Los Alamos
NATIONAL LABORATORY
EST. 1943

Los Alamos National Laboratory
Environmental Programs
Corrective Actions Project, MS M992
Los Alamos, New Mexico 87545
(505) 667-0819/FAX (505) 665-4747

RECEIVED
OCT 2006
NMED Hazardous Waste Bureau

National Nuclear Security Administration
Los Alamos Site Office, MS A316
Environmental Restoration Program
Los Alamos, New Mexico 87544
(505) 667-7203/FAX (505) 665-4504

Date: October 27, 2006
Refer to: EP2006-0933

Mr. James Bearzi
NMED-Hazardous Waste Bureau
2905 Rodeo Park Drive East, Building 1
Santa Fe, NM 87505-6303

SUBJECT: SUBMITTAL OF THE "WORK PLAN FOR SUPPLEMENTAL SAMPLING AT MATERIAL DISPOSAL AREA L, SOLID WASTE MANAGEMENT UNIT 54-006" AND THE "SAMPLING AND ANALYSIS PLAN FOR IMPOUNDMENTS B, C, AND D AT MATERIAL DISPOSAL AREA L, SOLID WASTE MANAGEMENT UNIT 54-006, REVISION 1"

Dear Mr. Bearzi:

Enclosed please find two hard copies with electronic files of the "Work Plan for Supplemental Sampling at Material Disposal Area (MDA) L, Solid Waste Management Unit 54-006" and the "Sampling and Analysis Plan for Impoundments B, C, and D at Material Disposal Area L, Solid Waste Management Unit 54-006, Revision 1." These plans were prepared in response to the notice of disapproval and are supplements to the MDA L investigation report.

If you have questions, please contact John Hopkins at (505) 667-9551 (johnhopkins@lanl.gov) or Frank Bosiljevac at (505) 845-5746 (fbosiljevac@doeal.gov).

Sincerely,

Andrew Phelps, Associate Director
Environmental Programs
Los Alamos National Laboratory

Sincerely,

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

AP/DG/JH/ew

Enclosures: 1) Two hard copies with electronic files - "Work Plan for Supplemental Sampling at Material Disposal Area L, Solid Waste Management Unit 54-006" (EP2006-0906)
2) Two hard copies with electronic files – "Sampling and Analysis Plan for Impoundments B, C, and D at Material Disposal Area L, Solid Waste Management Unit 54-006, Revision 1" (EP2006-0925)

Cy: (w/enc)
J. Hopkins, EP-CAP, MS M992 (with CD)
L.T. Trujillo, DOE LASO, MS A316 (with CD)
F. Bosiljevac, DOE AL, MS A316 (with CD)
EP-CAP File, MS M992 (with CD)
RPF, MS M707 (with CD)
SAFE S7, MS F674 (without CD)

Cy:(Letter and CD only)
L. King, EPA Region 6
P. Reneau, EP-ERSS, MS M992

Cy: (w/o enc)
A. Dorries, EP-ERSS, MS M992
G. Dover, EP-CAP, MS M992
D. McInroy, EP-CAP, MS M992
A. Phelps, ADEP, MS J591
C. Mangeng, ADEP, MS J591
D. Gregory, DOE LASO, MS A316
T. Skibitski, DOE OB
IRM-RMMSO, MS A150

LA-UR-06-7347
October 2006
EP2006-0925

Sampling and Analysis Plan for Impoundments B, C, and D at Material Disposal Area L, Solid Waste Management Unit 54-006, Revision 1

Los Alamos
NATIONAL LABORATORY
EST. 1943

Prepared by the Environmental Programs Directorate

Los Alamos National Laboratory, operated by Los Alamos National Security, LLC, for the U.S. Department of Energy under Contract No. DE-AC52-06NA25396, has prepared this document pursuant to the Compliance Order on Consent, signed March 1, 2005. The Compliance Order on Consent contains requirements for the investigation and cleanup, including corrective action, of contamination at Los Alamos National Laboratory. The U.S. government has rights to use, reproduce, and distribute this document. The public may copy and use this document without charge, provided that this notice and any statement of authorship are reproduced on all copies.

LA-UR-06-7347
EP2006-0925

Sampling and Analysis Plan for Impoundments B, C, and D at Material Disposal Area L, Solid Waste Management Unit 54-006, Revision 1

October 2006

Responsible project leader:

Printed Name	Signature	Title	Organization	Date
John Hopkins		Project Leader	Environmental Programs	10/23/06

Responsible LANS representative:

Printed Name	Signature	Title	Organization	Date
Andrew Phelps		Associate Director	Environmental Programs	10/25/06

Responsible DOE representative:

Printed Name	Signature	Title	Organization	Date
David Gregory		Federal Project Director	DOE-LASO	10/26/06

CONTENTS

1.0 INTRODUCTION 1

2.0 DESCRIPTION OF THE IMPOUNDMENTS 1
2.1 Surface Dimensions of Impoundments B, C, and D 1
2.2 Subsurface Dimensions of Impoundments B, C, and D 2
2.3 Disposal History and Waste Inventory at MDA L 2
2.3.1 Source Term Database 2
2.3.2 Batch Waste Source Term Database 3
2.3.3 Uncertainties in the MDA L Inventory 3
2.3.4 Process Descriptions 3

3.0 SCOPE OF ACTIVITIES 4
3.1 Borehole Drilling 5
3.2 Core Sampling 5
3.3 Field Screening 5

4.0 DRILLING AND SAMPLING METHODS 5
4.1 Drilling Methods 5
4.2 Collecting Core Samples 5
4.3 Field-Screening Methods 6
4.4 Analytical Methods 6
4.5 Quality Assurance and Quality Control Sample Procedures 6

5.0 SCHEDULE 6

6.0 REFERENCES AND MAP DATA SOURCES 7
6.1 References 7
6.2 Map Data Sources 8

Figures

Figure 1.0-1 Location of MDA L in TA-54 with respect to Laboratory technical areas and surrounding land holdings 9
Figure 2.1-1 Locations of surface impoundments at MDA L and area topography 10
Figure 3.1-1 Proposed borehole locations based on MDA L impoundment sampling plan 11

Tables

Table 2.1-1 Dimensions, Dates of Operation, and Capacities of Surface Impoundments at MDA L 13
Table 3.4-1 Proposed Sample Descriptions and Rationale for Sampling at the Impoundments 13

1.0 INTRODUCTION

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

Material Disposal Area (MDA) L (also known as Solid Waste Management Unit [SWMU] 54-006) is located on Mesita del Buey in the east-central portion of the Laboratory at Technical Area (TA) 54 (Figure 1.0-1). It lies within an 1100-ft by 3000-ft (2.5-acre) fenced area (known as Area L) and consists of one inactive subsurface disposal pit (Pit A); three inactive subsurface treatment and disposal impoundments (Impoundments B, C, and D); and 34 inactive disposal shafts (Shafts 1 through 34), with depths ranging from 10 to 65 ft below the original ground surface. Between 1989 and 1996, an asphalt cover was placed over the site to accommodate ongoing waste management activities. The pit, impoundments, and shafts are constructed in the Tshirege Member of the Bandelier Tuff, a consolidated tuff unit. The regional aquifer is estimated to be at a depth of approximately 930 ft, based on data from other wells at the Laboratory and the predictions of the hydrogeologic conceptual model for the Pajarito Plateau (LANL 1998, 59599). The topography of Area L is relatively flat; surface water runoff from this area is controlled and diverted to an outfall at the northeast corner of the site.

This sampling and analysis plan (SAP) updates the plan presented in Appendix E of the MDA L corrective measures evaluation plan (LANL 2006, 91861) and describes characterization activities to be performed at Impoundments B, C, and D at MDA L in accordance with the notice of disapproval (NOD) issued by the New Mexico Environment Department (NMED) on August 25, 2006 (NMED 2006, 93542). The activities proposed in this SAP will provide information necessary to characterize the hazardous waste in the impoundments and will provide information to develop a closure plan for Impoundments B and D, in accordance with 40 CFR 265.228.

2.0 DESCRIPTION OF THE IMPOUNDMENTS

The descriptions of the dimensions of Impoundments B, C, and D presented below are based on available Laboratory engineering drawings and on historical documents.

2.1 Surface Dimensions of Impoundments B, C, and D

The dimensions, periods of operations, and capacities of the unlined surface Impoundments B, C, and D are listed in Table 2.1-1. The locations and lateral boundaries of the impoundments were surveyed before the asphalt pavement was installed over MDA L; these survey locations are recorded in Laboratory Engineering Drawings AB113 (LANL 1993, 76052) and ENG-C-45259 (LANL 1987, 25606). No geodetic data exist for the impoundments at MDA L, although geographic coordinates for each were taken using Drawing AB113 (LANL 1993, 76052). Ground-penetrating radar data from a geophysical survey conducted at MDA L in February 2004 verified the locations of the impoundments as determined by historical data (AGS 2004, 89655). Figure 2.1-1 shows the locations of Impoundments B, C, and D and the area topography.

2.2 Subsurface Dimensions of Impoundments B, C, and D

The Resource Conservation and Recovery Act (RCRA) facility investigation (RFI) work plan for Operable Unit (OU) 1148 (LANL 1992, 07669) describes the depth of the base of Impoundments B, C, and D as 10 ft below the original ground surface. The elevation of the original ground surface for the three impoundments is shown in Laboratory engineering drawing ENG-C-45259 (LANL 1987, 25606). Engineering Drawing 54-50 (LANL 1989, 55113) depicts the surface of Impoundments B and D in greater detail, showing a decrease of approximately 5 ft in elevation from south to north for both impoundments. Drawing AB113 (LANL 1993, 76052) delineates the surface elevations at MDA L after cover material was placed over the impoundments and the asphalt pad was installed. This drawing indicates that elevations in the immediate area of the impoundments have increased approximately 1 to 3 ft as a result of the paving of MDA L. The pre-cover surface elevation has been verified by the depth of the asphalt cover and base-course material recorded in logs during the drilling of the Phase I RFI and the 2004–2005 boreholes near Impoundments B, C, and D.

Drawing 54-50 (LANL 1989, 55113) contains several cross sections describing the precise subsurface geometries of Impoundments B and D. These two impoundments were excavated into native tuff with steep walls on the east and west sides and the more gently sloping walls on the north and south sides. The bases of Impoundments B and D slope slightly downward towards their centers along a north to south centerline. As described in the historical investigation report (Appendix B) of the approved investigation work plan (LANL 2004, 87624), Impoundment C shares a similar subsurface profile; however, no data defining the subsurface geometry of Impoundment C exist. The 2004 geophysical survey of MDA L failed to determine conclusively the depth of any of the impoundments (AGS 2004, 89655).

2.3 Disposal History and Waste Inventory at MDA L

Information on the type, date, location, and volume of waste placed in MDA L can be found in unnumbered disposal logbooks (LANL 2003, 76036). The records before 1974 are incomplete, and many logbook entries contain only brief descriptions of wastes disposed of at MDA L (i.e., the waste types, volumes, and disposal locations are not always provided).

An estimate of the types and quantities of waste disposed of at MDA L was compiled in the OU 1148 data report (LANL 1992, 23247) and in Appendix L of the approved RFI work plan for OU 1148 (LANL 1992, 07669). Two waste inventory databases were developed based on original logbook entries for MDA L. The Source Term Database contains information on untreated waste, and the Batch Waste Source Term Database describes wastes that underwent batch treatment before disposal.

2.3.1 Source Term Database

The Source Term Database includes the following categories of information for untreated waste disposed at MDA L: date of disposal; waste volume or weight; number of cylinders or waste items disposed of; specific location of disposal (shaft, pit, or impoundment), if known; and a description of the untreated waste. Many of the entries do not include a specific location of disposal within MDA L. The Source Term Database is included in Appendix L of the approved MDA L work plan, along with the assumptions used to create the database (LANL 2004, 87624, pp. 3-1 to 3-2).

2.3.2 Batch Waste Source Term Database

The Batch Waste Source Term Database includes the following categories of information for waste treated and/or disposed of at MDA L: date of treatment; waste volume; source area where material originated; waste type (inorganic and organic); impoundment or pit location, if known; treatment method; and the physical form of the waste (LANL 1992, 07669, pp. 5-110 to 5-116). The records document only the wastes disposed of without treatment or following treatment in Pit A and Impoundment B. The Batch Waste Source Term Database is presented in Appendix L of the approved MDA L work plan, along with the assumptions used to create the database (LANL 2004, 87624, pp. 3-3 to 3-4).

2.3.3 Uncertainties in the MDA L Inventory

Logbook records for Impoundment B allow for the general characterization of waste disposed at MDA L. However, disposal records are incomplete. For example, according to the OU 1148 data report, only 369 of 1995 total records in the MDA L Source Term Database were complete (LANL 1992, 07669). Furthermore, no logbook entries document waste disposed of at MDA L before 1975, although Impoundment D began receiving waste in 1972. Therefore, the specific identity and final disposition of some of the waste disposed at MDA L are uncertain.

2.3.4 Process Descriptions

Process descriptions and operating dates for each impoundment based on disposal records and databases for MDA L are described below.

Impoundments B (1979 to 1985) and C (1985 to 1985)

Impoundments B and C were used for evaporating batch-treated salt solutions and electroplating wastes. The disposal records provided in Appendix L of the approved investigation work plan (LANL 2004, 87624) indicate that 2622 ft^3 of aqueous waste was discharged into Impoundment B, pooled, and allowed to evaporate. No logbook entries are available documenting the treatment in Impoundment C. The waste streams discharged into Impoundments B and C were treated solutions from the following four aqueous treatment processes (LANL 1992, 23247, pp. 5-115 to 5-116). After they were decommissioned, Impoundments B and C were covered with a minimum of 3 ft of crushed tuff.

- Ammonium bifluoride waste was neutralized with calcium chloride and calcium hydroxide. The end product was an aqueous solution consisting of ammonium chloride, calcium fluoride, and water.
- Acids and caustics in quantities greater than 55 gal. were diluted to a concentration of 15% or less and neutralized. The acid solutions were neutralized with sodium hydroxide; the base solutions were neutralized with mineral acids. The heavy metals were precipitated and removed before disposal. The heavy metals precipitated from acid solutions were packaged in 15-gal. drums and disposed of in the same shaft(s) as the neutralized acid solutions, while the heavy metals precipitated from caustic solutions were also packaged in 15-gal. drums and disposed of in the same shaft(s) as the neutralized caustic solutions (LANL 2003, 76036).
- Cyanide solutions were treated with calcium hypochlorite or calcium chloride and calcium hydroxide at TA-50. The end products of both processes are cyanate, carbon dioxide, and nitrogen. The resulting aqueous solution was tested to ensure complete cyanide treatment. After treatment, the aqueous solution was discharged primarily to Pit A or to one of the evaporation

impoundments (B or C). Solids from the process were placed in metal drums, mixed with cement, and disposed of in the shafts at MDA L.

- Chromium waste was treated with sodium hydroxide and one of two reducing agents: sulfur dioxide or sodium bisulfate. The end products of this process were sodium sulfate and chromium hydroxide. The treated chromium waste was disposed of in the same shaft(s) as the neutralized acid solutions.

Impoundment D (1972 to 1984)

Impoundment D was used exclusively for treating small-batch quantities of lithium hydride by reaction with water and allowing the neutralized solutions to evaporate. Based on the results of a safety review, this treatment process was discontinued in 1984, and the disposal activities in Impoundment D ceased. Impoundment D was partially filled with crushed tuff in 1985 and completely filled in 1989. Between 1984 and 1989, six aboveground fiberglass used-oil storage tanks (area of concern [AOC] 54-021) were located within a soil-containment berm adjacent to Impoundment D. The tanks, which stored waste oil, were emptied in 1985 and moved from MDA L to MDA G in 1989 to make room for new waste management facilities on the surface of MDA L. The tanks themselves were subsequently closed in 1990 under 40 CFR 265, Subpart G regulations, and a closure report was submitted to NMED in 1991 (LANL 1991, 12598).

3.0 SCOPE OF ACTIVITIES

A systematic sampling program will be implemented at MDA L for Impoundments B, C, and D. The borehole layout was generated using DOE and U.S. Environmental Protection Agency (EPA)-sponsored Visual Sample Plan (VSP) software (Version 4.6).

The sampling design is intended to provide sufficient area coverage to characterize the contents of the impoundments and to estimate the volume of waste material in each disposal unit. Based on the NOD, the proposed boreholes were located within the base of the impoundments; no boreholes were located on the access ramps or sidewalls. For the purpose of this investigation, the VSP module for estimating mean values in a sampling grid was selected. This method is consistent with estimating mass values for contaminants in a waste stream. The VSP mean estimate module allows for the placement of a pre-established number of boreholes on a systematic grid. An iterative approach was used to select a layout with borehole spacing of less than 10 ft. The sampling grid was oriented with the axis of the grid set between 0 degrees north and the long axis of each disposal unit (approximately 15 degrees east) so various distances from the sidewalls could be sampled, including smaller discontinuous areas. The VSP was run to select sampling locations based on a uniform, systematic grid, with the starting point with the target sampling area selected at random by the software. Several iterations using different numbers of locations were run until the less than 10 ft spacing requirement was met, and professional judgment determined acceptable area coverage.

The proposed borehole locations are shown in Figure 3.1-1, along with the locations of the impoundments. The distance between sampling locations ranges from approximately 6.5 ft to 8.5 ft, and the largest unsampled area has a radius of approximately 4.4 ft. Factors such as the presence of dome walls and utilities and access restrictions may affect the exact location of each borehole (e.g., location C-3 may be moved several feet to gain safe access away from the edge of the dome).

3.1 Borehole Drilling

A total of 18 boreholes will be advanced into the surface impoundments at MDA L at the locations selected by VSP: eight boreholes will be advanced into Impoundment B, four will be drilled into Impoundment C, and six will be advanced into Impoundment D (Figure 3.1-1). Each borehole will be cored to the base of the corresponding impoundment.

3.2 Core Sampling

Continuous core samples will be collected from each borehole. A minimum of one composite sample from the material within the impoundment will be collected for laboratory analysis. If the impoundment appears to be stratified, a discrete sample will be collected from each layer thick enough to obtain sufficient sample for analysis.

3.3 Field Screening

The field screening of core will include visual examination and field screening. Core will be screened for volatile organic compounds (VOCs) during drilling activities, in accordance with SOP-06.22, Head Space Vapor Screening with a Photoionization Detector. Gross radiation monitoring will be conducted in accordance with the Laboratory's radiation work permit. Field-screening data will be recorded in borehole logs.

4.0 DRILLING AND SAMPLING METHODS

The following sections describe the methods for drilling and sampling for Impoundments B, C, and D.

4.1 Drilling Methods

Boreholes will be advanced using the direct push drilling method to permit undisturbed samples of core to be collected in the impoundments. The direct push sampler consists of a hollow steel shaft with a plastic sampling sleeve inside. The sampler is pushed through the subsurface by a hydraulic drive.

After the drill string is removed, the boreholes will be abandoned using a bentonite hole plug or grout, in accordance with SOP-05.03, Monitoring Well and RFI Borehole Abandonment.

4.2 Collecting Core Samples

At a minimum, one impoundment material composite sample will be collected from each borehole within the impoundments for the suite of analyses described in section 4.4. If the impoundment material appears to be stratified, a discrete sample will be collected from each layer thick enough to obtain a sample for laboratory analysis. For VOC samples, the NOD requires the use of a split-spoon sampler with a brass sleeve; however, the preferred method for evaluating layering using direct push is to use longer (5 ft) transparent plastic sleeves while collecting continuous core samples. The proposed path forward for collecting VOC samples is to cut a section from the plastic sleeve at the desired depth, seal it, and cool it immediately to 4ºC.

Borehole logs will be completed in accordance with SOP-12.01, Field Logging, Handling, and Documentation of Borehole Materials. Subsurface core samples will be collected from core provided from a direct push core barrel into sealed sleeves or core-protect bags to preserve core moisture following the most recent version of SOP-06.26, Core Barrel Sampling for Subsurface Earth Materials.

Detailed borehole logs for each borehole drilled will document the matrix material and the results of all field screening.

Field documentation of samples collected and sludge/sediment stratification will include a detailed physical description of the material sampled according to SOP-12.01.

Detailed borehole logs for each borehole drilled will document the matrix material and the results of all field screening. Photographs of core will be taken as part of documenting field activities. Fractures and matrix samples will be assigned unique identifiers.

4.3 Field-Screening Methods

The primary screening methods to be used include (1) visual examination, (2) radionuclide screening, and (3) vapor screening for VOCs for health and safety purposes.

Radionuclide screening will target gross alpha, beta, and gamma radiation. Field screening for alpha, beta, and gamma radiation will be conducted within 6 in. from the core material. All instrument background checks, background ranges, and calibration procedures will be documented daily in field logbooks.

Vapor screening for VOCs will be conducted using a photoionization detector (PID) equipped with an 11.7-eV lamp. The maximum PID reading and the ambient-air temperature will be recorded for each sample. Vapor-monitoring equipment will be calibrated each day to the manufacturer's specifications for instrument operation (all calibration results will be documented daily in the field logbooks).

4.4 Analytical Methods

Impoundment samples will be analyzed for VOCs (EPA 5035 and EPA 8260B), target analyte list (TAL) metals, toxicity characteristic leaching procedure (TCLP) metals, hexavalent chromium, total nickel, and cyanide. The sludge/sediment sample collected from Impoundment D will include analysis of the above as well as of lithium, semivolatile organic compounds (SVOCs), and diesel-range organics.

4.5 Quality Assurance and Quality Control Sample Procedures

Quality assurance/quality control samples for subsurface samples will include field duplicate samples to evaluate the reproducibility of the sampling technique and rinsate blanks to evaluate the decontamination procedures. These samples will be collected following SOP-01.05, Field Quality Control Samples. The analytical methods are summarized in Table 3.4-1.

5.0 SCHEDULE

Assuming the SAP is approved by mid-December 2006, the Laboratory will mobilize a drill crew to the site in mid-January, providing a drill crew is available. Drilling is anticipated to take five weeks. The analytical data will be available in late March. A data report will be submitted to NMED in late April

6.0 REFERENCES AND MAP DATA SOURCES

6.1 References

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

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

AGS (Advanced Geological Services), April 2004. "Geophysical Investigation of Material Disposal Area L, Technical Area 54, Los Alamos National Laboratory," Los Alamos, Advanced Geological Services report prepared for Los Alamos National Laboratory, Malvern, Pennsylvania. (AGS 2004, 89655)

LANL (Los Alamos National Laboratory), May 1998. "Hydrogeologic Workplan," Los Alamos National Laboratory document, Los Alamos, New Mexico. (LANL 1998, 59599)

LANL (Los Alamos National Laboratory), February 1987. Engineering Drawing ENG-C-45259, number LA-ZU-B-C4, prepared by Black and Veatch for the U.S. Department of Energy, Los Alamos Area Office, Los Alamos, New Mexico. (LANL 1987, 25606)

LANL (Los Alamos National Laboratory), January 24, 1989. Engineering Drawing ENG-54-50, prepared for Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1989, 55113)

LANL (Los Alamos National Laboratory), 1991. "Closure Report, Technical Area 54, Waste Oil Storage Tanks," Los Alamos National Laboratory document, Los Alamos, New Mexico. (LANL 1991, 12598)

LANL (Los Alamos National Laboratory), May 1992. "RFI Work Plan for Operable Unit 1148," Los Alamos National Laboratory document LA-UR-92-855, Los Alamos, New Mexico. (LANL 1992, 07669)

LANL (Los Alamos National Laboratory), September 1992. "Operable Unit 1148 Data Report," Los Alamos National Laboratory document, Los Alamos, New Mexico. (LANL 1992, 23247)

LANL (Los Alamos National Laboratory), September 1993. Engineering Drawing AB-113, number C1, prepared by Johnson Controls for Los Alamos National Laboratory, Los Alamos, New Mexico. (LANL 1993, 76052)

LANL (Los Alamos National Laboratory), August 2003. TA-54, Area G, Los Alamos National Laboratory, Logbooks from January 1966 to January 1996, ENV Record Package 661, Los Alamos, New Mexico. (LANL 2003, 76036)

LANL (Los Alamos National Laboratory), November 2004. "Investigation Work Plan for Material Disposal Area L, Solid Waste Management Unit 54-006 at Technical Area 54, Revision 2," Los Alamos National Laboratory document LA-UR-04-8245, Los Alamos, New Mexico. (LANL 2004, 87624)

LANL (Los Alamos National Laboratory), March 2006. “Corrective Measures Evaluation Plan for Material Disposal Area L, Solid Waste Management Unit 54-006, at Technical Area 54,” Los Alamos National Laboratory document LA-UR-06-8862, Los Alamos, New Mexico. (LANL 2006, 91861)

NMED (New Mexico Environment Department), August 2006. “Notice of Disapproval of the Investigation Report for Material Area (MDA), Solid Waste Management Unit 54-006 at Technical Area 54, Revision 1, Los Alamos National Laboratory (LANL) EPA ID #NM0890010515, HWB-LANL-06-008,”New Mexico Environment Department letter to D. Gregory (DOE) and D. McInroy (LANL), Santa Fe, New Mexico. (NMED 2006, 93542)

6.2 Map Data Sources

Hypsography, 20 and 100 Foot Contour Intervals; Los Alamos National Laboratory, ENV-Environmental Remediation and Surveillance Program; 1991

LANL DOE Boundary; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; Development Edition of 05 January 2005

LANL Technical Areas; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; Development Edition of 05 January 2005

Materials Disposal Areas; Los Alamos National Laboratory, ENV-Environmental Remediation and Surveillance Program; ER2004-0221; 1:2,500 Scale Data; 23 April 2004

Paved Road Arcs; Los Alamos National Laboratory, KSL Site Support Services, Planning, Locating and Mapping Section; Development Edition of 17 January 2006

Waste Storage Features; Los Alamos National Laboratory, ENV-Environmental Remediation and Surveillance Program, ER2005-0748; 1:2,500 Scale Data; 06 October 2005

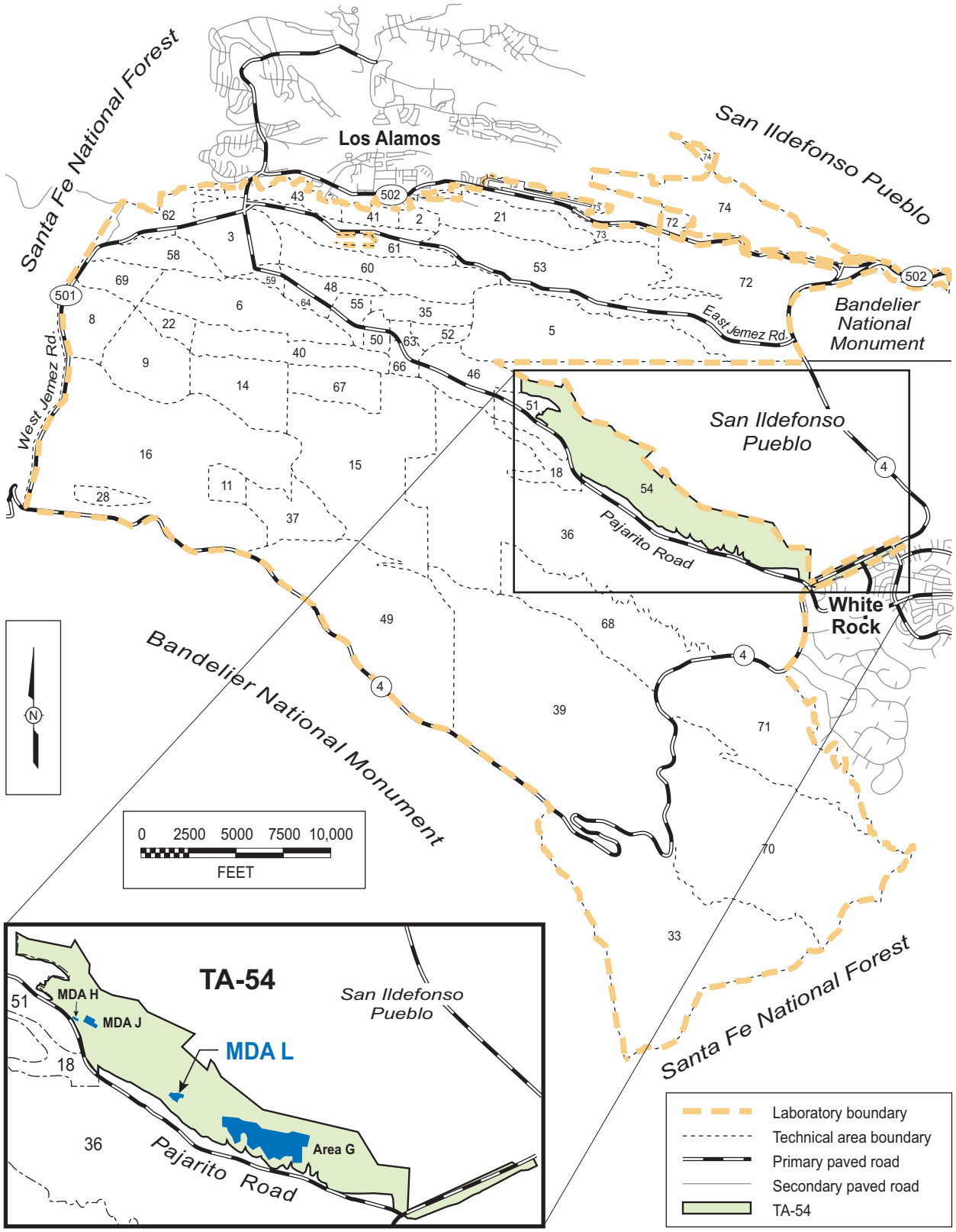

Figure 1.0-1. Location of MDA L in TA-54 with respect to Laboratory technical areas and surrounding land holdings

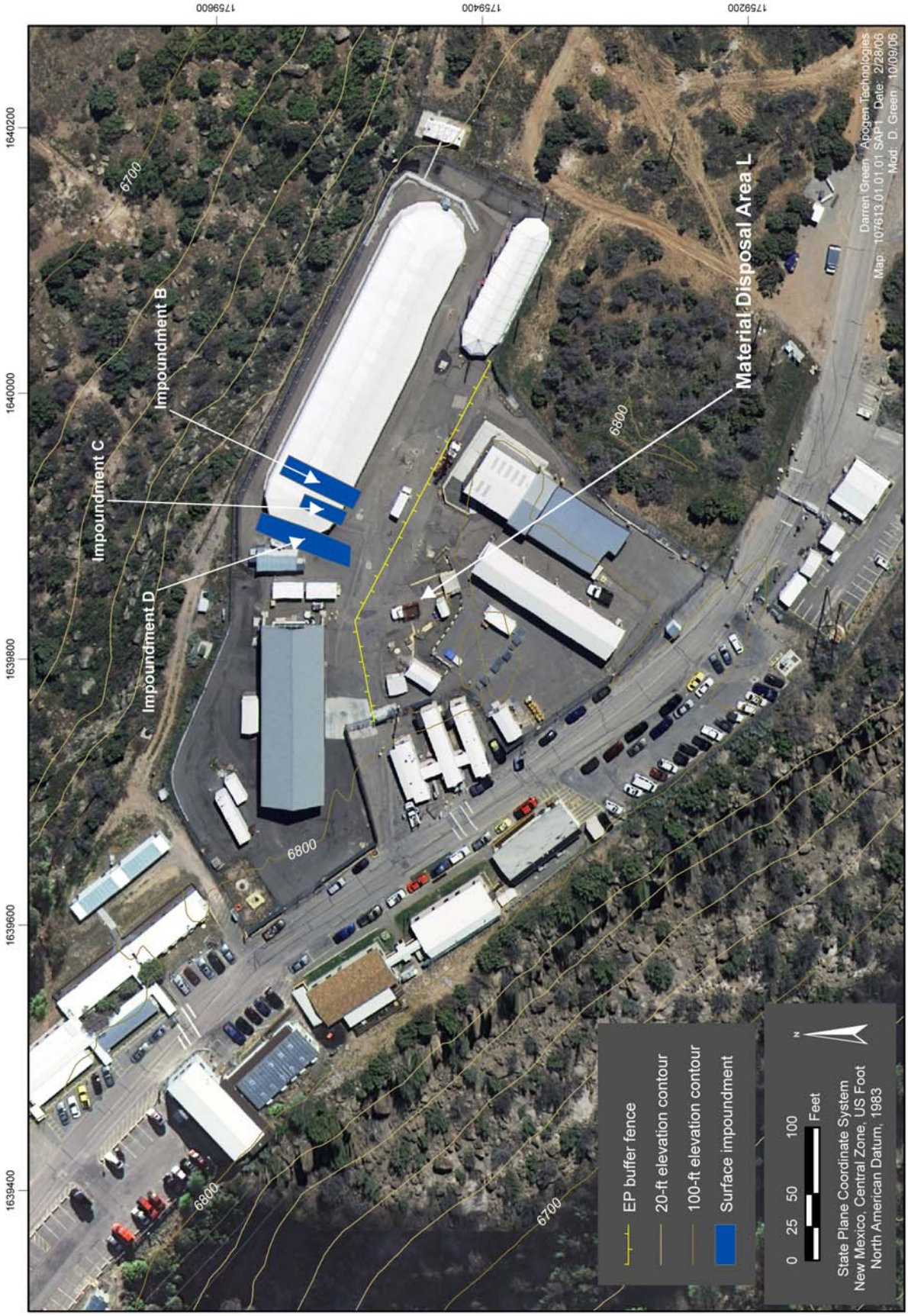

Figure 2.1-1. Locations of surface impoundments at MDA L and area topography

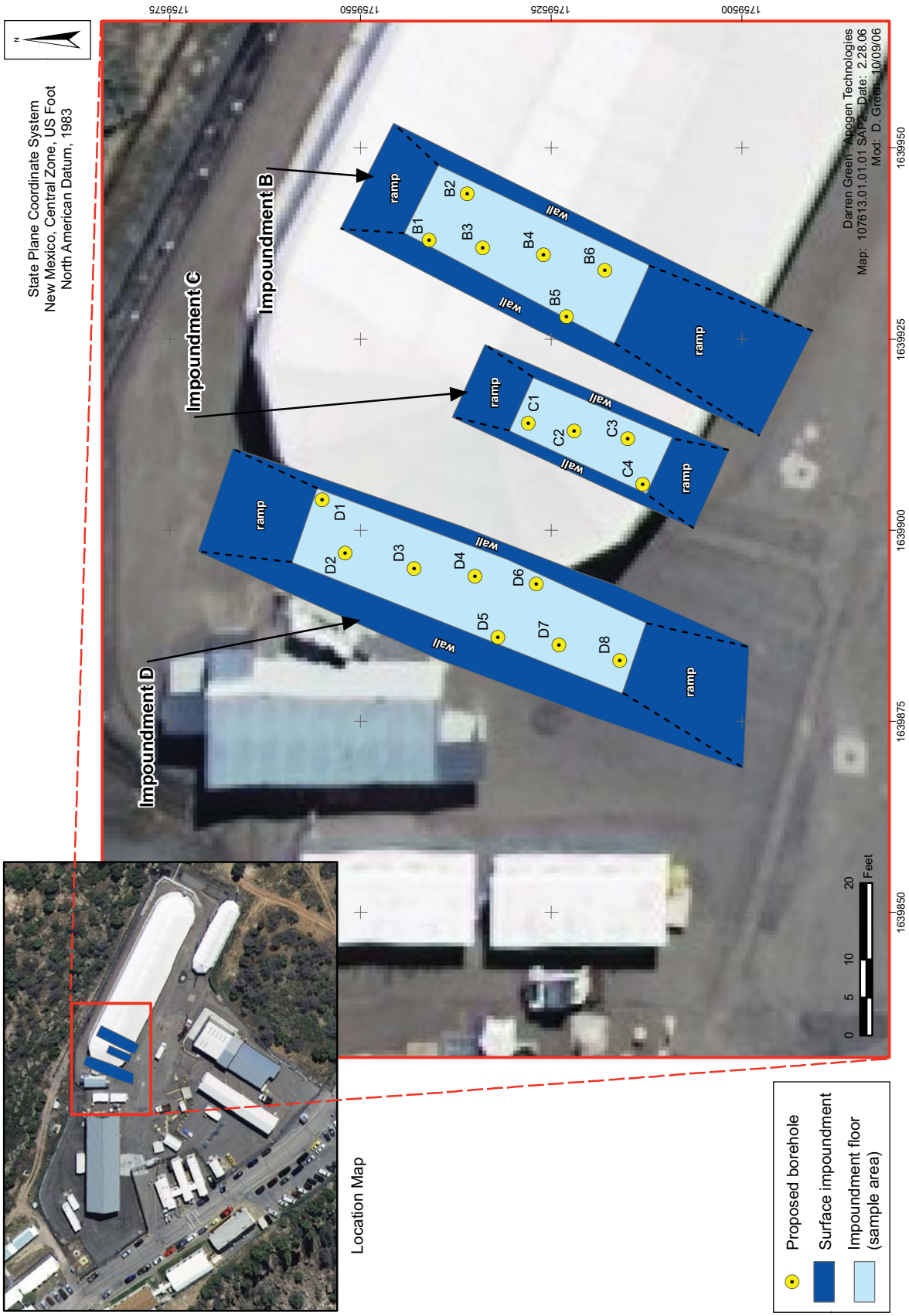

Figure 3.1-1. Proposed borehole locations based on MDA L Impoundment sampling plan

This page intentionally left blank.

Table 2.1-1
Dimensions, Dates of Operation, and Capacities of Surface Impoundments at MDA L

Impoundment	Dimensions (ft) (width × length × depth)	Period of Use	Months Used	Total Capacity (ft^3)
B	60 × 18 × 10	01/1979–06/1985	78	7560
C	35 × 12 × 10	07/1985–12/1986	18	2940
D	75 × 18 × 10	1972–1984	156	9450

Table 3.4-1
Proposed Sample Descriptions and Rationale for Sampling at the Impoundments

Sample Type	Sample Location and Depth	Sample Description and Rationale	Analytical Suites
Subsurface core: sediment/sludge	A minimum of 1 sample from one depth interval at the18 new borehole locations.	At each borehole location, one sludge/sediment sample will be collected from within the impoundment. If the sludge/sediment appears to be stratified, a discrete sample will be collected from each layer with sufficient sample volume for laboratory analyses.	VOCs (EPA 5035 and 8620B), TAL metals, TCLP metals, hexavalent chromium, total nickel, and cyanide. The sample collected from Impoundment D also will be analyzed for lithium, SVOCs, and diesel-range organics as well as the above.

This page intentionally left blank.