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DOCUMENT TO: James P. Shipley, Jr **DOCUMENT DATE:** 08/03/92

ORIGINATOR NAME: Cheryl K. Rofer **ORGANIZATION:** LANL

SYMBOL: EES-1 **PAGE COUNT:** 5

SUBJECT/TITLE: Collaboration Between Environmental Restoration and Technology Development: An Example

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Los Alamos
NATIONAL LABORATORY
memorandum
Nuclear Technology & Engineering Division
N-2, Advanced Nuclear Technology

To/MS: Cheryl Rofer, EES-1, D-462
From/MS: Michelle Catlett, N-2, J-562
Phone/FAX: 5-5411/FAX5-3657
Symbol: N2-92:852MMC
Date: July 21, 1992

TA-06 Alpha Monitoring Results

On June 15 and 16 the LRAD Soil Surface Monitor (SSM) was used to measure the residual alpha contamination on a blasting pad at TA-6. Krag Allander, John Bounds, Becky Caress, and Michelle Catlett of Group N-2 participated in the field work. This blasting pad is left over from the Manhattan Project, and little is known about it, save that it was used for explosives testing. The blasting pad is part of a SWMU managed by Cheryl Rofer, and this monitoring was undertaken at her request.

The rest of this memo is a short report on the results of this field exercise. We will write a longer report later in the summer, incorporating data from other demonstrations.

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N-2 Files

THE LRAD SOIL SURFACE MONITOR

CONCEPT:

The soil surface monitor (SSM) used at TA-6 is based on the "fanless" long-range alpha detector (LRAD) shown schematically in Fig. 1. Alpha particles emitted by contamination on the surface of the soil create air ions in the space between the soil and the signal plane. The signal plane is connected to a battery through an electrometer as shown in Fig. 2. The voltage on the signal plane attracts one polarity of ions to the signal plane while repelling the other polarity into the ground. This ion flow is measured with an electrometer; the ion current is proportional to the level of alpha contamination under the detector. The sample enclosure forms a reasonably tight seal with the ground to reduce the influence of external ion sources. Since the signal plane is held at high voltage (HV), an intermediate guard plane is required to reduce the leakage current through the stand-offs.

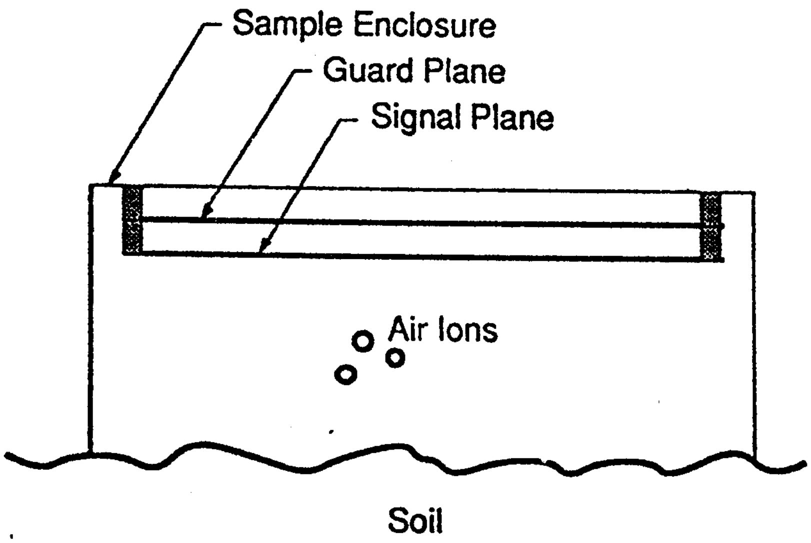

Fig. 1. Conceptual drawing of "fan-less" LRAD soil monitor.

MONITORING DESCRIPTION

The visible area of the pad was roped off for the testing of the LRAD Soil Surface Monitor (SSM). To determine how the pad contamination is distributed, we took a set of readings at ten-foot intervals along each of several rows. (Time did not permit monitoring the entire pad.) The rows were five feet apart, and the data collection points were staggered five feet from row to row, similar to a five-spot on a pair of dice. We obtained data for five full rows of six data points each in this manner, starting at the downhill side of the pad where any surface contamination should have concentrated over the years. We also took points off of our grid in areas of interest: the metal cover plate, the circular metal plate, and several points near the pit. The SSM was set stationary on each data collection point for about ten minutes, then it was moved manually to the next point. As support equipment a Ludlum 139 (a hand-held alpha meter) was used to confirm "hot spots," and a high-purity germanium detector was used for gamma-ray analysis.

LRAD MONITORING RESULTS

Results of an SSM scan of the blasting pad are shown in Fig. 3. The surface of the pad was monitored at the sample points (20-in by 20-in in area) indicated in the figure, and radiation levels between those points were interpolated by a computer graphics program. The SSM registered variations in natural background on most of the pad, but the areas above and below the sump indicate minor residual contamination. The "hottest" spot measured between 350 and 400 dpm/100 cm^2. For comparison, the DOE standard for public release is 300 dpm/100 cm^2 for transuranics.

Figure 4 shows a comparison of the SSM monitoring results with those generated using a traditional fieldable device, a Ludlum 139. (Both Fig. 3 and Fig. 4 are more useful in color. Duncan MacArthur (7-8943) has color viewgraphs and can generate color hard copies if requested.) An area scan is not feasible with the Ludlum, but it was used to verify the "hot spots." Even at the most radioactive points, the Ludlum barely read above background, but its readings do agree qualitatively with the SSM results. Due to low count rates and the small monitoring area of the Ludlum 139 (1 3/4-in by 7-in), these count rates are an estimate only. However, there was a definite reading above background contamination.

The pit was too small for the SSM, so it was checked with the other two instruments. No detectable contamination was found in the pit. The rectangular cover plate and the round metal plate had average radiation levels of 283 dpm/100 cm^2 and 406 dpm/100 cm^2, respectively.

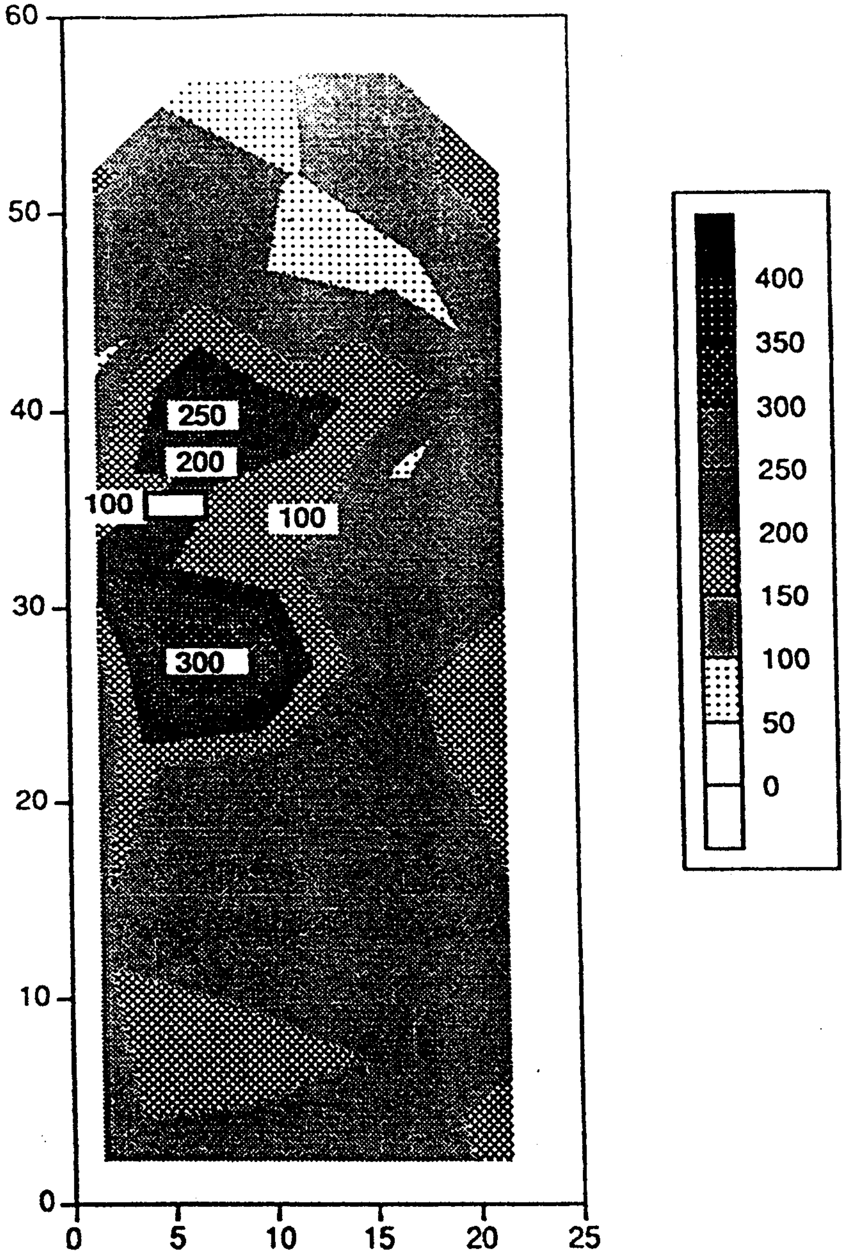

Fig. 4. Comparison on the results of SSM scan with spot results generated by a Ludlum 139 hand-held alpha scanner. The scales are in feet, the boxed numbers are the results (in counts per minute) measured by the Ludlum 139, and the rectangle at 5, 35 represents the concrete "sump" located in the blasting pad.

Los Alamos
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Los Alamos, New Mexico 87545

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memorandum

TO James P. Shipley, Jr., EE-AET, MS D460

DATE August 3, 1992

FROM Cheryl K. Rofer Cheryl K. Rofer

MAIL STOP/TELEPHONE D462/7-2988

SYMBOL EES-1

SUBJECT **COLLABORATION BETWEEN ENVIRONMENTAL RESTORATION AND TECHNOLOGY DEVELOPMENT: AN EXAMPLE**

In this memo, I would like to bring to your attention an example that you may find useful in supporting your argument about the desirability of using Los Alamos sites as test beds for development of new environmental technologies.

A novel alpha radiation detector with very high sensitivity was field tested on Operable Unit (OU) 1111, to the mutual benefit of the technology developers and the Environmental Restoration (ER) Program. I am ER Project Leader for OU 1111. In this particular case, the technology development was supported by the ER Program, but the example holds for the Office of Technology Development and other sponsors as well.

Duncan MacArthur and others in Group N-2 have been developing the Long-Range Alpha Detector (LRAD). The LRAD detects air ions produced by the alpha particles as they are emitted. This allows higher accuracy and monitoring at lower levels than direct detection of alpha particles with conventional alpha detectors. In addition, the LRAD can monitor contained volumes not accessible to conventional alpha detectors. More information about the LRAD is given in the attached memo.

One of the Solid Waste Management Units (SWMUs) on OU 1111 is an asphalt pad reported to have been a firing area for explosive shots containing natural uranium [SWMU No. 6-003(c)]. The SWMU Report notes that this pad has shown some alpha contamination. I recommended this pad to MacArthur as a test bed for the LRAD where he might field test the LRAD in a timely way before taking it to Fernald for a field test on soils. After inspecting the asphalt pad, he felt that it would be a suitable field test area with characteristics intermediate between concrete surfaces used in prior field tests and the surface soils to be tested at Fernald.

The monitoring field test was done on June 15 and 16, 1992. In addition to the LRAD, a conventional alpha detector and a high-purity germanium detector were used. Spots on the pad were found to be above background, and the radionuclides detected were ^{235}U, ^{238}U, and ^{137}Cs. A preliminary report of the monitoring is attached.*

Received by ER-RPF
JUN 09 1993
JCG

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* The report's interpretation of the results needs correction. No explosive tests likely to result in nuclear fission were ever conducted on Two Mile Mesa, according to all the archival information the OU 1111 team has assembled. Archival sources report that natural uranium was used in tests on the asphalt pad, accounting for the presence of ^{235}U. ^{137}Cs is often a low-level impurity in natural uranium.