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Date: April 4, 2006
Refer to: ER2006-0282

Mr. James Bearzi
NMED – Hazardous Waste Bureau
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Santa Fe, NM 87505-6303

SUBJECT: SUBMITTAL OF THE "SUPPLEMENTAL INVESTIGATION WORK PLAN FOR DELTA PRIME SITE AGGREGATE AREA AT TECHNICAL AREA 21"

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of the "Supplemental Investigation Work Plan for Delta Prime Site Aggregate Area at Technical Area 21."

If you have questions, please contact Bruce Wedgeworth (505) 606-1422 (brucew@lanl.gov) or Woody Woodworth at (505) 665-5820 (lwoodworth@doeal.gov).

Sincerely,

for David McInroy, Deputy Program Director
Environmental Remediation & Surveillance
Los Alamos National Laboratory

Sincerely,

David Gregory, Federal Project Director
Department of Energy
Los Alamos Site Office

BW/jk

Enclosure: Two hard copies with electronic files – Supplemental Investigation Work Plan for Delta Prime Site Aggregate Area at Technical Area 21 (ER2006-0203)

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LA-UR-06-1508
April 2006
ER2006-0203

Supplemental Investigation Work Plan for Delta Prime Site Aggregate Area at Technical Area 21

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Prepared by
Environmental Stewardship Division–
Environmental Remediation and Surveillance Program

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LA-UR-06-1508
ER2006-0203

Supplemental Investigation Work Plan for Delta Prime Site Aggregate Area at Technical Area 21

April 2006

Responsible project leader:

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David Gregory		Federal Project Director	DOE-LASO	4/4/06

EXECUTIVE SUMMARY

The purpose of this supplemental investigation work plan is to provide information to support status determinations of six sites that are part of the Delta Prime Site Aggregate Area at Los Alamos National Laboratory. The six sites were listed in Tables 1.2-2 and 1.2-3 of the "Investigation Work Plan for Delta Prime Site Aggregate Area at Technical Area 21" as "addressed in other work plans," "deferred," "remedy complete," or "having a no further action decision." As a result, these sites were not proposed for investigation or corrective action in the original plan. A letter from the New Mexico Environment Department dated December 27, 2005, concluded that the determinations in Tables 1.2-2 and 1.2-3 were not supported and that a supplemental investigation work plan was needed to address the six sites.

The objectives of this supplemental work plan are to

(1) propose investigation/corrective action where appropriate, or

(2) provide background information and explanation for these sites where no investigation/corrective action is proposed.

This supplemental investigation work plan proposes the following actions for these six sites:

- Solid Waste Management Unit (SWMU) 21-002(a), several unidentified container storage areas: Will be addressed by ongoing decontamination and decommissioning (D&D) activities at Technical Area (TA) 21. Therefore, a site history is presented in this plan, but no site-specific activities are proposed for this site.

- SWMU 21-024(i), a septic system: This site was addressed in the "Investigation Work Plan for Delta Prime Site Aggregate Area at Technical Area 21." The proposed corrective action for the SWMU 21-024(i) inlet line will be deferred until the associated building has undergone D&D. The septic tank and outfall were previously addressed in an interim action; results are presented in the "Interim Action Completion Report for Solid Waste Management Unit 21-024(i) at Technical Area 21."

- AOC 21-028(d), an active container storage dock area: Sampling will be deferred until the dock area has been removed.

- AOC C-21-001, a one-time spill: Will be addressed by ongoing D&D activities at TA-21. Therefore, a site history is presented in this plan, but no site-specific activities are proposed for this site.

- AOC C-21-006, an unintentional release area: Proposed for investigation.

- AOC C-21-027, a cooling tower: Proposed for corrective action.

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1.0 INTRODUCTION

The Delta Prime (DP) Site Aggregate Area at Los Alamos National Laboratory (LANL or the Laboratory) consists of 155 solid waste management units (SWMUs) and areas of concern (AOCs) in Technical Area (TA) 21 (Figure 1.0-1). Tables 1.0-1 through 1.0-4 identify these sites and indicate their regulatory status. Six of these sites (Table 1.0-1) were listed in the Environmental Stewardship (ENV) Division-Environmental Remediation and Surveillance (ERS) Program's "Investigation Work Plan for Delta Prime Site Aggregate Area at Technical Area 21" (LANL 2004, 88021, Tables 1.2-2 and 1.2-3) as being "addressed in other work plans," "deferred," "remedy complete," or "having a no further action decision." A letter from the New Mexico Environment Department (NMED) dated December 27, 2005 (NMED 2005, 91145), concluded that the determinations in these tables were not supported and that a supplemental investigation work plan was needed. As a result, the following sites are presented in this supplemental investigation work plan:

- SWMU 21-002(a), several unidentified container storage areas
- SWMU 21-024(i), a septic system
- AOC 21-028(d), an active container storage dock area
- AOC C-21-001, a one-time spill
- AOC C-21-006, an unintentional release area
- AOC C-21-027, a cooling tower

The objectives of this supplemental work plan are to

(1) propose investigation/corrective action where appropriate, or

(2) provide background information and explanation for these sites where no investigation/corrective action is proposed.

Table 1.0-2 identifies the SWMUs and AOCs that were addressed in "Investigation Work Plan for Delta Prime Site Aggregate Area at Technical Area 21" (LANL 2004, 88021). Table 1.0-3 identifies SWMUs and AOCs that will be addressed under other investigation work plans, including those for the five material disposal areas (MDAs) at TA-21 and sites that have been investigated or remediated previously but are awaiting no further action (NFA) determinations. Table 1.0-4 lists the SWMUs and AOCs for which there has been a determination of NFA.

The described work's objective is to characterize or define the nature and extent of contamination, if any, associated with the sites. The work activities include conducting characterization sampling and analysis and implementing the appropriate corrective action, if necessary (section 2.0). Investigation methods are presented in section 3.0. The monitoring and sampling program information is presented in section 4.0. A schedule of the decontamination and decommissioning (D&D) activities and of the investigation report submittal is provided in section 5.0. Appendix A includes a list of acronyms and abbreviations, a glossary, and a metric conversion table. Appendix B describes the management of investigation-derived waste (IDW).

The "Investigation Work Plan for Delta Prime Site Aggregate Area at Technical Area 21" (LANL 2004, 88021) presented a detailed TA-21 operational history and land use section (section 2.0) and an existing site conditions section (section 3.0), which apply to the sites addressed in this supplemental investigation work plan; therefore, this information is not repeated here.

2.0 BACKGROUND AND SCOPE OF ACTIVITIES

The operational history, previous investigations, and/or field activities for each site are presented below. All historical data were evaluated in developing the summary of the previous investigations. This evaluation concluded that for sites that have available data, the existing data are not sufficient to define the nature and extent of contamination. Therefore, additional sampling is proposed where applicable.

2.1 SWMU 21-002(a), Unidentified Container Storage Areas

SWMU 21-002(a) consists of all unidentified, inactive container storage areas at TA-21. Drums, gas cylinders, and other containers were reported to have been stored in “several locations” throughout TA-21, and some were reported to have leaked (LANL 1991, 07529, p. 18-21). These locations were never specifically identified but will be addressed by the proposed D&D activities at TA-21. Therefore, site-specific sampling or remedial activities are not proposed for this SWMU. However, D&D confirmation sampling will be conducted after the structures at TA-21 are removed. Section 5.0 presents a schedule showing the planned D&D and investigation report completion dates, which should be finished by September 2010.

2.2 SWMU 21-024(i), Septic System

SWMU 21-024(i) consists of a septic tank, pipelines, and associated outfall (Figure 2.2-1). The only portion of the septic system remaining at the site is the inlet line from Building TA-21-209 (the Tritium Science Fabrication Facility [TSFF]) to the fence line. Building TA-21-209 currently is located on top of a part of the pipeline. The portion of the inlet line from the fence to the septic tank, the septic tank, the outlet line, and the outfall were removed in 2001 in an interim action (LANL 2003, 76053).

Operational History

- 1945—Building TA-21-152 was constructed to serve as a polonium-processing and high-temperature laboratory. The SWMU 21-024(i) septic system that served Building TA-21-152 was constructed at the same time. The septic system routed sewage from the laboratory by way of a 6-in. vitrified-clay pipe (VCP) inlet line to a reinforced concrete, 6-ft by 10-ft by 8-ft-deep septic tank (Structure TA-21-181) and then into a sump (Structure TA-21-175) (Los Alamos Scientific Laboratory [LASL] 1946, 24460). Blowdown pipelines from cooling towers (Structures TA-21-166 and TA-21-167) were also connected to this sump. Effluent was then routed by way of a 6-in. VCP outlet line to the surface and into a broad open area with a gentle slope extending approximately 30 ft to the southern edge of DP Mesa above Los Alamos Canyon. The sump and portions of the pipe currently lie under Building TA-21-209 (LASL 1946, 71281).
- 1964 to 1965—Building TA-21-209 was built to serve as a high-temperature chemistry building and was located on top of the existing inlet lines from Building TA-21-152, Structure TA-21-166, and Structure TA-21-167 (LASL 1946, 71281). New blowdown pipelines from Structures TA-21-166 and TA-21-167 were connected into the SWMU 21-024(k) septic system. These newer lines will be addressed under the SWMU 21-024(k) investigation (LANL 2005, 90225, pp. 5-70 through 5-72).
- 1965—The septic system was no longer used but was left in place.

Previous Investigations

No previous sampling has been conducted of the inlet line from Building TA-21-152 to the fence line. The results of a 2004 geophysical survey in the area of the inlet line are summarized below. In addition, a brief

summary of the previous investigations conducted at the septic tank and outfall areas are also presented; further details are provided in the interim action completion report (LANL 2003, 76053).

- 1992/1993—Phase I Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) sampling was conducted near the septic tank and outfall (LANL 2003, 76053, p. 5).
- 1997—Phase II RFI sampling was conducted near the septic tank and outfall. Based on these results, an interim action was identified as the best option for the site (LANL 2003, 76053, p. 5).
- 1998—An interim action was conducted that consisted of soil removal and confirmation sampling in the outfall area. The septic tank was not removed at this time because a suitable disposal method for the septic tank contents was lacking (LANL 2003, 76053, p. 13).
- 2001/2002—The septic tank, inlet line between the septic tank and the fence line, outlet line, and contaminated mesa top soil in the outfall were removed in an additional interim action. Samples were collected to determine the nature and extent of these areas, and the area was reseeded (LANL 2003, 76053, pp. 17–22).
- 2004—Radiological and geophysical surveys were completed (results were presented in Appendixes D and E of the investigation work plan revisions [LANL 2005, 90225]). The geophysical survey identified a portion of the inlet pipeline from the fence line up to Building TA-21-209. The pipeline could not be located on the west side of Building TA-21-209, where it should have connected to Building TA-21-152.

SWMU 21-024(i) Data

Soil sampling in 1997 indicated that the septic tank contained sludge with radioactive and hazardous chemicals, and that elevated levels of radioactive contaminants were present in the outfall area (LANL 2003, 76053, p. 13). As a result, the septic tank and outfall areas were remediated. After the structure and soil removal, confirmation sampling was conducted and then presented in the “Interim Action Completion Report for Solid Waste Management Unit 21-024(i) at Technical Area 21” (LANL 2003, 76053). The nature and extent of contamination were defined. In addition, as a result of the risk assessment performed using the confirmation sampling data, NFA was recommended for the septic tank and outfall areas.

Scope of Activities for SWMU 21-024(i)

Sampling has not been conducted where the inlet line remains in the ground. Section 5.12 of the investigation work plan revisions (LANL 2005, 90225, pp. 5-61 and 5-62) describes the proposed sampling locations, depths, the objectives each sample addresses, and the proposed analytical suites for the inlet line. Investigation of the inlet line is proposed for deferral until the associated Building TA-21-209 has undergone D&D.

2.3 AOC 21-028(d), Active Container Storage Dock Area

AOC 21-028(d) consists of an active less-than-90-day storage site located on a concrete loading dock on the northwest corner of Building TA-21-209 (Figure 2.3-1) (LANL 1991, 07529, p. 14-39). The dimensions of the dock are approximately 8.5 ft wide by 60 ft long by 3.25 ft deep.

Operational History

- 1965—Building TA-21-209 was constructed. The storage of containers at the loading dock likely began at this time (LANL 1991, 07529, p. 14-39).

- 1990—Area was inspected. Fifty-five-gal. drums of lithium-deuterium waste, 30- and 55-gal. drums of fissionable waste (waste containing natural uranium, natural thorium, uranium-235, uranium-238, thorium-228, thorium-230, and thorium-232), and gas cylinders of tritium-contaminated hydrogen and argon gas (LANL 1991, 07529, p. 14-39) were stored on the dock. Containers of product stored in the same area included cylinders of deuterium, argon, nitrogen, helium, and compressed hydrogen; 55-gal. drums of oil; acetone; Convoil 20 (a multi-purpose vacuum pump fluid); ethanol; ethyl alcohol; and various solvents stored in a chemical safety cabinet (LANL 1991, 07529, p. 14-39).
- Currently (2006)—Dock area is still used as a storage area. Gas cylinders and empty drums are visible on the dock. Cracks are also evident in several places along the surface and side of the dock.

Previous Investigations

In 1994, RFI activities included a radiological surface survey of the area adjacent to the west side of the loading dock. In addition, soil from four locations in this same area was sampled (0- to 0.5-ft-depth interval) and sent to an off-site laboratory for analyses of inorganic chemicals, organic chemicals, and radionuclides (LANL 1996, 58676, pp. 37–47). The site was recommended for NFA in the RFI report (LANL 1996, 58676, p. 51).

AOC 21-028(d) Data

Quality assurance/quality control (QA/QC) information is not available for the four samples analyzed. The data collected indicated that inorganic chemicals and radionuclides were detected above background/fallout values (BVs/FVs) (LANL 1998, 59730) and that organic chemicals were also detected. The vertical extent was not defined since only one depth was sampled. The lateral extent was not defined since only one row of samples was collected parallel to the dock. Additionally, these samples were not collected in the area of the highest radiological activity as indicated by radiological survey results (LANL 1996, 58676, pp. 39–42).

Sampling Activities for AOC 21-028(d)

The container storage area is currently active. Therefore, it is proposed that additional investigation of this site be performed after the container storage area dock is no longer used. The section below describes proposed activities once the dock is removed.

The proposed sampling locations at AOC 21-028(d) are shown in Figure 2.3-1. Table 2.3-1 provides a summary of the proposed sampling locations, depths, the objectives each sample addresses, and the proposed analytical suites.

Samples will be collected from a location centered just north of the loading dock, and from three locations just west of the loading dock at the northern end, middle, and southern end (Figure 2.3-1, locations BH-1 through BH-4, respectively). Two locations centered under the base of the loading dock will also be sampled. The first location will be sampled halfway between locations BH-2 and BH-3. The second location will be sampled halfway between BH-3 and BH-4, near cracks if possible (Figure 2.3-1, locations BH-5 and BH-6). After the removal of the loading dock, sampling under the dock will be biased toward any visible staining. If staining is not apparent, samples will be collected from locations BH-5 and BH-6 as described above.

Samples will be collected from the 0- to 0.5-ft, 5.0- to 6.0-ft, and 10.0- to 11.0-ft-depth intervals. Zero depth is defined as 0.5 ft under the asphalt (locations BH-1 through BH-4) or directly under the base of

the loading dock after it is removed (locations BH-5 and BH-6). Samples will be analyzed for Target Analyte List (TAL) metals, cyanide, nitrates, perchlorate, volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), radionuclides (gamma-emitting radionuclides, americium-241, isotopic plutonium, isotopic thorium, isotopic uranium, strontium-90, and tritium), polychlorinated biphenyls (PCBs), moisture, and pH.

All material brought to the surface will be field-screened for radioactivity and VOC vapors. Where field-screening instruments and/or visual inspection indicate potential contamination, additional samples will be collected and sent for off-site laboratory analysis. Additionally, samples will be collected every 2 ft below contaminated intervals as determined by field screening until an uncontaminated sampling interval is collected. Field screening will also determine the need for collecting step-out samples to bound the extent of contamination. Step-out sampling starts with one data point and then calls for measuring specific distances in one or more directions from that point before additional samples are collected at defined intervals (e.g., 20 ft laterally to the north, south, east, and west, if applicable). The samples collected at these defined intervals are called step-out samples because they “step out” from the original data point. The step-out samples will be collected from the same depth intervals as their corresponding contaminated sampling location(s) until field-screening results indicate no measurable contamination.

2.4 AOC C-21-001, One-time Spill

AOC C-21-001 consists of a hydrogen fluoride spill inside a corridor (Building TA-21-017) (Figure 2.4-1) (LANL 1991, 07529, p. 18-35) that occurred in the 1950s (U.S. Department of Energy [DOE] 1987, 08663, p. TA 21-16). The quantity of hydrogen fluoride spilled is unknown.

Operational History

- 1945—Building TA-21-017 (a passageway connecting Buildings TA-21-004 and TA-21-005) was constructed (LASL 1946, 71281).
- 1969—Building TA-21-017 was removed (LANL 1991, 07529, p. 15-34).

Previous Investigations

This site has not been investigated.

AOC C-21-001 Data

There are no analytical data.

Scope of Activities for AOC C-21-001

Building TA-21-315 is situated on top of the former location of Building TA-21-017, where the spill occurred. Hydrogen fluoride in liquid form will vaporize if it is exposed to air, such as during a spill (Occupational Safety and Health Administration [OSHA] 2006, 91146). Because hydrogen fluoride would have dispersed into the air and would not have remained in liquid form to contaminate the floor, no activities are planned to address this one-time spill.

2.5 AOC C-21-006, Unintentional Release Area

AOC C-21-006 consists of a release of americium-241 from a leaking transport trailer near the southwestern corner of Building TA-21-002. The contaminated area was covered with asphalt after the spill/release. Since then this area has been disturbed, and the location of the asphalt is not apparent (Figures 2.4-1 and 2.5-1) (LANL 1991, 07529, p. 18-35).

Operational History

- 1945—Building TA-21-002 was constructed (LANL 1991, 07529, p. 18-55).
- 1949 to 1979—Tanker trailers were loaded on the north side of Room 218 at Building TA-21-002. Room 218 was located on the southwestern corner of the building (Maraman and Christensen 1987, 01453). On occasion, overflow from the tanker trailers was thought to have occurred south of Building TA-21-002 to the canyon (Walker 1979, 06460). When the trailer was full, it was moved to Building TA-21-257 (the waste treatment plant), where the contents were emptied and treated (LANL 1991, 07529, p. 18-34).
- 1977—A transport trailer leaked, resulting in a large area of americium-241 contamination (up to 5×10^4 counts/min/100 cm^2) (DOE 1987, 08663, p. TA 21-17). A 1977 memorandum indicated the area would be covered with asphalt (Wenzel 1977, 06451).
- Currently (2006)—Building TA-21-002 is still present at the site. The exact location of the spill is unclear.

Previous Investigations

The results of a recently completed field survey using instrument detectors for measuring low-energy radiations (FIDLER) indicate an area along the west side of Room 218 with greater than 18,000 counts per minute (CPM) (background) of gamma emission radiation (americium-241 is a gamma emitter) (Figure 2.5-2). No other investigations have been performed.

AOC C-21-006 Data

There are no analytical data.

Sampling Activities for AOC C-21-006

Samples will be collected around Room 218 as part of the work conducted under “Work Plan for Characterization of Underlying Soils at Delta Prime West Structures at Technical Area 21” (LANL 2005, 91289). The work plan’s purpose is to determine if any potential contamination exists adjacent to, or under, the remaining structures at DP West. Figure 2.5-1 shows the planned sampling locations. At locations 21-27 through 21-30, samples will be collected from 0 ft to 2.0 ft (an interim depth) and from 8.0- to 10.0-ft-depth intervals. These samples will be analyzed for TAL metals, sodium, cyanide, PCBs, dioxins, furans, pH, nitrates, chlorides, fluorides, perchlorate, VOCs, SVOCs, isotopic plutonium, americium-241, total uranium, isotopic uranium, gamma-emitting radionuclides, strontium-90, and tritium.

Because the scope of the work in this area does not include determining the extent, and because it is focused solely on the potential contamination adjacent to, or under, the structures at the site (LANL 2005, 91289), five additional locations will be sampled (Figure 2.5-1, locations BH-1 through BH-5) as part of this supplemental investigation work plan. These samples will be collected from the following locations (see also Table 2.5-1): 10 ft north of 21-29; 10 ft west of 21-29; south of BH-2; centered between 21-28 and 21-29; and along the western side of Room 218, east of BH-3 (Figure 2.5-1, locations BH-1 through BH-5, respectively). Samples will be collected from the 0- to 0.5-ft, 5.0- to 6.0-ft, and 10.0- to 11.0-ft-depth intervals and analyzed for americium-241. Zero depth is defined as the ground surface.

All material brought to the surface will be field-screened for radioactivity. Where field-screening instruments and/or visual inspection indicate potential contamination, additional samples will be collected and sent for off-site laboratory analysis. Additionally, samples will be collected every 2 ft below contaminated intervals, as determined by field screening, until an uncontaminated sampling interval is

collected. Field screening will also determine the need for collecting step-out samples (e.g., 20 ft laterally to the north, south, east, and west, if applicable) to bound the extent of contamination. The step-out samples will be collected from the same depth intervals as their corresponding contaminated sampling location(s) until field-screening results indicate no measurable contamination.

2.6 AOC C-21-027, Cooling Tower

AOC C-21-027 consists of a former cooling tower (chilled water recirculator), Structure TA-21-143 (Figures 2.4-1 and 2.6-1) (LANL 1991, 07529, p. 18-35). The tower received water from Building TA-21-003, circulated it, and returned it to the building in a closed loop (LANL 1995, 49987). The cooling tower was connected to an acid tank (LASL 1957, 24520) and also had a 3-in. cast-iron drain that discharged into Los Alamos Canyon to the south (LASL 1957, 24518; LASL 1957, 24520).

Operational History

- 1956/1957—The cooling tower was constructed (LASL 1957, 24520). The cooling tower occupied an area approximately 10 ft by 20 ft (LANL 1995, 49987). The associated underground piping was approximately 4 ft below ground surface (bgs) (LASL 1957, 24516; LASL 1957, 24520)
- 1994—The cooling tower surface structures were removed (LANL 1995, 49987).
- 1995—The cooling tower subsurface structures were removed (LANL 1995, 49987). It is not known whether the inlet and outlet piping were removed.
- Currently (2006)—The only evidence of the cooling tower is a depression in the ground surface.

Previous Investigations

After the subsurface structures had been removed in 1995, three confirmation samples were collected from one location in the center of the cooling tower's footprint. Samples were collected from the 0- to 0.5-ft, 0.5- to 1.0-ft, and 1.0- to 1.5-ft-depth intervals and sent to an off-site fixed laboratory for analyses of inorganic chemicals, organic chemicals, and radionuclides (LANL 1995, 49987). Samples were not collected in the areas of the inlet or outlet piping, and no information is available that indicates they were removed; therefore, it is assumed these pipes are still in place.

AOC C-21-027 Data

Only one location was sampled in the middle of cooling tower TA-21-143, but the sample coordinates are not available. The samples were analyzed for inorganic chemicals, organic chemicals, and radionuclides (LANL 1995, 49987). The data associated with these samples are more than 10 yr old. Calcium and chromium were detected above BVs; various organic chemicals were detected; americium-241 was detected above its FV; plutonium-239 and strontium-90 were detected at depths where FVs do not apply; and cobalt-60, europium-152, and tritium were detected (no FVs available) (LANL 1998, 59730). None of the piping areas were sampled. Therefore, additional sampling is proposed.

Sampling and Excavation Activities for AOC C-21-027

The proposed sampling locations at AOC C-21-027 are shown in Figure 2.6-1. Table 2.6-1 provides a summary of the proposed sampling locations, depths, the objectives each sample addresses, and the proposed analytical suites.

Samples will be collected to address adjacent SWMU 21-027(a), as described in section 5 of the investigation work plan revisions (LANL 2005, 90225, pp. 5-99 and 5-100, and Figure 5.19-3, p. 5-161).

Therefore, as shown in Figure 2.6-1, the proposed SWMU 21-027(a) sampling locations (blue squares) provide partial extent for AOC C-21-027.

During the pipeline removal activities, the excavation of soil and/or rock (including all visibly stained areas) will proceed until the radiological and VOC-vapor field-screening results indicate that the contaminated material has been removed. Confirmation samples will be collected as these activities are completed. Sampling at AOC C-21-027 will consist of the following activities:

- *Cooling tower sampling.* Samples will be collected from the center of the former cooling tower location (Figure 2.6-1, location BH-1). Two additional locations will be sampled 20 ft north and 20 ft east of BH-1 (Figure 2.6-1, locations BH-2 and BH-3), parallel to the orientation of the former cooling tower. The cooling tower had subsurface structures that were approximately 4 ft bgs. Therefore, at each location a sample will be collected at the 0- to 0.5-ft, 5.0- to 6.0-ft, and 10.0- to 11.0-ft-depth intervals. The zero depth is defined as the ground surface.
- *Pipeline excavation and sampling.* The cooling tower had underground chambers and piping that were likely removed during voluntary corrective action (VCA) activities; however, there is no evidence that the inlet and outlet pipes were also removed. Trenching will be conducted with a backhoe and will progress from the surface to approximately 5 ft bgs north and south of the former cooling tower structure. The trenches will be visually logged for evidence of nonnative materials, disturbed bedding horizons, and areas of visible staining. Elevated radiological or organic vapor field-screening results will be documented. Trenching will continue in the historically identified area until the pipeline is located, evidence of a former pipeline is found, or the absence of a pipeline at that location has been verified. If a pipe, or evidence of a former pipe, is not identified during field activities, confirmation samples will be collected from location(s) and depth(s) where the pipe was most likely located, using the proposed sampling map as a guide.
- Any pipelines and backfilled former pipeline beds will be carefully excavated and inspected for visible signs of leakage. Where elevated VOC and/or radioactivity levels are present, as determined by field screening, or where visible evidence of a leak is found (e.g., stained soil, break in the pipe), samples will be collected immediately beneath the pipe to define the vertical extent. The pipelines will be followed and carefully excavated. If no field-screening evidence or visible evidence of a leak is found, a sample will be collected from one location beneath the outlet pipeline approximately 50 ft from the cooling tower (or where evidence of a former pipeline exists) (Figure 2.6-1, location “1”). At each location, a sample will be collected at the 0-to-1.0-ft and 2.0-to-3.0-ft-depth intervals. The zero depth is defined as immediately beneath the pipe or at the bottom of the pipe bed for pipelines that no longer exist.
- *Outfall investigation.* Samples will be collected from the center of the outfall 0.5 ft downslope from the mouth of the outfall pipe (Figure 2.6-1, location BH-4), and samples will be collected from the 0- to 0.5-ft, 2.0- to 3.0-ft, and 5.0- to 6.0-ft-depth intervals. One sample will be located 5 ft to the west of BH-4 (Figure 2.6-1, location “2”) to determine the lateral extent. Samples will be collected at depths of 0 ft to 0.5 ft and 2.0 ft to 3.0 ft. The zero depth is defined as the ground surface.
- *Bench investigation.* On the topographical bench beneath the mesa cliff edge, three sampling locations will be established downslope from the mouth of the pipe, in the center of a distinguishable drainage, or in a catchment basin aligned with the mouth of the pipe at the northern end, center, and southern end of the bench (Figure 2.6-1, locations “3” through “5”). Samples will be collected at depths of 0 ft to 0.5 ft and 2.0 ft to 3.0 ft. The zero depth is defined as the ground surface.

Samples will be analyzed for TAL metals, hexavalent chromium, cyanide, nitrates, perchlorate, organic chemicals (VOCs and SVOCs [VOCs only in samples deeper than 0.5 ft bgs]), radionuclides (americium-241, isotopic plutonium, isotopic uranium, strontium-90, and tritium), moisture, and pH.

All material brought to the surface will be field-screened for radioactivity and VOC vapors. Where field-screening instruments and/or visual inspection indicate potential contamination, additional samples will be collected and sent for off-site laboratory analysis. Additionally, samples will be collected every 2 ft below contaminated intervals, as determined by field screening, until an uncontaminated sampling interval is collected. Field screening will also determine the need for collecting step-out samples (e.g., 20 ft laterally to the north, south, east, and west, if applicable) to bound the extent of contamination. The step-out samples will be collected from the same depth intervals as their corresponding contaminated sampling location until field-screening results indicate no measurable contamination.

3.0 INVESTIGATION METHODS

The ENV-ERS standard operating procedures (SOPs) and quality procedures (QPs) listed below are applicable to the investigation methods proposed in this plan.

- SOP-01.01, General Instructions for Field Investigations
- SOP-01.02, Sample Containers and Preservation
- SOP-01.03, Handling, Packaging, and Shipping of Samples
- SOP-01.04, Sample Control and Field Documentation
- SOP-01.05, Field Quality Control Samples
- SOP-01.06, Management of Environmental Restoration Project Waste
- SOP-01.08, Field Decontamination of Drilling and Sampling Equipment
- SOP-01.10, Waste Characterization
- SOP-03.11, Coordination and Evaluating Geodetic Surveys
- SOP-04.01, Drilling Methods and Drill-Site Management
- SOP-05.03, Monitoring Well and RFI Borehole Abandonment
- SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples
- SOP-06.10, Hand Auger and Thin-Wall Tube Sampler
- SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials
- SOP-12.01, Field Logging, Handling, and Documentation of Borehole Materials
- SOP-15.09, Chain of Custody for Analytical Data Packages
- QP-02.2, Personnel Training Management
- QP-03.4, Corrective Action Process
- QP-04.4, Records Transmittal to the Records Processing Facility
- QP-05.3, Readiness Planning and Review
- QP-05.7, Notebook Documentation for Environmental Restoration Technical Activities
- QP-05.12, Integrating Work with Other Organizations

- QP-07.1, Procurement
- QP-07.2, Supplier Evaluation
- QP-10.5, Planning, Performing, and Managing Surveillances

Additional procedures may be added as necessary or appropriate to describe and document activities. All work will be performed in accordance with applicable SOPs, QPs, and the ENV Quality Management Program. Table 3.0-1 provides a summary of the key investigation methods.

3.1 Methods for the Investigation and Corrective Action Sites in this Plan

3.1.1 Drilling

Boreholes that are 10 or more feet deep will be drilled with a rotary drill rig capable of core retrieval. The goal is to obtain data to determine the vertical extent of potential contamination. The core will be field-screened for radioactivity and organic vapors (see section 3.1.3), visually inspected, and geologically logged. Additional samples may be collected for analysis at additional depths, as necessary, based on field-screening results. All drilling activities will refer to appropriate SOPs, QPs, Laboratory guidance documents, and protocol to ensure that health and safety issues are reviewed and addressed during field operations.

3.1.2 Collecting Soil and Rock Samples

The most common method for surface and shallow-subsurface sampling is the spade-and-scoop method, described in SOP-06.09. Stainless-steel shovels, spades, scoops, and bowls will be used because of the ease of decontamination. Disposable tools made of polystyrene or Teflon may also be used. In some cases, hand-augering tools may be used to collect shallow-subsurface samples if geologic material conditions permit. The use of tools and their applicability are described in SOP-06.10. If a surface sample location is in bedrock, an axe or hammer and chisel may be used to collect samples.

Samples will be field-screened for radioactivity and organic vapors (see section 3.1.3), photographed, then placed in Ziploc bags and/or sample jars as grab samples derived from hand augers, scoops, or chiseling devices in accordance with the sampling guidance document and appropriate SOPs (SOP-01.01 through SOP-01.08). If field screening detects radioactivity at a depth beyond the reach of standard surface methods, drilling will be conducted to define the vertical extent of the contamination.

Core samples will be collected in accordance with SOP-06.26, examined for lithologic and structural features, field-screened for radioactivity and organic vapors (see section 3.1.3), photographed, and then removed from the split-barrel sampler and placed into seam-sealed plastic sleeves or protec-core heat-sealed bags to preserve the core moisture content. Sample jars and/or Ziploc bags will be filled with discrete segments of the core.

All samples (surface and subsurface) will be shipped through the ENV-Environmental Characterization and Remediation (ECR) Sample Management Office (SMO) to off-site fixed laboratories for analysis. Samples will be sent to laboratories that are on the ENV-ECR-approved suppliers list. All samples will be collected and handled in compliance with SOP-15.09. The analytical suites for each borehole and surface sampling location are described in the sections pertaining to the individual site and are listed in Tables 2.3-1, 2.5-1, and 2.6-1.

QA/QC samples will include field duplicate samples collected in accordance with SOP-01.05. Field duplicate samples will be collected at a frequency of at least one for every 20 regular samples, or as

directed by SOP-01.05. Rinsate blanks will also be collected to confirm the decontamination of sampling equipment.

Auger holes will be continuously cored to total depth and geologically logged (i.e., lithology, apparent moisture, structural features, specifically the occurrence of fracture, orientation, and density), and core recovery will be compared to the footage drilled in accordance with SOP-12.01 and SOP-04.01. The moisture-content samples will be collected and placed in glass sample jars. Backfilling of the investigation auger hole and the placement of backfill materials, such as bentonite and cement, will be documented with regard to volume (calculated and actual), intervals of placement, and additives used to enhance backfilling.

3.1.3 Field Screening

Samples will be field-screened for gross alpha radiation using a Model 139 rate meter and for beta/gamma radiation using an ESP-1. Radiological screening will be provided by the Laboratory's Health Physics Operations (HSR-1) radiation control technicians (RCTs). The subcontractor will field-screen samples for organic vapors using a photoionization detector (PID). Cores collected by split-spoon core barrel will be screened immediately upon opening the core barrel, and any visibly stained or discolored zones, fractures, or clay-rich weathered zones will be noted. Samples collected by spade-and-scoop or hand-auger methods will be screened in the collection bowl or sample container soon after the sample is collected. Screening values will be recorded in the appropriate spaces on the corresponding sample collection logs at the time of sample collection. If field-screening results are used to change the planned sampling interval or to collect additional samples, the modification will be recorded in the appropriate sample collection log and in the field notebook. Field-screening instruments will be checked at least daily for proper operation, and they will be checked at least daily against calibration standards, as appropriate.

3.1.4 Geodetic Surveying

Geodetic surveying of all sampling locations will be conducted in accordance with SOP-03.11. Horizontal coordinates and elevations will be determined by a professional, registered New Mexico land surveyor, using the New Mexico State Plane Coordinate System. The survey results will be presented as part of the investigation report. Sample coordinates will be reported to the SMO representative.

3.1.5 Equipment Decontamination

After the investigation activities, project personnel will decontaminate all equipment. Residual material adhering to the equipment will be removed using dry decontamination methods, including wire-brushing and scraping (SOP-01.08). If equipment cannot be free-released after the dry decontamination, a high-pressure sprayer, along with long-handled brushes and rods, will be used to remove contaminated material from equipment more effectively. Residual media adhering to equipment will be removed using dry decontamination methods, including wire-brushing and scraping (SOP-01.08). Pressure washing of equipment will be performed on a temporary wash pad with a high-density polyethylene liner. Cleaning solutions and wash water will be collected and contained for proper disposal. Decontamination solutions are then sampled to determine final disposition. All parts of the equipment, including the undercarriage, wheels, tracks, chassis, and cab, will be thoroughly cleaned. Air filters on equipment operating in the exclusion zone will be considered contaminated and will be removed and replaced before the equipment leaves the site. Equipment ready for demobilization will be surveyed by a HSR-1 RCT before being released from the site.

3.1.6 Excavation

Excavations will be completed using a standard backhoe. Structures will be exposed and inspected for cracks or other signs of potential release to the environment and then disposed of in accordance with Laboratory procedures. Excavation methods will vary among locations, but the primary method employed will be to advance from the ground surface to remove material in lifts until the structure is unearthed and removed.

3.1.7 Trenching

Trenching will be completed using the same protocols and equipment as the excavations. Trenching will assist in locating subsurface structures. Trenching will be conducted to remove lifts of soil in areas of suspected subsurface features to allow the identification of disturbed soil of nonnative material.

3.1.8 Waste Management

Materials identified as waste will be segregated into their specific waste types for appropriate disposal. Investigation activities will minimize the waste generated by following the 2005 “Hazardous Waste Minimization Report” (Pollution Prevention Waste Minimization Plan; LANL 2005, 091291). Methods managing IDW, including soil, tuff, concrete and other structural material, protective personal equipment, and other miscellaneous materials used, are described in Appendix B.

3.1.9 Excavation Backfilling and Trench Cover Replacement

The excavations and trenches will be backfilled and compacted, and clean soil cover material (shipped from off-site) will be placed over the affected area. All affected surfaces will be restored to original grade, reseeded, and straw mulch will be applied to help stabilize the surface. To prevent future subsidence, the replaced material will be compacted to the extent practical and will be mounded slightly in anticipation of settling.

3.1.10 Borehole Abandonment

Backfilling (abandonment) of investigation boreholes will be conducted according to procedures outlined in SOP-05.03. The use of backfill materials, such as bentonite and cement, will be documented in a field logbook with regard to volume (calculated and actual), intervals of placement, and additives used to enhance backfilling.

4.0 MONITORING AND SAMPLING PROGRAM

No monitoring is currently performed at any of the sites.

5.0 SCHEDULE

The proposed work schedule will be sent to NMED under a separate cover and will update the previous schedule sent on November 3, 2005 (LANL 2005, 91293).

6.0 REFERENCES AND MAP DATA SOURCES

6.1 References

The following list includes all documents cited in this supplemental investigation work plan, except for Appendix B. The references for Appendix B are located in that appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the ENV-ERS Program Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the ENV-ERS Program master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau (HWB); the U.S. Department of Energy-Los Alamos Site Office; the U.S. Environmental Protection Agency (EPA), Region 6; and the ENV-ERS Program. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

DOE (U.S. Department of Energy), October 1, 1987. “Comprehensive Environmental Assessment and Response Program Phase I: Installation Assessment, Los Alamos National Laboratory, Volume 1 of 2,” Comprehensive Environmental Assessment and Response Program, Albuquerque Operations Office, Albuquerque, New Mexico. (DOE 1987, 08663)

EPA (U.S. Environmental Protection Agency), August 16, 2004. “EPA’s Prior Decisions on SWMU/AOC Sites at Los Alamos National Laboratory (LANL),” U.S. Environmental Protection Agency memorandum to J. Bearzi (Chief, New Mexico Environment Department-HWB) from L. F. King (Chief, EPA Federal Facilities Section 6PD-F), Dallas Texas. (EPA 2004, 87296)

LANL (Los Alamos National Laboratory), May 1, 1991. “TA-21 Operable Unit RFI Work Plan for Environmental Restoration, Vol. II,” Los Alamos National Laboratory document LA-UR-91-962, Los Alamos, New Mexico. (LANL 1991, 07529)

LANL (Los Alamos National Laboratory), September 28, 1995. “Voluntary Corrective Action Completion Report Potential Release Site C21-027 TA-21 Cooling Tower,” Los Alamos National Laboratory document, Los Alamos, New Mexico. (LANL 1995, 49987)

LANL (Los Alamos National Laboratory), June 1996. “RFI Report for Potential Release Sites 21-004(a-c) and 21-028(d,e),” Los Alamos National Laboratory document LA-UR-96-2041, Los Alamos, New Mexico. (LANL 1996, 58676)

LANL (Los Alamos National Laboratory), September 22, 1998. “Inorganic and Radionuclide Background Data for Soils, Sediments, and Bandelier Tuff at Los Alamos National Laboratory,” Los Alamos National Laboratory document LA-UR-98-4847, Los Alamos, New Mexico. (LANL 1998, 59730)

LANL (Los Alamos National Laboratory), March 1, 2003. “Interim Action Completion Report for Solid Waste Management Unit 21-024(i) at Technical Area 21,” Los Alamos National Laboratory document LA-UR-03-1546, Los Alamos, New Mexico. (LANL 2003, 76053)

LANL (Los Alamos National Laboratory), August 30, 2004. “Investigation Work Plan for Delta Prime Site Aggregate Area at Technical Area 21,” Los Alamos National Laboratory document LA-UR-04-5009, Los Alamos, New Mexico. (LANL 2004, 88021)

LANL (Los Alamos National Laboratory), September 2005. “Revisions to the Investigation Work Plan for Delta Prime Site Aggregate Area at Technical Area 21,” Los Alamos National Laboratory document LA-UR-05-3218, Los Alamos, New Mexico. (LANL 2005, 90225)

LANL (Los Alamos National Laboratory), November 3, 2005. “Schedule for deferred sites at Technical Area 21,” Los Alamos National Laboratory letter (ER2005-0800) to J. Bearzi (Chief, NMED-HWB) from D. McInroy (Deputy Program Director, ENV-ERS Program) and D. Gregory (Federal Project Director, DOE-Los Alamos Site Office), Los Alamos, New Mexico. (LANL 2005, 91293)

LANL (Los Alamos National Laboratory), November 8, 2005. “Work Plan for Characterization of Underlying Soils at Delta Prime West Structures at Technical Area 21,” Los Alamos National Laboratory document LA-UR-05-7649, Los Alamos, New Mexico. (LANL 2005, 91289)

LANL (Los Alamos National Laboratory), November 9, 2005. “Hazardous Waste Minimization Report,” Los Alamos National Laboratory document LA-UR-05-8650, Los Alamos, New Mexico. (LANL 2005, 091291)

LASL (Los Alamos Scientific Laboratory), March 19, 1946. “Septic Tanks, ‘DP’ Site Construction (Sheet U6),” Los Alamos Scientific Laboratory drawing/map ENG-C-2214, Los Alamos, New Mexico. (LASL 1946, 71281)

LASL (Los Alamos Scientific Laboratory), May 16, 1946. “Laboratory Sump—DPW-81, 84, 87, 89, and 173,” Los Alamos National Laboratory drawing ENG-C-2215, Los Alamos, New Mexico. (LASL 1946, 24460)

LASL (Los Alamos Scientific Laboratory), December 30, 1957. “Plant Circulating Chilled Water System Foundation Plan and Details,” Los Alamos Scientific Laboratory drawing ENG-C-18229, Los Alamos, New Mexico. (LASL 1957, 24516).

LASL (Los Alamos Scientific Laboratory), December 30, 1957. “Plant Circulating Chilled Water System Mech-General Layout,” Los Alamos Scientific Laboratory drawing ENG-C-18231, Los Alamos, New Mexico. (LASL 1957, 24518).

LASL (Los Alamos Scientific Laboratory), December 30, 1957. “Plant Circulating Chilled Water System Mech-Cooling Tower, Sections and Details,” Los Alamos Scientific Laboratory drawing ENG-C-18235, Los Alamos, New Mexico. (LASL 1957, 24520).

Maraman, B., and E. Christensen, July 21, 1987. “Review of Drawing Number ENG C-43338 and Notes Compiled by L. Walker from Conversation with Bill Maraman and Wilbur McNeese on May 31, 1979,” Los Alamos National Laboratory memorandum, Los Alamos, New Mexico. (Maraman and Christensen 1987, 01453)

NMED (New Mexico Environment Department), December 23, 1998. “Approval: Class III Permit Modification to Remove Ninety-Nine (99) Solid Waste Management Units from the Department of Energy/Los Alamos National Laboratory Permit NM0890010515,” New Mexico Environment Department letter to T. Taylor (DOE-Los Alamos Area Office) and J. Browne (LANL) from E. Kelley (NMED-Hazardous and Radioactive Materials Bureau), Santa Fe, New Mexico. (NMED 1998, 63042)

NMED (New Mexico Environment Department), October 10, 2001. "Approval of Class III Permit Modification (to Remove 7 Solid Waste Management Units [SWMUs] from the HSWA Module of Permit) [00-016, 02-008(b), 06-003(g), 15-007(l), 15-012 (a)(b), 21-005]," New Mexico Environment Department letter to Concerned Citizens from J. Young (Corrective Action Project Lead, NMED-HWB Permits Management), Santa Fe, New Mexico. (NMED 2001, 70236)

NMED (New Mexico Environment Department), February 1, 2004. "Technical Background Document for Development of Soil Screening Levels, Revision 2.0, Volume 1, Tier 1: Soil Screening Guidance Technical Background Document," New Mexico Environment Department document, HWB Ground Water Quality Bureau and Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2004, 85615)

NMED (New Mexico Environment Department), December 27, 2005. "Investigation Work Plan for Delta Prime Site Aggregate Area at Technical Area 21, LANL, EPA ID# NM0890010515 HWB-LANL-04-011," New Mexico Environment Department memorandum to D. Gregory (Federal Project Director, DOE) and D. McInroy (Remediation Services Deputy Project Director) from J. Bearzi (Chief, NMED-HWB), Santa Fe, New Mexico. (NMED 2005, 91145)

OSHA (Occupational Safety and Health Organization), January 5, 2006. "Online search results for hydrogen fluoride," http://www.osha.gov/SLTC/healthguidelines/hydrogenfluoride/recognition.html. (OSHA 2006, 91146)

Walker, L., May 31, 1979. "Notes from conversation with B. Maraman and W. McNeese concerning possible sites of contamination in DP Area," Los Alamos, New Mexico. (Walker 1979, 06460)

Wenzel, W.J., August 10, 1977. "Monitoring and Covering ^{241}Am Liquid Waste Transport Trailers," Los Alamos National Laboratory memorandum to E. Christensen (CMB-11) from W.J. Wenzel (H-1), Los Alamos, New Mexico. (Wenzel 1977, 06451)

6.2 Map Data Sources

GISLab Map #: m201668

Date: January 17, 2006

Title; Owner; ID; Intended Scale; Publication Date.

1991 Hypsography (100 ft); Los Alamos National Laboratory, ENV Remediation and Surveillance Program; NA; Unknown; 1991.

Fences; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; NA; Unknown; 06 January 2004.

Former Structures; Los Alamos National Laboratory, ENV Remediation and Surveillance Program; ER2004-0372; 1:2,500; 07 July 2004.

Potential Release Sites; Los Alamos National Laboratory, ENV Remediation and Surveillance Program; ER2005-0865; 1:2,500; 28 November 2005.

Roads, Dirt; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

Roads, Paved; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

GISLab Map #: m201669

Date: January 18, 2006

1991 Hypsography (100 ft); Los Alamos National Laboratory, ENV Remediation and Surveillance Program; NA; Unknown; 1991.

Fences; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; NA; Unknown; 06 January 2004.

Former Structures; Los Alamos National Laboratory, ENV Remediation and Surveillance Program; ER2004-0372; 1:2,500; 07 July 2004.

Location Ids; Los Alamos National Laboratory, ENV Remediation and Surveillance Program; ER2005-0931; 1:2,500; 13 December 2005.

Potential Release Sites; Los Alamos National Laboratory, ENV Remediation and Surveillance Program; ER2005-0865; 1:2,500; 28 November 2005.

Roads, Dirt; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

Roads, Paved; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

GISLab Map #: m201670

Date: January 18, 2006

1991 Hypsography (100 ft); Los Alamos National Laboratory, ENV Remediation and Surveillance Program; NA; Unknown; 1991.

Fences; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; NA; Unknown; 06 January 2004.

Former Structures; Los Alamos National Laboratory, ENV Remediation and Surveillance Program; ER2004-0372; 1:2,500; 07 July 2004.

Former Structures; Los Alamos National Laboratory, ENV Remediation and Surveillance Program; NA; Unknown; Unknown; data is in a draft form.

Location Ids; Los Alamos National Laboratory, ENV Remediation and Surveillance Program; ER2005-0931; 1:2,500; 13 December 2005.

Potential Release Sites; Los Alamos National Laboratory, ENV Remediation and Surveillance Program; ER2005-0865; 1:2,500; 28 November 2005.

Roads, Dirt; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

Roads, Paved; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

GISLab Map #: m201680

Date: February 14, 2006

1991 Hypsography; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; NA; Unknown; 1991.

Fences; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; NA; Unknown; 06 January 2004.

Former Structures; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; NA; Unknown; Unknown.

Location Ids; Los Alamos National Laboratory ENV Environmental Remediation and Surveillance Program; ER2006-0071; 1:2,500; 01 February 2006.

Potential Release Sites; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; ER2006-0114; 1:2,500; 08 February 2006.

Roads, Dirt; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

Roads, Paved; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

GISLab Map #: m201681

Date: February 14, 2006

1991 Hypsography; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; NA; Unknown; 1991.

Fences; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; NA; Unknown; 6 January 2004.

Former Structures; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; NA; Unknown; Unknown.

Location Ids; Los Alamos National Laboratory ENV Environmental Remediation and Surveillance Program; ER2006-0071; 1:2,500; 1 February 2006.

Potential Release Sites; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; ER2006-0114; 1:2,500; 08 February 2006.

Roads, Dirt; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

Roads, Paved; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating, and Mapping Section; Unknown; 06 January 2004.

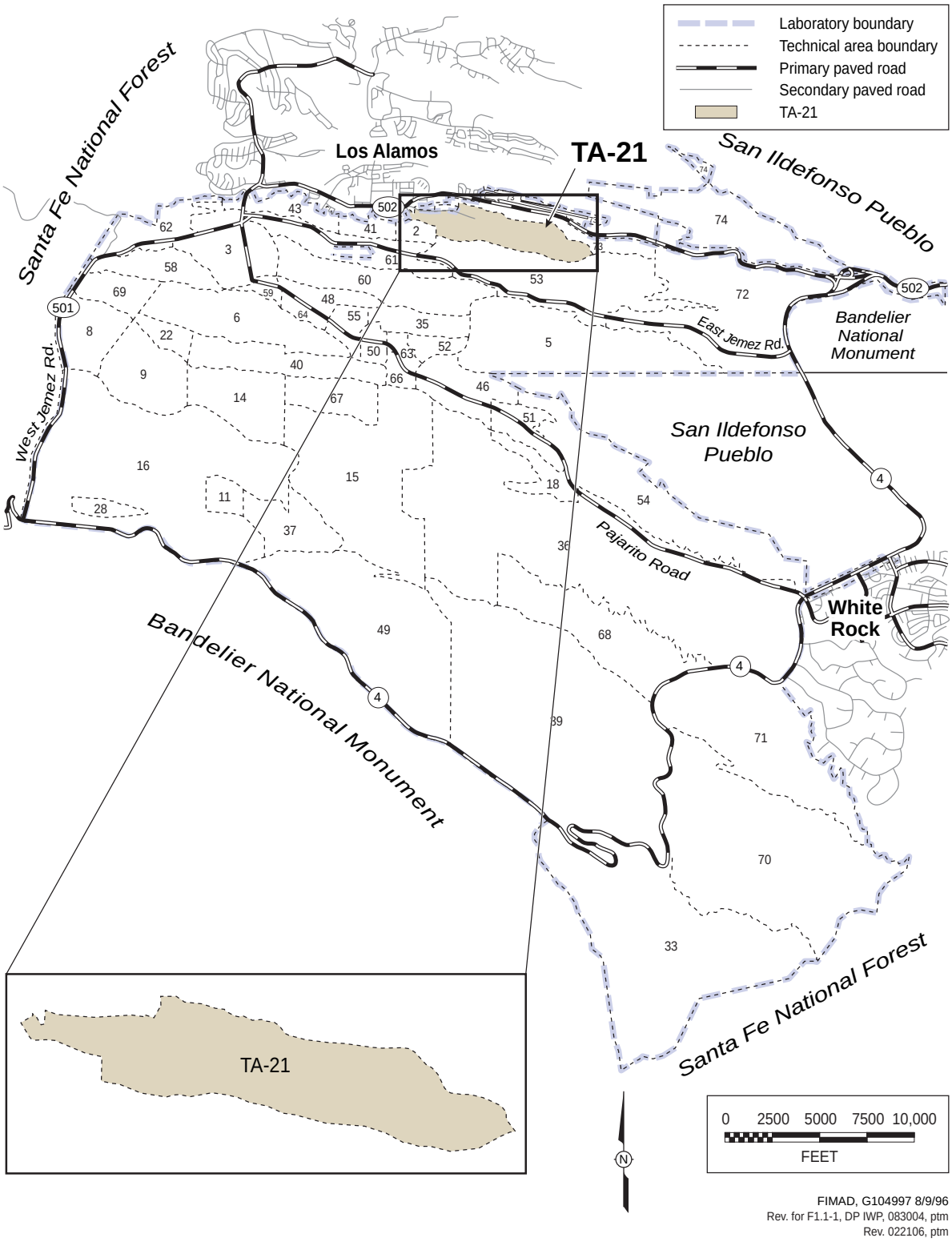

Figure 1.0-1. Location of TA-21 with respect to Laboratory technical areas and surrounding land holdings

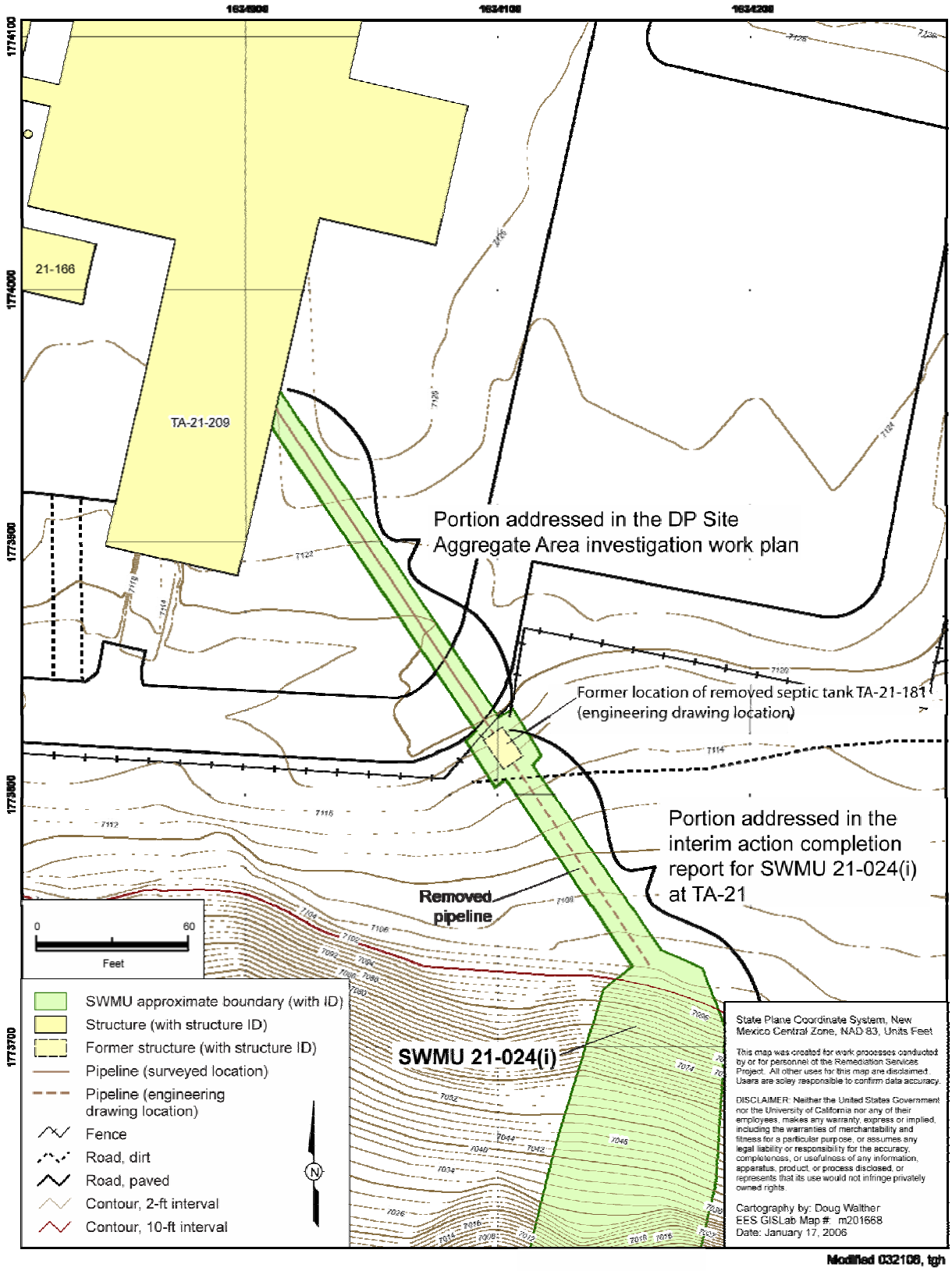

Figure 2.2-1. Site map for SWMU 21-024(i)

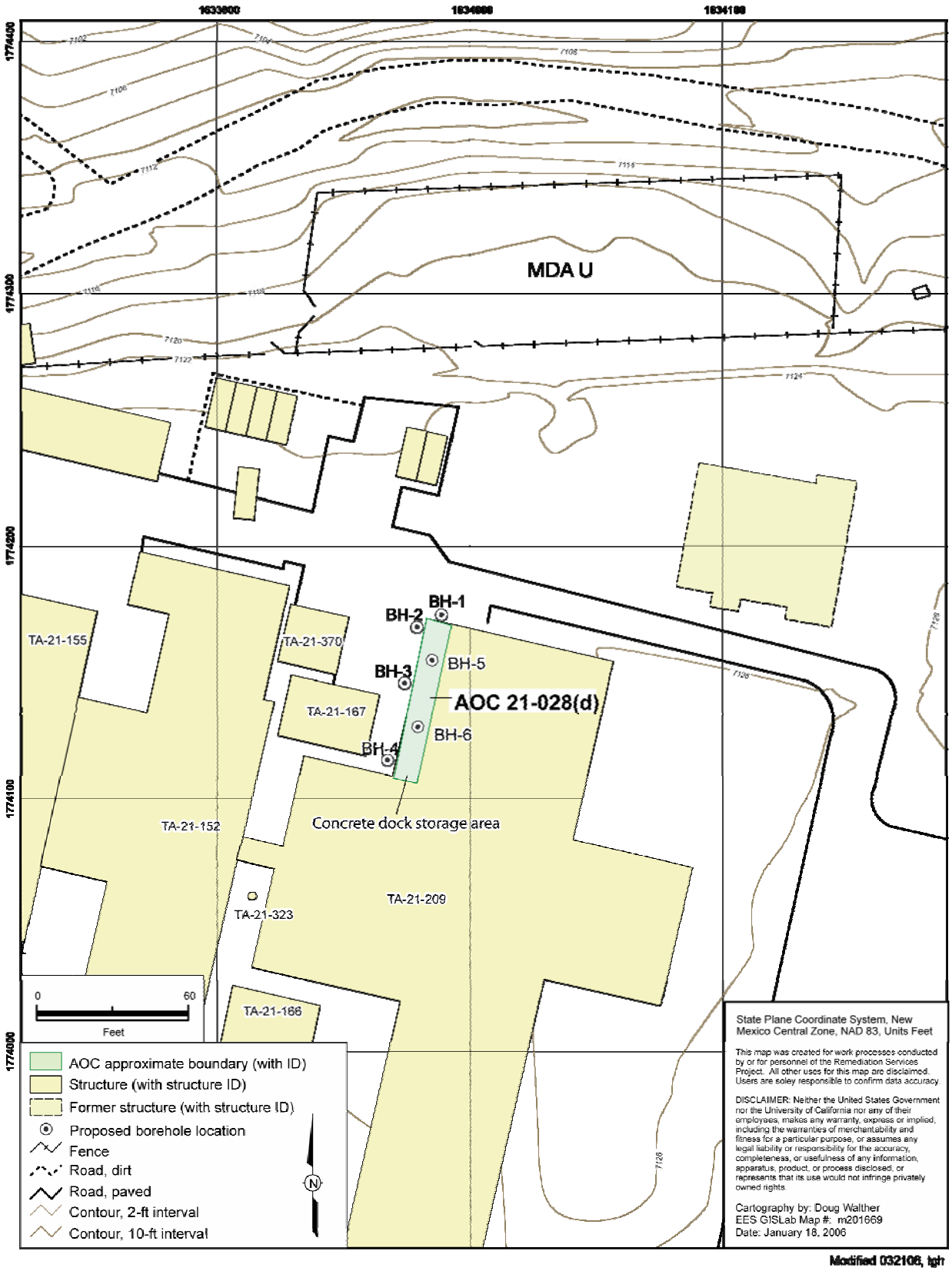

Figure 2.3-1. Site map and proposed sampling location for AOC 21-028(d)

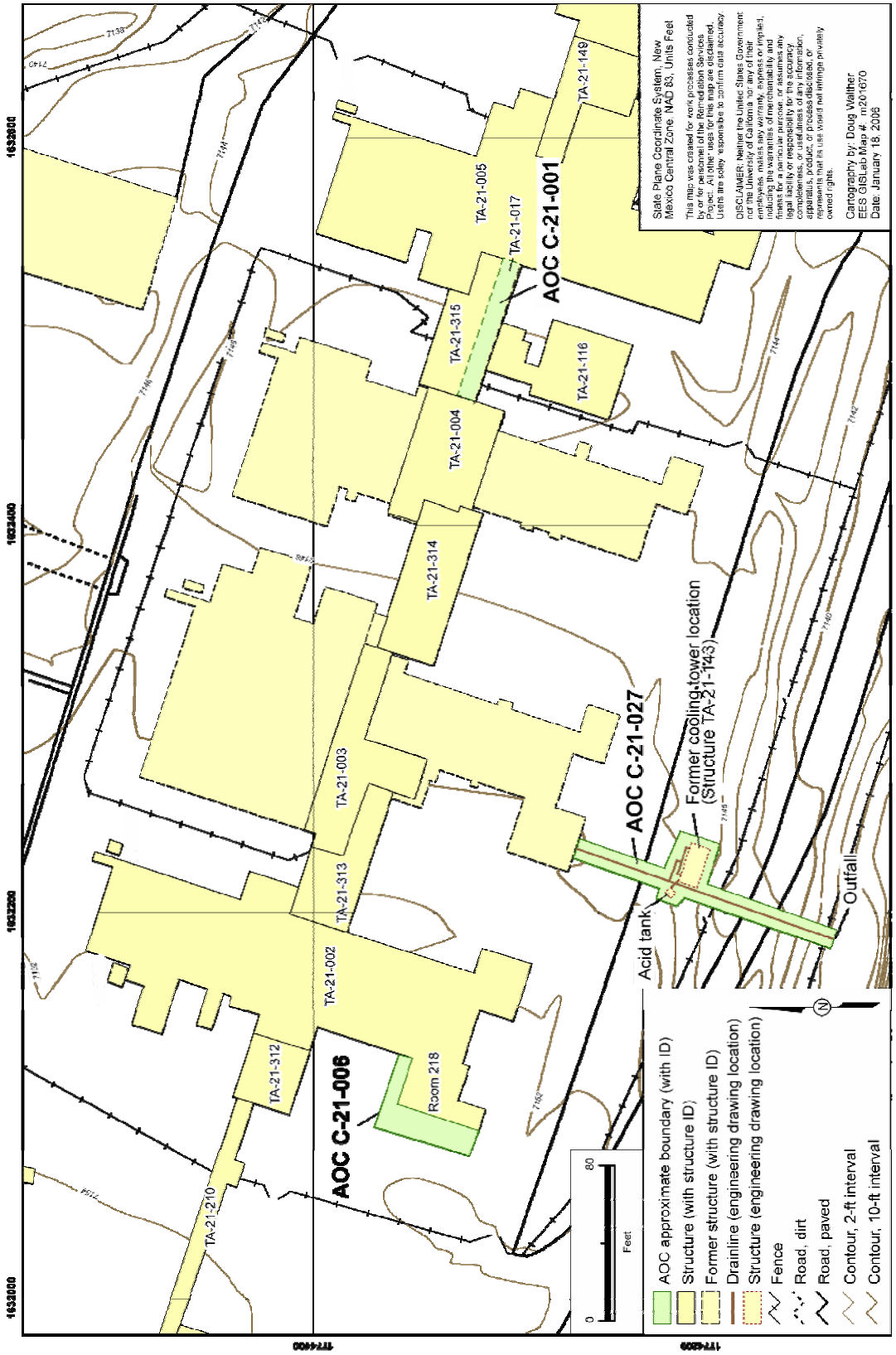

Figure 2.4-1. Site map for AOCs C-21-001, C-21-006, and C-21-027

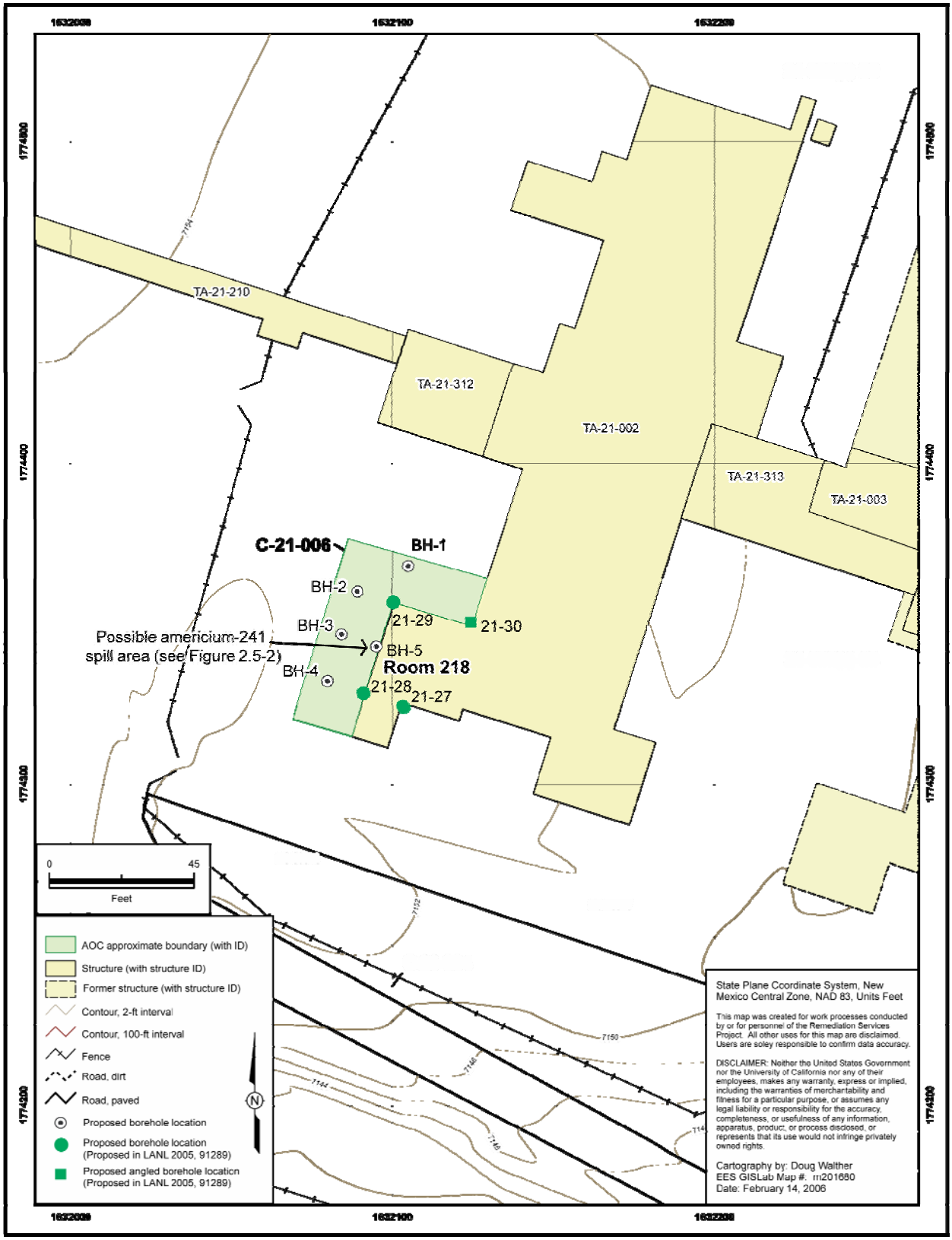

Figure 2.5-1. Proposed sampling locations for AOC C-21-006

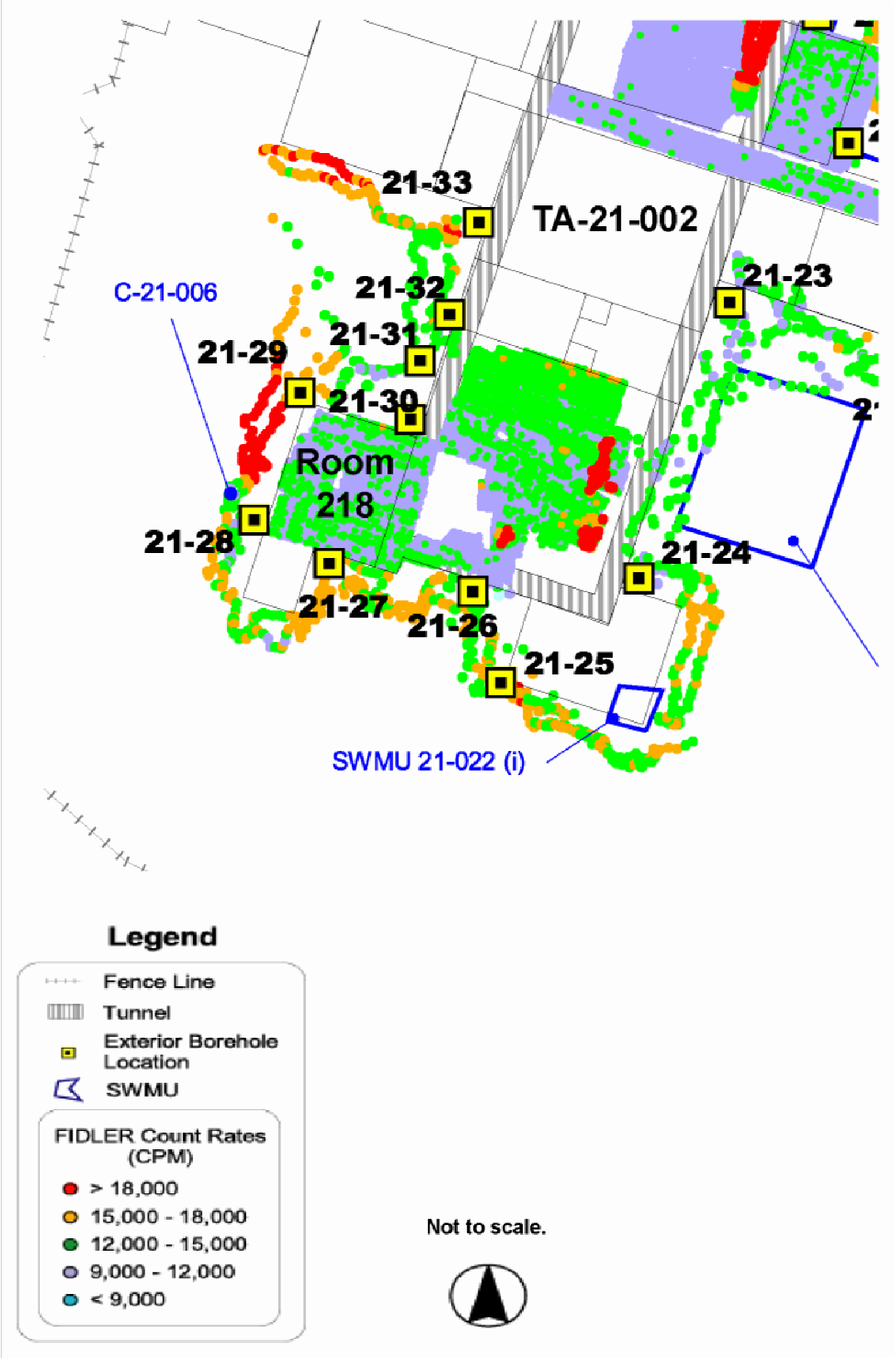

Figure 2.5-2. 2006 FIDLER Survey of DP West at TA-21

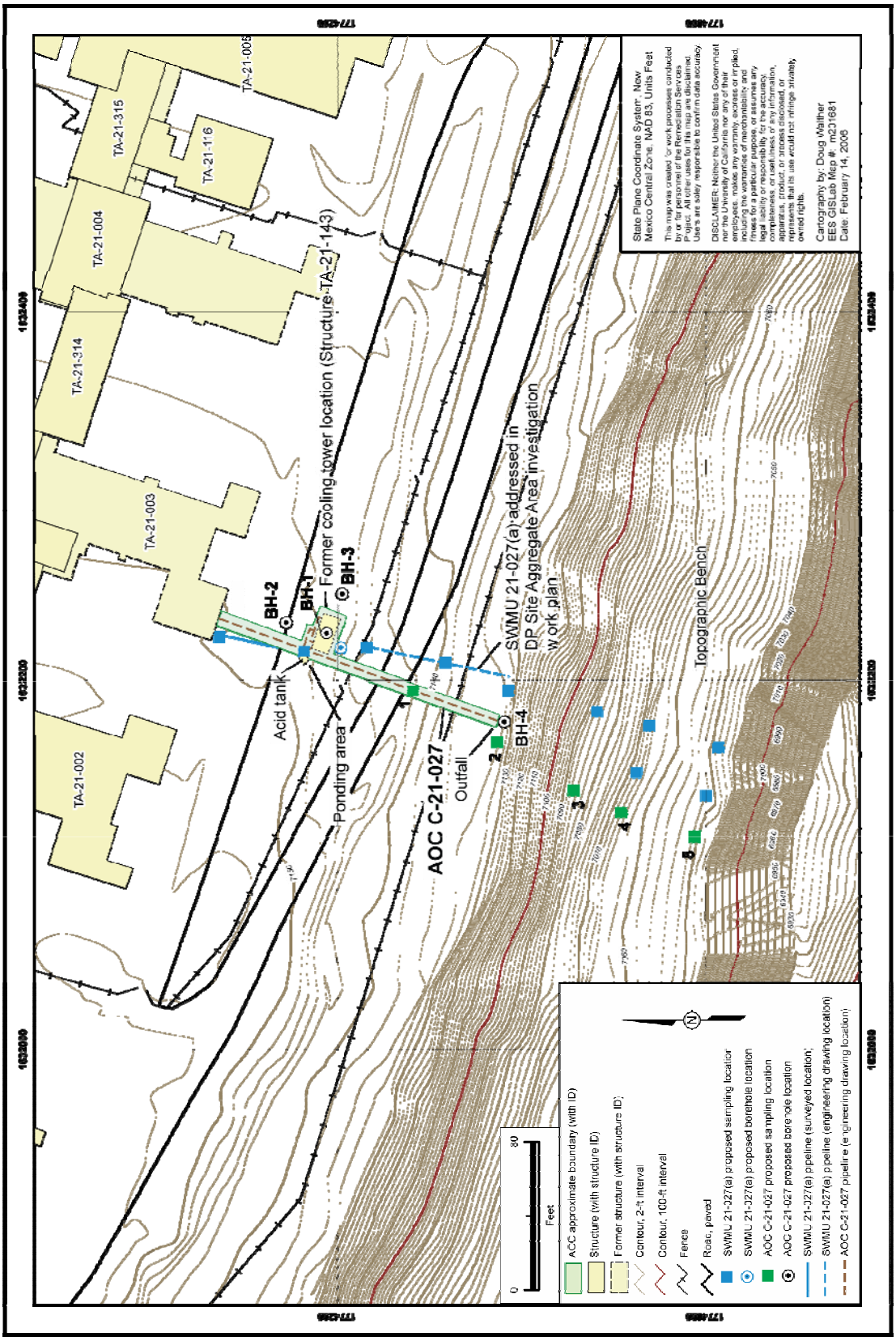

Figure 2.6-1. Proposed sampling locations for AOC C-21-027

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Table 1.0-1
SWMUs and AOCs Addressed in this Supplemental Work Plan

SWMU/AOC Number	Site Description	Site Status Reported in Investigation Work Plan[a]	Revised Site Status[b]
SWMU 21-002(a)	Unidentified container storage areas	Reported in other work plans	No site-specific investigation proposed
SWMU 21-024(i)	Septic system	Remedy complete (tank and outfall only)	Corrective action deferred; inlet line addressed in the investigation work plan revisions (LANL 2005, 90225, pp. 5-60 through 5-62)
AOC 21-028(d)	Active container storage area	No further action approval	Investigation deferred
AOC C-21-001	One-time spill	Deferred investigation	No site-specific investigation proposed
AOC C-21-006	Unintentional release area	Deferred investigation	Investigation proposed
AOC C-21-027	Cooling tower	Remedy complete	Corrective action proposed

[a] = LANL 2004, 88021, Tables 1.2-2 and 1.2-3.
[b] = See Figure 3.0-1 for investigation report submittal dates.

Table 1.0-2
SWMUs and AOCs Addressed in the DP Site Aggregate Area Investigation Work Plan

Consolidated Unit	SWMU/AOC Number	Site Description	Site Status
	AOC 21-002(b)	Container storage area	Investigation
21-003-99	SWMU 21-003	Container storage area	Investigation
	AOC 21-013(f)	Surface disposal site	Investigation
21-006(c)-99	SWMU 21-006(a)	Seepage pits	Corrective action
	SWMU 21-006(b)	Seepage pits	Corrective action
	SWMU 21-006(c)	Seepage pits	Corrective action
	SWMU 21-006(d)	Seepage pits	Corrective action
	AOC 21-009	Waste treatment laboratory	Investigation
	SWMU 21-012(b)	Dry well and system	Corrective action
	SWMU 21-013(c)	Surface disposal area	Investigation
21-017(a)-99	SWMU 21-022(f)	Sump and pipeline	Corrective action
21-022(h)-99	SWMU 21-022(h)	Sump, pipeline, and outfall	Corrective action
	SWMU 21-022(i)	Sump pump	Corrective action
	SWMU 21-022(j)	Sump pump	Corrective action
21-023(a)-99	SWMU 21-023(a)	Septic system, Building 21-3	Corrective action
	SWMU 21-023(b)	Septic system, Building 21-3	Corrective action
	SWMU 21-023(d)	Septic system, Building 21-3	Corrective action
	SWMU 21-024(a)	Septic system	Corrective action
	SWMU 21-024(b)	Septic system	Corrective action
	SWMU 21-024(c)	Septic system	Investigation
	SWMU 21-024(d)	Septic system	Corrective action
	SWMU 21-024(e)	Septic system	Corrective action
	SWMU 21-024(g)	Septic system	Corrective action
	SWMU 21-024(h)	Septic system	Corrective action
	SWMU 21-024(i)	Septic system (inlet line only)	Corrective action
	SWMU 21-024(j)	Septic system	Corrective action
	SWMU 21-024(k)	Septic system	Corrective action
21-024(l)-99	AOC 21-004(a)	Aboveground tank	Corrective action
	SWMU 21-022(a)	Waste line and sump	Corrective action
	SWMU 21-024(l)	Outfall	Corrective action
	SWMU 21-024(n)	Drain line	Corrective action
	SWMU 21-024(o)	Drain line	Corrective action
21-026(a)-99	SWMU 21-013(a)	Surface disposal area	Corrective action
	SWMU 21-026(a)	Sewage treatment plant	Corrective action
	SWMU 21-026(b)	Sludge drying/sand filter beds	Corrective action
	AOC 21-026(c)	Dosing siphon chamber	Corrective action
	AOC 21-026(d)	Outfall	Corrective action
	SWMU 21-027(a)	Surface drainage and outfalls	Corrective action
	SWMU 21-027(c)	Pipe and outfall	Corrective action

Note: Shading denotes SWMUs/AOCs that are not consolidated.

Table 1.0-3
SWMUs and AOCs Not Addressed in the DP Site Aggregate Area Investigation Work Plan

Consolidated Unit	SWMU/AOC Number	Site Description	Site Status
21-004(b)-99	SWMU 21-004(b)	Tank and/or associated equipment	Other work plan (Middle Los Alamos)
	SWMU 21-004(c)	Tank and/or associated equipment	Other work plan (Middle Los Alamos)
	AOC 21-004(d)	Drain line	Other work plan (Middle Los Alamos)
21-006(e)-99	SWMU 21-006(e)	Seepage pit	Other work plan (Middle Los Alamos)
	AOC 21-006(f)	Seepage pit	Other work plan (Middle Los Alamos)
	SWMU 21-011(b)	Sump	Other work plan (Middle Los Alamos)
	SWMU 21-011(k)	Outfall	Remedy complete
21-013(d)-99	SWMU 21-013(d)	Surface disposal site (cold dump)	Remedy complete
	SWMU 21-013(e)	Surface disposal site	Remedy complete
	SWMU 21-014	Material disposal area (MDA A)	Other work plan (MDA A)
	SWMU 21-015	Material disposal area (MDA B)	Other work plan (MDA B)
21-016(a)-99	AOC 21-001	Container storage	Other work plan (MDA T)
	SWMU 21-007	Incinerators	Other work plan (MDA T)
	SWMU 21-010(a)	Waste treatment facility	Other work plan (MDA T)
	SWMU 21-010(b)	Waste treatment facility	Other work plan (MDA T)
	SWMU 21-010(c)	Waste treatment facility	Other work plan (MDA T)
	SWMU 21-010(d)	Waste treatment facility	Other work plan (MDA T)
	SWMU 21-010(e)	Waste treatment facility	Other work plan (MDA T)
	SWMU 21-010(f)	Waste treatment facility	Other work plan (MDA T)
	SWMU 21-010(g)	Waste treatment facility	Other work plan (MDA T)
	SWMU 21-010(h)	Waste treatment facility	Other work plan (MDA T)
	SWMU 21-011(a)	Waste treatment facility	Other work plan (MDA T)
	SWMU 21-011(c)	Tank and sump	Other work plan (MDA T)
	SWMU 21-011(d)	Aboveground tank	Other work plan (MDA T)
	SWMU 21-011(e)	Aboveground tank	Other work plan (MDA T)
	SWMU 21-011(f)	Aboveground tank	Other work plan (MDA T)
	SWMU 21-011(g)	Aboveground tank	Other work plan (MDA T)
	AOC 21-011(h)	Aboveground tank	Other work plan (MDA T)
	SWMU 21-011(i)	Aboveground tank	Other work plan (MDA T)
	SWMU 21-011(j)	Aboveground tank	Other work plan (MDA T)
	SWMU 21-016(a)	MDA T	Other work plan (MDA T)
	SWMU 21-016(b)	MDA T	Other work plan (MDA T)
	AOC 21-028(a)	Container storage	Other work plan (MDA T)
	AOC C-21-009	One-time spill	Other work plan (MDA T)
	AOC C-21-012	One-time spill	Other work plan (MDA T)

Table 1.0-3 (continued)

Consolidated Unit	SWMU/AOC Number	Site Description	Site Status
21-017(a)-99	SWMU 21-017(a)	MDA U	Other work plan (MDA U)
	SWMU 21-017(b)	MDA U	Other work plan (MDA U)
	SWMU 21-017(c)	MDA U	Other work plan (MDA U)
21-018(a)-99	SWMU 21-013(b)	Surface disposal site	Other work plan (MDA V)
	AOC 21-013(g)	Surface disposal site	Other work plan (MDA V)
	SWMU 21-018(a)	MDA V	Other work plan (MDA V)
	SWMU 21-018(b)	MDA V laundry facility	Other work plan (MDA V)
	SWMU 21-023(c)	Septic system	Other work plan (MDA V)
21-021-99	SWMU 21-021	Systematic release (sitewide)	Investigation complete
21-022(b)-99	SWMU 21-022(b)	Waste lines, Building 21-2	Other work plan (Middle Los Alamos)
	SWMU 21-022(c)	Waste lines, Building 21-3	Other work plan (Middle Los Alamos)
	SWMU 21-022(d)	Waste lines, Building 21-4	Other work plan (Middle Los Alamos)
	SWMU 21-022(e)	Waste lines, Building 21-5	Other work plan (Middle Los Alamos)
	SWMU 21-022(g)	Waste lines, Building 21-150	Other work plan (Middle Los Alamos)
	SWMU 21-024(f)	Septic system	Remedy complete
	SWMU 21-024(i)	Septic system (tank and outfall area)	Partial remedy complete
21-027(d)-99	SWMU 21-027(d)	Drain line	Partial remedy complete
	AOC 21-028(c)	Container storage Building 21-3	Other work plan (Middle Los Alamos)
	SWMU 21-029	DP tank farm	Investigation complete
	AOC 21-030	Sump	Remedy complete
	AOC C-21-002	Unintentional release area	Other work plan (MDA T)
	AOC C-21-005	One-time spill	Other work plan (MDA T)
	AOC C-21-007	Unintentional release area	Other work plan (MDA T)
	AOC C-21-033	One-time spill	Other work plan (MDA T)
	AOC C-21-034	Tank	Other work plan (MDA T)
	AOC C-21-035	Aboveground tank	Other work plan (MDA T)
	AOC C-21-036	Aboveground tank	Other work plan (MDA T)
	AOC C-21-037	Aboveground tank	Other work plan (MDA T)

Note: Shading denotes SWMUs/AOCs that are not consolidated.

Table 1.0-4
SWMUs and AOCs Approved for No Further Action

Consolidated Unit	SWMU/AOC Number	ER ID Number of Request or Approval Document
	SWMU 21-005	NMED 2001, 70236
	AOC 21-008	EPA 2004, 87296
	SWMU 21-012(a)	NMED 1998, 63042
21-021-99	AOC 21-019(a)	EPA 2004, 87296
	AOC 21-019(b)	EPA 2004, 87296
	AOC 21-019(c)	EPA 2004, 87296
	AOC 21-019(d)	EPA 2004, 87296
	AOC 21-019(e)	EPA 2004, 87296
	AOC 21-019(f)	EPA 2004, 87296
	AOC 21-019(g)	EPA 2004, 87296
	AOC 21-019(h)	EPA 2004, 87296
	AOC 21-019(i)	EPA 2004, 87296
	AOC 21-019(j)	EPA 2004, 87296
	AOC 21-019(k)	EPA 2004, 87296
	AOC 21-019(l)	EPA 2004, 87296
	AOC 21-019(m)	EPA 2004, 87296
	AOC 21-020(a)	EPA 2004, 87296
	AOC 21-020(b)	EPA 2004, 87296
	SWMU 21-024(m)	NMED 1998, 63042
	AOC 21-025(a)	EPA 2004, 87296
	AOC 21-025(b)	EPA 2004, 87296
	SWMU 21-027(b)	NMED 1998, 63042
	AOC 21-028(b)	EPA 2004, 87296
	AOC 21-028(e)	EPA 2004, 87296
	AOC C-21-002	EPA 2004, 87296
	AOC C-21-003	EPA 2004, 87296
	AOC C-21-004	EPA 2004, 87296
	AOC C-21-008	EPA 2004, 87296
	AOC C-21-010	EPA 2004, 87296
	AOC C-21-011	EPA 2004, 87296
	AOC C-21-013	EPA 2004, 87296
	AOC C-21-014	EPA 2004, 87296
	AOC C-21-015	EPA 2004, 87296
	AOC C-21-016	EPA 2004, 87296
	AOC C-21-017	EPA 2004, 87296
	AOC C-21-018	EPA 2004, 87296

Table 1.0-4 (continued)

Consolidated Unit	SWMU/AOC Number	ER ID Number of Request or Approval Document
	AOC C-21-019	EPA 2004, 87296
	AOC C-21-020	EPA 2004, 87296
	AOC C-21-021	EPA 2004, 87296
	AOC C-21-022	EPA 2004, 87296
	AOC C-21-023	EPA 2004, 87296
	AOC C-21-024	EPA 2004, 87296
	AOC C-21-025	EPA 2004, 87296
	AOC C-21-026	EPA 2004, 87296
21-027(d)-99	AOC C-21-028	EPA 2004, 87296
	AOC C-21-029	EPA 2004, 87296
	AOC C-21-030	EPA 2004, 87296
	AOC C-21-031	EPA 2004, 87296
	AOC C-21-032	EPA 2004, 87296

Note: Shading denotes SWMUs/AOCs that are not consolidated.

Table 2.3-1
Summary of Proposed Soil Sampling at AOC 21-028(d)

Objective Addressed	Location Number	Location	Sample Depth (ft) *	VOCs	SVOCs	TAL Metals	Cyanide	Nitrates	Perchlorates	Gamma Spectroscopy	Americium-241	Isotopic Plutonium	Isotopic Thorium	Isotopic Uranium	Strontium-90	Tritium	PCBs	Moisture	pH
Loading Dock																			
Determine lateral and vertical extent north of the loading dock	BH-1	Just north of the loading dock, centered	0 to 0.5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			5 to 6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			10 to 11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Determine lateral and vertical extent west of the loading dock	BH-2	Just west of the loading dock, northern end	0 to 0.5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			5 to 6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			10 to 11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Determine lateral and vertical extent north of the loading dock	BH-3	Just west of the loading dock, centered	0 to 0.5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			5 to 6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			10 to 11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Determine lateral and vertical extent under the loading dock	BH-4	Just west of the loading dock, southern end	0 to 0.5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			5 to 6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			10 to 11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Determine lateral and vertical extent under the loading dock	BH-5	Under the base of the loading dock, centered between BH-2 and BH-3.	0 to 0.5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			5 to 6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			10 to 11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Determine lateral and vertical extent under the loading dock	BH-6	Under the base of the loading dock, centered between BH-3 and BH-4	0 to 0.5	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			5 to 6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			10 to 11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

* Zero depth is defined as 0.5 ft under the asphalt (BH-1 through BH-4) or directly under the base of the loading dock (BH-5 and BH-6).

Table 2.5-1
Summary of Proposed Soil Sampling at AOC C-21-006

Objective Addressed	Location Number	Location	Sample Depth (ft)	Americium-241
Loading Dock				
Determine lateral and vertical extent of spill	BH-1	10 ft north of 21-29, parallel to orientation of Building 21-002	0 to 0.5 5 to 6 10 to 11	X X X
Determine lateral and vertical extent of spill	BH-2	10 ft west of 21-29, parallel to orientation of Building 21-002	0 to 0.5 5 to 6 10 to 11	X X X
Determine lateral and vertical extent of spill	BH-3	South of BH-2, centered between 21-28 and 21-29, parallel to orientation of Building 21-002	0 to 0.5 5 to 6 10 to 11	X X X
Determine lateral and vertical extent of spill	BH-4	10 ft west of 21-28, parallel to orientation of Building 21-002	0 to 0.5 5 to 6 10 to 11	X X X
Determine lateral and vertical extent of spill	BH-5	Centered between 21-28 and 21-29, parallel to orientation of Building 21-002	0 to 0.5 5 to 6 10 to 11	X X X

Table 2.6-1
Summary of Proposed Soil Sampling at AOC C-21-027

Objective Addressed	Location Number	Location	Sample Depth (ft)	VOCs	SVOCs	TAL Metals	Hexavalent Chromium	Cyanide	Nitrates	Perchlorates	Gamma Spectroscopy	Americium-241	Isotopic Plutonium	Isotopic Uranium	Strontium-90	Tritium	Moisture	pH
Cooling Tower																		
Determine vertical extent under the cooling tower	BH-1	Center of former cooling tower	0 to 0.5	—	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			5 to 6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			10 to 11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Determine lateral and vertical extent north of the cooling tower	BH-2	20 ft north of BH-1, parallel to orientation of former cooling tower	0 to 0.5	—	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			5 to 6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			10 to 11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Determine lateral and vertical extent east of the cooling tower	BH-3	20 ft east of BH-1, parallel to orientation of former cooling tower	0 to 0.5	—	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			5 to 6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			10 to 11	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Outlet Pipeline																		
Determine lateral extent	1	50 ft south of cooling tower under the outlet pipeline	0 to 1	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2 to 3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Outfall																		
Determine vertical extent at the outfall	BH-4	0.5 ft downslope of the outfall pipe mouth	0 to 0.5	—	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2 to 3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			5 to 6	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Determine lateral extent	2	5 ft west of BH-4	0 to 0.5	—	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2 to 3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Determine lateral extent	3	Northern end of bench	0 to 0.5	—	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2 to 3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Determine lateral extent	4	Middle of bench	0 to 0.5	—	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2 to 3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Determine lateral extent	5	Southern end of bench	0 to 0.5	—	X	X	X	X	X	X	X	X	X	X	X	X	X	X
			2 to 3	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X

— = This sample will not be collected.

Table 3.0-1
Summary of Investigation Methods

Method	Summary
Spade-and-Scoop Collection of Soil Samples	This method is typically used for collection of shallow (i.e., approximately 0–12-in.) soil or sediment samples. The "spade-and-scoop" method involves digging a hole to the desired depth, as prescribed in the sampling and analysis plan, and collecting a discrete grab sample. The sample is typically placed in a clean stainless steel bowl for transfer into various sample containers.
Hand Auger Sampling	This method is typically used for sampling soil or sediment at depths lower than 10 ft to 15 ft but may in some cases be used for collecting samples of weathered or nonwelded tuff. The method involves hand-turning a stainless-steel bucket auger (typically 3–4-in. inner diameter [i.d.]), creating a vertical hole which can be advanced to the desired sample depth. When the desired depth is reached, the auger is decontaminated before advancing the hole through the sample depth. The sample material is transferred from the auger bucket to a stainless-steel sampling bowl before filling the various required sample containers.
Split-Spoon Core-Barrel Sampling	In this method, a stainless-steel core barrel (typically 4-in. i.d., 2.5 ft long) is advanced using a powered drilling rig. The core barrel extracts a continuous length of soil and/or rock which can be examined as a unit. The split-spoon core barrel is a cylindrical barrel split length-wise so that the two halves can be separated to expose the core sample. Once extracted, the section of core is typically screened for radioactivity and organic vapors, photographed, and described in a geologic log. A portion of the core may then be collected as a discrete sample from the desired depth.
Headspace Vapor Screening	Individual soil, rock, or sediment samples may be field-screened for volatile organic compounds by placing a portion of the sample in a plastic sample bag or in a glass container with a foil-sealed cover. The container is sealed and gently shaken and allowed to equilibrate for 5 minutes. The sample is then screened by inserting a photoionization detector (PID) probe into the container and measuring and recording any detected vapors. PIDs must use lamps with voltage of 10.6 eV or higher.
Handling, Packaging, and Shipping of Samples	Field team members seal and label samples before packing, and ensure that the sample containers and the containers used for transport are free of external contamination. Field team members package all samples to minimize the possibility of breakage during transportation. After all environmental samples are collected, packaged, and preserved, a field team member transports them to either the Sample Management Office (SMO) or an SMO-approved radiation screening laboratory under chain of custody. The SMO arranges for the shipping of samples to analytical laboratories. The field team member must inform the SMO and/or the radiation screening laboratory coordinator when levels of radioactivity are in the action-level or limited-quantity ranges.
Sample Control and Field Documentation	The collection, screening, and transport of samples are documented on standard forms generated by the SMO. These include sample collection logs, chain-of-custody forms, and sample container labels. Collection logs are completed at the time of sample collection and are signed by the sampler and a reviewer who verifies the logs for completeness and accuracy. Corresponding labels are initialed and applied to each sample container, and custody seals are placed around container lids or openings. Chain-of-custody forms are completed and assigned to verify that the samples are not left unattended. Site attributes (e.g., former and proposed soil sample locations, sediment sample locations) are located by using a global-positioning system (GPS). Horizontal locations will be measured to the nearest 0.5 ft. The survey results for this field event will be presented as part of the investigation report. Sample coordinates will be uploaded into the Environmental Restoration Database.

Table 3.0-1 (continued)

Method	Summary
Field Quality-Control Samples	Field quality control samples are collected as directed in the Consent Order as follows: • Field Duplicate: At a frequency of 10%; collected at the same time as a regular sample and submitted for the same analyses. • Equipment Rinsate Blank: At a frequency of 10%; collected by rinsing sampling equipment with deionized water, which is collected in a sample container and submitted for laboratory analyis. • Trip Blanks: Required for all field events that include the collection of samples for volatile organic compound (VOC) analysis. Trip blanks containers of certified clean sand that are opened and kept with the other sample containers during the sampling process.
Field Decontamination of Drilling and Sampling Equipment	Dry decontamination is the preferred method to minimize the generation of liquid waste. Dry decontamination may include the use of a wire brush or other tool for removal of soil or other material adhering to the sampling equipment, followed by use of a commercial cleaning agent (nonacid, waxless cleaners) and paper wipes. Dry decontamination may be followed by wet decontamination if necessary. Wet decontamination may include washing with a nonphosphate detergent and water, followed by a water rinse and a second rinse with deionized water. Alternatively, steam cleaning may be used.
Containers and Preservation of Samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on U.S. Environmental Protection Agency guidance for environmental sampling, preservation, and quality assurance. Specific requirements for each sample are printed on the sample collection logs provided by the SMO (size and type of container, such as glass, amber glass, polyethylene, preservative). All samples are preserved by placing them in insulated containers with ice to maintain a temperature of 4˚C. Other requirements, such as nitric acid or other preservatives, may apply to different media or analytical requests.
Management, Characterization, and Storage of Investigation-Derived Waste (IDW)	IDW is managed, characterized, and stored in accordance with an approved waste characterization strategy form (WCSF) that documents site history, field activities, and the characterization approach for each waste stream managed. Waste characterization shall be adequate to comply with on-site or off-site waste acceptance criteria. All stored IDW will be marked with appropriate signage and labels, as appropriate. Drummed IDW will be stored on pallets to prevent deterioration of containers. Generators are required to reduce the volume of waste by as much as is technically and economically feasible. Means to store, control, and transport each potential waste type and classification shall be determined ahead of field operations that generate waste. A waste storage area shall be established before generating waste. Waste storage areas located in controlled laboratory areas shall be controlled as needed to prevent inadvertent addition or management of wastes by unauthorized personnel. Each container of waste generated shall be individually labeled as to waste classification, item identification number, and radioactivity (if applicable), immediately after containerization. All waste shall be segregated by classification and compatibility to prevent crosscontamination. See Appendix B for additional information.

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Appendix A

Acronyms and Abbreviations, Glossary, and Metric Conversion Table

A-1.0 ACRONYMS AND ABBREVIATIONS

AH	auger hole
AOC	area of concern
bgs	below ground surface
BV	background value
CPM	counts per minute
D&D	decontamination and decommissioning
DOE	Department of Energy (U.S.)
DP	Delta Prime
ECR	Environmental Characterization and Remediation (an ENV group)
ENV	Environmental Stewardship (a LANL division)
ER	environmental remediation
ERS	Environmental Remediation and Surveillance (an ENV program)
EPA	Environmental Protection Agency (U.S.)
FIDLER	field instrument detectors for measuring low energy radiations
FV	fallout value
GPR	gound-penetrating radar
GPS	global-positioning system
HEPA	high-efficiency particulate air
HSR	Health Physics Operations (a LANL group)
HSWA	Hazardous and Solid Waste Amendments of 1984
HWB	Hazardous Waste Bureau (New Mexico Environment Department)
IDW	investigation-derived waste
LAAO	Los Alamos Area Office (DOE; changed to LASO in December 2002)
LANL	Los Alamos National Laboratory
LASL	Los Alamos Scientific Laboratory (former LANL name)
LASO	Los Alamos Site Office (DOE)
LLW	low-level waste

MDA	material disposal area
NFA	no further action
NMED	New Mexico Environment Department
NMHWA	New Mexico Hazardous Waste Act
OSHA	Occupational Safety and Heath Administration
PCB	polychlorinated biphenyl
PID	photoionization detector
PPE	personal protective equipment
QA/QC	quality assurance/quality control
QP	quality procedure
RCRA	Resource Conservation and Recovery Act
RCT	radiation control technician
RFI	RCRA facility investigation
RPF	Records Processing Facility
SMO	Sample Management Office (an ENV office)
SOP	standard operating procedure
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
TAL	Target Analyte List
TCLP	toxicity characteristic leaching procedure
TSFF	Tritium Science Fabrication Facility
UC	University of California
VCA	voluntary corrective action
VCP	vitrified-clay pipe
VOC	volatile organic compound
WCSF	waste characterization strategy form

A-2.0 GLOSSARY

administrative authority—For Los Alamos National Laboratory, one or more regulatory agencies, such as the New Mexico Environment Department, the U.S. Environmental Protection Agency, or the U.S. Department of Energy, as appropriate.

aggregate—At the Los Alamos National Laboratory, an area within a *watershed* containing solid waste management units (SWMUs) and/or areas of concern (AOCs), and the media affected or potentially affected by releases from those SWMUs and/or AOCs. Aggregates are designated to promote efficient and effective corrective action activities.

alpha radiation—A form of particle radiation that is highly ionizing and has low penetration. Alpha radiation consists of two protons and two neutrons bound together into a particle that is identical to a helium nucleus and can be written as He^{2+}.

analysis—A critical evaluation, usually made by breaking a subject (either material or intellectual) down into its constituent parts, then describing the parts and their relationship to the whole. Analyses may include physical analysis, chemical analysis, toxicological analysis, and knowledge-of-process determinations.

analyte—The element, nuclide, or ion a chemical analysis seeks to identify and/or quantify; the chemical constituent of interest.

area of concern—(1) A release that may warrant investigation or remediation and is not a solid waste management unit (SWMU). (2) An area at Los Alamos National Laboratory that may have had a release of a hazardous waste or a hazardous constituent but is not a SWMU.

background data—Data that represent naturally occurring concentrations of inorganic and radionuclide constituents in a geologic medium. Los Alamos National Laboratory's (the Laboratory's) background data are derived from samples collected at locations that are either within, or adjacent to, the Laboratory. These locations (1) are representative of geological media found within Laboratory boundaries, and (2) have not been affected by Laboratory operations.

background value (BV)—A statistically derived concentration (i.e., the upper tolerance limit [UTL]) of a chemical used to represent the background data set. If a UTL cannot be derived, either the detection limit or maximum reported value in the background data set is used.

beta radiation—High-energy electrons emitted by certain types of radioactive nuclei, such as potassium-40. The beta particles emitted are a form of ionizing radiation also known as beta rays.

borehole—(1) A hole drilled or bored into the ground, usually for exploratory or economic purposes. (2) A hole into which casing, screen, and other materials may be installed to construct a well.

chemical of concern—A chemical identified in human-health or ecological risk assessments as posing a risk.

chemical of potential concern (COPC)—A detected chemical compound or element that has the potential to adversely affect human receptors as a result of its concentration, distribution, and toxicity.

Compliance Order on Consent (Consent Order)—For the Environmental Remediation and Surveillance Program, an enforcement document signed by the New Mexico Environment Department, the

U.S. Department of Energy, and the Regents of the University of California on March 1, 2005, which prescribes the requirements for corrective action at Los Alamos National Laboratory. The purposes of the Consent Order are (1) to define the nature and extent of releases of contaminants at, or from, the facility; (2) to identify and evaluate, where needed, alternatives for corrective measures to clean up contaminants in the environment and prevent or mitigate the migration of contaminants at, or from, the facility; and (3) to implement such corrective measures. The Consent Order supersedes the corrective action requirements previously specified in Module VIII of the Laboratory's Hazardous Waste Facility Permit.

Consent Order—See Compliance Order on Consent.

consolidated unit—A group of solid waste management units (SWMUs), or SWMUs and areas of concern, which generally are geographically proximate and have been combined for the purposes of investigation, reporting, or remediation.

contaminant—(1) Chemicals and radionuclides present in environmental media or on debris above background levels. (2) According to the March 1, 2005, Compliance Order on Consent (Consent Order), any hazardous waste listed or identified as characteristic in 40 Code of Federal Regulations (CFR) 261 (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]); any hazardous constituent listed in 40 CFR 261 Appendix VIII (incorporated by 20.4.1.200 NMAC) or 40 CFR 264 Appendix IX (incorporated by 20.4.1.500 NMAC); any groundwater contaminant listed in the Water Quality Control Commission (WQCC) Regulations at 20.6.3.3103 NMAC; any toxic pollutant listed in the WQCC Regulations at 20.6.2.7 NMAC; explosive compounds; nitrate; and perchlorate. (Note: Under the Consent Order, the term "contaminant" does not include radionuclides or the radioactive portion of mixed waste.)

corrective action—(1) In the Resource Conservation and Recovery Act, an action taken to rectify conditions potentially adverse to human health or the environment. (2) In the quality assurance field, the process of rectifying and preventing nonconformances.

decommissioning—The permanent removal of facilities and their components from service after the discontinued use of structures or buildings that are deemed no longer useful. Decommissioning must take place in accordance with regulatory requirements and applicable environmental policies.

decontamination—The removal of unwanted material from the surface of, or from within, another material.

Environmental Restoration (ER) Project—A Los Alamos National Laboratory project established in 1989 as part of a U.S. Department of Energy nationwide program, and precursor of today's Environmental Remediation and Surveillance (ERS) Program. This program is designed (1) to investigate hazardous and/or radioactive materials that may be present in the environment as a result of past Laboratory operations, (2) to determine if the materials currently pose an unacceptable risk to human health or the environment, and (3) to remediate (clean up, stabilize, or restore) those sites where unacceptable risk is still present.

environmental samples—Air, soil, water, or other media samples that have been collected from streams, wells, and soils, or other locations, and that are not expected to exhibit properties classified as hazardous by the U.S. Department of Transportation.

facility—All contiguous land (and structures, other appurtenances, and improvements on the land) used for treating, storing, or disposing of hazardous waste. A facility may consist of several treatment,

storage, or disposal operational units. For the purpose of implementing a corrective action, a facility is all the contiguous property that is under the control of the owner or operator seeking a permit under Subtitle C of the Resource Conservation and Recovery Act.

gamma radiation—A form of electromagnetic, high-energy ionizing radiation emitted from a nucleus. Gamma rays are essentially the same as x-rays (though at higher energy) and require heavy shielding, such as concrete or steel, to be blocked.

half-life—(1) The time required for a pollutant to lose one-half of its original concentration (for example, the biochemical half-life of DDT [dichlorodiphenyltrichloroethane] in the environment is 15 yr). (2) The time required for one half of the atoms in a radioactive element to undergo self-transmutation or decay (the half-life of radium is 1620 yr). (3) The time required for the elimination of one half of a total dose from the body.

hazard index—The sum of hazard quotients for multiple contaminants to which a receptor may have been exposed.

Hazardous and Solid Waste Amendments (HSWA)—Public Law No. 98-616, 98 Stat. 3221, enacted in 1984, which amended the Resource Conservation and Recovery Act of 1976 (42 United States Code § 6901 et seq).

hazardous constituent (hazardous waste constituent)—According to the March 1, 2005, Compliance Order of Consent (Consent Order), any constituent identified in Appendix VIII of Part 261, Title 40 Code of Federal Regulations (CFR) (incorporated by 20.4.1.200 New Mexico Administrative Code [NMAC]) or any constituent identified in 40 CFR 264, Appendix IX (incorporated by 20.4.1.500 NMAC).

hazardous samples—Samples of on-site air particulates, soil, or water and materials collected at waste sites that are known, or thought, to meet the definition of a hazard class per 49 Code of Federal Regulations 171.8. The term “hazardous samples” does not refer to Resource Conservation and Recovery Act hazardous wastes unless so stated.

hazardous waste—(1) Solid waste that is listed as a hazardous waste, or exhibits any of the characteristics of hazardous waste (i.e., ignitability, corrosivity, reactivity, or toxicity, as provided in 40 CFR, Subpart C). (2) According to the March 1, 2005, Compliance Order of Consent (Consent Order), any solid waste or combination of solid wastes that, because of its quantity, concentration, or physical, chemical, or infectious characteristics, meets the description set forth in New Mexico Statutes Annotated 1978, § 74-4-3(K) and is listed as a hazardous waste or exhibits a hazardous waste characteristic under 40 CFR 261 (incorporated by 20.4.1.200 New Mexico Administrative Code).

Hazardous Waste Facility Permit—The authorization issued to Los Alamos National Laboratory (the Laboratory) by the New Mexico Environment Department that allows the Laboratory to operate as a hazardous waste treatment, storage, and disposal facility.

Los Alamos unlimited release (LA-UR) number—A unique identification number required for all documents or presentations prepared for distribution outside Los Alamos National Laboratory (the Laboratory). LA-UR numbers are obtained by filling out a technical information release form (http://enterprise.lanl.gov/alpha.htm) and submitting the form together with 2 copies of the document to the Laboratory’s Classification Group (S-7) for review.

mixed waste—Waste containing both hazardous and source, special nuclear, or byproduct materials subject to the Atomic Energy Act of 1954.

Module VIII—Module VIII of the Los Alamos National Laboratory (the Laboratory) Hazardous Waste Facility Permit. This permit allows the Laboratory to operate as a hazardous-waste treatment, storage, and disposal facility. From 1990 to 2005, Module VIII included requirements from the Hazardous and Solid Waste Amendments. These requirements have been superceded by the March 1, 2005, Compliance Order on Consent (Consent Order).

no further action—Under the Resource Conservation and Recovery Act, a corrective-action determination whereby, based on evidence or risk, no further investigation or remediation is warranted.

notice of deficiency—A written notification from the administrative authority to a facility owner/operator following the review of a permit application or other permit-related plan or report. A notice of deficiency requests additional information before a decision can be made regarding the original plan or report.

notices of approval, of approval with modification, or of disapproval—Notices issued by the New Mexico Environment Department (NMED). Upon receipt of a work plan, schedule, report, or other deliverable document, NMED reviews the document and approves the document as submitted, modifies the document and approves it as modified, or disapproves the document. A notice of approval means that the document is approved as submitted. A notice of approval with modifications means that the document is approved but with modifications specified by NMED. A notice of disapproval means that the document is disapproved and it states the deficiencies and other reasons for disapproval.

operable units (OUs)—At Los Alamos National Laboratory, 24 areas originally established for administering the Environmental Remediation and Surveillance Program. Set up as groups of potential release sites, the OUs were aggregated according to geographic proximity for the purposes of planning and conducting Resource Conservation and Recovery Act (RCRA) facility assessments and RCRA facility investigations. As the project matured, it became apparent that there were too many areas to allow efficient communication and to ensure consistency in approach. In 1994, the 24 OUs were reduced to 6 administrative field units.

outfall—A place where effluent is discharged into receiving waters.

permit—An authorization, license, or equivalent control document issued by the U.S. Environmental Protection Agency or an approved state agency to implement the requirements of an environmental regulation.

permit modification—A change to a condition in a facility's permit, initiated by either a request from the permittee or by the administrative authority's action.

polychlorinated biphenyls (PCBs)—Any chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees, or any combination that contains such substances. PCBs are colorless, odorless compounds that are chemically, electrically, and thermally stable and have proven to be toxic to both humans and other animals.

quality assurance/quality control—A system of procedures, checks, audits, and corrective actions set up to ensure that all U.S. Environmental Protection Agency research design and performance,

environmental monitoring and sampling, and other technical and reporting activities are of the highest achievable quality.

quality control—See quality assurance/quality control.

quality-control sample—A specimen that, upon analysis, is intended to provide information that is useful for adjusting, controlling, or verifying the continuing acceptability of sampling and/or analysis activities in progress.

quality management plan (QMP)—A document providing a framework for planning, implementing, and assessing work performed by an organization and for carrying out required quality assurance/quality control. A QMP is part of an organization's structured and documented management system that describes the policies, objectives, principles, organizational authority, responsibilities, accountability, and implementation plan for ensuring quality in work processes, products, and services.

quality procedure—A document that describes the process, method, and responsibilities for performing, controlling, and documenting any quality-affecting activity governed by a quality management plan.

radiation—A stream of particles or electromagnetic waves emitted by atoms and molecules of a radioactive substance as a result of nuclear decay. The particles or waves emitted can consist of neutrons, positrons, alpha particles, beta particles, or gamma radiation.

radioactive material—For purposes of complying with U.S. Department of Transportation regulations, any material having a specific activity (activity per unit mass of the material) greater than 2 nanocuries per gram (nCi/g) and in which the radioactivity is evenly distributed.

radioactive waste—Waste that, by either monitoring and analysis, or acceptable knowledge, or both, has been determined to contain added (or concentrated and naturally occurring) radioactive material or activation products, or that does not meet radiological release criteria.

radioactivity (radioactive decay; radioactive disintegration)—The spontaneous change in an atom by the emission of charged particles and/or gamma rays.

radionuclide—Radioactive particle (human-made or natural) with a distinct atomic weight number.

RCRA facility assessment (RFA)—Usually the first step in the Resource Conservation and Recovery Act (RCRA) corrective action process. The RFA includes the identification of potential and actual releases from solid waste management units and preliminary determinations about releases and the need for corrective action and stabilization measures.

RCRA facility investigation (RFI)—A Resource Conservation and Recovery Act (RCRA) investigation that determines if a release has occurred and characterizes the nature and extent of contamination at a hazardous waste facility. The RFI is generally equivalent to the remedial investigation portion of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) process.

receptor—A person, other animal, plant, or geographical location that is exposed to a chemical or physical agent released to the environment by human activities.

reference set—A hard-copy compilation of reference items cited in Environmental Remediation and Surveillance Program documents.

release—Any spilling, leaking, pumping, pouring, emitting, emptying, discharging, injecting, escaping, leaching, dumping, or disposing of hazardous waste or hazardous constituents into the environment.

remediation—(1) The process of reducing the concentration of a contaminant (or contaminants) in air, water, or soil media to a level that poses an acceptable risk to human health and the environment. (2) The act of restoring a contaminated area to a usable condition based on specified standards.

remediation waste—All solid wastes and hazardous wastes, and all media (including groundwater, surface water, soils, and sediments) and debris, that are managed for implementing cleanup.

Resource Conservation and Recovery Act—The Solid Waste Disposal Act as amended by the Resource Conservation and Recovery Act of 1976 (Public Law [PL] 94-580, as amended by PL 95-609 and PL 96-482, United States Code 6901 et seq.).

risk—A measure of the probability that damage to life, health, property, and/or the environment will occur as a result of a given hazard.

risk analysis—In the quality assurance field, a qualitative evaluation of the probability and the potential consequences associated with noncompliant documents or work activities.

risk assessment—See baseline risk assessment.

risk characterization—The last phase in the risk assessment process which estimates the potential for adverse health or ecological effects to occur as a result of exposure to a stressor, and which evaluates the uncertainty involved.

sample—A portion of a material (e.g., rock, soil, water, or air), which, alone or in combination with other portions, is expected to be representative of the material or area from which it is taken. Samples are typically either sent to a laboratory for analysis or inspection or are analyzed in the field. When referring to samples of environmental media, the term field sample may be used.

sediment—(1) A mass of fragmented inorganic solid that comes from the weathering of rock and is carried or dropped by air, water, gravity, or ice. (2) A mass that is accumulated by any other natural agent and that forms in layers on the earth's surface (e.g., sand, gravel, silt, mud, fill, or loess). (3) A solid material that is not in solution and is either distributed through the liquid or has settled out of the liquid.

site characterization—Defining the pathways and methods of migration of hazardous waste or constituents, including the media affected; the extent, direction and speed of the contaminants; complicating factors influencing movement; or concentration profiles.

site conceptual model—A qualitative or quantitative description of sources of contamination, environmental transport pathways for contamination, and receptors that may be impacted by contamination and whose relationships describe qualitatively or quantitatively the release of contamination from the sources, the movement of contamination along the pathways to the exposure points, and the uptake of contaminants by the receptors.

site-specific health and safety plan (SSHASP)—A health and safety plan that has been tailored to a site or to an Environmental Remediation and Surveillance (ERS) Program field activity and that has been approved by an ERS health and safety representative. A SSHASP contains information specific to the project, including the scope of work, relevant history, descriptions of hazards from

activity associated with the project site(s), and techniques for exposure mitigation (e.g., personal protective equipment and hazard mitigation).

slope—A ratio of units of elevation change to units of horizontal change, usually expressed in degrees.

soil—(1) A material that overlies bedrock and has been subject to soil-forming processes. (2) A sample media group that includes naturally occurring and artificial fill materials.

solid waste—Any garbage, refuse, or sludge from a waste treatment plant, water-supply treatment plant, or air-pollution control facility, and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations and from community activities. Solid waste does not include solid or dissolved materials in domestic sewage; solid or dissolved materials in irrigation return flows; industrial discharges that are point sources subject to permits under section 402 of the Federal Water Pollution Control Act, as amended; or source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954, as amended.

solid waste management unit (SWMU)—(1) Any discernible site at which solid wastes have been placed at any time, whether or not the site use was intended to be the management of solid or hazardous waste. SWMUs include any site at a facility at which solid wastes have been routinely and systematically released. This definition includes regulated sites (i.e., landfills, surface impoundments, waste piles, and land treatment sites), but does not include passive leakage or one-time spills from production areas and sites in which wastes have not been managed (e.g., product storage areas). (2) According to the March 1, 2005, Compliance Order on Consent (Consent Order), any discernible site at which solid waste has been placed at any time, and from which the New Mexico Environment Department determines there may be a risk of a release of hazardous waste or hazardous waste constituents (hazardous constituents), whether or not the site use was intended to be the management of solid or hazardous waste. Such sites include any area in Los Alamos National Laboratory at which solid wastes have been routinely and systematically released; they do not include one-time spills.

standard operating procedure—A document that details the officially approved method(s) for an operation, analysis, or action, with thoroughly prescribed techniques and steps.

surface sample—A sample taken at a collection depth that is (or was) representative of the medium's surface during the period of investigative interest. A typical depth interval for a surface sample is 0 to 6 in. for mesa-top locations, but may be up to several feet in sediment-deposition areas within canyons.

target analyte—A chemical or parameter, the concentration, mass, or magnitude of which is designed to be quantified by a particular test method.

technical area (TA)—At Los Alamos National Laboratory, an administrative unit of operational organization (e.g., TA-21).

topography—The physical or natural features of an object or entity and their structural relationships.

transport (transportation)—(1) The movement of a hazardous waste by air, rail, highway, or water. (2) The movement of a contaminant from a source through a medium to a receptor.

tuff—Consolidated volcanic ash, composed largely of fragments produced by volcanic eruptions.

U.S. Department of Energy—The federal agency that sponsors energy research and regulates nuclear materials for weapons production.

U.S. Environmental Protection Agency (EPA)—The federal agency responsible for enforcing environmental laws. Although state regulatory agencies may be authorized to administer some of this responsibility, EPA retains oversight authority to ensure the protection of human health and the environment.

work plan—A document that specifies the activities to be performed when implementing an investigation or remedy. At a minimum, the work plan should identify the scope of the work to be performed, specify the procedures to be used to perform the work, and present a schedule for performing the work. The work plan may also present the technical basis for performing the work.

Metric to U.S. Customary Unit Conversions

Multiply SI (Metric) Unit	by	To Obtain U.S. Customary Unit
kilometers (km)	0.622	miles (mi)
kilometers (km)	3281	feet (ft)
meters (m)	3.281	feet (ft)
meters (m)	39.37	inches (in.)
centimeters (cm)	0.03281	feet (ft)
centimeters (cm)	0.394	inches (in.)
millimeters (mm)	0.0394	inches (in.)
micrometers or microns (µm)	0.0000394	inches (in.)
square kilometers (km^2)	0.3861	square miles (mi^2)
hectares (ha)	2.5	acres
square meters (m^2)	10.764	square feet (ft^2)
cubic meters (m^3)	35.31	cubic feet (ft^3)
kilograms (kg)	2.2046	pounds (lb)
grams (g)	0.0353	ounces (oz)
grams per cubic centimeter (g/cm^3)	62.422	pounds per cubic foot (lb/ft^3)
milligrams per kilogram (mg/kg)	1	parts per million (ppm)
micrograms per gram (µg/g)	1	parts per million (ppm)
liters (L)	0.26	gallons (gal.)
milligrams per liter (mg/L)	1	parts per million (ppm)
degrees Celsius (°C)	9/5 + 32	degrees Fahrenheit (°F)

Appendix B

Management Plan for Investigation-Derived Waste

B-1.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

This appendix to the supplemental investigation work plan describes how investigation-derived waste (IDW) generated during the investigation of the Delta Prime (DP) Site Aggregate Area supplemental sites at Los Alamos National Laboratory (LANL or the Laboratory) will be managed. IDW is solid waste generated as a result of field investigation activities and may include, but is not limited to, drill cuttings, contaminated personal protective equipment (PPE), sampling supplies, plastic, fluids from the decontamination of PPE and sampling equipment, and all other wastes potentially contacting contaminants.

IDW generated during the investigations at these sites will be managed in a way that is protective of human health and the environment, compliant with applicable regulatory requirements, and consistent with LANL's waste-minimization goals.

Applicable LANL-Environmental Stewardship (ENV) Division standard operating procedures (SOPs) incorporate the requirements of all applicable U.S. Environmental Protection Agency (EPA) and New Mexico Environment Department regulations, U.S. Department of Energy orders, and Laboratory implementation requirements. ENV SOPs applicable to the characterization and management of IDW are

- SOP-01.06, Management of Environmental Restoration Project Waste, and
- SOP-01.10, Waste Characterization.

In accordance with these SOPs, waste minimization is accomplished by implementing the requirements of the 2005 "Hazardous Waste Minimization Report" (Pollution Prevention Waste Minimization Plan; LANL 2005, 091291). The report is updated annually as a requirement of Module VIII of the Laboratory's Hazardous Waste Facility Permit (EPA 1990, 01585; EPA 1994, 44146).

A waste characterization strategy form (WCSF) will be prepared and approved by ENV-Environmental Characterization and Remediation (ECR) personnel in accordance with the requirements of SOP-01.10 before the start of field investigation activities. The WCSF will provide detailed information on IDW characterization, management, containerization, and potential volume generation. IDW characterization will be achieved through existing data and/or documentation and through direct sampling of the IDW or through sampling of the media being investigated (e.g., surface soil, subsurface soil, sediment). If waste characterization sampling is necessary, it will be described in the WCSF.

The selection of waste containers will be based on the appropriate U.S. Department of Transportation requirements, waste types, and estimated volumes of IDW to be generated. Immediately after containerization, each waste container will be individually labeled with a unique identification number and with information regarding waste classification, item(s), radioactivity (if applicable), and date generated. If wastes are waiting for analytical results to make a final characterization determination, the containers will be labeled as such until the analytical results are available. The wastes will be contained in clearly marked and appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements will be based on the type of IDW and its classification. Container and storage requirements will be detailed in the WCSF and approved before the waste is generated.

Transportation and disposal requirements will be detailed in the WCSF and approved before the generation of waste. Table B-1 provides a summary of how wastes will be managed.

The anticipated waste streams that will be generated and managed during work plan implementation at the DP Site Aggregate Area supplemental sites include the following materials:

Drill cuttings. The drill cuttings waste stream will consist of cuttings from all boreholes drilled during field activities. Drill cuttings will be collected and containerized at the point of generation (i.e., at the drill rig). The drill cutting waste stream will be characterized with analytical results from core samples, augmented by direct sampling of the containerized waste as necessary. The maximum detected concentrations of radionuclides will be compared with background/fallout values (BVs/FVs). If maximum concentrations exceed BVs/FVs, the waste cuttings will be designated as low-level radioactive waste (LLW). Total concentrations of toxicity characteristic leaching procedure (TCLP) constituents will be compared with 20 times the TCLP regulatory level. If total concentrations are less than 20 times the TCLP regulatory level, the waste cuttings will be designated nonhazardous by characteristic. If total concentrations exceed 20 times the TCLP regulatory level, the waste cuttings will be sampled and analyzed using the TCLP to determine if it is hazardous by characteristic. If potential EPA-listed hazardous waste constituents are detected, the Laboratory will conduct a review of historical records and data to determine whether the source of each constituent was a listed hazardous waste at its point of generation. If the source is determined to be a listed hazardous waste, the cuttings will be managed as hazardous or mixed waste (depending on the levels of radioactivity). Otherwise, the cuttings will be managed as nonhazardous solid waste or LLW (depending on the levels of radioactivity). Based on the results of previous investigations, the Laboratory expects these wastes to be designated as LLW that will be disposed of at Technical Area (TA) 54 or at an off-site LLW disposal facility.

Metal pipe debris. This waste stream will consist of inactive drain lines that may be removed at the cooling tower site, AOC C-21-027. These wastes will be collected and containerized at the point of generation (i.e., at the excavation). These wastes will be characterized based on field radiation screening, acceptable knowledge of processes associated with the debris, acceptable knowledge from site characterization sampling, and, if necessary, direct sampling of the waste. The Laboratory expects these wastes to be designated as LLW that will be disposed of at TA-54 or at an off-site LLW disposal facility.

Spent PPE. The spent PPE waste stream will consist of PPE that has potentially contacted contaminated environmental media (i.e., core and/or drill cuttings) and that cannot be decontaminated. The bulk of this waste stream will consist of protective clothing, such as coveralls, gloves, and shoe covers. Spent PPE will be collected in containers at personnel decontamination stations. Characterization of this waste stream will be performed through acceptable knowledge of the waste materials, the methods of generation, and the analytical results from the sampling of the environmental media with which the materials were in contact. The Laboratory expects these wastes to be designated as LLW that will be disposed of at TA-54 or at an off-site LLW disposal facility.

Disposable sampling supplies. The disposable sampling supplies waste stream will consist of all equipment and materials necessary for collecting samples that come into direct contact with contaminated environmental media and that cannot be decontaminated. This waste stream also includes wastes associated with dry decontamination activities. This waste stream will consist primarily of paper and plastic items collected in bags at the sampling location and transferred to accumulation drums. Characterization of this waste stream will be performed through acceptable knowledge of the waste materials, the methods of generation, and the analytical results from the sampling of the environmental media with which the materials were in contact. The Laboratory expects these wastes to be designated as LLW that will be disposed of at TA-54 or at an off-site LLW disposal facility.

Decontamination fluids. The decontamination fluids waste stream will consist of liquid wastes from decontamination activities (i.e., decontamination solutions and rinse waters). Consistent with waste-minimization practices, the Laboratory employs dry decontamination methods to the extent possible. If dry

decontamination cannot be performed, liquid decontamination wastes will be collected in containers at the point of generation and characterized with analytical results from direct sampling of the containerized waste. The Laboratory expects these wastes to be designated as liquid LLW that will be sent to the radioactive liquid waste treatment facility at TA-50 for disposal.

REFERENCES

The following list includes all documents cited in this appendix. Parenthetical information following each reference provides the author(s), publication date, and ER ID number. This information is also included in text citations. ER ID numbers are assigned by the ENV-Environmental Remediation and Surveillance (ERS) Program Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the ENV-ERS Program master reference set.

Copies of the master reference set are maintained at the New Mexico Environment Department (NMED) Hazardous Waste Bureau; the U.S. Department of Energy-Los Alamos Site Office; the U.S. Environmental Protection Agency, Region 6; and the ENV-ERS Program. The set was developed to ensure that the administrative authority has all material needed to review this document, and it is updated with every document submitted to the administrative authority. Documents previously submitted to the administrative authority are not included.

EPA (U.S. Environmental Protection Agency), April 1990. United States Environmental Protection Agency, Region 6 Hazardous Waste Permit (Hazardous and Solid Waste Amendments), Dallas, Texas. (EPA 1990, 01585)

EPA (U.S. Environmental Protection Agency), April 1994. “Module VIII, Special Conditions Pursuant to the 1984 Hazardous and Solid Waste Amendments to RCRA for Los Alamos National Laboratory, EPA ID NM0890010515 38817,” module of EPA Hazardous Waste Facility Permit issued to Los Alamos National Laboratory, Dallas, Texas. (EPA 1994, 44146)

LANL (Los Alamos National Laboratory), November 9, 2005. “Hazardous Waste Minimization Report,” Los Alamos National Laboratory document LA-UR-05-8650, Los Alamos, New Mexico. (LANL 2005, 091291)

Table B-1
Summary of Waste Management

Waste Stream	Expected Waste Type	On-Site Management	Expected Disposition
Drill cuttings	LLW	B-25 boxes	Disposal at TA-54, or permitted off-site disposal facility
Metal pipe debris	LLW	Accumulation in 55-gal. drum or other appropriate container such as B-25 boxes and roll-offs	Disposal at TA-54, or permitted off-site disposal facility
Spent PPE	LLW	Accumulation in 55-gal. drum	Disposal at TA-54, or permitted off-site disposal facility
Disposable sampling supplies	LLW	Accumulation in 55-gal. drum	Disposal at TA-54, or permitted off-site disposal facility
Decontamination fluids	LLW	Accumulation in 55-gal. drum	Disposal at TA-50, or permitted off-site disposal facility