WORK PLAN FOR CORRECTIVE ACTION OF SWMU 73–002 AND INVESTIGATION OF CONSOLIDATED UNIT 73–002–99

Los Alamos National Laboratory, New Mexico
Contract No. DACA05-99-D-0014, Task Order CM26

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Document Approval

DOE Representative

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EXECUTIVE SUMMARY

The purpose of this Work Plan is to provide details on actions to be conducted on behalf of the U.S. Department of Energy (DOE), National Nuclear Security Administration at Consolidated Unit 73–002–99 at Los Alamos National Laboratory, New Mexico.

The actions described in this Work Plan include: (1) corrective action of SWMU 73-002 involving the removal of ash from the south slope of Pueblo Canyon immediately north of the former incinerator, located adjacent to the Los Alamos County Airport, and (2) investigative sampling at Consolidated Unit 73–002–99, comprised of Solid Waste Management Unit (SWMU) 73–002, SWMU 73–004(a), SWMU 73–004(b), SWMU 73–006, and Area of Concern (AOC) 73–003.

The scope of the corrective action at SWMU 73–002 includes the removal of incinerator ash and debris from Pueblo Canyon; collection and analysis of soil samples below the ash area following removal to confirm the remedial action and to provide data necessary to evaluate residual risk to human health and the environment; and subsequent restoration of the site.

The scope of the investigative sampling at SWMU 73–002, SWMU 73–004(a), SWMU 73–004(b), SWMU 73–006, and AOC 73–003 includes the collection and analysis of soil samples to:

- Identify whether contaminants from the ash pile have impacted underlying soils and bedrock, and/or been transported by runoff down slope along drainages, and evaluate the nature and extent of identified contaminants, if any, and
- Supplement the available historic data on contaminants released from former underground features of sites within Consolidated Unit 73–002–99 to better define the nature and extent of contaminants in soils and bedrock.

TABLE OF CONTENTS

LIST OF TABLES/FIGURES/APPENDICES

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

This Work Plan for Corrective Action of Solid Waste Management Unit (SWMU) 73–002 and Investigation of Consolidated Unit 73–002–99 (Work Plan) was developed by Innovative Technical Solutions, Incorporated (ITSI), to describe corrective and investigative actions to be conducted within Consolidated Unit 73–02–009, Miscellaneous Airport Structures, at Los Alamos National Laboratory, New Mexico. This Work Plan was prepared on behalf of the U.S. Department of Energy (DOE), National Nuclear Security Administration.

Los Alamos National Laboratory (LANL or the Laboratory) is a multidisciplinary research facility owned by DOE and managed by the University of California. The Laboratory is located in north-central New Mexico, approximately 60 miles northeast of Albuquerque and 30 miles northwest of Santa Fe. The Laboratory covers 40 square miles of the Pajarito Plateau, which consists of a series of finger-like mesas separated by deep canyons containing perennial and intermittent streams running from west to east. Mesa tops range in elevation between 6200 and 7800 feet above mean sea level (msl).

The SWMUs and AOCs addressed in this investigation work plan are potentially contaminated with both hazardous and radioactive components. The New Mexico Environment Department (NMED) has authority under the New Mexico Hazardous Waste Act (NMHWA) over cleanup of hazardous wastes and hazardous constituents. DOE has authority over cleanup of radioactive contamination. Radionuclides are regulated under DOE Order 5400.5, “Radiation Protection of the Public and the Environment,” and DOE Order 435.1, “Radioactive Waste Management.”

Corrective actions at the Laboratory are subject to the Compliance Order on Consent (hereafter, the Consent Order) entered into on March 1, 2005, by NMED, DOE, the Regents of the University of California, and the State of New Mexico Attorney General (NMED 2005, 88027). The Consent Order was issued pursuant to the New Mexico Hazardous Waste Act (HWA), New Mexico Statutes Annotated (NMSA) 1978, § 74-4-10, and the New Mexico Solid Waste Act (SWA), NMSA 1978, § 74-9-36(D). This work plan describes proposed work activities to be completed in accordance with the Consent Order (NMED 2005, 88027).

The actions described in this Work Plan include: (1) Corrective Action of SWMU 73–002 involving the removal of ash from the south slope of Pueblo Canyon immediately north of a former incinerator, located adjacent to the Los Alamos County Airport, and (2) Investigative Sampling at Consolidated Unit 73–002–99, comprised of SWMU 73–002, SWMU 73–004(a), SWMU 73–004(b), SWMU 73–006, and Area of Concern (AOC) 73–003.

The general site location is shown in Figure 1. Consolidated Unit 73–002–99 and its associated sites are shown on Figure 2.

1.1 GENERAL SITE INFORMATION

The former incinerator building associated with Consolidated Unit 73–002–99 is currently being used for airport-related storage and by Budget Car Rental for storage and automotive detailing. Some areas adjacent to the incinerator building are now used for airport parking.

Historic information relating to Consolidated Unit 73–002–99, including past use of the facilities and previous environmental investigations and remedial actions, is presented in the *Pueblo Canyon Aggregate Area Investigation Work Plan* (LANL, 2005a). This Work Plan provides a brief summary of this historic information in Section 2 to support the discussion of the proposed actions described in this Work Plan.

1.2 PROJECT OBJECTIVES

The primary objectives of the proposed actions described in this Work Plan are the following:

- Remove the ash pile associated with operations of the former incinerator,
- Identify whether contaminants from the ash pile have impacted underlying soils and bedrock, and/or been transported by runoff down slope along drainages, and evaluate the nature and extent of identified contaminants, if any, and
- Supplement the available historic data on contaminants released from former underground features of sites within Consolidated Unit 73–002–99 to better define the nature and extent of contaminants in soils and bedrock.

1.3 PROJECT ORGANIZATION

Key project personnel, their responsibilities, and contact information are listed below. Key personnel and lines of reporting and communication are depicted on Figure 3.

Program Manager: Dan Ledford (925-946-3124)
Project Manager: Kent Dorr (303-420-6325)
Project Superintendent: Jim Cox (925-946-3230)
Corporate Health and Safety Manager: Irene Fanelli, CIH (336-446-0118)

The DOE Project Manager, Mr. David Gregory, will be responsible for overall project execution at LANL, coordination with regulatory agencies, and DOE personnel management. The DOE Project Geologist, Mr. Robert Enz, will be the DOE Point of Contact (POC) for implementation of field activities and has the authority to suspend the project if DOE requirements are not fulfilled.

The ITSI Project Manager, Mr. Kent Dorr, will be the point of contact with USACE and DOE, and will be responsible for project execution and reporting. Mr. Dorr will report to Mr. Dan Ledford, PRAC Program Manager, who will assist Mr. Dorr in coordinating resources within the company to execute work in a timely and effective manner. Ms. Irene Fanelli, Certified Industrial Hygienist (CIH), is the ITSI Corporate Health and Safety Program Manager, and Mr. Jim Schollard is the ITSI Program Contractor Quality Control System Manager. Mr. Kevin Konzen, the ITSI Certified Health Physicist (CHP), will be on site periodically, be available as a consultant at all other times, and act as the interface between ITSI and the LANL Radiation Safety department. Either Mr. Konzen or another member of the ITSI radiation safety staff will visit the site on a weekly basis to support site personnel for questions or problems relating to radiological hazards during field activities.

Reporting directly to the Project Manager will be Mr. Jim Cox, who will serve as both the Site Superintendent (SS) and the Contractor Quality Control System Manager (CQCSM). Mr. Cox will be responsible for all field activities (including managing labor and subcontractors, field performance, site health and safety issues, and sampling, testing, and inspections), and for maintaining the level of quality control required under the terms of the contract. Mr. Cox will be on site during all field activities, with full authority and control over all aspects of field performance to execute all activities in compliance with project requirements. The ITSI labor

force, subcontractors, material suppliers, and vendors will report directly to Mr. Cox in the field. As the CQCSM, Mr. Cox will work closely with the Project Manager and Site Health and Safety Officer (SHSO) to ensure the quality of work, maintain quality data, and ensure performance in accordance with contract requirements.

The Site Health and Safety Officer will assist the Project Manager in health and safety and quality management on this project. The SHSO will implement the SSHSP and ensure that a safe working environment is maintained. In addition, the SHSO will work with the Project Manager, Site Superintendent and CHP to ensure compliance with federal, state, and local, laws, rules, and regulations, and USACE/DOE requirements.

The Project Manager will have administrative support from the Contract Administrative Manager to procure subcontracts, lease agreements and purchases, and administer subcontracts. The Project Manager will also be supported by the ITSI Cost and Schedule Specialist, which will update the schedule and provide regular cost reports.

Subcontractors shall comply with the requirements of the ITSI quality management plan and Site-Specific Health and Safety Plan while conducting their scopes of work. Each subcontractor is required to become familiar with ITSI's Quality Management Plan (QMP) and Site-specific Health and Safety Plan (SSHSP), and document this understanding and compliance. The SS will provide oversight and ensure the compliance of all subcontractors. It is of utmost importance that all project goals are achieved in an appropriate manner, especially with regard to worker health and safety and environmental impact. Any events, actions, or conditions that potentially affect worker health and safety or impact the environment shall be reported to ITSI’s Project Manager immediately for resolution.

Currently anticipated subcontractors and their planned roles include the following:

- Keers Remediation will perform the vacuum removal of the incinerator ash from the slope.
- Swaggart Enterprises will install and operate the skyline system and provide the labor necessary for the installation and operation.

- Kemp West will provide and operate the Spyder excavator that may be used to excavate material from the sloped canyon wall, if required.

Subcontractors may be changed or replaced, depending on availability and best-value determinations.

The LANL Sample Management Office (SMO) will submit samples for laboratory analysis for the confirmation and verification samples collected.

1.3 ORGANIZATION OF THIS DOCUMENT

This Work Plan serves a dual role of documenting the proposed activities relating to the corrective action at SWMU 73–002 and the subsequent investigatory sampling of Consolidated Unit 73–002–99. As such, this WP differs from the previously submitted Work Plan to account for the additional elements associated with the expanded investigatory sampling of SWMU 73–002, SWMU 73–003, SWMU 73–004(a), SWMU 73–004(b), and AOC 73–006, as requested by the NMED. Historical information on all the sites in Consolidated Unit 73–002–99 were added, even though covered in the *Pueblo Canyon Aggregate Area Investigation Work Plan* (LANL, 2005), along with work elements for the expanded post-removal investigatory sampling covering the added sites.

Appendix A provides a list of acronyms and glossary of terms used in this work plan. Appendix B, Investigation-Derived Waste Management Plan, describes procedures for the management and disposition of waste generated during project activities.

2.0 BACKGROUND

This Work Plan addresses Consolidated Unit 73–002–99, which is comprised of Potential Release Sites (PRS) SWMU 73–002, SWMU 73–003, SWMU 73–004(a), SWMU 73–004(b), and AOC 73–006. These sites are shown on Figure 2, and discussed below. Available results from previous sampling efforts for SWMU 73–002 are provided in the Historical Investigation Report (HIR) for SWMU 73–002 submitted under separate cover and included as Tables 1-6 of this Work Plan. Available results of previous sampling efforts for SWMU 73–003, SWMU 73–004(a), SWMU 73–004(b), and AOC 73–006 were included in *Pueblo Canyon Aggregate Area Investigation Work Plan* (LANL, 2005a).

2.1 SWMU 73–002, ASH DISPOSAL AREA

SWMU 73–002 is an ash pile associated with a small incinerator operated at the site for a short time beginning in 1947. The incinerator was housed in a two-story concrete building (73-2) on the north side of the current parking lot at the Los Alamos County Airport, northwest of the airport terminal building, as shown in Figure 2. The second floor of this structure is level with the current parking lot. A 6-foot diameter stack was located behind the building. Immediately north of the building and extending over the edge of Pueblo Canyon are two concrete landings that were used to dump the ash and unconsumed metal and glass generated by the incinerator operations into the canyon.

The incinerator's primary use was the destruction of classified documents; however, it did not function properly and was removed from service shortly after completion. In 1948, the facility was acquired by the Zia Company, which held it until 1973 and used the incinerator for other than classified sanitary waste, such as municipal trash from the townsite. The incinerator stack and equipment were removed prior to 1973, and the building is currently used for storage.

The ash pile generated by incinerator operations is located on the south slope of Pueblo Canyon, immediately north of the incinerator building. The ash and debris has been estimated to cover an area of approximately 30,000 square feet, and range in thickness from less than one foot to more than eight feet. During recent ash characterization activities conducted in preparation for

removing the ash, a limited survey of the location and thickness of ash indicated that the ash pile covers approximately 11,000 square feet and consists of approximately 1,650 cubic yards of ash. The extended debris field covers an additional area of approximately 19,000 square feet.

The incinerator's ash pile and associated drainages were sampled in 1996, 1997, and 1998. Elevated levels of organic chemicals, metals, and radionuclides were reported in the ash samples (LANL 2005a, p. 71). Sample locations for these events are shown on Figure 4, and the available data are presented in Tables 1, 3, and 5.

2.1.1 Characterization Sampling

To provide current results for purposes of proper characterization of the waste material for disposition during the current action, additional sampling of the ash was conducted in April 2005. The sampling was performed based on a 30-foot grid pattern with one or two samples taken within each grid unit within the ash profile, depending on the thickness of the ash, to represent approximately one sample per 100 cubic yards of material (see Figure 4 for sample locations and Tables 2, 4, and 6 for a summary of analytic results). Samples representative of the full thickness of the ash were collected by hand auger from each grid unit to represent the full lateral and vertical extent of ash. The suite of analyses requested was based on requirements from potential receiving facilities, and included volatile and semi-volatile organic compounds, PCBs, dioxins/furans, metals, radionuclides, and selected physical results.

2.2 SWMU 73–004(A), SEPTIC SYSTEM

SWMU 73–004(a) was a concrete septic tank, located adjacent to the northwest corner of the incinerator building, that received waste from toilets and showers in the incinerator building. The septic tank drained to Pueblo Canyon. The tank was removed in August 1996 as a Voluntary Corrective Action (VCA) (LANL 1996, 59374, p. 9; cited in LANL 2005a, p. 68). The inlet and outlet drain lines were not removed as part of the VCA.

Samples collected in 1996 beneath the septic tank, associated piping, and outfall were reported to contain low levels of some metals (e.g., lead), pesticides (e.g., DDT), and polycyclic aromatic hydrocarbons (PAHs) (e.g., fluoranthene) (LANL 1998, 62522, p. 15).

2.3 SWMU 73–004(B), SEPTIC SYSTEM

SWMU 73–004(b) was a concrete septic tank that received wash water from floor drains in the steam-cleaning facility associated with AOC 73–003. The tank was located approximately 90 feet northwest of the steam-cleaning facility. The tank was exposed during RCRA Facilities Investigation (RFI) activities in 1996, and removed in August 1996 as a VCA (LANL 1996, 59374, p. 27; cited in LANL 2005a, p. 68).

Samples collected in 1996 beneath the septic tank, associated piping, and outfall were reported to contain low levels of some metals (e.g., lead), with only the sample from the outfall containing metals notably above background values (LANL 1998, 62522, p. 14). Low levels of pesticides and PAHs were also reported in samples beneath the piping and outfall (LANL 1998, 62522, p. 15).

2.4 SWMU 73–006, INCINERATOR DRAIN LINES

SWMU 73–006 consists of two drain lines that discharged to Pueblo Canyon from floor drains on the east and west sides of the incinerator building. The drains are presumed to have handled wash water during the time that the incinerator was operational. The west drain line was removed in July 1997 as part of an RFI. The east drain line could not be located at the time of the RFI, and it was postulated the line was previously removed during installation of utilities. The inlets have been plugged with concrete (LANL 1998, 62522, p. 27; cited in LANL 2005a, p. 69).

Samples collected in 1996–1997 beneath the west drain line and outfall were reported to contain metals, pesticides, PAHs, and radionuclides. The outfall samples were collected from within the ash, and the results may be more indicative of the ash than of discharge from the drain lines (LANL 1998, 62522, p. 34).

2.5 AOC 73–003, STEAM CLEANING PLANT

AOC 73–003 was a 50-foot by 30-foot concrete block structure on a concrete slab used for steam-cleaning trash cans and dumpsters used to collect municipal waste from the Los Alamos townsite. The facility consisted of a drive-through bay for cleaning garbage trucks, an enclosed system for cleaning garbage cans, an unloading area, a heater room, and an office. Water was

collected by three 14-inch floor drains and piped to a septic tank (SWMU 73–004(b)) that drained to Pueblo Canyon through a six-inch pipe.

This facility was removed in 1971 (LANL 1992, pp. 3-11). This site is currently located beneath the asphalt parking lot northwest of the terminal building of the Los Alamos County Airport (LANL 2005a, p. 68), as shown on Figure 2.

2.6 SITE CONCEPTUAL MODEL

The Site Conceptual Model, as discussed in the *Pueblo Canyon Aggregate Area Investigation Work Plan* (LANL, 2005a), is based on the existing knowledge about the site and describes potential contaminants, environmental media to which potential human or ecological receptors may be exposed, media through which chemicals may be transported to potential receptors, and any relevant off-site transport mechanisms. The Site Conceptual Model for Consolidated Unit 73–002–99 includes both surface and subsurface sources of potential contamination.

2.6.1 Source of Contamination

Contamination at Consolidated Unit 73–002–99 may have originated from sewage flow from the various septic systems (SWMUs 73–004[a] and 73–004[b]), the ash pile downslope of the incinerator building (SWMU 73–002), and water from the drains in the wash area (AOC 73–003) and incinerator building (SWMU 73–006).

2.6.2 Transport Mechanisms

The following transport mechanisms may lead to the exposure of human and/or ecological receptors:

- Dissolution and/or particulate transport of surface contaminants during rainfall and snow melt runoff events
- Airborne transport of contaminated surface soils and/or ash pile
- Continued dissolution and advective/dispersive transport of chemicals in surface/subsurface soil
- Biotic perturbation and translocation of contaminants in subsurface soil

2.6.3 Potential Receptors and Exposure Pathways

The following current and potential future human receptors could reasonably be expected to be present at Consolidated Unit 73–002–99:

- Offsite Residents
- Site Workers
- Recreational Users

2.6.3.1 Human Receptors

The potential pathways for human exposure to surface soil and tuff are dermal contact, inhalation of particulates, and incidental soil ingestion. These pathways would be complete for the portion of Consolidated Unit 73–002–99 located on the slope of the canyon, but would be complete for the portions located at the top of the mesa only if the pavement cover were removed and contaminated soil or tuff were excavated and brought to the surface. Pathways from subsurface contamination to potential human receptors would be complete only if contaminated soil or tuff were excavated and brought to the surface.

2.6.3.2 Ecological Receptors

Terrestrial ecological receptors are expected to be present at Consolidated Unit 73-002-99. For ecological receptors, pathways from surface contamination to potential surface-dwelling animals would include dermal contact, inhalation of fugitive dust, incidental ingestion of soil, uptake by plants, and food web transport. Pathways would be complete for the portion of Consolidated Unit 73-002-99 located on the slope of the canyon, but incomplete for the portions located at the top of the mesa beneath pavement. Pathways from subsurface contamination may be complete for plants and burrowing animals, including the uptake of contaminants by plant roots and the exposure of burrowing animals through dermal contact, inhalation of dust, incidental ingestion of soil, and food web transport.

2.6.3.3 Groundwater

Exposure to groundwater at Consolidated Unit 73-002-99 is an incomplete pathway for both human and ecological receptors. No groundwater wells or groundwater seeps have been identified within the Consolidated Unit, and groundwater is much deeper than the maximum root depth for the native plants present within the Consolidated Unit. Although precipitation events may result in the intermittent short-term presence of surface water, exposure to surface water is

an incomplete pathway for both human and ecological receptors because no perennial surface water bodies exist at the site.

3.0 SITE CONDITIONS

This section describes the current surface features and the existing subsurface geologic characteristics of the Pueblo Canyon area. Consolidated Unit 73–002–99 is located on a mesa-top setting, and the known surface and subsurface characteristics of this setting and their potential effects on the occurrence and concentration of contaminants include:

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

These and other elements of the environmental setting in the Pueblo Canyon aggregate area were considered when evaluating site investigation data with respect to the fate and transport of contamination from historical site activities.

3.1 SURFACE CONDITIONS

The elevation of Consolidated Unit 73–002–99 ranges from about 6,900 ft to 7,150 feet above msl, with the bottom of Pueblo Canyon approximately 6,600 feet above msl. The surface conditions at Consolidated Unit 73-002-99 vary, with two sites (SWMU 73–004[b] and AOC 73–003) located beneath the asphalt parking lot for the Los Alamos County Airport, two sites located adjacent to Pueblo Canyon (SWMU 73–004[a] and SWMU 73–006) on a relative flat bench, and one (SWMU 73–002) located on the steeply sloping southern canyon wall of Pueblo Canyon.

The general area around SWMU 73–002 contains a significant amount of debris such as metal posts, car fenders, cans, and broken glass–similar to a landfill dump. The ash pile itself is soft but supports workers walking on it. The area is steep; some sections of the canyon wall are greater than a 70-degree slope. The area has brush, plants and small trees located in the vicinity of the ash pile. At the bottom perimeter of the ash, several feet of cans and debris are perched above a bench along the face of Pueblo Canyon. Below this bench, there is some evidence of

trace amounts of ash that follow normal drainage that stops well before a second bench. There is more debris above this second bench and some below. Site topography and drainage pathways are shown on Figure 5.

3.1.1 Surface Water

Mesas of the Pajarito Plateau are generally dry, both on the surface and within the bedrock forming the mesa. Canyons range from wet to relatively dry; the wettest portions of Pueblo Canyon contain persistent alluvial groundwater saturation with persistent, but discontinuous, surface water.

The surface water and alluvial groundwater hydrology of the Pueblo Canyon watershed is related to several primary factors, including the location and discharge volume of natural and anthropogenic water sources, seasonal events (e.g., snowmelt runoff and storm-water runoff), and general regional climatic conditions (LANL 2005a, pp. 76-77).

None of the four SWMUs and one AOC in Consolidated Unit 73-002-99 are directly associated with stream channels, however, several drainages from the mesa top are presently associated with SWMU 73–002. Generally, surface water flow is associated with storm water and snowmelt runoff from mesa-top sites.

3.1.2 Soil

Two of the five sites within Consolidated Unit 73-002-99 (SWMU 73–004[b] and AOC 73–003) are located in the parking lot of the airport at the top of the mesa. Undisturbed surface soil cover is expected to be limited because of construction activities relating to the airport and parking lot. The surface material at these two sites is likely fill, which may be crushed tuff, disturbed soil, or other kinds of imported material.

Two other sites (SWMU 73–004[a] and SWMU 73–006) are located on a bench on the southern canyon wall of Pueblo Canyon. Surface soil cover is also expected to be limited because of construction activities relating to the incinerator building, access road, and the supporting facilities. The remaining site (SWMU 73–002) is located on the southern slope of Pueblo

Canyon. A relatively well-developed soil horizon may be encountered, except in areas of high vertical relief.

3.2 SUBSURFACE CONDITIONS

3.2.1 Stratigraphy

The generalized stratigraphy in the Pueblo Canyon area consists of Bandelier Tuff (Qbt) (forming the mesa tops) overlain by a thin layer of alluvium and soil. The Bandelier Tuff unit is subdivided into two members, the Otowi and the Tshirege (in ascending order). Under the mesa-top sites, the Otowi and Tshirege Members are separated at about 340 feet bgs by the Cerro Toledo interval (Qct), a 10- to 40-foot-thick sequence of volcaniclastic sediments and primary fallout deposits. The basal Guaje Pumice Bed of the Otowi Member separates the Bandelier Tuff from the underlying clastic fanglomerate sediments of the Puye Formation (Tp).

The Tshirege Member, the shallower member of the Bandelier Tuff, is a compound cooling unit subdivided into four distinct units: Qbt 4, Qbt 3, Qbt 2, and Qbt 1v/1g. The Upper Tshirege, including Qbt 4 and Qbt 3, is a cliff-forming non-welded to partially welded tuff and underlies most of the SMWUs at LANL; this is the most likely unit to be encountered beneath the ash debris and was identified in samples collected during previous investigations at SWMU 73–004(b) (LANL 2005a, p. 77).

3.2.2 Hydrogeology

The depth to groundwater in the regional aquifer beneath the Pueblo Canyon area is greater than 1,000 feet bgs. Discontinuous areas of perched alluvial and intermediate groundwater also exist at depths of 100 to 250 feet bgs. These saturated zones, which are expected to form mainly at subsurface horizons where lithologic properties change, have been observed within the Puye Formation during installation of wells outside the footprint of Consolidated Unit 73–002–99.

4.0 SCOPE OF ACTIVITIES

The scope of this Work Plan includes both corrective action activities for removal of the ash pile at SWMU 73–002 adjacent to the current Los Alamos County Airport and investigative sampling at each of the sites within Consolidated Unit 73–002–99.

The activities identified in this Work Plan will be conducted in two phases: (1) removal of the ash pile at SWMU 73–002, including debris associated with the ash and other topical debris in the general area, and (2) post-removal confirmation sampling at SWMU 73–002 followed by investigative sampling at SWMU 73–002, SWMU 73–004(a), SWMU 73–004(b), SWMU 73–006, and AOC 73–003.

In order to provide full access for investigative sampling activities, the investigative sampling activities will occur after removal of the ash pile is complete, as outfalls associated with two SWMUs (SWMU 73–004[b] and SWMU 73–006) are directly impacted by the ash.

4.1 CORRECTIVE ACTION AT SWMU 73–002

The primary activities involved in the removal of the ash pile include:

- Mobilize crew and equipment
- Prepare equipment lay-down and staging areas
- Remove vegetation
- Survey existing topography prior to removal actions
- Establish haul routes and traffic control
- Remove topical debris from general area of SWMU 73–002
- Remove ash and associated debris from SWMU 73–002
- Manage and dispose of investigation-derived wastes
- Conduct post-removal inspection and topographical survey
- Perform site cleanup activities
- Conduct investigative sampling of SWMU 73–002 after removal of the ash pile
- Conduct post-sampling inspection
- Perform required restoration activities.

The above activities are discussed in more detail in Section 5.0.

4.2 INVESTIGATIVE SAMPLING AT CONSOLIDATED UNIT 73–002–99

Investigative sampling will be performed at each of the sites comprising Consolidated Unit 73–002–99 consistent with the planned sampling efforts associated with SWMU 73–002. However, given the differences between sites, the sampling schemes will be specific to each site based on the historic use and available historic data as presented in the Pueblo Canyon aggregate Area Investigation Work Plan (LANL, 2005a) and summarized below.

Sample results will be compared to published values obtained from "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory" (LANL, 1998a). The sampling criteria for each of the sites are discussed below and summarized in Table 7.

4.2.1 SWMU 73–002, Ash Disposal Area

To verify completion of the removal process, and to evaluate whether contaminants have migrated into the soils and tuff below the ash pile, or been transported by runoff down slope along drainages, samples will be collected from specified locations within the former footprint of the ash pile at SWMU 73-002 and from identified drainages, following removal of the ash pile. The full extent of the footprint will be determined during the removal action, and the sampling grid will be adjusted to insure the entire footprint is covered, with at least one grid unit extending beyond the footprint in each direction.

An example grid is shown on Figure 5, and is based on a 30-foot by 30-foot grid covering the full footprint of the ash pile. Up to three samples will be collected from each sample location from within the former footprint of the ash pile, depending on the nature of the substrate at each location: one surface soil sample, one soil sample from the soil/tuff interface (the first 6 inches of soil immediately above the rock surface), and a core sample of the underlying tuff. Due to the steep slopes and nature of the removal action, some sample locations may have no soil cover. At these locations, only the tuff will be sampled consisting of one surficial sample and one sample from 1-2 feet into the tuff.

In addition, surface sediment samples will be collected on the basis of one sample per 100 lineal feet along each of the three drainages identified at the site. Samples will be collected beginning at the top of the slope (starting at the base of the ash pile) and continue to the toe of the alluvium. Sediment sample collection will be biased towards areas of fine-grained sediment in outfall channels or pockets of sediment accumulation in the drainages.

Samples will be analyzed for VOCs, SVOCs, Pesticides, PCBs, explosives, dioxins/furans, metals, and radionuclides (by gamma spectroscopy), plus pH, cyanides, nitrates, and perchlorate.

4.2.2 AOC 73–003, Steam Cleaning Plant

Additional sampling is proposed to supplement the limited historic results available. The previous samples were analyzed for VOCs, SVOCs, pesticides, PCBs, and Target Analyte List (TAL) metals (LANL 1998b, 62522, p. 22), and the available results identified lead above background and trace levels of DDD, DDE and DDT in one or more of the samples. The lateral and vertical extent of contamination will be evaluated through a series of borings as shown on Figure 6 and discussed in Table 7, based off known coordinates for the previous sampling locations.

The site is presently paved. Samples will be collected at least 2 feet into the original fill (below the asphalt and base rock) to approximate the depth of the floor drain system; at the fill/tuff interface; and from 1-2 feet into the tuff. Samples will be analyzed for VOCs, SVOCs, Pesticides, PCBs, metals, and radionuclides, plus pH, cyanides, nitrates, and perchlorate. The past site use of AOC 73–003 as a truck and container cleaning facility for municipal trash operations. Dioxins/furans, generated typically as a byproduct of combustion, and explosives, are inconsistent with past site use and will not be analyzed for in samples from this AOC.

4.2.3 SWMU 73–004(a), Septic System

Additional sampling is proposed to supplement the limited historic results available. The previous samples were to be analyzed for VOCs, SVOCs, pesticides, PCBs and TAL metals (LANL 1998b, 62522, p. 44), and the available results identified low levels of metals, pesticides, and PAHs in several samples. The lateral and vertical extent of contamination will be evaluated

through a series of borings as shown on Figure 7 and discussed in Table 7, based off known coordinates for the previous sampling locations.

The site is located on an unpaved bench at the side of Pueblo Canyon. Samples will be collected at approximately 7 feet into the fill to approximate the depth of the septic tank; approximately 2 feet into the fill to approximate the depth of the piping; at the fill/tuff interface; and from 1-2 feet into the tuff. Samples will be analyzed for VOCs, SVOCs, Pesticides, PCBs, dioxins/furans, explosives, metals, and radionuclides, plus pH, cyanides, nitrates, and perchlorate.

4.2.4 SWMU 73–004(b), Septic System

Additional sampling is proposed to supplement the limited historic results available. The previous samples were analyzed for SVOCs, pesticides, PCBs and TAL metals (LANL 1998b, 62522, p. 22), and the available results identified low levels of metals (above background at the outfall) and low levels of pesticides and PAHs in several samples. The lateral and vertical extent of contamination will be evaluated through a series of borings as shown on Figure 6 and discussed in Table 7, based off known coordinates for the previous sampling locations.

The site is presently paved. Samples will be collected at least 8 feet into the original fill (below the asphalt and base rock) to the approximate the depth of the septic tank and piping beneath the top of the mesa (shallower for inlet piping samples and outfall piping samples off the top of the mesa); at the fill/tuff interface; and from 1-2 feet into the tuff. Samples will be analyzed for VOCs, SVOCs, Pesticides, PCBs, metals, and radionuclides, plus pH, cyanides, nitrates, and perchlorate. This SWMU received the effluent from the steam cleaning facility in AOC 73–003 used in municipal trash operations. As such, dioxins/furans, generated typically as a byproduct of combustion, and explosives, are inconsistent with past site use and will not be analyzed for in samples from this SWMU.

4.2.5 SWMU 73–006, Incinerator Drain Lines

Additional sampling is proposed to supplement the limited historic results available. The previous samples were analyzed for VOCs, SVOCs, pesticides, PCBs, TAL metals, dioxins/furans, and radionuclides (LANL 1998b, 62522, p. 44), and the available results

identified metals, pesticides, PAHs, and radionuclides in several samples. The lateral and vertical extent of contamination will be evaluated through a series of borings as shown on Figure 7 and discussed in Table 7, based off known coordinates for the previous sampling locations.

The site is located on an unpaved bench at the side of Pueblo Canyon. Samples will be collected approximately 2 feet into the fill to approximate the depth of the drain line; at the fill/tuff interface; and from 1-2 feet into the tuff. Samples will be analyzed for VOCs, SVOCs, Pesticides, PCBs, metals, dioxins/furan, explosives, and radionuclides, plus pH, cyanides, nitrates, and perchlorate.

5.0 INVESTIGATION METHODS

The methods presented in this section again include both corrective action activities for removal of the ash pile at SWMU 73–002, adjacent to the current Los Alamos County Airport, and investigative sampling at each of the sites within Consolidated Unit 73–002–99.

5.1 CORRECTIVE ACTION METHODS

5.1.1 Mobilization

Mobilization and site preparation activities include setup of a field trailer for ITSI personnel; placement of sanitation facilities; location of underground utilities; connection of utilities to the field trailer; establishment of staging areas; and mobilization of health and safety and sampling equipment. Secured storage containers will be mobilized to the job site as needed to store materials, small tools, and equipment.

A Pre-Construction meeting (i.e., Readiness Review) will be conducted prior to the start of field activities. This meeting may be attended by personnel representing LANL, DOE, USACE, ITSI, and key subcontractors, and will address the scope of work, lines of communication, health and safety, public relations, and contract requirements to be fulfilled.

Project activities to be discussed at the Readiness Review will include:

- Mobilization and demobilization of equipment
- Preparation of equipment lay-down and staging areas
- Vegetation removal
- Topographic surveying
- Equipment certification and inspections
- Haul routes and traffic control
- Daily work schedules and health and safety requirements
- Photographic documentation of the site and project activities
- Removal of ash and debris from the slopes
- Sampling and characterization of any unknown sludges or liquids encountered during the removal
- Management and disposal of investigation-derived wastes
- Confirmatory soil sampling after ash/debris removal
- Investigatory sampling procedures
- Post-removal and post-sampling inspections
- Site cleanup and restoration activities.

5.1.2 Site Layout and Security

The ITSI field trailer and container storage unit(s) will be set up near the work area as approved by the airport representative with concurrence from the Los Alamos County representative. Tentative locations for project trailers and storage facilities are shown on Figure 8. Exact locations will be determined prior to mobilization based on field conditions such as proximity to utilities (water, electricity, phone, and sewer) and work areas.

ITSI will establish utilities and infrastructure to support project activities as follows:

- Portable toilets, refuse containers, and hand-washing facilities will be set up near the office trailer and work areas.
- Potable water also will be available in the area of the office trailer.
- Local electrical lines will be used to provide power to the office trailer.
- Telephone lines will be installed at the office trailer for telephone service, faxing, and computer connections.

Access to the work site will be restricted to LANL, DOE, ITSI, and subcontractor personnel. ITSI project signs will be mounted at the site entrances near the site access.

The staging/storage area boundary will be secured by a temporary security fence. The access point to the staging area will be posted and locked to prevent unauthorized entry. Active work areas will be demarcated with temporary plastic fencing or other means. The ITSI Site Superintendent will be the field point of contact for public relations and will refer any public relations questions/issues to the USACE and DOE Project Manager.

5.1.3 Daily Work Schedule

On-site work hours will be 7:00 AM to 6:00 PM. The typical work week will be Monday through Friday, with Saturday as an optional work day to make up for any delays. ITSI will notify LANL/DOE 24 hours in advance of any work to be conducted on Saturdays. The above working hours do not pertain to off-site activities such as office work, mobile lab work, morning safety meetings, or off-site trucking and disposal.

5.1.4 Equipment Certification and Inspection

Prior to initial on-site use, equipment will be inspected and tested by the equipment operator or manufacturer's representative. Certification in writing that the equipment is operating within the

manufacturer's tolerances and specifications, is in safe operating condition, and complies with applicable safety requirements of the contract will be obtained and maintained in the site office. Daily equipment inspections will be documented with the daily Quality Control (QC) reports.

5.1.5 Permits, Notifications, and Utility Clearance

ITSI will make formal notifications to DOE, USACE, Los Alamos County, and Airport Operations personnel before field activities are initiated. DOE will then notify NMED at least 15 days prior to the start of field work.

Underground Service Alert will be notified a minimum of 2 days prior to intrusive activities for the access road and securing the office trailer so that utility companies can verify that no underground conduits or pipes are located in the work or support areas.

5.1.6 Haul Routes and Traffic Control

Both on-site personnel and off-site truck traffic will proceed to work areas (e.g., removal locations, sampling locations, applicable stockpile storage areas, etc.) over existing roads where possible. An additional access road will be constructed east of the incinerator building to connect with the existing roadway (see Figure 8).

Haul routes and traffic control measures will be established to control and minimize soil dispersion by vehicle transport and runoff during wet weather. In addition, project activities and traffic on and adjacent to haul routes will be coordinated with the Los Alamos County Engineer and other area contractors to minimize potential work delays due to uncontrolled traffic.

Prior to start of construction activities, ITSI will:

- Coordinate the proposed traffic route with the Los Alamos County Engineer,
- Identify other on-site contractors, and
- Meet with the Los Alamos County Engineer to ensure that impacts to airport operations are minimized during ash removal activities and to coordinate haul routes and equipment traffic.

5.1.7 Photographic Documentation

Before, during, and after photographs will be taken to document project activities and to record existing vegetation density in and adjacent to the removal area. Photographs will be taken of the following: typical ash area with debris, ash area during removal, ash area at completion of removal, and locations of confirmation sample locations. In addition, photographs will be taken of runoff and dust prevention measures implemented during field activities.

5.1.8 Vegetation Removal

Work areas will be cleared of vegetation and incidental debris as needed. Shrubs and brush within the clearing limits will be removed and disposed of with the debris or ash, depending on where the vegetation was removed from. It is currently anticipated that no trees over 8 inches in diameter will be encountered within the work area. If larger trees are identified, ITSI will coordinate with the Los Alamos County Engineer and the LANL Environmental Representative for permission to remove the trees.

5.1.9 Topographic and GPS Surveys

Pre- and post-removal surveys will be conducted to document the thickness of the layer of materials removed from the site and record any significant intrusive activity during investigative sampling. The post-removal elevations will provide the as-built contours after ash removal.

All vertical surveying will reference North American Vertical Datum (NAVD) 1988 benchmarks. Each survey point within the ash pile area will be located using a global positioning satellite (GPS) coordinate or tape measured from the location to a known fixed horizontal point surveyed using North American Datum (NAD) 1983. All survey data will identify the sector number, reference the applicable plan sheet number, state the name of the survey company, and list the applicable certifications. A New Mexico-licensed surveyor will conduct all topographic surveys and stamp documents submitted with the Corrective Action Report.

5.1.10 Erosion Control

Silt fencing will be installed at the base of the ash pile near the drainages. Silt fences will extend from the surface to between 16 and 34 inches above the ground surface, depending on field

conditions and erosion potential. Joints in the filter fabric will be minimized, but where unavoidable, joints will overlap by a minimum of 6 inches. A trench approximately 4 inches wide and 4 inches deep will be excavated on the upslope side of the silt fences. This trench will be backfilled over the filter fabric. Silt fences will be removed as a part of demobilization with the approval of LANL and the Los Alamos County Engineer.

5.1.11 Ash and Debris Removal Activities at SWMU 73–002

This section describes the steps involved in the removal process. Specialized equipment to be used during the process will include:

- A Madill-Thunderbird TMY-40 Mobile Skyline Yarder equipped with a 40-foot tower and an Eaglet motorized carriage. This machine has a 2,000-foot external yarding capability. It runs with a 3/4-inch skyline and a 1/2-inch skidding line. The clamping carriage maintains a fixed position on the skyline during lateral yarding (see Figure 9).
- A trailer mounted portable Guzzler Reach 2648 Module vacuum for wet or dry pick-up of ash and debris. System components include a high efficiency particulate air filter (HEPA) filtration system, continuous cleaning bag filters, 136 hp diesel engine, V-belt drive, belt guard, high temperature safety switch, vacuum relief valve, silencer and Type 304 stainless steel cyclone collector.
- A Kaiser Spyder All-Terrain Excavator. The Spyder four-wheel-drive "walking" excavator works safely on extreme grades.

5.1.11.1 Debris Removal

Prior to ash removal, crews will begin picking up and packaging the topical debris from the general area around SWMU 73–002. All debris not associated with the ash, such as plant material, trash, cans, and miscellaneous municipal debris, will be picked up, bagged, and disposed of as municipal/industrial waste at an approved industrial waste disposal facility.

Debris in contact with or otherwise directly associated with the ash pile (PPE, cans, vegetation, etc.) will be handled with the ash and packaged for transport to an approved low-level radioactive waste disposal facility. The current tentatively accepted waste profile for the ash as LLRW includes ash and debris.

The skyline will be used to remove the bagged debris up the side of the canyon to a loading operation near the incinerator building. If required, the Spyder excavator will be utilized to pick

up and remove heavy materials and load them into special containers that will be skylined up the canyon and dumped into appropriate containers for disposal.

Although it is not anticipated, if an unknown sludge or liquid is encountered in any container during debris removal, these containers will be collected, containerized, and managed in consultation with DOE personnel. The material will then be properly packaged and moved to the staging area pending disposal.

5.1.11.2 Movement of Debris via Skyline

A skyline yarder will remove the debris up the slope into roll-off containers or as directed by ITSI. The skyline yarder is stabilized by anchoring the 40-foot tower with two guyline cables that run from internally-powered drums, up through sheaves at the top of the tower. The rigging crew will anchor the skyline to a tailhold in the bottom of the canyon. Four men manage the skyline yarding system: an operator who runs the machine, two rigging men who set up the lines and hook the loads; and one chaser who unhooks the loads at the landing.

In the skyline yarding method, a radio-controlled, motorized carriage rides down the skyline, stops at a pre-determined spot, and pays out the skidding line to the hooking crew. The crew hooks the skidding line to the load. The yarder operator then hoists the loaded skidding line up to the carriage and "flies" it to the landing.

The crew will hook onto large debris with wire-rope chokers. They will hook the skidding line directly to loads of smaller debris that are pre-bundled in heavy-duty cargo nets, tarps, bags, cans, or other containers. When the carriage arrives at the top of the tower, the operator lowers the load to the landing, where a chaser unhooks it from the skidding line.

5.1.11.3 Ash Removal with Vacuum Truck

The corrective action at this site will involve the complete removal of ash and associated debris from the area depicted on Figure 8. The collection of ash and incidental small debris associated with the ash will be performed utilizing a Guzzler Vacuum Loader system to be supplied and operated by Keers Remediation.

In conjunction with the hand-picking operation, ITSI will mobilize the ash vacuuming and packaging operation. The Guzzler vacuum system utilizes two feed lines off an 8-inch main line to the vacuum hopper. When the hopper is full, the vacuumed material will be packaged in approved containers (as described in 5.1.11.4 below) and staged for proper disposal.

5.1.11.4 Packaging and Staging of Ash and Debris for Disposal

Topical debris not associated with the ash pile may be loaded directly into roll-off bins, or packaged in burlap or plastic bags for staging purposes. The debris will be evaluated by LANL Radiation Safety personnel for potential release to an industrial landfill. If the debris cannot be released as municipal / industrial waste, the waste will be packaged and handled according to the guidelines for ash and associated debris.

The ash will be collected in appropriate containers (as discussed below). A forklift will be used to load and unload waste material containers and move them to an approved staging area for storage until the containers can be transported to an approved disposal facility (the staging area is shown on Figure 8).

Based on initial evaluation of the incinerator ash sample results (as outlined in Section 4 above), it is appropriate that the material be classified for packaging purposes as Low Specific Activity (LSA) Type 1 (LSA–1) waste. Per 49 CFR 173.427, LSA–1 solid material is required to be packaged for transportation in an IP–1 or IP–2 rated package.

For this removal action, IP–2 containers will be obtained from a vendor or manufacturer that has certified the containers as meeting the specified regulatory requirements. Each container will be visually inspected by ITSI for integrity prior to filling, during filling, and during movement. The ITSI Container Custodian is responsible for maintaining control over the waste containers from their arrival on site to their transport to the staging area. All waste will be placed in the approved waste packages. Filled containers will be stored in a secure area that is fenced.

5.1.11.5 Air Sampling During Ash Removal Activities

Both personal and perimeter air monitoring will be conducted during project activities, according to the following framework:

Perimeter Air Sampling

- Real-time monitoring utilizing a portable dust meter, such as the mini real-time aerosol monitor (RAM) or Personal DataRAM (Frequency: daily during work activities)
- Air sampling for lead concentrations with subsequent lead analysis (Frequency: daily during first week; thereafter, weekly during work activities)
- Radiological Air Monitoring (performed during work activities)

Personal Air Sampling

- Real-time monitoring utilizing a portable dust meter, such as a mini real-time aerosol monitor (RAM) or Personal DataRAM (Frequency: daily during work activities)
- Personal exposure samples with subsequent laboratory analysis (Frequency: daily during first week; thereafter, weekly during work activities)

Real-time monitoring will be conducted regularly during all periods of active handling of ash materials. Monitoring will be conducted throughout the work zone, with special focus on the breathing zone of the workers most directly involved with the material-handling activities, and downwind of potential source areas.

Airborne lead concentrations will be measured through the collection of air samples, with subsequent laboratory analysis. This monitoring will be performed daily during the first week of ash-handling activities, and at least once per week thereafter. Monitoring frequency may also be increased based on the results of the sampling, in accordance with the Occupational Safety and Health Administration (OSHA) Lead in Construction Standard. This sampling will be performed in accordance with National Institute for Occupational Safety and Health (NIOSH) or OSHA Reference methods. Although a time delay exists between collection of the samples and receipt of the analytical results, these samples will provide an indication of exposure levels during the work, so that work practices may be modified for ongoing activities as necessary.

5.1.12 Post-Removal Confirmation Sampling

To verify completion of the removal process, samples will be collected at the ground surface from specified locations within the footprint of the ash/debris area and identified drainages at SWMU 73–002 following removal of the ash and debris. This confirmation sampling will be conducted as part of the investigative sampling discussed in Section 5.2 below.

If, during the confirmation sampling efforts, additional ash is identified in crevices or fractures, or areas not previously identified, confirmation sampling will be suspended and additional removal efforts will be conducted to remove the remaining ash. The area subject to additional removal actions will then be sampled.

Sample results will be compared to published values obtained from "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory" (LANL 1998a). This information will be presented in a Corrective Action Report.

5.1.13 Site Restoration

To prevent, retard or contain soil and sediment erosion, work areas on the site will be restored following removal activities. After removal of the ash and debris, and receipt of confirmation sample results, the disturbed work areas will be raked, re-contoured as necessary, then hydroseeded and hydromulched with LANL-approved mixtures of seed and nutrients to provide erosion control and re-vegetation. Jute matting, straw bales, and/or straw wattles will be placed as necessary to prevent runoff and erosion and stabilize disturbed areas.

The steeply sloped and relatively small work area to be hydroseeded will require a higher seed rate (live seed pounds per acre) in order to optimize germination of the seeds. In addition, seed blend selection will also take into consideration the timing of the hydroseeding applications (i.e., cooler, wetter weather conditions may call for different seeding than warmer, drier weather conditions). Final selection of the hydroseed blend will be coordinated with and approved by LANL and Los Alamos County personnel.

Berms and curbs removed during construction of roadway extensions on the site will be replaced, and any damage to paved areas or other improvements will be repaired.

All boreholes will be abandoned by filling the borehole with a bentonite mixture. The boreholes will be pressure grouted from the bottom of the borehole to the surface in accordance with the Section X.D of the Consent Order (NMED 2005, 88027). Soil cuttings will be managed as IDW

as described in Appendix B of this work plan. All borehole abandonment information will be provided in the final report.

5.1.14 Site Inspections and Cleanup

Prior to demobilizing from each work area, ITSI, DOE, NMED, and Los Alamos County will jointly inspect the area to ensure that final site conditions meet with the Scope of Work requirements. Any deficiencies noted during the site walk will be addressed, documented, and corrected before personnel and equipment are fully demobilized.

Upon completion of all field activities, and subject to input from DOE and Los Alamos County, ITSI will perform final site cleanup and will leave work areas in a suitably restored condition. Prior to demobilization, all equipment involved in the ash removal, and drilling and sampling activities will be decontaminated. Residual material adhering to equipment will be removed using dry decontamination methods such as the use of wire brushes and scrapers. If equipment cannot be decontaminated using dry decontamination methods, wet decontamination methods will be used. Pressure washing of equipment will be performed on a temporary decontamination pad with a high-density polyethylene liner. 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.

5.1.15 Demobilization

ITSI will demobilize equipment and personnel as activities are completed. Temporary facilities, including staging areas, fencing, and temporary utilities, will be removed from each work area upon the completion of field activities in that area. The immediate work area will be inspected by the ITSI field representative to verify that all project-related equipment, trash, and debris have been collected and properly disposed. Facilities or equipment to be used for additional project activities will be moved to the appropriate work area, and other items will be moved to the project laydown area or removed from the site if no longer required.

Demobilization will include the removal of equipment, tools, and supplies; and evacuation of the temporary office space. Temporary fencing, traffic control devices, signs, storage containers, portable toilets, refuse containers, and any temporary power and phone lines will be removed from the site. Debris will be removed and disposed of in accordance with Contract requirements, and work areas will be cleaned and left in an appropriate condition. Final demobilization will include removal of all site fencing.

5.1.16 Closeout Documentation

After completion of field activities at each of the sites addressed in the Work Plan, those project activities will be documented through the preparation and submission of the items described in this section.

5.1.16.1 Record Drawings

As-built drawing will be prepared to identify and update surveyed and/or GPS-located data-points for removal action area (including before- and after- elevations as appropriate). These drawings will provide sampling locations for the "confirmation samples" collected from beneath the ash pile following removal.

5.1.16.2 Reporting

A summary of the corrective action activities for SWMU 73–002 will be included as part of the overall Investigation Report prepared following completion of the investigative activities, as discussed in Section 5.2.7.

5.2 INVESTIGATIVE SAMPLING OF CONSOLIDATED UNIT 73–002–99

The methodology employed in the identification of sample locations and the collection and handling process for the samples are discussed below. The investigative sampling activities will be conducted consistent with other investigations conducted by the DOE at the LANL site by using the current methodology outlined in the LANL-approved Standard Operating Procedures (SOPs) summarized in Table 8 and available at: http://erproject.lanl.gov/documents/procedures/sops.html.

5.2.1 Field identification of Sample Locations

Sample locations will be located in the field using a New Mexico Registered Land Surveyor by initially locating previous sample locations where coordinates are known. Once the previous sample locations are identified in the field, the proposed sample locations will be marked to allow for underground utility clearance prior to breaking ground.

5.2.2 Radiological Clearance Survey

A radiological survey will be conducted by LANL at each site during initial investigation activities to ensure safe work conditions for the investigation crew and evaluate initial samples for radiological clearance prior to transportation to LANL Sample Management Office (SMO).

5.2.3 Soil and Sediment Sample Collection

Soil samples will be collected from the top few inches of soil within each sample grid beneath the ash pile at SWMU 73–002 following removal using a stainless steel or disposable trowel. Sediment samples will be collected in the same manner as the surface soil samples.

Subsurface soil samples from each of the sites within Consolidated Unit 73–002–99 will be collected using either a portable hand-held power hollow stem auger drill (for deeper soils) or a hand auger. Samples of the tuff will be collected by first excavating any overlying soils to expose the rock surface and then using either a hand or powered auger (if capable) or a portable diamond coring device (or rock drill) to remove a core sample to a cutting depth of 24 inches into the tuff, or until refusal of the cutting tool.

For deeper samples (e.g., beneath septic tanks), or if material is sufficiently hard to make the above approach impractical, a small hollow-stem auger drill rig may be employed, where access permits, to collect the soil and tuff samples.

Soil samples will be visually inspected for evidence of staining, and logged using American Society for Testing and Materials (ASTM) soils classification criteria. This information will be recorded on the sample collection log or boring log.

Samples will be transferred into appropriate containers provided by the LANL SMO. Samples will be labeled with unique sample identification number (ID) for each location and depth. Following labeling, samples will be placed in re-sealable plastic bags and transferred to the SMO under proper chain-of-custody (COC) procedures.

5.2.4 Field Screening

Soil, rock, and sediment samples will be field-screened using methods including visual examination, headspace vapor screening for VOCs (using an organic vapor meter equipped with photo-ionization detector [PID]), and metals screening using X-ray fluorescence (XRF). Samples also will be screened for radioactivity by LANL Radiation Safety personnel. This information will be recorded on the sample collection log or boring log.

5.2.5 Field Analytical Screening

Field analytical screening is not anticipated at this time.

5.2.6 Abandonment of Soil Borings

Soil borings will be backfilled from the bottom of the borehole to the surface using a concrete and bentonite grout.

5.2.7 Investigation Report

After the completion of the initial investigative sampling, and any required contingent sampling to fully delineate the nature and extent of contamination at SWMU 73–002, SWMU 73–004(a), SWMU 73–004(b), SWMU 73–006, and AOC 73–003, an Investigation Report will be prepared to present the results of the completed activities at these sites. This report will comply with the content requirements and format guidelines presented in Section XI.C of the March 1, 2005, Consent Order.

6.0 MONITORING AND SAMPLING PROGRAM

There is no ongoing monitoring and sampling being conducted within Consolidated Unit 73–002–99. No ongoing monitoring is proposed as part of this Work Plan.

7.0 SCHEDULE

The Project Schedule (Figure 10) provides the anticipated schedule for completion of corrective action activities at SWMU 73–002, and subsequent initial investigative sampling efforts for Consolidated Unit 73–002–99. Given the extremely steep terrain in the site work area where the corrective action will occur, provision will be made for delays attributable to inclement weather, weather-related equipment considerations, delays or stand-downs under health and safety guidelines, and other factors beyond ITSI's control. As the investigative sampling will occur following removal of the ash pile, any delays to the corrective action will have a corresponding delay on the investigative sampling activities.

8.0 REFERENCES

Los Alamos National Laboratory (LANL), 2005a, ER2005-0119. "Pueblo Canyon Aggregate Area Investigation Work Plan," May.

LANL, 2005b, 88700. SWMU 73-002 Fact Sheet.

LANL, 1999. "Preliminary Screening Evaluations of the Ash Debris (PRS 73-002)," document LA-UR-04-4474 (ER ID 87373), July.

LANL, 1998a. "Inorganic and Radionuclide Background Data for Soils, Sediments, and Bandelier Tuff at Los Alamos National Laboratory," (ER ID 59730).

LANL, 1998b. "Sampling and Analysis Plan for SWMU Group 73-2; 73-003, 73-004(a), 73-004(b), 73-005, 73-006, 73-007, C-73-005(a through f)," document LA-UR-98-4076 (ER ID 62522), November.

LANL, 1996. "Voluntary Corrective Action Completion Report for Potential Release Sites 73-004(a,b), 73-007, C-73-005(a-f)," (ER ID 59374), September.

LANL, 1992. "RFI Work Plan for Operable Unit 1071," document LA-UR-92-810, (LANL 07667), May.

State of New Mexico Environmental Department (NMED), 2005. Compliance Order on Consent (Consent Order) between State of New Mexico Environmental Department and the United Stated Department of Energy and Regents of the University of California for the Los Alamos National Laboratory, Los Alamos County, New Mexico, March 1.

Nuclear Regulatory Commission (NRC), 2002. NUREG/BR-0216, Rev. 2 "Radioactive Waste: Production, Storage, Disposal."

NRC, 2000. NUREG-1575, Rev. 1, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM), August.

United States Department of Energy (DOE), 1999. "Draft Preliminary Screening Evaluations of the Ash Debris (PRS 73-002)," Los Alamos National Laboratory, July.

DOE, 1995. EH Memorandum, "Application of DOE 5400.5 Requirements for Release and Control of Property Containing Residual Radioactive Material," R Pelletier (EH-41) to distribution, November 17, 1995.

DOE, 1990. Order 5400.5, "Radiation Protection of the Public and the Environment."

DOE, (DRAFT) Proposed Standard, "Guide to Good Practice for Establishing Authorized Limits for the Release of Waste and Property Contaminated with Residual Radioactivity."

DOE, (DRAFT) Proposed Regulation, 10 CFR 834, "Radiation Protection of the Public and the Environment."

United States Department of Transportation (DOT), 2004. "Shippers – General Requirements for Shipments and Packagings." Title 49 Code of Federal Regulations, Part 173.

Table 1
Summary of Historical Incinerator Ash Laboratory Analytical Data for Inorganic Analytes

Location ID	Depth (ft)	Sample ID	Media	Aluminum	Antimony	Arsenic	Barium	Beryllium	Cadmium	Calcium	Chromium	Cobalt	Copper	Iron	Lead
Soil Background Value				**29200**	**0.83**	**8.17**	**295**	**1.83**	**0.4**	**6120**	**19.3**	**8.64**	**14.7**	**21500**	**22.3**
Qbt 2,3,4 Background Value				**-**	**-**	**2.79**	**46**	**-**	**-**	**2200**	**-**	**-**	**-**	**-**	**-**
Fill Background Value				**29200**	**0.83**	**-**	**-**	**1.83**	**0.4**	**6120**	**-**	**-**	**-**	**21500**	**22.3**
73-02253	0.00-0.50	0173-96-0302	Soil	-	10 (J-)	-	-	-	0.52 (U)	-	-	-	-	-	-
73-02264	0.00-0.00	0173-96-0304	NA	8340	54.6 (U)	15	5290	0.29	5	12800	94.8	26	3690	6.4 (U)	4500
73-02260	0.00-0.70	0173-96-0305	NA	13400	40.1 (U)	11.4	883	0.21	12.6 (J+)	12500	76.5	22.5	999	160000	3020
73-02262	0.00-1.00	0173-96-0307	NA	4390	85.7 (U)	28.3	440	0.46	7.5 (U)	24300	90.2	37.8	543	431000	4290
73-02255	0.00-0.50	0173-96-0308	Soil	-	12 (J-)	-	-	-	0.62 (U)	-	-	-	-	-	48
73-02266	0.00-0.00	0173-96-0309	NA	18300	54.4 (U)	6.9	6280	0.43	15.1 (J+)	39800	106	30.3	843	174000	2170
73-02268	0.00-1.00	0173-96-0314	NA	15200	119 (J+)	8.9	3030	0.22	11.4	29600	103	18	6330	106000	9620
73-02270	0.00-0.00	0173-96-0316	NA	4320	41.3 (U)	9.7	689	0.22	4.5	8990	58.3	24.2	1360	265000	1380
73-02254	0.00-0.50	0173-96-0320	Soil	-	11 (J-)	-	-	-	0.56 (U)	-	-	-	-	-	-
73-02252	0.10-0.30	0173-96-0331	NA	7000	56 (J-)	90	650	2.8 (U)	7.4	3600	90	13	1800	170000	1300
73-02268	0.00-1.00	0173-96-0345	NA	19000	95.3	11.4	4090	0.4	13.3	33200	109	21.1	2420	117000	9780
73-02270	0.00-0.00	0173-96-0346	NA	4540	50.8	25.1	646	0.27	5	15900	29.5	11.6	588	115000	1210
73-02326	14.00-15.00	0173-96-0501	Fill	-	12	-	-	-	0.59 (U)	6500	-	-	-	-	-
73-02327	14.00-15.00	0173-96-0502	Fill	-	12	-	-	-	0.59 (U)	-	-	-	-	-	-
73-02268	1.20-2.20	0173-97-0001	NA	16900	32.5 (J-)	27	1490 (J-)	0.58	23.3 (J+)	45900	73.9	17.2	2760	52800	6790
73-02268	0.50-1.00	0173-97-0002	NA	18900	49 (J-)	76.5	2020 (J-)	0.65	24.9 (J+)	36200	74.3	16.7	2230	98600	3770
73-02261	0.50-1.00	0173-97-0003	NA	25300	16.8	19.8	2330 (J-)	0.65	11.2 (J+)	30300	133	22.7	1550	78400	2690
73-02261	3.50-4.50	0173-97-0004	NA	22900	29.6	20.1	1920 (J-)	0.51	42.9 (J+)	38700	90.5	17.7	4590	70600	4480
73-02268	1.20-2.20	0173-97-0008	NA	16700	159	20.4	1240	0.5	31.1	40600	71.8	15.6	2390	83500	13100
73-02451	0.50-1.00	0173-97-0312	Soil	-	-	-	-	-	-	-	-	-	-	-	-
73-02452	0.10-0.50	0173-97-0313	Soil	-	-	-	-	-	-	-	-	-	-	-	-
73-02454	0.10-0.50	0173-97-0318	Soil	-	-	-	-	-	12.2	-	-	-	-	-	168
73-02457	0.10-0.50	0173-97-0321	Soil	-	-	-	-	-	-	-	-	9.9	-	-	44.6
73-02459	0.10-0.50	0173-97-0323	Soil	-	-	-	-	-	-	-	-	-	-	-	28.8
73-02460	0.10-0.50	0173-97-0324	Soil	-	-	-	-	-	-	-	-	-	15.1	-	23.4
73-02461	0.10-0.50	0173-97-0325	Soil	-	-	-	325	-	0.81 (J)	-	-	-	40.2	-	82.2
73-02462	0.10-0.50	0173-97-0326	Soil	-	-	-	415	-	0.65 (J)	-	-	-	36.8	-	83.7
73-02463	3.50-4.00	0173-97-0333	Qbt 3	-	0.71 (U)	-	-	-	-	-	-	-	-	-	-
73-02463	3.50-4.00	0173-97-0337	Qbt 3	-	0.72	-	-	-	-	-	-	-	-	-	-
73-10099	7.50-8.50	RE73-99-0089	Fill	35000	-	-	-	1.9	-	-	-	-	-	25000	-
73-02207	5.50-6.00	RE73-99-0094	Qbt 3	-	-	3.2	80	-	-	17000	-	-	-	-	-
73-10106	4.80-5.30	RE73-99-0102	Fill	-	-	-	-	-	-	-	-	-	-	-	32
73-10096	4.30-4.80	RE73-99-0109	Qbt 3	-	-	-	-	-	-	-	-	-	-	-	-

Notes:
All values in milligrams per kilogram (mg/kg)
Background Values from LANL 1998 (59730, Table 6.0-2, p.45)
Qbt = Bandelier Tuff
- = If analyzed, sample result is less than BV
U = The analyte was analyzed for but not detected
J = The analyte was positively identified, value is estimated
J+ = The analyte was identified, value is likely biased high
J- = The analyte was identified, value is likely biased low

Table 1
Summary of Historical Incinerator Ash Laboratory Analytical Data for Inorganic Analytes

Location ID	Depth (ft)	Sample ID	Media	Magnesium	Manganese	Mercury	Nickel	Potassium	Selenium	Silver	Sodium	Thallium	Vanadium	Zinc
Soil Background Value				**4610**	**6.71**	**0.1**	**15.4**	**3460**	**1.53**	**1**	**915**	**0.73**	**39.6**	**48.8**
Qbt 2,3,4 Background Value				**-**	**-**	**-**	**-**	**-**	**0.3**	**-**	**-**	**-**	**-**	**-**
Fill Background Value				**4610**	**-**	**0.1**	**-**	**-**	**-**	**1**	**-**	**0.73**	**-**	**48.8**
73-02253	0.00-0.50	0173-96-0302	Soil	-	-	-	-	-	-	2.1 (J-)	-	1.3	-	-
73-02264	0.00-0.00	0173-96-0304	NA	1290 (J)	1240	2 (J+)	131 (J+)	1150	1.7	213	842	0.41	6.4	3820
73-02260	0.00-0.70	0173-96-0305	NA	6010	1250	1.3 (J+)	165	1990	0.93	28.9	940	0.31	5.5	1470
73-02262	0.00-1.00	0173-96-0307	NA	964 (J)	1960	0.55 (J+)	119 (J+)	806	0.96	23.2	675	0.3	10	752
73-02255	0.00-0.50	0173-96-0308	Soil	-	-	0.12 (U)	-	-	-	2.5	-	1.5 (J-)	-	52 (J-)
73-02266	0.00-0.00	0173-96-0309	NA	2380	1500	1.4 (J+)	134 (J+)	2040	4.3	448	1760	0.4	12.6	2530
73-02268	0.00-1.00	0173-96-0314	NA	2440	1140	2.3 (J+)	94.1 (J+)	2660	1	156	2280	0.36	14.4	4260
73-02270	0.00-0.00	0173-96-0316	NA	1250	1190	1.1 (J+0	81.2 (J+)	640	0.99	41.8	674	0.37	4.8	1050
73-02254	0.00-0.50	0173-96-0320	Soil	-	-	0.11 (U)	-	-	-	2.2	-	1.4 (J-)	-	470 (J-)
73-02252	0.10-0.30	0173-96-0331	NA	1000	730	19	60	740	1.1	66	390	1.4	47	1900
73-02268	0.00-1.00	0173-96-0345	NA	3800	1340	0.07	104	3270	1.2	188	2480	0.48	15.9	4250
73-02270	0.00-0.00	0173-96-0346	NA	711 (J)	770	0.07	50.5	582	1.2	31.6	613	3.6	5.9	1590
73-02326	14.00-15.00	0173-96-0501	Fill	-	-	0.12	-	-	-	2.4	-	1.2	-	260
73-02327	14.00-15.00	0173-96-0502	Fill	-	-	0.12	-	-	-	2.4	-	1.2	-	61
73-02268	1.20-2.20	0173-97-0001	NA	4800	1330	0.41	79.9	4290	2	21.3	3930	7.4	13.2	4790
73-02268	0.50-1.00	0173-97-0002	NA	4020	1880	0.49	147	4610	2.1	55.3	3180	10.6	8.2	3860
73-02261	0.50-1.00	0173-97-0003	NA	3200	1660	1.2	236	3220	2.8	55.4	3530	9.3	12.5	4380
73-02261	3.50-4.50	0173-97-0004	NA	3960	1760	2.2	112	5040	1.9	19.6	7760	6.4	12.8	7170
73-02268	1.20-2.20	0173-97-0008	NA	4380	1530	0.44	101	4240	3.8	17.9	4190	8.6	7.8	3790
73-02451	0.50-1.00	0173-97-0312	Soil	-	-	-	-	-	-	-	-	0.87 (J)	-	-
73-02452	0.10-0.50	0173-97-0313	Soil	-	-	-	-	-	-	-	-	0.8 (J)	-	-
73-02454	0.10-0.50	0173-97-0318	Soil	-	-	-	-	-	-	-	-	-	-	-
73-02457	0.10-0.50	0173-97-0321	Soil	-	790	-	-	-	-	-	-	-	-	-
73-02459	0.10-0.50	0173-97-0323	Soil	-	-	0.14	-	-	-	1.1 (J)	-	-	-	-
73-02460	0.10-0.50	0173-97-0324	Soil	-	-	-	-	-	-	1.9 (J)	-	0.77 (J)	-	-
73-02461	0.10-0.50	0173-97-0325	Soil	-	-	0.24	-	-	-	8.8	-	-	-	-
73-02462	0.10-0.50	0173-97-0326	Soil	-	-	-	-	-	-	10.7	-	-	-	-
73-02463	3.50-4.00	0173-97-0333	Qbt 3	-	-	-	-	-	-	-	-	-	-	-
73-02463	3.50-4.00	0173-97-0337	Qbt 3	-	-	-	-	-	-	-	-	-	-	-
73-10099	7.50-8.50	RE73-99-0089	Fill	5500	-	0.14	-	-	-	-	-	-	-	62
73-02207	5.50-6.00	RE73-99-0094	Qbt 3	-	-	-	-	-	-	-	-	-	-	-
73-10106	4.80-5.30	RE73-99-0102	Fill	-	-	-	-	-	-	-	-	-	-	-
73-10096	4.30-4.80	RE73-99-0109	Qbt 3	-	-	-	-	-	0.41	-	-	-	-	-

Notes:
All values in milligrams per kilogram (mg/kg)
Background Values from LANL 1998 (59730, Table 6.0-2, p.45)
Qbt = Bandelier Tuff
- = If analyzed, sample result is less than BV
U = The analyte was analyzed for but not detected
J = The analyte was positively identified, value is estimated
J+ = The analyte was identified, value is likely biased high
J- = The analyte was identified, value is likely biased low

Table 2
Summary of 2005 Incinerator Ash Laboratory Analytical Data for Inorganic Analytes

Sample ID	Sample Date	Total Metals (mg/kg)								
		Silver	Arsenic	Barium	Beryllium	Cadmium	Cobalt	Chromium	Copper	Manganese
Previous Maximum Concentrations		*448*	*90*	*6280*		*42.9*	*37.8*	*133*	*6320*	*1960*
RE-73-05-58824	4/18/2005	17.5	42	1170	0.27	16.9	16.2	102	1620	1520
RE-73-05-58825	4/19/2005	190	29.6	5030	0.21	12.4	17.9	74	993	1270
RE-73-05-58826	4/19/2005	54.9	22.7	1490	0.34	19.7	13.8	77	1670	1230
RE-73-05-58827	4/19/2005	118	33.6	4150	0.37	9	11.3	61.3	1270	895
RE-73-05-58828	4/19/2005	37.2	39.3	1550	2.4	48.3	18.3	85.9	219000	21800
RE-73-05-58829	4/19/2005									
RE-73-05-58830	4/19/2005	54	26.1	1980	0.39	18.2	40.3	154	1330	2190
RE-73-05-58831	4/19/2005	49.5	19	1880	0.28	78.5	15.1	88.5	4130	1330
RE-73-05-58832	4/19/2005	35.6	20.5	1580	0.28	14.9	13.2	66.8	1930	1380
RE-73-05-58833	4/19/2005	119	26.8	2660	1.2	7.7	17.3	107	1190	1750
RE-73-05-58834	4/19/2005	56.9	26.3	1000	0.74	15.4	17.7	81.8	31500	2540
RE-73-05-58835	4/19/2005									
RE-73-05-58836	4/19/2005	21.2	66.4	643	0.11	4.1	41.9	104	815	2050
RE-73-05-58837	4/19/2005	15.4	133	575	0.089	2.8	49.7	94.4	490	2330
RE-73-05-58838	4/19/2005	95.7	19.5	2600	0.33	67.5	10.1	54.1	3260	859
RE-73-05-58839	4/19/2005	125	76	2870	0.33	16.4	14.8	68.7	3820	2810
RE-73-05-58840	4/19/2005	187	22.1	3490	0.2	16.5	14.4	85	1040	1050
RE-73-05-58841	4/19/2005									
RE-73-05-58842	4/20/2005	63	29.8	1790	0.33	17.7	16.4	85.9	2710	1580
RE-73-05-58843	4/20/2005	59.6	56.4	1710	0.26	16.8	16.8	72.2	2360	1770
RE-73-05-58844	4/20/2005	73.3	45.1	1990	0.25	5.9	16.5	67.7	536	974
RE-73-05-58845	4/20/2005	78.2	138	1940	0.25	6	40.2	116	1640	2010
RE-73-05-58846	4/20/2005	102	21	3330	0.17	7.2	18.6	66.5	2750	1130
RE-73-05-58879	4/20/2005									
Sample ID	**Sample Date**	**TCLP Metals (mg/L)**								
Previous Maximum Concentrations		-	-	*1.45*		*0.151*		*0.033*		
RE-73-05-58824	4/18/2005	-	-	0.884		0.18		-		
RE-73-05-58825	4/19/2005	-	-	1.65		0.0912		-		
RE-73-05-58826	4/19/2005	-	-	1.44		0.105		-		
RE-73-05-58827	4/19/2005	-	-	2.4		0.0406		-		
RE-73-05-58828	4/19/2005	-	-	1.43		0.133		-		
RE-73-05-58829	4/19/2005									
RE-73-05-58830	4/19/2005	-	-	3.84		1.73		-		
RE-73-05-58831	4/19/2005	-	-	1.18		0.134		-		
RE-73-05-58832	4/19/2005	-	-	1.32		0.0403		-		
RE-73-05-58833	4/19/2005	-	-	0.939		0.0205		-		
RE-73-05-58834	4/19/2005	-	-	1.06		0.0316		-		
RE-73-05-58835	4/19/2005									
RE-73-05-58836	4/19/2005	-	-	1.76		0.0117		-		
RE-73-05-58837	4/19/2005	-	-	1.62		0.0112		-		
RE-73-05-58838	4/19/2005	-	-	1.79		0.16		-		
RE-73-05-58839	4/19/2005	-	-	1.59		0.095		-		
RE-73-05-58840	4/19/2005	-	-	0.786		0.0739		-		
RE-73-05-58841	4/19/2005									
RE-73-05-58842	4/20/2005	-	-	2.33		0.0719		-		
RE-73-05-58843	4/20/2005	-	-	1.45		0.0632		-		
RE-73-05-58844	4/20/2005	-	-	1.97		0.0214		-		
RE-73-05-58845	4/20/2005	-	-	2.48		0.0184		-		
RE-73-05-58846	4/20/2005	-	-	1.7		0.0481		-		
RE-73-05-58879	4/20/2005									

Notes:
mg/kg - milligrams per kilogram
mg/L - milligrams per liter
- = non detect
blank - not analyzed
TCLP = Toxicity Characteristic Leaching Procedure

Table 2
Summary of 2005 Incinerator Ash Laboratory Analytical Data for Inorganic Analytes

Sample ID	Sample Date	Total Metals (mg/kg)							
		Nickel	Lead	Antimony	Selenium	Thallium	Vanadium	Zinc	Mercury
Previous Maximum Concentrations		*236*	*13100*	*159*	*3.8*	*10.6*	*65*	*7170*	*19*
RE-73-05-58824	4/18/2005	203	3330	33.4	1.1	0.54	16.1	8220	0.62
RE-73-05-58825	4/19/2005	96.3	6650	52.1	1.6	-	12.8	3020	
RE-73-05-58826	4/19/2005	79.7	6700	48.4	1.1	-	15.3	4360	0.7
RE-73-05-58827	4/19/2005	43.7	2400	32.8	0.89	-	14.1	4450	0.9
RE-73-05-58828	4/19/2005	146	2460	27.8	0.92	-	24.7	11300	0.92
RE-73-05-58829	4/19/2005								
RE-73-05-58830	4/19/2005	633	6110	73.1	0.81	-	20.9	4880	1.6
RE-73-05-58831	4/19/2005	125	3950	27.8	1.7	-	17.2	43000	1.4
RE-73-05-58832	4/19/2005	131	2390	29.1	0.68	-	17.1	3940	1.7
RE-73-05-58833	4/19/2005	115	2500	29.8	0.57	-	12.9	3760	2.1
RE-73-05-58834	4/19/2005	295	8770	123	2	-	12.6	9830	1.6
RE-73-05-58835	4/19/2005								
RE-73-05-58836	4/19/2005	220	2840	36.2	0.45	-	3.8	939	0.71
RE-73-05-58837	4/19/2005	219	4310	24.7	0.64	-	4.1	823	0.28
RE-73-05-58838	4/19/2005	77	13700	116	1.2	-	14.5	4630	0.56
RE-73-05-58839	4/19/2005	98.6	33000	543	1.7	-	15.1	4370	1.2
RE-73-05-58840	4/19/2005	215	1950	19.9	0.94	-	14.1	5500	0.6
RE-73-05-58841	4/19/2005								
RE-73-05-58842	4/20/2005	234	3430	32.6	2.2	-	16.6	6460	0.79
RE-73-05-58843	4/20/2005	189	2220	27.3	1.6	0.31	15.3	6120	1.5
RE-73-05-58844	4/20/2005	115	2990	17.2	0.93	-	10.1	2040	0.7
RE-73-05-58845	4/20/2005	215	3690	64.7	0.55	-	8.6	1710	0.5
RE-73-05-58846	4/20/2005	792	1740	29.8	0.85	-	14.8	2190	0.33
RE-73-05-58879	4/20/2005								
Sample ID	**Sample Date**	**TCLP Metals (mg/L)**							
Previous Maximum Concentrations			*4.1*		-				
RE-73-05-58824	4/18/2005		3.14		-			37.4	-
RE-73-05-58825	4/19/2005		0.786		-			19.4	-
RE-73-05-58826	4/19/2005		2.39		-			39.1	-
RE-73-05-58827	4/19/2005		6.29		-			19.2	-
RE-73-05-58828	4/19/2005		2.56		-			40.5	-
RE-73-05-58829	4/19/2005								
RE-73-05-58830	4/19/2005		3.33		-			35.1	-
RE-73-05-58831	4/19/2005		4.37		-			42.4	-
RE-73-05-58832	4/19/2005		1.08		-			30.3	-
RE-73-05-58833	4/19/2005		0.633		-			24.9	-
RE-73-05-58834	4/19/2005		0.63		-			57.2	-
RE-73-05-58835	4/19/2005								
RE-73-05-58836	4/19/2005		0.792		-			5.1	-
RE-73-05-58837	4/19/2005		0.316		-			8.5	-
RE-73-05-58838	4/19/2005		2.47		-			36.7	-
RE-73-05-58839	4/19/2005		1.47		-			33.7	-
RE-73-05-58840	4/19/2005		1.44		-			67.5	-
RE-73-05-58841	4/19/2005								
RE-73-05-58842	4/20/2005		0.817		-			30.6	-
RE-73-05-58843	4/20/2005		0.779		-			42.5	-
RE-73-05-58844	4/20/2005		0.96		-			12.5	0.00037
RE-73-05-58845	4/20/2005		0.638		-			10.2	-
RE-73-05-58846	4/20/2005		1.33		-			22	-
RE-73-05-58879	4/20/2005								

Notes:
mg/kg - milligrams per kilogram
mg/L - milligrams per liter
- = non detect
blank - not analyzed
TCLP = Toxicity Characteristic Leaching Procedure

Table 3
Summary of Historical Incinerator Ash Laboratory Analytical Data for Organic Analytes

Location ID	Depth (ft)	Sample ID	Media	Acenaphthene	Acetone	Anthracene	Aroclor-1254	Benzene	Benzo(a) - anthracene	Benzo(a)-pyrene	Benzo(b) - fluoranthene	Benzo(k) fluoranthene	Benzoic Acid
SSL Residential				**4690**	**70400**	**23500**	**1.11**	**27**	**6.21**	**0.621**	**6.21**	**62.1**	**100000**
73-02264	0.00-0.00	0173-96-0304	NA	-	-	-	0.046	-	-	-	-	-	-
73-02260	0.00-0.70	0173-96-0305	NA	-	-	-	0.066	-	-	-	-	-	-
73-02262	0.00-1.00	0173-96-0307	NA	-	-	-	-	-	-	-	-	-	-
73-02255	0.00-0.50	0173-96-0308	Soil	-	-	-	-	-	-	-	-	-	-
73-02266	0.00-0.00	0173-96-0309	NA	-	-	-	-	0.002 (J)	-	-	-	-	-
73-02268	0.00-1.00	0173-96-0314	NA	-	-	-	0.17	-	0.043 (J)	-	-	-	-
73-02270	0.00-0.00	0173-96-0316	NA	-	-	-	0.059	-	-	-	-	-	-
73-02252	0.10-0.30	0173-96-0331	NA	-	-	-	-	-	-	-	-	-	-
73-02268	0.00-1.00	0173-96-0345	NA	-	0.005	-	0.13	-	-	-	-	-	-
73-02270	0.00-0.00	0173-96-0346	NA	-	-	-	0.04	-	0.09	-	0.094	0.075	-
73-02326	14.00-15.00	0173-96-0501	Fill	-	0.025 (J-)	-	-	-	-	-	-	-	-
73-02327	14.00-15.00	0173-96-0502	Fill	-	-	-	-	-	-	-	-	-	-
73-02268	1.20-2.20	0173-97-0001	NA	-	-	-	-	-	-	-	-	-	-
73-02268	0.50-1.00	0173-97-0002	NA	-	-	-	-	-	-	-	-	-	-
73-02261	0.50-1.00	0173-97-0003	NA	-	-	-	-	-	-	-	-	-	-
73-02261	3.50-4.50	0173-97-0004	NA	-	-	-	-	-	-	-	-	-	-
73-02268	1.20-2.20	0173-97-0008	NA	-	0.097	-	-	-	-	-	-	-	-
73-02451	0.10-0.50	0173-97-0311	Soil	-	-	-	-	-	-	-	-	-	-
73-02457	0.10-0.50	0173-97-0321	Soil	-	-	-	-	-	-	-	-	-	0.092 (J)
73-02458	0.10-0.50	0173-97-0322	Soil	-	-	-	-	-	-	-	-	-	0.043 (J)
73-02459	0.10-0.50	0173-97-0323	Soil	-	-	-	-	-	-	-	-	-	-
73-02460	0.10-0.50	0173-97-0324	Soil	-	-	-	-	-	-	-	-	-	-
73-02461	0.10-0.50	0173-97-0325	Soil	0.035 (J)	-	0.061 (J)	-	-	0.1 (J)	0.11 (J)	0.21 (J)	-	0.051 (J)
73-02462	0.10-0.50	0173-97-0326	Soil	0.78	-	-	-	-	-	-	-	-	-
73-02465	3.20-3.70	0173-97-0327	NA	-	-	-	-	-	-	-	-	-	-
73-02464	7.00-7.50	0173-97-0336	NA	-	-	-	-	-	-	-	-	-	-
73-02463	3.50-4.00	0173-97-0337	Qbt 3	-	-	-	-	-	-	-	-	-	-
73-02464	7.00-7.50	0173-97-0338	NA	-	-	-	-	-	-	-	-	-	-
73-10098	7.50-7.75	RE73-99-0093	Fill	-	-	-	-	-	-	-	-	-	-
73-02207	5.50-6.00	RE73-99-0094	Qbt 3	-	-	-	-	-	-	-	-	-	-
73-10106	4.80-5.30	RE73-99-0102	Fill	-	-	-	-	-	-	-	-	-	-
73-10107	6.00-6.50	RE73-99-0104	Fill	-	-	-	-	-	-	-	-	-	-
73-10096	4.30-4.80	RE73-99-0109	Qbt 3	-	-	-	-	-	-	-	-	-	-

Notes:
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Table 3
Summary of Historical Incinerator Ash Laboratory Analytical Data for Organic Analytes

Location ID	Depth (ft)	Sample ID	Media	BHC[beta-]	Bis(2-ethylhexyl) phthalate	Chlordane [alpha-]	Chlordane [gamma-]	Chrysene	DDD[4,4'-]	DDE[4,4'-]	DDT[4,4'-]	Dichloro - benzene[1,2-]	Dichloro - benzene[1,3-]
SSL Residential				**0.902**	**347**	**16.2**	**16.2**	**621**	**24.4**	**17.2**	**17.2**	**116**	**70.4**
73-02264	0.00-0.00	0173-96-0304	NA	0.0026	-	-	-	-	-	0.032	0.024	-	-
73-02260	0.00-0.70	0173-96-0305	NA	-	-	-	-	-	-	0.0057	-	-	-
73-02262	0.00-1.00	0173-96-0307	NA	-	-	-	-	-	-	-	-	-	-
73-02255	0.00-0.50	0173-96-0308	Soil	-	-	0.0035	-	-	-	0.029	0.034	-	-
73-02266	0.00-0.00	0173-96-0309	NA	-	-	-	-	-	-	0.019	0.02	-	-
73-02268	0.00-1.00	0173-96-0314	NA	-	-	-	-	0.047 (J)	-	0.03	0.022	-	-
73-02270	0.00-0.00	0173-96-0316	NA	-	-	-	-	-	-	0.0072	0.006	-	-
73-02252	0.10-0.30	0173-96-0331	NA	-	-	-	-	-	1.3 (J)	0.31	3.9	-	-
73-02268	0.00-1.00	0173-96-0345	NA	-	-	-	-	-	-	0.027	0.023	-	-
73-02270	0.00-0.00	0173-96-0346	NA	-	-	-	-	0.11	-	0.005	-	-	-
73-02326	14.00-15.00	0173-96-0501	Fill	-	-	0.028	0.038	-	0.31	0.089	0.11	-	-
73-02327	14.00-15.00	0173-96-0502	Fill	-	-	-	-	-	0.042	0.01	0.021	-	-
73-02268	1.20-2.20	0173-97-0001	NA	-	-	-	-	-	-	-	-	-	-
73-02268	0.50-1.00	0173-97-0002	NA	-	-	-	-	-	-	-	-	-	-
73-02261	0.50-1.00	0173-97-0003	NA	-	-	-	-	-	-	-	-	-	-
73-02261	3.50-4.50	0173-97-0004	NA	-	0.19 (J)	-	-	-	-	-	-	0.12 (J)	0.12 (J)
73-02268	1.20-2.20	0173-97-0008	NA	-	0.12	-	-	-	-	0.035	0.019	-	-
73-02451	0.10-0.50	0173-97-0311	Soil	-	-	-	-	-	-	-	-	-	-
73-02457	0.10-0.50	0173-97-0321	Soil	-	-	-	-	-	-	-	-	-	-
73-02458	0.10-0.50	0173-97-0322	Soil	-	-	-	-	-	-	-	-	-	-
73-02459	0.10-0.50	0173-97-0323	Soil	-	-	-	-	-	-	-	-	-	-
73-02460	0.10-0.50	0173-97-0324	Soil	-	-	-	-	-	-	-	-	-	-
73-02461	0.10-0.50	0173-97-0325	Soil	-	0.05 (J)	-	-	0.11	-	-	-	-	-
73-02462	0.10-0.50	0173-97-0326	Soil	-	-	-	-	-	-	-	-	-	-
73-02465	3.20-3.70	0173-97-0327	NA	-	-	-	-	-	-	-	-	-	-
73-02464	7.00-7.50	0173-97-0336	NA	-	-	-	-	-	-	-	-	-	-
73-02463	3.50-4.00	0173-97-0337	Qbt 3	-	-	-	-	-	-	-	-	-	-
73-02464	7.00-7.50	0173-97-0338	NA	-	-	-	-	-	-	-	-	-	-
73-10098	7.50-7.75	RE73-99-0093	Fill	-	-	-	-	-	-	0.0043	-	-	-
73-02207	5.50-6.00	RE73-99-0094	Qbt 3	-	-	-	-	-	-	-	0.0076	-	-
73-10106	4.80-5.30	RE73-99-0102	Fill	-	-	-	-		0.006	-	0.19	-	-
73-10107	6.00-6.50	RE73-99-0104	Fill	-	-	-	-	-	-	0.0046	0.03	-	-
73-10096	4.30-4.80	RE73-99-0109	Qbt 3	-	-	-	-	-	-	-	0.0041	-	-

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Table 3
Summary of Historical Incinerator Ash Laboratory Analytical Data for Organic Analytes

Location ID	Depth (ft)	Sample ID	Media	Dichloro - benzene[1,4-]	Di-n-butyl phthalate	Endosulfan I	Fluoranthene	Heptachlorodi benzodioxin [1,2,3,4,6,7,8-]	Heptachlorodi benzodioxins (Total)	Heptachlorodi benzofuran [1,2,3,4,6,7,8-]	Heptachlorodi benzofuran [1,2,3,4,7,8,9-]	Heptachlorodi benzofurans (Total)	Hexachlorodi benzodioxin [1,2,3,4,7,8-]
SSL Residential				**36**	**6000**	**360**	**2250**	**-**	**-**	**-**	**-**	**-**	**-**
73-02264	0.00-0.00	0173-96-0304	NA	-	-	-	-	-	-	-	-	-	-
73-02260	0.00-0.70	0173-96-0305	NA	-	-	-	-	-	-	-	-	-	-
73-02262	0.00-1.00	0173-96-0307	NA	-	-	-	-	-	-	-	-	-	-
73-02255	0.00-0.50	0173-96-0308	Soil	-	-	-	-	-	-	-	-	-	-
73-02266	0.00-0.00	0173-96-0309	NA	-	-	-	-	-	-	-	-	-	-
73-02268	0.00-1.00	0173-96-0314	NA	-	-	-	0.078 (J)	-	-	-	-	-	-
73-02270	0.00-0.00	0173-96-0316	NA	0.01	-	-	-	-	-	-	-	-	-
73-02252	0.10-0.30	0173-96-0331	NA	-	-	-	-	-	-	-	-	-	-
73-02268	0.00-1.00	0173-96-0345	NA	-	-	-	-	-	-	-	-	-	-
73-02270	0.00-0.00	0173-96-0346	NA	-	-	-	-	-	-	-	-	-	-
73-02326	14.00-15.00	0173-96-0501	Fill	-	-	-	-	-	-	-	-	-	-
73-02327	14.00-15.00	0173-96-0502	Fill	-	-	-	-	-	-	-	-	-	-
73-02268	1.20-2.20	0173-97-0001	NA	-	-	-	-	1.80E-10	0.33	0.098	0.0053	0.17	0.0062
73-02268	0.50-1.00	0173-97-0002	NA	-	-	-	-	1.80E-10	0.33	0.066	0.0064	0.11	0.0059
73-02261	0.50-1.00	0173-97-0003	NA	-	-	-	-	1.10E-09	1.8	0.13	0.011	0.25	0.014
73-02261	3.50-4.50	0173-97-0004	NA	-	-	0.0023	-	9.00E-10	1.6	0.35	0.0088	0.61	0.026
73-02268	1.20-2.20	0173-97-0008	NA	-	-	-	-	2.80E-10	0.51	0.071	0.004	0.15	0.0063
73-02451	0.10-0.50	0173-97-0311	Soil	-	-	-	-	1.00E-12		0.00065(J)	-	-	-
73-02457	0.10-0.50	0173-97-0321	Soil	-	-	-	-	3.50E-12	0.0069 (J)	0.0022 (J)	-	0.0041	-
73-02458	0.10-0.50	0173-97-0322	Soil	-	-	-	-	5.00E-12	0.0099(J)	0.0016 (J)	-	0.0029	-
73-02459	0.10-0.50	0173-97-0323	Soil	-	0.19 (J)	-	-	-	-	-	-	-	-
73-02460	0.10-0.50	0173-97-0324	Soil	-	-	-	-	1.40E-11	0.026	0.0033	-	0.0073	0.00027
73-02461	0.10-0.50	0173-97-0325	Soil	-	0.077 (J)	-	0.24 (J)	1.00E-10	0.17	0.044	0.0043 (J)	0.12	0.0033
73-02462	0.10-0.50	0173-97-0326	Soil	-	-	-	-	-	-	-	-	-	-
73-02465	3.20-3.70	0173-97-0327	NA	-	-	-	-	5.90E-11	0.11	0.011	0.00075 (J)	0.024	0.00067
73-02464	7.00-7.50	0173-97-0336	NA	-	-	-	-	4.90E-11	0.094 (J)	0.28	0.0099 (J)	0.34	0.016
73-02463	3.50-4.00	0173-97-0337	Qbt 3	-	-	-	-	2.80E-13	0.00043	0.00014	-	0.00014	-
73-02464	7.00-7.50	0173-97-0338	NA	-	-	-	-	7.60E-11	0.15	0.4	0.014	0.48	0.022
73-10098	7.50-7.75	RE73-99-0093	Fill	-	-	-	-	-	-	-	-	-	-
73-02207	5.50-6.00	RE73-99-0094	Qbt 3	-	-	-	-	-	-	-	-	-	-
73-10106	4.80-5.30	RE73-99-0102	Fill	-	-	-	-	-	-	-	-	-	-
73-10107	6.00-6.50	RE73-99-0104	Fill	-	-	-	-	-	-	-	-	-	-
73-10096	4.30-4.80	RE73-99-0109	Qbt 3	-	-	-	-	-	-	-	-	-	-

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Table 3
Summary of Historical Incinerator Ash Laboratory Analytical Data for Organic Analytes

Location ID	Depth (ft)	Sample ID	Media	Hexachlorodibenzodioxin [1,2,3,6,7,8-]	Hexachlorodibenzodioxin [1,2,3,7,8,9-]	Hexachlorodibenzodioxins (Total)	Hexachlorodibenzofuran [1,2,3,4,7,8-]	Hexachlorodibenzofuran [1,2,3,6,7,8-]	Hexachlorodibenzofuran [1,2,3,7,8,9-]	Hexachlorodibenzofuran [2,3,4,6,7,8-]	Hexachlorodibenzofurans (Total)	Isopropyl toluene [4-]	Methylene Chloride
SSL Residential				**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**700**	**165**
73-02264	0.00-0.00	0173-96-0304	NA	-	-	-	-	-	-	-	-	-	0.043
73-02260	0.00-0.70	0173-96-0305	NA	-	-	-	-	-	-	-	-	-	0.034
73-02262	0.00-1.00	0173-96-0307	NA	-	-	-	-	-	-	-	-	-	0.032
73-02255	0.00-0.50	0173-96-0308	Soil	-	-	-	-	-	-	-	-	-	-
73-02266	0.00-0.00	0173-96-0309	NA	-	-	-	-	-	-	-	-	-	0.036
73-02268	0.00-1.00	0173-96-0314	NA	-	-	-	-	-	-	-	-	-	0.1
73-02270	0.00-0.00	0173-96-0316	NA	-	-	-	-	-	-	-	-	-	0.059
73-02252	0.10-0.30	0173-96-0331	NA	-	-	-	-	-	-	-	-	0.013 (J+0	-
73-02268	0.00-1.00	0173-96-0345	NA	-	-	-	-	-	-	-	-	-	0.069
73-02270	0.00-0.00	0173-96-0346	NA	-	-	-	-	-	-	-	-	-	0.08
73-02326	14.00-15.00	0173-96-0501	Fill	-	-	-	-	-	-	-	-	-	-
73-02327	14.00-15.00	0173-96-0502	Fill	-	-	-	-	-	-	-	-	-	-
73-02268	1.20-2.20	0173-97-0001	NA	0.024	0.022	0.18	0.012	0.011	-	0.012	0.12	0.032 (J)	-
73-02268	0.50-1.00	0173-97-0002	NA	0.021	0.025	0.14	0.025	0.017	-	0.018	0.15	-	-
73-02261	0.50-1.00	0173-97-0003	NA	0.056	0.065	0.46	0.023	0.021	-	0.027	0.21	-	-
73-02261	3.50-4.50	0173-97-0004	NA	0.14	0.12	1	0.046	0.049	-	0.052	0.5	-	-
73-02268	1.20-2.20	0173-97-0008	NA	0.037	0.037	0.29	0.015	0.01	-	0.0098	0.1	-	-
73-02451	0.10-0.50	0173-97-0311	Soil	-	-	-	-	-	-	-	-	-	-
73-02457	0.10-0.50	0173-97-0321	Soil	-	-	0.0023 (J)	0.00066 (J)	0.00041	-	0.00032 (J)	-	-	-
73-02458	0.10-0.50	0173-97-0322	Soil	0.00034 (J)	-	0.0027 (J)	-	-	-	-	0.0013 (J)	-	-
73-02459	0.10-0.50	0173-97-0323	Soil	-	-	-	-	-	-	-	-	-	-
73-02460	0.10-0.50	0173-97-0324	Soil	0.00081 (J)	0.00085 (J)	0.0068 (J)	0.00067 (J)	0.0021	-	-	0.028	-	-
73-02461	0.10-0.50	0173-97-0325	Soil	0.0068	0.0073	0.052	0.0059	0.022	-	0.0085	0.32	-	-
73-02462	0.10-0.50	0173-97-0326	Soil	-	-	-	-	-	-	-	-	-	-
73-02465	3.20-3.70	0173-97-0327	NA	0.0037 (J)	0.0033	0.03	0.0021 (J)	0.0019	-	-	0.029	-	-
73-02464	7.00-7.50	0173-97-0336	NA	0.02 (J)	0.041 (J)	0.27	0.43	0.14	0.0061	0.14	1.4	-	-
73-02463	3.50-4.00	0173-97-0337	Qbt 3	-	-	-	-	-	-	-	-	-	-
73-02464	7.00-7.50	0173-97-0338	NA	0.029	0.063	0.42	0.67	0.23	0.01	0.2	2.1	-	-
73-10098	7.50-7.75	RE73-99-0093	Fill	-	-	-	-	-	-	-	-	-	-
73-02207	5.50-6.00	RE73-99-0094	Qbt 3	-	-	-	-	-	-	-	-	-	-
73-10106	4.80-5.30	RE73-99-0102	Fill	-	-	-	-	-	-	-	-	-	-
73-10107	6.00-6.50	RE73-99-0104	Fill	-	-	-	-	-	-	-	-	-	-
73-10096	4.30-4.80	RE73-99-0109	Qbt 3	-	-	-	-	-	-	-	-	0.00076	-

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Location ID	Depth (ft)	Sample ID	Media	Naphthalene	Octachlorodi benzodioxin [1,2,3,4,6,7,8,9-]	Octachlorodi benzofuran [1,2,3,4,6,7,8,9-]	Pentachlorodi benzodioxin [1,2,3,7,8-]	Pentachlorodi benzodioxins (Total)	Pentachlorodi benzofuran [1,2,3,7,8-]	Pentachlorodi benzofuran [2,3,4,7,8-]	Pentachlorodi benzofurans (Totals)	Phenanthrene	Pyrene
SSL Residential				**71.9**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1800**	**2300**
73-02264	0.00-0.00	0173-96-0304	NA	-	-	-	-	-	-	-	-	-	-
73-02260	0.00-0.70	0173-96-0305	NA	-	-	-	-	-	-	-	-	-	-
73-02262	0.00-1.00	0173-96-0307	NA	-	-	-	-	-	-	-	-	-	-
73-02255	0.00-0.50	0173-96-0308	Soil	-	-	-	-	-	-	-	-	-	-
73-02266	0.00-0.00	0173-96-0309	NA	-	-	-	-	-	-	-	-	-	-
73-02268	0.00-1.00	0173-96-0314	NA	-	-	-	-	-	-	-	-	-	0.076 (J)
73-02270	0.00-0.00	0173-96-0316	NA	-	-	-	-	-	-	-	-	-	-
73-02252	0.10-0.30	0173-96-0331	NA	-	-	-	-	-	-	-	-	-	-
73-02268	0.00-1.00	0173-96-0345	NA	-	-	-	-	-	-	-	-	-	-
73-02270	0.00-0.00	0173-96-0346	NA	-	-	-	-	-	-	-	-	-	0.049
73-02326	14.00-15.00	0173-96-0501	Fill	-	-	-	-	-	-	-	-	-	-
73-02327	14.00-15.00	0173-96-0502	Fill	-	-	-	-	-	-	-	-	-	-
73-02268	1.20-2.20	0173-97-0001	NA	-	0.64	0.048	0.0082	0.1	0.014	0.021	0.24	-	-
73-02268	0.50-1.00	0173-97-0002	NA	-	0.68	0.031	0.0084	0.071	0.023	0.035	0.43	-	-
73-02261	0.50-1.00	0173-97-0003	NA	-	4.8	0.1	0.016	0.25	0.019	0.032	0.4	-	-
73-02261	3.50-4.50	0173-97-0004	NA	-	3.2	0.15	0.049	0.58	0.11	0.15	1.9	0.25 (J)	-
73-02268	1.20-2.20	0173-97-0008	NA	-	1	0.043	0.013	0.15	0.015	0.02	0.27	-	-
73-02451	0.10-0.50	0173-97-0311	Soil	-	-	0.00071 (J)	-	-	-	-	-	-	-
73-02457	0.10-0.50	0173-97-0321	Soil	-	0.02	0.0024 (J)	-	0.00066 (J)		0.00068 (J)	0.0094	-	-
73-02458	0.10-0.50	0173-97-0322	Soil	-	0.037	0.0025 (J)	-	-	-	-	0.0019 (J)	-	-
73-02459	0.10-0.50	0173-97-0323	Soil	-	-	-	-	-	-	-	-	-	-
73-02460	0.10-0.50	0173-97-0324	Soil	-	0.082	0.005 (J)	0.00037 (J)	0.0016 (J)	-	0.00045 (J)	0.017 (J)	-	-
73-02461	0.10-0.50	0173-97-0325	Soil	0.041 (J)	0.61	0.055	0.0026 (J)	0.017 (J)	0.0022 (J)	0.0025 (J)	0.089	0.21 (J)	0.32 (J)
73-02462	0.10-0.50	0173-97-0326	Soil	-	-	-	-	-	-	-	-	-	-
73-02465	3.20-3.70	0173-97-0327	NA	-	0.29	-	0.00095 (J)	0.014 (J)	0.00066 (J)	0.00091 (J)	0.019 (J)	-	-
73-02464	7.00-7.50	0173-97-0336	NA	-	-	-	0.06	0.56	0.43	0.54	6.3	-	-
73-02463	3.50-4.00	0173-97-0337	Qbt 3	-	-	-	-	-	-	-	-	-	-
73-02464	7.00-7.50	0173-97-0338	NA	-	-	-	0.096	0.87	0.75	0.84	9.6	-	-
73-10098	7.50-7.75	RE73-99-0093	Fill	-	-	-	-	-	-	-	-	-	-
73-02207	5.50-6.00	RE73-99-0094	Qbt 3	-	-	-	-	-	-	-	-	-	-
73-10106	4.80-5.30	RE73-99-0102	Fill	-	-	-	-	-	-	-	-	-	-
73-10107	6.00-6.50	RE73-99-0104	Fill	-	-	-	-	-	-	-	-	-	-
73-10096	4.30-4.80	RE73-99-0109	Qbt 3	-	-	-	-	-	-	-	-	-	-

Notes:
All values in milligrams per kilogram (mg/kg)
- = if analyzed, sample result is less than Background Value
SSLs from NMED 2004 (85615)
J = The analyte was positively identified, value is estimated
J+ = The analyte was identified, value is likely biased high
J- = The analyte was identified, value is likely biased low

Table 3
Summary of Historical Incinerator Ash Laboratory Analytical Data for Organic Analytes

Location ID	Depth (ft)	Sample ID	Media	Tetrachlorodibenzodioxin [2,3,7,8-]	Tetrachlorodibenzodioxins (Total)	Tetrachlorodibenzofuran [2,3,7,8-]	Tetrachlorodibenzofurans (Total)	Tetrachloroethene	Toluene	Trichloroethane [1,1,1]	Trichloroethene	Trichlorofluoromethane	Trimethylbenzene [1,3,5-]
SSL Residential				**-**	**-**	**-**	**-**	**9.83**	**248**	**-**	**0.648**	**528**	**22.3**
73-02264	0.00-0.00	0173-96-0304	NA	-	-	-	-	0.003 (J)	-	0.004 (J)	-	0.013	-
73-02260	0.00-0.70	0173-96-0305	NA	-	-	-	-	0.004 (J)	-	0.006	0.006	0.013	-
73-02262	0.00-1.00	0173-96-0307	NA	-	-	-	-	0.002 (J)	-	0.002 (J)	0.001 (J)	0.005	-
73-02255	0.00-0.50	0173-96-0308	Soil	-	-	-	-	-	-	-	-	-	-
73-02266	0.00-0.00	0173-96-0309	NA	-	-	-	-	0.002 (J)	-	0.004 (J)	0.007	0.009	-
73-02268	0.00-1.00	0173-96-0314	NA	-	-	-	-	0.005 (J)	-	0.007	0.002 (J)	0.016	-
73-02270	0.00-0.00	0173-96-0316	NA	-	-	-	-	0.008	-	0.003 (J)	0.004(J)	0.006 (J)	-
73-02252	0.10-0.30	0173-96-0331	NA	-	-	-	-	-	-	-	-	-	0.01
73-02268	0.00-1.00	0173-96-0345	NA	-	-	-	-	0.007	-	0.009	0.003	0.016	-
73-02270	0.00-0.00	0173-96-0346	NA	-	-	-	-	0.009	0.001	0.006	0.005	0.007	-
73-02326	14.00-15.00	0173-96-0501	Fill	-	-	-	-	-	-	-	-	-	-
73-02327	14.00-15.00	0173-96-0502	Fill	-	-	-	-	-	-	-	-	-	-
73-02268	1.20-2.20	0173-97-0001	NA	0.0033	0.1	0.029	0.51	-	-	-	-	-	-
73-02268	0.50-1.00	0173-97-0002	NA	0.0045	0.12	0.042	0.79	-	-	-	-	-	-
73-02261	0.50-1.00	0173-97-0003	NA	0.0064	0.27	0.032	0.57	-	-	-	-	-	-
73-02261	3.50-4.50	0173-97-0004	NA	0.037	0.71	0.35	5.4	-	-	-	-	-	-
73-02268	1.20-2.20	0173-97-0008	NA	0.0066	0.11	0.031	0.51	-	-	-	-	-	-
73-02451	0.10-0.50	0173-97-0311	Soil	-	-	-	-	-	-	-	-	-	-
73-02457	0.10-0.50	0173-97-0321	Soil	-	0.0011 (J)	0.0031	0.026	-	-	-	-	-	-
73-02458	0.10-0.50	0173-97-0322	Soil	-	0.00081 (J)	0.00085 (J)	0.0045 (J)	-	-	-	-	-	-
73-02459	0.10-0.50	0173-97-0323	Soil	-	-	-		-	-	-	-	-	-
73-02460	0.10-0.50	0173-97-0324	Soil	-	0.00073 (J)	0.00097 (J)	0.017	-	-	-	-	-	-
73-02461	0.10-0.50	0173-97-0325	Soil	0.00069 (J)	0.012	0.0062	0.093	-	-	-	-	-	-
73-02462	0.10-0.50	0173-97-0326	Soil	-	-	-		-	-	-	-	-	-
73-02465	3.20-3.70	0173-97-0327	NA	-	0.0084	0.0026	0.025	-	-	-	-	-	-
73-02464	7.00-7.50	0173-97-0336	NA	0.096	1.5	4.5	28	-	-	-	-	-	-
73-02463	3.50-4.00	0173-97-0337	Qbt 3	-	-	0.0003	0.00068	-	-	-	-	-	-
73-02464	7.00-7.50	0173-97-0338	NA	0.14	2.1	6.7	42	-	-	-	-	-	-
73-10098	7.50-7.75	RE73-99-0093	Fill	-	-	-	-	-	-	-	-	-	-
73-02207	5.50-6.00	RE73-99-0094	Qbt 3	-	-	-	-	-	0.00026 (J)	-	-	-	-
73-10106	4.80-5.30	RE73-99-0102	Fill	-	-	-	-	-	-	-	-	-	-
73-10107	6.00-6.50	RE73-99-0104	Fill	-	-	-	-	-	-	-	-	-	-
73-10096	4.30-4.80	RE73-99-0109	Qbt 3	-	-	-	-	-	-	-	-	-	-

Notes:
All values in milligrams per kilogram (mg/kg)
- = if analyzed, sample result is less than Background Value
SSLs from NMED 2004 (85615)
J = The analyte was positively identified, value is estimated
J+ = The analyte was identified, value is likely biased high
J- = The analyte was identified, value is likely biased low

Table 4
Summary of 2005 Incinerator Ash Laboratory Analytical Data for Organic Analytes

Sample ID:	RE73-05-58829	RE73-05-58835	RE73-05-58841	RE73-05-58878	RE73-05-58879
Matrix:	Ash	Ash	Ash	Ash	Ash
Sample Date:	4/19/2005	4/19/2005	4/19/2005	4/20/2005	4/20/2005
Units:	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)	(ug/kg)
Volatile Organic Compounds					
Bromomethane	3.5	4.7	2.4	-	3
Acetone	ND	ND	ND	26	-
Methylene Chloride	11	12	6.6	14	31
Carbon Disulfide	-	-	-	-	-
2-Butanone (MEK)	-	-	-	3.9	-
Chloroform	-	-	-	-	-
Trichloroethene	0.71	-	-	-	-
Bromodichloromethane	-	-	-	-	-
Toluene	-	0.99	-	-	-
Chlorodibromomethane	-	-	-	-	-
Xylenes (total)	-	-		-	3.7
1,2,4-Trimethylbenzene	0.79	-	-	-	-
p-Isopropyltoluene	17	-	1.3	-	-
1,3-Dichlorobenzene	-	2.1	-	-	-
1,4-Dichlorobenzene	-	-	-	-	2.5
1,2-Dichlorobenzene	-	2.6	-	-	-
Semi-Volatile Organic Compounds					
1,3-Dichlorobenzene	160	-	-		-
1,4-Dichlorobenzene	170	-	-		-
Benzyl alcohol	-	-	-		-
1,2-Dichlorobenzene	150	-	-		-
Nitrobenzene	210	-	-		-
2-Nitrophenol	180	-	-		-
Benzoic Acid	830	490	-		-
1,2,4-Trichlorobenzene	180	-	-		-
Naphthalene	130	-	-		-
Hexachlorobutadiene	140	-	-		-
2-Methylnaphthalene	120	-	-		-
2,4,6-Trichlorophenol	130	-	-		-
2-Chloronaphthalene	140	-	-		-
Acenaphthylene	150	-	-		-
Acenaphthene	130	-	-		-
Dibenz(a,h)anthracene	86	-	-		-
Dibenzofuran	140	-	-		-
Fluorene	150	-	-		-
4-Chlorophenyl phenyl ether	190	-	-		-
N-Nitrosodiphenylamine	190	-	-		-
Pyrene	470	110	320		-
4-Bromophenyl phenyl ether	190	-	-		-
Hexachlorobenzene	450	110	-		-
Pentachlorophenol	180	-	-		-
Phenanthrene	150	-	200		-
Anthracene	140	-	-		-
Fluoranthene	140	-	300		-
Benzo(a)anthracene	150	-	150		-
Chrysene	160	-	150		-
Bis(2-ethylhexyl)phthalate	88	97	98		330
Benzo(b)fluoranthene	180	-	120		-
Benzo(k)fluoranthene	150	-	120		-
Benzo(a)pyrene	540	-	110		-
Indeno(1,2,3-cd)pyrene	530	-	-		-
Benzo(ghi)perylene	130	340	-		-
Di-n-butyl phthalate	500	-	-		-
Benzo(ghi)perylene	420	-	-		-
PCBs					
Aroclor 1254	-	58	96		380
Dioxins/Furans					
TEQ	0.0612	0.0742	0.0768		0.0353

Notes:
ug/kg = micrograms per kilogram
ug/L = micrograms per liter
NA = not available
- = not detected
blank = not analyzed/not sampled
TCLP = Toxicity Characteristic Leaching Procedure

Table 4
Summary of 2005 Incinerator Ash Laboratory Analytical Data for Organic Analytes

Sample ID:	RE73-05-58923	RE73-05-58924	TCLP	
Matrix:	Water	Water		
Sample Date:	4/20/2005	4/20/2005	Results	Pass/Fail
Units:	(ug/L)	(ug/L)	(ug/L)	
Volatile Organic Compounds				
Bromomethane	-	-		NA
Acetone	-	3.4		NA
Methylene Chloride	5.5	6		NA
Carbon Disulfide	2.2	-		NA
2-Butanone (MEK)	-	-	200000	Pass
Chloroform	2.1	2.5	6000	Pass
Trichloroethene	-	-	500	Pass
Bromodichloromethane	0.34	-		NA
Toluene	0.27	-		NA
Chlorodibromomethane	0.19	1.9		NA
Xylenes (total)	-	-		NA
1,2,4-Trimethylbenzene	-	-		NA
p-Isopropyltoluene	-	-		NA
1,3-Dichlorobenzene	-	-		NA
1,4-Dichlorobenzene	0.14	-	7500	Pass
1,2-Dichlorobenzene	-	-		NA
Semi-Volatile Organic Compounds				
1,3-Dichlorobenzene	-	-		NA
1,4-Dichlorobenzene	-	-	7500	Pass
Benzyl alcohol	-	3.1		NA
1,2-Dichlorobenzene	-	-		NA
Nitrobenzene	-	-	2000	Pass
2-Nitrophenol	-	-		NA
Benzoic Acid	-	-		NA
1,2,4-Trichlorobenzene	-	-		NA
Naphthalene	-	-		NA
Hexachlorobutadiene	-	-	500	Pass
2-Methylnaphthalene	-	-		NA
2,4,6-Trichlorophenol	-	-	2000	Pass
2-Chloronaphthalene	-	-		NA
Acenaphthylene	-	-		NA
Acenaphthene	-	-		NA
Dibenz(a,h)anthracene	-	-		NA
Dibenzofuran	-	-		NA
Fluorene	-	-		NA
4-Chlorophenyl phenyl ether	-	-		NA
N-Nitrosodiphenylamine	-	-		NA
Pyrene	-	-		NA
4-Bromophenyl phenyl ether	-	-		NA
Hexachlorobenzene	-	-	130	Pass
Pentachlorophenol	-	-	100000	Pass
Phenanthrene	-	-		NA
Anthracene	-	-		NA
Fluoranthene	-	-		NA
Benzo(a)anthracene	-	-		NA
Chrysene	-	-		NA
Bis(2-ethylhexyl)phthalate	-	-		NA
Benzo(b)fluoranthene	-	-		NA
Benzo(k)fluoranthene	-	-		NA
Benzo(a)pyrene	-	-		NA
Indeno(1,2,3-cd)pyrene	-	-		NA
Benzo(ghi)perylene	-	-		NA
Di-n-butyl phthalate	-	-		NA
Benzo(ghi)perylene	-	-		NA
PCBs				
Aroclor 1254	-	-		NA
Dioxins/Furans				
TEQ				NA

Notes:
ug/kg = micrograms per kilogram
ug/L = micrograms per liter
NA = not available
- = not detected
blank = not analyzed/not sampled
TCLP = Toxicity Characteristic Leaching Procedure

Table 5
Summary of Historical Incinerator Ash Laboratory Analytical Data for Radionuclides

Location ID	Depth (ft)	Sample ID	Media	Gross alpha	Gross beta	Gross gamma	Cs-137	Pu-239	U-234	U-235	U-238	Tritium
Soil Background Value (BV)				**-**	**-**	**-**	**1.65**	**0.054**	**2.59**	**0.2**	**2.29**	**0.76**
Units				**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/ml)**
73-02252	0.1-0.3	0173-96-0331	NA	-	-	-	-	-	-	-	-	0.08
73-02252	0.10-0.30	0173-96-0331	NA	8.9	6.7	6.65	-	-	-	-	-	-
73-02253	0.00-0.50	0173-96-0302	Soil	0.66	1.04	8.08	-	-	-	-	-	-
73-02254	0.00-0.50	0173-96-0320	Soil	3.55	3.6	14.1	-	-	-	-	-	0.054
73-02255	0.00-0.50	0173-96-0308	Soil	3.07	4.33	16.5	-	-	-	-	-	0.064
73-02260	0.00-0.70	0173-96-0305	NA	6.4	7.7	6.98	-	-	-	-	-	-
73-02262	0.00-1.00	0173-96-0307	NA	2.88	-	2.24	-	-	-	-	-	-
73-02264	0.00-0.00	0173-96-0304	NA	4.7	7.8	5.32	-	-	-	-	-	-
73-02266	0.00-0.00	0173-96-0309	NA	11.6	8.8	5.33	-	-	-	-	-	-
73-02268	0.00-1.00	0173-96-0314	NA	8.7	9.4	7.11	-	-	-	-	-	-
73-02268	0.00-1.00	0173-96-0345	NA	10.7	9	6.21	-	-	-	-	-	-
73-02270	0.00-0.00	0173-96-0316	NA	2.94	5.6	3.99	-	-	-	-	-	-
73-02270	0.00-0.00	0173-96-0346	NA	-	5.2	2.48	-	-	-	-	-	-
73-02326	14.00-15.00	0173-96-0501	Fill	6.02	3.15	12.3	-	-	-	-	-	-
73-02327	14.00-15.00	0173-96-0502	Fill	2.44	1.42	13	-	-	-	-	-	-
73-02467	0.10-0.50	0173-97-0331	NA	22.2	13.8	9.15	-	-	12.57	0.5	8.84	-
73-02468	0.1-0.5	0173-97-0332	NA	-	-	-	0.239	-	-	-	-	-
73-02468	0.10-0.50	0173-97-0332	NA	19.8	21.4	8.89	-	-	17.1	0.771	15.93	-
73-10000	0.00-0.50	RE73-98-0001	NA	-	-	-	-	-	5.37	0.308	2.51	-
73-10000	0-0.5	RE73-98-0001	NA	-	-	-	1.51	2.54	-	-	-	-
73-10000	0.00-0.50	RE73-98-0002	NA	-	-	-	-	-	4.9	0.578	2.23	-
73-10000	0-0.5	RE73-98-0002	NA	-	-	-	1.45	2.5				-
73-10001	0.00-0.50	RE73-98-0003	NA	-	-	-	-	-	3.84	0.352	1.98	-
73-10001	0-0.5	RE73-98-0003	NA	-	-	-	0.98	0.522	-	-	-	-
73-10002	0.00-0.50	RE73-98-0066	NA	-	-	-	-	-	2.82	0.219	1.44	-
73-10002	0-0.5	RE73-98-0066	NA	-	-	-	0.87	0.801	-	-	-	-
73-10003	0.00-0.50	RE73-98-0004	NA	-	-	-	-	-	14.15	0.765	6.6	-
73-10003	0-0.5	RE73-98-0004	NA	-	-	-	-	1.228	-	-	-	-
73-10004	0.00-0.50	RE73-98-0005	NA	-	-	-	-	-	14.53	0.966	11.62	-
73-10004	0-0.5	RE73-98-0005	NA	-	-	-	0.34	0.731	-	-	-	-
73-10005	0.00-0.50	RE73-98-0006	NA	-	-	-	-	-	9.41	0.783	8.11	-
73-10005	0-0.5	RE73-98-0006	NA	-	-	-	-	0.709	-	-	-	-
73-10006	0.00-0.50	RE73-98-0007	NA	-	-	-	-	-	5.89	0.523	4.31	-
73-10006	0-0.5	RE73-98-0007	NA	-	-	-	0.32	1.82				-
73-10007	0.00-0.50	RE73-98-0008	NA	-	-	-	-	-	4.97	0.289	4.32	-
73-10007	0-0.5	RE73-98-0008	NA	-	-	-	0.26	1.052				-
73-10008	0.00-0.50	RE73-98-0009	NA	-	-	-	-	-	3.15	0.211	2.41	-
73-10008	0-0.5	RE73-98-0009	NA	-	-	-	0.5	0.469				-
73-10009	0.00-0.50	RE73-98-0010	NA	-	-	-	-	-	3.53	0.219	2.83	-
73-10009	0-0.5	RE73-98-0010	NA	-	-	-	0.33	0.363	-	-	-	-
73-10010	0.00-0.50	RE73-98-0011	NA	-	-	-	-	-	5.7	0.439	4.57	-
73-10010	0-0.5	RE73-98-0011	NA	-	-	-	0.38	0.627	-	-	-	-
73-10011	0.00-0.50	RE73-98-0012	NA	-	-	-	-	-	6.71	0.353	4.12	-
73-10011	0-0.5	RE73-98-0012	NA	-	-	-	-	1.95	-	-	-	-
73-10026	0.00-0.50	RE73-98-0027	NA	-	-	-	-	-	1.62	0.082	1.5	-

Table 5
Summary of Historical Incinerator Ash Laboratory Analytical Data for Radionuclides

Location ID	Depth (ft)	Sample ID	Media	Gross alpha	Gross beta	Gross gamma	Cs-137	Pu-239	U-234	U-235	U-238	Tritium
Soil Background Value (BV)				**-**	**-**	**-**	**1.65**	**0.054**	**2.59**	**0.2**	**2.29**	**0.76**
Units				**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/g)**	**(pCi/ml)**
73-10026	0-0.5	RE73-98-0027	NA	-	-	-	0.35	1.242	-	-	-	-
73-10027	0.00-0.50	RE73-98-0028	NA	-	-	-	-	-	1.45	0.085	1.332	-
73-10027	0-0.5	RE73-98-0028	NA	-	-	-	-	0.202	-	-	-	-
73-10028	0.00-0.50	RE73-98-0029	NA	-	-	-	-	-	1.298	0.086	1.253	-
73-10028	0-0.5	RE73-98-0029	NA	-	-	-	-	0.088	-	-	-	-
73-10029	0.00-0.50	RE73-98-0030	NA	-	-	-	-	-	2.88	0.201	2.26	-
73-10029	0-0.5	RE73-98-0030	NA	-	-	-	-	0.51	-	-	-	-
73-10030	0.00-0.50	RE73-98-0031	NA	-	-	-	-	-	1.49	0.083	1.281	-
73-10030	0-0.5	RE73-98-0031	NA	-	-	-	-	0.273	-	-	-	-
73-10031	0.00-0.50	RE73-98-0032	NA	-	-	-	-	-	1.86	0.158	1.69	-
73-10031	0-0.5	RE73-98-0032	NA	-	-	-	0.53	0.225	-	-	-	-
73-10032	0.00-0.50	RE73-98-0033	NA	-	-	-	-	-	2.67	0.226	2.23	-
73-10032	0-0.5	RE73-98-0033	NA	-	-	-	0.43	0.353	-	-	-	-
73-10033	0.00-0.50	RE73-98-0034	NA	-	-	-	-	-	1.43	0.129	1.205	-
73-10033	0-0.5	RE73-98-0034	NA	-	-	-	0.42	0.218	-	-	-	-
73-10034	0.00-0.50	RE73-98-0035	NA	-	-	-	-	-	3.18	0.306	2.98	-
73-10034	0-0.5	RE73-98-0035	NA	-	-	-	0.36	0.322	-	-	-	-
73-10034	0.00-0.50	RE73-98-0068	NA	-	-	-	-	-	3.04	0.216	2.61	-
73-10034	0-0.5	RE73-98-0068	NA	-	-	-	0.27	0.546	-	-	-	-
73-10035	0.00-0.50	RE73-98-0036	NA	-	-	-	-	-	4	0.409	3.48	-
73-10035	0-0.5	RE73-98-0036	NA	-	-	-	0.42	0.48	-	-	-	-
73-10036	0.00-0.50	RE73-98-0037	NA	-	-	-	-	-	5.25	0.383	4.92	-
73-10036	0-0.5	RE73-98-0037	NA	-	-	-	0.29	0.346	-	-	-	-
73-10037	0.00-0.50	RE73-98-0038	NA	-	-	-	-	-	1.312	0.131	1.215	-
73-10037	0-0.5	RE73-98-0038	NA	-	-	-	0.29	0.115	-	-	-	-

Notes:
NA - not available
- = if analyzed, sample result is less than BV
BV from LANL 1998
pCi/g = picoCurries per gram
Cs = Cesium
Pu = Plutonium
U = Uranium

Table 6
Summary of 2005 Incinerator Ash Laboratory Analytical Data for Radionuclides

Sample ID	Location	Am-241	U-234	U-235	U-238	Pu-238	Pu-239	Ra-226	Ra-224	Th-234	Cs-137
Soil Background Value (BV)		**0.013**	**2.59**	**0.2**	**2.29**	**0.023**	**0.054**	**2.59**	**2.33**	**2.29**	**1.65**
RE-73-05-58842/43	B3	0.036	9.090	0.360	7.160	-	1.070	6.240	2.440	5.050	-
RE-73-05-58844/45	Ash	0.029	1.700	0.081	1.360	-	0.143	1.950	2.190	-	0.138
RE-73-05-58846	B4	-	3.290	0.157	2.770	-	0.296	2.060	-	1.340	-
RE73-05-58824	C3 East	0.035	8.410	0.400	7.640	-	0.360	4.740	2.900	3.870	-
RE73-05-58825	C3 West	-	12.400	0.458	5.780	-	2.340	4.910	-	2.390	-
RE73-05-58826	C2 East	0.024	8.220	0.475	7.010	-	0.475	6.210	2.040	4.330	-
RE73-05-58827	C2 West	-	9.970	0.494	6.970	-	0.544	6.910	5.400	5.490	-
RE73-05-58828	C1	0.037	5.230	0.267	3.310	-	1.680	6.650	2.340	5.220	-
RE73-05-58830	D2	0.023	5.540	0.264	4.990	-	0.375	3.360	-	2.200	-
RE73-05-58831	D3	-	20.000	1.060	18.700	-	0.310	8.120	2.300	7.500	-
RE73-05-58832	D3	-	3.540	0.193	2.610	-	0.236	2.810	2.110	1.790	-
RE73-05-58833	E3	-	1.590	0.057	1.240	-	0.219	3.970	2.040	2.970	-
RE73-05-58834	E3	-	1.730	0.092	1.150	-	0.186	-	1.990	-	-
RE73-05-58836	D4	-	2.240	0.106	1.930	-	0.104	1.900	1.150	1.060	0.092
RE73-05-58837	C4	-	1.680	0.089	1.450	-	0.100	1.370	1.130	1.000	-
RE73-05-58838	B1	-	37.300	2.020	31.200	-	0.848	25.200	-	21.100	-
RE73-05-58839	B2	-	7.400	0.340	4.840	-	0.455	4.390	2.490	2.490	-
RE73-05-58840	B3	-	3.030	0.194	2.420	-	0.842	1.640	-	1.160	-

Notes:
All values are in picoCurries per gram (pCi/g)
BVs from LANL 1998 (59730), Table 6.0-2)

- = non detect
Am - Americium

U - Uranium
Pu - Plutonium
Ra - Radium
Th - Thorium
Cs - Cesium

Table 7
Rationale for Proposed Sampling Locations, Depths and Analytes

Location ID	Description	Sampling Rationale	Proposed Depths and Media Type (feet bgs)	VOCs, SVOCs, PCBs, Pesticides, Metals	Dioxins/Furans, Explosives	Radiochemistry (by gamma spectroscopy)	Perchlorate, Cyanide, Nitrates, pH
73-003 Former Truck Cleaning Facility							
#1	Former sump and drain line	Sampling of historical location to define vertical extent of contamination: pesticides detected at 4.8-6.5 feet in several historical samples from this former facility.	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#2	Step-out	Sampling to define lateral extent of contamination from sump and drain lines	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#3	Step-out	Sampling to define lateral extent of contamination from sump and drain lines	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#4	Former sump and drain line	Sampling of historical location to define vertical extent of contamination: pesticides detected at 4.8-6.5 feet in several historical samples from this former facility.	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#5	Drain line and step-out	Sampling to define lateral extent of contamination from sump and drain lines	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#6	Step-out	Sampling to define lateral extent of contamination from sump and drain lines	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X

Table 7 (Continued)
Rationale for Proposed Sampling Locations, Depths and Analytes

Location ID	Description	Sampling Rationale	Proposed Depths and Media Type (feet bgs)	VOCs, SVOCs, Pesticides, PCBs, Metals	Dioxins/Furans	Radiochemistry	Perchlorate, Cyanide, Nitrates, pH
73-004(a) Septic System at Former Incinerator Building							
#1	Former septic tank	Sampling of historical location to define vertical extent of contamination: pesticides and PAHs detected at 7.2-7.4 feet	Fill (approx. 7 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	X X X	X X X	X X X
#2	Step-out	Sampling to define lateral extent of contamination from septic tank and piping	Fill (approx. 7 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	X X X	X X X	X X X
#3	Step-out	Sampling to define lateral extent of contamination from septic tank and piping	Fill (approx. 7 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	X X X	X X X	X X X
73-004(b) Septic System from Former Truck Cleaning Facility							
#1	Former septic tank	Sampling of historical location to define vertical extent of contamination: pesticides detected at 14-15 feet	Fill (approx. 14-15 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#2	Step-out	Sampling to define lateral extent of contamination from septic tank and piping	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#3	Step-out	Sampling to define lateral extent of contamination from septic tank and piping	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#4	Step-out	Sampling to define lateral extent of contamination from septic tank and piping	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X

Table 7 (Continued)
Rationale for Proposed Sampling Locations, Depths and Analytes

Location ID	Description	Sampling Rationale	Proposed Depths and Media Type (feet bgs)	VOCs, SVOCs, Pesticides, PCBs, Metals	Dioxins/Furans	Radiochemistry	Perchlorate, Cyanide, Nitrates, pH
73-004(b) Septic System from Former Truck Cleaning Facility (Continued)							
#5	Step-out	Sampling to define lateral extent of contamination from septic tank and piping	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#6	Former discharge line	Sampling of historical location to define vertical extent of contamination: pesticides detected at 14-15 feet	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#7	Step-out	Sampling to define lateral extent of contamination from piping	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#8	Step-out	Sampling to define lateral extent of contamination from piping	Fill (approx. 5-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#9	Former outfall	Sampling of historical location to define vertical extent of contamination: pesticides and PAHs detected at 0-2 feet	Fill (approx. 0-2 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#10	Step-out	Sampling to define lateral extent of contamination from outfall	Fill (approx. 0-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#11	Step-out	Sampling to define lateral extent of contamination from outfall	Fill (approx. 0-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X

Table 7 (Continued)
Rationale for Proposed Sampling Locations, Depths and Analytes

Location ID	Description	Sampling Rationale	Proposed Depths and Media Type (feet bgs)	VOCs, SVOCs, Pesticides, PCBs, Metals	Dioxins/Furans	Radiochemistry	Perchlorate, Cyanide, Nitrates, pH
73-004(b) Septic System from Former Truck Cleaning Facility (Continued)							
#12	Step-out	Sampling to define lateral extent of contamination from outfall	Fill (approx. 0-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
#13	Step-out	Sampling to define lateral extent of contamination from outfall	Fill (approx. 0-6 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	(1)	X X X	X X X
73-006 Incinerator Drain Lines							
#1	Former drain line	Sampling of historical location to define vertical extent of contamination: trace pesticides detected at 4.3-4.8 feet	Fill (approx. 4 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	X X X	X X X	X X X
#2	Step-out	Sampling to define lateral extent of contamination from piping	Fill (approx. 0-2 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	X X X	X X X	X X X
#3	Step-out	Sampling to define lateral extent of contamination from piping	Fill (approx. 0-2 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	X X X	X X X	X X X
#4	Step-out	Sampling to define lateral extent of contamination from piping	Fill (approx. 0-2 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	X X X	X X X	X X X
#5	Former drain line	Sampling of historical location to define vertical extent of contamination: pesticides and PAHs detected at 3-3.4 feet	Fill (approx. 0-3 feet) Fill/Tuff Interface 1-2 Feet into Tuff	X X X	X X X	X X X	X X X

Table 7 (Continued)
Rationale for Proposed Sampling Locations, Depths and Analytes

Footnotes:
(1) Dioxins/Furans are a byproduct of combustion, and explosives are unlikely to be associated with the cleanout of municipal trash trucks and containers.
VOCs – Volatile organic compounds by EPA Method 8260B
SVOCs – Semi-volatile organic compounds by EPA Method 8270C
PCBs – Polychlorinated biphenyls by EPA Method 8082
Pesticides by EPA Method 8081
Dioxins/Furans by EPA Method 8290
Radiochemistry by gamma spectroscopy
Perchlorate by EPA Method 314 and SW-846 Method 8321A
Cyanide by EPA Method 9021A
Nitrates by EPA Method 300
pH by SW-846 Method 9045C)

Table 8
Summary of Applicable Investigation Methods

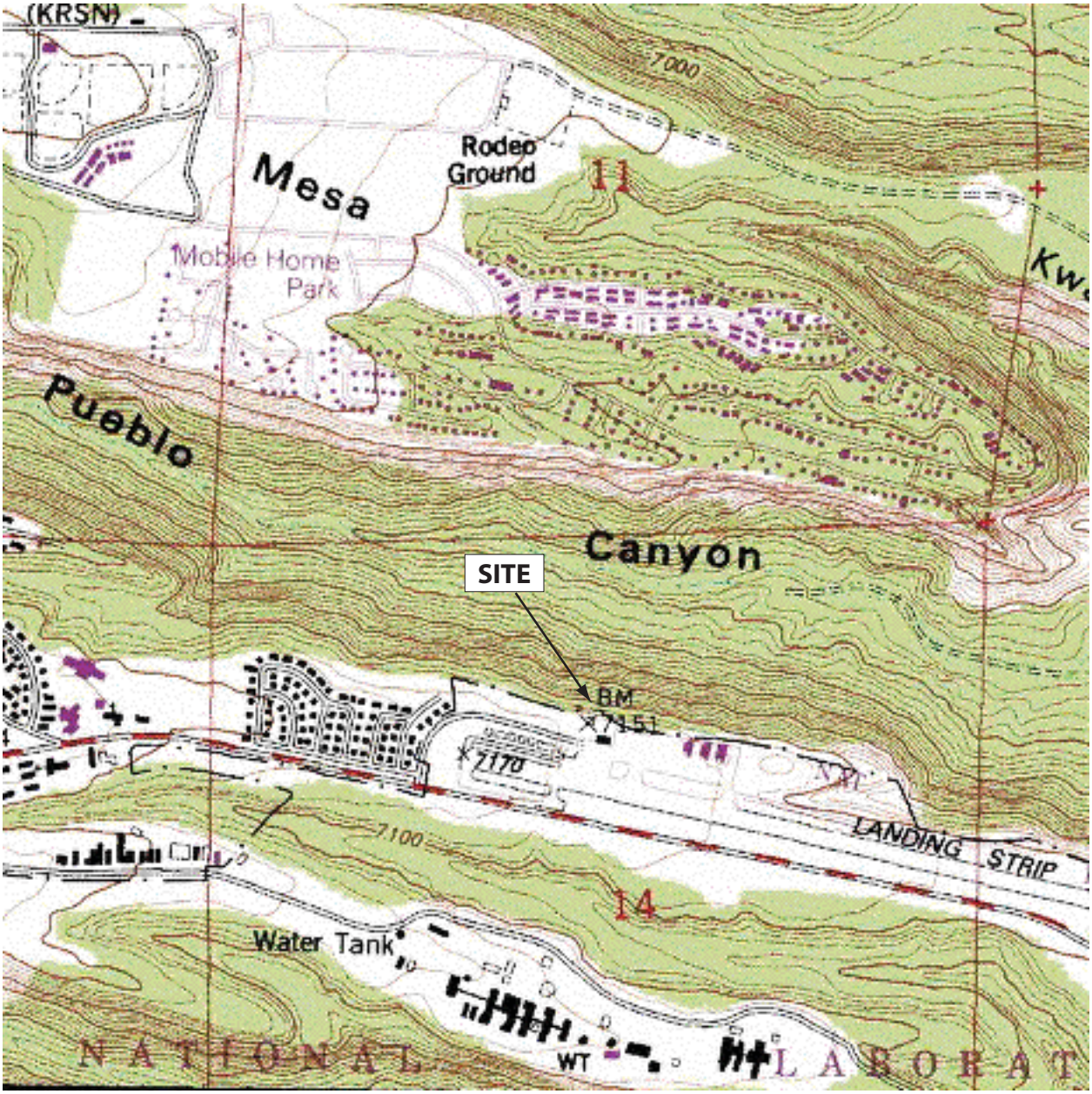
Procedure	Title	Summary
SOP 01.01	General Instructions for Field Investigations	This standard operating procedure (SOP) provides an overview of instructions regarding activities to be performed before, during, and after field investigations completed by the Los Alamos National Laboratory's Environmental Stewardship, Remediation Services (ENV-RS) project. It is assumed that field investigations involve standard sampling equipment, personal protective equipment, waste-management, and site-control equipment/materials. The procedure covers premobilization activities, mobilization to the site, documentation and sample-collection activities, sample-media evaluation, surveying, and completing lessons learned.
SOP 01.02	Sample Containers and Preservation	This SOP describes the specific requirements/process for sample containers, preservation techniques, and holding times as specified by field regulations and guidance documents. The use of specific types of sample containers, and preservation techniques is mandatory for hazardous site investigations because the integrity of any sample is diminished over time. Physical factors (light, pressure, temperature, etc.), chemical factors (changes in pH, volatilization, etc.), and biological factors may alter the original quality of the sample. Because the various target parameters are uniquely altered at varying rates, distinct sample containers, preservation techniques, and holding times have been established to maintain sample integrity for a reasonable and acceptable period of time. The procedure covers documenting SOP deviations, using proper sample containers and preservatives, performing data entry, implementing containment procedures, preserving samples, implementing holding times, completing documentation, implementing postoperation activities, and performing lessons learned.
SOP 01.03	Handling, Packaging, and Shipping of Samples	This SOP directs field team members in the preparation of environmental and waste characterization samples for transportation to the Sample Management Office or an approved radiation-screening laboratory. In general, samples taken for the Remediation Services Project are expected to have a low concentration of potential contaminants, although higher concentrations will be present in some cases. Those low-concentration samples that do not satisfy the U.S. Department of Transportation (DOT) hazard-class definitions are classified as environmental samples and are not subject to DOT regulations. Historical data, knowledge of processes, and field screening results assist the team members in making decisions as to whether a sample can be designated as "environmental" or needs to be treated as a DOT-regulated material. The procedure covers the transportation of environmental and DOT-regulated samples.
SOP 01.04	Sample Control and Field Documentation	This SOP describes the process for documenting samples collected for the ENV-RS project using sample control and field documentation, specifically, container labels, sample collection logs, chain of custody (COC)/request for analysis forms, and daily activity log forms or field notebooks. The procedure covers performing request notification, generating sample control and field documentation, completing sample collection logs, using field chain-of-custody forms, delivering samples to the Sample Management Office (SMO), delivering samples to another analytical laboratory, using custody seals, collecting the samples, completing field investigation summaries, and performing field closeouts.

Table 8 (continued)
Summary of Applicable Investigation Methods

Procedure	Title	Summary
SOP 01.05	Field Quality Control Samples	This SOP describes the requirements for the collection of field quality control (QC) samples to ensure the reliability and validity of field and laboratory data. Field QC samples shall be collected as described in this procedure and taken to the Los Alamos National Laboratory SMO with the regular field samples for subsequent chemical and physical testing. The procedure covers preoperation activities, collecting and preparing each type of QC sample including equipment rinsate blank, field duplicate, and trip blank.
SOP 01.06	Management of Environmental Restoration Project Wastes	This SOP describes the process for managing waste generated during corrective action activities. This procedure outlines the preparation, approval, and retention of all required documents associated with waste generation. The procedure covers waste identification and characterization, waste minimization/recycling, waste generation/storage, segregation, waste treatment, authorized release limits, packaging/transportation, disposal options, and specific ENV-RS project policies, including the area of contamination policy, environmental media, and "contained in" policy.
SOP 01.08	Field Decontamination of Drilling and Sampling Equipment	This SOP describes the process for the general field decontamination of drilling and sampling equipment. It is intended to help ensure the integrity of soil, sediment, rock, water, and other samples collected from potentially contaminated sites and to minimize the potential for cross contamination between sampling locations. Implementation of this procedure will help protect site and project personnel, requiring that equipment not be removed from a controlled area without proper decontamination. The procedure covers set up of dry and wet decontamination areas, drilling/excavation equipment decontamination, and sampling equipment decontamination.
SOP 01.10	Waste Characterization	This SOP describes the development of a strategy for characterizing wastes generated during projects performed. Specifically, this document (1) identifies the steps involved in waste identification and characterization, and (2) provides instructions for completing a Waste Characterization Strategy Form (WCSF), a task that is required before every project.
SOP 03.11	Geodetic Surveys	This SOP describes the methodology for coordinating and evaluating geodetic surveys and establishing quality assurance (QA) and control 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.
SOP 04.01	Drilling Methods and Drill-Site Management	This SOP describes the drilling methods and drilling-package implementation to meet subsurface sampling requirements. Various drilling methods have been developed to achieve successful subsurface contact for retrieving suitable formation, gas, and water samples. These include, but are not limited to, solid-stem augering, hollow-stem augering, direct rotary drilling, reverse rotary drilling, cable-tool drilling, and hand augering.
SOP 05.03	Monitoring Well and RFI Borehole Abandonment	This SOP describes the process for monitoring well and RFI borehole abandonment. Procedures described in this SOP are consistent with acceptable practice for monitoring well and borehole abandonment under RCRA (Resource Conservation and Recovery Act) facility investigation (RFI) guidance. The procedure covers monitoring well and RFI borehole abandonment, placement of the appropriate sealing and fill material, options for destroying monitoring wells and RFI boreholes in urban areas and near active technical areas, and reporting requirements.

Table 8 (continued)
Summary of Applicable Investigation Methods

Procedure	Title	Summary
SOP 06.09	Spade and Scoop Method for the Collection of Soil Samples	This SOP describes the process for spade-and-scoop collection of shallow (i.e., typically 0 to 12 inches) soil 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 or portion of a composite sample. The procedure covers presampling activities, sampling activities, and post sampling activities.
SOP 06.10	Hand Auger and Thin-Wall Tube Sampler	This SOP states the responsibilities and describes the process for collecting surface and subsurface (up to about 15 ft) soil samples with a hand auger and thin-wall tube sampler. This procedure describes the selection and use of sampling methods and equipment at sites that may include contamination with hazardous or radioactive materials. The procedure covers presampling activities, sampling activities, collecting field duplicates, and postsampling activities.
SOP 06.26	Core-Barrel Sampling for Subsurface Earth Materials	This SOP describes the process for collecting core-barrel samples of subsurface earth materials. The field team may sample for other constituents under this SOP (or modifications thereof). The procedure covers presampling activities, sampling activities, and postsampling activities.
SOP 12.01	Field Logging, Handling, and Documentation of Borehole Materials	This SOP prescribes the specific borehole material management methods to be followed and the documentation to be prepared, during handling and field logging of selected borehole materials identified in the site guidance documents and waste-characterization strategy form. This procedure is limited to the activities necessary to take custody of core and cuttings from drill rig personnel, conduct field screening, remove time-sensitive analytical samples and subsamples for preliminary characterization, complete photo documentation when necessary, perform field structural and lithologic description, and mark, package, and temporarily store the borehole materials at a drill-site borehole material storage trailer. This procedure describes the handling of the subset of borehole materials to be curated from the time they are withdrawn from the borehole to the time they are ready to be transported to the Remediation Services Project's Field Support Facility for curating and archiving. For the purposes of this SOP, borehole material may also refer to other solid materials, such as drive samples or augured materials. This procedure covers borehole material staging, temporary packaging of time-sensitive analytical samples, measurement and determination of material loss, marking core (depth notation and stripes), core photography, core logging, removal of analytical samples (core), and core-box loading and storing.
SOP 15.09	Chain of Custody for Analytical Data Record Packages	This SOP states the responsibilities and describes the process for establishing and maintaining a proper chain of custody (COC) in the management and processing of analytical data record packages.
SOP 15.13	Performing Background Value Comparisons for Radionuclides	This SOP describes the process for performing background value comparisons and fallout value comparisons on radionuclides at the Los Alamos National Laboratory ER Project. Background values used for comparison are based on LA-UR-98-4847, "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory."



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NOT TO SCALE

Source: USGS 7.5 minute, Guaje Mountain Quadrangle, 1984

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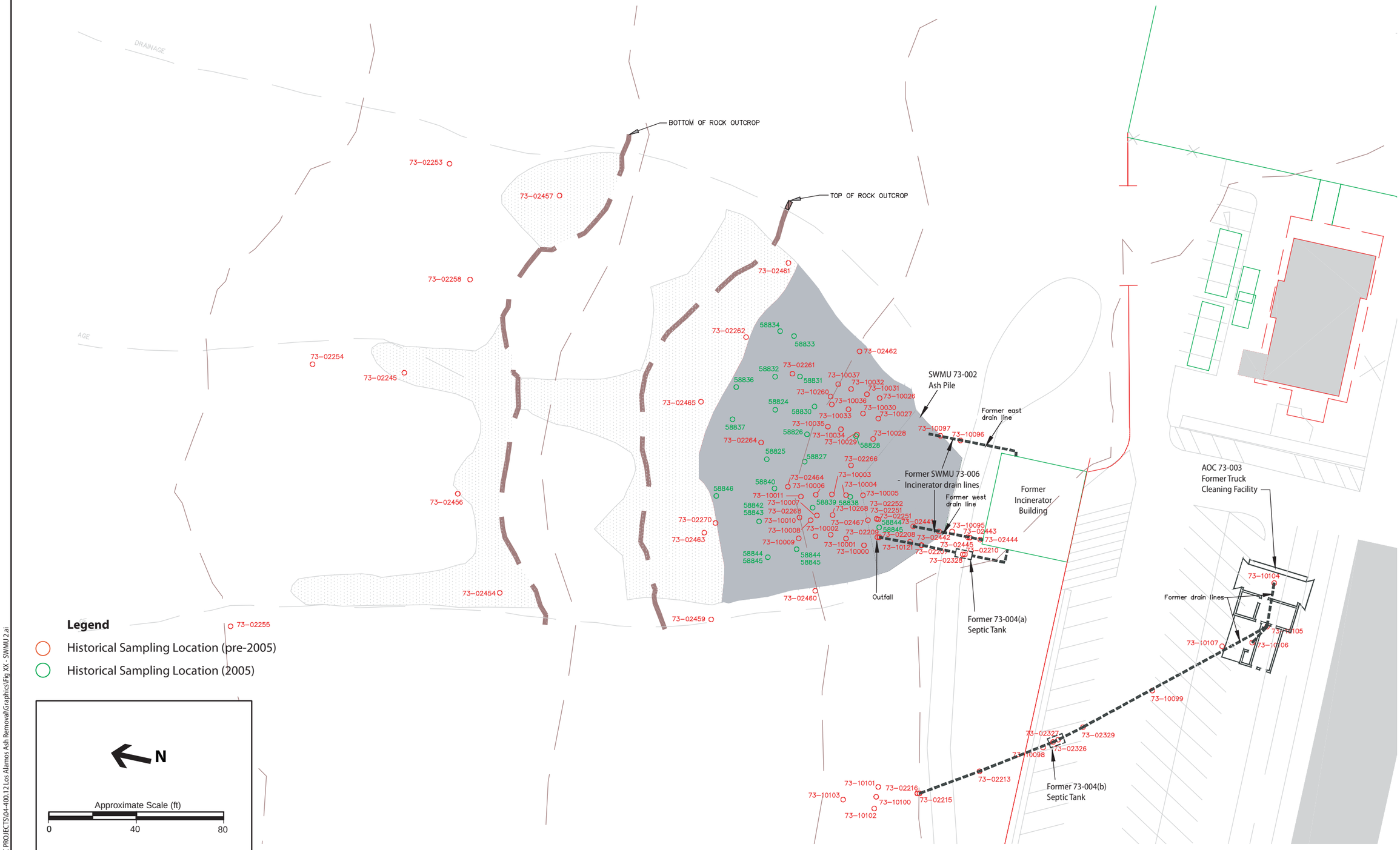
Los Alamos National Laboratory, U.S. Department of Energy

Consolidated Unit 73-002-99, Los Alamos National Laboratory, New Mexico

FIGURE 1
Site Location Map

04-400.12\LANL\Graphics\Waste Characterization Workplan\Fig 1 - Site Location Map.ai



2004 Projects\04-400 SPD PRAC PROJECTS\04-400.12 Los Alamos Ash Removal\Graphics\Fig XX - SWMU 2.ai

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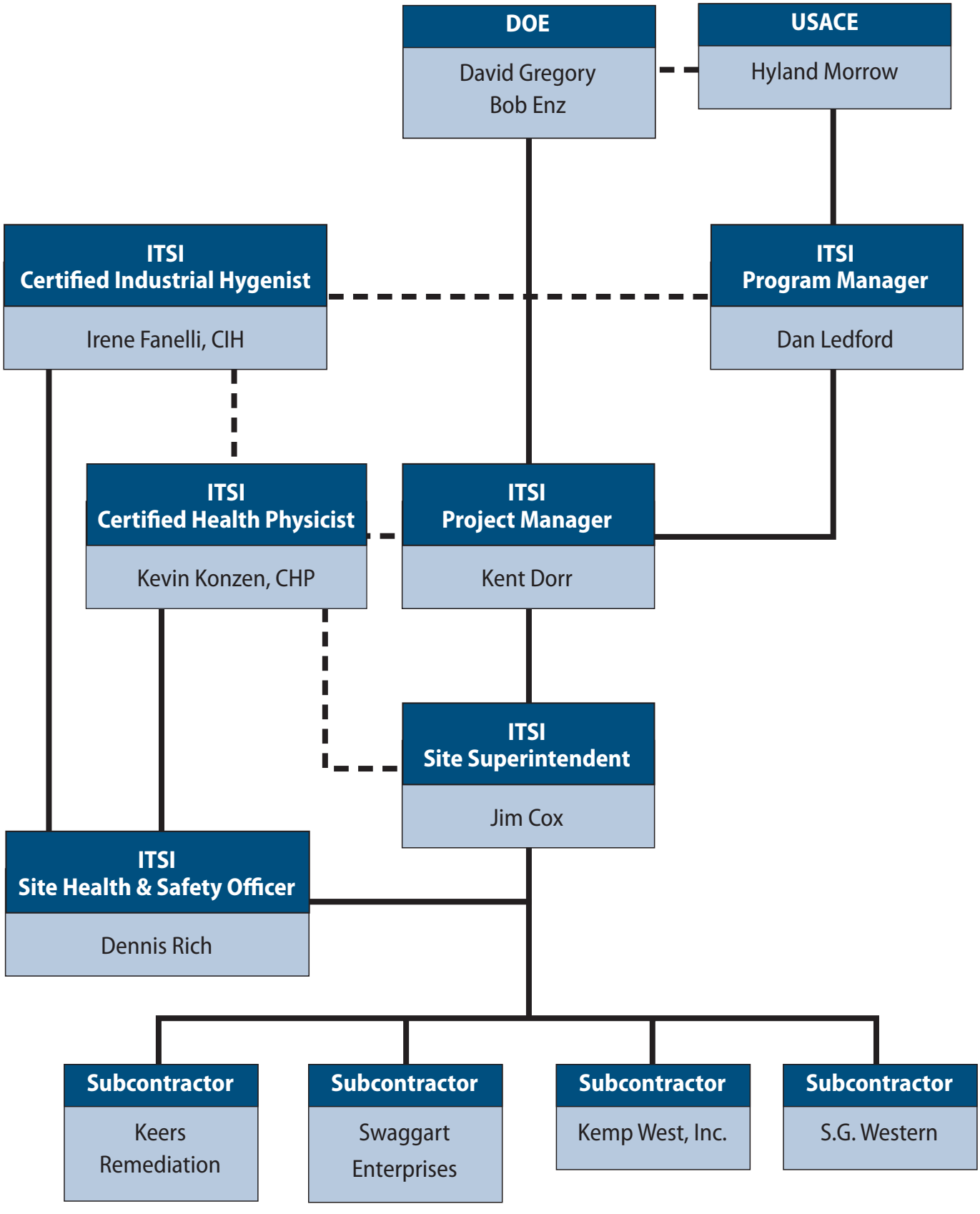
Los Alamos National Laboratory, U.S. Department of Energy

Consolidated Unit 73–002–99, Los Alamos National Laboratory, New Mexico

FIGURE 2
Consolidated Unit 73-002-99
Miscellaneous Airport Structures



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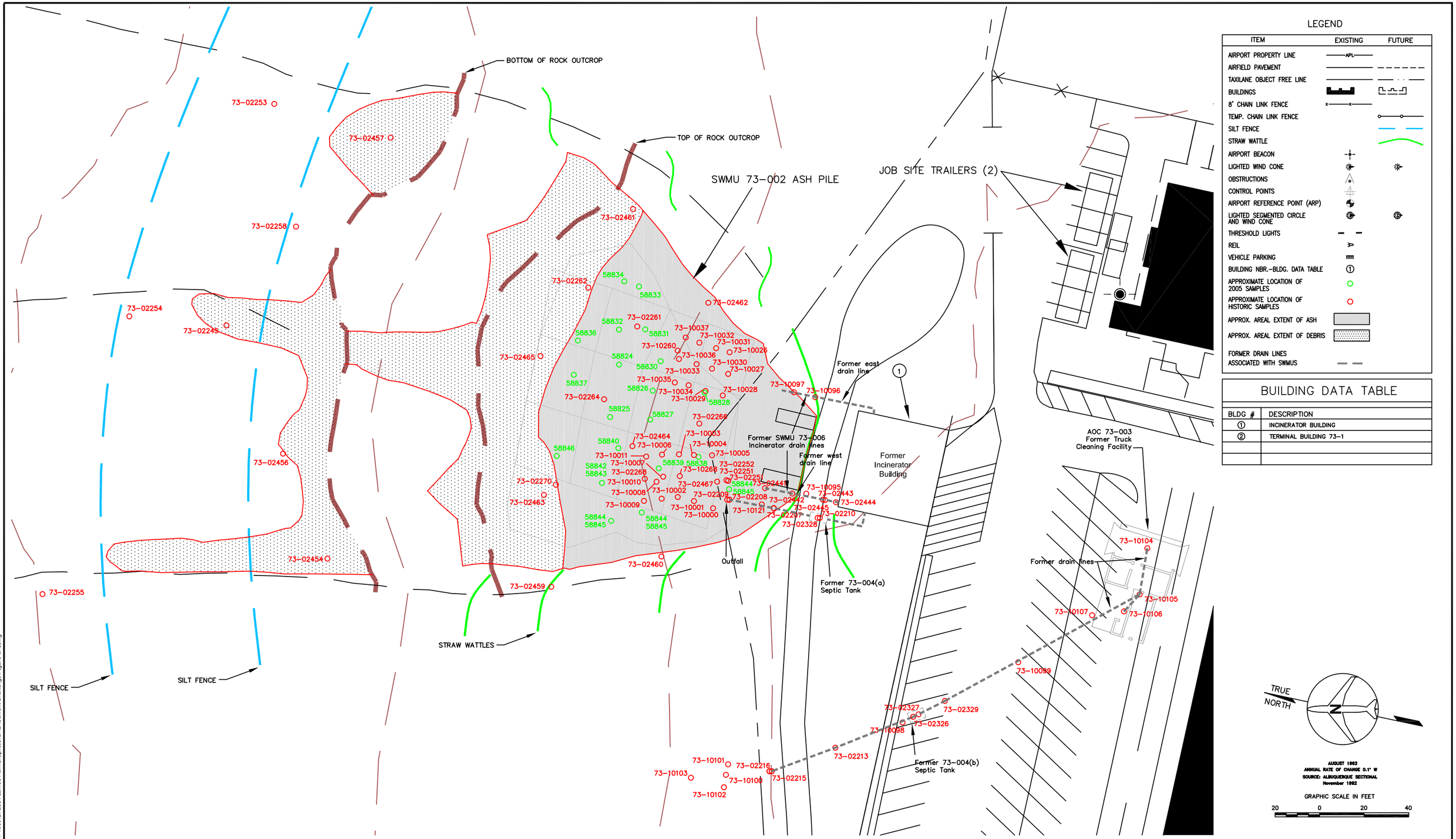
Consolidated Unit 73-002-99, Los Alamos National Laboratory, New Mexico

FIGURE 3
Organization Chart



2004 Projects\04-400 SPD PRAC\04-400.121 Los Alamos Ash\Graphics\CAD\Current Drawings\Figure 5A.dwg

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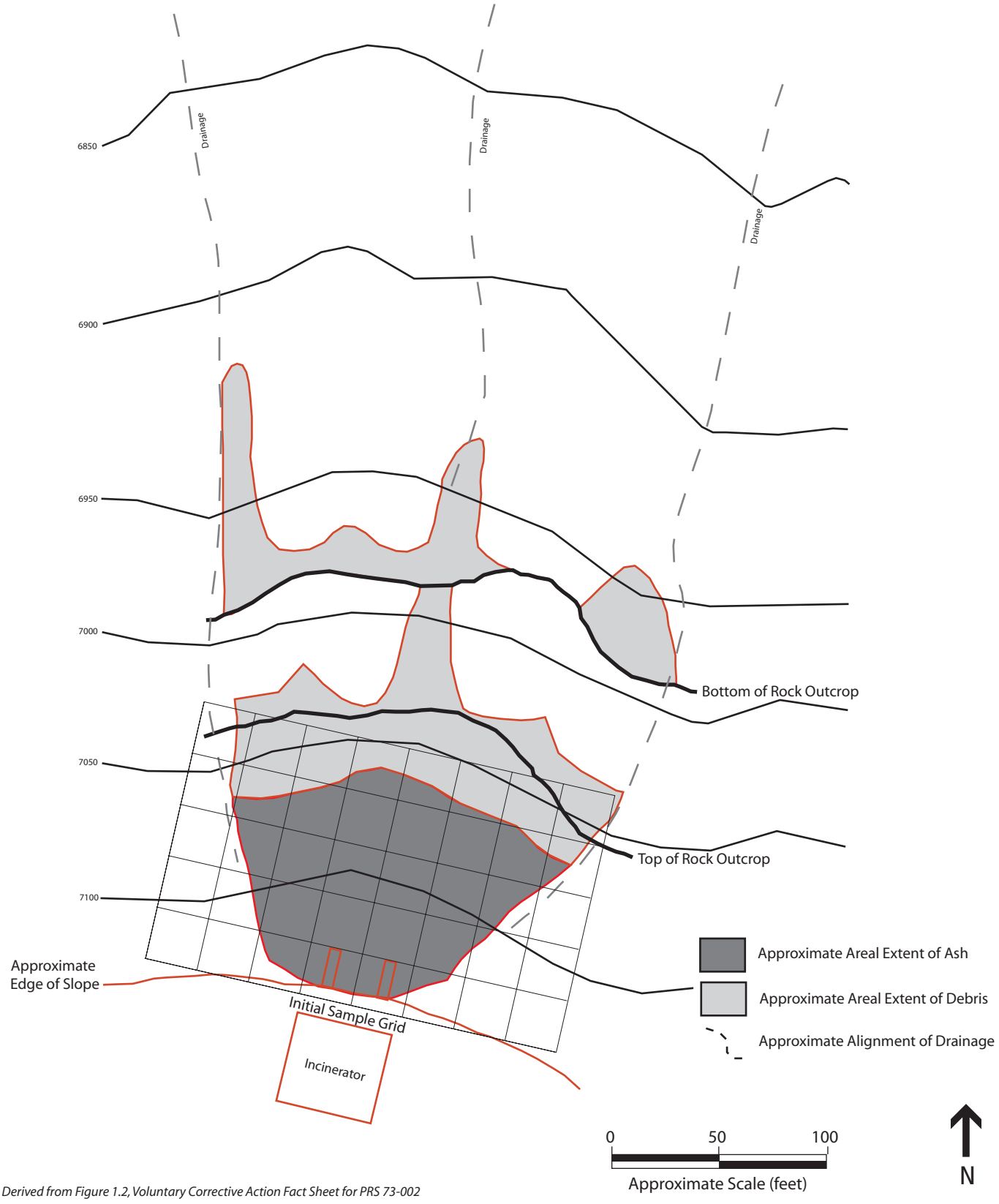
Los Alamos National Laboratory, U.S. Department of Energy
Consolidated Unit 73-002-99, Los Alamos National Laboratory, New Mexico

FIGURE 4
Distribution of Ash and
Previous Sample Locations



Source: Derived from Figure 1.2, Voluntary Corrective Action Fact Sheet for PRS 73-002

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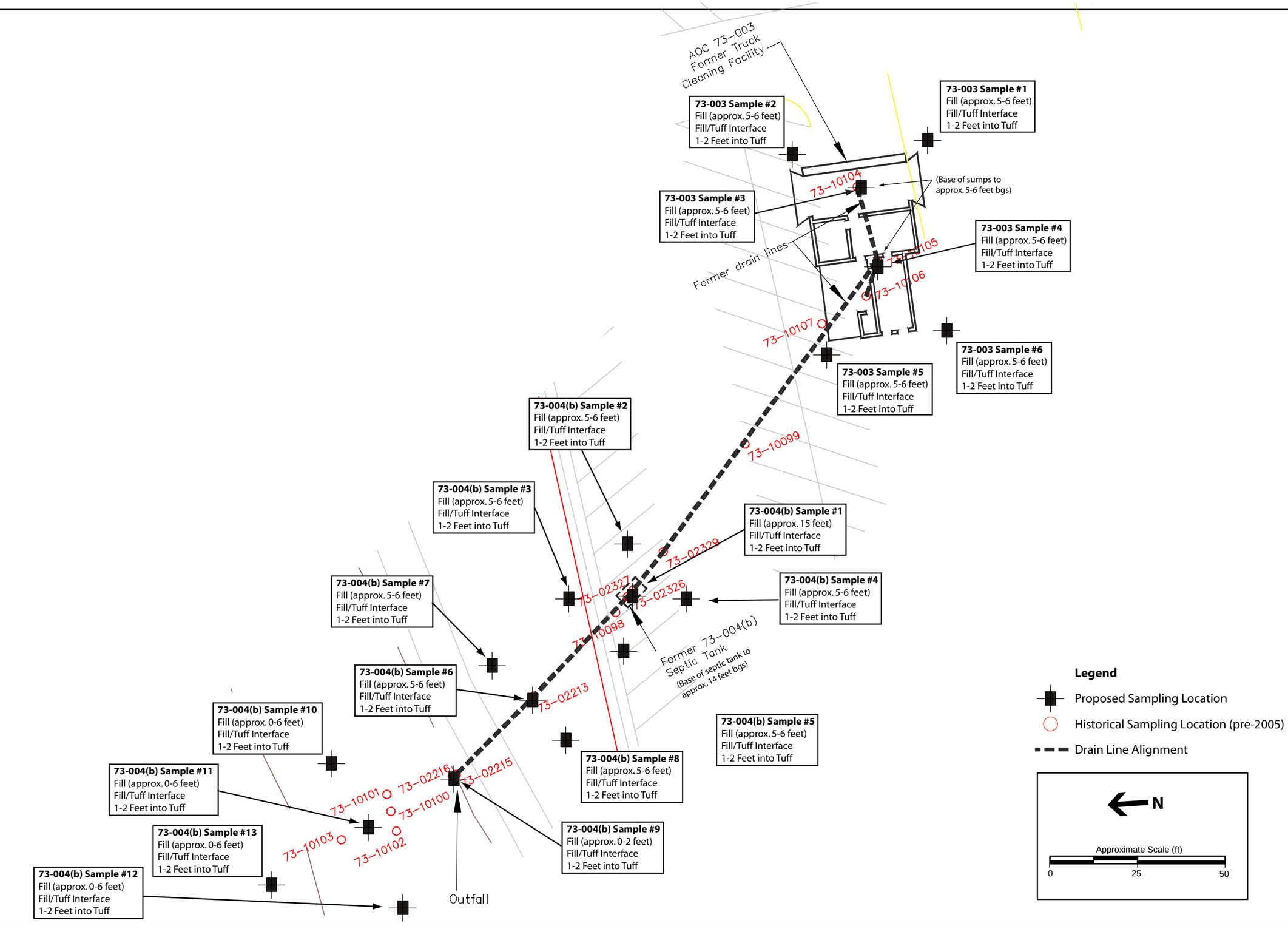
FIGURE 5
Distribution of Ash and Proposed Initial Sample Grid

04-400.12\LANL\Graphics\Waste Characterization Workplan\Fig 5 - Distribution of Ash.ai



04-400.12\LANL\Graphics\Consolidated Unit Work\an\Fig XX - PropSampleLoc 73-003.ai

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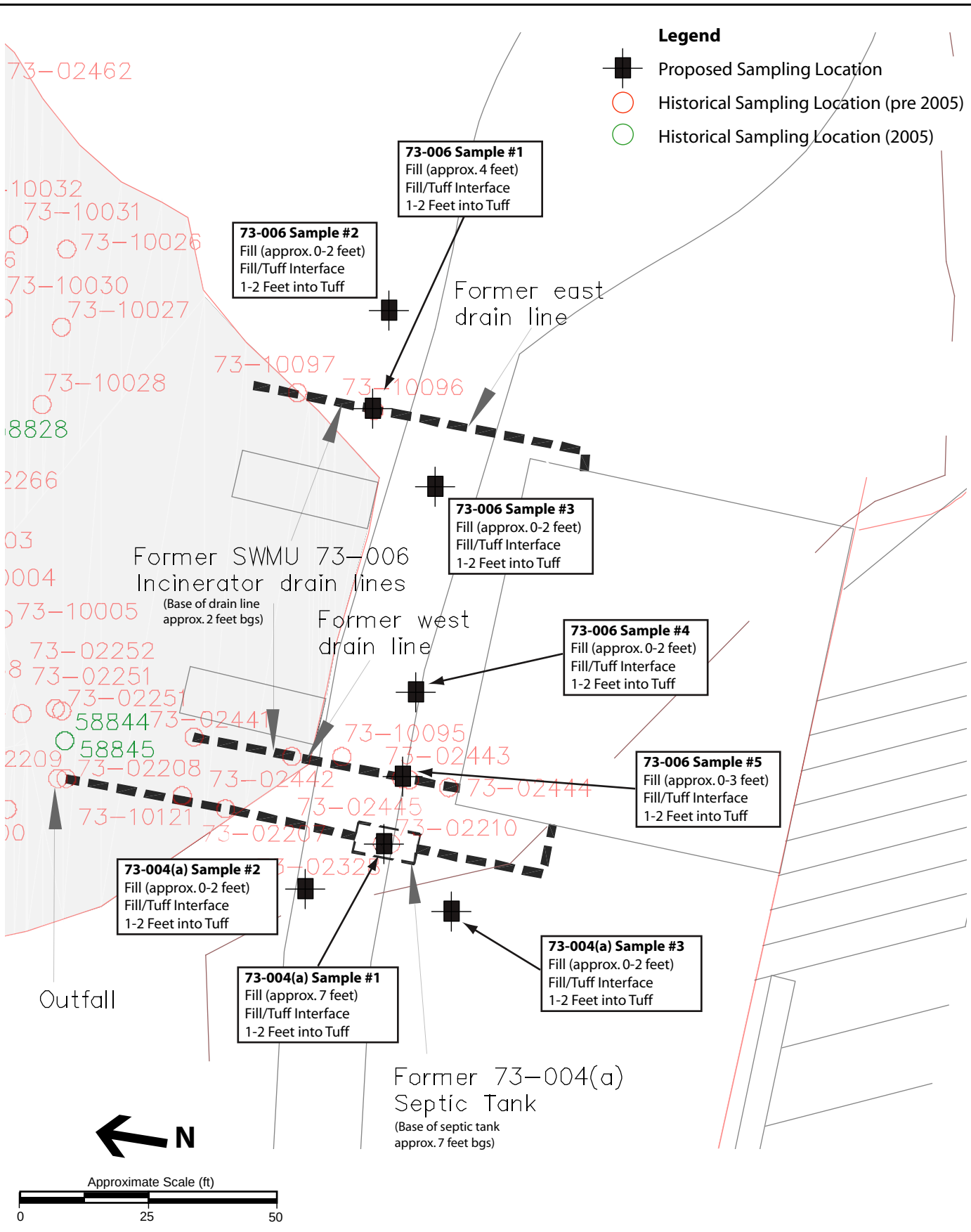
FIGURE 6
Proposed Sample Locations
AOC 73–003 and SWMU 73–004(b)



04-400.12\LANL\Graphics\Consolidated Unit Work\an\Fig XX - SWMU4(a) and 6.ai

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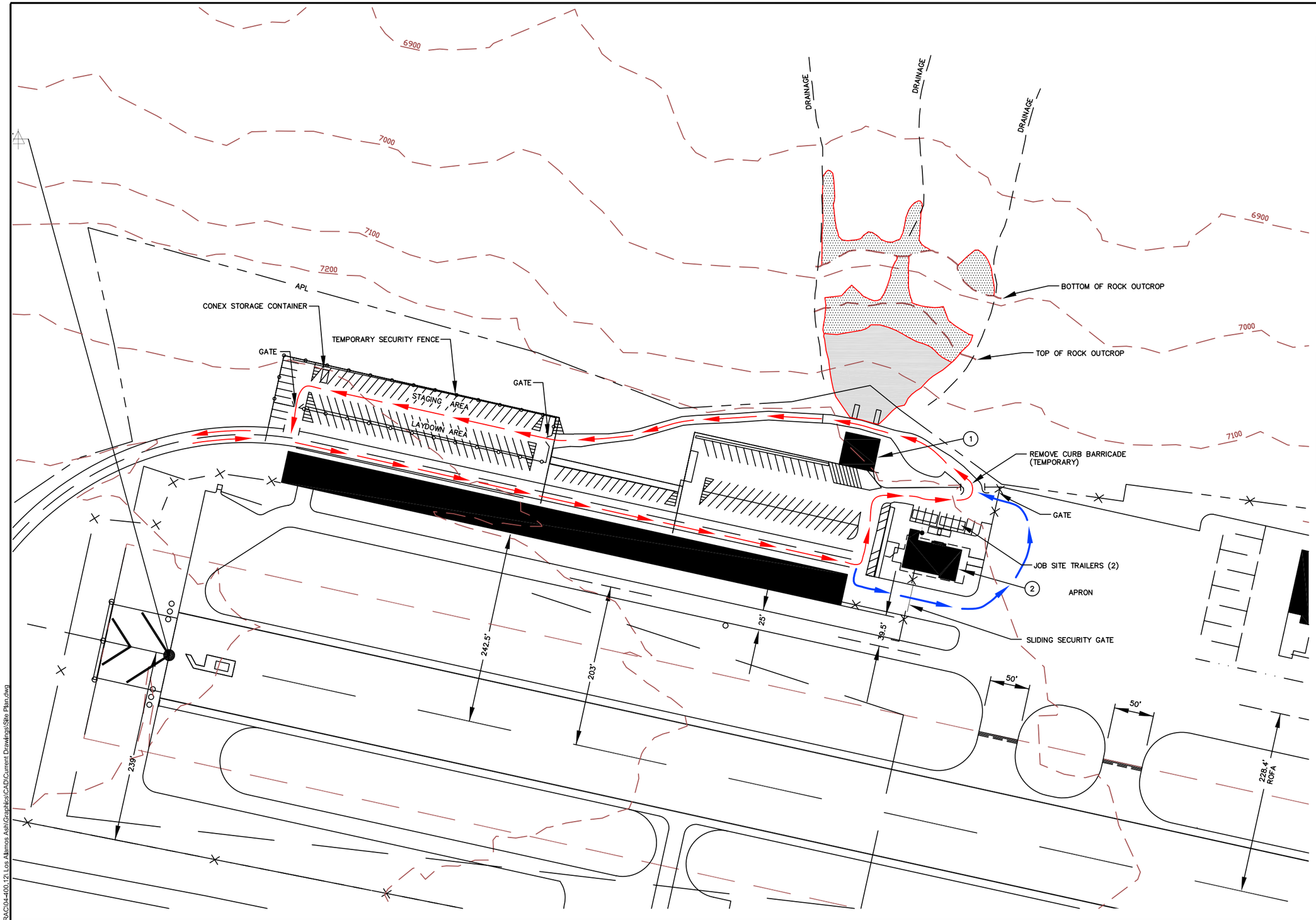
FIGURE 7
Proposed Sample Locations
SWMUs 73–004(a) and 73–006



LEGEND

ITEM	EXISTING	FUTURE
AIRPORT PROPERTY LINE	APL	
AIRFIELD PAVEMENT		
TAXILANE OBJECT FREE LINE		
BUILDINGS		
8' CHAIN LINK FENCE		
TEMP. CHAIN LINK FENCE		
AIRPORT BEACON		
LIGHTED WIND CONE		
OBSTRUCTIONS		
CONTROL POINTS		
AIRPORT REFERENCE POINT (ARP)		
LIGHTED SEGMENTED CIRCLE AND WIND CONE		
THRESHOLD LIGHTS		
REIL		
VEHICLE PARKING		
BUILDING NBR.–BLDG. DATA TABLE		
HAUL ROUTE		
OPTIONAL HAUL ROUTE FOR LONGER TRUCKS (ONLY IF NECESSARY)		
APPROX. AREAL EXTENT OF ASH		
APPROX. AREAL EXTENT OF DEBRIS		

BUILDING DATA TABLE

BLDG #	DESCRIPTION
1	INCINERATOR BUILDING
2	TERMINAL BUILDING 73-1

VAR 17°E

AUGUST 1992
ANNUAL RATE OF CHANGE 0.1° W
SOURCE: ALBUQUERQUE SECTIONAL
November 1992

GRAPHIC SCALE IN FEET

60 0 60 120

2004 Projects\04-400 SPD PRAC\04-400.12\ Los Alamos Ash\Graphics\CAD\Current Drawings\Site Plan.dwg

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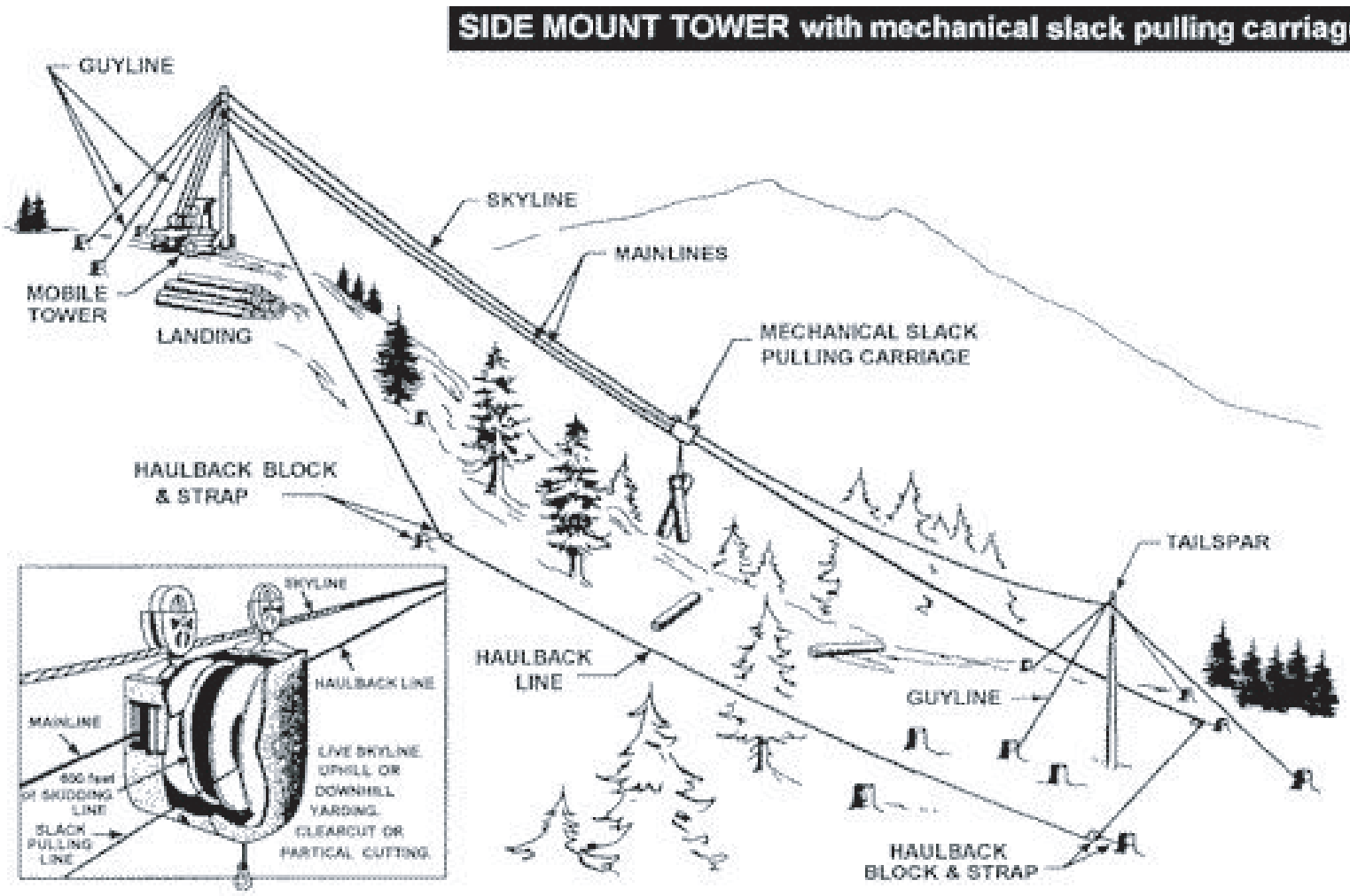
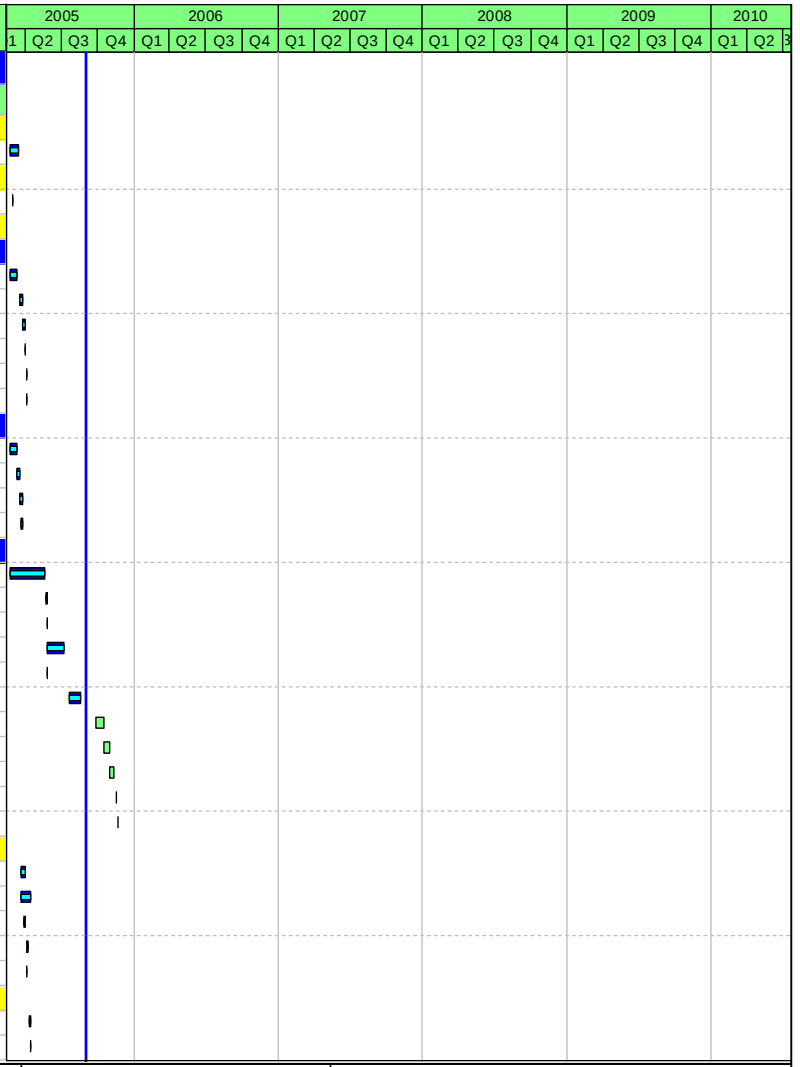
FIGURE 8
Site Plan with Work Areas


SIDE MOUNT TOWER with mechanical slack pulling carriage
GUYLINE
SKYLINE
MAINLINES
MOBILE TOWER
LANDING
MECHANICAL SLACK PULLING CARRIAGE
HAULBACK BLOCK & STRAP
TAILSPAR
HAULBACK LINE
GUYLINE
HAULBACK BLOCK & STRAP
SKYLINE
HAULBACK LINE
MAINLINE
LIVE SKYLINE UPHILL OR DOWNHILL YARDING. CLEARCUT OR PARTICAL CUTTING.
SLACK PULLING LINE

Activity ID	Activity Name	Orig Dur	Rem Dur	Activity %	Start	Finish
Project: VCA for Construction Los Alamos Nat...		407	774		21-Feb-05 A	12-Sep-08
WBS: Engineering		406	251		21-Feb-05 A	12-Sep-06
WBS: Kickoff Meeting & Site Visit		16	0		21-Feb-05 A	14-Mar-05 A
1.00	Kickoff Meeting & Site Visit - Sampling	16	0	100%	21-Feb-05 A	14-Mar-05 A
WBS: Planning Communication & Management		1	0		28-Feb-05 A	01-Mar-05 A
1.10	Planning Communication & Management	1	0	100%	28-Feb-05 A	01-Mar-05 A
WBS: Plans		195	40		21-Feb-05 A	21-Nov-05
WBS: Waste Characterization Sampling Work Plan		35	0		21-Feb-05 A	05-Apr-05 A
2.14	Develop Waste Characterization Work Plan	15	0	100%	21-Feb-05 A	11-Mar-05 A
2.19	Submit Work Plan for Review	5	0	100%	18-Mar-05 A	24-Mar-05 A
2.15	Incorporate USACE/DOE Comments	4	0	100%	25-Mar-05 A	30-Mar-05 A
2.17	Submit Final Waste Characterization Work Plan	2	0	100%	31-Mar-05 A	01-Apr-05 A
2.16	Submit Final Sampling for Approval	2	0	100%	04-Apr-05 A	05-Apr-05 A
2.18	Submit Final Waste Characterization WP to Disposal...	1	0	100%	04-Apr-05 A	05-Apr-05 A
WBS: Health & Safety Plan (SSHSP)		23	0		21-Feb-05 A	25-Mar-05 A
3.12	Develop Site Specific Health & Safety Plan	15	0	100%	21-Feb-05 A	11-Mar-05 A
3.13	Incorporate USACE/DOE Comments	5	0	100%	11-Mar-05 A	17-Mar-05 A
3.11	Complete Final SSHSP for Submittal & Approval Sigs	5	0	100%	18-Mar-05 A	24-Mar-05 A
3.14	Obtain USACE/DOE Approval Signatures	4	0	100%	22-Mar-05 A	25-Mar-05 A
WBS: Corrective Action Work Plan - Ash Removal		195	40		21-Feb-05 A	21-Nov-05
3.01	Develop Draft Corrective Action WP- Waste Samplin...	65	0	100%	21-Feb-05 A	20-May-05 A
3.02	USACE/DOE Review Draft CA Work Plan	2	0	100%	23-May-05 A	26-May-05 A
3.03	Incorporate Comments	2	0	100%	25-May-05 A	26-May-05 A
3.05	USACE/DOE/Regulators Review Draft CA Work Plan	30	0	100%	27-May-05 A	08-Jul-05 A
3.04	Submit Draft Final WP to USACE/DOE/Regulators	1	0	100%	27-May-05 A	27-May-05 A
3.06	Incorporate USACE/DOE/Regulator Comments	5	0	100%	22-Jul-05 A	19-Aug-05 A
3.08	DOE - NMED Review	15	15	0%	27-Sep-05*	17-Oct-05
3.09	Incorp & Sub Final Review Comments to DOE	10	10	0%	18-Oct-05	31-Oct-05
3.1	DOE Final Review - Submit to NMED	10	10	0%	31-Oct-05*	11-Nov-05
3.1.1	Receive DOE/NMED Notice of Approval	1	1	0%	17-Nov-05	17-Nov-05
3.07	Press Release - DOE/ County	1	1	0%	21-Nov-05*	21-Nov-05
WBS: Site Access Request - Sampling		103	0		22-Mar-05 A	15-Apr-05 A
2.25	Radiological Work Permit Request Development	8	0	100%	22-Mar-05 A	31-Mar-05 A
2.24a	Site Access Request	5	0	100%	22-Mar-05 A	15-Apr-05 A
2.26	Receive Site Access	2	0	100%	29-Mar-05 A	30-Mar-05 A
2.27	Radiological Work Permit Complete	3	0	100%	04-Apr-05 A	06-Apr-05 A
2.28	Received Radiological Work Permit	1	0	100%	04-Apr-05 A	05-Apr-05 A
WBS: Specialized Training - Sampling		5	0		11-Apr-05 A	15-Apr-05 A
4.11	Rad Worker II Training	3	0	100%	11-Apr-05 A	13-Apr-05 A
4.12	8hr GET - Lead Awareness	2	0	100%	14-Apr-05 A	15-Apr-05 A



Actual Level of Effort
Actual Work
Remaining Work
Remaining Level of Effort
Critical Remaining Work
Milestone
% Complete

Page 1 of 3

22-Sep-05

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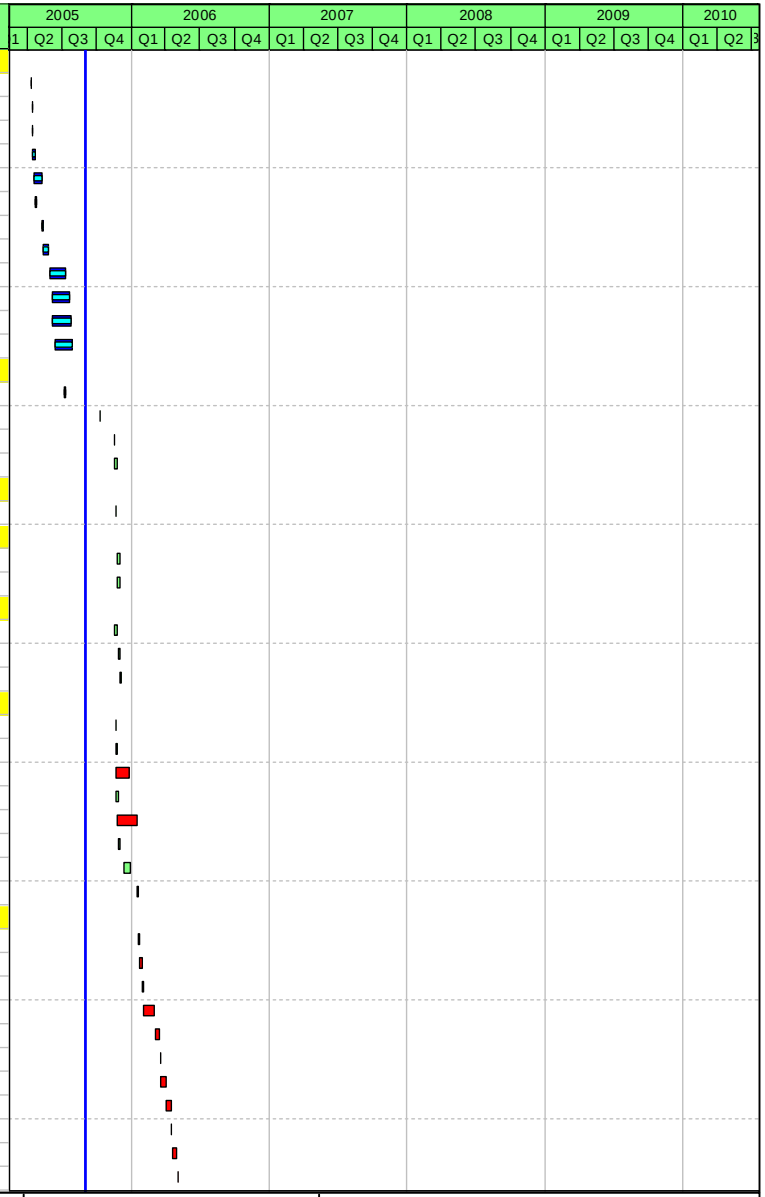
Los Alamos National Laboratory, U.S. Department of Energy

Consolidated Unit 73-002, Los Alamos National Laboratory, New Mexico

FIGURE 10
Project Schedule

Activity ID	Activity Name	Orig Dur	Rem Dur	Activity %	Start	Finish
WBS: Waste Characterization & Disposal Options - Samp...		83	0		11-Apr-05 A	27-Jul-05 A
2.01	Mobilize Sampling Team for Training	1	0	100%	11-Apr-05 A	12-Apr-05 A
2.03	Layout Survey Grid	2	0	100%	14-Apr-05 A	16-Apr-05 A
2.02	Sampling Readiness Review	1	0	100%	14-Apr-05 A	15-Apr-05 A
2.04	Collect & Ship Samples	5	0	100%	16-Apr-05 A	22-Apr-05 A
2.06	Sample Analysis	15	0	100%	19-Apr-05 A	09-May-05 A
2.05	Demobilize Sampling Team	2	0	100%	22-Apr-05 A	25-Apr-05 A
2.07	Review Analytical Data	3	0	100%	10-May-05 A	12-May-05 A
2.08	Draft Waste Disposal Option Plan (WD04)	11	0	100%	13-May-05 A	27-May-05 A
2.09	Review Draft Waste Disposal Option Plan	4	0	100%	30-May-05 A	11-Jul-05 A
2.10	Final Waste Disposal Option Plan	2	0	100%	06-Jun-05 A	22-Jul-05 A
2.11	Submit Site Characterization Report	3	0	100%	06-Jun-05 A	26-Jul-05 A
2.12	Waste Profiling	2	0	100%	13-Jun-05 A	27-Jul-05 A
WBS: Site Access Request - Ash Removal		98	34		08-Jul-05 A	24-Nov-05
4.71	RWP Request Development	3	0	100%	08-Jul-05 A	11-Jul-05 A
4.72	RWP Complete	2	2	0%	10-Oct-05*	11-Oct-05
4.70	Receive Site Access	1	1	0%	18-Nov-05*	18-Nov-05
4.69	Request State Site Access	5	5	0%	18-Nov-05	24-Nov-05
WBS: Work Plan Addendum		1	1		21-Nov-05	21-Nov-05
4.01	Field Technical Work Plan	1	1	0%	21-Nov-05	21-Nov-05
WBS: Specialized Training - Ash Removal		5	5		25-Nov-05	01-Dec-05
4.14	RadWorker II Training	5	5	0%	25-Nov-05	01-Dec-05
4.15	8hr GET - Lead Awareness	5	5	0%	25-Nov-05	01-Dec-05
WBS: Mob & Site Readiness - Ash Removal		12	12		18-Nov-05	05-Dec-05
4.03	Assessment Pattern of Wildlife/Environmental Conce...	6	6	0%	18-Nov-05	25-Nov-05
4.05	Ash Removal Readiness Review - DOE	2	2	0%	29-Nov-05	30-Nov-05
4.04	Secure Site	3	3	0%	01-Dec-05	05-Dec-05
WBS: Ash Removal Activities		44	44		21-Nov-05	19-Jan-06
4.21	Kickoff Meeting & Site Visit - Ash Removal	1	1	0%	21-Nov-05*	21-Nov-05
4.22	Mobilize Field Staff	3	4	0%	21-Nov-05*	24-Nov-05
4.26	Debris & Removal	25	25	0%	22-Nov-05*	26-Dec-05
4.24	Mobilize Vacuum Unit	5	5	0%	22-Nov-05*	28-Nov-05
4.27	Ash Removal	38	38	0%	24-Nov-05*	16-Jan-06
4.23	Mobilize Skyline Unit	5	5	0%	28-Nov-05*	02-Dec-05
4.25	Mobilize Excavator Unit	15	15	0%	12-Dec-05*	30-Dec-05
4.29	Demobilization/Ash Removal Team	3	3	0%	17-Jan-06	19-Jan-06
WBS: Confirmation-Investigation of Consilidated Unit Sa...		170	170		18-Jan-06	12-Sep-06
4.31	Mobilize Sampling Team	4	4	0%	18-Jan-06	23-Jan-06
4.32	Take Confirmation Samples	5	5	0%	24-Jan-06	30-Jan-06
4.33	Submit Samples	2	2	0%	31-Jan-06	01-Feb-06
4.34	Analyze Samples	30	30	0%	02-Feb-06	03-Mar-06
4.35	Record Results	10	10	0%	06-Mar-06	17-Mar-06
4.36	Start Corrective Action Report	1	1	0%	20-Mar-06	20-Mar-06
4.37	Draft Correction Action Report & Submit	10	10	0%	21-Mar-06	03-Apr-06
4.38	DOE/USACE Review Correction Action Report	10	10	0%	04-Apr-06	17-Apr-06
4.39	Receive DOE/USACE Review Comments	1	1	0%	18-Apr-06	18-Apr-06
4.40	Incorporate DOE/USACE Comments	10	10	0%	19-Apr-06	02-May-06
4.41	Submit to DOE/USACE for Final Review	1	1	0%	03-May-06	03-May-06



Actual Level of Effort
Actual Work
Remaining Work
Remaining Level of Effort
Critical Remaining Work
Milestone
% Complete

Page 2 of 3

22-Sep-05

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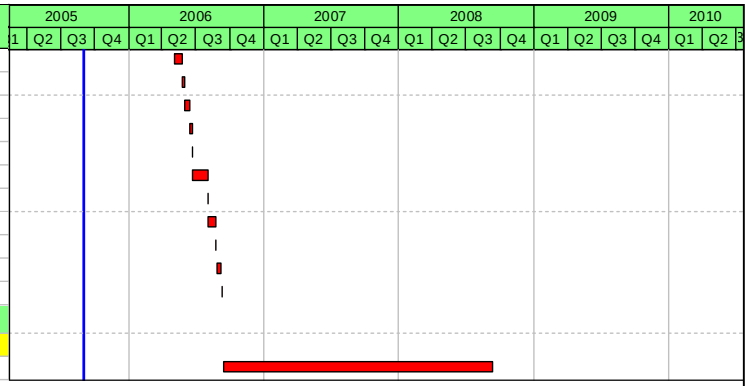
FIGURE 10
Project Schedule

Activity ID	Activity Name	Orig Dur	Rem Dur	Activity % complete	Start	Finish
4.42	DOE/USACE Final Review	15	15	0%	04-May-06	24-May-06
4.43	Incorporate Additional DOE/USACE Comments	5	5	0%	25-May-06	31-May-06
4.45	Final DOE/USACE Review-Comments	10	10	0%	01-Jun-06	14-Jun-06
4.46	Submit Final Report to DOE/USACE for Review	5	5	0%	15-Jun-06	21-Jun-06
4.47	Submit Final Report by DOE/USACE to NMED	1	1	0%	22-Jun-06	22-Jun-06
4.49	NMED Review of Final Report	30	30	0%	22-Jun-06	02-Aug-06
4.50	NMED Comments to DOE/USACE	1	1	0%	02-Aug-06	02-Aug-06
4.51	Incorporate NMED Comments - Report	15	15	0%	03-Aug-06	23-Aug-06
4.52	Submit Reviesed Report to DOE/USACE	2	2	0%	24-Aug-06	25-Aug-06
4.53	DOE/USACE Review of Revised Report-Incorp Com...	10	10	0%	28-Aug-06	08-Sep-06
4.54	DOE/USACE Submit Report to NMED	2	2	0%	11-Sep-06	12-Sep-06
WBS: Remedy Completion Report		1	523		13-Sep-06	12-Sep-08
WBS: Spot Holder Only		1	523		13-Sep-06	12-Sep-08
4.59	Spot Holder	1	523	0%	13-Sep-06	12-Sep-08



Actual Level of Effort
Actual Work
Remaining Work
Remaining Level of Effort
Critical Remaining Work
Milestone
% Complete

Page 3 of 3

22-Sep-05

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Consolidated Unit 73-002, Los Alamos National Laboratory, New Mexico

FIGURE 10
Project Schedule

APPENDIX A
ACRONYMS AND GLOSSARY
CU 73-002-99
Los Alamos National Laboratory
New Mexico

ACRONYMS

AA	administrative authority
AK	acceptable knowledge
AOC	Area of Concern
asl	above sea level
ASTM	American Society for Testing and Materials
bgs	below ground surface
BMP	best management practice
BV	background value
CAR	corrective action report
CFR	Code of Federal Regulations
CHP	Certified Health Physicist
CIH	Certified Industrial Hygienist
COC	chain of custody
COPC	chemical of potential concern
CQCSM	Contractor Quality Control System Manager
CSM	conceptual site model
D&D	decontamination and decommissioning
DDD	dichlorodiphenyldichloroethane [4,4'-]
DDE	dichlorodiphenyldichloroethylene [4,4']
DDT	dichlorodiphenyltrichloroethane [4,4']
DOE	United States Department of Energy
DOT	United States Department of Transportation
EPA	U.S. Environmental Protection Agency
EQL	estimated quantitation limit
ER	Environmental Restoration
ERDB	Environmental Restoration Database
ER ID	Environmental Restoration Project document identification number
ESL	ecological screening level
GPS	global positioning system
HE	high explosives
HEPA	High-Efficiency Particulate Air filter
HIR	Historical Investigation Report
HWA	Hazardous Waste Act
ICPMS	inductively coupled plasma mass spectrometry
IDW	investigation-derived waste
IM	interim measure
ITSI	Innovative Technical Solutions, Inc.

KPA	kinetic phosphorescence analysis
LANL	Los Alamos National Laboratory
LAPCIR	Los Alamos and Pueblo Canyons Investigation Report
LLRW	Low Level Radiological Waste
LSA	Low Specific Activity
MDA	minimum detectable activity
MDL	method detection limit
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
mrem	millirem
msl	mean sea level
NAVD	North American Vertical Datum
NAD	North American Datum
NFA	no further action
NIOSH	National Institute for Occupational Safety and Health
NMED	New Mexico Environment Department
NMHWA	New Mexico Hazardous Waste Act
NMSA	New Mexico Statutes Annotated
NOI	Notice of Intent
NRC	Nuclear Regulatory Commission
OSHA	Occupational Safety and Health Administration
PAH	polyaromatic hydrocarbons
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
pCi/g	picocuries per gram
PEB	Pre-Evolution Briefings
PID	photoionization detector
POC	Point of Contact
POD	Plan of the Day
PPE	personal protective equipment
ppm	parts per million
ppmv	parts per million by volume
PRS	Potential Release Site
QA	quality assurance
QC	quality control
QMP	Quality Management Plan
RAM	Real-time Aerosol Monitor
RCRA	Resource Conservation and Recovery Act

RFI	RCRA facility investigation
RL	reporting limits
SAL	screening action level
SAP	Sampling and Analysis Plan
SHSO	Site Health and Safety Officer
SMO	Sample Management Office
SOP	standard operating procedure
SOW	statement of work
SS	Site Superintendent
SSHSP	Site-Specific Health and Safety Plan
SSL	soil screening level
SVOC	semivolatile organic compound
SWA	Solid Waste Act
SWMU	solid waste management unit
TA	technical area
TAL	target analyte list
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbons
UCI	Upper Confidence Interval
UCL	Upper Confidence Limit
USACE	U.S. Army Corps of Engineers
UST	underground storage tank
UTL	upper tolerance limit
VCA	voluntary corrective action
VCP	vitrified clay pipe
VOA	volatile organic analysis
VOC	volatile organic compound
WCSF	Waste Characterization Strategy Form
WQCC	Water Quality Control Commission
WWTP	wastewater treatment plant
XRF	X-ray fluorescence

GLOSSARY

abandonment—The plugging of a well or *borehole* in a manner that precludes the *migration* of surface *runoff* or *groundwater* along the length of the well or borehole.

accuracy—A measure of the closeness of measurements to the true value of the parameter being measured.

action level—(1) A numerical value that has been established by statistical *analysis* or has been set according to regulatory limits and is used as a criterion for action. Contamination found in a particular medium below an appropriate action level would not generally be subject to *remediation* or further study. (2) A health- and environment-based concentration derived using *chemical*-specific toxicity information and standardized exposure assumptions. An action level can be developed on a *facility*-specific basis or can be taken from standardized lists. (61 Federal Register 19446)

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.

aliquot—A measured portion of a *sample* taken for *analysis*.

alkalinity—In water *analysis*, the presence of carbonates, bicarbonates, and/or hydroxides, and occasionally borates, chlorates, silicates, or phosphates.

alluvial—Pertaining to geologic deposits or features formed by running water.

alluvium—*Soil* deposited by a river or other running water.

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.

analytical method—A procedure or technique for systematically performing an activity.

aquifer—An underground geological formation (or group of formations) containing water that is the source of *groundwater* for wells and *springs*.

area of concern—(1) A *release* that warrants investigation or *remediation*, whether or not it is associated with a specific *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. (Note: Generally, the acronym AOC is used for *area of concern*.)

area of contamination—A discrete regulatory definition under *Environmental Protection Agency* policy: certain areas of generally dispersed contamination that could be equated to a *Resource Conservation and Recovery Act (RCRA)* landfill. The movement of *hazardous wastes* within those areas would not be considered *land disposal* and would not trigger RCRA *land-disposal restrictions*.

artificial fill—A material that has been imported and typically consists of disturbed *soils* mixed with crushed Bandelier Tuff or other rock types.

ash-flow tuff—A *tuff* deposited by a hot, dense volcanic current. Ash-flow tuff can be either *welded tuff* or nonwelded tuff.

assessment—(1) The act of reviewing, inspecting, testing, checking, conducting surveillance, auditing, or otherwise determining and documenting whether items, processes, or services meet specified requirements. (2) An evaluation process used to measure the performance or effectiveness of a system and its elements. In this glossary, assessment is an all-inclusive term used to denote any one of the following: *audit*, *performance evaluation*, management system review, *peer review*, *inspection*, or surveillance.

audit (quality)—An independent, systematic examination to determine whether quality activities and related results comply with planned arrangements, whether these arrangements are implemented effectively, and whether they are suitable for achieving objectives.

auger flights—Winding metal strips welded to auger sections that carry cuttings to the surface when an auger is rotated.

background concentration—Naturally occurring concentrations of an inorganic *chemical* or *radionuclide* in *soil*, *sediment*, or *tuff*.

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 level—(1) The concentration of a substance in an environmental *medium* (air, water, or *soil*) that occurs naturally or is not the result of human activities. (2) In exposure *assessment*, the concentration of a substance in a defined control area over a fixed period of time before, during, or after a data-gathering operation.

background radiation—The amount of *radioactivity* naturally present in the environment, including cosmic rays from space and natural *radiation* from *soils* and rock.

background sample—A *sample* collected from an area or *site* that is similar to the one being studied but known, or thought, to be free from constituents of concern.

background value (BV)—The *background concentration* of a *chemical* used to represent the

background of statistically derived BV in the *upper tolerance limit* (UTL) of the distribution. If a UTL cannot be derived, either the *detection limit* or maximum reported value in the *background data* set is used.

basalt—A fine-grained, dark volcanic rock comprised chiefly of plagioclase, augite, olivine, and magnetite.

baseline contaminant level—*Anthropogenic* soil concentrations of a given *chemical* associated with Los Alamos National Laboratory and/or with commercial activities or processes that may not be related to source material(s) or *release(s)* from within a *potential release site*. (Also see *contaminant*.)

baseline data—Data that result from *samples* not directly associated with, or attributed to, a *site*. Baseline data must be identified during planning as originating from baseline samples. They are not equivalent to Los Alamos National Laboratory *background data*, usually are specific to an industrial area (such as a *technical area*), and are not applicable to another site without approval by the *administrative authority*.

bentonite—An absorbent aluminum silicate clay formed from volcanic ash and used in various adhesives, cements, and ceramic fillers. Because bentonite can absorb large quantities of water and expand to several times its normal volume, it is a common drilling mud additive.

best management practices—Methods that have been determined to be the most effective, practical means of preventing or reducing pollution from non-point sources.

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.

blank—A s*ample* that is expected to have a negligible or unmeasurable amount of an *analyte*. Results of blank sample analyses indicate whether *field samples* might have been contaminated during the sample collection, *transport*, storage, preparation, or *analysis* processes.

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.

borehole logging—The process of making remote measurements of physical, chemical, or other parameters at multiple depths in a *borehole*.

borehole logging technical specifications—*Documents* included in a *site*-specific *drilling package* that define the capabilities and the data quality required of prospective logging contractors for a given *operable unit* or a portion thereof.

caldera—A large crater formed by a volcanic explosion or by the collapse of a volcanic cone.

calibration—A process used to identify the relationship between the true *analyte* concentration or other variable and the response of a measurement instrument, *chemical analysis method*, or other measurement system.

calibration blank—A *calibration standard* prepared to contain negligible or unmeasurable amounts of *analytes*. A calibration blank is used to establish the zero concentration point for analytical measurement *calibrations*.

calibration standard—A *sample* prepared to contain known amounts of *analytes* of interest and other constituents required for an *analysis*.

canyon—A stream-cut chasm or gorge, the sides of which are composed of cliffs or a series of cliffs rising from the canyon's bed. Canyons are characteristic of arid or semiarid regions where downcutting by streams greatly exceeds weathering.

casing—A solid piece of pipe, typically steel, stainless steel, or polyvinyl chloride (PVC) plastic, used to keep a well open in either unconsolidated material or unstable rock and as a means to contain zone isolation materials, such as cement *grout* or *bentonite*.

chain of custody—An unbroken, documented trail of accountability that is designed to ensure the uncompromised physical integrity of *samples*, data, and *records*.

chemical—Any naturally occurring or human-made substance characterized by a definite molecular composition, including molecules that contain *radionuclides*.

chemical analysis—A process used to measure one or more attributes of a *sample* in a clearly defined, controlled, and systematic manner. Chemical analysis often requires treating a sample chemically or physically before measurement.

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. A COPC remains a concern until *exposure pathways* and receptors are evaluated in a *site*-specific human-health *risk assessment*. (Also see *chemical of potential ecological concern*.)

Code of Federal Regulations (CFR)—A *document* that codifies all rules of the executive departments and agencies of the federal government. The code is divided into 50 volumes, known as titles. Title 40 of the CFR (referenced as 40 CFR) covers environmental regulations.

collocated sample—One of two or more *samples* collected within close proximity of each other and meant to represent the same immediate area.

colluvium—A loose deposit of rock debris accumulated through the action of gravity at the base of a cliff or *slope*.

comparability—A qualitative measure of the degree to which one item or data set can be compared with another.

Compliance Order on Consent (Consent Order)—For the *Environmental Restoration Project*, an enforcement *document* signed by the New Mexico Environment Department, the *U.S. Department of Energy*, and 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 *Hazardous Waste Facility Permit*.

composite sample—A *sample* collected over a temporal or spatial range that typically consists of a series of discrete equal samples which have been combined or composited.

conceptual hydrogeologic model—An approximation of the occurrence, movement, and quality of *groundwater* in a given area and the relationship of that groundwater to the surface water, *soil water*, and geologic framework in that area.

conceptual model—See *site conceptual model*.

confined—Pertaining to *groundwater* in an artesian *aquifer*.

confluence—A place where two or more streams or *canyons* meet; the point where a tributary meets the main stream.

Consent Order—See *Compliance Order on Consent*.

construction worker scenario—A scenario that evaluates exposures to a human *receptor* throughout a construction project. The activities typically involve substantial short-term on-site exposures.

contaminant—(1) Any *chemical* (including *radionuclides*) present in environmental media or on structural debris above *background levels*. (2) According to the New Mexico Environment Department (NMED) *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 NMED Consent Order, the term "contaminant" does not include radionuclides or the radioactive portion of *mixed waste*.)

contract analytical laboratory—An analytical laboratory under contract to the University of California to analyze samples from work performed at Los Alamos National Laboratory.

Curie—A unit of *radioactivity* defined as the quantity of any radioactive nuclide that has an activity of 3.7×10^{10} disintegrations per second (dps).

daily calibration—The combination of a *calibration blank* and *calibration standard* used to determine if the instrument response to an *analyte* concentration is within acceptable bounds relative to the *initial calibration*. A daily *calibration* establishes the instrument response factors on which quantitations are based, thus verifying the satisfactory performance of an instrument on a day-to-day basis.

data package—The hard copy deliverable for each sample delivery group produced by a *contract analytical laboratory* in accordance with the statement of work for analytical services.

data quality assessment—The statistical and/or scientific evaluation of a data set that establishes whether the data set is adequate for its intended use.

data quality objectives—Qualitative and quantitative statements of the overall level of uncertainty that a decision-maker will accept regarding results or decisions based on environmental data. The objectives provide the statistical framework for planning and managing environmental data operations that will meet user needs.

data validation—A systematic process that applies a defined set of performance-based criteria to a body of data and that may result in the *qualification* of the data. The data-validation

process is performed independently of the analytical laboratory that generates the data set and occurs before conclusions are drawn from the data. The process may comprise a standardized data review (*routine data validation*) and/or a problem-specific data review (*focused data validation*).

data verification—The process of evaluating the completeness, correctness, consistency, and compliance of a laboratory *data package* against a specified standard or contract.

- Completeness: All required information is present—in both hard copy and electronic forms.
- Correctness: The reported results are based on properly documented and correctly applied algorithms.
- Consistency: The values are the same when they appear in different reports or are transcribed from one report to another.
- Compliance: The data pass numerical *quality control* tests based on parameters or limits specified in a contract or in an auxiliary *document*.

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

detect (detection)—An analytical result, as reported by an analytical laboratory, that denotes a *chemical* or *radionuclide* to be present in a *sample* at a given concentration.

detection limit—The minimum concentration that can be determined by a single measurement of an instrument. A detection limit implies a specified statistical confidence that the analytical concentration is greater than zero.

discharge—The accidental or intentional spilling, leaking, pumping, pouring, emitting, emptying, or dumping of *hazardous waste* into, or on, any land or water. (Resource Conservation and Recovery Act, 40 Code of Federal Regulations [CFR] 260.10)

disposal—The *discharge*, deposit, injection, dumping, spilling, leaking, or placing of any *solid waste* or *hazardous waste* into, or on, any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including *groundwaters*. (40 Code of Federal Regulations [CFR] 260.10)

drill bit—The cutting tool attached to the bottom of a drill stem.

drilling string—The string of pipe (extending from the bit to the driving mechanism) that serves to carry mud down a *borehole* and to rotate a bit.

drill rod (drill pipe)—Special pipe used to transmit rotation and energy from the drill rig to the bit. This conduit conveys circulation fluids such as air, water, or other mixtures to cool the bit and evacuate the *borehole* cuttings.

duplicate analysis—An *analysis* performed on one member of a pair of identically prepared *subsamples* taken from the same *sample*.

duplicate measurement—An additional measurement performed on a *prepared sample* under identical conditions to evaluate any variance in measurement.

effluent—Wastewater (treated or untreated) that flows out of a *treatment* plant, sewer, or industrial *outfall*. Generally refers to wastes discharged into surface waters.

Environmental Restoration (ER) Project—A Los Alamos National Laboratory project established in 1989 as part of a *U.S. Department of Energy* nationwide program. The ER Project's specific purposes are (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 contamination is still present.

ephemeral—Pertaining to a stream or *spring* that flows only during, and immediately after, periods of rainfall or snowmelt.

equipment blank (rinsate blank)—A *sample* used to rinse sample-collection equipment and expected to have negligible or unmeasurable amounts of *analytes*. The equipment blank is collected after the equipment *decontamination* is completed but before the collection of another *field sample*.

ER data—Data derived from *samples* that have been collected and paid for through *Environmental Restoration Project* funding.

ER database (ERDB)—A database housing analytical and other programmatic information for the *Environmental Restoration Project*. The ERDB currently contains about 3 million analyses in 300 tables.

ER identification (ER ID) number—A unique identifier assigned by the *Environmental Restoration (ER) Project*'s Records Processing Facility to each *document* when it is submitted as a final *record*. The ER ID number signals the end of the document process.

error—The quantifiable difference between an observed value and the true value of a parameter being measured.

estimated detection limit—A *reporting limit* required by a Los Alamos National Laboratory statement of work for analytical services.

estimated quantitation limit (EQL)—The lowest concentration that can be reliably achieved within specified limits of *precision* and *accuracy* during routine analytical-laboratory operating conditions. The low point on a *calibration* curve should reflect this quantitation limit. The EQL is not used to establish detection status. Sample EQLs are highly matrix-dependent and the specified EQLs might not always be achievable.

evapotranspiration—(1) The discharge of water from the Earth's surface to the atmosphere by evaporation from lakes, streams, and soil surfaces and by transpiration from plants. (2) The loss of water from the *soil* by evaporation and/or by transpiration from the plants growing in the soil.

exposure pathway—Any path from the sources of *contaminants* to humans and other species or settings via *soil*, water, or food.

exposure unit—The bounded area or volume within which a person or other *receptor* could be exposed to *contaminants* that have been *released* into the environment.

external standard calibration—A comparison of instrument responses from a *sample* to the responses from target compounds in the *calibration standards*. The sample's peak areas (or peak heights) are compared to the standards' peak areas (or peak heights).

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 (40 Code of Federal Regulations 260.10).

fallout radionuclides—*Radionuclides* that are present at globally elevated levels in the environment as a result of fallout from atomic weapons tests. The Los Alamos National Laboratory (the Laboratory) *background data* sets consist of *environmental surveillance samples* taken from marginal and regional locations for the following radionuclides associated with fallout: tritium, cesium-137, americium-241, plutonium-238, plutonium-239/240, and strontium-90. Samples were collected from regional and marginal locations in the Laboratory's vicinity that were (1) representative of geological media found within Laboratory boundaries, and (2) were not impacted by Laboratory operations.

fault—A fracture, or zone of fractures, in rock along which vertical or horizontal movement has taken place and adjacent rock layers or bodies have been displaced.

Federal Register—The official daily publication for Rules, Proposed Rules, and Notices from federal agencies and organizations, as well as Executive Orders and other presidential documents.

field blank (field reagent blank)—A *blank sample* prepared in the field or carried to the sampling *site*, exposed to sampling conditions (e.g., by removing bottle caps), and returned to a laboratory to be analyzed in the same manner in which *environmental samples* are being analyzed. Field blanks are used to identify the presence of any contamination that may have been added during the sampling and *analysis* process.

field duplicate (replicate) samples—Two separate, independent *samples* taken from the same source, which are collected as *collocated samples* (i.e., equally representative of a sample matrix at a given location and time).

field matrix spike—A known amount of a *field sample* to which a known amount of a *target analyte* has been added and used to compute the proportion of the added analyte that is recovered upon *analysis*.

field notebook—A *record* of activities performed in the field or a compilation of field data.

field reagent blank—See *field blank*.

field sample—See *sample*.

field split—A *field sample* that has been homogenized and divided, in the field, into equally representative portions which are submitted for *analysis*. (Also see *split sample*.)

filter pack—Sand, gravel, or glass beads that are uniform, clean, and well-rounded and are placed in the annulus of a well, between the *borehole* wall and the well intake, to stabilize the formation and to prevent foreign material from entering through the well intake.

flood plain—The flat, or nearly flat, land along a river or stream, or in a tidal area, that is covered by water during a flood.

focused data validation—A technically based *analyte*-, *sample*-, and data-use-specific process that extends the *qualification* of data beyond method or contractual compliance and provides a higher level of confidence that an analyte is present or absent. If an analyte is present, the quality of the quantitation may be obtained through focused validation. (Also see *data validation*.)

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.

geohydrology—The science that applies hydrologic methods to the understanding of geologic phenomena.

grab sample—A specimen collected by a single application of a field sampling procedure to a target *population* (e.g., the surface *soil* from a single hole collected after the spade-and-scoop sampling procedure, or a single air filter left in the field for 3 months).

gravimetric moisture content—See *water content*.

groundwater—Interstitial water that occurs in saturated earth material and is capable of entering a well in sufficient amounts to be used as a water supply.

grout—Cement or *bentonite* mixtures used for sealing *boreholes* and wells and for zone isolation. Only Portland Type I or II cement is approved for use at investigative *sites*.

Hazardous and Solid Waste Amendments (HSWA)—The HSWA of 1984 (Public Law No. 98-616, 98 Stat. 3221), 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 New Mexico Environment Department's *Consent Order*, any constituent identified in Appendix VIII to 40 Code of Federal Regulations (CFR) 261 (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* (as defined in 40 Code of Federal Regulations [CFR] 261.2) that is a listed *hazardous waste* (as provided in 40 CFR Subpart D), or a waste that 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 New Mexico Environment Department's *Consent Order*, any solid waste or combination of solid wastes which, 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 *permit* 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*.

Hazardous Waste Bureau—The New Mexico Environment Department bureau charged with providing regulatory oversight and technical guidance to New Mexico *hazardous waste* generators and to *treatment, storage, and disposal facilities*, as required by the New Mexico Hazardous Waste Act and by regulations promulgated under the Act.

high-explosive wastes—Any waste-containing material having an amount of stored chemical energy that could start a violent reaction when initiated by impact, spark, or heat. This violent reaction would be accompanied by a strong shock wave and the potential for high-velocity particles to be propelled. (Laboratory Implementation Requirement 404-00-02.3)

holding time—The maximum elapsed time a *sample* can be stored without unacceptable changes in *analyte* concentrations. Holding times apply under prescribed conditions, and deviations from these conditions may affect the holding times. Extraction holding time refers to the time lapsed between sample collection and sample preparation. Analytical holding time refers to the time lapsed between sample preparation and *analysis*.

HSWA module—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*. Module VIII incorporates requirements from the *Hazardous and Solid Waste Amendments*, including the requirement of *corrective actions* for *releases* from *solid waste management units*.

hydraulic conductivity—(1) A coefficient of proportionality that describes the rate at which a fluid can move through a permeable *medium*. The rate is a function of both the medium and the fluid flowing through it. (2) The quantity of water that will flow through a unit of cross-sectional area of a porous material per unit time under a *hydraulic gradient* of 1.00 (measured at right angles to the direction of flow) at a specified temperature. (Also see *unsaturated hydraulic conductivity*.)

hydraulic gradient—The rate of change in *hydraulic head* per unit of distance in the direction of *groundwater* flow.

hydrogen-ion activity (pH)—The effective concentration (activity) of dissociated hydrogen ions (H+); a measure of the acidity or *alkalinity* of a solution that is numerically equal to 7 for neutral solutions, increases with alkalinity, and decreases as acidity increases.

"Hydrogeologic Workplan"—The *document* that describes the activities planned by Los Alamos National Laboratory (the Laboratory) to characterize the hydrologic setting beneath the Laboratory and to enhance the Laboratory's *groundwater* monitoring program.

hydrogeology—The science dealing with the occurrence of surface water and *groundwater*, their utilizations, and their functions in modifying the Earth, primarily by erosion and deposition.

industrial scenario—A land-use condition in which current Los Alamos National Laboratory operations or industrial/commercial operations within Los Alamos County are continued or planned. Any necessary *remediation* involves *cleanup* to standards designed to ensure a safe and healthy work environment for workers.

infiltration—(1) The penetration of water through the ground surface into subsurface *soil*. (2) The technique of applying large volumes of wastewater to land to penetrate the surface and percolate through the underlying soil.

instrument detection limit (IDL)—A measure of instrument *sensitivity* without any consideration for contributions to the signal from reagents. The IDL is calculated as follows: Three times the average of the standard deviations obtained on three nonconsecutive days from the *analysis* of a standard solution, with seven consecutive measurements of that solution per day. The standard solution must be prepared at a concentration of three to five times the instrument manufacturer's estimated IDL.

interim measure—An action that can be implemented to minimize or prevent *migration* of *contaminants*, and to minimize or prevent actual or potential human or ecological exposure to contaminants, while long-term final *corrective action* remedies are evaluated and, if necessary, implemented.

intermittent stream—A stream that flows only in certain reaches as a result of the channel bed's losing and gaining characteristics.

internal standards—Compounds added to a *sample* after the sample has been prepared for qualitative and quantitative instrument *analysis*. The compounds serve as a standard of retention time and response which is invariant from run to run.

Investigation-derived waste—*Solid waste* or *hazardous waste* that was generated as a result of *corrective action* investigation or *remediation* field activities. Investigation-derived waste may include drilling muds, cuttings, and purge water from the installation of test pits or wells; purge water, *soil*, and other materials from the collection of *samples*; residues from the testing of *treatment* technologies and pump-and-treat systems; contaminated personal protective equipment; and solutions (aqueous or otherwise) used to decontaminate nondisposable protective clothing and equipment. (U.S. Environmental Protection Agency, January 1992. Publication 9345.3-03FS)

laboratory qualifier (laboratory flag)—Codes applied to data by a *contract analytical laboratory* to indicate, on a gross scale, a verifiable or potential data deficiency. These flags are applied according to the *U.S. Environmental Protection Agency* contract-laboratory program guidelines.

LANL (Los Alamos National Laboratory) data validation qualifiers—The Los Alamos National Laboratory data qualifiers which are defined by, and used in, the *Environmental Restoration (ER) Project* validation process. The qualifiers describe the general usability (or quality) of data. For a complete list of data qualifiers applicable to any particular analytical suite, consult the appropriate ER Project *standard operating procedure*.

LANL (Los Alamos National Laboratory) data validation reason codes—The Los Alamos National Laboratory designations applied to sample data by data validators who are independent of the contract laboratory that performed a given sample *analysis*. Reason codes provide an analysis-specific explanation for applying a qualifier, with some description of the qualifier's potential impact on data use. For a complete list of data qualifiers applicable to any particular analytical suite, consult the appropriate *Environmental Restoration Project standard operating procedure*.

log book—A notebook used to record tabulated data (e.g., the history of *calibrations*, *sample* tracking, numerical data, or other technical data).

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.

matrix—Relatively fine material in which coarser fragments or crystals are embedded; also called "ground mass" in the case of igneous rocks. (Also see *sample matrix*.)

matrix spike—An *aliquot* of a *sample* spiked with a known concentration of *target analyte(s)*. Matrix spike samples are used to measure the ability to recover prescribed analytes from a native *sample matrix*. The spiking typically occurs before sample preparation and *analysis*. (Also see *matrix spike duplicate*.)

matrix spike duplicate—An intralaboratory duplicate *sample* spiked with a known amount of *target analyte(s)*. Spiking typically occurs before sample preparation and *analysis*. (Also see *matrix spike*.)

maximum contaminant level (MCL)—Under the Safe Drinking Water Act, the maximum permissible level of a *contaminant* in water that is delivered to any user of a public water system serving 15 or more connections and 25 or more people. MCLs are enforceable standards and take into account the feasibility and cost of attaining the standards.

medium (environmental)—Any medium capable of absorbing or transporting constituents. Examples of media include *tuffs*, *soils* and *sediments* derived from these tuffs, surface water, *soil water*, *groundwater*, air, structural surfaces, and debris.

medium (geological)—The solid part of the hydrogeological system; may be unsaturated or saturated.

method blank—An *analyte*-free matrix to which all reagents are added in the same volumes or proportions as those used in the *environmental sample* processing, and which is prepared and analyzed in the same manner as the corresponding environmental samples. The method blank is used to assess the potential for *sample* contamination during preparation and *analysis*.

method detection limit (MDL)—The minimum concentration of a substance that can be measured and reported with a known statistical confidence that the *analyte* concentration is greater than zero. After subjecting *samples* to the usual preparation, the MDL is determined by analyzing those samples of a given matrix type that contain the analyte. The MDL is used to establish detection status.

migration—The movement of inorganic and organic chemical species through unsaturated or saturated materials.

migration pathway—A route (e.g., a stream or subsurface flow path) for the potential movement of *contaminants* to environmental *receptors* (plants, humans, or other animals).

minimum detectable activity (MDA)—For the *analysis* of *radionuclides*, the lowest detectable *radioactivity* for a given analytical technique. The following equation is used to

calculate the MDA unless otherwise noted or approved by Los Alamos National Laboratory. (Note: "MDA" here should not to be confused with *material disposal area)*:

with material disposal area):

$$MDA = \frac{4.65(BKG)^{0.5} + 2.71}{2.22 \times EFF \times V \times T_S \times Y}$$

where BKG = the total background counts,

EFF = the fraction detector efficiency,

V = the volume or unit weight,

Ts = the sample count duration, and

Y = the fractional chemical recovery obtained from the tracer recovery.

Depending on the type of analysis, other terms may also be required in the denominator (e.g., gamma abundance).

mixed waste—Waste containing both hazardous and source, special nuclear, or byproduct materials subject to the Atomic Energy Act of 1954. (Laboratory Implementation Requirement 404-00-03.1)

model—A schematic description of a physical, biological, or social system, theory, or phenomenon that accounts for its known or inferred properties and may be used for the further study of its characteristics.

monitoring well—(1) A well used to obtain water-quality *samples* or to measure *groundwater* levels. (2) A well drilled at a *hazardous waste* management facility or *Superfund site* to collect groundwater samples for the purpose of physical, chemical, or biological analysis and to determine the amounts, types, and distribution of *contaminants* in the groundwater beneath the site.

National Pollutant Discharge Elimination System—The national program for issuing, modifying, revoking and reissuing, terminating, monitoring, and enforcing *permits* to discharge wastewater or storm water, and for imposing and enforcing pretreatment requirements under the Clean Water Act.

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

nondetect—A result that is less than the *method detection limit*.

notice of deficiency (NOD)—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. The NOD 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. If NMED issues a notice of disapproval for a document, it may include written instructions for modifying and resubmitting the document. (Note: Notices of disapproval have grown out of the NMED's *Consent Order*. *Notices of deficiency* are used more broadly by NMED and have been in use for a longer time. Generally, the acronym NOD is used for a notice of deficiency.)

operable units (OUs)—At Los Alamos National Laboratory, 24 areas originally established for administering the *Environmental Restoration Project*. 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.

percent recovery (%R)—The amount of material detected in a *sample* (less any amount already in the sample) divided by the amount added to the sample, expressed as a percentage.

perched water—A zone of unpressurized water held above the *water table* by impermeable rock or *sediment*.

perennial stream—Water in a channel or bed that flows continuously throughout the year.

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. (40 Code of Federal Regulations 270.2)

permit modification—A change to a condition in Los Alamos National Laboratory's *Hazardous Waste Facility Permit*, initiated by either a request from the permittee or by the *administrative authority*'s action.

piezometer—A non-pumping well (generally of small diameter) for measuring the elevation of a *water table*.

piezometric surface (potentiometric surface)—The surface that represents the static head in an *aquifer* ; applies to both *confined* and *unconfined aquifers*.

polychlorinated biphenyls (PCBs)—Any chemical substance that is limited to the biphenyl molecule which 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.

porosity—The degree to which *soil*, gravel, *sediment*, or rock is permeated with pores or cavities through which water or air can move.

potential release site (PRS)—A potentially contaminated *site* at Los Alamos National Laboratory. PRSs are further divided into *solid waste management units* (SWMUs*)* and *areas of contamination* (AOCs).

potentiometric surface—See *piezometric surface*.

prepared sample—A *sample* that has been treated to render it amenable to *analysis*. The sample preparation may include additives or treatments such as digestate, distillate, electroplate, extract, filter retentate, filtrate, homogenate, precipitate, pulverized/sieved portion of sample, or residue.

quality-assessment sample—A *sample* submitted for *analysis*, the data from which are used to assess the performance quality of a sampling or analysis process. May include *performance-evaluation samples*, *field duplicates*, or *field blanks*.

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* which, 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*.

Quaternary—The second period of the Cenozoic Era, following the Tertiary, and including the last two to three million years of Earth history.

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; can have as long a life as *soil* or water pollutants.

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.

reach—A specific length of a *canyon* that is treated as a single unit for sampling and *analysis*. Reaches tend to be internally uniform with respect to geomorphic setting and land use.

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**.**

recharge—The process by which water is added to a zone of saturation, usually by *percolation* from the *soil* surface (e.g., the recharge of an *aquifer*).

record—Any book, paper, map, photograph, machine-readable material, or other documentary material, regardless of physical form or characteristics.

recreational scenario—A land-use condition under which individuals may be exposed to *contaminants* for a limited amount of time as a result of outdoor activities such as hiking, camping, hunting, or fishing.

reference set—A hard-copy compilation of reference items cited in *Environmental Restoration Project documents*.

regional aquifer—Geologic material(s) or unit(s) of regional extent whose saturated portion yields significant quantities of water to wells, contains the regional zone of saturation, and is characterized by the regional *water table* or *potentiometric surface*. (Also see *aquifer*.)

regulatory standard—Media-specific *contaminant* concentration levels of potential concern which are mandated by federal or state legislation or regulation (e.g., the Safe Drinking Water Act, New Mexico Water Quality Control Commission regulations).

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.

reporting limit (RL)—The numerical value that an analytical laboratory (in conjunction with its client) selects for determining if a *target analyte* has been detected. Results below the RL are considered to be undetected, whereas results above the RL are considered to be detected. The RLs are not necessarily based on instrument *sensitivity*. RLs can be established at the *instrument detection limit*, *method detection limit*, *estimated quantitation limit*, or *contract-required detection limit*.

representativeness—The degree to which data accurately and precisely represent a characteristic of a *population* or an environmental condition.

residential scenario—The land use under which individuals may be exposed to *contaminants* as a result of living on or near contaminated *sites*.

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.*)

rill erosion—An erosion process in which numerous small channels only several inches deep are formed by concentrated *runoff* that flows during and immediately after rain storms.

rinsate blank—See *equipment blank*.

routine data validation—The process of reviewing analytical data relative to quantitative routine acceptance criteria. The objective of routine *data validation* is two-fold:

- to estimate the technical quality of the data relative to minimum national standards adopted by the *Environmental Restoration Project*, and
- to indicate to data users the technical data quality at a gross level by assigning *laboratory qualifiers* to environmental data whose *quality indicators* do not meet acceptance criteria.

runoff—The portion of the precipitation on a drainage area that is discharged from the area either by sheet flow or adjacent stream channels.

run-on—Surface water that flows onto an area as a result of *runoff* occurring higher up on a *slope*.

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.

sample matrix—In *chemical analysis*, that portion of a *sample* which is exclusive of the *analytes* of interest. Together, the matrix and the analytes of interest form the sample.

screening action level (SAL)—A *chemical's medium*-specific concentration level; it is calculated by using conservative criteria below which it is generally assumed that no potential for unacceptable *risk* to human health exists. The derivation of a SAL is based on conservative exposure and on land use assumptions. However, if an applicable *regulatory standard* exists that is less than the value derived by risk-based computations, it will be used for the SAL.

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—An area or place that falls under the jurisdiction of the *U.S. Environmental Protection Agency* and/or a state for *corrective action*.

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. (U.S. Environmental Protection Agency, May 1994. Publication EPA-520/R-94/004)

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.

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

soil—A sample media group that includes soil and can include artificial fill materials. "Soil" refers to a material that overlies bedrock and has been subject to soil-forming processes. The sample media group of soil includes soils from all soil horizons.

soil gas—Gaseous elements and compounds in the small spaces between particles of the earth and *soil*. Such gases can be moved or driven out under pressure.

soil moisture—The water contained in the pore space of the *unsaturated zone*.

soil screening level (SSL)—The concentration of a *chemical* (inorganic or organic) below which no potential for unacceptable *risk* to human health exists. The derivation of an SSL is based on conservative exposure and land-use assumptions, and on target levels of either a *hazard quotient* of 1.0 for a noncarcinogenic chemical or a cancer risk of 10^{-5} for a carcinogenic chemical.

soil water—Water in the *unsaturated zone*, regardless of whether it occurs in *soil* or rock.

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* which 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 New Mexico Environment Department (NMED) *Consent Order*, any discernible site at which solid waste has been placed at any time, and from which NMED 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.

split sample—A *sample* that has been divided into two or more portions that are expected to be of the same composition; used to characterize within-sample heterogeneity, sample handling, and measurement variability.

split-spoon sampler—A hollow, tubular sampling device below a drill stem that is driven by a weight to retrieve *soil samples*. The core barrel can be opened to remove samples. This is a sampling method commonly used with auger drilling. The split-spoon sampler can be driven into the ground or can be advanced inside hollow-stem augers.

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

stratigraphy—The study of the formation, composition, and sequence of *sediments*, whether consolidated or not.

Superfund—Another term for the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The two terms are used interchangeably.

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 inches for mesa-top locations, but may be up to several feet in *sediment*-deposition areas within *canyons*.

surrogate (surrogate compound)—An organic compound used in the analyses of organic *target analytes* which is similar in composition and behavior to the target analytes but is not normally found in *field samples*. Surrogates are added to every *blank* and spike *sample* to evaluate the efficiency with which *analytes* are being recovered during extraction and *analysis*.

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).

tentatively identified compound (TIC)—A chemical compound detected in a *sample* that is not a *target analyte*, *internal standard*, or *surrogate*. Up to 30 chromatographic peaks may be subject to mass spectral matching for identification as TICs.

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. (40 Code of Federal Regulations 260.10) (2) The movement of a *contaminant* from a source through a *medium* to a *receptor*.

treatment, storage, and disposal facility—An interim-status or permitted facility in which *hazardous waste* is treated, stored, or disposed.

tremie pipe—A small-diameter pipe used to carry sand pack, *bentonite*, or grouting materials to a borehole's bottom. Materials are pumped under pressure or poured to the hole bottom through the pipe. The pipe is retracted as the *annular space* is filled.

trip blank—A *sample* of *analyte*-free medium taken from a sampling *site* and returned to an analytical laboratory unopened, along with samples taken in the field; used to monitor cross contamination of samples during handling and storage both in the field and in the analytical laboratory.

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

unconfined aquifer—An *aquifer* containing water that is not under pressure; the water level in a well is the same as the *water table* outside the well.

underground storage tank—A tank located at least partially underground and designed to hold gasoline or other petroleum products or *chemicals*.

unrestricted area—Any area, whose access is not controlled by a licensee for purposes of protecting individuals from exposure to *radiation* and *radioactive materials*, and any area used for residential quarters. (10 Code of Federal Regulations 60.2) (Also see *restricted area*.)

unsaturated hydraulic conductivity—A coefficient that describes the rate at which a fluid can potentially move through a permeable, unsaturated *medium*. (Also see *hydraulic conductivity*.)

unsaturated zone—The area above the *water table* where *soil* pores are not fully saturated, although some water may be present.

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.

vadose zone—The zone between the land surface and the *water table* within which the moisture content is less than saturation (except in the capillary fringe) and pressure is less than atmospheric. *Soil* pore space also typically contains air or other gases. The capillary fringe is included in the vadose zone. (Also see *unsaturated zone*.)

watershed—A region or basin drained by, or contributing waters to, a river, stream, lake, or other body of water and separated from adjacent drainage areas by a divide, such as a mesa, ridge, or other geologic feature.

water table—The top of the regional saturated zone; the *piezometric surface* associated with an *unconfined aquifer*.

welded tuff—A volcanic deposit hardened by the action of heat, pressures from overlying material, and hot gases.

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 ENGLISH CONVERSIONS

Multiply SI (Metric) Unit	by	To Obtain US 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)

DATA QUALIFIER DEFINITIONS

Data Qualifier	Definition
U	The analyte was analyzed for but not detected.
J	The analyte was positively identified, and the associated numerical value is estimated to be more uncertain than would normally be expected for that analysis.
J+	The analyte was positively identified, and the result is likely to be biased high.
J-	The analyte was positively identified, and the result is likely to be biased low.
UJ	The analyte was not positively identified in the sample, and the associated value is an estimate of the sample-specific detection or quantitation limit.
R	The data are rejected as a result of major problems with quality assurance/quality control (QA/QC) parameters.

APPENDIX B

INVESTIGATION-DERIVED WASTE PLAN

FOR CONSOLIDATED UNIT 73-002-99

Los Alamos National Laboratory

New Mexico

Innovative Technical Solutions, Inc.

TABLE OF CONTENTS

1.0 INTRODUCTION

This plan describes the management of Investigation-Derived Waste (IDW) generated during the removal of incinerator ash at Solid Waste Management Unit (SWMU) 73-002 and subsequent investigative sampling of SWMU 73-002, SWMU 73-004(a), SWMU 73-004 (b), SWMU 73-006, and Area of Concern (AOC) 73-003 in Consolidated Unit 73-002-99 at Los Alamos National Laboratory (the Laboratory), New Mexico.

IDW is waste generated during field activities, and may include, but is not limited to, drill cuttings, ash and debris, contaminated personal protective equipment (PPE), sampling supplies, fluids from decontamination of PPE and sampling equipment, and other waste that has or may have been in contact with contaminants.

The objective of this plan is to describe procedures for handling, storing, characterizing, and disposing of IDW generated during performance of sampling and remediation activities in a manner that will meet regulatory requirements while limiting the on-site handling and storage of materials.

IDW generated during the investigation of Consolidated Unit 73-002-99 sites will be managed in a manner that protects human health and the environment, complies with applicable regulatory requirements, and adheres to Laboratory waste-minimization goals. IDW generated during the investigation of Consolidated Unit 73-002-99 sites will be managed in a manner that protects human health and the environment, complies with applicable regulatory requirements, and adheres to the Laboratory waste-minimization goals.

Management of IDW will be generally consistent with Laboratory standard operating procedures (SOPs) 01.06, Management of Environmental Restoration Project Wastes; 01.08, Field Decontamination of Drilling and Sampling Equipment; and 01.10, Waste Characterization (SOPS are characterized in Table 8 of the Work Plan). These SOPs also incorporate references to applicable EPA and New Mexico Environmental Department (NMED) regulations, and U.S. Department of Energy (DOE) orders.

2.0 IDW WASTE STREAMS

This section describes the waste streams that will be generated and managed during the ash removal and field investigations at the Consolidated Unit 73-002-99 area sites are described in the following subsections.

As outlined in Section 3, characterization of these waste streams will be achieved through existing data and or documentation, direct sampling of the IDW, or sampling of the media being investigated (e.g., surface soil, subsurface soil, etc.). LANL Radiation Safety personnel will also evaluate IDW prior to release for off-site disposal.

2.1 DRILL CUTTINGS

Drill cuttings will consist of soil removed from boreholes drilled at sites in Consolidated Unit 72-002-99. The cuttings will be placed in appropriate containers (such as covered bins or DOT-approved 55-gallon drums), temporarily labeled "On Hold Pending Analysis," and staged in the area designated by LANL for waste staging.

2.2 ASH AND DEBRIS

Waste from removal of ash and debris at SWMU 73-002 will consist of ash, cans, plants and shrubs, and municipal debris. The ash waste will be placed in IP-2 containers and secured at the site before it is shipped to EnviroCare. Other debris (i.e., cans, municipal waste, etc.) will be placed in appropriate containers and evaluated for disposal as outlined in Section 3.

2.3 SPENT PERSONAL PROTECTIVE EQUIPMENT

This waste stream will consist of personal protective equipment (PPE) that has contacted contaminated environmental media and cannot be decontaminated. The bulk of this waste stream will consist of protective clothing such as Tyvek™ over-garments, latex gloves, shoe covers, and (if required) respirator cartridges. Spent PPE will be collected in containers at personal decontamination stations. Characterization of this waste stream will be performed

through acceptable knowledge of the waste media. It is anticipated that spent PPE will be designated as non-hazardous waste and will be disposed of at the Waste Management Landfill in Rio Rancho, New Mexico.

2.4 DISPOSABLE SAMPLING SUPPLIES

This waste stream will consist of disposable equipment and materials used during sample collection (e.g., filters, tape, plastic sheeting, and plastic packaging) that come into direct contact with contaminated environmental media and cannot be decontaminated. It is anticipated that this waste will be designated as non-hazardous waste and will be disposed of at the Waste Management Landfill in Rio Rancho, New Mexico.

2.5 ENVIRONMENTAL MEDIA

Certain field investigation activities may also displace environmental media, which are defined as naturally occurring materials indigenous to the environment, including surface and subsurface soil, rock, bedrock, and gravel. In most cases, environmental media are not subject to Resource Conservation and Recovery Act (RCRA) regulation because they do not meet the definition of solid waste (i.e., they are not discarded, abandoned, recycled, or inherently waste-like).

According to the U.S. Environmental Protection Agency (EPA) area of contamination policy, environmental media are not considered to be waste (and, therefore, are not IDW) if they are returned to their points of origin (EPA 1996, 82288). EPA guidance indicates that moving hazardous waste from an area of contamination into a drum, followed by replacing it in the area of contamination, does not constitute "land disposal" for RCRA purposes (Wehling 1991, 87382). Therefore, non-hazardous media will be returned to their points of origin.

3.0 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Investigation-derived waste will consist of the solid and liquid waste streams described in Section 2. Handling/management and characterization procedures for these streams are described in this section. Every effort will be made to characterize, profile, and remove IDW from the site, regardless of its classification, within 90 days from when it is generated.

3.1 SOLID WASTES

Solid IDW will consist primarily of ash and debris generated by removal activities at SWMU 73-002, soil cuttings from investigations of the SWMUs, and PPE and disposable sampling equipment used during field activities.

Solid waste from the removal of ash and related debris (i.e., ash, cans, shrubs, etc.) at SWMU 73-002 that has been designated as Low Level Radiological Waste (LLRW) will be placed in IP-2 containers and secured at the site before being shipped to EnviroCare for disposal. The classification procedure used to characterize this material is outlined in Section 4.

Soil cuttings generated during the SWMU investigation activities will be characterized using analytical results from soil samples collected from the boreholes.

Other debris from removal activities (e.g., cans, municipal waste, etc.), along with general refuse, disposable PPE, and disposable equipment generated during remediation and investigative activities, will be placed in garbage bags or other appropriate containers. The filled bags will be stored in designated general refuse containers or receptacles at the site.

Waste that has not been previously designated as LLRW will be visually inspected for ash-related waste, and evaluated for release by LANL Radiation Safety personnel to ensure the release requirements of 10CFR835 are satisfied. Based on evaluation results, waste determined to be contaminated with ash will be consolidated with the LLRW ash destined for disposal at

EnviroCare. The remaining solid waste will be appropriately disposed of, either at a sanitary landfill or at an industrial waste landfill for low-level radioactive material.

3.2 LIQUID WASTES

Some liquid waste will be generated from decontamination and sampling activities. All liquid IDW will be placed in DOT approved 55 gallon-drums or other appropriate containers, temporarily labeled as "on hold pending analysis," and stored at an approved on-site staging area pending waste characterization, profiling, and final off-site disposal.

It is anticipated that liquid IDW will be non-hazardous. However, profiling of the containerized liquid IDW will be necessary for waste acceptance by a receiving facility. A representative sample will be collected from the liquid IDW stored in each drum using a clean disposable bailer and transferred into clean sample containers provided by the laboratory. Sample containers will be labeled, placed in an ice-chilled cooler, and transported under chain-of-custody procedures to the LANL Sample Management Office for analysis.

Analytical criteria will be dependent on the requirements of the receiving facility, but are anticipated to include the following:

- VOCs/SVOCs
- Metals
- Polychlorinated biphenyls (PCBs)
- Radioactive Material

Additional tests beyond the above methods may be required based on the results of the above tests and discussions with the receiving facilities.

When the results of the waste characterization analysis are received, the liquid IDW will be properly profiled. Disposal will be coordinated with the DOE and New Mexico State-permitted disposal facility, and the facility will then issue a letter of waste acceptance for each container or other unit received, as indicated by the waste characterization. The liquid IDW will be loaded and transported to the approved facility.

Liquid waste generally will be disposed by one of the following processes:

- Non-hazardous liquids will be disposed at an off-site permitted industrial wastewater treatment plant.
- Hazardous liquids, if identified, will be disposed at an off-site permitted treatment/disposal facility.

4.0 ASH AND DEBRIS WASTE CLASSIFICATION

Based on the results of the April 2005 ash characterization sampling efforts, along with the results of previous sampling efforts at the site, the appropriate waste classification for the ash and debris to be removed from SWMU 73-002 can be determined. The results were evaluated against requirements promulgated by EPA under Resource Conservation and Recovery Act (RCRA) and rules governing the classification of radiological wastes.

4.1 RCRA WASTE CLASSIFICATION

A solid waste can be considered hazardous based on the following primary criteria:

- The waste exhibits the characteristics of a hazardous waste if it exhibits on one or more of the following (40CFR 261 Subpart C):
  - Characteristics of ignitability (40CFR 261.21)
  - Characteristics of corrosivity (40CFR 261.22)
  - Characteristics of reactivity (40CFR 261.23)
  - Characteristics of toxicity (40CFR 261.24)
- The waste is specifically listed as hazardous (40CFR 261 Subpart D)

4.1.1 Reactivity, Corrosivity, and Ignitability (RCI)

The results of the characterization sampling efforts included testing for reactivity, corrosivity and ignitability (known collectively as RCI). The results of analyses for each of the characteristics of RCI are shown in the Historical Investigation Report, and discussed below:

- The ash did not exhibit characteristics of reactivity (there are several criteria, most relevant is the generation of cyanide or sulfide in sufficient quantity to present a danger to human health or the environment [typically reactive cyanide >250 mg/kg, and reactive sulfide >500 mg/kg]) based on non-detect reactive sulfide and reactive cyanide measurements for samples analyzed ranging from 0.052 to 0.14 mg/kg.
- The ash did not exhibit characteristics of corrosivity (requiring a pH of ≤ 2 or ≥ 12.5) based on pH measurements for samples analyzed ranging from 8 to 8.3.
- The ash did not exhibit characteristics of ignitability (requiring a flashpoint <60°C) based on flashpoint measurements for each sample analyzed of >60°C.

4.1.2 Toxicity

The results of the characterization sampling efforts included testing for organic and inorganic compounds with established maximum concentrations by Toxicity Characteristic Leaching Procedure (TCLP) listed in 40CFR 261.24. The Historical Investigation Report provides the results for metals analyzed using TCLP methodology, and provides the results for organic compounds analyzed as totals, and adjusting these results based on the 20:1 dilution employed in the TCLP methodology and assuming 100% solubility (a very conservative assumption). See Table 1 for a summary of the inorganic chemicals sampled in 2005.

The 90% Upper Confidence Interval (UCI) of the mean is then calculated using all the sample results from the most recent ash characterization sampling, per EPA methodology (EPA SW-846 Chapter 9). The 90% UCI of the mean is then compared to the established regulatory levels. In every case, the 90% USI of the mean is below the established regulatory levels, and the waste is non-hazardous.

To further clarify this methodology, an example will be calculated using TCLP lead. The raw values reported for lead by TCLP ranged from minimum of 0.316 to a maximum of 6.29 milligrams per liter (mg/L), with a regulatory level for lead of 5.0 mg/L. To calculate the confidence interval (CI) of the mean, the following equation is used:

$$CI = \bar{x} \pm t_{.20} s_{\bar{x}}$$

with $t_{.20}$ from tabulated student's "t" test values for two-tailed probability of 0.20 (equivalent to 0.10 single tail probability) with appropriate degrees of freedom (n-1, where n is number of samples collected and analyzed). The first step is calculating the mean of the samples using the equation:

$$\bar{x} = \frac{\sum_{i=n}^{n} x_i}{n}$$

where n = number of sample measurements. For lead, 20 samples were collected, and the calculated mean is 1.811. Standard error is calculated using the following equation:

$$s_{\bar{x}} = \frac{s}{\sqrt{n}}$$

where s is the standard deviation of the samples. For lead, the standard deviation is 1.527 and, as mentioned above, n is 20.

Now, calculating the CI and substituting the above equation:

$$CI = \bar{x} \pm t_{.20} s_{\bar{x}} = (1.811) \pm (1.328)(\frac{1.527}{\sqrt{20}}) = 1.811 \pm 0.453 = 1.358 - 2.264$$

Thus, the 90% UCI for lead is 2.264 mg/L, well below the regulatory level of 5.0 mg/L.

4.2 RADIOLOGICAL WASTE CLASSIFICATION

Characterization of the incinerator ash is complicated by the presence of low levels of radioactive material. The key questions are (1) whether the ash is considered a radioactive waste (typically material that has become contaminated [i.e., greater than background concentrations] by radioactive elements or isotopes), and (2) if a radioactive waste, should the ash be considered a LLRW, or could the ash be released to an industrial-waste landfill.

There is little guidance on evaluating bulk media for release from radioactive waste requirements. The guidance available is mainly governed by DOE Order 5400.5, "Radiation Protection of the Public and the Environment" (DOE, 1990), DOE-EH memorandum "Application of DOE 5400.5 Requirements for Release and Control of Property Containing Residual Radioactive Material" (DOE, 1995) regarding the implementation of DOE 5400.5, and the proposed regulation 10 CFR 834, "Radiation Protection of the Public and the Environment." The "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM) process is not applicable for waste characterization, but is applicable for final site closure after completion of remediation activities.

Furthermore, the proposed DOE Standard, "Guide to Good Practice for Establishing Authorized Limits for the Release of Waste and Property Contaminated with Residual Radioactivity," was reviewed. This standard reiterates the requirements specified in the DOE 1995 memorandum.

Laboratory SOP 15.13 "Performing Background Value Comparisons for Radionuclides," provides guidance on comparing background and fallout values on radionuclides at LANL Environmental Restoration (ER) projects (this SOP is summarized in Table 8 of the Work Plan). Recent sample results and available results from earlier samples were compared to background values (BV) obtained from "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory" (LANL, 1998).

The 2005 sample results demonstrably exceed background values for the following radionuclides: Ra–226; U–234; U–235; U–238; Pu–239; and Am–241. Likewise, the sample results exceeded the 1999 summary report for the following radionuclides: Ra–226; U–234; U–235; and U–238. The samples also revealed the presence of plutonium. Nearly all plutonium is manufactured synthetically by exposing U–238 to neutron radiation; thus its presence could suggest a classification of "low level radioactive waste" under Nuclear Regulatory Commission (NRC) guidelines NUREG/BR-0216, Rev. 2 "Radioactive Waste: Production, Storage, Disposal" (NRC, 2002).

In addition to the radioisotope lab results discussed above, a gross alpha mean activity of 11.2 pCi/g and a gross beta mean activity of 13.3 pCi/g, was also provided by the analytical laboratory. These results were lower than expected in comparison with the individual radionuclide analytical results, which was mainly due to the analytical errors associated with sampling. These values will be used for information only, with more weight placed on the individual radioisotope lab results when used for waste characterization.

4.3 DOT CHARACTERIZATION

Based on the presence of transuranic radionuclides (e.g., plutonium), the subject waste may be classified as LLRW. However, the waste may be subject to release from regulation based on calculated authorized limits, with approval of DOE headquarters. If released, the waste may still be subject to regulation under the Department of Transportation (DOT).

According to the DOT regulations (49 Code of Federal Regulations [CFR]173.403, revised 10/2004), radioactive material means any material containing radionuclides where both the activity concentration and the total activity in the consignment exceed the values specified in the table in article 173.436 or values derived according to the instructions in article 173.433.

The activity of the waste is based on the mean concentration of the radionuclides. The samples that were taken of the incinerator ash were based on collecting a representative sample for each 100 cubic yards of ash. The distribution of radionuclides is relatively consistent between samples (e.g., plutonium is reported in each of the samples); thus using the mean and 95% Upper Confidence Level (UCL95%) of the samples is appropriate to characterize the entire waste stream.

The mean activity concentrations of the radionuclides also were compared to the exemption limits specified in 49CFR173.436, "Exempt Material Activity Concentrations and Exempt Consignment Activity Limits for Radionuclides." In every case, the individual radionuclides met the exemption criteria for activity concentration; thus the material is classified as DOT exempt.

4.4 SUMMARY AND CONCLUSIONS

Based on activity levels demonstrably greater than background, and the presence of transuranic radionuclides (e.g., plutonium), the waste is classified as LLRW. The waste may be subject to release from regulation based on calculated authorized limits; however, this exception would require approval of DOE headquarters based on the previously calculated exposure greater than 1 mrem/yr.

Based on the discussions and analyses contained in this section, the appropriate classification of the ash is as a non-hazardous, low-level radioactive waste. These characterization results have been reviewed by EnviroCare of Utah, which has tentatively accepted the ash for disposal as LLRW, to be handled as debris due to its physical properties (low bulk density).

As indicated in section 3, the miscellaneous debris associated with the ash (degraded cans, etc.) that has been in direct contact with the ash will be managed with the ash (this method of handling has been approved by EnviroCare of Utah).

Topical debris (cans and other metallic debris) not associated with the ash can be handled as non-hazardous debris for disposal at an industrial landfill. This topical debris has been tentatively accepted for disposal at Rio Rancho Landfill, as long as it contains no ash (Rio Rancho Landfill is excluded from accepting ash, not due to any chemical or radiological constituent in the ash but due to its classification as a "special waste" by the State of New Mexico, with specific permit requirements).

5.0 REFERENCES

Compliance Order on Consent (Consent Order) between State of New Mexico Environmental Department and, the United Stated Department of Energy and Regents of the University of California for the Los Alamos National Laboratory, Los Alamos County, New Mexico. March 1, 2005.

U.S. Department of Energy (DOE) Standard, "Guide to Good Practice for Establishing Authorized Limits for the Release of Waste and Property Contaminated with Residual Radioactivity."

DOE Proposed regulation 10 CFR 834, "Radiation Protection of the Public and the Environment."

DOE, 1995. DOE-EH memorandum "Application of DOE 5400.5 Requirements for Release and Control of Property Containing Residual Radioactive Material."

DOE, 1990. DOE Order 5400.5, "Radiation Protection of the Public and the Environment"

DOT, 2004. 49 Code of Federal Regulations [CFR] 173.403, revised October.

LANL, 1998. "Inorganic and Radionuclide Background Data for Soils, Canyon Sediments, and Bandelier Tuff at Los Alamos National Laboratory," September.

Nuclear Regulatory Commission (NRC), 2002. NUREG/BR-0216, Rev. 2 "Radioactive Waste: Production, Storage, Disposal."

NRC, 2000. NUREG-1575, Rev. 1, "Multi-Agency Radiation Survey and Site Investigation Manual" (MARSSIM), August.