LA-UR-11-0553
February 2011
EP2011-0028

Phase II Investigation Work Plan for Sites at Technical Area 49 Outside the Nuclear Environmental Site Boundary

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared by the Environmental Programs Directorate

LA-UR-11-0553
EP2011-0028

Phase II Investigation Work Plan for Sites at Technical Area 49 Outside the Nuclear Environmental Site Boundary

February 2011

Responsible project manager:

Printed Name	Signature	Title	Organization	Date
Stephani Fuller		Project Manager	Environmental Programs	2-11-11

Responsible LANS representative:

Printed Name	Signature	Title	Organization	Date
Michael J. Graham		Associate Director	Environmental Programs	14 Feb 2011

Responsible DOE representative:

Printed Name	Signature	Title	Organization	Date
George J. Rael		Manager	DOE-LASO	2/15/11

EXECUTIVE SUMMARY

Technical Area 49 sites outside the nuclear environmental site (NES) boundary consist of nine solid waste management units (SWMUs) and areas of concern (AOCs) at Los Alamos National Laboratory. Of the nine sites, six sites have investigations completed, deferred, or approved for no further action. This Phase II investigation work plan identifies and describes the activities needed to complete the investigation of the remaining three sites: SWMUs 49-004 and 49-005(a) and AOC 49-002.

The previous investigations did not define the extent of contamination for one or more contaminants at AOC 49-002 and SWMU 49-005(a). Additional sampling is necessary at each of these sites. At SWMU 49-004, the previous investigation defined extent for all potential contaminants investigated, but there were no analyses for dioxins and furans. Additional sampling and analysis is necessary to characterize potential contamination from dioxins and furans at SWMU 49-004.

CONTENTS

Figures

Tables

Appendixes

Plates

1.0 INTRODUCTION

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by the U.S. Department of Energy (DOE) and managed by Los Alamos National Security, LLC. The Laboratory is located in north-central New Mexico approximately 60 mi northeast of Albuquerque and 20 mi northwest of Santa Fe. The Laboratory site covers 40 mi^2 of the Pajarito Plateau, which consists of a series of fingerlike mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation from approximately 6200 to 7800 ft above mean sea level (amsl).

The Laboratory is participating in a national effort by DOE to clean up sites and facilities formerly involved in weapons research and development. The goal of the Laboratory's efforts is to ensure past operations do not threaten human or environmental health and safety in and around Los Alamos County, New Mexico. To achieve this goal, the Laboratory is currently investigating sites potentially contaminated by past Laboratory operations. These sites are designated as either solid waste management units (SWMUs) or areas of concern (AOCs).

The SWMUs and AOC addressed in this Phase II investigation work plan are potentially contaminated with both hazardous and radioactive components. Corrective actions at the Laboratory are subject to the Compliance Order on Consent (the Consent Order). Information on radioactive materials and radionuclides, including the results of sampling and analysis of radioactive constituents, is voluntarily provided to the New Mexico Environment Department (NMED) in accordance with DOE policy.

1.1 Work Plan Overview

Technical Area 49 (TA-49), also known as the Frijoles Mesa Site, occupies approximately 1280 acres along the south-central boundary of the Laboratory (Figure 1.1-1). The TA-49 sites outside the nuclear environmental site (NES) boundary consist of nine SWMUs and AOCs located within four areas (Figure 1.1-2). The status of each site is presented in Table 1.1-1. AOCs 49-007(a) and 49-007(b) were previously approved for no further action by the U.S. Environmental Protection Agency (EPA) (EPA 2005, 088464) . The investigation of AOC 49-008(a) and SWMU 49-008(b) is deferred per Table IV-2 of the Consent Order. Two sites [AOCs 49-005(b) and 49-006] were recommended for corrective actions complete without controls in the approved investigation report (LANL 2010, 110654.16; NMED 2010, 110859) and the Laboratory has requested certificates of completion for these sites (LANL 2010, 111342). This Phase II investigation work plan identifies and describes the activities needed to complete the investigation of the remaining two SWMUs [SWMUs 49-004 and 49-005(a)] and one AOC [AOC 49-002(a)] based on the results from previous investigations.

Section 2 of this work plan provides summaries of the site description, operational history, nature and extent of contamination, and proposed investigation activities. Section 3 provides a description of investigation methods for proposed field activities. Ongoing monitoring and sampling programs in the vicinity of TA-49 are presented in section 4. Section 5 is an overview of the anticipated schedule of the investigation and reporting activities. The references cited in this Phase II work plan and the map data sources are provided in section 6. Appendix A of this work plan includes a list of acronyms and abbreviations, metric conversion table, and a data qualifier definitions table. Appendix B describes the management of investigation-derived waste (IDW).

1.2 Work Plan Objectives

The objective of this Phase II work plan is to

- complete the determination of nature and extent of contamination at SWMU 49-005(a) and AOC 49-002(a)], and
- characterize the potential dioxin and furan contamination at SWMU 49-004.

To accomplish this objective, this Phase II work plan

- presents summaries of site background and current site conditions;
- describes the rationale and proposed scope of activities for each site based on the results and recommendations in the approved investigation report (LANL 2010, 110654.16; NMED 2010, 110859);
- identifies and proposes appropriate methods and protocols for collecting, analyzing, and evaluating data to finalize characterization of these sites; and
- provides a proposed schedule for conducting investigation and remediation activities and reporting results.

1.3 Cleanup Levels

NMED soil screening levels (SSLs) (NMED 2009, 108070) or the Laboratory's screening action levels (LANL 2009, 107655) will be used as soil cleanup levels unless they are determined to be impractical or unless values do not exist for the current and reasonably foreseeable future land-use scenarios. If NMED SSLs do not exist, EPA regional screening values will be used (http://www.epa.gov/earth1r6/6pd/rcra_c/pd-n/screen.htm).

1.4 Site Conditions

Surface and subsurface features and geologic characteristics of TA-49 in the vicinity of sites outside the NES boundary are described in detail in the approved investigation work plan (LANL 2008, 102215; NMED 2008, 100465). Conditions at the sites included in this Phase II investigation work plan are predominantly influenced by

- a semiarid climate with low precipitation and a high evapotranspiration rate that limits the extent of subsurface moisture percolation and, therefore, the amount of moisture available to transport radionuclides or hazardous waste constituents in the subsurface, and
- a thick, relatively dry unsaturated (vadose) zone that greatly restricts or prevents downward migration of contaminants to the regional aquifer.

Topographically, the area consists of a mesa top centrally located on the Pajarito Plateau at an average elevation of approximately 7140 ft amsl. The TA-49 sites outside the NES boundary addressed in this Phase II work plan are located within the Ancho Canyon and Water Canyon watersheds.

These and other elements of the environmental setting at TA-49 are considered when evaluating investigation data with respect to the fate and transport of contaminants.

1.5 Operational History

Between 1959 and 1961, hydronuclear and related experiments at TA-49 deposited plutonium, uranium, lead, and beryllium in underground shafts. These experiments were conducted in subsurface shafts located at Material Disposal Area AB (Areas 2, 2A, and 2B) and Areas 1, 3, and 4 (Figure 1.1-2). These areas are the subject of the investigation of the TA-49 sites inside the NES boundary (LANL 2008, 102691). Investigation results for TA-49 sites inside the NES boundary have been presented in a separate investigation report (LANL 2010, 110656.17).

Facilities in Areas 5 and 10 were used to support the experiments at the test shaft areas. Uncontaminated materials generated at these facilities were deposited into a landfill in Area 6. Additionally, general site cleanups conducted in 1971 and 1984 resulted in disposal of uncontaminated structure debris and materials into the Area 6 landfill and the creation of small landfills at Areas 5 and 10 (LANL 1992, 007670, pp. 6-4-6-9).

2.0 SITE DESCRIPTIONS AND PROPOSED INVESTIGATION ACTIVITIES

This section presents a brief description and operational history, summary of the nature and extent of contamination, and proposed investigation activities for each TA-49 site outside the NES boundary that require additional investigation. More complete descriptions of the sites and previous investigations are presented in the approved investigation work plan (LANL 2008, 102215; NMED 2008, 100465) and the approved investigation report (LANL 2010, 110654.16; NMED 2010, 110859). Additional sampling proposed in this section is based upon the results of the approved investigation report (LANL 2010, 110654.16; NMED 2010, 110859).

2.1 SWMU 49-004, Landfill, Area 6 West

2.1.1 Site Description and Operational History

SWMU 49-004 is an inactive landfill located in Area 6 West at TA-49 (Figure 2.1-1). Landfill dimension are approximately 60 ft by 350 ft (LANL 1992, 007670). The site was used from 1959 to 1961 for open-pit burning of combustible construction materials and for the burial of uncontaminated residues generated from other areas at TA-49 (Purtymun and Stoker 1987, 006688). Wastes disposed of at this site were reportedly screened for radioactivity before burial (LANL 1992, 007670, p. 6.3-6). It is not known what, if any, activities occurred at the site between 1961 and 1971. During the 1971 cleanup of TA-49, the landfill was reopened for disposal of uncontaminated building debris, principally from Area 11. Approximately 2160 ft^3 of uncontaminated debris was disposed of within the pit. Upon completion of the cleanup activities in 1971, the pit was backfilled and covered with 3 ft of soil (Gibbons and Blackwell 1971, 030590). In 1977, the La Mesa Fire burned over the location of SWMU 49-004 and the surrounding area. In 1984, a second sitewide cleanup effort took place at TA-49. The existing Area 6 West disposal pit was reopened and enlarged and used to dispose of uncontaminated solid debris removed from throughout TA-49. A trench measuring 30 ft × 100 ft × 15 ft was excavated at the site for the disposal of uncontaminated solid materials (LANL 1992, 007670, p. 6.3-7). The pit was subsequently backfilled with 3 ft of fill, covered with 6 in. of topsoil, and reseeded with native grasses (Hansen 1984, 030691). No documentation exists concerning disposal of hazardous chemicals, but this is unlikely based on the nature of activities conducted at TA-49.

2.1.2 Nature and Extent of Contamination

The approved investigation report (LANL 2010, 110654.16; NMED 2010, 110859) concluded that nature and extent of contamination had been defined for all chemicals and radionuclides detected at SWMU 49-004. NMED requested that additional sampling be performed at SWMU 49-004 for dioxins and furans (NMED 2010, 110470). Although the analysis of dioxins and furans was not originally required in the approved investigation work plan (LANL 2008, 102215; NMED 2008, 100465), the potential for dioxin and furan contamination was identified based on the past history of open burning at this site. Plate 1 shows all sample locations with decision-level data from the 2009/2010 investigation and previous investigations.

2.1.3 Proposed Activities at SWMU 49-004

To define the extent of any dioxin and/or furan release associated with historical burning activities at SWMU 49-004, soil/tuff samples will be collected from 12 existing sample locations (49-608962, 49-608964, 49-608966, 49-608967, 49-608968, 49-608970, 49-608977, 49-608981, 49-608982, 49-608984, 49-608997, and 49-608998) within the landfill boundary and 12 existing locations (49-608986, 49-608987, 49-608988, 49-608989, 49-608990, 49-608991, 49-609000, 49-609001, 49-609002, 49-609003, 49-609007, and 49-609008) outside the landfill boundary. Because of the relatively low mobility of these compounds in soil and/or tuff, proposed sampling will be limited to the upper sample interval on the surface within the landfill boundary and two intervals beneath the bottom of the landfill. Samples within the landfill boundary will be collected from a depth of 0 to 1.0 ft below ground surface (bgs). Samples outside the landfill boundary will be collected from depths of 0 to 1.0 ft and 2.0 to 3.0 ft bgs to define vertical extent. Samples will also be collected from the four existing borehole locations (49-609882, 49-609883, 49-609884, and 49-609885) to define vertical extent beneath the landfill. Borehole samples will be collected from depths of 13.0 to 14.0 ft bgs and 20.0 to 21.0 ft bgs, (2.0 to 3.0 ft and 9.0 to 10.0 ft below the bottom of the landfill as identified in the 2010 borehole logs, field notebook, and sample collection logs [SCLs]). All samples will be analyzed for dioxins and furans only. Proposed sampling locations for SWMU 49-004 are shown on Figure 2.1-2. Table 2.1-1 summarizes the proposed sampling locations, depths, and analytical suites.

2.2 AOC 49-002, Calibration Chamber Facility

2.2.1 Site Description and Operational History

AOC 49-002 consists of a former underground calibration chamber and two associated shafts located in Area 10 at TA-49 (Figure 2.2-1). The underground chamber and shafts were constructed in 1959 and used for calibration tests conducted in 1960 and 1961. Each shaft is approximately 6 ft to 7 ft in diameter × 64 ft deep. One is an elevator shaft used to transport personnel and equipment to the calibration chamber; an elevator building (former building 49-61) previously located over the elevator shaft was removed in 1979. The other shaft is the calibration shaft. The shafts are connected at the bottom by a tunnel or gallery that is 4 ft × 7 ft × 12 ft. The calibration room, which is 14 ft × 10 ft, was lined with 8 in. of reinforced concrete faced with a 1-in. steel plate. The calibration shaft was used to place a portable pulsed neutron source over calibration samples placed in the calibration room. A hydraulic lift platform at the bottom of the calibration room was connected to a hydraulic oil reservoir at the surface in an equipment building (former structure 49-58) by conduits located in the utilities shaft, which also housed ventilation ducts. The total volume of hydraulic oil in the lift system was estimated to be less than 100 gal. and is not believed to have contained polychlorinated biphenyls. A radiation shield (former structure 49-62) that consisted of a concrete pad was located over the top of the calibration shaft. A concrete pad around the top of both shafts served as a foundation for the elevator building and shielding wall and is still in place.

Small amounts (e.g., milligram quantities) of enriched uranium were occasionally released through spallation from critical assemblies during tests, although this material generally was cleaned up. Operation of the pulsed neutron source may have activated surrounding soil and structures, but by now activation products have decayed to undetectable levels. Use of the site after 1961 did not involve hazardous materials other than small radioactive sources used for radiochemical counting (LANL 1992, 007670, pp. 6.5-1-6.5-6). The entrances to both shafts have been covered with concrete blocks. The elevator shaft is covered by a concrete cover and is believed to still be partially open, although the calibration shaft was reportedly backfilled with soil and crushed tuff. Other surface features, including the hydraulic oil reservoir and equipment building, have been removed.

2.2.2 Nature and Extent of Contamination

The approved investigation report (LANL 2010, 110654.16; NMED 2010, 110859) concluded that nature and extent of contamination had been defined for all chemicals and radionuclides at AOC 49-002 except for zinc. The vertical extent of zinc is not defined at sample locations 49-609543 and 49-609544 (Plate 2).

The approved investigation work plan (LANL 2008, 102215; NMED 2008, 100465) did not require collection of deep samples adjacent to the shafts. NMED requested that at least two boreholes be drilled adjacent to the calibration and elevator shafts to investigate the extent of contamination at the bottom of the shafts (NMED 2010, 110470).

2.2.3 Proposed Activities at AOC 49-002

Subsurface tuff samples will be collected at two previously sampled locations (49-609543 and 49-609544), but the depth at each sample location will be extended to define the vertical extent of zinc. Samples will be collected from depth intervals of 6.5 to 7.5 ft bgs and 11.5 to 12.5 ft bgs (5.0 to 6.0 ft and 10.0 to 11.0 ft below the deepest interval previously sampled) at the two sampling locations. All samples will be analyzed for zinc. In addition, two new boreholes (2-1 and 2-2) will be drilled within 10 ft of the south side of the calibration shaft and the elevator shaft. Samples will be collected from depth intervals of 69.0 to 70.0 ft bgs and 74.0 to 75.0 ft bgs (5 ft and 10 ft below the bottom of the shafts). Borehole samples will be analyzed for the same analytical suite as the samples collected from AOC 49-002 during the 2009/2010 investigation: target analyte list (TAL) metals, isotopic plutonium, isotopic uranium, americium-241, and gamma-emitting radionuclides. Proposed sampling locations for AOC 49-002 are shown on Figure 2.2-2. Table 2.2-1 summarizes proposed sampling locations, depths, and analytical suites.

2.3 SWMU 49-005(a), Landfill

2.3.1 Site Description and Operational History

SWMU 49-005(a) is an inactive landfill located east of Area 10 at TA-49 (Figure 2.2-1). The landfill is located north of the road that runs east from Area 10 and is approximately 75 ft northeast of the Area 10 experimental chamber facility (AOC 49-002). The landfill, described as a small pit in the 1990 SWMU Report, was constructed in 1984 as a disposal area for uncontaminated debris generated during the 1984 general surface cleanup of TA-49 (LANL 1990, 007513).

2.3.2 Nature and Extent of Contamination

The approved investigation report (LANL 2010, 110654.16; NMED 2010, 110859) concluded that nature and extent of contamination had been defined for all chemicals and radionuclides detected at SWMU 49-005(a) except for aluminum and barium. The vertical extent of aluminum and barium is not defined at borehole locations 49-07512 and 49-07527 (Plate 2).

2.3.3 Proposed Activities as SWMU 49-005(a)

Subsurface tuff samples will be collected at two previously sampled borehole locations (49-07512 and 49-07527), but the depth at each borehole location will be extended to define the vertical extent of aluminum and barium. Samples will be collected from depth intervals of 14.0 to 15.0 ft bgs and 19. 0 to 20.0 ft bgs (5.0 to 6.0 ft and 10.0 to 11.0 ft below the deepest interval previously sampled) at the two sampling locations. All samples will be analyzed for aluminum and barium. Proposed sampling locations for SWMU 49-005(a) are shown on Figure 2.2-2. Table 2.3-1 summarizes proposed sampling locations, depths, and analytical suites.

3.0 INVESTIGATION METHODS

A summary of the investigation methods to be implemented is presented in Table 3.0-1. The standard operating procedures (SOPs) used to implement these methods are available at http://www.lanl.gov/environment/all/qa.shtml. Summaries of the field-investigation methods are provided below. Additional procedures may be added as necessary to describe and document quality-affecting activities.

Chemical analyses will be performed in accordance with the analytical statement of work (LANL 2008, 109962). Accredited contract analytical laboratories will use the most recent EPA- and industry-accepted extraction and analytical methods for analyses of the samples.

3.1 Establish Sampling Locations

Proposed sampling locations are identified for each site based on engineering drawings, surveyed locations of existing structures (from the geographic information system database), previous sampling locations, and topography or other features identified in the field (e.g., drainage channels and sediment accumulation areas). The coordinates of proposed new sampling locations will be obtained by georeferencing the points from the proposed sampling maps. Those coordinates will be located and flagged or otherwise marked in the field using a differential Global Positioning System (GPS) unit. If any proposed sampling locations are moved because of field conditions, utilities, or other unexpected reasons, the new locations will be surveyed immediately following sample collection as described in section 3.2 of this report.

3.2 Geodetic Surveys

Geodetic surveys will be conducted by a land surveyor in accordance with the latest version of SOP-5028, Coordinating and Evaluating Geodetic Surveys, to locate historical structures and to document field activities such as sampling locations. The surveyors will use a Trimble GeoXT hand-held GPS or equivalent for the surveys. The coordinate values will be expressed in the New Mexico State Plane Coordinate System (Transverse Mercator), Central Zone, North American Datum 1983. Elevations will be reported per the National Geodetic Vertical Datum of 1929. All GPS equipment used will meet the accuracy requirements specified in SOP-5028.

3.3 Field Screening

Because sampling is primarily being conducted to finalize nature and extent of contamination based on previous investigations, field screening will be conducted for health and safety purposes. However, if elevated field-screening levels are observed for the deepest sample collected from a specific sampling location, sample collection will continue until field-screening results show no elevated readings. The Laboratory's proposed field-screening approach will be to (1) visually examine all samples for evidence of contamination, (2) screen for organic vapors, and (3) screen for radioactivity. The field-screening methods are discussed below.

3.3.1 Organic Vapors

Based on 2009/2010 site investigation results, substantial volatile organic compound (VOC) contamination is not expected to be encountered, and organic vapor screening will be conducted for health and safety purposes.

Screening will be conducted using a photoionization detector (PID) capable of measuring quantities as low as 1 ppm. Vapor screening of soil, sediment, and subsurface core will be conducted using a PID equipped with an 11.7 eV lamp. All samples will be screened for VOCs in headspace gas in accordance with SOP-06.33, Headspace Vapor Screening with a Photo Ionization Detector.

The PID will be calibrated daily to the manufacturer's standard for instrument operation and the daily calibration results will be documented in the field logbooks. All instrument background checks, background ranges, and calibration procedures will be documented daily in the field logbooks in accordance with SOP-5181, Notebook and Logbook Documentation for Environmental Directorate Technical and Field Activities.

3.3.2 Radioactivity

Field screening for radioactivity will be conducted for health and safety purposes. Radiological screening will target gross-alpha, -beta, and -gamma radiation. Field screening for alpha, beta, and gamma radiation will be conducted within 6 in. from the core material and will be performed using appropriate field instruments calibrated in accordance with the Laboratory's Health Physics Operations Group procedures. All instrument calibration activities will be documented daily in the field logbooks in accordance with SOP-5181.

3.4 Sample Collection

Soil and tuff samples will be collected by the most efficient and least invasive method practicable. The methods will be determined by the field team based on site conditions such as topography, the nature of the material to be sampled, the depth intervals required, accessibility, and the level of disruption to Laboratory activities, local residents, and businesses. Typically, samples will be collected using spade and scoop, hand auger, or drill rig methods.

Samples will be placed in appropriate containers in accordance with SOP-5056, Sample Containers and Preservation. Quality assurance/quality control (QA/QC) samples will include field duplicate samples, equipment/rinsate blanks, and trip blanks. These samples will be collected following the current version of SOP-5059, Field Quality Control Samples, and will comply with a frequency of 10% of total samples collected for field duplicates and rinsate blanks. Trip blanks will be supplied and remain with analytical samples when samples are collected for VOC analysis. QA/QC samples are used to monitor the validity of the sample collection procedures.

3.4.1 Surface Sampling

Surface and shallow subsurface soil and sediment samples will be collected in accordance with SOP-06.09, Spade and Scoop Method for the Collection of Soil Samples. Stainless-steel shovels, spades, scoops, and bowls will be used for ease of decontamination. Decontamination will be completed using a dry decontamination method with disposable paper towels and an over-the-counter cleaner such as Fantastik or an equivalent. If the surface location is at bedrock, an axe or hammer and chisel will be used to collect samples.

3.5 Subsurface Sampling

Subsurface samples will be collected using hand auger, hollow-stem auger, or direct-push methods, depending on the depth of the samples and the material being sampled. A brief description of these methods is provided below.

3.5.1 Hand Auger

Hand augers may be used to bore shallow holes (e.g., 0 to 10 ft). The hand auger is advanced by turning or pounding the auger into the soil until the barrel is filled. The auger is removed and the sample is emptied into a clean bowl. Hand-auger samples will be collected in accordance with SOP-06.10, Hand Auger and Thin-Wall Tube Sampler.

3.5.2 Direct Push

Direct push is a subsurface sampling method that pushes a tool string into the ground using the weight of a truck in combination with a hydraulic ram or hammer. Various tool strings can be used to collect discrete samples, continuous samples, both discrete and continuous samples, and groundwater samples. The direct-push core samples collected in this investigation will be continuous. The inside of the continuous sampler is exposed to the subsurface environment as it is advanced to the sampling interval. This is a dual-tube sampler, so named because it uses two sets of rods to collect soil cores. The outer rods receive the driving force from the hydraulic pushing method and provide a sealed hole from which soil samples may be recovered without the threat of cross-contamination or cave in. The inner set of rods is placed within the outer rods and holds a sampler in place as the outer rods are driven to the sample interval. The inner rods are then retracted to retrieve the soil core. The direct-push method will follow the American Society of Testing and Materials D18 Subcommittee on Direct-Push Sampling (D18.21.01) (ASTM 1997, 057511).

3.5.3 Hollow-Stem Auger

Hollow-stem augers are used to collect subsurface samples where hand augering is impractical because of the depth or the material being sampled. The hollow-stem auger consists of a hollow-steel shaft with a continuous spiraled-steel flight welded onto the exterior of the stem. The stem is connected to an auger bit; when the auger is rotated, it transports cuttings to the surface. The hollow stem of the auger allows insertion of drill rods, split-spoon core barrels, Shelby tubes, and other samplers through the center of the auger so that samples may be retrieved during drilling operations.

During sampling, the auger will be advanced to just above the desired sampling interval. The sample will then be collected by driving a split-spoon sampler into undisturbed soil/tuff to the desired depth in accordance with SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials. All borehole cuttings will be managed as IDW as described in Appendix B.

Field documentation will include detailed borehole logs for each borehole drilled. The borehole logs will document the matrix material in detail and will include the results of all field screening; fractures and matrix samples will be assigned unique identifiers. All field documentation will be completed in accordance with the current version of SOP-12.01, Field Logging, Handling, and Documentation of Borehole Materials.

Borehole Abandonment

All hollow-stem auger boreholes will be abandoned in accordance with SOP-5034, Monitor Well and RFI Borehole Abandonment, by one of the following methods.

- Shallow boreholes, with a total depth of 20 ft or less, will be abandoned by filling the borehole with bentonite chips and then hydrating the chips in 1- to 2-ft lifts. The borehole will be visually inspected as the bentonite chips are being added to ensure bridging does not occur.
- Boreholes greater than 20 ft in depth will be pressure-grouted from the bottom of the borehole to the surface using the tremie pipe method. Acceptable grout materials include cement or bentonite grout, neat cement, or concrete.

The use of backfill materials such as bentonite and grout will be documented in a field logbook with respect to volumes (calculated and actual), intervals of placement, and additives used to enhance backfilling. All borehole abandonment information will be presented in the investigation report.

3.6 Quality Assurance/Quality Control Samples

The QA/QC samples will include field duplicate, equipment rinsate, and trip blank samples. Field duplicate and equipment rinsate samples will be collected at an overall frequency of at least 1 for every 10 regular samples as directed by the current version of SOP-5059, Field Quality Control Samples. Trip blanks will be included in each sample container that contains samples to be analyzed for VOCs.

3.7 Chain of Custody for Samples

The collection, screening, and transport of samples will be documented on standard forms generated by the Laboratory's Sample Management Office (SMO). These include SCLs, chain-of-custody forms, and sample container labels. SCLs will be completed at the time of sample collection and signed by the sampler and a reviewer who will verify the logs for completeness and accuracy. Corresponding labels will be initialed and applied to each sample container, and custody seals will be placed around container lids or openings. Chain-of-custody forms will be completed and signed to verify that the samples are not left unattended.

3.8 Laboratory Analytical Methods

The analytical suites for laboratory analyses are summarized in Table 3.8-1. All analytical methods are presented in the statement of work for analytical laboratories (LANL 2008, 109962). Sample collection and analysis will be coordinated with the SMO.

3.9 Health and Safety

The field investigations described in this investigation work plan will comply with all applicable requirements pertaining to worker health and safety. An integrated work document and a site-specific health and safety plan will be in place before fieldwork is performed.

3.10 Equipment Decontamination

Equipment for drilling and sampling will be decontaminated before and after drilling and sampling activities (as well as between drilling boreholes) to minimize the potential for cross-contamination. Dry decontamination methods are preferred and will be given priority because they do not generate liquid wastes. Residual material adhering to the equipment will be removed using dry decontamination methods, including wire-brushing and scraping as described in SOP-5061, Field Decontamination of Equipment. Dry decontamination of sampling equipment may include use of a nonphosphate detergent such as Fantastik on a paper towel and the equipment is wiped so that no liquid waste is generated.

If dry decontamination methods are not effective, the equipment may be decontaminated by steam cleaning or hot water pressure washing as described in SOP-5061. Wet decontamination methods will be conducted on a high-density polyethylene liner on a temporary decontamination pad. Cleaning solutions and wash water will be collected and contained for proper disposal. Decontamination solutions will be sampled and analyzed to determine the final disposition of the wastewater and the effectiveness of the decontamination procedures.

3.11 Investigation-Derived Waste

The IDW generated during field-investigation activities may include, but is not limited to, drill cuttings; contaminated soil; excavated debris; contaminated personal protective equipment (PPE), sampling supplies, and plastic; fluids from the decontamination of PPE and sampling equipment; and all other waste that has potentially come into contact with contaminants.

All IDW generated during field-investigation activities will be managed in accordance with applicable SOPs that incorporate the requirements of all applicable EPA and NMED regulations, DOE orders, and Laboratory implementation requirements. Appendix B presents the IDW management plan.

4.0 MONITORING PROGRAMS

4.1 Groundwater

Groundwater-monitoring activities in the Ancho Canyon Watershed are performed in accordance with the Laboratory’s Interim Facility-Wide Groundwater Monitoring Plan, which is updated annually. This includes semiannual monitoring near or downstream from areas of past Laboratory weapons-testing activities. Monitoring locations in the Ancho Canyon Watershed include six regional wells (DT-5A, DT-9, DT-10, R-29, R-30, and R-31) (LANL 2010, 110654.16).

4.2 Stormwater

SWMU 49-005(a) is the only site addressed in this Phase II investigation work plan subject to the stormwater monitoring requirements of the Laboratory’s National Pollutant Discharge Elimination System individual permit (IP) for stormwater discharges from SWMUs and AOCs. Monitoring under the IP is performed using site-monitoring areas (SMAs) that monitor stormwater runoff from individual SWMUs and AOCs or groups of SWMUs and AOCs. The SMA monitored under the IP at SWMU 49-005(a) is W-SMA-15.1 (LANL 2010, 110654.16). Monitoring results are reported to EPA annually.

5.0 SCHEDULE

Preparation for investigation activities is anticipated to begin in early fiscal year (FY) 2012. In order to integrate field activities and results from the Qbt 4 background study, fieldwork is expected to begin in FY2012 and be completed in mid-FY2012. A submittal date of no later than September 30, 2012, is proposed for the Phase II investigation report.

6.0 REFERENCES AND MAP DATA SOURCES

6.1 References

The following list includes all documents cited in this report. Parenthetical information following each reference provides the author(s), publication date, and ER ID. This information is also included in text citations. ER IDs are assigned by the Environmental Programs Directorate's Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the master reference set.

Copies of the master reference set are maintained at the NMED Hazardous Waste Bureau and the Directorate. 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.

ASTM (American Society for Testing and Materials), June 1997. "D6001 Standard Guide for Direct-Push Water Sampling for Geoenvironmental Investigations," in *Annual Book of ASTM Standards*, Vol. 04.09 Soil and Rock (II), ASTM, West Conshohocken, Pennsylvania. (ASTM 1997, 057511)

EPA (U.S. Environmental Protection Agency), January 21, 2005. "EPA's Prior Decisions on SWMU/AOC Sites at Los Alamos National Laboratory (LANL)," U.S. Environmental Protection Agency letter to J. Bearzi (NMED-HRMB) from L.F. King (EPA Federal Facilities Section Chief), Dallas, Texas. (EPA 2005, 088464)

Gibbons, D., and C. Blackwell, 1971. "Demolition of Structures at Area 11, TA-49," Los Alamos Scientific Laboratory, Los Alamos, New Mexico. (Gibbons and Blackwell 1971, 030590)

Hansen, W.R., January 13, 1984. "Use of Exiting Trench at TA-49 for Building Wastes," Los Alamos National Laboratory memorandum (HSE8-84-36) to L. Alexander from W.R. Hansen (HSE-8 Group Leader), Los Alamos, New Mexico. (Hansen 1984, 030691)

LANL (Los Alamos National Laboratory), November 1990. "Solid Waste Management Units Report," Vol. III of IV (TA-26 through TA-50), Los Alamos National Laboratory document LA-UR-90-3400, Los Alamos, New Mexico. (LANL 1990, 007513)

LANL (Los Alamos National Laboratory), May 1992. "RFI Work Plan for Operable Unit 1144," Los Alamos National Laboratory document LA-UR-92-900, Los Alamos, New Mexico. (LANL 1992, 007670)

LANL (Los Alamos National Laboratory), January 2008. "Investigation Work Plan for Sites at Technical Area 49 Outside the Nuclear Environmental Site Boundary, Revision 1," Los Alamos National Laboratory document LA-UR-08-0449, Los Alamos, New Mexico. (LANL 2008, 102215)

LANL (Los Alamos National Laboratory), January 2008. "Investigation Work Plan for Sites at Technical Area 49 Inside the Nuclear Environmental Site Boundary, Revision 1," Los Alamos National Laboratory document LA-UR-08-0447, Los Alamos, New Mexico. (LANL 2008, 102691)

LANL (Los Alamos National Laboratory), June 30, 2008. "Exhibit "D" Scope of Work and Technical Specifications, Analytical Laboratory Services for General Inorganic, Organic, Radiochemical, Asbestos, Low-Level Tritium, Particle Analysis, Bioassay, Dissolved Organic Carbon Fractionation, and PCB Congeners," Los Alamos National Laboratory document RFP No. 63639-RFP-08, Los Alamos, New Mexico. (LANL 2008, 109962)

LANL (Los Alamos National Laboratory), December 2009. "Radionuclide Screening Action Levels (SALs) from RESRAD, Version 6.5," Los Alamos National Laboratory document LA-UR-09-8111, Los Alamos, New Mexico. (LANL 2009, 107655)

LANL (Los Alamos National Laboratory), September 2010. "Investigation Report for Sites at Technical Area 49 Outside the Nuclear Environmental Site Boundary, Revision 1," Los Alamos National Laboratory document LA-UR-10-6033, Los Alamos, New Mexico. (LANL 2010, 110654.16)

LANL (Los Alamos National Laboratory), September 2010. "Investigation Report for Sites at Technical Area 49 Inside the Nuclear Environmental Site Boundary, Revision 1," Los Alamos National Laboratory document LA-UR-10-6032, Los Alamos, New Mexico. (LANL 2010, 110656.17)

LANL (Los Alamos National Laboratory), December 6, 2010. "Request for Certificates of Completion for Two Technical Area 49 Areas of Concern Outside the Nuclear Environmental Site Boundary," Los Alamos National Laboratory letter (EP2010-0546) to J.P. Bearzi (NMED-HWB) from M.J. Graham (LANL) and G.J. Rael (DOE-LASO), Los Alamos, New Mexico. (LANL 2010, 111342)

NMED (New Mexico Environment Department), February 14, 2008. "Approval with Modifications, Investigation Work Plan for Sites at Technical Area 49 Outside the Nuclear Environmental Site Boundary," New Mexico Environment Department letter to D. Gregory (DOE-LASO) and D. McInroy (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2008, 100465)

NMED (New Mexico Environment Department), December 2009. "Technical Background Document for Development of Soil Screening Levels, Revision 5.0," with revised Table A-1, New Mexico Environment Department, Hazardous Waste Bureau and Ground Water Quality Bureau Voluntary Remediation Program, Santa Fe, New Mexico. (NMED 2009, 108070)

NMED (New Mexico Environment Department), August 12, 2010. "Notice of Disapproval, Investigation Report for Sites at Technical Area 49 Outside the Nuclear Environmental Site Boundary," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2010, 110470)

NMED (New Mexico Environment Department), September 22, 2010. "Approval with Modifications, Investigation Report for Sites at Technical Area 49 Outside the Nuclear Environmental Site Boundary, Revision 1," New Mexico Environment Department letter to G.J. Rael (DOE-LASO) and M.J. Graham (LANL) from J.P. Bearzi (NMED-HWB), Santa Fe, New Mexico. (NMED 2010, 110859)

Purtymun, W.D., and A.K. Stoker, November 1987. “Environmental Status of Technical Area 49, Los Alamos, New Mexico,” Los Alamos National Laboratory report LA-11135-MS, Los Alamos, New Mexico. (Purtymun and Stoker 1987, 006688)

6.2 Map Data Sources

Data sources used in original figures and/or plates created for this report are described below and identified by legend title.

LANL Technical Areas - Technical Area Boundaries; Los Alamos National Laboratory, Site Planning & Project Initiation Group, Infrastructure Planning Office; September 2007; as published 04 December 2008.

Paved roads - Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Dirt roads - Dirt Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Drainages - WQH Drainage_arc; Los Alamos National Laboratory, ENV Water Quality and Hydrology Group; 1:24,000 Scale Data; 03 June 2003.

LANL structures - Structures; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

LANL fence lines - Security and Industrial Fences and Gates; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; 06 January 2004; as published 28 May 2009.

Former/other existing TA-49 structures - Description of: Geospatial Data Created for Maps Appearing in TA-49 HIRS and IWPS, K. Crowell, ERID-098702, October 2007

LANL PRS boundaries - Potential Release Sites; Los Alamos National Laboratory, Waste and Environmental Services Division, Environmental Data and Analysis Group, EP2009-0137; 1:2,500 Scale Data; 13 March 2009.

TA-49 2009/10 sample locations - TPMC field survey data, now found in: Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, 12 April 2010.

LANL historical sample locations - Point Feature Locations of the Environmental Restoration Project Database; Los Alamos National Laboratory, Waste and Environmental Services Division, 21 January 2010.

Contours - Hypsography, 10, 20, and 100 Foot Contour Interval; Los Alamos National Laboratory, ENV Environmental Remediation and Surveillance Program; 1991.

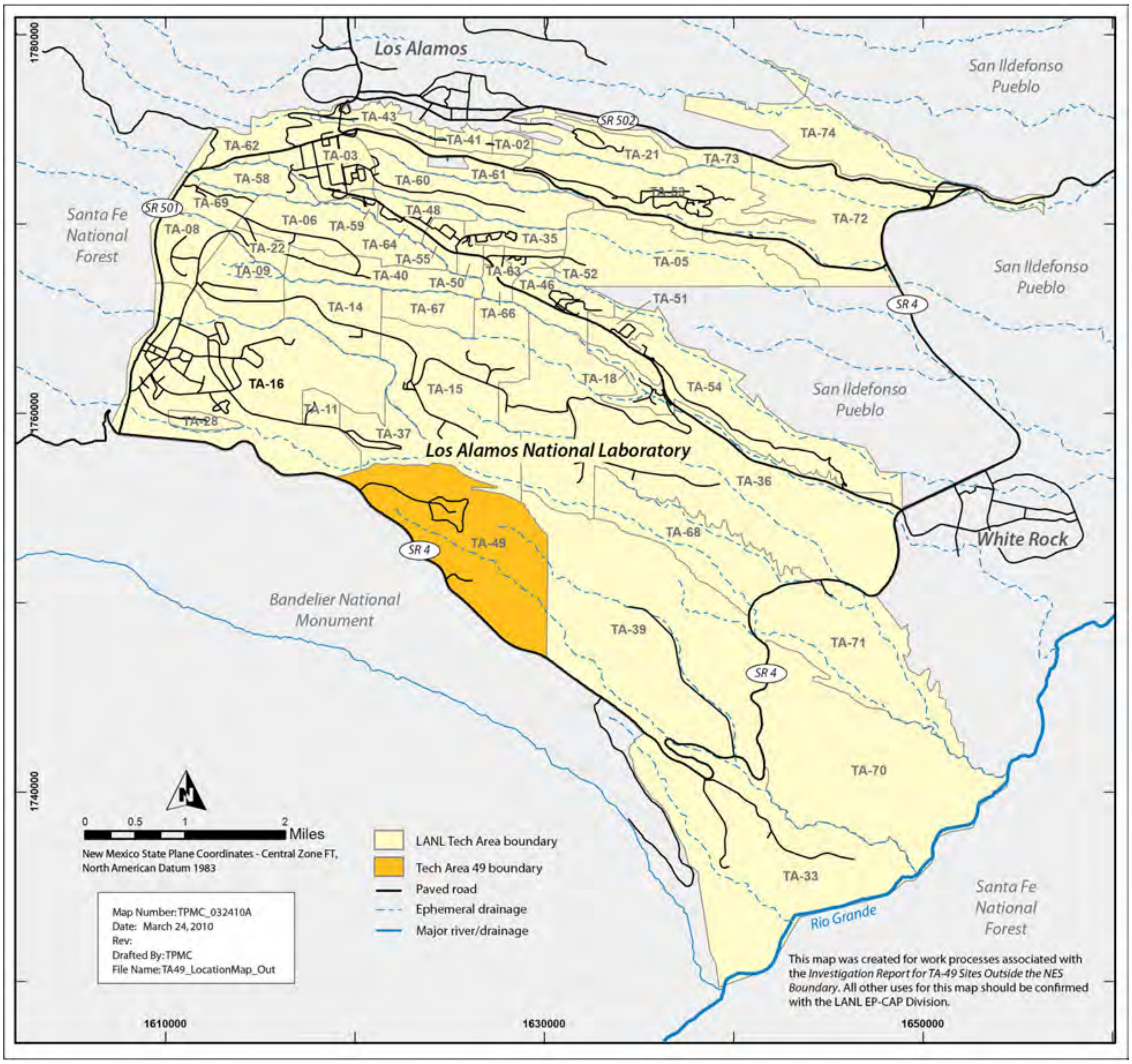

Figure 1.1-1 Location of TA-49 with respect to Laboratory technical areas and surrounding landholdings

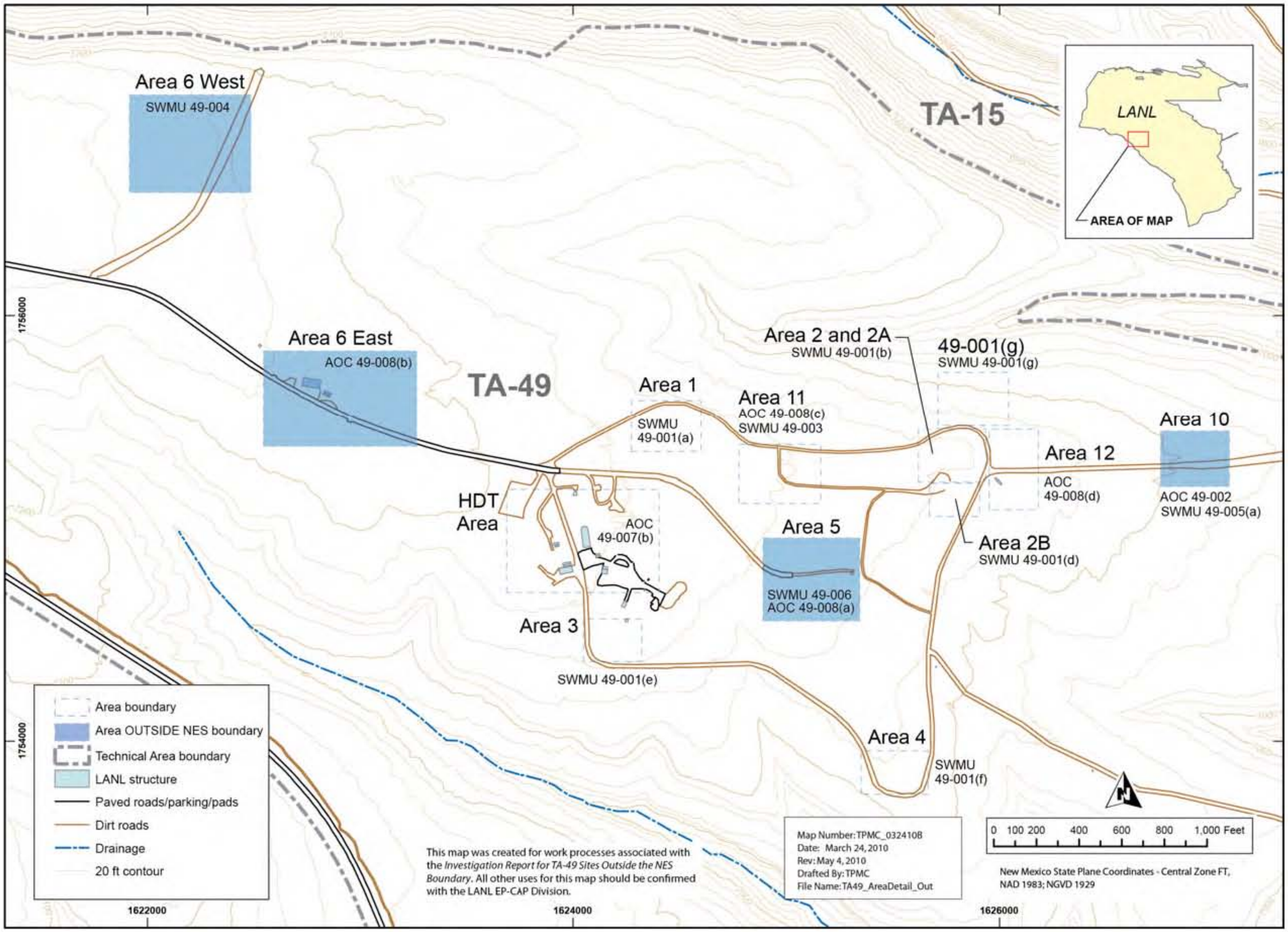

Figure 1.1-2 Locations of TA-49 SWMUs and AOCs

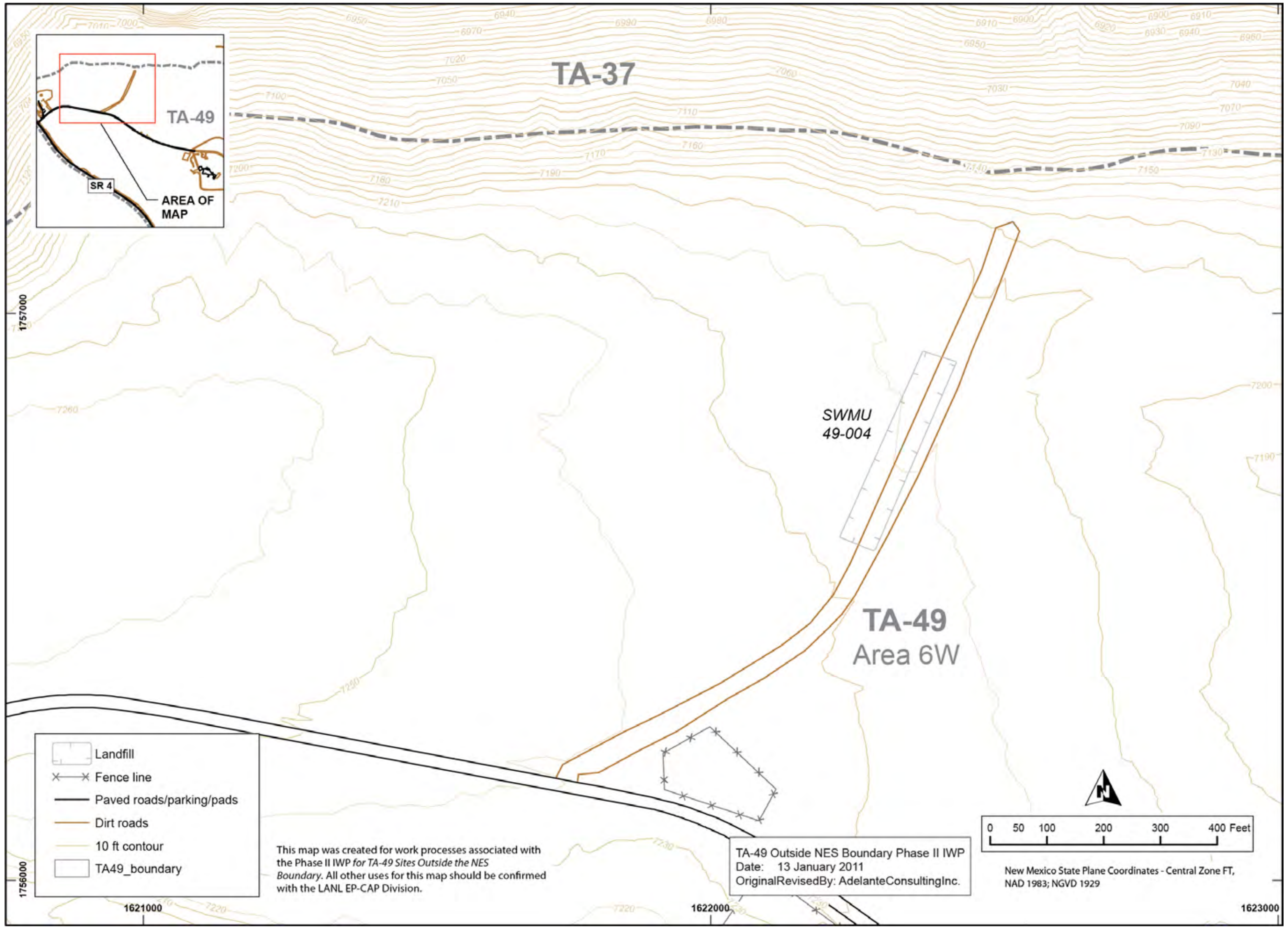

Figure 2.1-1 Site features for SWMU 49-004

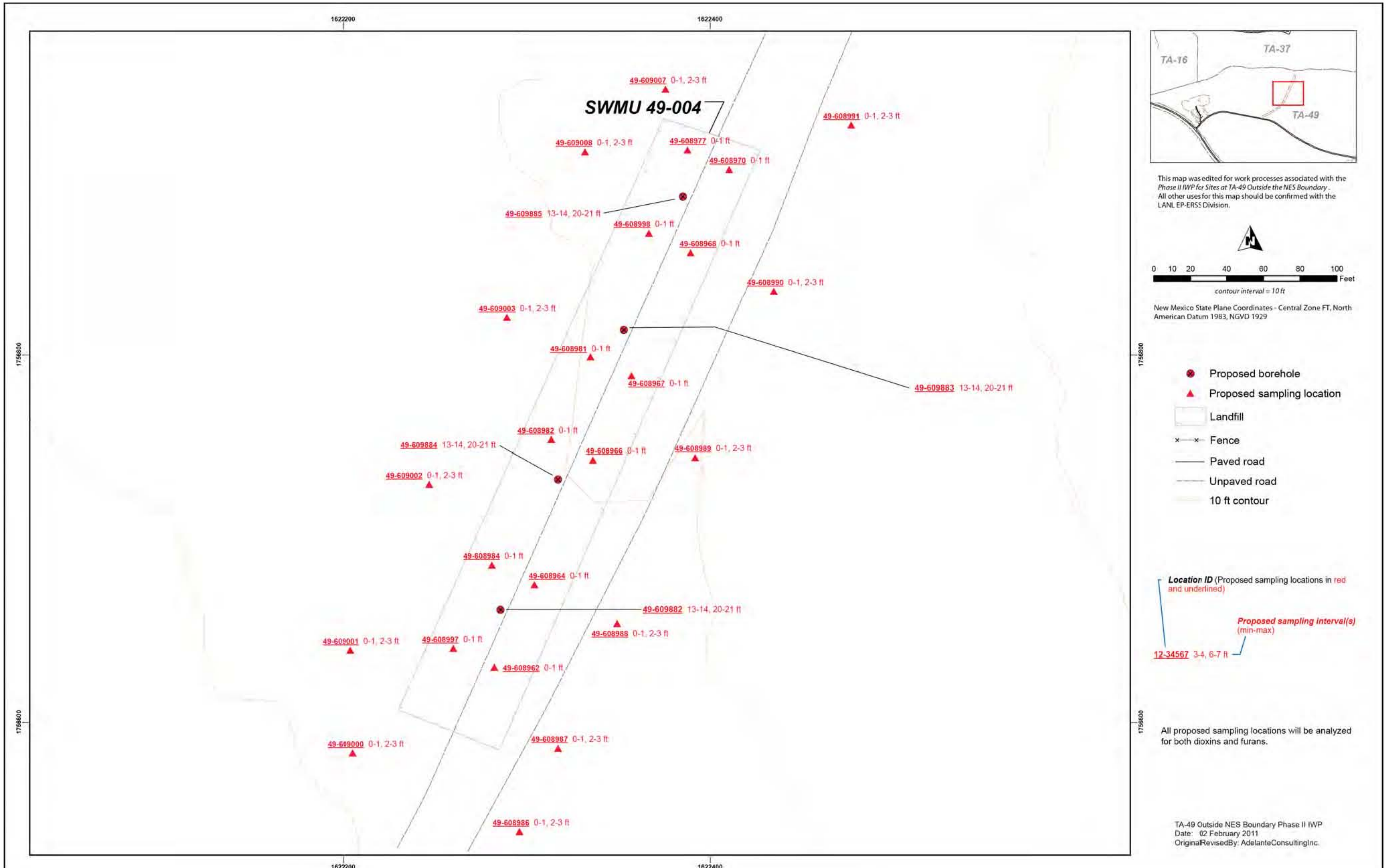

Figure 2.1-2 Proposed locations of surface and subsurface samples at Area 6 West, SWMU 49-004

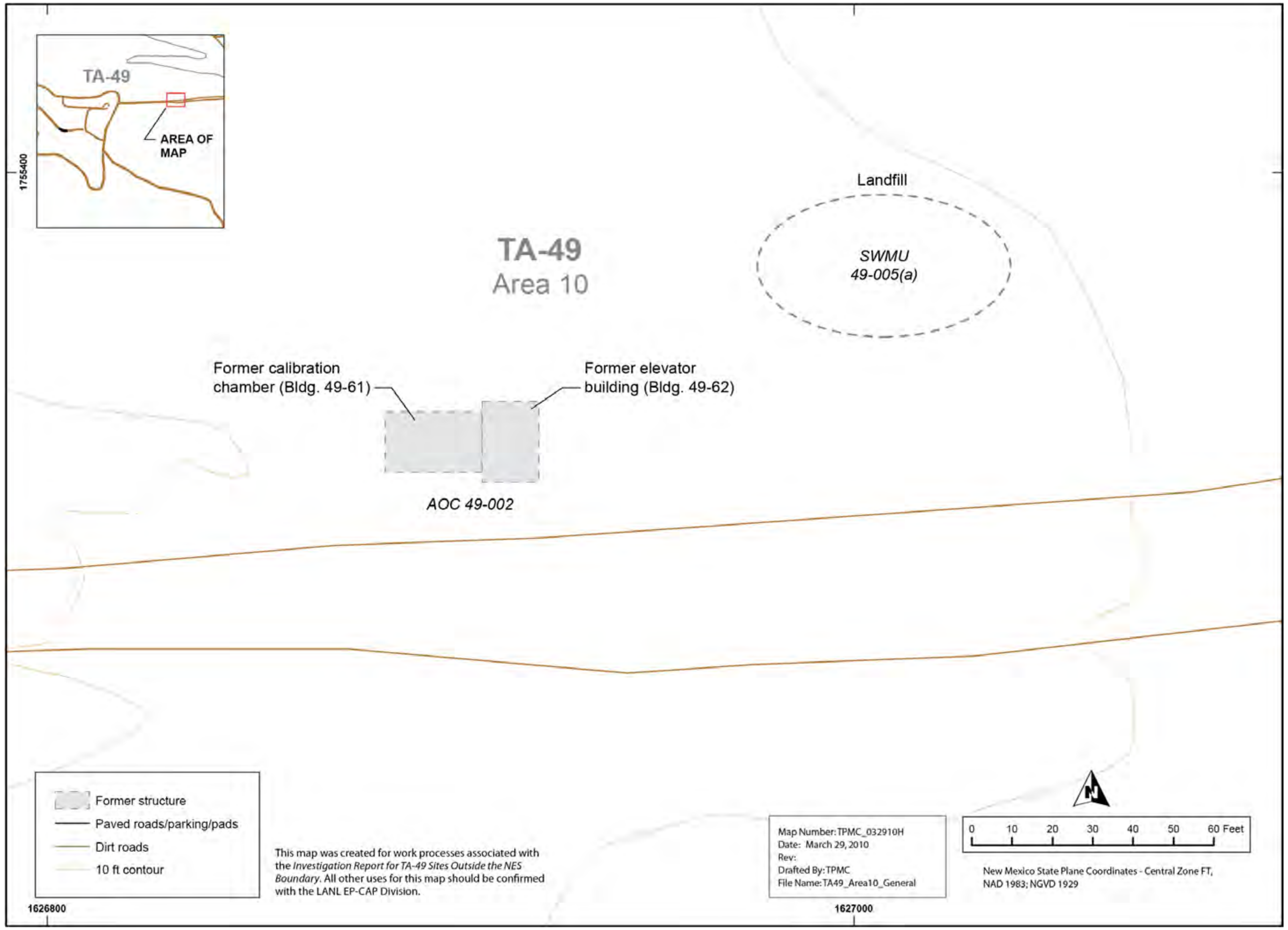

Figure 2.2-1 Site features for Area 10, AOC 49-002 and SWMU 49-005(a)

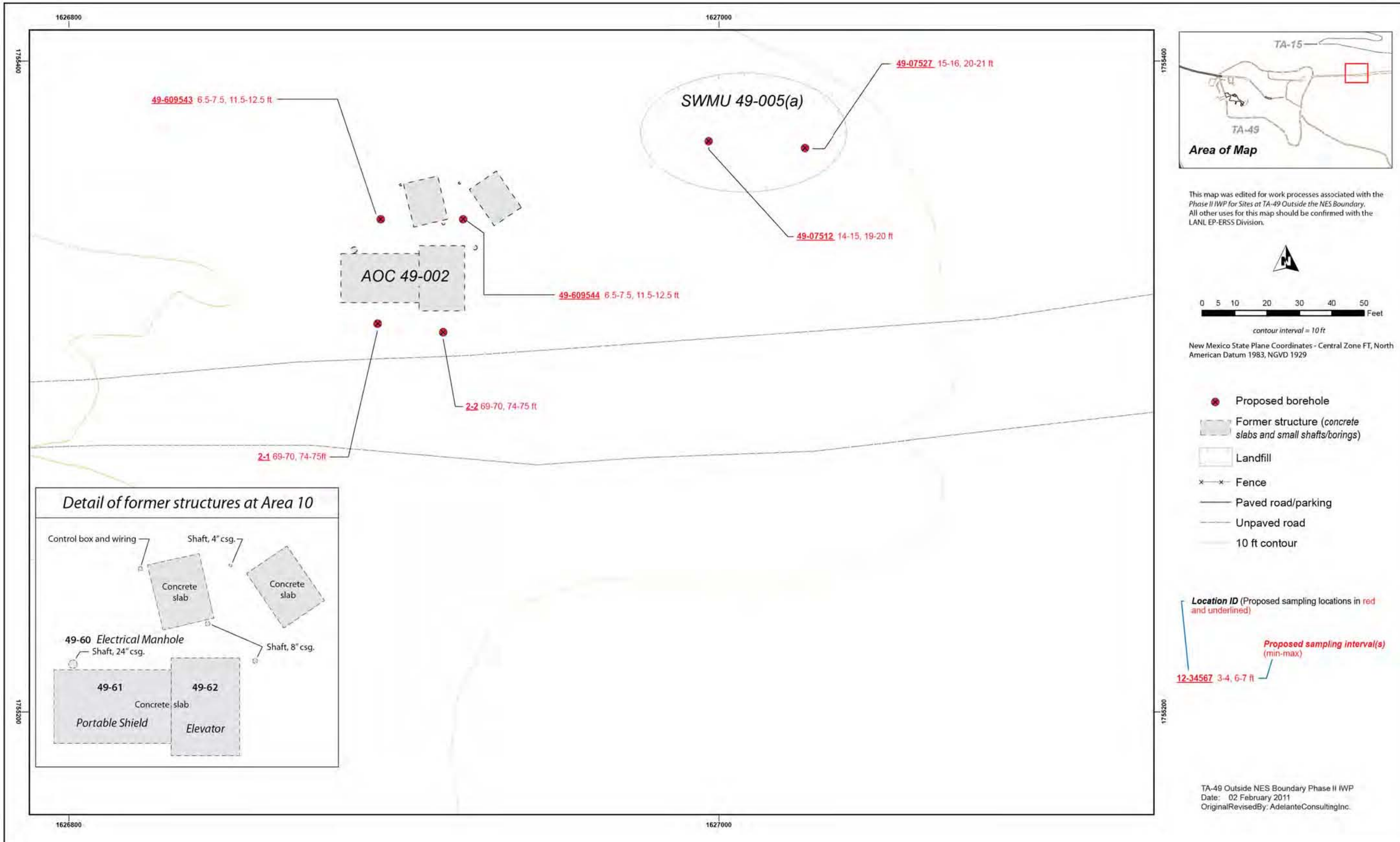

Figure 2.2-2 Proposed locations of subsurface samples at Area 10, AOC 49-002 and SWMU 49-005(a)

Table 1.1-1
Investigation Status of SWMUs and AOCs Located Outside the TA-49 NES Boundary

Area	Site ID	Brief Description	2010 Investigation Results	Phase II Proposed Activities
5	AOC 49-005(b)	Small debris landfill	Extent defined: certificate of completion without controls requested (LANL 2010, 111342)	None; investigation complete
	SWMU 49-006	Former sump	Extent defined: certificate of completion without controls requested (LANL 2010, 111342)	None; investigation complete
	AOC 49-008(a)	Potential soil contamination from historical central control area	Investigation deferred per Table IV-2 of the Consent Order	None
6 East	AOC 49-008(b)	Former general support area with potential contamination	Investigation deferred per Table IV-2 of the Consent Order	None
	AOC 49-007(a)*	Former sanitary septic system	None: NFA approved, 01/21/05; EPA 2005, 088464	None
	AOC 49-007(b)	Former sanitary leach field	None: NFA approved, 01/21/05; EPA 2005, 088464	None
6 West	SWMU 49-004	Inactive open-burning area and landfill	Samples not previously analyzed for dioxins and furans	Additional sampling for nature and extent
10	AOC 49-002	Underground calibration chamber and elevator shaft	Extent not defined: vertical extent for zinc; nature and extent of contamination adjacent to and below the calibration shaft and elevator shaft	Additional sampling for nature and extent
	SWMU 49-005(a)	Inactive small debris landfill	Extent not defined: vertical extent for aluminum and barium	Additional sampling for extent

*Shading denotes no further action (NFA) approved.

Table 2.1-1
Summary of Proposed Sampling at SWMU 49-004

Site	Sampling Extent Objective	Location	Depth (ft)	Media	Dioxins, Furans (EPA SW-846:8280A)
SWMU 49-004	Define extent of any dioxin and/or furan release associated with historical burning activities	12 existing locations, 12 samples within the landfill boundary (49-608962, 49-608964, 49-608966, 49-608967, 49-608968, 49-608970, 49-608977, 49-608981, 49-608982, 49-608984, 49-608997, 49-608998)	0–1	Soil, tuff	X*
		4 existing borehole locations, 8 samples beneath the landfill (49-609882, 49-609883, 49-609884, 49-609885)	13.0 to 14.0 and 20.0 to 21.0 (2–3, 9–10 below bottom of landfill)	Tuff	X
		12 existing locations, 24 samples outside the landfill boundary (49-608986, 49-608987, 49-608988, 49-608989, 49-608990, 49-608991, 49-609000, 49-609001, 49-609002, 49-609003, 49-609007, 49-609008)	0–1, 2–3	Soil, tuff	X

*X = Analysis proposed.

Table 2.2-1
Summary of Proposed Sampling at AOC 49-002

Site	Sampling Extent Objective	Location	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)	Isotopic plutonium, isotopic uranium, americium-241 (HASL-300)	Gamma Spectroscopy (EPA 901.1M)
AOC 49-002	Define vertical extent of contamination for zinc	49-609543, 49-609544	6.5–7.5, 11.5–12.5	Soil, tuff	X[a] (zinc)	—[b]	—
	Two new boreholes within 10 ft of the south side of the calibration shaft and elevator shaft	2-1, 2-2	69–70, 74–75	Tuff	X	X	X

[a] X = Analysis proposed.

[b] — = Analysis will not be performed.

Table 2.3-1
Summary of Proposed Sampling at SWMU 49-005(a)

Site	Sampling Extent Objective	Location	Depth (ft)	Media	TAL Metals (EPA SW-846:6010B/6020)
SWMU 49-005(a)	Define vertical extent of contamination for aluminum and barium	49-07512	14–15, 19–20	Tuff	X* (aluminum and barium)
		49-07527	15–16, 20–21	Tuff	X (aluminum and barium)

*X = Analysis proposed.

Table 3.0-1
Summary of Investigation Methods

Method	Summary
Spade-and-scoop collection of soil samples	This method is typically used to collect shallow (e.g., 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 of less than 10–15 ft, but in some cases may be used for collecting samples of weathered or nonwelded tuff. The method involves hand turning a stainless-steel bucket auger (typically 3–4 in. inside diameter), creating a vertical hole that can be advanced to the desired sampling depth. When the desired depth is reached, the auger is decontaminated before the hole is advanced to the sampling depth. The sample material is transferred from the auger bucket to a stainless-steel sampling bowl before the various required sample containers are filled. Carbon steel auger buckets may be used, particularly in cases where chromium and nickel are the primary constituents of interest and cross-contamination from stainless-steel equipment is a concern.
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 so as to minimize the possibility of breakage during transportation. After all environmental samples are collected, packaged, and preserved; a field team member transports the samples either to the SMO or to an SMO-approved radiation screening laboratory under chain of custody. The SMO arranges to ship samples to the 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 forms 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 sampling locations, sediment sampling locations) are located by using a 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 Sample Management Database.
Field quality control samples	Field quality control samples are collected 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 analysis. *Trip blanks*: Required for all field events that include the collection of samples for VOC analysis. Trip blanks are 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 generating liquid waste. Dry decontamination may include using a wire brush or other tool to remove soil or other material adhering to the sampling equipment, followed by using 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.

Table 3.0-1 (continued)

Method	Summary
Containers and preservation of samples	Specific requirements/processes for sample containers, preservation techniques, and holding times are based on EPA guidance for environmental sampling, preservation, and QA. Specific requirements for each sample are printed on the sample collection logs provided by the SMO (size and type of container [glass, amber glass, polyethylene, preservative, etc.]). 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 IDW	IDW is managed, characterized, and stored in accordance with an approved waste characterization strategy form that documents site history, field activities, and the characterization approach for each waste stream managed. Waste characterization complies with on-site or off-site waste acceptance criteria. All stored IDW will be marked with appropriate signage and labels. Drummed IDW will be stored on pallets to prevent the containers from deterioration. Generators are required to reduce the volume of waste generated as much as technically and economically feasible. Means to store, control, and transport each potential waste type and classification shall be determined before field operations that generate waste begin. A waste storage area will be established before waste is generated. Waste storage areas located in controlled areas of the Laboratory will be controlled as needed to prevent inadvertent addition or management of wastes by unauthorized personnel. Each container of waste generated will be individually labeled immediately following containerization as to waste classification, item identification number, and radioactivity (if applicable),. All waste shall be segregated by classification and compatibility to prevent cross-contamination. See Appendix B for additional information.
Geodetic surveys	This method describes the methodology for coordinating and evaluating geodetic surveys and establishing QA and QC for geodetic survey data. The procedure covers evaluating geodetic survey requirements, preparing to perform a geodetic survey, performing geodetic survey field activities, preparing geodetic survey data for QA review, performing QA review of geodetic survey data, and submitting geodetic survey data.
Hollow-stem auger drilling methods	In this method, hollow-stem augers (sections of seamless pipe with auger flights welded to the pipe) act as a screw conveyor to bring cuttings of sediment, soil, and/or rock to the surface. Auger sections are typically 5 ft in length and have outside diameters of 4.25 to 14 in. Drill rods, split-spoon core barrels, Shelby tubes, and other samplers can pass through the center of the hollow-stem auger sections for collection of discrete samples from desired depths. Hollow-stem augers are used as temporary casings when setting wells to prevent cave ins of the borehole walls.
Direct-push sampling methods	In this method, a tool string is pushed into the ground using the weight of a truck in combination with a hydraulic ram or hammer. Various tool strings can be used for obtaining discrete samples, continuous samples, both discrete and continuous samples, and groundwater samples. The direct-push core samples collected in this investigation are continuous. The inside of the continuous sampler is exposed to the subsurface environment while it is advanced to the sampling interval. This is a dual-tube sampler, so named because it uses two sets of rods to collect soil cores. The outer rods receive the driving force from the hydraulic pushing method and provide a sealed hole from which soil samples may be recovered without the threat of cross-contamination or cave in. The inner set of rods is placed within the outer rods and holds a sampler in place as the outer rods are driven to the sample interval. The inner rods are then retracted to retrieve the soil core.

Table 3.8-1
Summary of Analytical Methods

Analyte	Analytical Method
TAL metals	SW-846:6010B, SW-846:6020, SW-846:7471A (mercury)
Americium-241	HASL-300:AM-241
Gamma-emitting radionuclides	EPA:901.1M
Isotopic plutonium	HASL-300:ISOPU
Isotopic uranium	HASL-300:ISOU
pH	SW-846:9045C
Dioxins/furans	SW-846:8290A

Appendix A

Acronyms and Abbreviations,
Metric Conversion Table, and Data Qualifier Definitions

A-1.0 ACRONYMS AND ABBREVIATIONS

AK	accepted knowledge
amsl	above mean sea level
AOC	area of concern
bgs	below ground surface
Consent Order	Compliance Order on Consent
DOE	Department of Energy (U.S.)
DOT	Department of Transportation (U.S)
EPA	Environmental Protection Agency (U.S.)
FY	fiscal year
GPS	Global Positioning System
IDW	investigation-derived waste
IP	individual permit
LANL	Los Alamos National Laboratory
LLW	low-level waste
MLLW	mixed low-level waste
NES	nuclear environmental site
NMED	New Mexico Environment Department
PID	photoionization detector
PPE	personal protective equipment
QA	quality assurance
QC	quality control
RPF	Records Processing Facility
SCL	sample collection log
SMA	site-monitoring area
SMO	Sample Management Office
SOP	standard operating procedure
SSL	soil screening level
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TA	technical area
TAL	target analyte list
TCLP	toxicity characteristic leaching procedure

VOC	volatile organic compound
WAC	waste acceptance criteria
WCSF	waste characterization strategy form

A-2.0 METRIC CONVERSION TABLE

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)

A-3.0 DATA QUALIFIER DEFINITIONS

Qualifier	Explanation
U	The analyte was analyzed for but not detected. Reported value is the sample-specific estimated quantitation limit or detection limit.
J	The reported value should be regarded as estimated.
J+	The reported value should be regarded as estimated and biased high.
J-	The reported value should be regarded as estimated and biased low.
UJ	The analyte was analyzed for but not detected. Reported value is an estimate of the sample-specific quantitation limit or detection limit.
R	The sample results were rejected because of serious deficiencies in the ability to analyze the sample and meet quality control criteria; presence or absence cannot be verified.

Appendix B

Management Plan for Investigation-Derived Waste

B-1.0 INTRODUCTION

This appendix describes how investigation-derived waste (IDW) generated during the Phase II investigation of sites comprising Technical Area 49 (TA-49) at Los Alamos National Laboratory (LANL or the Laboratory) will be managed. IDW may include, but is not limited to, drill cuttings, excavated media, excavated man-made debris, contact waste, decontamination fluids, and all other waste that has potentially come into contact with contamination.

B-2.0 INVESTIGATION-DERIVED WASTE

All IDW generated during investigation activities will be managed in accordance with the current version of Standard Operating Procedure (SOP) 5238, Characterization and Management of Environmental Program Waste. This SOP incorporates the requirements of applicable U.S. Environmental Protection Agency and New Mexico Environment Department (NMED) regulations, U.S. Department of Energy (DOE) orders, and Laboratory requirements.

The most recent version of the Laboratory’s “Hazardous Waste Minimization Report” will be implemented during the investigation to minimize waste generation. The “Hazardous Waste Minimization Report” is updated annually as a requirement of Module VIII of the Laboratory’s Hazardous Waste Facility Permit.

A waste characterization strategy form (WCSF) will be prepared and approved according to the requirements of SOP-5238. The WCSF will provide detailed information on IDW characterization methods, management, containerization, and potential volumes. IDW characterization is completed through review of investigation data and/or documentation or by direct sampling. Waste characterization may include a review of historical information and process knowledge to identify whether listed hazardous waste may be present (i.e., due diligence reviews). If low levels of listed hazardous waste are identified, a “contained in” determination may be submitted for approval to NMED.

Wastes will be containerized and placed in clearly marked and appropriately constructed waste accumulation areas. If IDW is generated within the boundary of an area of contamination, it will be managed as nonhazardous within those boundaries in designated, properly constructed waste management areas. If hazardous, the IDW will be managed in accordance with hazardous waste requirements once it is removed from the area of contamination. If IDW is generated outside the area of contamination boundaries, the initial management of the waste will rely on the data from previous investigations and/or process knowledge. If new analytical data change the expected waste category, the waste will be managed in accumulation areas appropriate to the final waste determination. 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. The waste streams anticipated to be generated during work plan implementation are described below.

B-2.1 Drill Cuttings

This waste stream consists of soil and rock generated by drilling boreholes with the intent to sample. Drill cuttings include excess core samples not submitted for analysis and any returned samples sent for analysis. Drill cuttings will be containerized in 20 yd^3 rolloff containers, 55-gal. drums, B-12 containers, or other appropriate containers at the point of generation.

Cuttings will be land applied if they meet the criteria in the NMED-approved Notice of Intent Decision Tree for Land Application of Investigation Derived Waste Solids from Construction of Wells and Boreholes.

This waste stream will be characterized based either on direct sampling of the waste or on the results from core samples collected during drilling. If directly sampled, the following analyses will be performed: volatile organic compounds (VOCs); semivolatile organic compounds (SVOCs); cyanide, nitrate, explosives compounds, and perchlorate (if screening and/or process knowledge indicates the presence of explosives); radionuclides identified for each site in the work plan; total metals; and, if needed, toxicity characteristic leaching procedure (TCLP) metals. If process knowledge, odors, or staining indicate that the cuttings may be contaminated with petroleum products, the materials will also be analyzed for total petroleum hydrocarbons and polychlorinated biphenyls (PCBs). Other constituents may be analyzed as necessary to meet the waste acceptance criteria (WAC) for a receiving facility. The Laboratory expects most cuttings will be land applied or disposed of as a PCB-contaminated low-level waste (LLW). However, the waste may also be classified as hazardous, LLW, or mixed low-level waste (MLLW). All drill cuttings will be treated/disposed of at an authorized on-site or off-site facility appropriate for the waste classification.

B-2.2 Contact Waste

The contact waste stream consists of potentially contaminated materials that contacted waste during sampling and excavation. This waste stream consists primarily of, but is not limited, to personal protective equipment (PPE) such as gloves; decontamination wastes such as paper wipes; and disposable sampling supplies. Characterization of this waste stream will use acceptable knowledge (AK) of the waste materials, the methods of generation, the extent of contamination, and analysis of the material contacted (e.g., drill cuttings and soil). The waste will be containerized (e.g., in 55-gal. drums) and managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. The Laboratory expects most of the contact waste to be designated industrial waste or PCB waste. However, the waste may also be classified as hazardous, MLLW, PCB-contaminated LLW, or LLW. All contact waste will be treated/disposed of at an authorized off-site facility appropriate for the waste classification.

B-2.3 Waste/Debris from Borehole Abandonment

This waste stream will consist of polyvinyl chloride casing, bentonite, concrete, soil, and rock from wells and boreholes that are to be abandoned during the Phase II investigation. The waste will be generated when casing is removed or overdrilled during abandonment activities at wells and boreholes. The waste will be containerized (e.g., in 55-gal. drums) and managed in accordance with applicable Laboratory waste management requirements based on the waste characterization results. The Laboratory expects most of this waste to be designated industrial waste. However, the waste may also be classified as hazardous, LLW, MLLW, or PCB-contaminated LLW. Waste generated from well and borehole abandonment activities will be treated/disposed of at an authorized off-site facility appropriate for the waste classification.

B-2.4 Decontamination Fluids

This waste stream will consist of liquid wastes from decontamination activities if dry decontamination cannot be performed. Consistent with waste minimization practices, the Laboratory uses dry equipment 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. The fluids from decontaminating drilling or sampling equipment will be characterized through AK of the waste materials, the levels of contamination measured in the environmental media (e.g., the results of the associated drill cuttings), and, if necessary, direct sampling of the containerized waste. If directly sampled, the following analyses will be performed: VOCs, SVOCs, radionuclides (identified for each site in the work plan), total metals, and, if needed, TCLP metals and other analytes required by the receiving facility (e.g., total suspended solids, Microtox, chemical oxygen demand, oil and grease, pH, nitrates). The Laboratory expects any decontamination liquid waste to be nonhazardous liquid waste or PCB-contaminated liquid waste that will be sent to one of the Laboratory's wastewater treatment facilities or to an authorized off-site facility where the WAC allows the waste to be received.

B-3.0 WASTE MANAGEMENT

All wastes will be managed in accordance with applicable federal, state, DOE, and Laboratory requirements. The IDW waste streams, expected waste types, and expected disposition are listed in Table B-3.0-1.

All waste drums and containers (rolloff bins) will remain at a hazardous waste accumulation area until analytical results have been received and waste characterization has been completed.

Before field-investigation activities begin, a WCSF will be prepared and approved as required by the current version of SOP-01.10, Waste Characterization. The WCSF will provide detailed information about IDW characterization, management, containerization, and potential volume generation.

The IDW will be characterized through existing data and/or documentation, direct sampling of the IDW, or sampling of the media being investigated (e.g., surface or subsurface soil). If sampling is necessary, the procedures will be described in a sampling and analysis plan that will be developed in conjunction with the WCSF.

Some wastes will be characterized on the basis of AK rather than direct waste analysis. The AK characterization will consist of the results of analyzing the environmental media associated with each waste stream. For example, spent PPE and disposable sampling supplies that have potentially come into contact with contaminated media will be characterized based on the analytical results for samples of that media. Similarly, borehole drill cuttings will be characterized by the analytical results for the core samples from that borehole. If decontamination fluids are to be sent off-site for disposal, they will be sampled to demonstrate compliance with the WAC of the receiving facility.

B-4.0 WASTE CONTAINERS AND TRANSPORTATION

The selection of waste containers will be based on both the appropriate U.S. Department of Transportation (DOT) requirements and the type and amount of IDW anticipated to be generated. Immediately following containerization, each waste container will be individually labeled to identify the waste classification, the item identification number, its radioactivity (if applicable), and the date of generation. Waste containers will be managed in clearly marked and appropriately constructed waste accumulation areas. Waste accumulation area postings, regulated storage duration, and inspection requirements will be based on IDW type and classification. The wastes will be stored in accordance with Laboratory hazardous and mixed-waste requirements documents.

Packaging and transportation of IDW will comply with appropriate DOT requirements. Transportation and disposal requirements will be detailed in the WCSF and approved before generating waste.

Table B-3.0-1
Summary of Estimated IDW Generation and Management

Waste Stream	Expected Waste Type	Expected Disposition
Drill cuttings	Industrial Hazardous PCB-LLW LLW MLLW	Land application or treatment/disposal at an authorized on-site or off-site facility
Debris	Industrial Hazardous PCB LLW	Disposal at an authorized off-site facility
Contact waste	Industrial Hazardous PCB PCB-LLW LLW MLLW	Disposal at an approved off-site facility
Waste/debris from borehole abandonment	Industrial Hazardous PCB-LLW LLW MLLW	Disposal at an approved off-site facility
Decontamination fluids	Industrial PCB	Treatment at an on-site wastewater treatment facility or treatment/disposal at an authorized off-site facility