLINE; 16-029(w), HE SUMP AND DRAINLINE; 16-029(x), HE SUMP AND DRAINLINE; AND 16-031(c), V-SITE COOLING TOWER

4.1 Characterization and Setting

4.1.1 Site Description

The following PRSs at V-Site and TA-16-27 are all inactive and located on the mesa top. The watershed for this region of TA-16 is Water Canyon. The amount of contamination associated with overburden from trenching activities is not known. The extent of contamination will be determined after implementing the SAP and will be presented in the VCM report to be submitted in 1999. If other PRSs require trenching, a similar mode of analysis will be employed. Figures 4.1.1-1 and 4.1.1-2 present the location of the PRSs where trenching will occur. Figure 4.1.1-3 presents a sketch of how the overburden will be addressed. Photographs of these sites are presented in Figures 4.1.1-4, 4.1.1-5, and 4.1.1-6.

PRS 16-005(d) is septic tank TA-16-177 and its drain line. TA-16-177 served lavatories in former structure TA-16-27. The septic tank was constructed of reinforced concrete and had a wooden cover. It discharged to a 6-in. vitreous clay pipe located southeast of the tank (ENG-R 289).

AP 4.5 for 16-005(d) has been performed. The erosion matrix score is 10.6. The estimated ground cover at the site is 75 to 100% with a less than 10% slope.

PRS 16-006(g) is septic tank TA-16-527, located in a level, wooded area about 50 ft south of TA-16-515, V-Site. The tank is 6 ft long × 10 ft wide × 4.5 ft deep, has a capacity of 1500 gal., and is constructed of reinforced concrete with a wooden cover. The septic tank is still in place. Engineering drawing ENG-C 6031 indicates that the septic tank was connected by a 4-in. vitreous clay pipe to sinks and toilets at the southeast corner of TA-16-515 and that the system did not serve any of the HE processing areas in the building. Drawing ENG-C 6028 indicates that effluent from the tank discharged to the outfall line from sump PRS 16-029(x) at manhole TA-16-795.

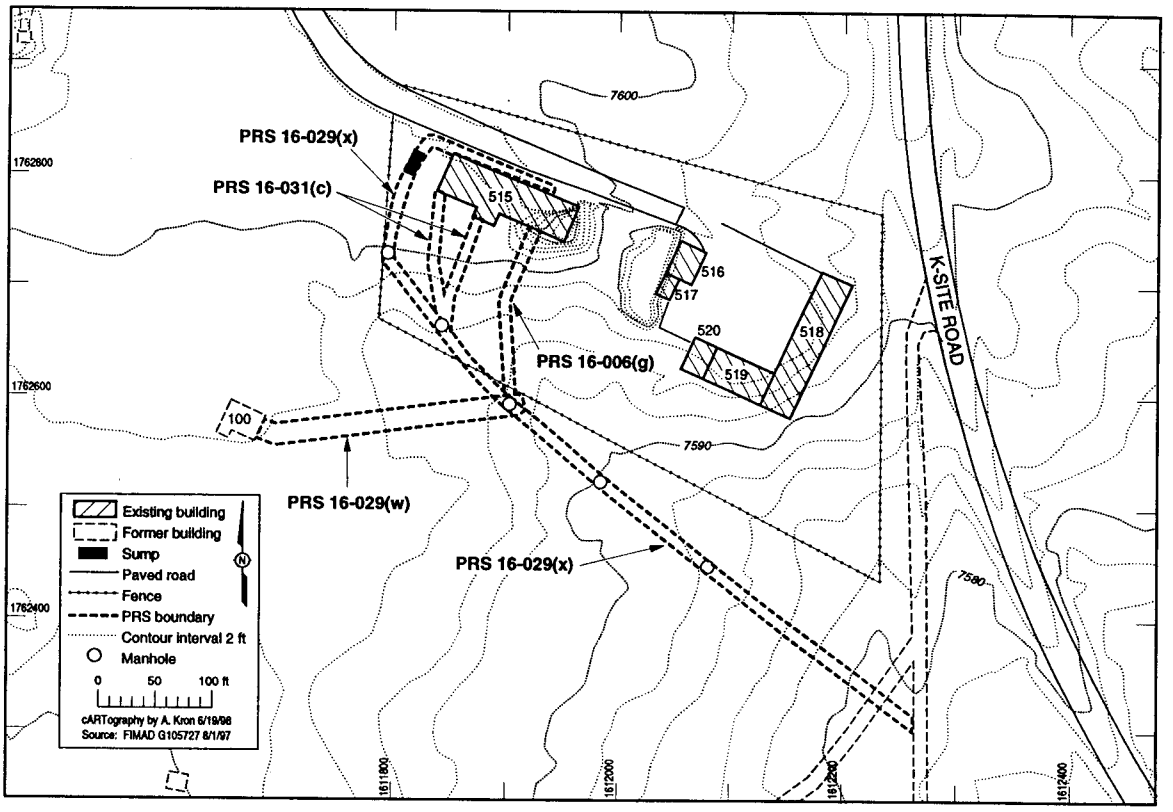

Figure 4.1.1-1 Locations of Overburden at V-Site

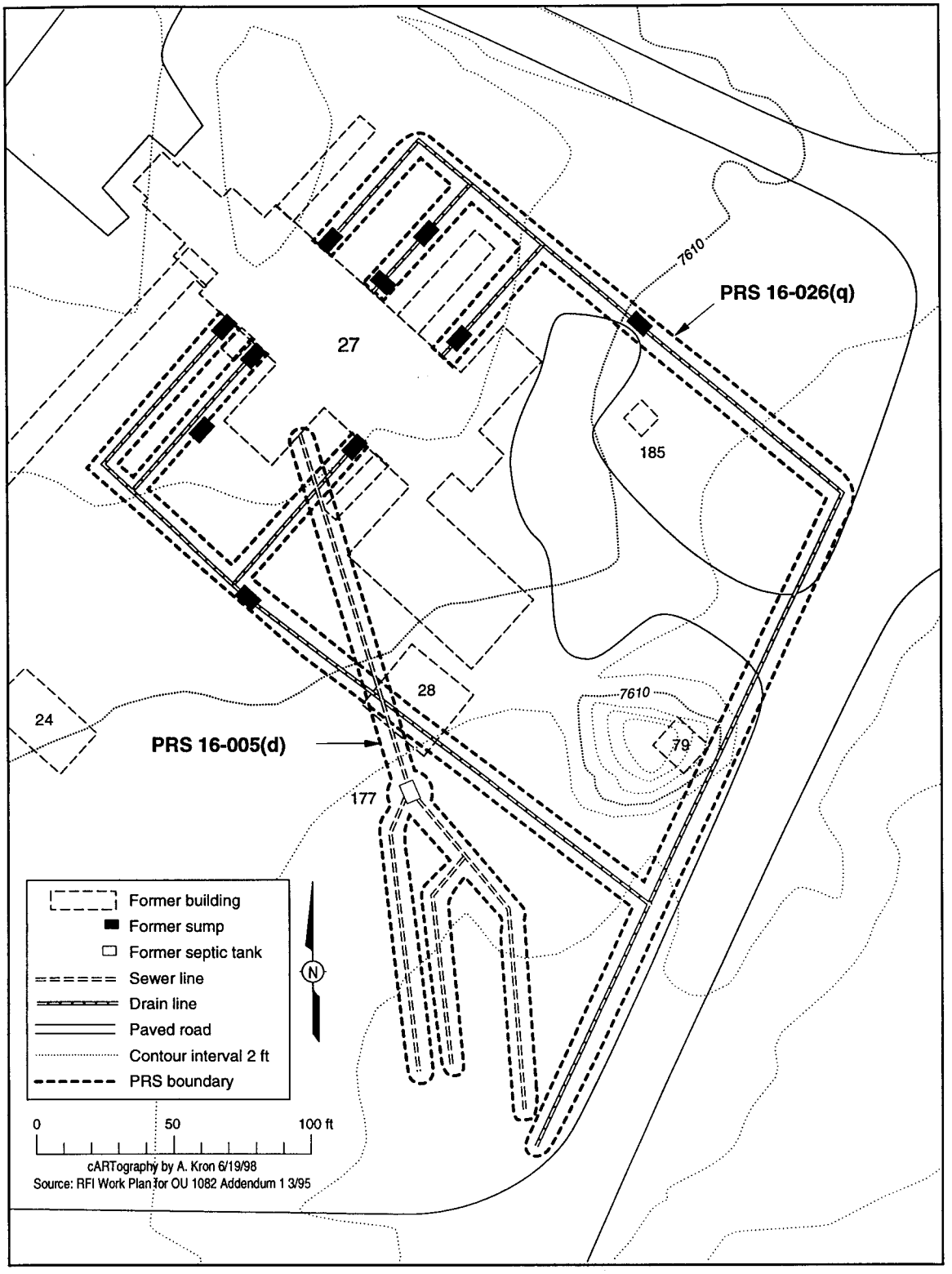

Figure 4.1.1-2 Locations of Overburden at TA-16-27

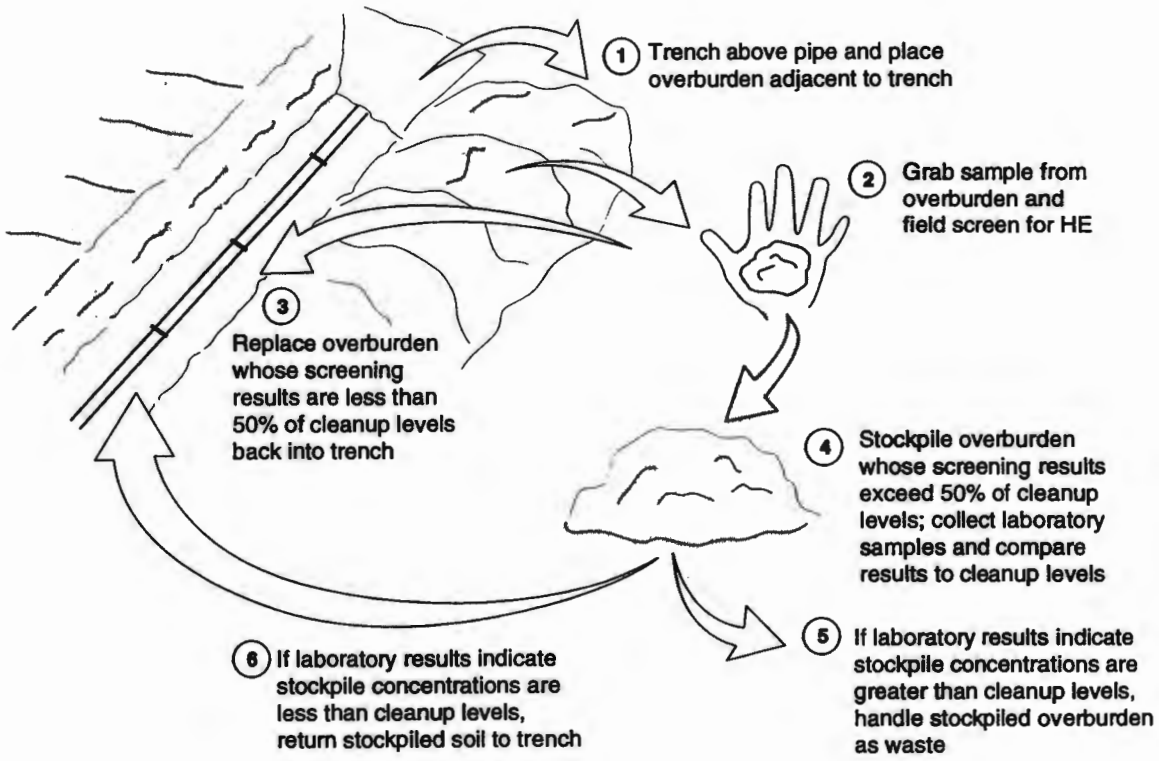

Figure 4.1.1-3 Overburden flow diagram

Figure 4.1.1-4 PRSs 16-005(d) and 16-026(q)

Figure 4.1.1-5 PRS 16-029(x)

Figure 4.1.1-6 PRS 16-006(g) Septic Tank TA-16-527

AP 4.5 has not yet been performed for 16-006(g). However, two other PRSs located at V-Site were assessed and have an erosion matrix score of 3.6 and 10.6. Because of the proximity of 16-006(g) to these other PRSs, the erosion matrix score would be comparable. The estimated ground cover at the site is 75 to 100%, with a slope of less than 10%. There is no visible debris in a watercourse.

PRS 16-026(q) contains surface and subsurface soil associated with the sumps, drainlines, and inactive outfalls for TA-16-27. This HE casting building was originally constructed with four sumps. The north and south sides of the building each had one primary sump adjacent to the building. These sumps were connected to secondary sumps located a few feet from the building. In the early 1950s, these four sumps were removed and five new primary sumps were constructed. All sumps were reportedly removed from the site in the 1960s. The drainlines from both secondary sumps flowed eastward in rock-lined ditches to a ditch that flowed south along the roadway, under the road corer, and into the main drainage of the World War II–era S-Site.

AP 4.5 for 16-026(q) has been performed. The erosion matrix score is 10.5. The estimated ground cover at the site is 75 to 100%, with a slope of less than 10%. There is no visible debris in a watercourse.

PRS 16-029(w) contains potentially contaminated soil associated with a 6.3 ft long × 14 ft wide HE sump located on the east side of former structure TA-16-100, electroplating laboratory. It drained via a 4-in. pipe to manhole TA-16-795 and then to the outfall of the V-Site system [PRS 16-029(x)].

AP 4.5 has not yet been performed for 16-029(w). However, 16-029(x) has an erosion matrix score of 10.6. Because of the proximity of these two PRSs, the erosion matrix score for 16-029(w) would be comparable to that of 16-029(x). The estimated ground cover at the site is 75 to 100%, with a slope of less than 10%. There is no visible debris in a watercourse.

PRS 16-029(x) is associated with the inactive HE sump from floor troughs in building TA-16-515. Engineering drawing ENG-C 6030 indicates that effluent flowed from two work areas inside the building to an open trough under the north porch. ENG-C 6028 shows that effluent flowed through a drop inlet and then through an underground 6-in. vitreous clay pipe to the sump west of the building. The 4 × 11 × 4 ft sump contains three chambers. The first was fitted with a wire catch basket. Outflow from the final chamber went through a standpipe inlet 2 ft above the bottom of the sump and then into a 6-in. vitreous clay drain pipe. Site map ENG-C 6028 indicates that drains from the darkroom and the utility room in TA-16-515 entered the system within 50 ft of the sump. From the sump, a 6-in. vitreous clay pipe led through seven manholes to daylight about

800 ft southeast of V-Site. Drainlines from septic tank TA-16-527 [PRS 16-006(g)] and laboratory building TA-16-100 [PRS 16-029(w)] entered the system at manhole TA-16-795. Photographs from the 1960s indicate that portions of the drain line were removed. Recent site visits suggest some of the pipe remains. The entire system drained into a low, level swale, then into a drainage ditch beside K-Site Road. These drainage areas are considered to be part of the PRS.

AP 4.5 for 16-029(x) has been performed. The erosion matrix score is 10.6. The estimated ground cover at the site is 75 to 100%, with a slope of less than 10%. There is no visible debris in a watercourse.

PRS 16-031(c) is described in the Solid Waste Management Unit (SWMU) Report as an inactive cooling tower for building TA-16-515 (LANL 1990, ER ID 07512). There are no indications on engineering drawings or aerial photographs that the building ever housed a cooling tower. Former employees deny that a cooling tower was ever associated with the building (Martin 1993, ER ID 52964). Engineering drawings indicate that all effluent from the building entered the drain system described for PRS 16-029(x). Thus, any potential contamination from this PRS will be discovered through the analyses done for 16-029(x).

AP 4.5 has not yet been performed for 16-031(c). However, 16-029(x) has an erosion matrix score of 10.6. Because of the proximity of these two PRSs, the erosion matrix score for 16-031(c) would be comparable to that of 16-029(x), 10.6. The estimated ground cover at the site is 75 to 100%, with a slope of less than 10%. There is no visible debris in a watercourse.

The current and future land use as well as the geology and soil properties of these site are addressed in Section 2.1.1.

4.1.2 Operational History

The operational histories for V-Site and TA-16-27 are located in Sections 2.1.2. and 3.1.2, respectively.

4.1.3 Waste Characteristics

This section addresses the potential contaminants that may be present at these PRSs, based on the information contained in Section 4.1.1, Site Description, and Section 4.1.2, Operational History. This information is potentially relevant to waste only to the extent that *solid waste*, as that term is defined under RCRA, is subsequently generated at these PRSs. This discussion of potential contaminants in no way implies that the materials present at these PRSs are *solid waste* or *hazardous waste* as those terms are defined under New Mexico Statutes Annotated (NMSA),

the New Mexico Administrative Code (NMAC), RCRA, HSWA, SWDA, or any other statutes or regulations.

Based on the operational histories described in Sections 2.1.2 and 3.1.2, RDX, TNT, TNB, and barium are expected to be found at V-Site and TA-16-27 above cleanup levels. In addition, operations at V-Site suggest that metals, specifically silver and chromium, would be likely contaminants of potential concern from photoprocessing. The volumes and periods of discharges are not known.

4.2 Investigatory Approach

4.2.1 Existing Data

4.2.1.1 Nonsampling

No previous nonsampling investigations have been performed at the PRSs.

4.2.1.2 Sampling

No analytical information is available for these PRSs.

4.2.2 Conceptual Model

The conceptual models for V-Site and TA-16-27 are the same and are addressed in Section 2.2.2.

4.2.2.1 Nature and Extent of Contamination

Nature and extent of contamination at these sites is unknown. However, nature and extent of contamination does not apply to excavated overburden addressed in this section because the objective of the SAP is to ensure that soil returned to the trenches is not contaminated.

4.2.2.2 Fate and Transport

Fate and transport are addressed in Section 2.2.2.2.

4.2.2.3 Data Gaps

The original assumption in the approved VCM plan was that there was no mechanism for soil overlying a potentially contaminated structure to become contaminated. However, mechanisms were identified and are addressed in Section 4.2.3.2.

4.2.3 Sampling Activities

The goal of the proposed sampling design is to determine if soil overlying drainlines and subsurface structures is contaminated. It is expected that during the partial removal of drainlines in 1968, that contaminated soil was mixed with clean soil overlying the pipe. The mechanisms by which contamination may have been transferred from potentially contaminated structures to overburden soil are discussed in Section 4.2.3.2. Any overburden soil that is determined to contain HE above 50% of the cleanup levels (based on screening) will be removed and stockpiled until further screening indicates contaminant levels are below 50%. The soil that is removed from overburden will be stockpiled and sampled. The laboratory results will then be compared to the cleanup levels listed in Table 2.2.3-1. If the results indicate concentrations greater than cleanup levels, the soil will be managed as waste. If analytical results show concentrations below cleanup levels, the soil will be used as fill for the trenches.

4.2.3.1 Contaminant Source

Contaminant source characterization is addressed in the original VCM Plan.

4.2.3.2 Media Characterization

Sampling of the overburden removed from above the drainlines and underground structures is required in order to characterize this material and verify, using confirmatory sampling, that only soil with concentrations below the cleanup levels is returned to the site. Sampling of this material was not included in the VCM plan. This sampling plan presents HE screening and confirmatory sampling for four types of overburden soil:

- overburden soil associated with clean areas,
- overburden soil associated with HE-contaminated pipe or underlying soil,
- overburden soil found to contain broken clay pipe and other debris, and
- overburden soil that was placed back in trenches prior to screening.

Any overburden soil that is presumed to be clean will be screened for HE using the HE spot test kit only. This screening is in accordance with the approved VCM plan for soil underlying potentially contaminated structures and serves as confirmation that the overburden soil associated with clean areas is not contaminated. This screening is less stringent than the screening of soil associated with known or suspected HE-contaminated areas because the model discussed above does not indicate a probable mechanism for spreading contamination into clean areas. The suspect

overburden soil will be screened for HE using the HE spot test kit and the D-Tech kit. The D-Tech kit, which screens for RDX and TNT, has lower detection limits than the HE spot test kit, and will be used to further define suspect areas.

Potentially contaminated soil from the overburden will be removed until further screening indicates that contaminant levels are below 50% of the cleanup levels. The contaminated soil that is removed from the overburden will be stockpiled and covered with hay and/or jute matting prior to rainstorm events. This is done to prevent sediment runoff. Clean overburden will be returned to the trench. To confirm that cleanup has been achieved, confirmatory samples will be collected in the soil underlying the excavated material. Extent, or bounding, samples will be screened 2 ft horizontally and vertically using D-Tech kits for a contaminated location in the trench. In addition, a 6pt composite sample will be collected from the overburden associated with this contaminated area. No laboratory bounding samples will be collected because there is no mechanism of contaminant transport from the temporarily stored overburden soil to the underlying undisturbed soil.

a. Overburden Soil Associated with Clean Areas

Sampling the overburden soil associated with clean areas will consist of screening for HE using the HE spot test kit. This soil will be screened at 10- to 15-ft intervals (approximately 50 to 100 cubic yards of soil per interval) from locations that coincide with previously sampled soil underlying the excavated structures. These previously sampled locations are the locations most likely to have been contaminated (e.g., via cracked pipes or as noted during D&D). The soil within the trenches at these locations was determined to be clean; therefore, the associated overburden soil is presumed to be clean.

b. Overburden Soil Associated with HE-Contaminated Pipe or Underlying Soil

Sampling the overburden soil associated with HE-contaminated pipe and underlying soil will consist of screening for HE using the HE spot test kit and D-Tech kits (for RDX and TNT). The soil will be screened at 5-ft intervals (approximately 30 cubic yards of soil per interval) along the extent of the previously noted contaminated areas.

c. Overburden Soil Found to Contain Broken Clay Pipe and Other Debris

At several locations, soil overlying the drainline pipe was found to contain broken clay pipe. This clay pipe is believed to have been left behind from previous removal operations. This soil was removed by D&D as overburden soil. Sampling of this overburden soil will consist of screening for

HE using the HE spot test kit and D-Tech kits (for RDX and TNT). The soil will be screened at 5-ft intervals (approximately 30 cubic yards of soil per interval) along the extent of the area.

d. Overburden Soil That Was Placed Back in Trenches Prior to Screening

Overburden soil that was moved back into open trenches by D&D prior to ER Project personnel screening the soil. This soil was either pushed into the trench by the trackhoe moving over the trench or pushed into the trench for lack of space. This overburden soil is separated into three types:

- overburden soil pushed into the trenches prior to screening the soil beneath the excavated pipe,
- overburden soil pushed into the trenches after screening and determined to be clean, and
- overburden soil pushed into the trenches after screening and determined to be HE-contaminated above 50% of cleanup levels.

Overburden Soil Pushed into the Trenches Prior to Screening the Soil Beneath the Excavated Pipe

Two areas were backfilled with soil prior to conducting any screening within the trenches. These two areas are surrounded by clean soil and are not located in suspect areas (no cracked pipes or HE contamination were noted during D&D). Therefore, the overburden soil associated with the clean area is not suspected to be HE-contaminated. This soil will be re-excavated and will be screened at 5-ft intervals (approximately 30 cubic yards of soil per interval) along the extent of the areas. The bottom of the trenches will also be screened. This soil will be screened for HE using the HE spot test kit and D-Tech kits (for RDX and TNT).

Overburden Soil Pushed into the Trenches After Screening and Determined to be Clean

One area that had previously been determined to be clean was backfilled with soil. One sample will be collected from this backfilled soil. Because the soil within the trench was previously determined to be clean, the overburden soil that was put back into the trench is also presumed to be clean. The area will not be re-excavated. The sample will be collected using a shovel and will be screened for HE using the HE spot test kit.

Overburden Soil Pushed into the Trenches After Screening and Determined to be HE-Contaminated Above 50% of Cleanup Levels

One area, which had previously been determined to be HE-contaminated above 50% cleanup levels, was backfilled to avoid interfering with D&D activities. The locations known to be contaminated were marked and surveyed. The overburden soil in this area (with an approximate volume of 30 cubic yards) will be re-excavated and three samples collected and screened for HE using the HE spot test kit and D-Tech kit (for RDX and TNT). Because the bottom of the original trench is marked with straw, the overburden soil should be easily separated from the HE-contaminated soil underlying the straw. This overburden will be addressed as stated previously in part b of this section. One laboratory sample will be collected from the excavated soil. This sample location will be biased to screening results for HE and metals and submitted for analyses.

The soil within the trench will then be removed and sampled per the VCM plan for contaminated soil.

Figure 4.1.1-3 illustrates the general approach to sampling overburden.

5.0 DATA COLLECTION DESIGN AND PROCEDURES

5.1 Data Quality Objectives

The bias and precision of fixed-site laboratory analyses for inorganic and organic chemicals will be assessed using the standard quality control (QC) procedures described in the EPA SW-846 methods. For radiological measurements, QC procedures similar to the EPA SW-846 procedures will be employed. The ER Project analytical services statement of work (LANL 1995, ER ID 49738) contains the LANL-specific acceptance criteria for these QC procedures.

a. Data Management

The data management scheme described in Sections A10 and B10 of the ER Project Quality Assurance Project Plan (QAPP) (LANL 1996, ER ID 55298) will be followed. Manually recorded data will be reviewed by the field team as required by the Laboratory's standard operating procedures (SOP) entitled "General Instructions for Field Investigations" (LANL-ER-SOP-1.01), by (LANL-ER-SOP-01.04, R3), and by "Field and Laboratory Notebook Documentation for Environmental Restoration Earth Science Studies" (LANL-ER-SOP-03.12). Field records will document sample collection and tracking, health and safety (H&S) briefings and checks of monitoring equipment performance, and nonsampling activities such as site inspections and

walkovers, which are documented as engineering surveys on Daily Activity Logs. All original documents will be transferred to the ER Project Records Processing Facility (RPF) in accordance with administrative procedure LANL-ER-AP-02.1, "Procedure for LANL ER Records Management" (LANL 1995, ER ID 11025).

Data generated by the analytical laboratories will be submitted to the Field Support Facility (FSF) in accordance with the requirements of the ER Project analytical services statement of work (LANL 1995, ER ID 49738). The reporting requirements include electronic and hard copy deliverables for routine analyses. The FSF is responsible for data verification, validation, and transmittal to the Facility for Information Management, Analysis, and Display (FIMAD).

b. Verification and Routine Validation

Data generated by the analytical laboratories will undergo the verification and baseline validation procedures described in Sections D1 and D2 of the ER Project QAPP (LANL 1996, ER ID 55298). Field data will be reviewed for accuracy and completeness by the field team at the time of collection.

c. Data Quality Assessment

Reconciliation of the data with the investigation objectives will be accomplished using the qualitative data quality assessment methods described in Section D3 of the ER Project QAPP (LANL 1996, ER ID 55298). The assessment team will evaluate the sufficiency of the data set for decision-making purposes using their best professional judgment. The assessment team shall consist of a geologist, human health risk assessor, ecological risk assessor, statistician, and chemist (at a minimum). The data quality assessment process outlined in Figure D-3 of the ER Project QAPP will be followed.

5.2 Quality Assurance/Quality Control

QA samples are collected to assess the quality of sampling and measurement techniques and may also be used to support future decisions about specific samples and PRSs at V-Site and TA-16-27 area. Field QA samples will be collected at a minimum rate of 1 per 10 (10%).

Measurements to Verify Assumptions and Requirements

Two types of field QA samples will be collected at V-Site and the TA-16-27 area: collocated field duplicates and field duplicate splits.

- Collocated samples will be collected 1 ft away from their respective sample locations. The purposes of these samples are to provide data to evaluate contaminant spatial variability, to meet the criteria of variance parameter estimations, and to evaluate if the data is complete, representative, and comparable.

- Duplicate split samples will be splits of homogenized material collected from a single location. The purpose of these samples is to provide data to evaluate field sample technique and laboratory measurement error. The duplicate samples will be submitted from locations with HE-positive results from field screening.

The number of field samples, collocated quality assurance (QA) samples, and split QA samples that will be collected from each PRS addressed in this SAP is presented in Table 5.2-1.

TABLE 5.2-1

QA SAMPLES SUBMITTED FOR LABORATORY ANALYSIS

PRS	NUMBER OF LABORATORY SAMPLES [a]	DUPLICATE: COLLOCATED	DUPLICATE: SPLITS
16-005(d)	3	0	0
16-006(g)	2	1	1
16-006(h)	2 [b]	0	0
16-017	5-10 [b]	1	1
16-026(q)	30–40	1	1
16-029(g2)	2 [b]	0	0
16-029(w)	3	1	1
16-029(x)	27	1	2
C-16-074	2 [b]	0	0
16-031(c)	4 [b]	1	1

a. Based on approved V-Site VCM Plan

b. Revised number of laboratory samples

All QA/QC activities associated with field measurements and surveys have been and will be carried out as specified in the applicable SOP.

5.3 Field Activities

The work will be carried out following the approach outlined in the approved VCM plan. Work will follow the Laboratory's ER Project SOPs and administrative procedures (APs).

a. Field Methods

Land Surveys

Following sample collection, the sample points will be staked, documented, and surveyed using global positioning system (GPS) technology. The data will be recorded on the base map. The surveying will be performed by licensed professionals working to minimum standards for land surveying in New Mexico, and with oversight by the field team leader (FTL).

A land survey will not be conducted on the overburden soil sample locations because the locations do not represent in-place soil. The sample locations, and their approximate distances from known reference points, are documented in the field notebook.

Screening

The soil samples will be screened for HE in the field using the HE spot test kit with modified Griess™ reagents (LANL-ER-SOP-10.06, R0, "High Explosive Spot Test"). Samples will be analyzed for RDX and TNT using the D-Tech immunoassay HE field screening kit, following draft EPA SW-846 Methods 4051 and 4050.

Sampling

The appropriate health and safety precautions will be taken under the site-specific health and safety plan (SSHASP) for V-Site in accordance with 29 CFR 1910.120, the LANL radiological control manual, and the LANL generic health and safety plan.

Surface samples will be collected using a spade-and-scoop method and according to LANL-ER-SOP-06.09. Subsurface sediment samples will be collected with the hand auger and thin-walled tube sampler methods according to LANL-ER-SOP-06.10. Borehole samples will be collected using drilling techniques according to LANL-ER-SOP-04.01, R0.

The actual sample site and sampling conditions will be described and documented in the Sample Collection Log. The sample material will be described in the Sample Collection Log and/or the Core Description Log, when applicable. Sample collection methods will be documented in the Sample Collection Log. Surface samples, hand-auger holes, hollow-stem auger drilling, and excavation (trenching) methods will be used to collect soil samples as described below.

The soil and sediment samples will be field-screened for gross-alpha, -beta, and -gamma radiation, and for volatile organic vapors at the time of sampling. The field screening data will be recorded by the site safety officer on the Direct Survey Results Form and by the FTL in the Sample Collection Log. Information about the field screening equipment calibration will be recorded by the site radiological control technician (RCT) on the Direct Survey Results Form and by the FTL in the Daily Activity Log.

If other field screening methods are identified that appropriately detect contamination, those field screening methods will be considered for use during sample collection. Appropriate field screening methods may be used to select sample locations from borehole samples and to screen samples for fixed-site laboratory analyses, as necessary. The implementation of field screening methods will be documented by the FTL in the Daily Activity Log.

Soil and sediment samples will be collected using the methods and SOPs listed in Table 5.3-1 (LANL 1991, ER ID 51575). The tools used to collect surface and subsurface soil samples will be determined by the FTL with consideration given for the accessibility of the specific sampling site, the depth of samples to be collected, and safety concerns. A scoop or spade will be used to collect surface sediment samples at depths of 0 to 0.5 ft. A hand auger will generally be used to collect samples ranging in depth from 1 to 5 ft, and a drill rig with a hollow-stem auger split-spoon core barrel will generally be used to collect samples from depths greater than 5 ft. Where additional subsurface detail is required by the sampling plan, excavations using mechanical equipment such as a backhoe may be used to expose pipelines and/or trenches.

TABLE 5.3-1

SUMMARY OF REQUIREMENTS FOR SOIL AND SEDIMENT SAMPLING METHODS

SAMPLING TOOLS	SAMPLE TYPES	SAMPLING DEPTH (ft)	LANL-ER-SOP
Spade and scoop	Surface grab	0–1	06.09
Hand auger	Surface or subsurface grab	0–5	06.10
Ring sampler	Undisturbed surface soil grab	0–1	06.11

Drilling methods (hollow-stem auger and rotary drilling) are described in LANL-ER-SOP-04.01, "Drilling Methods and Drill Site Management." Hand auger surface and subsurface grab sampling methods are described in LANL-ER-SOP-06.10, "Hand-Auger and Thin-Wall Tube Sampler." Trenching methods (pit excavation) are described in LANL-ER-SOP-03.10, "Trenching and Logging." Grab sampling is described in LANL-ER-SOP-06.09, "Spade and Scoop Method of

Collection of Soil Samples." Other applicable SOPs for drilling operations and subsurface sampling are listed in Table 5.3-2. All borehole core intervals (maximum 5-ft lengths) will be field-screened for gross-alpha, -beta, and -gamma radiation using hand-held instruments.

TABLE 5.3-2

REQUIREMENTS FOR SUBSURFACE AND CORE SAMPLING METHODS

ACTIVITY	LANL-ER-SOP
Trenching and logging	03.10
Drilling methods and drill-site management	04.01
General borehole logging	04.04
Core-barrel sampling for subsurface earth materials	06.26
Field logging, handling, and documentation of borehole samples	12.01

If trenching is used to expose grab sample points associated with buried pipelines, samples for VOC and SVOC analysis will be collected using the appropriate method as determined by the FTL, with consideration given to the size and stability of the trench, H&S concerns, and the availability of appropriate sampling equipment. If possible (because of safety concerns and the dimensions of the trench) extension handles will be used with standard hand-auger and thin-wall tube samplers to collect the VOC samples directly from the bottom of the trench. If safety concerns do not allow access to the trench for direct sampling, VOC samples may be collected from a backhoe bucket or similar excavation equipment using conventional methods. Regardless of the method used, the FTL will ensure the integrity of the samples and will document the sampling method in the Daily Activity Log.

Each sample location will be marked or permanently monumented (where possible), photographed, and assigned a unique ER Project sample location identification number.

All samples will be collected in accordance with the applicable ER Project SOPs (LANL 1991, ER ID 51575) for the collection, preservation, identification, storage, transport, and documentation of environmental samples, as described in the ER Project QAPP (LANL 1996, ER ID 55298). All samples will be identified in accordance with LANL-ER-SOP-01.04, "Sample Control and Field Documentation." Chain-of-custody requirements described in LANL-ER-SOP-01.04 will be implemented. The FSF will be consulted regarding the appropriate sample containers and preservation. Samples will be packaged and shipped in accordance with LANL-

ER-SOP-01.03, "Handling, Packaging and Shipping of Samples." All samples will be shipped from the FSF to off-site laboratories for analysis.

b. Measurement Methods

Soil, sediment, and borehole core samples collected will undergo full-suite analyses for organic chemicals, inorganic chemicals, and/or radionuclides. All analyses will be performed at ER Project–approved fixed-site laboratories. The analytical suites and methods for analysis of organic chemicals are listed in Table 5.3-3. Analysis for VOCs will be performed on any sample for which a significant organic vapor measurement is obtained by field screening. All analyses for organic chemicals will be performed according to EPA SW-846 protocols (EPA 1986, ER ID 56034). The detailed analyte lists, estimated quantitation limits (EQLs), required QC procedures, and the acceptance criteria are found in the ER Project analytical services statement of work (LANL 1995, ER ID 49738).

TABLE 5.3-3

ANALYTE SUITES AND ANALYTICAL METHODS FOR ANALYSIS OF ORGANIC CHEMICALS IN SOIL, SEDIMENT, AND CORE SAMPLES

ANALYTE SUITE	ANALYTICAL METHOD	ANALYTICAL PROTOCOL
VOCs	GC/MS	SW-8260
SVOCs	GC/MS	SW-8270
HE	HPLC	SW-8330

The target analytes, estimated detection limits (EDLs), and analytical methods for inorganic chemicals are listed in Table 5.3-4. All analyses for inorganic chemicals will be performed according to EPA SW-846 protocols using mineral acid sample extraction procedures for the ICPES, graphite furnace atomic absorption (GFAA), and inductively coupled plasma mass spectrometry (ICPMS) techniques.

TABLE 5.3-4

ANALYTE LIST, ESTIMATED DETECTION LIMITS, AND ANALYTICAL METHODS FOR INORGANIC CHEMICALS IN SOIL, SEDIMENT, AND CORE SAMPLES

ANALYTE	EDL (mg/kg)	ANALYTICAL METHOD	ANALYTICAL PROTOCOL
Aluminum	40	ICPES	SW-6010B
Antimony	0.05	ICPES or ICPMS	SW-6010B or SW-6020
Arsenic	2	GFAA or ICPMS	SW-7060 or SW-6020
Barium	40	ICPES	SW-6010B
Beryllium	1	ICPES	SW-6010B
Cadmium	1	ICPES	SW-6010B
Calcium	500	ICPES	SW-6010B
Chromium	2	ICPES	SW-6010B
Cobalt	10	ICPES	SW-6010B
Copper	5	ICPES	SW-6010B
Iron	20	ICPES	SW-6010B
Lead	0.6	GFAA or ICPMS	SW-7421 or SW-6020
Magnesium	1000	ICPES	SW-6010B
Manganese	3	ICPES	SW-6010B
Mercury	0.1	CVAA	SW-7471A
Nickel	8	ICPES	SW-6010B
Potassium	500	ICPES	SW-6010B
Selenium	1	GFAA or ICPMS	SW-7741 or SW-6020
Silver	2	ICPES	SW-6010B
Sodium	500	ICPES	SW-6010B
Thallium	2	GFAA or ICPMS	SW-7841 or SW-6020
Vanadium	10	ICPES	SW-6010B
Zinc	4	ICPES	SW-6010B

c. Waste Management

Waste management and minimization will conform to LANL policies EM/ER:95-PCT-025, "Management of Investigation-Derived Waste" and EM/ER:96-PCT-002, "Management of Samples Returned from Analytical Laboratories."

6.0 PROJECT MANAGEMENT

6.1 Project Scheduling and Reporting Requirements

See attachment.

6.2 Health and Safety Plan

A site-specific health and safety plan will be developed in accordance with the Environmental Restoration Project Site-Specific Health and Safety Plan (SSHASP) (LANL EM/ER:95-PCT-012, April 13, 1995, ER ID 56448).

6.3 Investigation-Derived Waste Plan (SOP)

Investigation-derived waste, if any, will be handled in accordance with (LANL-ER-SOP-1.06, ER ID 51575).

6.4 Community Relations Plan (SOP)

Community relations are governed by the Public Involvement Plan in Chapter 7 of the IWP (1996, ER ID 57368.

REFERENCES

The following list includes all of the documents cited in the body of this SAP. The parenthetical information following each reference provides the author, publication date, and ER ID number. This information is also included in the citations in the text. This information can be used to locate the documents on this list.

The ER ID number is assigned by the Laboratory's ER Project to track material associated with LANL PRSs. This number can be used to locate the actual document at the ER Project's Records Processing Facility.

Ackerman, Major J.O., June 11, 1945. "Preparedness for Emergency Production at S-Site," Los Alamos Scientific Laboratory Memorandum to G.B. Kistiakowsky (X-Division) from J.O. Ackerman (X-3), Los Alamos, New Mexico. **(Ackerman 1945, ER ID 57746)**

Ackerman, Major J.O., July 24, 1945. "Alterations at S-Site," Los Alamos Scientific Laboratory Memorandum to G.B. Kistiakowsky (X-Division) from J.O. Ackerman (X-3), Los Alamos, New Mexico. **(Ackerman 1945, ER ID 06217)**

Blackwell, C., November 17, 1983. "Structures Removed From TA-16," Los Alamos National Laboratory Memorandum to A.J. Ahlquist (HSE-8) from C. Blackwell (HSE-1), Los Alamos, New Mexico. **(Blackwell 1983, ER ID 05823)**

Buckland, C., March 4, 1970. "Contamination Survey: Buildings and Structures, TA-16," Los Alamos Scientific Laboratory Memorandum to S.E. Russo (ENG-3) from C. Buckland, Los Alamos, New Mexico. **(Buckland 1970, ER ID 05788)**

Courtright, W.C., March 3, 1970. "Contamination Survey: Buildings and Structures, TA-16," Los Alamos Scientific Laboratory Memorandum to S.E. Russo (ENG-3) from W.C. Courtright (H-3), Los Alamos, New Mexico. **(Courtright 1970, ER ID 05787)**

Crockett, A.B., H.D. Craig, and T.F. Jenkins, May 1997. "On-Site Analytical Methods for Explosives," On-Site Analysis, American Environmental Laboratory, Shelton, Connecticut pp27-29. **(Crockett et al. 1994, ER ID 57076)**

Crockett, A.B., H.D. Craig, and T.F. Jenkins, and W.E. Sisk, November 1996. "Field Sampling and Selected On-Site Analytical Methods for Explosives in Soil," in Federal Facilities Forum Issue, EPA/540/R-97/501, Office of Research and Development and

Office of Solid Waste and Emergency Response, US Environmental Protection Agency, Washington D.C. **(Crockett et al. 1996, ER ID 55840)**

DOE (Department of Energy) November 14, 1997. "Los Alamos National Laboratory Historical Buildings," Department of Energy Memorandum (LAAO: TA-16:JHM:1.4.2.6.2.8) to J. Canepa (EM/ER) from T. Taylor (LAAO), Los Alamos, New Mexico. **(DOE 1997, ER ID 56940)**

EPA (US Environmental Protection Agency), April 10, 1990. Module VIII of RCRA Permit No. NM0890010515, EPA Region VI, issued to Los Alamos National Laboratory, Los Alamos, New Mexico, effective May 23, 1990, EPA Region VI, Hazardous Waste Management Division, Dallas, Texas. **(EPA 1990, ER ID 07947)**

EPA (Environmental Protection Agency), September 1, 1995. "Region IX Preliminary Remediation Goals (PRGs) Second Half 1995," San Francisco, California. **(EPA 1996, ER ID 53970)**

EPA (U.S. Environmental Protection Agency), July 1995. "Code of Federal Regulations Protection of Environment Parts 260 to 299, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. **(EPA 1995, ER ID 56034)**

EPA (U.S. Environmental Protection Agency), 1986. Test Methods for Evaluating Solid Waste, Third Edition, SW-846. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, Washington, D.C. **(EPA 1986, ER ID 57589)**

Hawkins, D., 1946. "Project Y: The Los Alamos Story, Part 1, Toward Trinity," Los Alamos Scientific Laboratory Report LAMS-2532, Los Alamos New Mexico **(Hawkins 1946, ER ID 04704)**

Husselton, E.P., November 20, 1945. "Report On The Possible Hazard to Casting Buildings Caused by H.E. Contamination of the Earth Under Buildings," Los Alamos Scientific Laboratory Report, Los Alamos, New Mexico. **(Huselton 1945, ER ID 05546)**

Kennedy, W.R., March 9, 1970. "Contamination Survey: Buildings and Structures, TA-16," Los Alamos Scientific Laboratory Memorandum to S.E. Russo (ENG-3) from W.R. Kennedy (H-6), Los Alamos, New Mexico. **(Kennedy 1970, ER ID 05789)**

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Volumes I through IV, Los Alamos National Laboratory Report No. LA-UR-90-3400, prepared by International Technology Corporation under Contract 9-XS8-0062R-1, Los Alamos, New Mexico. **(LANL 1990, ER ID 07512)**

LANL (Los Alamos National Laboratory), July 1993. "RFI Work Plan for Operable Unit 1082," Los Alamos National Laboratory Report No. LA-UR-93-1196, Los Alamos, New Mexico. **(LANL 1993, ER ID 20948)**

LANL (Los Alamos National Laboratory). "Los Alamos National Laboratory Environmental Restoration Program Standard Operating Procedures," Los Alamos National Laboratory Report, Los Alamos, New Mexico. **(LANL 1995, ER ID 51575)**

LANL (Los Alamos National Laboratory), July 1995. "Statement of Work-Analytical Support," Revision 2, No. 9-XS1-Q4257, Los Alamos, New Mexico. **(LANL 1995, ER ID 49738)**

LANL (Los Alamos National Laboratory), 1995. "Site Development Plan Annual Update 1995", Los Alamos, New Mexico. **(LANL 1995, ER ID 57224)**

LANL (Los Alamos National Laboratory), 1995. "Procedure for LANL ER Records Management," Los Alamos National Laboratory Procedure LANL-ER-AP-02.1, Los Alamos, New Mexico. **(LANL 1995, ER ID 11025)**

LANL (Los Alamos National Laboratory) April 13, 1995. "The Environmental Restoration Project Site-Specific Health and Safety Plan (SSHASP)," LANL EM/ER:95-PCT-012, Los Alamos, New Mexico. **(LANL 1995, ER ID 56448)**

LANL (Los Alamos National Laboratory), December 1996. "Installation Work Plan for Environmental Restoration Program," Revision 6, Los Alamos National Laboratory Report LA-UR-96-4629, Los Alamos, New Mexico. **(LANL 1996, ER ID 57368)**

LANL (Los Alamos National Laboratory), 1996. "ER Project Quality Assurance Program Plan," Los Alamos National Laboratory, Los Alamos, New Mexico. **(LANL 1996, ER ID 55298)**

LANL (Los Alamos National Laboratory), March 1, 1997. "Voluntary Corrective Measures Plan for Potential Release Sites AT TA-16 16-005(d), 16-006(g,h), 16-013, 16-017, 16-025(x), 16-026(q), 16-029(g2, h2, w, x), 16-031(c,d), 16-034(p), C-16-065, C-16-068, C-16-074 Field Unit 3", Los Alamos National Laboratory Report No. LA-UR-97-640, Los Alamos, New Mexico. **(LANL 1997, ER ID 55512)**

Martin, W.B., November 17, 1993. "Early S-Site History: Lee Hilton Interview," Los Alamos National Laboratory Memorandum CST-6-ER/BM-93-060 to File from W.B. Martin (CST-6), Los Alamos, New Mexico. **(Martin 1993, ER ID 52964)**

Mitchell, R.N., March 18, 1970. "Contamination Survey: Building and Structure Survey, TA-16," Los Alamos Scientific Laboratory Memorandum to S.E. Russo (ENG-3) from R.N. Mitchell (H-5), Los Alamos, New Mexico. **(Mitchell 1970, ER ID 05790)**

NMED (New Mexico Environment Department), September 30, 1997. "Approval of the Voluntary Corrective Measures (VCM) Plan Potential Release Sites at Technical Area (TA) 16 Los Alamos National Laboratory NM0890010515," New Mexico Environment Department Hazardous & Radioactive Materials Bureau letter to T. Todd (LAAO) and S. Hecker (Director of LANL) from R. Dinwiddie (NMED) Santa Fe, New Mexico. **(NMED 1997, ER ID 58030)**

Nyhan, J.W., L.W. Hacker, T. E. Calhoun, and D.L. Young, June 1978. "Soil Survey of Los Alamos County, New Mexico," Los Alamos Scientific Laboratory Report LA-6779-MS, Los Alamos, New Mexico. **(Nyhan et al. 1978, ER ID 05702)**

Thrap, R.L., February 11, 1970. "S-Site Demolition and Restoration Projects to Remove Potential Explosives Hazards," Los Alamos Scientific Laboratory Memorandum to C.A. Reynolds from R.L. Thrap (GMX-3), Los Alamos, New Mexico. **(Thrap 1970, ER ID 05784)**

Truslow, E.R., March 1973. "Nonscientific Aspects of Los Alamos Project Y, 1942 through 1946," "Early S-Site Experiences," Appendix by E. Wilder, Jr., LA-5200, Los Alamos, New Mexico. **(Truslow 1973, ER ID 04967)**