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DOCUMENT TO: Steve Slater ORGANIZATION: DOE

ORIGINATOR NAME: Tracy Hatzmaier ORGANIZATION: EM-13

SYMBOL: EM-13:93-A197 DOCUMENT DATE: 10/22/93

SUBJECT/TITLE: Draft Modification for Material Disposal Area (MDA) L pilot Study plan at Operable Unit (OU) 1148

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ATTACHMENT LIST

A) Plan TO: — FROM: D. A. Neeper SYMBOL: —
SUBJECT: Proposed Action Plan Drilling Near Area L TA-54, OU 1148
DATED: 10/21/93

B) Map TO: — FROM: — SYMBOL: —
SUBJECT: Pilot Extraction Study Plan, Location Map of planned boreholes and pilot tests
DATED: —

C) _____ TO: _____ FROM: _____ SYMBOL: _____
SUBJECT: _____
DATED: _____

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Los Alamos National Laboratory
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(6)

DATE October 22, 1993
IN REPLY REFER TO EM-13:93-A197
MAIL STOP M992
TELEPHONE (505) 665-2613

Steve Slaten
Department of Energy
Los Alamos Area Office, A316
Los Alamos, NM 87544

Dear Steve,

SUBJECT: DRAFT MODIFICATION FOR MATERIAL DISPOSAL AREA (MDA) L PILOT STUDY PLAN AT OPERABLE UNIT (OU) 1148

Enclosed is the revised version of the modification for drilling in and near MDA L in Technical Area-54 as we discussed in your office on Tuesday. Please review this draft and call me if you have any further questions. Thank you for your time.

Sincerely,

Tracy Glatzmaier

Tracy Glatzmaier
Programmatic Project Leader

TG/vvm

Enclosures: a/s

Cy R. Vocke, EM-13, MS M992
P. Aamodt, EM-13, MS M992
D. Neeper, MEE-13, MS J577
RPF, MS M707
CRM-4, MA A150, w/o enclosures

PROPOSED ACTION PLAN
DRILLING NEAR AREA L
TA-54, OU 1148

D. A. Neeper, OUPL

BACKGROUND

This discussion paper describes proposed changes in the drilling program described in the Pilot Extraction Study Plan, which is Appendix A (revised) of the RFI Work Plan. These proposed changes are based upon information obtained from drilling the first five of six planned "angle" boreholes.

The Pilot Extraction Study Plan specifies that six angle holes be augered to the depth of the basalt southeast of Area L, and that three deep vertical boreholes be drilled by air rotary methods to a depth of 500 feet near the disposal units. The six angle holes are intended to provide:

- rock samples for measurement of geologic properties related to transport;
- moisture profile;
- the distribution of VOCs in the rock matrix;
- the distribution and content of subsurface fractures;
- confirmation of the stratigraphy, in which tuff with occasional surge beds was expected to overly a thick basalt layer, with contact at some depth between 250 and 300 feet.

The angle holes are intended to serve multiple purposes during the pilot investigations. Flow tests will investigate fracture flow and matrix flow. Some of the holes will be completed with SEAMIST® membranes fitted with instrumentation for monitoring subsurface temperatures, pressures, and VOC concentrations in the pore gas.

The deep vertical boreholes were intended to reveal the depth of VOC contamination and to enable instrumentation in the basalt beneath the level of the disposal units. The holes would also reveal the vertical distribution of non-volatile contaminants in the rock near the disposal units. These holes were designed to extend below the top of the basalt to reveal the stratigraphy, to explore the fractures in the basalt, and to investigate whether the VOC plume has penetrated into the basalt. It was planned to sample pore gas at the drill bit during drilling, and subsequently to monitor conditions in the basalt with an instrumented SEAMIST® membrane.

To avoid creation of a conduit for contaminants, it was planned to advance an Odex casing from the surface to the top of the basalt during drilling of the deep vertical boreholes. A plastic inner casing was to be grouted from the basalt to the surface as the Odex casing was removed. Within the basalt, the holes were to be temporarily lined by SEAMIST® membranes. When the deep vertical holes were no longer needed, the membranes would

be removed, the plastic casing would be drilled out, and the entire depth of each hole would be grouted.

ACCOMPLISHMENTS TO DATE

Five of the six angle holes have been drilled by hollow stem auger (see the attached map). As indicated by arrows on the map, holes 54-1001, -1002, and -1006 were drilled at angles between 20 and 25 degrees from vertical, toward the South. In each hole, the tuff extends to about 160 feet. Below the tuff is a unit of weak ash and pumice that we believe will not support a fracture. In an attempt to obtain better samples in the weak material, it was decided to drive the sampling tube ahead of the auger with a downhole hammer. This scheme did not work properly at a non-vertical angle; consequently, holes 54-1003 and -1004 were drilled vertically. The first four holes reached basalt at about 290 feet of vertical depth below the top of casing. However, the fifth hole of the sequence (54-1004) was terminated at the 340-foot depth limit of the auger rig without reaching basalt. Basaltic cobbles were noted near 300 feet, with ash below that level. The lower ash appears to be of different origin than the material lying between 160 and 300 feet. Borehole video reveals that unconsolidated powder fills hole 54-1003 at 250 feet, although it was drilled to 299 feet. Borehole video found that powder fills the other four holes at depths of ten to forty feet above the drilled bottom.

Except for the fact that the basalt is deeper or nonexistent at hole 54-1004, all five holes reveal the same stratigraphy. Because little new information would be gained from one additional hole at its location, the drilling of 54-1005 was postponed. We propose below that it be drilled in the future at a location closer to 54-1004 or at another location determined from the data of the first five holes.

Field screening detected volatile contaminants extending to the basalt in hole 54-1006 (the angle hole nearest the disposal shafts), but did not detect VOCs in the lower regions of the other four holes.

TECHNICAL CONCERNS

1. Incompetent material. The weak layer of pumice and ash between the tuff and the basalt will not support a fracture, and may not even support an open borehole. We are therefore concerned that air rotary drilling could erode large cavities around a borehole. If deep boreholes were drilled near the disposal units as planned, it might be impossible to seal the annulus with grout as the Odex casing is removed. Each borehole might become a conduit for downward migration of contaminants immediately adjacent to the disposal units. It is therefore unwise to proceed with air rotary drilling of the deep vertical holes at this time.

Below, we propose to substitute shallow auger drilling for deep air rotary drilling at this stage of the drilling program.

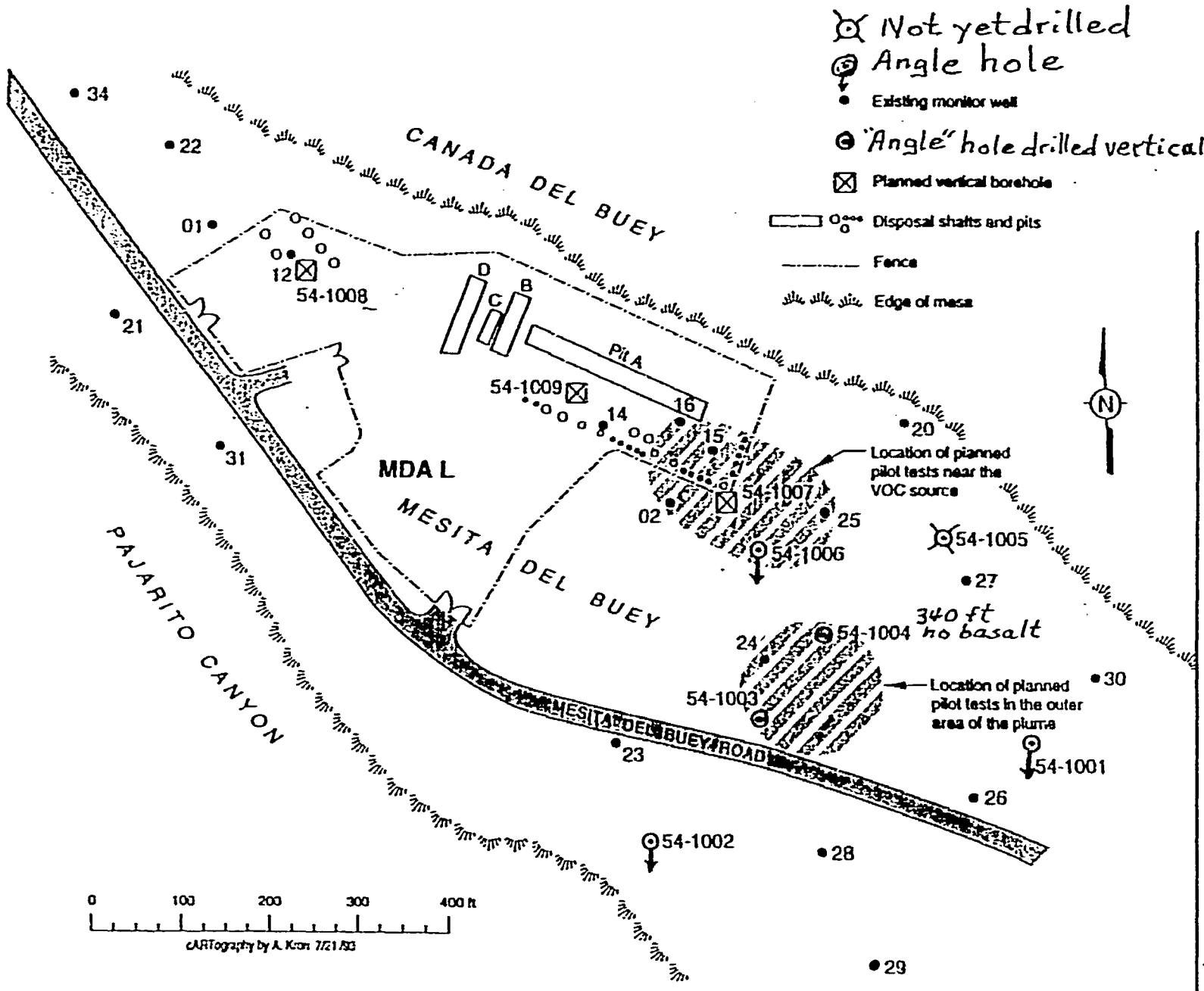
2. Gas sampling during drilling. The pilot study plan specifies collection of gas samples from each 20 foot depth interval during drilling of the deep vertical boreholes. With air rotary drilling, we had planned to inject a tracer gas with the drilling air. The tracer would indicate the fraction of a gas sample that did not come from soil pores. Without the tracer, gas samples obtained during drilling would be of uncertain quality. Because there is no routine way to provide tracer gas with auger drilling, collection of gas samples during auger drilling would be of little benefit. Furthermore, from field screening of core at hole 54-1006, we know that the soil matrix near the disposal units is contaminated with VOCs at least to the top of the basalt. Therefore, there is no need to conduct gas sampling during the proposed shallow auger drilling proposed below. Given these circumstances, we propose to eliminate the requirement for gas sampling during shallow auger drilling at the locations projected for the deep vertical boreholes.

PROPOSED PLAN OF ACTION

Angle holes. Because there is no immediate need for more stratigraphic data, we propose to postpone drilling of the sixth angle hole. The laboratory analysis of the VOC content in cores from the previous five angle holes may reveal the need for placing 54-1005 in a different location. Meanwhile, we will evaluate the possibility of extending hole 54-1004 (by air rotary) until the basalt is located. If the top of the basalt is anomalously deep at 54-1004, hole 54-1005 might be located so as to explore further the ash-basalt contact. (Although the air rotary extension of hole 54-1004 might cause a cavity in the soft material, 54-1004 is located some 200 feet from the nearest disposal unit. A cavity at 54-1004 would have a smaller impact on contaminant migration than a cavity closer to a disposal unit.)

Deep vertical holes. We propose that these holes not be drilled as planned because of the potential for creating cavities in the weak material below the disposal units. We propose to drill three vertical holes by auger to a depth of 150 feet (within consolidated tuff) at these locations, obtaining continuous core with sampling of core at the intervals specified in the pilot study plan. Gas samples would not be collected during drilling. Because the soil is very dry, we expect that only volatile contaminants have migrated to depths greater than 150 feet; therefore, the proposed action would reveal the vertical extent of non-volatile contamination, just as well as the original deep drilling. The holes would be backfilled with cuttings (per LANL SOP) and then grouted and abandoned.

Although it would provide the desired core samples, this plan would not provide deep instrumented wells to investigate air flow and VOC penetration within the basalt. We propose to defer drilling in the basalt beneath the disposal units until we have examined the drilling logs and the reports of borehole geophysics of the five angle holes and the proposed three 150-foot vertical holes near the disposal units. We will investigate alternate possibilities for drilling within the basalt. For example, we will consider angle drilling from the canyon on the north side of Area L, and we will seek methods to reduce the risk of erosion in the weak material above the basalt. During April 1994, we will submit a phase report presenting the geologic information, an analysis of options for investigation of the basalt, a recommendation on how best to proceed, and a proposed schedule for drilling in the basalt.



Location map of planned boreholes and pilot tests

Pilot Extraction Study Plan