RE: Transmittal of a Copy of the MDA-L Corrective Measures Evaluation Plan for Your Information

Dear Ms. Lynnes:

The purpose of this letter is to transmit a copy of the above referenced plan for your information. This was a request during a previous discussion. I have asked John Hopkins to copy you on all future documents sent in relation to corrective action.

I am still trying to establish a date(s) for a meeting on the closure activities for MDA-L. We are coordinating this with the operations and corrective action people here at the Laboratory. Once we have everyone's buy in we will be ready to meet and discuss the issues with you and Dave Cobrain.

If you should have any questions concerning this please call me at (505) 667-0633.

Sincerely,

Jack Ellenger
Deputy Group Leader
Solid Waste Regulatory Compliance

Attachment: (1)

Cc: J. Hopkins
    G. Turner
    L. Vigil Holtermann
    S. French
SUBJECT: REQUESTED REVIEW AND APPROVAL OF THE CORRECTIVE MEASURES EVALUATION PLAN FOR MATERIAL DISPOSAL AREA L

Dear Mr. Bearzi:

Attached for your review and approval is the corrective measures evaluation (CME) plan for Material Disposal Area (MDA) L. This plan describes the activities that will be conducted by Los Alamos National Laboratory (LANL) to perform the CME for MDA L, as required by the March 1, 2005, Compliance Order on Consent the (Consent Order).

As described in the CME plan, evaluation of potential corrective measures for the MDA L corrective action units under the Consent Order must be closely integrated with closure of the Resource Conservation and Recovery Act (RCRA)-regulated disposal units at Area L (i.e., the Area L landfill). On May 5, 2005, the New Mexico Environment Department (NMED) sent a letter to LANL indicating that the Hazardous Waste Bureau (HWB) will issue a closure permit for inactive interim status hazardous waste units, such as the Area L landfill. As noted in the CME plan, LANL must know the conditions of this closure permit in order to proceed with the CME for the corrective action units and to ensure that potential corrective measures for corrective action units will be compatible with closure conditions.

Presently, the CME report is due to HWB on July 31, 2007. LANL anticipates HWB approval of the CME plan by July 1, 2006, and at that time will begin to draft the CME report. LANL is concerned that if the closure permit is not issued by the time the CME activities will begin, the schedule for completing the CME may be affected. Schedule delays resulting from the inability to obtain the closure permit would be subject to the force majeure provisions of Section III.H of the Consent Order.

The CME plan contains a sampling and analysis plan (SAP) for characterizing the contents of surface Impoundment C. This characterization information is necessary to support the evaluation of excavation and containment options for these units. Because such information should prove useful for supporting closure activities, this SAP also includes characterization of the contents of surface Impoundments B and D, which are RCRA-regulated units. Although these two units are not subject to the requirements of the Consent Order, LANL is proposing characterizing them in conjunction with the corrective action units to expedite the closure process.
If you have any questions or comments, please contact John Hopkins at 505-667-9551 (johnhopkins@lanl.gov) or Frank Bosiljevic at 505-845-5746 (fbosiljevac@doeal.gov).

Sincerely,

[Signature]

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

Sincerely,

[Signature]

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

Enclosures: Two hard copies with electronic files of the "Corrective Measures Evaluation Plan for Material Disposal Area L, Solid Waste Management Unit 54-006, at Technical Area 54" (ER2005-0793)

Cy:(w/enc)
D. Gregory, DOE LASO, MS A316 (with CD)
F. Bosiljevac, DOE-AL (with CD)
L. King, EPA Region 6 (with CD)
J. Hopkins, ENV-ECR, MS M992 (with CD)
ENV-ECR File, MS M992 (with CD)
RPF, MS M707 (with CD)
S-7, MS F674

Cy: (CD only)
P. Reneau, ENV-ECR, MS M992

Cy:(w/o enc)
A. Dorries, ENV-ECR, MS M992
D. McInroy, ENV-ERS, MS M992
B. Rich, ADTS, MS A104
D. Pepe, NMED-OB
IM-9, MS A150

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Appendix E

Sampling and Analysis Plan for Impoundments B, C, and D
E-1.0 INTRODUCTION

During the implementation of the corrective measure evaluation for Material Disposal Area (MDA) L at Los Alamos National Laboratory (the Laboratory), core samples will be collected from within and beneath Impoundments B, C and D to provide data needed to evaluate the corrective measures involving excavation. These also data may be used to support the development of a closure plan in accordance with 40 CFR §265.228.

E-1.1 General Site Information

MDA L (also known as Solid Waste Management Area [SWMU] 54-006) is located on Mesita del Buey in the east-central portion of the Laboratory at Technical Area (TA) 54 (Figure E-1.1-1). 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.

E-1.2 Objectives

This sampling and analysis plan (SAP) addresses the sampling and analysis to be performed at Impoundments B, C, and D at MDA L at TA-54. The activities proposed in this SAP will provide information regarding the nature of contamination existing within and directly beneath Impoundments B, C, and D. The investigation results will provide information needed to develop a closure plan for Impoundments B and D, in accordance with 40 CFR §265.228. The activities described in this SAP are based on the requirements for the impoundments outlined in the NMED letter of January 5, 2006 (NMED 2006, 91294).

E-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 (Attachment E-1), and historical documents.

E-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 E-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 Laboratory drawing AB113 (LANL 1993, 76052). Ground-penetrating radar data from a geophysical survey conducted at MDA L in February 2004 validate those impoundment locations that were determined by historical data (AGS 2004, 89655). Figure E-2.1-1 shows the locations of Impoundments B, C, and D and the area topography.
E-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). Laboratory 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. Laboratory engineering 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 precover surface elevation is verified by the depth of the asphalt cover and base-course material recorded in logs during the drilling of Phase I RFI and the 2004–2005 boreholes near Impoundments B, C, and D.

Laboratory engineering 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 other data constraining 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).

E-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 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.

E-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 I 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).
E-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 I 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).

E-2.3.3 Uncertainties in the MDA L Inventory

No logbook entries documenting the waste disposed of at MDA L before 1974 and 1975 are available, and no logbook entries documenting the treatment in Impoundments C and D have been found. Impoundments C and D may have been used for waste treatment and the residues removed and placed elsewhere at MDA L; however, the residues possible were left in situ and not accounted for in the logbooks.

E-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 (January 1979 to June 1985) and C (July 1985 to December 1985)

Impoundments B and C were used for evaporating batch-treated salt solutions and electroplating wastes. The disposal records provided in Appendix I of the approved investigation work plan (LANL 2004, 87624) indicate that 2622 ft³ of aqueous waste was discharged into Impoundment B, pooled and allowed to evaporate. No logbook entries are available that document the treatment in Impoundment C. After they were decommissioned, Impoundments B and C were covered with a minimum of 3 ft of crushed tuff. 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).

- 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 15% or less concentration 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 RCRA regulations, and a closure report was submitted to NMED in 1991 (LANL 1991/12598).

**E-3.0 SCOPE OF ACTIVITIES**

A systematic random sampling program will be implemented at MDA L for Impoundments B, C, and D. This sampling design program was generated using DOE and U.S. Environmental Protection Agency (EPA)-sponsored Visual Sample Plan software (version 4.4).

The sampling design is intended to detect the presence of a hot spot with a specified size and shape; Visual Sample Plan creates a sampling design resulting in a 95% probability that a hot spot of the specified dimensions will be detected in the investigation area. The number of sampling locations generated by Visual Sample Plan is calculated based on the Singer and Wicker algorithm that determines the sample location layout from the following user-defined parameters: the size, shape, and orientation of the hot spot; the acceptable probability of not locating the hot spot; and the desired type of sampling grid (square, triangular, or rectangular).

For the purpose of this investigation, a hot spot with a semi-major axis length of 9 ft and an area of approximately 203 ft² was selected. The height-to-width ratio of the hot spot was input at 0.8, and the grid pattern was selected as “square.” The angle of orientation of the grid was selected to be 15 degrees. Visual Sample Plan then selected sampling locations based on a uniform, systematic grid measuring approximately 12 ft² and used a random start location in the first square of the grid.

A visual inspection of the resulting sampling location layout for the surface impoundments at MDA L confirmed that the proposed borehole locations provide reasonable lateral coverage of each impoundment.

**E-3.1 Borehole Drilling**

A total of 18 boreholes will be drilled into the surface impoundments at MDA L at the locations selected by Visual Sample Plan: seven boreholes will be drilled into Impoundment B, three boreholes will be drilled into Impoundment C, and eight boreholes will be drilled into Impoundment D. Each borehole will be drilled to a total depth of 20 ft. below the base of the corresponding impoundment. The proposed borehole locations are presented in Figure E-3.1-1 along with the impoundment locations and the superimposed 10 ft coordinate grid.
E-3.2 Core Sampling

Core samples will be collected, at a minimum, from the following locations in each borehole: one sample from the sludge/sediment within the impoundment, one sample from the native tuff directly beneath the base of the impoundment, one sample from 10 ft below the base of the impoundment, and one sample from 20 ft below the base of the impoundment. If the sludge/sediment appears to be stratified, a discrete sample will be collected from each layer thick enough to obtain a sample for analysis.

E-3.3 Field Screening

The field screening of core will include visual examination and gross radiation monitoring. For health and safety purposes, the work zone will be screened for volatile organic compounds (VOCs) for health and safety purposes during drilling activities.

E-4.0 METHODS FOR DRILLING AND SAMPLING IMPOUNDMENTS B, C, AND D

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

E-4.1 Drilling Methods

Boreholes will be drilled using the hollow-stem auger method to permit undisturbed samples of core to be collected in the impoundments and underlying Bandelier Tuff. The hollow-stem auger consists of a hollow steel shaft with a continuous spiraled steel flight welded onto the exterior site of the stem. The stem is connected to an auger bit, and it transports cuttings to the surface when it is rotated. The hollow stem of the auger allows drill rods, split-spoon core barrels, and sleeves to be inserted through the center of the auger so that samples may be retrieved during drilling operations.

Each borehole will be continuously cored with either split-spoon core barrels or sleeves chosen to optimize recovery of both consolidated and unconsolidated subsurface materials. After the drill string is removed, the boreholes will be abandoned using a bentonite hole plug or grout.

E-4.2 Collection of Core Samples

The proposed location of each borehole has been determined using a systematic random sampling design. Factors such as the presence of utilities and access restrictions may affect the exact location of each borehole.

All boreholes will be cored continuously to total depth following the most recent versions of Standard Operating Procedure (SOP) 4.01, Drilling Plan Development, and SOP-12.01, Field Logging, Handling, and Documentation of Borehole Materials. Subsurface core samples will be collected from core provided from a split-spoon core barrel into sealed sleeves or core-protect bags to preserve core moisture following the most recent version of SOP-6.26, Core Barrel Sampling for Subsurface Earth Materials.

Field documentation of samples collected from tuff and sludge/sediment stratifications will include a detailed physical description of the material and rock matrix sampled according to SOP-12.01 and Section IV.C.1e.iv of the Compliance Order on Consent.

Detailed borehole logs for each borehole drilled will document the matrix material and the results of all field screening. Fractures and matrix samples will be assigned unique identifiers.
E-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).

E-4.4 Analytical Methods

Sludge sediment samples will be analyzed for VOCs (EPA 5035 and EPA 8260B), target analyte list (TAL) metals, hexavalent chromium, and cyanide. The sludge/sediment sample collected from Impoundment D will include all of the above, as well as semivolatile organic compounds (SVOCs) and diesel-range organics (C10-C36) samples.

Samples collected from subsurface tuff will be analyzed for VOCs, TAL metals, and cyanide.

E-4.5 Quality Assurance and Quality Control Sample Procedures

Quality assurance/quality control samples for subsurface tuff 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-1.05, Field Quality Control Samples. The analytical methods are summarized in Table E-3.4-1.

E-5.0 REFERENCES AND MAP DATA SOURCES

E-5.1 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 Stewardship Division–Environmental Remediation and Surveillance (ENV-ERS) Program Records Processing Facility (RPF) and are used to locate the document at the RPF and, where applicable, in the ENV-ERS Program master reference set.

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


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 1987, 76052)


E-5.2 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 E-1.1-1. Location of MDA L in TA-54 with respect to Laboratory technical areas and surrounding land holdings.
Figure E-2.1-1. Locations of surface impoundments at MDA L
Figure E-3.1-1. Proposed borehole locations based on MDA L impoundment sampling plan.
Table E-2.1-1
Dimensions, Dates of Operation, and Capacities of Surface Impoundments at MDA L

<table>
<thead>
<tr>
<th>Impoundment</th>
<th>Dimensions (ft) (width x length x depth)</th>
<th>Period of Use</th>
<th>Months Used</th>
<th>Total Capacity (ft³)</th>
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</thead>
<tbody>
<tr>
<td>B</td>
<td>60 x 18 x 10</td>
<td>01/1979-06/1985</td>
<td>78</td>
<td>7560</td>
</tr>
<tr>
<td>C</td>
<td>35 x 12 x 10</td>
<td>07/1985-12/1986</td>
<td>18</td>
<td>2940</td>
</tr>
<tr>
<td>D</td>
<td>75 x 18 x 10</td>
<td>1972-1984</td>
<td>156</td>
<td>9450</td>
</tr>
</tbody>
</table>

Table E-3.4-1
Proposed Sample Descriptions and Rationale

<table>
<thead>
<tr>
<th>Sample Type</th>
<th>Sample Location and Depth</th>
<th>Sample Description and Rationale</th>
<th>Analytical Suites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subsurface core:</td>
<td>A minimum of 1 sample from one depth interval at 18 new borehole locations from Impoundments B, C, and D</td>
<td>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.</td>
<td>VOCs (EPA 5035 and 8620B), TAL metals, hexavalent chromium, and cyanide. The sample collected from Impoundment D will include all the above plus SVOCs and diesel-range organics (C10-C36).</td>
</tr>
<tr>
<td>sediment/sludge</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Subsurface core:</td>
<td>A minimum of 1 sample from three depth intervals at 18 new borehole locations from Impoundments B, C, and D</td>
<td>At each borehole location, one sample will be collected from the native tuff directly below the base of the impoundment, one tuff sample will be collected from 10 ft below the base of the impoundment, and one tuff sample will be collected from 20 ft below the base of the impoundment.</td>
<td>TAL metals and cyanide, and VOCs</td>
</tr>
</tbody>
</table>