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*Date:* November 14, 1997
*Refer to:* EM/ER:97-484

1/1106/21

Dr. Stu Dinwiddie
NMED-HRMB
P.O. Box 26110
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**SUBJECT: RESPONSE TO REQUEST FOR SUPPLEMENTAL INFORMATION FOR SAP FOR PRS 21-016(a, b, c) (FORMER OU 1106)**

Dear Dr. Dinwiddie:

Enclosed is the Los Alamos National Laboratory's Response to the New Mexico Environment Department Hazardous and Radioactive Bureau's Request for Supplemental Information for Sampling and Analysis Plan for Potential Release Site 21-016(a, b, c) in Technical Area 21.

If you have any questions, please contact Gary McMath at (505) 665-4969 or Bonnie Koch at (505) 665-7202.

Sincerely,

Julie A. Canepa, Program Manager
LANL/ER Project

Sincerely,

for Joseph H. Mose

Theodore J. Taylor, Program Manager
DOE/LAAO

JC/TT/ss

Enclosures (1) Response to Request for Supplemental Information for SAP for PRS 21-016(a, b, c) in TA-21 (former OU 1106)



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TL

Cy (w/enc.):
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EM/ER File (CT# C338), MS M992
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# RESPONSE TO REQUEST FOR SUPPLEMENTAL INFORMATION FOR THE SAMPLING AND ANALYSIS PLAN FOR POTENTIAL RELEASE SITES 21-016(a, b, c)

## INTRODUCTION

This document responds to a letter from the New Mexico Environment Department (NMED) to the Los Alamos National Laboratory (LANL). To facilitate review of this response, NMED's comments are included verbatim. The comments are divided into general and specific categories as presented in NMED's letter. LANL's responses follow each NMED comment.

## GENERAL COMMENTS

### NMED Comment

1. *Clarify if composite sampling was used. Composite sampling should not be used in this investigation.*

### LANL Response

Composite sampling was not conducted during the Material Disposal Area (MDA) T subsurface investigation nor was it proposed in the sampling and analysis plan. Discrete samples were collected from various sampling intervals within the 19 boreholes drilled at the site.

### NMED Comment

2. *Flow of water and contaminants in volcanic tuffs can be dominated by fracture flow. This plan does not seem to take fracture flow into consideration. Fracture flow can result in contaminant migration and distribution that is very different from that predicted from simple vertical seepage. LANL shall detail how fracture flow will be addressed.*

### LANL Response

The sampling and analysis plan (SAP) identified the sampling interval to be 10 ft in each borehole, but it did not account for sampling of fractures encountered during drilling. After submittal of the SAP but before field activities were initiated, LANL Environmental Restoration (ER) Project personnel recognized this deficiency. A formal addendum to the SAP was not prepared, but the field team was directed to collect samples from every identifiable fracture that contained clay or that was determined to have elevated radioactivity levels during field screening. If no fractures were identified within a 10-ft interval, the field team was directed to collect a sample at the bottom of the interval or where a lithologic change was noted by the field geologist. LANL ER Project representatives discussed this approach with an NMED Oversight Bureau representative during a field visit on January 28, 1997.

## SPECIFIC COMMENTS

### NMED Comment

1. ***Page 8, Section 1.4, Paragraph 1; "The presence of RCRA Contaminants, primarily metals,..."***
   *The RFI Work Plan lists organics, solvents and oils in addition to metals in Table 16.3-IX. These waste types should be included in this sentence.*

### LANL Response

The statement quoted above was not intended to indicate that organics were not anticipated to be present at the site. The statement was intended to indicate that, based on the history of MDA T and the Technical Area (TA) 21 processing laboratories, metals were anticipated to be the primary, but not the only, Resource Conservation and Recovery Act (RCRA) contaminant. The RCRA analytical suite for this investigation included metals, volatile organics compounds (VOCs), and semivolatile organics compounds (SVOCs). The sentence quoted above should be modified to state, "The presence of RCRA contaminants associated with MDA T subunits has not been confirmed."

### NMED Comment

2. ***Page 10, Section 2.1:*** *The differences between this SAP and the one presented in the TA-21 RFI Work Plan, which was approved in 1991, are the number of boreholes to be drilled and sampled, sampling intervals, number of samples to be collected, and types of analysis to be performed. However, this SAP only discusses the number of boreholes. LANL needs to provide detailed information on all parts of the sampling.*

### LANL Response

The proposed sampling intervals, number of samples to be collected, and analytical suites are described in the SAP in Section 2.3 and Attachment B, Table B-1. Analytical methods are described in the SAP in Section 3.6. A detailed summary of the differences between the RCRA Facility Investigation (RFI) work plan and the SAP is provided in Table 1 of this response.

The work plan called for samples to be collected every 2.5 ft in the absorption beds and every 5 ft beneath the absorption beds, disposal shafts, and retrievable waste area (RWA). Samples were to be submitted to a mobile radiological analytical laboratory for tritium and soil moisture analyses and to a fixed laboratory for analysis of gamma spectrometry, tritium, uranium, plutonium, strontium, VOCs, SVOCs, and metals.

The SAP called for samples to be collected every 2 ft in the absorption beds and every 10 ft beneath the absorption beds, disposal shafts, and RWA. All samples were to be submitted to a mobile radiological analytical laboratory for gross alpha, beta, and gamma radiation analyses and to a mobile chemical analytical laboratory for VOC and x-ray fluorescence (XRF) metals analyses. Ten percent of the samples were to be submitted to a fixed laboratory to verify the results of the mobile laboratories and for analyses of plutonium, uranium, strontium, gamma spectroscopy, tritium, metals, and SVOCs.

As discussed in a meeting with an NMED Oversight Bureau representative held January 28, 1997, samples were collected at 2.5- to 3-ft intervals in the absorption beds and at approximate 10-ft intervals beneath the absorption beds. In the 10-ft intervals beneath the beds and in all other boreholes drilled, the field team sampled every identifiable fracture that contained clay or that was determined to have elevated radioactivity levels during field screening. If no fractures were identified within a 10-ft interval, the field team collected a sample at the bottom of the interval or where a lithologic change was noted by the field geologist.

Samples were collected at approximate 5-ft intervals in the top 20 to 30 ft of the two boreholes drilled in the RWA, and at approximate 10-ft intervals beneath the RWA. Fractures were also sampled as described above. Samples were collected at approximate 5-ft intervals in the top 10 to 15 ft of the vertical boreholes drilled outside of the absorption beds and disposal shafts, and the angled boreholes drilled beneath the absorption beds and disposal shafts. Samples were then collected at approximate 10-ft intervals from 15 ft to the bottom of these boreholes.

All samples were submitted to the TA-21 Radiological Screening Laboratory (RSL) for gross alpha, beta, and gamma radioactivity, tritium, and moisture content analyses. All samples were then submitted to off-site fixed laboratories for all other analyses, which included gamma spectroscopy, VOCs by Environmental Protection Agency (EPA) SW-846 Method 8260, SVOCs by EPA-846 Method 8270, strontium-90, isotopic plutonium, isotopic uranium, and total uranium. No field laboratories were used during the investigation.

**NMED Comment**

3. ***Page 14, Section 2.2.1, Paragraph 2; "If no RCRA chemicals are detected in these boreholes, this information will be used as a basis to further limit the analysis of inorganic, semivolatile organic compounds (SVOCs), and volatile organic compounds (VOCs) in the remaining MDA T boreholes." and Page 19, Section 2.3, Paragraph 2; "Core samples will be collected from the upper 50 ft of the borehole 1 (beneath absorption bed 1) and from the entire length of boreholes 21 and 22 (beneath building TA-21-257) at 10 ft intervals and analyzed by a fixed lab for SVOCs."*** *The list of COCs should not be limited or reduced based on the analytical results of these boreholes. The TA has had a long history which included a variety of processing and waste handling methods and waste materials. Before the list is limited, each of the absorption beds, the shaft area, and the retrievable waste storage area should be investigated for the entire suite of possible COCs.*

**LANL Response**

A full suite of analyses was conducted for samples collected in the absorption beds, disposal shafts, and RWA. The analytical suite was limited in only four boreholes: 21-05063, 21-05064, 21-05071, and 21-05074. These boreholes were located south of absorption bed 1, south of absorption bed 2, east of the disposal shafts, and north of absorption bed 4, as shown in Fig. 1 of this response. Total metals and organics analyses were not conducted for samples collected from boreholes 21-05064,

21-05071, and 21-05074, or the bottom 50 ft of borehole 21-05063. Samples collected from the top 60 ft of borehole 21-05063 were submitted for metals, VOC, and SVOC analyses.

Borehole 21-05064 was drilled after receipt of approximately one-half of the data from boreholes 21-05053 and 21-05054, which indicated no RCRA constituents were present in or immediately beneath absorption bed 2. Therefore, no samples were collected for RCRA analyses from borehole 21-05064. However, the remainder of the data from boreholes 21-05053 and 21-05054 indicated that RCRA constituents were present at very low concentrations. Therefore, all samples collected from borehole 21-05060, an angled borehole drilled approximately 35 ft east-southeast of 21-05064, were submitted for metals, VOC, and SVOC analyses as well as isotopic analyses. Borehole 21-05060 was drilled beneath absorption bed 2 and the east end of the disposal shafts.

Borehole 21-05071 was drilled after all data had been received from borehole 21-05059, which was drilled approximately 12 ft south of 21-05071. Data from 21-05059 indicated that RCRA constituents were not present at concentrations greater than their respective LANL screening action level (SALs), with the exception of copper, which was detected at a concentration of 4 860 mg/kg in a sample collected from a depth of approximately 36.5 ft below ground surface (bgs).

Borehole 21-05074 was drilled after receipt of the data from boreholes 21-05073 and 21-05056, which were drilled within absorption bed 4. Data from boreholes 21-05073 and 21-05056 indicated that no RCRA constituents were detected at concentrations greater than their respective SALs.

**NMED Comment**

4. ***Page 18, Section 2.2.6:*** *Borehole #16 is discussed as having an* ***"initial depth of 50 ft."*** *However, in Table B-1, the final depth is listed as 150 ft. LANL shall provide the criteria for extending the depth from 50 ft to 150 ft.*

**LANL Response**

Field screening results were used as the criteria for extending boreholes beyond the initial depths stated in the sampling plan. Boreholes were extended to 20 ft beyond the last elevated field screening results.

The SAP provided for drilling borehole 16 as a contingency borehole to evaluate the lateral extent of contamination in the event that borehole 9 (location 21-05059) was found to be contaminated. Borehole 16 would have been drilled, if necessary, to the planned depth of 50 ft and then extended, if necessary, according to the criteria described above. However, laboratory analytical results from samples collected in borehole 9 indicated that the eastern lateral extent of contamination had been determined. Therefore, borehole 16 was never drilled.

**NMED Comment**

5. ***Page 21, 2nd Paragraph:*** *LANL shall explain the meaning of the following sentences:* ***"All fixed laboratory data should have an accuracy of ±30 percent or better."*** *(2nd Paragraph) and "The MCAL data (for VOCs and metals) should have an accuracy of ±50 percent or better." (3rd Paragraph)*

   *HRMB is concerned with the data quality and data accuracy of the mobile laboratory and fixed laboratory. Data with such poor accuracy may not be appropriate to be use in the decision-making process. LANL shall reduce the use of its mobile laboratory due to its imprecise quality assurance/quality control measures unless it can now demonstrate a better rate of accuracy. If the data quality and accuracy of those laboratories cannot be improved, LANL shall have all samples analyzed by a reputable laboratory outside of the LANL with better data quality.*

**LANL Response**

The statement, "All fixed laboratory data should have an accuracy of ±30 percent or better," was included to define the lower limit of acceptability for data accuracy and precision. In general, data from the analytical laboratories have an accuracy and precision of ±10 percent or better for routine analyses. However, in the case of difficult samples, the accuracy and precision can be much lower. LANL's intent in requiring an accuracy and precision of ±30 percent or better was to set a limit for difficult samples, not for routine samples. The statement will be changed as follows: "In general, fixed laboratory data should have an accuracy of ±15 percent or better for routine samples, and an accuracy of ±30 percent or better for all samples."

The LANL ER Project no longer uses the Mobile Chemical Analytical Laboratory (MCAL). No samples collected during the investigation at MDA T were submitted to LANL laboratories or mobile laboratories. All samples were screened by the TA-21 RSL for gross alpha, beta, and gamma radioactivity to ensure compliance with Department of Transportation requirements for the packaging and shipping of radioactive materials. All samples were then submitted to reputable, off-site fixed laboratories.

**NMED Comment**

6. ***Page 24, 5th Paragraph:*** *The Plan states that field quality control samples will be collected in accordance with LANL Environmental Restoration (ER) Quality Assurance Project Plan (QAPP), which has not been finalized or approved. LANL shall follow the QAPP which has previously been approved until NMED approves the new QAPP.*

**LANL Response**

LANL's Quality Assurance Project Plan (QAPP), which was approved in 1991, was updated based on experience from ER operations. The updated QAPP more accurately meets the current QA requirements. The updated QAPP was submitted to NMED and EPA in March 1996 for approval.

**NMED Comment**

*7. Table B-1 indicates that a great deal of "Field Screening" data will be collected. This is in contrast to a lesser amount of field laboratory analyses and an even lesser amount of fixed laboratory analyses. LANL shall address how the field screening data will be used, and if the field screening data will be used to modify the location samples which will be sent for laboratory analyses. At least one fixed laboratory analyses is needed for each borehole.*

**LANL Response**

Core material from LANL ER drilling projects is field screened for radioactivity, VOCs, and/or tritium, depending on the site. The screening data are used to determine whether radioactivity, VOCs, and/or tritium are present at levels exceeding instrument detection limits or health and safety action levels. Screening data are also used in determining locations for sampling within each borehole. Samples are collected from those zones within a borehole that exhibit elevated radioactivity, VOCs, or tritium, as appropriate. When no elevated levels of radioactivity, VOCs, and/or tritium are detected, samples are collected from fractures, from zones of the core representing lithologic changes, or from areas chosen by field team geologists and/or leaders. Field screening also provides data to evaluate stopping criteria (see Section 3.4 of the SAP), and to determine the depth at which drilling is terminated.

As discussed in a meeting with an NMED Oversight Bureau representative held January 28, 1997, all samples were submitted to off-site analytical laboratories for isotopic and chemical analyses during the investigation at MDA T. Approximately eight samples were collected from each vertical borehole that was drilled to a depth of 100 ft or less bgs. Approximately 20 samples were collected from each vertical and angled borehole that was drilled to depths ranging from 100 to 200 ft bgs.

**NMED Comment**

*8. LANL should drill at least one borehole in Absorption Bed 3 to an initial depth of at least 50 feet bgs.*

**LANL Response**

After consulting with an NMED Oversight Bureau representative on January 28, 1997, LANL deviated from the SAP by drilling one borehole, 21-05025, in the approximate center of absorption bed 3. This borehole was located in the approximate location of the overflow discharge point from absorption bed 1 and was drilled and sampled to a depth of 70 ft bgs at the sampling intervals described above in the response to NMED's specific comment 7. This deviation from the sampling plan will be documented in the RFI report.

## TABLE 1

## COMPARISON OF THE 1991 TA-21 RFI WORK PLAN AND 1996 SAP FOR PRSs 21-016(a–c) AND 21-011(c)

| LOCATION | BOREHOLES SPECIFIED IN 1991 RFI WORK PLAN | BOREHOLES SPECIFIEDIN 1996 SAP | COMMENTS | WORK PLAN OBJECTIVES MET |
|---|---|---|---|---|
| Absorption Bed 1 | One vertical to 150 ft bgs in west end of bed<br>One vertical to 150 ft bgs in east end of bed<br>Two angled beneath bed from south side | One vertical to 150 ft bgs in west end of bed<br>One vertical to 150 ft bgs in east end of bed<br>One vertical to 50 ft bgs 20 ft south of bed<br>One vertical contingency to 50 ft bgs 40 ft south of bed | In the work plan, vertical boreholes were to be drilled during initial investigation, while angled boreholes were to be drilled during subsequent investigation.<br>In the SAP, all boreholes were vertical and were to be drilled during one investigation. Vertical boreholes could provide the needed information without having to drill the angled boreholes. Thus, angled boreholes beneath the absorption bed were not proposed.<br>One borehole was planned south of the absorption bed to assess lateral contaminant migration to the south. One contingency borehole was planned to further assess southerly lateral migration if contamination was detected in the borehole drilled 20 ft south of the absorption bed.<br>During the investigation, the two 150-ft boreholes in the absorption bed were drilled, one 110-ft vertical borehole was drilled approximately 30 ft south of the bed, and no additional contingency borehole was drilled. | Yes |
| Absorption Bed 2 | One vertical to 75 ft bgs in west end of bed<br>One vertical to 75 ft bgs in east end of bed | One vertical to 50 ft bgs in west end of bed<br>One vertical to 50 ft bgs in east end of bed<br>One vertical to 50 ft bgs 20 ft south of bed<br>One vertical contingency to 50 ft bgs 40 ft south of bed | The SAP stipulated that boreholes were to be stopped at 50 ft bgs if no contamination was detected based on stopping criteria. If contamination was detected at that depth, boreholes were to be extended until the vertical extent of contamination was determined.<br>One borehole was to be drilled 20 ft south of the absorption bed to assess southerly lateral contaminant migration. A contingency borehole 40 ft south of the absorption bed was planned to further assess lateral migration if contamination was detected in the borehole drilled 20 ft south of the absorption bed.<br>During the investigation, one vertical 90-ft borehole was drilled in the west end, one 60-ft borehole was drilled in the east end, and one 50-ft borehole was drilled 20 ft south of the bed. No contingency borehole was drilled 40 ft south of the bed. | Yes |

**TABLE 1(continued)**

**COMPARISON OF THE 1991 TA-21 RFI WORK PLAN AND 1996 SAP FOR PRSs 21-016(a–c) AND 21-011(c)**

| LOCATION | BOREHOLES SPECIFIED IN 1991 RFI WORK PLAN | BOREHOLES SPECIFIEDIN 1996 SAP | COMMENTS | WORK PLAN OBJECTIVES MET |
|---|---|---|---|---|
| Absorption Bed 3 | One vertical to 75 ft bgs | None | No borehole in absorption bed 3 was planned based on the assumption that the source term was the same as that detected in absorption bed 2.<br>During the investigation, one 70-ft borehole was drilled in the center of the absorption bed. | Yes |
| Absorption Bed 4 | One vertical to 75 ft bgs | One vertical to 50 ft bgs in east end of bed<br>One vertical to 50 ft bgs in west end of bed | One borehole was planned in the east end of the absorption bed to assess the potential for difference in the source term resulting from waste discharge into the bed through an emergency flow line from Building TA-21-257. A second borehole was planned in the west end of the absorption bed.<br>Boreholes were to be stopped at 50 ft bgs if no contamination was detected based on stopping criteria. If contamination was still detected at that depth, boreholes were to be extended until the vertical extent of contamination was determined.<br>During the investigation, one 50-ft borehole was drilled in the east end of the bed and one 15-ft and one 70-ft borehole were drilled in the east end of the bed. The 15-ft borehole was terminated because the drilling team encountered refusal at that depth. The drilling rig was moved approximately 5 ft to the west and the 70-ft borehole was drilled. | Yes |
| Retrievable Waste Area (RWA) | One vertical to 75 ft bgs in east end of RWA<br>One vertical to 75 ft bgs in west end of RWA | One vertical to 50 ft bgs in east end of RWA<br>One vertical to 50 ft bgs in west end of RWA<br>One vertical contingency to 50 ft bgs north of RWA<br>One vertical contingency to 50 ft bgs south of RWA. | Boreholes were to be stopped at 50 ft bgs if no contamination was detected based on stopping criteria. If contamination was still detected at that depth, boreholes were to be extended until the vertical extent of contamination was determined.<br>Contingency boreholes were planned to assess possible lateral migration of contamination. If no contamination was detected in boreholes drilled in the RWA, contingency boreholes were not to be drilled.<br>During the investigation, one 50-ft borehole was drilled in the east end and on 50-ft borehole was drilled in the west end of the RWA. No contingency boreholes were drilled. | Yes |

## TABLE 1(continued)

## COMPARISON OF THE 1991 TA-21 RFI WORK PLAN AND 1996 SAP FOR PRSs 21-016(a–c) AND 21-011(c)

| LOCATION | BOREHOLES SPECIFIED IN 1991 RFI WORK PLAN | BOREHOLES SPECIFIEDIN 1996 SAP | COMMENTS | WORK PLAN OBJECTIVES MET |
|---|---|---|---|---|
| Disposal Shafts | Two angled from north side<br>Two angled from south side<br>One angled from northeast corner<br>One vertical to 75 ft bgs in northeast corner<br>One vertical to 75 ft bgs in southwest corner | One angled from west side<br>One angled from east side<br>One angled from north side<br>One vertical to 50 ft bgs on east side | Each of the seven boreholes described in the work plan were to be drilled and sampled in a subsequent investigation. In the SAP, three angled boreholes (one each from the west, east, and north sides) were planned to provide same data as the five boreholes identified in work plan.<br>A borehole was not planned to be drilled near southwest corner of the disposal shafts as called for in the work plan because boreholes drilled in absorption bed 1 and in the east end of the RWA would provide the same data as the one borehole in the southwest corner of the shafts. One borehole was planned to be drilled east of shafts to assess the extent of possible easterly lateral contaminant migration.<br>During the investigation, two angled boreholes were drilled from the northwest, extending beneath the shafts. However, the first of the two boreholes (21-05062) penetrated a disposal shaft at approximately 83 linear ft of drilling. This borehole was abandoned and angled borehole 21-05061 was drilled beneath absorption bed 3 and the west end of the disposal shafts. One angled borehole was drilled from the south side of the disposal and extended beneath absorption bed 4 and the east end of the disposal shafts.<br>One 50-ft vertical borehole and one 200-ft vertical borehole were drilled approximately 20 ft east of the disposal shafts. | Yes |

## TABLE 1(continued)

## COMPARISON OF THE 1991 TA-21 RFI WORK PLAN AND 1996 SAP FOR PRSs 21-016(a–c) AND 21-011(c)

| LOCATION | BOREHOLES SPECIFIED IN 1991 RFI WORK PLAN | BOREHOLES SPECIFIEDIN 1996 SAP | COMMENTS | WORK PLAN OBJECTIVES MET |
|---|---|---|---|---|
| Others | Four vertical along northern fenceline<br>Three angled beneath bed 3 and RWSA from north side of bed 3.<br>One 300-ft vertical. | One vertical to 50 ft bgs north of bed 3 | One 50-ft borehole was planned to be drilled north of absorption bed 3 to assess possible northerly migration of contamination. No others were planned along the northern fenceline because subsurface geologic data gathered after preparation and approval of the work plan indicate that subsurface formations are dipping to the south and, thus, subsurface migration would likely to be in a southerly direction.<br>No boreholes were planned to be drilled through or beneath bed 3 because of an assumption that source term would be the same or no worse than elsewhere within the MDA. The two vertical boreholes drilled in RWA adequately characterize the RWA, and no angled boreholes are needed.<br>The 300-ft vertical borehole was eliminated because it was originally designed to gather geologic data. The 300-ft borehole was no longer needed because enough geologic information has since been gathered about TA-21 through other boreholes and field studies.<br>During the investigation, one 50-ft borehole was drilled north of absorption bed 3 and one 50-ft borehole was drilled north of absorption bed 4. One angled borehole was drilled beneath absorption bed 3 and the west end of the disposal shafts. | Yes |

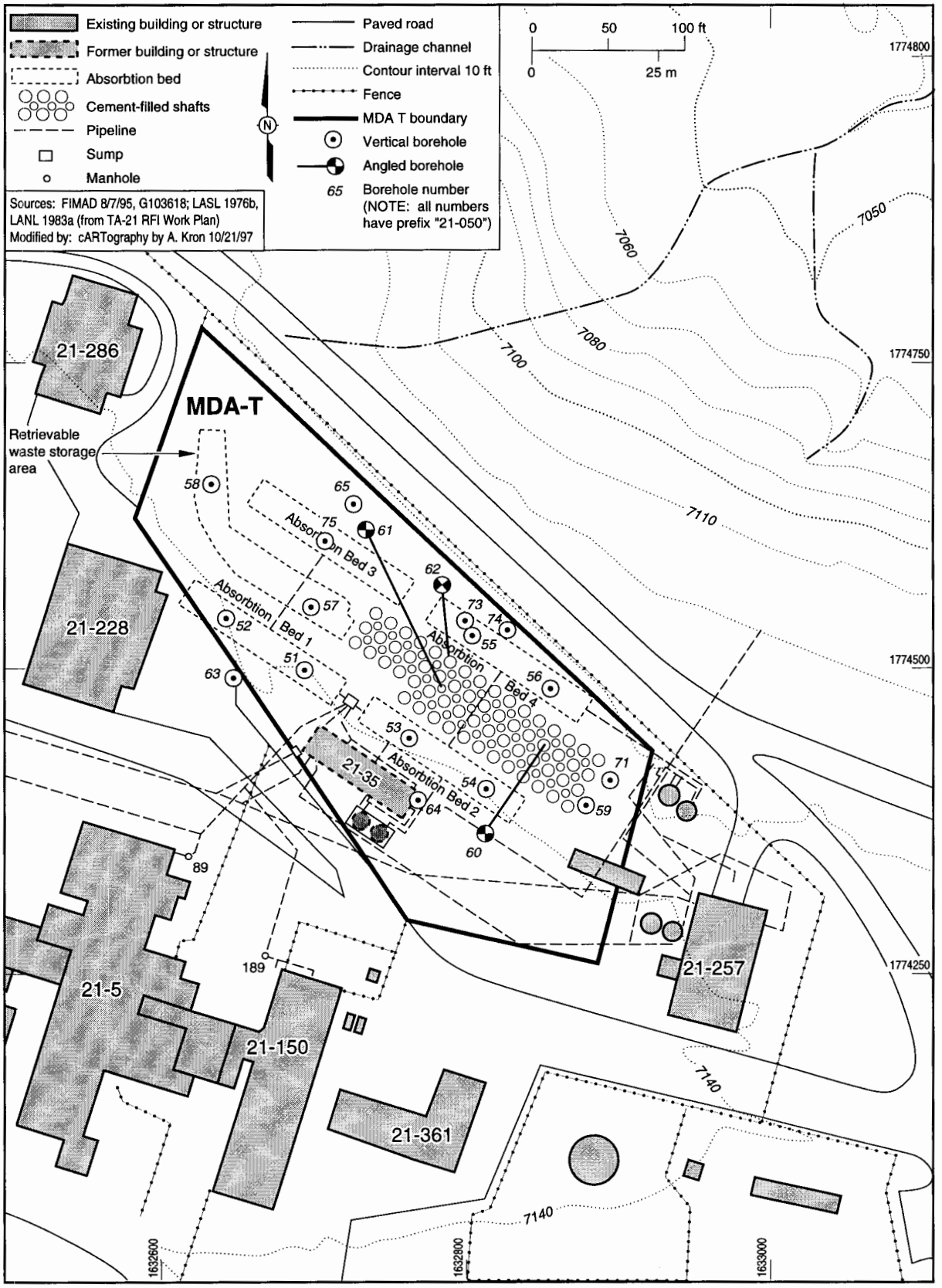


**Fig. 1 Borehole locations at MDA T.**

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