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Mr. Alfred Wong
Department of Toxic Substances Control
700 Heinz Avenue, Building F, Suite 200
Berkeley, CA 94710-2721

RE: Closure Certification Report for the Mixed
Waste Storage Facility (MWSF), Laboratory
for Energy-Related Health Research (LEHR)
WA Job # 128-4001-432

Dear Mr. Wong:

Enclosed is the Closure Certification Report for the MWSF at the LEHR site, University of California Davis. As described in the report, an independent professional engineer certified that the MWSF was closed in accordance with the Closure Plan approved by DTSC on June 23, 1999.

If you have any questions about the MWSF closure, please call me at (510) 450-6150.

Sincerely,
Weiss Associates

Michael Zimmerman, PE, REA
Senior Project Engineer

Enclosure: Closure Certification Report

cc: Salvatore Ciriello, DTSC (w/o enclosure)
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U.S. Department of Energy

Oakland Operations Office, Oakland, California

CLOSURE CERTIFICATION REPORT

for the

MIXED WASTE STORAGE FACILITY

at the

LABORATORY FOR ENERGY-RELATED HEALTH
RESEARCH
UNIVERSITY OF CALIFORNIA AT DAVIS, CALIFORNIA

prepared by:

Weiss Associates
5801 Christie Avenue, Suite 600
Emeryville, CA 94608-1827

November 30, 1999

Rev. 0

DOE Oakland Operations Contract DE-AC03-96SF20686

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Approvals Page

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November 30, 1999
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ACRONYMS AND ABBREVIATIONS

Am-241	Americium-241
ANSI	American National Standard Institute
C-14	Carbon-14
CEQA	California Environmental Quality Act
CFR	Code of Federal Regulations
cm ²	Square centimeters
cpm	Counts per minute
Cs-137	Cesium-137
D&D	Decontamination and decommissioning
DAC	Derived air concentration
DOE	U.S. Department of Energy
dpm	Disintegrations per minute
DTSC	Department of Toxic Substances Control
EPA	U.S. Environmental Protection Agency
FC	Field coordinator
HWP	Hazardous work permit
K-40	Potassium-40
LEHR	Laboratory for Energy-Related Health Research
LSC	Liquid scintillation counter
MDA	Minimum detectable activity
Mn-54	Manganese-54
MOA	Memorandum of Agreement
mR	Milliroentgen
mR/h	Milliroentgen per hour
μR	Microrentgen
μR/h	Microrentgen per hour

MWSF	Mixed Waste Storage Facility
NIST	National Institute for Standards and Technology
NPL	National Priorities List
OSHA	Occupational Safety and Health Administration
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
Pb-210	Lead-210
Pu-241	Plutonium-241
pCi/g	picoCuries per gram
PHSP	Project Health and Safety Plan
PID	Photoionization detector
PPE	Personal protective equipment
QAMS	EPA Quality Assurance Management Staff
QAPP	Quality Assurance Project Plan
Ra-226	Radium-226
RF	Reliability factor
SHSO	Site Health and Safety Officer
SOP	Standard operating procedure
Sr-90	Strontium-90
SVOCs	Semi-volatile organic compounds
Th-230	Thorium-230
UC Davis	University of California Davis
VOCs	Volatile organic compounds

SUMMARY

The Mixed Waste Storage Facility (MWSF) is a 200 square foot prefabricated steel structure that was used to store hazardous and radioactive mixed waste at the former Laboratory for Energy-Related Health Research (LEHR) site located at the University of California, Davis (UC Davis). It was closed in accordance with the MWSF Closure Plan (EMS, 1997) that was approved by the California EPA's Department of Toxic Substances Control (DTSC) on June 23, 1999. All closure activities were reviewed and certified by an independent California Professional Engineer (Section 5.0).

1. INTRODUCTION

1.1 Objectives

This Closure Certification Report supports the final closure of the Mixed Waste Storage Facility (MWSF) at the former Laboratory for Energy-Related Health Research (LEHR) site located at the University of California, Davis (UC Davis). This report documents the MWSF closure activities, clean closure of the MWSF, and confirms compliance with the MWSF Closure Plan (EMS, 1997) that was approved by the California EPA's Department of Toxic Substances Control (DTSC) on June 23, 1999. All closure activities were reviewed and certified by an independent California Professional Engineer (Section 5.0).

1.2 Site Background

The MWSF was used to store hazardous and radioactive mixed waste from the U.S. Department of Energy (DOE)-funded research program at the LEHR site. The MWSF is owned by DOE and operated by the DOE contractor for the LEHR site under a RCRA Part A Permit Application submitted in 1989.

The LEHR site was established in 1958 at UC Davis as a research laboratory. The DOE-funded research at the LEHR site focused on the health effects from chronic exposures to radionuclides, primarily strontium-90 (Sr-90) and radium-226 (Ra-226). In a separate but related project, research animals were exposed to gamma radiation to study the effect of this type of radiation on the development of cancers such as leukemia. DOE-funded research involving the use of small amounts of plutonium-241 (Pu-241), cesium-137 (Cs-137), carbon-14 (C-14), and other radioisotopes was also conducted at LEHR.

In 1988, pursuant to a Memorandum of Agreement (MOA) between DOE and UC Davis, DOE's Office of Energy Research decided to close the research program, remediate the LEHR site as required, and turn the facility and land over to UC Davis for unrestricted use. Site restoration activities, including decontamination and decommissioning (D&D) of laboratory buildings, started in earnest in 1990. As a result of ground water contamination detected during a preliminary investigation and a potential threat to public health and the environment, the U.S. Environmental Protection Agency (EPA) placed the LEHR site on the National Priorities List (NPL), in May 1994.

In concert with ongoing environmental restoration activities, a waste management program was established by the DOE Oakland Operations Office Waste Management Division. This program focuses on characterization, storage, off-site transportation and disposal of the various legacy waste

streams generated from past DOE-funded research activities at the LEHR site. The program also coordinates the operation of the MWSF at the LEHR site.

1.3 Site and Facility Description

1.3.1 Site Description

The LEHR site is a DOE facility located 1.5 miles south of the main UC Davis campus (Figure 1-1). UC Davis owns the land at the site, and DOE owns the buildings and other facilities including the MWSF.

After the conclusion of the DOE-funded research program in 1988, numerous legacy waste streams including laboratory containers of chemicals, specimens preserved in organic liquids, cleaners, lubricants, paints and other miscellaneous materials were inventoried during a comprehensive room-by-room inspection. These waste streams were collected from various on-site research buildings and transferred to the MWSF.

The wastes were disposed off-site at appropriately permitted facilities. The MWSF is no longer needed to store mixed wastes and has been closed according to the DTSC-approved Closure Plan (EMS, 1997).

1.3.2 Mixed Waste Storage Facility Description

The MWSF is located in the eastern part of the LEHR site (Figure 1-2), and consists of a pre-fabricated steel structure with three separate compartments (Figure 1-3). This facility was designed to store hazardous or mixed waste/materials and to provide sound environmental protection against contamination due to spills or leaks. These compartments also provide a high level of security and protection from the elements. The compartments were built with secondary metal spill containment compartments and an integrated dry-chemical fire suppression system. The facility was situated on an asphalt pavement during its use.

Designed and built by Chem-Stor in 1989 to meet the requirements for storing hazardous materials and/or waste, each of the compartments include:

- Venting to relieve internal pressures and to limit structural damage in the event of an explosion;
- Static ground connection to protect flammable or combustible materials from ignition by electrical discharge;
- Interior and exterior two-part chemical resistant epoxy paint to protect the steel components from corrosion;

- Additional coal tar sealant coating in the containment reservoir;
- Structural grade 14 and 16 gauge steel construction;
- Secondary containment for up to 750 gallons;
- Easy visual inspection of the secondary containment;
- Seismic tie-downs;
- Pressure relief skylights and side vents; and,
- Continuous forced-air ventilation.

Two of the compartments have interior dimensions of 7'6" wide x 9' deep x 8' high; the third compartment's interior dimensions are 7' wide x 9' deep x 8' high. The MWSF was used to store hazardous and mixed waste between 1989 and 1996. All contained waste streams have been properly characterized, packaged and shipped to off-site locations for treatment and/or disposal. The MWSF is now empty.

Visual inspections of the MWSF and adjacent areas were performed and documented weekly during its use. No evidence of leakage was ever observed at the MWSF. Radiological surveys were performed and documented on a monthly basis. After the stored waste was removed, no radiation above ambient background was detected inside or outside the MWSF structure.

1.3.3 Maximum Waste Inventory

The maximum inventory of waste stored in the MWSF during its operations is summarized below (DOE, 1995):

Waste Designation	Waste Types	Maximum Inventory
Liquid scintillation cocktails	Flammable, Corrosive, Radioactive	150 gallons
Miscellaneous aqueous solutions	Toxic, Radioactive	100 gallons
Miscellaneous organic liquids	Flammable, Radioactive	40 gallons
Miscellaneous organic solids	Toxic, Carcinogenic, Radioactive	80 gallons
Total	---	370 gallons

This maximum inventory was less than 18% of the MWSF design capacity of 2,100 gallons.

1.3.4 Potential Historical Waste Materials

Review of sampling, historical records, and operational history of the MWSF indicates the following waste materials were potentially stored at the MWSF (DOE, 1995):

Radioisotopes

Gamma emitters
Strontium-90
Radium-226
Tritium
Carbon-14
Plutonium-238, 239, 240, 241
Americium-241

Chemicals

Volatile organic compounds (VOCs)
Semi-volatile organic compounds (SVOCs)
Formaldehyde

2. CONFIRMATION OF COMPLIANCE WITH APPROVED CLOSURE PLAN

2.1 Modifications to the Approved Closure Plan

The Closure Plan for the Mixed Waste Storage Facility at the LEHR site was prepared on September 30, 1997 (EMS, 1997). It was approved by DTSC on June 23, 1999, and there have been no subsequent modifications.

2.2 Analytical Laboratory Results

Sampling was conducted in May/June 1998 at the MWSF in accordance with the Closure Plan and the Final Sampling Plan dated April 30, 1998 (WA, 1998a). The results of this sampling program are provided in Appendix D of the Summary Data Report (WA, 1999).

2.3 Manifests, Bills-of-Lading, Receipts and/or Disposal Documentation

There were no wastes present in the MWSF at the time of closure that required removal; they were shipped off-site for disposal prior to 1998. No shipments of waste and decontamination waste from the MWSF closure activities have been required or made to date. In the event such shipments would be necessary, copies of the appropriate shipping documents will be held in project files by the generator and copies will be forwarded to the appropriate regulatory agencies as required by Title 22 of the California Code of Regulations (22 CCR) Sections 66262.20, 66262.40(a), and 66262.42.

2.4 Specific Closure Activities

The MWSF closure activities were completed according to Section 5.1 of the Closure Plan, as summarized below.

Step 1: The secondary containment trays were inspected; there was no rainwater observed in them. Therefore, it was not necessary to remove rainwater accumulated in the secondary containment tray, nor was it necessary to analyze water samples for the potential contaminants listed in Section 1.3.5 of the Closure Plan and determine the rainwater disposition method based on the analytical results and applicable discharge limitations.

- Step 2: Since there was no rainwater accumulated in the secondary containment trays, it was not necessary to implement a rainwater disposition method based on chemical analysis and regulatory limits for wastewater discharges.
- Step 3: Surface radiological measurements were performed through surface scans and smears of walls, shelves, the ceiling and secondary containments. As discussed in Section 4, the measurements determined radiological measurements were not above the residual radioactivity guidelines referenced in Section 2.1 of the Closure Plan.
- Step 4: The surface activity measurements were not above the release guidelines. Therefore, it was not necessary to identify contaminated area(s) including hot spots and decontaminate these areas as required using one or more of the decontamination methods identified in Section 5.3.2 of the Closure Plan. Decontamination was not required.
- Step 5: Since decontamination was not required, it was not necessary to resurvey (scan or smear) decontaminated areas and repeat Step 4 as needed until contamination levels were below residual guidelines.
- Step 6: Scrap wood samples were obtained from the floor of each chemical storage compartment and analyzed for potential chemical constituents provided in Section 1.3.5 of the Closure Plan.
- Step 7: The results of chemical analyses of samples taken from the wood frame floor of the compartments were not above the established criteria for hazardous classification. Due to the porous nature of the wood and its potential to accumulate radionuclides, the wood floor has been removed and will be disposed off-site as low level waste.
- Step 8: This Closure Certification Report is the closure certification package prepared as described in Sections 7.4 and 7.5 of the Closure Plan.
- Step 9: Postings were removed and the fire suppression system was dismantled.
- Step 10: Section 4 includes information to release the facility for unrestricted use per DOE Order 5400.5.

In addition to the above 10 steps, soil samples underlying the MWSF unit were obtained from various depths and analyzed. Analytical results confirmed that no soil contamination resulted from the operation of the MWSF.

These steps are complete. Therefore, the MWSF is radiologically and chemically clean and was closed in accordance with applicable RCRA requirements and the specifications in the approved Closure Plan.

2.5 Attainment of Closure Performance Standards

The Closure Plan specified four Closure Performance Standards for clean closure of the MWSF. Table 2-1 summarizes the Closure Performance Standards along with the status of the closure activities, the locations of documentation for these activities, and any findings associated with the closure activities for each standard. Table 2-2 summarizes analytical data from the verification sampling program and compares these data to the Closure Performance Standards from the Closure Plan. The analytical data demonstrates that each of the Closure Performance Standards was met.

2.6 Post-Closure

The DTSC closure regulations include specific post-closure management requirements for disposal facilities, such as landfills. The MWSF was used only for storage of hazardous and mixed wastes; it was not used for disposal. No hazardous or radioactive wastes remain in any of the MWSF units after closure.

The verification sampling verified that the MWSF was eligible for unrestricted use and was clean-closed; therefore, the following items related to post-closure (22 CCR 66265.118) do not apply to the MWSF closure:

- Maintenance Minimization
- Post-Closure Hazard Control

3. VERIFICATION SAMPLING AND ANALYSES CONDUCTED

This section describes the verification sampling activities performed in March 1998, May/June 1998, and September 1999, and analyses of radionuclides and hazardous chemicals for the MWSF structure and underlying surface soil. The MWSF was sampled to determine whether the structure's surfaces were contaminated.

All laboratory analyses were performed using the methods specified in the Final Sampling Plan (WA, 1998a) by General Engineering Laboratories (GEL) in Charleston, South Carolina. All analytical data were validated according to Section 3 of the Final Sampling Plan (WA, 1998a) and Standard Operating Procedure No. 21.1-Data Validation.

3.1 Facility Survey and Inspection

This section describes the MWSF survey and inspection conducted in March 1998 to determine whether residual radiological and chemical contaminants exist on the underside of the MWSF structure.

The MWSF structure was lifted and moved on March 3, 1998 in order to inspect the bottom and the asphalt-paved area upon which the MWSF had been situated. After inspection, the MWSF structure's bottom was found to be in good condition. There were no visible signs of past leakage on the structure's bottom or the asphalt pavement. Radiological surveys were performed around the bottom perimeter of the structure (Appendix A of the Summary Data Report), but not toward the center of the structure due to the danger involved with placing personnel under a raised structure.

No radiation above ambient background (measured at the survey location, but outside of the MWSF "footprint") was detected around the structure's perimeter. Additional radiological surveys were conducted over the asphalt surface of the building's "footprint" (Appendix A of the Summary Data Report). All radiological readings of the asphalt "footprint" were below the background value of 40 counts per minute (cpm), except for one area on the eastern edge of the "footprint," where 20-30 cpm above background was measured. This one slight exceedance is negligible because it is less than two times the background value of 40 cpm.

3.2 Radiological and Chemical Analysis of MWSF Structure

This section describes the requirements and procedures that were used in May/June 1998 and September 1999, to determine whether residual radiological and chemical contaminants exist within the MWSF structure. Based on the operational history and inspection logs, no pesticides were stored in the MWSF, therefore, analysis for pesticides was not warranted.

3.2.1 Radiological Surface Surveys

The purpose of radiological surveys was to determine whether radiological conditions of the MWSF structure and components satisfy surface residual radioactivity guidelines for unrestricted use established in DOE Order 5400.5 (DOE, 1990), NRC 1.86 (NRC, 1974), or by the State of California (CA, 1977). The MWSF structure and components were classified as follows, based on the guidelines in NUREG/CR-5849 (Berger, 1992):

- **Affected areas:** Interior walls, ceilings, and floors, including secondary containment floors (surveyed in June 1998 and September 1999).
- **Unaffected areas:** Exterior surfaces (four sidewalls and top surveyed in June 1998 and bottom surveyed in March 1998).

Though not required in the Closure Plan, a radiological survey of the unaffected areas was performed that included 30 randomly selected measurements for total and removable radiological activity. Exposure rate measurements were performed at each location of surface activity measurement. Alpha, beta, and gamma radiation were measured using the instruments listed in Table 3-1.

For the affected areas, the following survey procedures were used.

Reference Grids: The areas were gridded for the survey.

Frequency and Pattern: At each storage unit, a 1-meter grid system was established. This grid system was marked using indelible markers so that the grid reference could be easily reproduced. As shown in Figure 3-1, the reference grids were divided into four quadrants (A through D) in order to facilitate survey activities.

Measurement Methodology: Individual surveys within each of the grids were performed as described below.

All surfaces were 100% scanned for alpha and beta activity using instruments listed in Table 3-1.

Scanning surveys were performed with large area gas-flow proportional detectors. Alpha and beta-gamma measurements were made with a gas-flow proportional detector coupled with a Ludlum Model 2221 scaler/rate meter.

Surfaces were scanned at speeds no greater than five centimeters per second for alpha and beta measurements. Audible and visual indicators were used to identify locations with elevated (greater than ambient) levels of direct radiation. If a location exhibited an elevated reading a direct measurement was made and annotated on the grid map, and the area was marked. Only one location exhibited an elevated reading: beta/gamma of 230 cpm/100 cm² for Room 3 East Wall, Survey Point 1A-Ce; background = 92 cpm/100 cm². Surfaces were not scanned for gamma radiation because

counting efficiencies for gamma radiation with gas-flow proportional detectors are extremely low (< 8%).

Direct measurements were made at the center of the grid and at the center of each quadrant for a total of five measurements. Measurements were made by integrating counts over a 1-minute period. One minute count times ensured the minimum detectable activity (MDA) is approximately 25% of the guidelines for beta-gamma emitters and 30% of the guidelines for alpha emitters. These measurements were made with a large area gas-flow proportional detector coupled with a Ludlum Model 2221 scaler/rate meter.

Samples for removable contamination were collected at each grid location at the rate of seven smears per grid. Smears for removable contamination were analyzed on-site for gross alpha and gross beta activity. Results were reported in disintegrations per minute (dpm)/100 cm². The smears were counted using a Ludlum Model 2929 dual channel scaler coupled with a phoswich detector. Count time for the smears were 5 minutes to ensure the MDA was approximately 24% of the guideline for beta-gamma emitters and 40% of the guideline value for alpha emitters. Low energy beta activity was counted using a liquid scintillation counter (LSC), Packard Tri-Carb LSC Model 1600TR.

Gamma exposure rates were measured with a microroentgen (μ R) meter utilizing a sodium iodide scintillation detector. Measurements were uniformly spaced, and one measurement was made in every square meter of surface area.

Survey Instrumentation: Instruments used for the release surveys are listed in Table 3-1. Portable instruments were calibrated annually per the DOE/industry standard using sources traceable to the National Institute for Standards and Technology (NIST). Bench-top alpha and beta counting systems were also calibrated using sources traceable to NIST. Electroplate sources, made with Thorium-230 (Th-230), were used for the alpha calibration and check sources. Beta calibration and check sources were made with Strontium-90 (Sr-90). The standards for the LSC were assayed when it was manufactured, but are not NIST traceable. Therefore, the LSC calibration relies on the initial manufacturer's calibration accuracy.

Prior to initiating radiological survey activities, instrument background levels were obtained from areas and structures known to be free of radiological contamination and not associated with site D&D or other cleanup activities. Background levels for scaler instruments were determined by averaging the results of a series of 30 replicate 1-minute integrated counts.

Results of the May/June 1998 radiological surface surveys are presented in Appendix B of the Summary Data Report. The results of the September 1999 radiological surface surveys are presented in Appendix B of this Closure Certification Report. The results of the surveys are discussed in Section 4.

3.2.2 Radiological and Chemical Sampling and Analysis of Wood Floors

No chemical contamination was suspected at any of the MWSF unit interior or exterior walls, ceiling, or roof, as indicated by a thorough review of facility operational history and inspection/incidents records. It is possible, however, that the wood floor covers and secondary containment of the MWSF units may have become exposed to minor contamination during facility operations. Though not required in the Closure Plan, the wooden floor covers and secondary containment of each unit were sampled and analyzed for chemical constituents. This section describes the sampling activities performed for radiological and chemical sampling and analysis of the wood flooring.

One sample was chipped from the wood floor of each MWSF compartment and analyzed for the potential radiological and chemical contaminants listed in Section 1.3.4 and shown in Table 3-2. Sampling and analysis protocols are specified in Table 3-2, and are in accordance with the LEHR Quality Assurance Project Plan (QAPP) (WA, 1998b) and DOE-approved procedures. A total of three wood samples (MFWO0001 through MFWO0003) were analyzed using the methods listed in Table 3-2.

Field sampling documentation is presented in Appendix C of the Summary Data Report. Validated results of the radiological and chemical analyses are summarized in Appendix D of the Summary Data Report.

3.2.3 Secondary Containment Water Analysis

There was no water or other liquid in the secondary containment during the closure sampling/surveying; therefore, no water samples were collected.

3.2.4 Radiological and Chemical Sampling and Analysis of Secondary Containment

Radiological surveys were performed for the secondary containment along with the other MWSF surfaces. Section 3.2.1 presents additional details on the secondary containment radiological surveys.

There were no hazardous chemical residues in the secondary containment at the time of closure. The operational records for the MWSF did not indicate there had been past releases into the secondary containment; therefore, sampling for hazardous chemicals was not necessary.

3.3 Radiological and Chemical Analysis of Asphalt and Soil

The approved Closure Plan did not require sampling of the asphalt or soil under or around the MWSF. At the request of DTSC, the surface soil and asphalt under and around the MWSF were

sampled to determine whether a release of contaminants occurred from the MWSF to the environment. Information from this sampling and analysis was provided to DTSC for use in the California Environmental Quality Act (CEQA) determination/exemption for MWSF closure.

This section summarizes the radiological and chemical sampling and analysis of the asphalt and soil under the MWSF structure.

3.3.1 *Asphalt Surface Survey*

The MWSF structure was lifted and moved on March 3, 1998 to plan the soil sampling. A "direct frisk" radiological survey was conducted over 100% of the facility's asphalt "footprint," and radiological smears for loose surface contamination were collected at 16 points within the "footprint" (Appendix A of the Summary Data Report). Each of the 16 smears was collected over a 100 cm² area; all readings were less than the MDA. All radiological readings of the asphalt "footprint" were below background (40 cpm) except for a two square-foot area on the eastern edge of the "footprint," which was slightly higher than (20-30 cpm above) background. These slight exceedances are negligible because they are less than two times the background value of 40 cpm. The results of the asphalt radiological survey are described in more detail in the Summary Data Report and the data are presented in Appendix A of that report.

Chemical sampling of the asphalt was not conducted. The potential contaminants listed in Section 1.3.4 are VOCs, SVOCs, and formaldehyde. Analyses of VOCs and SVOCs in an asphalt matrix are inherently unreliable because asphalt is composed of mainly organic hydrocarbons and tar. Interference from the hydrocarbon matrix would result in high (parts per million level) and misleading detection levels for VOCs and SVOCs, which are not useful in determining whether a release of contaminants has occurred from the MWSF to the environment.

3.3.2 *Soil Sampling and Analysis*

Based on operational history and inspection logs for the MWSF, soil beneath the facility was not likely to be contaminated. This was confirmed by (1) the asphalt radiological surface survey in which only one point was found to be slightly above background, and (2) the lack of visible stains on the asphalt surface. As a conservative measure, soil samples were collected beneath the facility on May 14, 1998 to confirm that there is no soil contamination (Table 3-3). VOCs were detected at parts-per-billion levels in the surface soil sample from the northeast area, off the pavement (sampling location No. 2; Figure 3-2). To confirm that there has been no environmental release from the MWSF, additional soil samples were collected and analyzed for VOCs on October 30, 1998. Sample results showed that constituents of potential concern in soil under and around the unit were within the standards of the USEPA's Preliminary Remediation Goals (PRGs) and/or site-specific background concentrations. Four naturally occurring radioisotopes slightly exceeded (less than two times background) the background activities for the site. These radionuclides were not associated with the operations of the MWSF and are likely analytical artifacts.

Further details about the asphalt and soil sampling and the analytical results are included in the Summary Data Report (WA, 1999).

4. RADIOLOGICAL SURVEY PROCEDURES, RESULTS, AND FREE-RELEASE CRITERIA

This section presents the procedures and equipment utilized to perform radiological surveys on the MWSF and summarizes the results associated with these surveys. The procedures referenced in this section have been deemed acceptable by industrial standards and DOE. The radiological release criteria used to verify unrestricted use of the MWSF is defined in this section.

4.1 Survey Procedures and Equipment

The purpose of the radiological surveys was to demonstrate that the radiological conditions of the MWSF structure and components satisfy the established surface residual radioactivity guidelines for unrestricted use.

Prior to the surveying activities, the MWSF structure and components were classified as follows, based on the guidelines in NUREG/CR-5849 (Berger, 1992):

- Potentially Affected Areas: all interior surfaces (walls, ceilings, and floors), including secondary containment floors.
- Potentially Unaffected Areas: exterior surfaces (four sidewalls, top, and bottom).

The surveys summarized in this section were performed in three phases:

1. The first phase was performed in March 1998 on the under-side of the MWSF structure.
2. The second phase was conducted in June 1998 to survey the interior and exterior surfaces that were not surveyed in March 1998.
3. The final phase was completed in September 1999 to standardize smears and measurements of the interior surfaces with the procedures included in the Closure Plan.

The instrumentation used during the radiological surveying activities is listed in Table 3-1. Detailed survey procedures and measurement methodology are presented in the Final Sampling Plan (WA, 1998a).

4.2 Surveys of the Mixed Waste Storage Facility

Reference grids were established for the affected areas of each of the three chemical storage rooms which make up the MWSF to conduct radiological measurements. For each room, a 1-meter grid system was established on all interior surfaces. The reference grids were divided into five sectors in order to facilitate survey activities. Prior to initiating radiological survey activities, instrument background levels were obtained from areas and structures known to be free of radiological contamination.

Once the reference grids were established and the background levels were obtained, individual surveys at each of the sectors were performed as summarized below:

- All interior surfaces (walls, ceilings, and floors) of each room were 100% scanned for alpha, beta, and gamma radiation;
- Direct measurements were made at the center and each corner of each grid;
- Removable contamination smear samples were collected in each grid location at the rate of seven smears per grid; and,
- The survey included one smear per grid for low-energy beta emitters (tritium and carbon-14).

The Closure Plan did not require a radiological survey of the unaffected areas of the MWSF. As a conservative measure, unaffected areas were surveyed using 30 randomly selected measurements for total and removable activity. Exposure rate measurements were performed at each surface activity measurement location.

4.3 Free-Release Criteria

Regulations for the release of material and equipment from radiologically controlled areas are presented in DOE Order 5400.5 (DOE, 1990) and 10 CFR 835 (DOE, 1993). Table 4-1 summarizes the surface residual radioactivity guidelines from DOE Order 5400.5 that have been used to determine whether the MWSF can be released for unrestricted use.

4.4 Survey Results and Conclusions

Table 4-2 summarizes the survey results and references the release criteria for comparison. Evaluation of the MWSF closure survey data has determined that the surfaces of the MWSF are well below the radiological release limits presented in DOE Order 5400.5 for unrestricted use.

5. INDEPENDENT PROFESSIONAL ENGINEER CERTIFICATION

All closure activities were reviewed by an independent California Professional Engineer (P.E.). The independent P.E. certification of closure is included in Appendix C. As required in 22 CCR 66265.115, the independent P.E. certified that the MWSF was closed in accordance with the specifications in the Closure Plan approved by DTSC on June 23, 1999.

6. CONCLUSIONS

Based on data presented in this Closure Certification Report as well as that in Section 3, "Summary of Findings," of the MWSF Summary Data Report (WA, 1999), residuals remaining on the facility surfaces and soils do not exceed the Closure Performance Standards. This report documents that

- Each of the Closure Performance Standards in the Closure Plan have been achieved;
- Clean closure was obtained; and,
- The surfaces of the MWSF are well below the radiological release limits presented in DOE Order 5400.5 for unrestricted use.

An independent California Professional Engineer reviewed the closure activities and signed a certification, provided in Appendix C, that the MWSF closure was completed according to the Closure Plan.

The data in this report demonstrate that the MWSF closure has met all the requirements of the approved Closure Plan.

7. REFERENCES

- Berger, J.D., 1992. Manual for Conducting Radiological Surveys in Support of License Termination, NUREGICR-5849, Oak Ridge Associated Universities.
- State of California (CA), 1977. Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use, State of California, Department of Health Services.
- Environmental Management Services (EMS), 1997. Closure Plan, Mixed Waste Storage Facility, Laboratory for Energy-Related Health Research (LEHR), Davis, California, September.
- Environmental Protection Agency (EPA), 1990. Test Methods for Evaluating Solid Waste Physical/Chemical, SW-846, 3rd Edition, Washington D.C.
- Nuclear Regulatory Commission (NRC), 1974. Termination of Operating Licenses for Nuclear Reactors, Regulatory Guide 1.86, June.
- Oak Ridge National Laboratory (ORNL), 1981. Monitoring for Compliance with Decommissioning Termination Survey Criteria, NUREGICR-2082.
- United States Department of Energy (DOE), 1990. DOE Order 5400.5: Radiation Protection of the Public and the Environment. Washington, DC. June.
- United States DOE, 1993. Occupational Radiation Protection, Final Rule (10 CFR 835): Federal Register Volume 58, Number 238 (p. 65458-66612). Washington, DC. December.
- United States DOE, 1995. Laboratory for Energy-Related Health Research (LEHR), Mixed Waste Shipment Records.
- Weiss Associates, 1998a. Final Sampling Plan for the Mixed Waste Storage Facility at the Laboratory for Energy-Related Health Research (LEHR), Davis, California, April.
- Weiss Associates, 1998b. Final Quality Assurance Project Plan, Laboratory for Energy-Related Health Research (LEHR), Davis, California, February.
- Weiss Associates, 1999. Summary Data Report for the Mixed Waste Storage Facility at the Laboratory for Energy-Related Health Research, University of California at Davis, California. January.

TABLES

Table 2-1. Closure Compliance Matrix, Mixed Waste Storage Facility, LEHR University of California, Davis, California

Closure Performance Standard	Documentation of Completion	Findings
CLOSURE PERFORMANCE STANDARD #1: RAINWATER IN SECONDARY CONTAINMENT		
<ul style="list-style-type: none"> Removal of any rainwater and disposition of this rainwater based on analytical results. 	MWSF Summary Data Report, §2.1.3 and MWSF Closure Certification Report §2.5 and §3.2.3.	Documented that no rainwater was present; therefore, rainwater removal and sampling were not required. Closure Performance Standard #1 was not applicable. This report documents that no further action is necessary for this standard.
CLOSURE PERFORMANCE STANDARD #2: DECONTAMINATION OF PHYSICAL SURFACES OF THE UNIT		
<ul style="list-style-type: none"> No Hazardous Chemicals at Levels Above Characteristic Hazardous Waste Limits in Title 22 66261.24 		
<ul style="list-style-type: none"> i. Interior and exterior surfaces 	MWSF Closure Certification Report §2.5.	The following factors were used to determine decontamination was not necessary: (1) there were no hazardous chemical residues present on the interior or exterior of the MWSF at the time of closure, (2) there was no history of releases in the unit, and (3) the verification sampling completed for Closure Performance Standard #4 verified that there were no hazardous chemicals at levels above the characteristic hazardous waste limits. Closure Performance Standard #2 was not applicable. This report documents that no further action is necessary for this standard.

Table 2-1. Closure Compliance Matrix, Mixed Waste Storage Facility, LEHR University of California, Davis, California (continued)

Closure Performance Standard	Documentation of Completion	Findings
<ul style="list-style-type: none"> No Surface Radioactive Material Contamination Remains at Levels Above those for Unrestricted Use 		
<ul style="list-style-type: none"> i. Interior and exterior surfaces. 	MWSF Closure Certification Report §2.5.	The following factors were used to determine decontamination was not necessary: (1) there were no residues present on the interior or exterior of the MWSF at the time of closure, (2) there was no history of releases in the unit, and (3) the verification sampling completed for Closure Performance Standard #4 that there were no radioactive materials at levels above DOE 5400.5 limits for unrestricted use. Closure Performance Standard #2 was not applicable. This report documents that no further action is necessary for this standard.
CLOSURE PERFORMANCE STANDARD #3: COLLECTION AND DISPOSAL OF DECONTAMINATION SOLUTIONS AND WASTES (IF ANY)		
<ul style="list-style-type: none"> Collection of decontamination solutions and wastes. 	MWSF Closure Certification Report §2.5.	No decontamination was necessary (see Closure Performance Standard #2); therefore, there were no decontamination solutions or wastes to be collected. Closure Performance Standard #3 was not applicable. This report documents that no further action is necessary for this standard.
<ul style="list-style-type: none"> Send decontamination solutions and wastes to an off-site approved disposal facility. 	MWSF Closure Certification Report §2.5.	No decontamination was necessary (see Closure Performance Standard #2); therefore, there were no decontamination solutions or wastes to be disposed off-site. Closure Performance Standard #3 was not applicable. This report documents that no further action is necessary for this standard.

Table 2-1. Closure Compliance Matrix, Mixed Waste Storage Facility, LEHR University of California, Davis, California (continued)

Closure Performance Standard	Documentation of Completion	Findings
CLOSURE PERFORMANCE STANDARD #4: PERFORM VERIFICATION SAMPLING THAT ALLOWS CERTIFICATION OF THE MWSF CLEAN CLOSURE		
Hazardous Chemicals		
<ul style="list-style-type: none"> Samples were analyzed for the chemical parameters identified in Section 1.3.5 of the Closure Plan. 	MWSF Summary Data Report, Appendices A, B, C, and D ^a .	There were no hazardous chemical residues present during the closure. In addition, the wood flooring which will be removed and disposed off-site was sampled for waste characterization purposes.
<ul style="list-style-type: none"> Documentation of sampling is complete for hazardous chemical parameters in the wood floor. 	MWSF Summary Data Report, §2.1.2, Appendices C and D ^a .	Documentation completed in the Summary Data Report.
<ul style="list-style-type: none"> <ul style="list-style-type: none"> Samples were analyzed for the chemical parameters identified in Section 1.3.5 of the Closure Plan. 	MWSF Summary Data Report, §2.1.2, Appendices C and D ^a .	Wood samples were analyzed for hazardous chemicals identified in Section 1.3.5 of the Closure Plan.
<ul style="list-style-type: none"> <ul style="list-style-type: none"> Wood samples were below the hazardous waste characteristic limits/ Determination of whether or not wood floor is contaminated. 	MWSF Summary Data Report, §2.1.2, Appendices C and D ^a and Certification Closure Report §2.5.	There was no detected characteristic hazardous waste as listed in Title 22 CCR 66261.24. The data were presented as total concentrations in units of mass per unit mass. The data indicate the hazardous characteristic chemicals were less than the California total threshold limit concentrations (TTLCs). In addition, the total contaminant concentrations were also less than 10 times the California soluble threshold limit concentrations (STLCs) and less than 20 times the Federal RCRA toxicity characteristic leaching procedure (TCLP) limits. Closure Performance Standard #4 was achieved for hazardous chemicals. This report documents that no further action is necessary for this standard.

Table 2-1. Closure Compliance Matrix, Mixed Waste Storage Facility, LEHR University of California, Davis, California (continued)

Closure Performance Standard	Documentation of Completion	Findings
iii. If wood is contaminated, determine appropriate disposal facility.	Planned for disposal off-site as low-level waste.	The floor is not contaminated with hazardous chemicals. The wood is a volumetric waste that would require disposal as a potential low-level waste at Envirocare or Hanford.
iv. Removal and disposal of contaminated wood	Planned for disposal off-site as low-level waste.	The wood is a volumetric waste that would require disposal as a potential low-level waste.
v. Validation of wood data is complete and documented	MWSF Summary Data Report, §2.1.2 and Appendix D ^a	Data were validated and documented.
vi. Wood data are presented and summarized.	MWSF Summary Data Report, §2.1.2 Appendix D ^a	Data presented and summarized in Summary Data Report.
Radiological Materials Survey		
● Identification of any area that exceeds radiological release guidelines.	MWSF Summary Data Report, §3.1 ^a	Documented. Closure Performance Standard #4 was achieved for radionuclides. This report documents that no further action is necessary for this standard.
● Decontamination of areas that exceed radiological release guidelines.	Not applicable	Documented in Section 4 of the Closure Certification Report.
● Resurvey and decontamination as necessary to meet radiological release guidelines.	Not applicable	Documented in Section 4 of the Closure Certification Report.

^a Weiss Associates (1999).

Table 2-2. Summary of Survey Radionuclide Data and Analytical Chemical Data Above Detection Limits vs. DOE 5400.5 Release Criteria and Chemical Closure Criteria

Sampling Activity	Matrix	Analytes Present above Detection Limits	Highest Analyte Concentration	Closure Performance Standard	Closure Standard Citation
1. Radiological Surface Survey					
	Surfaces	Alpha emitters	18.8 dpm/100cm ²	100 dpm/100 cm ²	DOE 5400.5
	Surfaces	Beta emitters	326.7 dpm/100cm ²	1,000 dpm/100cm ²	DOE 5400.5
	Surfaces	Removable alpha emitters	8.0 dpm/100cm ²	20 dpm/100 cm ²	DOE 5400.5
	Surfaces	Removable beta emitters	174 dpm/100cm ²	200 dpm/100cm ²	DOE 5400.5
2. Wood Floor					
	Wood	Bismuth-212	0.385 pCi/g	Background not defined; therefore, it is not possible to compare to background.	DOE 5400.5
	Wood	Cesium-137	0.0755 pCi/g	Background not defined; therefore, it is not possible to compare to background.	DOE 5400.5
	Wood	Potassium-40	0.619 pCi/g	Background not defined; therefore, it is not possible to compare to background.	DOE 5400.5
	Wood	2-Hexanone	395 µg/kg	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Wood	4-Methyl-2-Pentanone	194 µg/kg	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Wood	Acetone	433 µg/kg	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Wood	Ethylbenzene	3140 µg/kg	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Wood	Methylene Chloride	6550 µg/kg	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Wood	Styrene	544 µg/kg	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Wood	Toluene	73.4 µg/kg	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Wood	Xylenes	43300 µg/kg	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Wood	Naphthalene	7430 µg/kg	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Wood	Formaldehyde	424 µg/kg	No TTLC hazardous characteristic standard	22 CCR 66261.24
3. Soil Sampling					
	Soil	Bismuth-212	0.505 pCi/g	< 2 times background (@ 0.43 pCi/g)	Site-specific background values or USEPA PRGs
	Soil	Cesium-137	0.076 pCi/g	< 2 times background (@ 0.043 pCi/g)	Site-specific background values or USEPA PRGs
	Soil	Lead-210	2.37 pCi/g	< 2 times background (@ 1.6 pCi/g)	Site-specific background values or USEPA PRGs
	Soil	Thorium-234	1.0 pCi/g	< 2 times background (@ 0.78 pCi/g)	Site-specific background values or USEPA PRGs
3. Soil Sampling (continued)	Soil	Uranium-238	1.0 pCi/g	< 2 times background (@ 0.65 pCi/g)	Site-specific background

Table 2-2. Summary of Survey Radionuclide Data and Analytical Chemical Data Above Detection Limits vs. DOE 5400.5 Release Criteria and Chemical Closure Criteria (continued)

Sampling Activity	Matrix	Analytes Present above Detection Limits	Highest Analyte Concentration	Closure Performance Standard	Closure Standard Citation
					values or USEPA PRGs
	Soil	Acetone	4.6 $\mu\text{g}/\text{kg}$	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Soil	2-Butanone	16.7 $\mu\text{g}/\text{kg}$	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Soil	Dibromo-chloromethane	0.62 $\mu\text{g}/\text{kg}$	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Soil	1,1,2-Trichloroethane	1.1 $\mu\text{g}/\text{kg}$	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Soil	4-methyl-2pentanone	29.2 $\mu\text{g}/\text{kg}$	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Soil	2-hexanone	35.6 $\mu\text{g}/\text{kg}$	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Soil	1,1,2,2,-tetrachlorethane	2.8 $\mu\text{g}/\text{kg}$	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Soil	Ethylbenzene	1.2 $\mu\text{g}/\text{kg}$	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Soil	Xylenes	13.0 $\mu\text{g}/\text{kg}$	No TTLC hazardous characteristic standard	22 CCR 66261.24
	Soil	Formaldehyde	1.31 $\mu\text{g}/\text{kg}$	No TTLC hazardous characteristic standard	22 CCR 66261.24

Table 3-1. LEHR Mixed Waste Storage Facility Instrumentation for Radiological Surface Surveys

Type of Measurement	Instrumentation		Background ^a	Efficiency ^a (%)	Detection Sensitivity ^a
	Detector (window)	Meter			
Surface scan – alpha	Large area gas prop. (100 cm ²) Ludlum Model 43-68	Scaler/rate meter ^b Ludlum Model 2221	1 cpm ^d	10	70 dpm/100 cm ²
Surface scan – beta	Large area gas prop. (100 cm ²) Ludlum Model 43-68	Scaler/rate meter ^b Ludlum Model 2221	80 cpm	19	370 dpm/100 cm ²
Surface activity (grids) – alpha	Large area gas prop. (100 cm ²) Ludlum Model 43-68	Scaler/rate meter ^c Ludlum Model 2221	1 cpm	10	40 dpm/100 cm ²
Surface activity (grids) – beta	Large area gas prop. (100 cm ²) Ludlum Model 43-68	Scaler/rate meter ^c Ludlum Model 2221	80 cpm	19	180 dpm/100 cm ²
Exposure rates	Scintillation	Ludlum Model 19	5 µR/h	N/A	1 µR/h
Surface scans – beta/gamma	Pancake G-M Ludlum Model 44-9	Ratemeter Ludlum Model 3	40 cpm	N/A	3,300 cpm/mR/hr
Gross alpha/beta on smears	Phoswich Ludlum Model 43-10-1	Dual scaler Ludlum 2929	0.3 cpm α 35 cpm β	30 30	10 dpm 80 dpm
Low energy beta on smears	Scintillation	Packard Tri-Carb LSC Model 1600TR	10 cpm	66	266 dpm

Notes:

^aTypical values

^bMonitoring by audible signal

^c1 minute integrated count

^dcpm – count per minute; dpm = disintegrations per minute; mR/hr = milliroentgen per hour; µR/h = microroentgen per hour

Table 3-2. LEHR Mixed Waste Storage Facility Wood Sampling and Analyses Protocol

Analytical Parameter	Method	Recommended Containers	Preservative	Max. Holding Time	Min. Volume Required for Analysis	Detection Limit
Americium-241	Lab SOP ²	1 x 8-oz. glass or polyethylene jars	None	180 days after collection	1 x 8-oz.	< 0.5 pCi/g
Carbon-14	Lab SOP					< 100 pCi/g
Gross alpha/beta	EPA 9310					< 5 pCi/g gross alpha < 10 pCi/g gross beta
Gamma emitters	EPA 901.1					see Appendix D of the Summary Data Report
Plutonium-238, 239/240, 241	Lab SOP					< 10 pCi/g
Radium-226	EPA 903.1(m)					< 1 pCi/g
Strontium-89, 90 and total Strontium	EPA 905					< 1 pCi/g
Tritium ¹	EPA 906	1 x 8-oz. glass jar	None	180 days after collection	1 x 8-oz.	10 pCi/g
Volatile organic compounds	EPA 8240	1 x 4-oz. glass jar (no headspace)	4°C	14 days	1 x 4-oz.	see Appendix D of the Summary Data Report
Semi-volatile organic compounds	EPA 8270	1 x 4-oz. glass jar	4°C	14 days to extraction, 40 days to analysis	1 x 4-oz.	see Appendix D of the Summary Data Report
Formaldehyde	AOAC ³ 20.062	1 x 4-oz. glass or polyethylene jar	None	28 days	1 x 4-oz.	<1 mg/Kg

Note:

¹ Tritium is very volatile. Sample containers must be air-tight to eliminate tritium loss.

² SOP = Standard Operating Procedure.

³AOAC = Association of Official Analytical Chemists.

Table 3-3 LEHR Mixed Waste Storage Facility Soil Sampling and Analyses Protocol

Analytical Parameter	Method	Recommended Containers	Preservative	Max. Holding Time	Min. Volume Required for Analysis	Detection Limit
Americium-241	Lab SOP ²	1 x 6-in. sample tube	None	180 days after collection	1 x 6-in. sample tube	< 0.1 pCi/g
Carbon-14	Lab SOP					< 50 pCi/g
Gross alpha/beta	EPA 9310					< 5 pCi/g gross alpha < 10 pCi/g gross beta
Gamma emitters	EPA 901.1					see Appendix D
Tritium ¹	EPA 906					5 pCi/g
Plutonium-238, 239/240, 241	Lab SOP					< 10 pCi/g
Radium-226	EPA 903.1(m)					< 1 pCi/g
Strontium-89, 90 and total Strontium	EPA 905					< 1 pCi/g
Volatile organic compounds	EPA 8240	1 x 6-in. sample tube	4°C	14 days	1 x 6-in. sample tube	see Appendix D
Semi-volatile organic compounds	EPA 8270			14 days to extraction, 40 days to analysis		see Appendix D
Formaldehyde	AOAC ³ 20.062			28 days		< 1 mg/Kg

Note:

¹ Tritium is very volatile. Sample containers must be as air tight as possible to eliminate tritium loss

² SOP = Standard Operating Procedure

³AOAC = Association of Official Analytical Chemists

Table 4-1. Surface Residual Radioactivity Guidelines

Radionuclides ²	Allowable Total Residual Surface Contamination (dpm/100 cm ²) ¹		
	Average ^{3,4}	Maximum ^{4,5}	Removable ^{4,6}
Transuranics, I-125, I-129, Ra-226 , Ac-227, Ra-228, Th-228, Th-230, Pa-231	100 ⁷	300 ⁷	20 ⁷
Th-Natural, Sr-90 , I-126, I-131, I-133, Ra-223, Ra-224, U-232, Th-232	1,000	3,000	200
U-Natural, U-235, U-238, and associated decay product, alpha emitters	5,000	15,000	1,000
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above ⁸	5,000	15,000	1,000

Note: Radioisotopes shown in bold-face are the primary isotopes of concern at the Laboratory for Energy-Related Health Research site.

Footnotes:

¹ As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute measured by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

² Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

³ Measurements of average contamination should not be averaged over an area of more than 1 m². For objects of less surface area, the average should be derived for each such object.

⁴ The average and maximum dose rates associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h and 1.0 mrad/h, respectively, at 1 cm.

⁵ The maximum contamination level applies to an area of not more than 100 cm².

⁶ The amount of removable material per 100 cm² of surface area should be determined by wiping an area of that size with dry filter or soft absorbent paper, applying moderate pressure, and measuring the amount of radioactive material on the wiping with an appropriate instrument of known efficiency. When removable contamination on objects of surface area less than 100 cm² is determined, the activity per unit area should be based on the actual area and the entire surface should be wiped. It is not necessary to use wiping techniques to measure removable contamination levels if direct scan surveys indicate that the total residual surface contamination levels are within the limits for removable contamination.

⁷ Limits used are U.S. NRC Regulatory Guide 1.86 limits plus ALARA (As defined in 10 CFR 834, ALARA is not a dose limit, but rather a process which has the objective of attaining doses as far below the applicable limit as is reasonably achievable).

⁸ This category of radionuclides includes mixed fission products, including the Sr-90 which is present in them. It does not apply to Sr-90 which has been separated from the other fission products or mixtures where the Sr-90 has been enriched.

Table 4-2. Surface Contamination Survey Results

	Surface Contamination ⁽¹⁾ (dpm/100 cm ²)			
	Fixed Contamination		Removable Contamination	
	Alpha	Beta/Gamma	Alpha	Beta/Gamma
Surface Radioactivity Guidelines⁽²⁾	Average: 100 Maximum: 300	Average: 1,000 Maximum: 3,000	20	200
Mixed waste Storage Facility	19	327	8.0	174

NOTES:

¹ Surface contamination is the maximum level measured for each room or area.

² Allowable total residual surface contamination guidelines from DOE Order 5400.5 (DOE, 1990).

dpm = disintegrations per minute

cm² = square centimeters

FIGURES

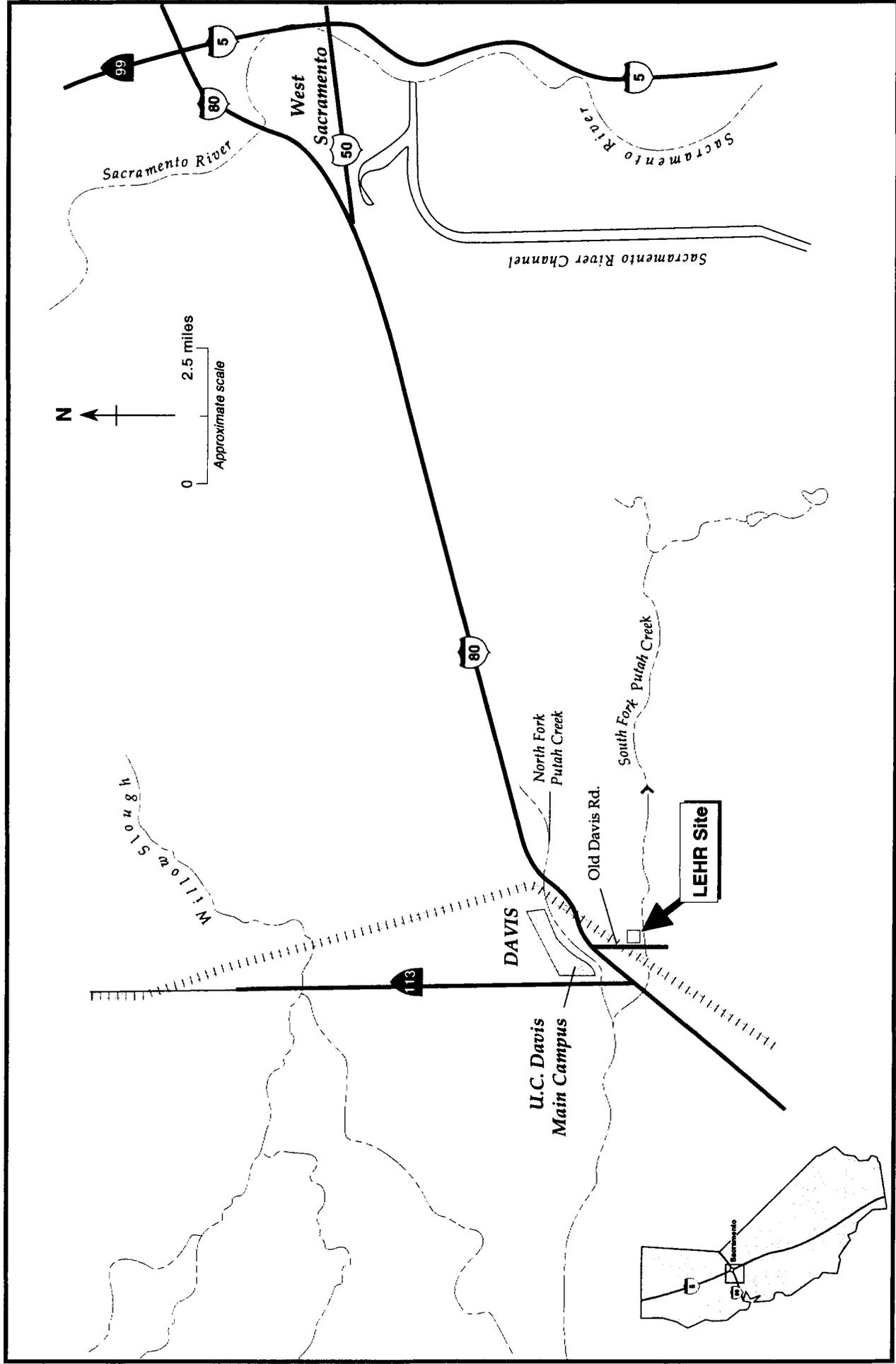


Figure 1-1. LEHR Site Location

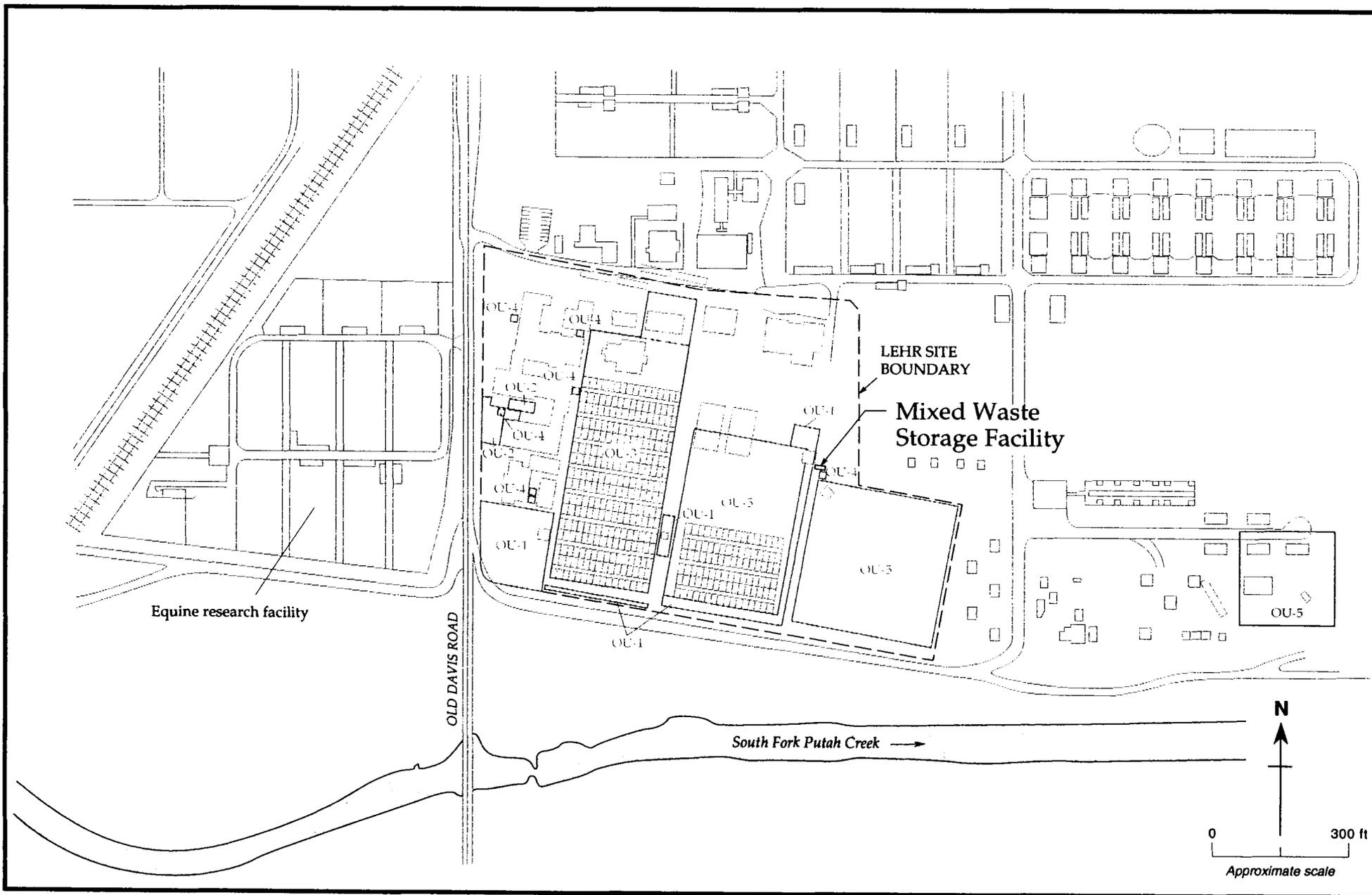


Figure 1-2. LEHR Site Mixed-Waste Storage Facility Location, UC Davis.

Weiss Associates



Figure 1-3. Photograph of Mixed-Waste Storage Facility—LEHR Site, UC Davis

Weiss Associates

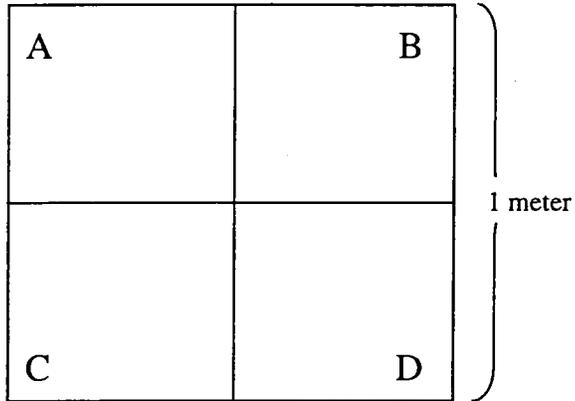
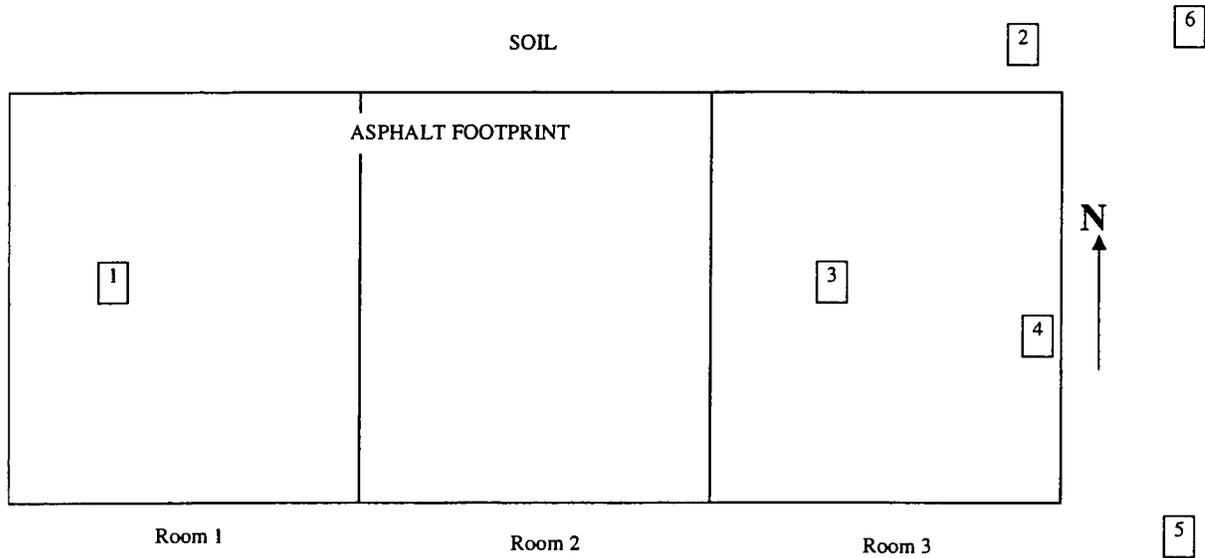


Figure 3-1. Reference Grid Sectors for MWSF Radiological Surveys



- | | | |
|-------------------|---|---|
| Sample Location 1 | = | Sample ID MFSS0001 |
| Sample Location 2 | = | Sample ID MFSS0002, 0006 (0-6") and 0007 (18-24") |
| Sample Location 3 | = | Sample ID MFSS0003 |
| Sample Location 4 | = | Sample ID MFSS0004 |
| Sample Location 5 | = | Sample ID MFSS0005 |
| Sample Location 6 | = | Sample ID MFSS0008 (0-6") and 0009 (18-24") |

Figure 3-2. LEHR Mixed Waste Storage Facility Soil Sampling Locations

APPENDIX A

RADIOLOGICAL SURFACE SURVEY CALIBRATION DATA (1998)

IT Corporation

SCALER SETUP SHEET

Project Name/# LEHR UC Davis / 774080
 Instrument/# Ludlum 2221 / 117370
 Probe Type/# 43-68 / 094819
 Technician D. Brown

Date/Time 6-4-98 / 1440
 Date Calibrated 5-18-98
 Source Activity 8730.00 dpm
 Source Type Sr-90
 HV Check/Setting Sat / 1650

1. Total Background Counts observed: record counts in 1 - 10

Count Time 1.00 minutes

1	<u>133</u>	<u>14.60</u>	<u>213.16</u>
2	<u>121</u>	<u>2.60</u>	<u>6.76</u>
3	<u>116</u>	<u>-2.40</u>	<u>5.76</u>
4	<u>111</u>	<u>-7.40</u>	<u>54.76</u>
5	<u>114</u>	<u>-4.40</u>	<u>19.36</u>
6	<u>108</u>	<u>-10.40</u>	<u>108.16</u>
7	<u>120</u>	<u>1.60</u>	<u>2.56</u>
8	<u>128</u>	<u>9.60</u>	<u>92.16</u>
9	<u>125</u>	<u>6.60</u>	<u>43.56</u>
10	<u>108</u>	<u>-10.40</u>	<u>108.16</u>

Average Counts = 118.40 counts

Average count rate = 118.40 cpm

Standard Deviation Bkg 8.53 counts

Sum of Squares = 654.40

2. Total Source Counts observed: record in 1 - 10

1	<u>2499</u>	<u>-80.20</u>	<u>6432.04</u>
2	<u>2603</u>	<u>23.80</u>	<u>566.44</u>
3	<u>2512</u>	<u>-67.20</u>	<u>4515.84</u>
4	<u>2614</u>	<u>34.80</u>	<u>1211.04</u>
5	<u>2575</u>	<u>-4.20</u>	<u>17.64</u>
6	<u>2575</u>	<u>-4.20</u>	<u>17.64</u>
7	<u>2565</u>	<u>-14.20</u>	<u>201.64</u>
8	<u>2584</u>	<u>4.80</u>	<u>23.04</u>
9	<u>2658</u>	<u>78.80</u>	<u>6209.44</u>
10	<u>2607</u>	<u>27.80</u>	<u>772.84</u>

Average source count = 2579.20 counts

Avg Source Ct Rate = 2579.20 cpm

Std Dev Source cts = 47.10 counts

Sum of Squares = 19967.60

Net source cts = 2460.80 counts

Efficiency = 0.28 cpm/dpm

Std. Dev. Net = 47.87 counts

Corr. Factor 3.55 dpm/cpm

Net Ct. Rate = 2460.80 cpm

LLD = 53.31 counts

MDA = 189.12 dpm/100 cm²

RSO REVIEW



Date

6/5/98

IT Corporation

SCALER SETUP SHEET

Project Name/# LEHR UC Davis / 774080
 Instrument/# Ludlum2221/97826
 Probe Type/# 43-68/435
 Technician D. Brown

Date/Time 6-4-98 /1400
 Date Calibrated 5-18-98
 Source Activity 11300.00 dpm
 Source Type Th-230
 HV Check/Setting Sat/1300

1. Total Background Counts observed: record counts in 1 - 10

Count Time 1.00 minutes

1	2	-2.20	4.84
2	5	0.80	0.64
3	7	2.80	7.84
4	3	-1.20	1.44
5	5	0.80	0.64
6	4	-0.20	0.04
7	6	1.80	3.24
8	2	-2.20	4.84
9	3	-1.20	1.44
10	5	0.80	0.64

Average Counts = 4.20 counts

Average count rate = 4.20 cpm

Standard Deviation Bkg 1.69 counts

Sum of Squares = 25.60

2. Total Source Counts observed: record in 1 - 10

1	1939	-63.80	4070.44
2	1984	-18.80	353.44
3	1996	-6.80	46.24
4	1958	-44.80	2007.04
5	1989	-13.80	190.44
6	1989	-13.80	190.44
7	2062	59.20	3504.64
8	2052	49.20	2420.64
9	2008	5.20	27.04
10	2051	48.20	2323.24

Average source count = 2002.80 counts

Avg Source Ct Rate = 2002.80 cpm

Std Dev Source cts = 41.01 counts

Sum of Squares = 15133.60

Net source cts = 1998.60 counts

Efficiency = 0.18 cpm/dpm

Std. Dev. Net = 41.04 counts

Corr. Factor 5.65 dpm/cpm

Net Ct. Rate = 1998.60 cpm

LLD = 12.24 counts

MDA = 69.20 dpm/100 cm²

RSO REVIEW



Date

6/5/98

2

INSTRUMENT EFFICIENCY

Project: LEHA Date/Time: 2/23/98 @ 0930
 Instrument: L-2929 Serial #: 126145
 Source Ser.#: Th-230 #1888-94 Activity: 11300 dpm
 Performed By: D. Brown

Background Determination

DETERMINE AVERAGE BACKGROUND COUNT RATE

Background Count Time: 1.0 min

Background Counts:

<u>0</u>	<u>0</u>

$$\bar{C}_b = \frac{\sum C_b}{10} \quad \dot{C}_b = \frac{C_b}{t}$$

$\bar{C}_b = \underline{0}$ $\dot{C}_b = \underline{0}$

Source Determination

DETERMINE AVERAGE SOURCE COUNT RATE

Source Count Time: 1.0 min

Source Counts:

<u>2832</u>	<u>2791</u>
<u>2824</u>	<u>2885</u>
<u>2889</u>	<u>2829</u>
<u>2841</u>	<u>2784</u>
<u>2789</u>	<u>2739</u>

$$\bar{C}_s = \frac{\sum C_s}{10} \quad \dot{C}_s = \frac{C_s}{t}$$

$\bar{C}_s = \underline{2820.3}$ $\dot{C}_s = \underline{2820}$
 $\dot{C}_n = \underline{2820}$

$$\dot{C}_n = \dot{C}_s - \dot{C}_b$$

Efficiency Determination

DETERMINE INSTRUMENT EFFICIENCY

$E_{ff} = \underline{0.25}$
 $CF = \underline{4}$

$$E_{ff} = \frac{\dot{C}_n}{A_c} \quad CF = \frac{1}{E_{ff}}$$

B-8

INSTRUMENT EFFICIENCY

Project: LEH Date/Time: 2/23/98 @ 0830
 Instrument: L-2929 Serial #: 126145
 Source Ser.#: S-30 #1887-4 Activity: 8730 Lp
 Performed By: D. Brown

Background Determination

DETERMINE AVERAGE BACKGROUND COUNT RATE

Background Count Time: 1.0 min

Background Counts:

<u>47</u>	<u>33</u>
<u>53</u>	<u>34</u>
<u>37</u>	<u>30</u>
<u>39</u>	<u>41</u>
<u>47</u>	<u>30</u>

$$\bar{C}_b = \frac{1}{10} \sum C_b \quad \dot{C}_b = \frac{C_b}{t}$$

$\bar{C}_b = \underline{39.1}$ $\dot{C}_b = \underline{39}$

Source Determination

DETERMINE AVERAGE SOURCE COUNT RATE

Source Count Time: 1.0 min

Source Counts:

<u>L 3380</u>	<u>3368</u>
<u>3423</u>	<u>3423</u>
<u>3425</u>	<u>3374</u>
<u>3334</u>	<u>3358</u>
<u>3443</u>	<u>3431</u>

$$\bar{C}_s = \frac{1}{10} \sum C_s \quad C_s = \frac{C_s}{t}$$

$\bar{C}_s = \underline{3395.4}$ $\dot{C}_s = \underline{3396}$
 $\dot{C}_n = \underline{3357}$

$$\dot{C}_n = \dot{C}_s - \dot{C}_b$$

Efficiency Determination

DETERMINE INSTRUMENT EFFICIENCY

$E_{ff} = \underline{0.38}$

CF = 2.6

$$E_{ff} = \frac{\dot{C}_n}{A_c} \quad CF = \frac{1}{E_{ff}}$$

INSTRUMENT MDA and LLD

DETERMINE LOWER LIMIT OF DETECTION

$$LLD = 2.71 + 4.65 \sqrt{C_b \bar{c}}$$

$$LLD = \underline{32}$$

DETERMINE MINIMUM DETECTABLE ACTIVITY

$$MDA = \frac{LLD}{(E_{ff}) (t) (Quantity)}$$

$$MDA = \underline{84}$$



Designer and Manufacturer
of
Scientific and Industrial
Instruments

CERTIFICATE OF CALIBRATION

LUDLUM MEASUREMENTS, INC.
OFFICE BOX 810 PH. 915-235-5494
501 OAK STREET FAX NO. 915-235-4672
SWEETWATER, TEXAS 79556, U.S.A.

CUSTOMER WEISS ASSOCIATES-JOHN WOLF ORDER NO. 217232

1. Ludlum Measurements, Inc. Model 19 Serial No. 144285

Mfg. _____ Model _____ Serial No. _____

Cal. Date 7-May-98 Cal Due Date 7-May-99 Cal. Interval 1 Year Meterface 202-016

Check mark applies to applicable instr. and/or detector IAW mfg. spec. T. 77 °F RH 36 % Alt 697.8 mm Hg

New Instrument Instrument Received Within Toler. +-10% 10-20% Out of Tol. Requiring Repair Other-See comments

Mechanical ck. Meter Zeroed Background Subtract Input Sens. Linearity

F/S Resp. ck. Reset ck. Window Operation Geotropism

Audio ck. Alarm Setting ck. Batt. ck. (Min. Volt) 2.2 VDC

Calibrated in accordance with LMI SOP 14.8 rev 12/05/89. Calibrated in accordance with LMI SOP 14.9 rev 12/19/89.

Instrument Volt Set 730 V Input Sens. 35 mV Det. Oper. _____ V at _____ mV Threshold Dial Ratio _____ = _____ mV

HV Readout (2 points) Ref./Inst. _____ / _____ V Ref./Inst. _____ / _____ V

COMMENTS:

Gamma Calibration: GM detectors positioned perpendicular to source except for M 44-9 in which the front of probe faces source.

RANGE/MULTIPLIER	REFERENCE CAL. POINT	INSTRUMENT REC'D "AS FOUND READING"	INSTRUMENT METER READING*
5000	4000uR/hr		4000
5000	1000uR/hr		1000
500	400uR/hr = 23600cpm		400
500	100uR/hr		110
250	200uR/hr = 32100cpm		200
250	100uR/hr		100
50	2360 cpm		40
50	1840 cpm		10
25	3210 cpm		20
25	928 cpm		5

*Uncertainty within ± 10% C.F. within ± 20% 50, 25 Range(s) Calibrated Electronically

REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*	Log Scale	REFERENCE CAL. POINT	INSTRUMENT RECEIVED	INSTRUMENT METER READING*
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____	_____

Ludlum Measurements, Inc. certifies that the above instrument has been calibrated by standards traceable to the National Institute of Standards and Technology, or to the calibration facilities of other International Standards Organization members, or have been derived from accepted values of natural physical constants or have been derived by the ratio type of calibration techniques. The calibration system conforms to the requirements of MIL-STD-45662A and ANSI N323-1978. State of Texas Calibration License No. LO-1963

Reference Instruments and/or Sources:

Cs-137 Gamma S/N 1162 G112 M565 5105 T1008 T879 E552 E551 Neutron Am-241 Be S/N T-304

Alpha S/N _____ Beta S/N _____ Other _____

m 500 S/N 94940 Oscilloscope S/N _____ Multimeter S/N 62840682

Calibrated By: Amanda D. Loren Date 7 May 98

Reviewed By: Rhonda Harris Date 8 May 98



GTS Instrument Services
 2045 Route 286
 Pittsburgh, PA 15239-2839
 724/733-1900 Fax: 724/327-8189

CALIBRATION CERTIFICATE

This Certificate will be accompanied by Calibration Charts or Readings where applicable

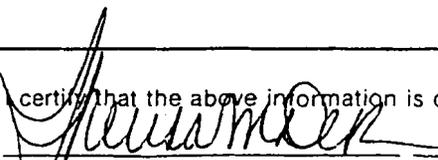
CUSTOMER INFORMATION		INSTRUMENT INFORMATION	
Customer Name:	GTS INSTRUMENT SERVICES	Instrument Manufacturer	Ludlum
Customer Address:	2045 Rt. 286	Model	2221
	Pittsburgh, PA 15239	Serial Number	97826 (370)
		External Probe(s)	43-68
		Serial #	435
		w/	20 Tygon Tubing
Customer P.O.#	I-98-05-221	Calibration Method	Pulser s/n 101500
Work Order #	774079		

INSTRUMENT CALIBRATION INFORMATION

	Instrument Range	Calibration Standard Value	Instrument Response		Comment
			Before Calib.	After Calib.	
1	DIGITAL RATE	100 CPM		100 CPM	All Calibrations Btn. + & - 10%
2		200		200	
3		400		400	
4		1K		1,000	
5		2K		2,000	
6		4K		4,000	
7		10K		10,004	
8		20K		20,010	
9		40K		40,025	
10		100K		100,018	
11		200K		200,027	
12		400K		400,351	
13					
14	SCALER				
15	0.1 MIN	40K		4,002	
16	0.2	40K		8,004	
17	0.5	40K		20,010	
18	1	40K		40,020	
19	2	40K		80,041	
20	5	40K		200,102	
21	10	40K		400,191	
22					
23					

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all of the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated by: 	certify that the above information is correct:
Calibration Date: 05-18-98 (Signed)	 05-18-98
Next Calibration Due: 11-18-98	Administrative Coordinator Date



GTS Instrument Services
 2045 Route 286
 Pittsburgh, PA 15239-2839
 724/733-1900 Fax: 724/327-8189

CALIBRATION CERTIFICATE

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		INSTRUMENT INFORMATION	
Customer Name:	GTS INSTRUMENT SERVICES	Instrument Manufacturer:	Ludlum
Customer Address:	2045 Rt. 286 Pittsburgh, PA 15239	Model:	2221
Customer P.O.#:	774079	Serial Number:	97826 (37)
Work Order #:	I-98-05-221	External Probe(s):	43-68 Serial # 435 w/ 20' Tygon Tubing
		Calibration Method:	230 Pulser s/n 101500 Th s/n 11623

INSTRUMENT CALIBRATION INFORMATION

Instrument Range	Calibration Standard Value	Instrument Response		Comment
		Before Calib.	After Calib.	
1 X1	100 CPM		100 CPM	All Calibrations Btn. + & - 10%
2	200		200	
3	400		400	
4 X10	1K		1K	Battery: OK
5	2K		2K	
6	4K		4K	
7				Mechanical Zero: OK
8 X100	10K		10K	
9	20K		20K	
10	40K		40K	Response: OK
11				
12 X1K	100K		100K	
13	200K		200K	Zero: OK
14	400K		400K	
15				
16 LOG	400		400	Audio: OK
17	4K		4K	
18	40K		40K	
19	400K		400K	Lamp: OK
20				
21				
22				High Voltage = 1300 Volts
23				

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all of the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated by:		I certify that the above information is correct:	
Calibration Date:	05-18-98 (Signed)	Administrative Coordinator	05-18-98
Next Calibration Due:	11-18-98	Date	



GTS Instrument Services
 2045 Route 286
 Pittsburgh, PA 15239-2839
 724/733-1900 Fax: 724/327-8189

CALIBRATION CERTIFICATE

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		INSTRUMENT INFORMATION	
ITAL EQUIPMENT			
Customer Name:	GTS INSTRUMENT SERVICES	Instrument Manufacturer	Ludlum
Customer Address:	2045 Rt. 286	Model	2221
	Pittsburgh, PA 15239	Serial Number	117370 (1)
		External Probe(s)	43-68 Serial # 094819 (37)
		w/ 20'	Tygon Tubing
Customer P.O.#	774079	Calibration Method	Pulser s/n 101500
Work Order #	I-98-05-221		

INSTRUMENT CALIBRATION INFORMATION

	Instrument Range	Calibration Standard Value	Instrument Response		Comment
			Before Calib.	After Calib.	
1	DIGITAL RATE	100 CPM		100 CPM	All Calibrations Btn. + & - 10%
2		200		200	
3		400		400	
4		1K		1,000	
5		2K		2,000	
6		4K		4,006	
7		10K		10,005	
8		20K		20,012	
9		40K		40,066	
10		100K		100,054	
11		200K		200,126	
12		400K		400,718	
13	SCALER				
14	0.1 MIN	40K		4,004	
15	0.2	40K		8,009	
16	0.5	40K		20,027	
17	1	40K		40,060	
18	2	40K		80,150	
19	5	40K		200,391	
20	10	40K		400,775	
21					
22					
23					

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all of the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated by:		I certify that the above information is correct:	
Calibration Date:	05-18-98 (Signed)		05-18-98
Next Calibration Due:	11-18-98	Administrative Coordinator	Date



GTS Instrument Services
 2045 Route 286
 Pittsburgh, PA 15239-2839
 724/733-1900 Fax: 724/327-8189

CALIBRATION CERTIFICATE

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION		INSTRUMENT INFORMATION	
GENERAL AGREEMENT Customer Name: <u>GTS INSTRUMENT SERVICES</u> Customer Address: <u>2045 Rt. 286</u> <u>Pittsburgh, PA 15239</u> Customer P.O.# <u>774079</u> Work Order # <u>I-98-05-221</u>		Instrument Manufacturer <u>Ludlum</u> Model <u>2221</u> Serial Number <u>117370 (12)</u> External Probe(s) <u>43-68</u> Serial # <u>094819 (37)</u> <u>w/ 20' tygon Tubing</u> Calibration Method <u>99</u> Pulser s/n <u>101500</u> <u>Tc s/n S1256</u>	

INSTRUMENT CALIBRATION INFORMATION

	Instrument Range	Calibration Standard Value	Instrument Response		Comment
			Before Calib.	After Calib.	
1	X1	100 CPM		100 CPM	All Calibrations Btn. + & - 10%
2		200		200	
3		400		400	Battery: OK
4					
5	X10	1K		1K	Mechanical Zero: OK
6		2K		2K	
7		4K		4K	Response: OK
8					
9	X100	10K		10K	Zero: OK
10		20K		20K	
11		40K		40K	Audio: OK
12					
13	X1K	100K		100K	Lamp: OK
14		200K		200K	
15		400K		400K	High Voltage = 1650 Volts
16					
17	LOG	400		400	Threshold = 50 ~ 5mV
18		4K		4K	
19		40K		40K	Window: OUT
20		400K		400K	99 Tc Efficiency = 23.4%
21					
22					
23					

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all of the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated by <u>[Signature]</u> Calibration Date: <u>05-18-98</u> (Signed) Next Calibration Due: <u>11-18-98</u>	certify that the above information is correct: <u>[Signature]</u> Administrative Coordinator Date <u>05-18-98</u>
--	--



GTS Instru Services
 2045 Route 280
 Pittsburgh, PA 15239-2839
 412/733-1900 Fax: 412/327-8189

CALIBRATION CERTIFICATE

This Certificate will be accompanied by Calibration Charts or Readings where applicable

CUSTOMER INFORMATION	INSTRUMENT INFORMATION
Customer Name: <u>Weiss Associates</u>	Instrument Manufacturer <u>Ludlum</u>
Customer Address: <u>Old Davis Road</u>	Model <u>2929</u> Serial Number <u>126145</u>
<u>Davis, CA 95616</u>	External Probe(s) <u>43-10-1</u> Serial # <u>129045</u>
Customer P.O.# _____	Calibration Method <u>99</u> <u>Pulser s/n 120935</u>
Work Order # <u>I-98-01-241</u>	<u>230</u> <u>Tc s/n S1256</u>
	<u>Th s/n 11623</u>

INSTRUMENT CALIBRATION INFORMATION

	Instrument Range	Calibration Standard Value	Instrument Response		Comment
			Before Calib.	After Calib.	
1	BETA				All Calibrations Btn. + & - 10%
2	0.1 MIN	40K CPM	4,005 CPM	4,005 CPM	BETA:
3					Input Sensitivity = 5mV
4	1 MIN	40K	40,084	40,084	⁹⁹ Tc Efficiency = 16.99%
5					
6	10 MIN	40K	400,971	400,971	High Voltage = 745 Volts
7					2.94 on dial
8	ALPHA				ALPHA:
9	0.1 MIN	40K	4,009	4,009	Input Sensitivity = 172mV
10					
11	1 MIN	40K	40,108	40,108	²³⁰ Th Efficiency = 22.89%
12					
13	10 MIN	40K	401,171	401,171	
14					
15					See attached sheets for additio
16					information
17					
18					
19					
20					
21					
22					
23					

STATEMENT OF CERTIFICATION

We Certify that the instrument listed above was calibrated and inspected prior to shipment and that it met all of the Manufacturers published operating specifications. We further certify that our Calibration Measurements are traceable to the National Institute of Standards and Technology (We are not responsible for damage incurred during shipment or use of this instrument).

Instrument Calibrated by: <u>William Owens</u>	I certify that the above information is correct:
Calibration Date: <u>02-09-98</u> (Signed)	<u>Heather M. Bas</u> <u>02-09-98</u>
Next Calibration Due: <u>02-09-99</u>	Administrative Coordinator Date



Instrument Services
 2045 Route 286
 Pittsburgh, PA 15239-2839
 412/733-1900 Fax: 412/327-8189

ELECTRONIC CALIBRATION

Electronic Calibration

- | | | | |
|--------------------|-----------------------------|------------------|--|
| 1. Test Instrument | <u>SEE</u> | 5. Time Base | |
| 2. Pulse Rate | <u>CAL</u> | 6. Counting Time | |
| 3. Amplitude | <u>CERT.</u> | 7. High Voltage | |
| 4. Time Period | <u> </u> | 8. Counts | |

Background Determination

- | | | | |
|---------------------|----------------------|-------------------|---|
| 9. Instrument Model | <u>2929/4310-1</u> | 15. Time Period | <u>K10</u> |
| 10. Serial Number | <u>126145/129045</u> | 16. Time Base | <u>1</u> |
| 11. Location | <u>Pittsburgh</u> | 17. Counting Time | <u>10 min</u> |
| 12. Date | <u>2-9-88</u> | 18. Purge Time | <u>N/A</u> |
| 13. Time | <u>9:30</u> | 19. Radiation | <input checked="" type="checkbox"/> Alpha <input type="checkbox"/> Beta |
| 14. Test By | <u>W. Owens</u> | 20. Background | <u>.5</u> @ <u>745</u> v |

Efficiency Determination

- | | | | |
|-------------------|--------------------|--|---|
| 21. Source & S/N | <u>TH230/11623</u> | 26. Average Count Rate | $\left(\frac{\text{sum total A}}{10} \right) = \underline{3984.1} \text{ CPM}$ |
| 22. Source DPM | <u>17,400</u> | 27. 2 σ (2 $\sqrt{\text{average count rate}}$) | <u>= 126.24</u> |
| 23. Time Base | <u>1</u> | 28. Chi Square Number | $\left(\frac{\text{sum total C}}{\text{line 26}} \right) = \underline{9.19}$ |
| 24. Time Period | <u>K1</u> | 29. Chi Square Fit (2-22) | <u>= <input checked="" type="checkbox"/> Yes</u> |
| 25. Counting Time | <u>1 min</u> | | |

Trial #	CPM (A)	Difference from Ave. Count (B)	Difference Squared (C)
1	3981	6.9	47.61
2	3930	54.1	2926.81
3	4035	50.9	2590.81
4	3931	53.1	2819.61
5	4123	138.9	19293.21
6	4010	25.9	670.81

- If "NO" Contact Foreman No
30. Count Rate (line 26-line 20) 3983.6
31. Efficiency:
- Net CPM (line 30) / Source DPM (line 22) X 100 = 22.89%

Trial #	CPM	Difference	Difference Squared
8	4002	17.9	320.41
9	3903	81.1	6577.21

TOTAL 3983.6



Instrument Services
 2045 Route 286
 Pittsburgh, PA 15239-2839
 412/33-1900 Fax: 412/327-8189

ELECTRONIC CALIBRATION

Electronic Calibration

- 1. Test Instrument SEE
- 2. Pulse Rate CAL
- 3. Amplitude CENT.
- 4. Time Period →
- 5. Time Base ↓
- 6. Counting Time ↓
- 7. High Voltage ↓
- 8. Counts ↓

Background Determination

- 9. Instrument Model 2929/43-10-1
- 10. Serial Number 126145/129045
- 11. Location Pittsburgh
- 12. Date 2-9-88
- 13. Time 5:00
- 14. Test By W. Owens
- 15. Time Period X 10
- 16. Time Base 1
- 17. Counting Time 10 min
- 18. Purge Time N/A
- 19. Radiation Alpha Beta
- 20. Background 44.6 @ 745 v

Efficiency Determination

- 21. Source & S/N TC55/2-1256
- 22. Source DPM 14,260
- 23. Time Base 1
- 24. Time Period X 1
- 25. Counting Time 1 min
- 26. Average Count Rate $\left(\frac{\text{sum total A}}{10} \right) = 2467.2$ CPM
- 27. 2σ (2 $\sqrt{\text{average count rate}}$) = 99.34
- 28. Chi Square Number $\left(\frac{\text{sum total C}}{\text{line 26}} \right) = 4.4$
- 29. Chi Square Fit (2-22) = Yes

Trial #	CPM (A)	Difference from Ave. Count (B)	Difference Squared (C)
1	2400	67.2	4515.84
2	2506	38.8	1505.44
3	2484	16.8	282.24
4	2466	1.2	1.44
5	2434	33.2	1102.24
6	2473	5.8	33.64

- If "NO" Contact Foreman No
- 30. Count Rate (line 26-line 20) 2422.6

31. Efficiency:
 $\frac{\text{Net CPM (line 30)}}{\text{Source DPM (line 22)}} \times 100 = 16.99\%$

Trial #	CPM	Difference	Difference Squared	TOT
8	2486	28.8	829.44	2467.2
9	2512	44.8	2007.04	

APPENDIX B

RADIOLOGICAL SURFACE SURVEY RESULTS (September 1999)

APPENDIX B

RADIOLOGICAL SURFACE SURVEY RESULTS (September 1999)

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF Room #1 Interior - Ceiling

All results are dpm/100cm2

Lud Model -2224 s/n146714 w/ Lud 43-68 s/n PR126794	Cal: 8-1-99
Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045	Cal: 6-10-99

GRID - A1				
Data Point	Total Alpha	Total Beta	Loose Alpha	Loose Beta
A1-1	6.3	-167	1.6	21.1
A1-2	12.5	-40	1.6	21.1
A1-3	0.0	-26.4	0.8	36.6
A1-4	12.5	66.0	1.6	29.1
A1-5	6.3	-19.8	1.6	20.0
A1-6	na	na	1.6	21.7
A1-7	na	na	0.0	17.7
GRID - A2				
A2-1	6.3	-85.8	0.8	24.6
A2-2	18.8	-19.8	1.6	24.0
A2-3	0.0	-46.2	0.0	24.6
A2-4	6.3	66.0	0.0	24.0
A2-5	12.5	0.0	0.0	9.1
A2-6	na	na	0.8	17.7
A2-7	na	na	0.0	15.4
GRID - A3 (1/2M2)				
A3-1	0.0	26.4	1.6	-5.1
A3-2	0.0	99.0	0.8	-4.0
A3-3	12.5	19.8	0.0	-10.3
A3-4	na	na	0.0	-12.6
GRID - B1				
B1-1	0.0	73.3	0.0	8.0
B1-2	6.3	0.0	0.8	23.4
B1-3	0.0	-119	1.6	6.3
B1-4	0.0	-66.6	0.8	17.7
B1-5	12.5	-59.9	0.8	14.3
B1-6	na	na	0.8	2.9
B1-7	na	na	0.8	14.3
GRID - B2				
B2-1	6.3	-6.7	0.0	13.1
B2-2	6.3	6.7	0.8	8.6
B2-3	6.3	-20.0	4.0	3.4
B2-4	6.3	-40.0	0.8	-2.9
B2-5	6.3	-13.3	0.8	-4.6
B2-6	na	na	0.0	-17.1
B2-7	na	na	0.0	-9.1

GRID - B3 (1/2M2)				
Data Point	Total Alpha	Total Beta	Loose Alpha	Loose Beta
B3-1	0.0	59.9	0.0	-7.4
B3-2	6.3	-33.3	0.8	-5.7
B3-3	12.5	66.6	0.8	-8.6
B3-4	na	na	0.0	-2.9
GRID - C1 (1/2M2)				
C1-1	0.0	-20.0	1.6	-19.1
C1-2	6.3	-33.3	4.0	-9.3
C1-3	6.3	26.6	0.8	4.1
C1-4	na	na	2.4	-10.4
GRID - C2 (1/2M2)				
C2-1	0.0	79.9	1.6	-8.7
C2-2	0.0	113.3	0.8	-9.3
C2-3	12.5	-26.6	0.0	-27.3
C2-4	na	na	0.8	-26.7
GRID - C3 (1/M2)				
C3-1	12.5	20.0	0.8	10.4
C3-2	6.3	33.3	1.6	5.8
C3-3	6.3	-33.3	0.8	12.8
C3-4	na	na	0.0	28.4

NOTE: Loose smear results are for 5 minute sample count times.

Completed 8-31-99
Survey # 083199006

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF Room #1 Interior - Shelving

All results are dpm/100cm2

Lud Model -2224 s/n146714 w/ Lud 43-68 s/n PR126794	Cal: 8-1-99
Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045	Cal: 6-10-99

Shelving on East Wall				
Data Point	Total Alpha	Total Beta	Loose Alpha	Loose Beta
E1	12.5	6.7	0.0	10.4
E2	6.3	-40.0	0.8	29.0
E3	6.3	-20.0	0.8	26.1
E4	6.3	106.6	1.6	12.6
E5	0.0	-46.6	1.6	2.9
E6	12.5	79.9	0.8	19.4
E7	12.5	59.9	1.6	13.1
E8	6.3	73.3	2.4	17.1
E9	0.0	86.6	0.8	12.0
Shelving on North Wall				
N1	0.0	6.7	2.4	-6.4
N2	0.0	159.8	1.6	12.8
N3	12.5	93.2	1.6	15.1
N4	6.3	119.9	0.0	10.4
N5	6.3	33.3	1.6	11.6
N6	0.0	-6.7	1.6	11.0
N7	6.3	139.9	0.8	42.3
N8	6.3	40.0	0.8	11.6
N9	0.0	-26.6	0.0	2.9
Shelving on West Wall				
W1	0.0	20.0	1.6	40.6
W2	6.3	26.6	1.6	23.8
W3	0.0	13.3	0.0	13.9
W4	0.0	106.6	1.6	13.1
W5	0.0	20.0	0.0	36.0
W6	6.3	93.2	0.0	13.7
W7	6.3	0.0	0.0	16.0
W8	6.3	53.3	0.8	5.1
W9	6.3	99.9	0.0	13.7

Exhaust Fan				
Data Point	Total Alpha	Total Beta	Loose Alpha	Loose Beta
EF1	12.5	-6.7	1.6	0.0
EF2	0.0	153.2	2.4	10.4
EF3	6.3	239.8	1.6	21.5

NOTE: Loose smear results are for 5 minute sample count times.

Completed 9-1-99
Survey # 090199003

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF Room # 1 Interior

All results are dpm/100cm2

Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045 Cal: 6-10-99

EAST WALL

NORTH WALL

GRID - A1 (1/2M2)			GRID - B1 (1/2M2)			GRID - A1			GRID - B1		
Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta
A1-1	1.6	21.9	B1-1	0.8	17.1	A1-1	0.0	21.7	B1-1	-0.8	1.7
A1-2	0.0	21.5	B1-2	0.8	2.9	A1-2	-0.8	4.0	B1-2	-0.8	-4.6
A1-3	2.4	13.3	B1-3	0.8	-12.6	A1-3	2.4	8.6	B1-3	-0.8	-11.4
A1-4	1.6	-9.3	B1-4	0.8	-1.1	A1-4	2.4 2.4	22.3 22.3	B1-4	0.8	-1.1
GRID - A2			GRID - B2			A1-5	0.8	26.3	B1-5	-0.8	-31.4
A2-1	2.4	-12.8	B2-1	-0.8	1.7	A1-6	0.0	20.6	B1-6	-0.8	0.0
A2-2	0.8	-4.6	B2-2	-0.8	-14.9	A1-7	0.0	13.1	B1-7	0.0	5.7
A2-3	0.8	-25.5	B2-3	0.0	-2.3	GRID - A2			GRID - B2		
A2-4	0.8	-15.7	B2-4	0.0	4.0	A2-1	0.8	14.9	B2-1	0.0	24.0
A2-5	0.0	-13.9	B2-5	0.0	-21.1	A2-2	0.8	-2.3	B2-2	0.0	26.9
A2-6	0.8	-6.4	B2-6	-0.8	-3.4	A2-3	-0.8	18.3	B2-3	-0.8	32.0
A2-7	0.8	-26.7	B2-7	-0.8	18.3	A2-4	0.0	6.3	B2-4	-0.8	32.6
GRID - A3			GRID - B3			A2-5	0.8	12.0	B2-5	0.0	28.0
A3-1	2.4	-15.7	B3-1	0.8	14.9	A2-6	-0.8	26.9	B2-6	-0.8	-17.7
A3-2	1.6	-27.8	B3-2	0.0	16.6	A2-7	0.0	12.6	B2-7	0.0	1.7
A3-3	1.6	-5.1	B3-3	0.8	20.0	GRID - A3 (1/2M2)			GRID - B3 (1/2M2)		
A3-4	3.2	-3.5	B3-4	0.0	37.1	A3-1	-0.8	25.7	B3-1	-0.8	0.6
A3-5	2.4	-2.4	B3-5	0.0	46.3	A3-2	0.0	29.7	B3-2	-0.8	-10.2
A3-6	3.2	-2.3	B3-6	-0.8	4.6	A3-3	0.8	11.4	B3-3	0.8	6.3
A3-7	3.2	-14.3	B3-7	-0.8	27.4	A3-4	-0.8	9.1	B3-4	-0.8	-8.6
Completed 9-1-99 Survey# 090199003			Completed 9-2-99 Survey# 090299007			Completed 9-2-99 Survey# 090299007			Completed 9-2-99 Survey# 090299007		

NOTE: Loose smear results are for 5 minute sample count times.

See survey#060598004 of 6-5-98 for results of fixed activity surveys.

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF Room # 1 Interior

All results are dpm/100cm2

Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045 Cal: 6-10-99

West Wall

South Wall

GRID - A1			GRID - B1			GRID - A1 (1/2M2)			GRID - B1 (1/2M2)		
Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta
A1-1	0.8	5.7	B1-1	0.0	-15.1	A1-1	-0.8	6.9	B1-1	0.0	9.1
A1-2	0.0	-0.6	B1-2	0.0	22.6	A1-2	1.6	1.7	B1-2	-0.0	16.0
A1-3	-0.8	4.6	B1-3	8.0	11.6	A1-3	0.0	0.0	B1-3	-0.8	0.6
A1-4	0.0	9.1	B1-4	0.0	-11.6	A1-4	0.8	0.0	B1-4	0.8	-4.6
A1-5	-0.8	1.7	B1-5	0.0	-5.8	GRID - A2			GRID - B2		
A1-6	-0.8	1.7	B1-6	2.4	-20.9	A2-1	0.8	3.4	B2-1	0.8	-4.6
A1-7	-0.8	6.9	B1-7	3.2	1.6	A2-2	0.8	-12.6	B2-2	-0.8	-4.6
GRID - A2			GRID - B2			A2-3	-0.8	4.6	B2-3	-0.8	8.6
A2-1	-0.8	9.1	B2-1	0.8	-10.4	A2-4	0.0	-1.7	B2-4	1.6	18.3
A2-2	2.4	-0.6	B2-2	3.2	0.0	A2-5	-0.8	4.6	B2-5	1.6	-1.7
A2-3	0.8	12.6	B2-3	3.2	-20.3	A2-6	0.0	-4.6	B2-6	1.6	-10.9
A2-4	0.0	0.0	B2-4	0.8	-4.1	A2-7	0.0	6.3	B2-7	0.0	-2.3
A2-5	0.0	5.2	B2-5	3.2	-2.3	GRID - A3			GRID - B3		
A2-6	0.0	2.9	B2-6	1.6	-4.0	A3-1	0.0	-11.7	B3-1	-0.8	-2.9
A2-7	0.0	12.2	B2-7	-0.8	-9.1	A3-2	0.0	-4.6	B3-2	-0.8	8.0
GRID - A3 (1/2M2)			GRID - B3 (1/2M2)			A3-3	-0.8	-13.7	B3-3	0.0	16.0
A3-1	0.0	-9.7	B3-1	0.0	16.0	A3-4	0.0	-3.4	B3-4	0.0	1.7
A3-2	0.0	6.3	B3-2	0.0	2.3	A3-5	0.8	2.9	B3-5	0.0	6.9
A3-3	0.0	-11.2	B3-3	0.0	2.9	A3-6	-0.8	4.6	B3-6	0.0	13.7
A3-4	1.6	-0.6	B3-4	-0.8	9.1	A3-7	0.0	-2.9	B3-7	0.8	-2.3
Completed 9-3-99 Survey# 090399001			Completed 9-3-99 Survey# 090399001			Completed 9-3-99 Survey# 090399001			Completed 9-3-99 Survey# 090399001		

NOTE: Loose smear results are for 5 minute sample count times.

See survey#060598004 of 6-5-98 for results of fixed activity surveys.

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF Room # 1 Interior

All results are dpm/100cm2

Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045 Cal: 6-10-99

Floor

GRID - A1			GRID - B1			GRID - C1 (1/2M2)		
Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta
A1-1	0.0	-11.6	B1-1	0.0	-5.8	C1-1	0.0	-8.7
A1-2	0.0	-14.5	B1-2	0.8	9.9	C1-2	1.6	-2.3
A1-3	0.0	4.1	B1-3	-0.8	-17.4	C1-3	-0.8	0.0
A1-4	2.4	174.0	B1-4	-0.8	-1.2	C1-4	1.6	-8.7
A1-5	1.6	-22.0	B1-5	2.5	-13.3	GRID - C2 (1/2M2)		
A1-6	2.4	-10.4	B1-6	0.8	-11.6	C2-1	0.8	5.8
A1-7	4.0	5.8	B1-7	2.5	-24.9	C2-2	1.6	-2.9
GRID - A2			GRID - B2			C2-3	-0.8	-29.0
A2-1	0.8	-12.8	B2-1	0.0	-14.5	C2-4	0.0	-29.0
A2-2	0.8	16.2	B2-2	1.6	-8.7	GRID - C3 (1/2M2)		
A2-3	0.0	9.3	B2-3	-0.8	-14.5	Data Point	Loose Alpha	Loose Beta
A2-4	0.8	-5.8	B2-4	1.6	-14.5	C3-1	-0.8	-8.7
A2-5	0.8	-2.3	B2-5	0.0	-5.8	C3-2	0.0	-14.5
A2-6	0.0	2.9	B2-6	0.8	-14.5	C3-3	0.0	-20.3
A2-7	1.6	11.6	B2-7	0.0	-2.9	C3-4	0.8	-8.7
GRID - A3 (1/2M2)			GRID - B3 (1/2M2)					
A3-1	1.6	11.6	B3-1	0.8	0.0			
A3-2	0.8	-7.5	B3-2	0.0	-8.7			
A3-3	1.6	-10.4	B3-3	0.8	-8.7			
A3-4	0.8	2.9	B3-4	0.8	-11.6			
Completed 9-7-99 Survey# 090799017			Completed 9-7-99 Survey# 090799017			Completed 9-7-99 Survey# 090799017		

NOTE: Loose smear results are for 5 minute sample count times.

See survey#060598004 of 6-5-98 for results of fixed activity surveys.

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF - Room #2 Interior - Ceiling

All results are dpm/100cm2

Lud Model -2224 s/n146714 w/ Lud 43-68 s/n PR126794	Cal: 8-1-99
Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045	Cal: 6-10-99

GRID - A1				
Data Point	Total Alpha	Total Beta	Loose Alpha	Loose Beta
A1-1	6.3	-28.6	2.4	5.8
A1-2	0	71.4	0	-5.8
A1-3	6.3	7.1	1.6	8.7
A1-4	0	-14.3	0	0
A1-5	6.3	114.3	0	-8.7
A1-6	na	na	0.8	20.3
A1-7	na	na	2.4	-11.6
GRID - A2				
A2-1	6.3	-14.3	0	2.9
A2-2	6.3	78.6	0	-5.8
A2-3	12.5	107.1	-0.8	-8.7
A2-4	12.5	92.9	0.8	0.0
A2-5	18.8	14.3	2.4	5.8
A2-6	na	na	1.6	2.9
A2-7	na	na	-0.8	0.0
GRID - A3 (1/2M2)				
A3-1	0.0	121.4	0	17.4
A3-2	12.5	28.6	1.6	-5.8
A3-3	6.3	107.1	0.0	-2.9
A3-4	na	na	0.8	2.9
GRID - B1				
B1-1	0.0	50.0	0.0	2.9
B1-2	6.3	28.6	0.0	-8.7
B1-3	0.0	35.7	1.6	2.9
B1-4	0.0	-7.1	0.0	5.8
B1-5	12.5	57.1	0.8	0.0
B1-6	na	na	0.0	5.8
B1-7	na	na	0.0	-4.6

GRID - B2				
Data Point	Total Alpha	Total Beta	Loose Alpha	Loose Beta
B2-1	0.0	42.9	0.8	11.6
B2-2	6.3	150.0	0.0	-8.7
B2-3	6.3	92.9	0.0	-0.6
B2-4	0.0	64.3	2.4	-16.0
B2-5	6.3	142.9	0.0	1.7
B2-6	na	na	0.8	4.0
B2-7	na	na	0.8	0.0
GRID - B3 (1/2M2)				
B3-1	0.0	100.0	0.0	-8.6
B3-2	6.3	128.6	0.0	-4.0
B3-3	0.0	107.1	0.0	6.9
B3-4	na	na	-0.8	1.7
GRID - C1 (1/2M2)				
C1-1	0.0	42.9	0.0	5.8
C1-2	6.3	185.7	1.6	2.9
C1-3	0.0	78.6	0.8	20.3
C1-4	na	na	-0.8	14.5
GRID - C2 (1/2M2)				
C2-1	12.5	164.3	1.6	8.7
C2-2	6.3	178.6	-0.8	0.0
C2-3	12.5	78.6	0.0	26.1
C1-4	na	na	0.8	0.0
GRID - C3 (1/2M2)				
C3-1	6.3	50.0	0.0	-17.4
C3-2	6.3	157.1	0.8	5.8
C3-3	0.0	85.7	-0.8	-5.8
C3-4	na	na	0.0	8.7

Completed 9-8-99
Survey# 090899002

NOTE: Loose smear results are for 5 minute sample count times.

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF - Room #2 Interior

All results are dpm/100cm2

Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045 Cal: 6-10-99

EAST WALL

NORTH WALL

GRID - A1 (1/2M2)			GRID - B1 (1/2M2)			GRID - A1			GRID - B1		
Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta
A1-1	0.0	8.7	B1-1	-0.8	2.9	A1-1	-0.8	7.4	B1-1	-1.6	-12.0
A1-2	0.0	0.0	B1-2	-0.8	2.3	A1-2	0.0	13.7	B1-2	-0.8	19.7
A1-3	2.4	14.9	B1-3	-0.8	1.7	A1-3	0.0	25.1	B1-3	-0.8	2.9
A1-4	0.0	2.9	B1-4	0.0	4.6	A1-4	0.8	2.9	B1-4	-0.8	17.4
GRID - A2			GRID - B2			A1-5	-0.8	15.4	B1-5	-0.8	8.7
A2-1	0.0	8.7	B2-1	-0.8	20.6	A1-6	-1.6	26.9	B1-6	1.6	8.7
A2-2	2.4	-4.0	B2-2	-0.8	2.9	A1-7	1.6	16.6	B1-7	-1.6	-5.8
A2-3	0.0	13.1	B2-3	0.0	8.6	GRID - A2			GRID - B2		
A2-4	4.8	1.1	B2-4	0.8	6.3	A2-1	-0.8	-1.7	B2-1	-0.8	14.5
A2-5	-0.8	14.5	B2-5	0.0	5.1	A2-2	-1.6	4.6	B2-2	-0.8	5.8
A2-6	0.8	-17.4	B2-6	0.8	2.9	A2-3	-1.6	-13.7	B2-3	-0.8	8.7
A2-7	-0.8	11.6	B2-7	-0.8	1.1	A2-4	-0.8	9.7	B2-4	-1.6	8.7
GRID - A3			GRID - B3			A2-5	-1.6	12.0	B2-5	-0.8	-5.8
A3-1	-0.8	-0.6	B3-1	0.0	-0.6	A2-6	-1.6	2.9	B2-6	-1.6	2.9
A3-2	0.0	-14.5	B3-2	0.0	5.7	A2-7	-0.8	5.1	B2-7	-0.8	14.5
A3-3	0.0	5.1	B3-3	2.4	3.4	GRID - A3 (1/2M2)			GRID - B3 (1/2M2)		
A3-4	1.6	1.7	B3-4	0.8	-9.7	A3-1	-0.8	18.9	B3-1	-1.6	20.3
A3-5	0.8	1.7	B3-5	1.6	9.1	A3-2	-0.8	23.4	B3-2	-1.6	17.4
A3-6	0.8	0.0	B3-6	0.0	2.9	A3-3	-0.8	4.0	B3-3	-1.6	19.4
A3-7	0.8	0.0	B3-7	-0.8	4.6	A3-4	-1.6	8.0	B3-4	-0.8	11.6
Completed 9-8-99			Completed 9-8-99			Completed 9-9-99			Completed 9-9-99		
Survey# 090899002			Survey# 090899002			Survey# 090999001			Survey# 090999001		

NOTE: Loose smear results are for 5 minute sample count times.

See Survey # 060898001 for results of fixed activity surveys.

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF - Room #2 Interior

All results are dpm/100cm2

Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045 Cal: 6-10-99

West Wall

South Wall

GRID - A1			GRID - B1			GRID - A1 (1/2M2)			GRID - B1 (1/2M2)		
Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta
A1-1	-0.8	-8.7	B1-1	-1.6	26.1	A1-1	-0.8	14.5	B1-1	-1.6	4.0
A1-2	0.0	26.1	B1-2	-1.6	8.7	A1-2	-0.8	5.8	B1-2	-1.6	11.4
A1-3	1.6	8.7	B1-3	-1.6	17.4	A1-3	0.8	11.6	B1-3	0.0	2.9
A1-4	-0.8	8.7	B1-4	-1.6	11.6	A1-4	-1.6	12.6	B1-4	-1.6	10.3
A1-5	-0.8	29.0	B1-5	-1.6	5.8	GRID - A2			GRID - B2		
A1-6	-0.8	11.6	B1-6	-0.8	11.6	A2-1	-0.8	19.4	B2-1	-1.6	9.1
A1-7	0.8	20.3	B1-7	-1.6	43.5	A2-2	0.8	20.6	B2-2	-1.6	8.6
GRID - A2			GRID - B2			A2-3	0.8	22.9	B2-3	-0.8	6.3
A2-1	-0.8	28.0	B2-1	0.0	23.2	A2-4	-0.8	17.7	B2-4	-1.6	6.3
A2-2	-0.8	23.4	B2-2	-0.8	26.1	A2-5	-1.6	20.0	B2-5	0.0	14.3
A2-3	-1.6	19.4	B2-3	-0.8	29.0	A2-6	0.8	28.6	B2-6	-1.6	13.7
A2-4	0.0	12.0	B2-4	-0.8	26.1	A2-7	-0.8	9.1	B2-7	-0.8	9.1
A2-5	0.8	47.4	B2-5	0.0	17.4	GRID - A3			GRID - B3		
A2-6	-0.8	21.1	B2-6	-1.6	20.3	A3-1	-0.8	5.1	B3-1	-1.6	3.4
A2-7	0.0	9.1	B2-7	-1.6	20.3	A3-2	-0.8	16.6	B3-2	-0.8	5.1
GRID - A3 (1/2M2)			GRID - B3 (1/2M2)			A3-3	-1.6	6.3	B3-3	-0.8	0.6
A3-1	-0.8	18.3	B3-1	-1.6	17.4	A3-4	-1.6	24.6	B3-4	-0.8	12.6
A3-2	-0.8	2.9	B3-2	0.0	11.6	A3-5	-1.6	4.0	B3-5	-0.8	18.9
A3-3	-1.6	21.1	B3-3	-0.8	2.9	A3-6	0.0	12.6	B3-6	0.0	4.6
A3-4	-0.8	23.4	B3-4	-0.8	8.7	A3-7	-0.8	22.9	B3-7	-1.6	18.9
Completed 9-9-99 Survey# 090999001			Completed 9-9-99 Survey# 090999001			Completed 9-9-99 Survey# 090999001			Completed 9-9-99 Survey# 090999001		

NOTE: Loose smear results are for 5 minute sample count times.

See Survey # 060898001 for results of fixed activity surveys.

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF - Room #2 Interior

All results are dpm/100cm2

Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045 Cal: 6-10-99

Floor

GRID - A1			GRID - B1			GRID - C1 (1/2M2)		
Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta
A1-1	0.0	5.7	B1-1	1.6	19.4	C1-1	2.4	24.0
A1-2	-0.8	14.3	B1-2	1.6	18.3	C1-2	0.8	36.6
A1-3	0.8	25.7	B1-3	-0.8	14.3	C1-3	0.0	40.0
A1-4	0.8	5.7	B1-4	0.0	10.3	C1-4	-0.8	24.6
A1-5	0.0	16.6	B1-5	2.4	29.7	GRID - C2 (1/2M2)		
A1-6	0.8	14.3	B1-6	0.0	22.3	C2-1	1.6	34.9
A1-7	0.8	36.6	B1-7	0.0	28.0	C2-2	0.0	20.6
GRID - A2			GRID - B2			C2-3	2.9	44.0
A2-1	-0.8	24.6	B2-1	0.0	23.4	C2-4	0.8	18.3
A2-2	0.8	24.0	B2-2	0.8	30.8	GRID - C3 (1/2M2)		
A2-3	1.7	16.6	B2-3	0.0	14.3	Data Point	Loose Alpha	Loose Beta
A2-4	-0.8	19.4	B2-4	-0.8	30.9	C3-1	0.8	29.7
A2-5	0.8	14.3	B2-5	0.8	8.0	C3-2	0.8	25.1
A2-6	0.8	26.3	B2-6	1.6	41.7	C3-3	1.6	29.1
A2-7	-0.8	12.0	B2-7	2.4	18.3	C3-4	2.4	25.1
GRID - A3 (1/2M2)			GRID - B3 (1/2M2)					
A3-1	-0.8	15.4	B3-1	0.0	14.9			
A3-2	0.8	20.6	B3-2	0.0	22.9			
A3-3	0.8	12.6	B3-3	0.0	8.0			
A3-4	0.0	21.1	B3-4	2.4	42.9			
Completed 9-10-99 Survey# 091099003			Completed 9-10-99 Survey# 091099003			Completed 9-10-99 Survey# 091099003		

NOTE: Loose smear results are for 5 minute sample count times.

See Survey # 060898001 for results of fixed activity surveys.

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF - Room #3 Interior - Ceiling

All results are dpm/100cm2

Lud Model -2224 s/n146714 w/ Lud 43-68 s/n PR126794	Cal: 8-1-99
Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045	Cal: 6-10-99

GRID - A1				
Data Point	Total Alpha	Total Beta	Loose Alpha	Loose Beta
A1-1	-6.3	133.3	1.6	8.7
A1-2	-6.3	20.0	0.8	31.9
A1-3	-6.3	106.7	1.6	-8.7
A1-4	0.0	33.3	0.8	17.4
A1-5	-6.3	106.7	0.0	26.1
A1-6	na	na	0.0	8.7
A1-7	na	na	3.2	8.7
GRID - A2				
A2-1	6.3	180.0	0.0	20.3
A2-2	0.0	93.3	0.0	14.5
A2-3	-6.3	106.7	1.6	5.8
A2-4	-6.3	180.0	-0.8	11.6
A2-5	-6.3	166.7	-0.8	29.0
A2-6	na	na	0.0	14.5
A2-7	na	na	0.0	17.4
GRID - A3 (1/2M2)				
A3-1	-6.3	73.3	0.0	11.6
A3-2	-6.3	86.7	-0.8	31.9
A3-3	6.3	33.3	-0.8	-8.7
A3-4	na	na	0.0	20.3
GRID - B1				
B1-1	6.3	20.0	0.0	5.8
B1-2	6.3	106.7	0.0	12.6
B1-3	0.0	20.0	0.0	14.5
B1-4	0.0	166.7	0.0	11.6
B1-5	0.0	60.0	0.0	17.1
B1-6	na	na	1.6	23.4
B1-7	na	na	2.4	8.6

GRID - B2				
Data Point	Total Alpha	Total Beta	Loose Alpha	Loose Beta
B2-1	0.0	186.7	-0.8	24.0
B2-2	0.0	166.7	0.8	16.6
B2-3	0.0	146.7	0.0	26.9
B2-4	-6.3	73.3	-0.0	17.1
B2-5	-6.3	113.3	-0.8	12.6
B2-6	na	na	1.6	22.9
B2-7	na	na	-0.8	6.3
GRID - B3 (1/2M2)				
B3-1	0.0	106.7	0.0	20.0
B3-2	-6.3	113.3	0.0	9.1
B3-3	-6.3	73.3	0.8	8.6
B3-4	na	na	-0.8	25.7
GRID - C1 (1/2M2)				
C1-1	-6.3	26.7	-0.8	5.1
C1-2	-6.3	86.7	0.0	13.7
C1-3	-6.3	40.0	1.6	8.0
C1-4	na	na	1.6	32.0
GRID - C2 (1/2M2)				
C2-1	0.0	20.0	0.0	17.1
C2-2	-6.3	160.0	0.0	1.1
C2-3	0.0	153.3	-0.8	26.3
C1-4	na	na	-0.8	5.7
GRID - C3 (1/M2)				
C3-1	-6.3	66.7	0.0	29.1
C3-2	-6.3	166.7	-0.8	6.9
C3-3	-6.3	140.0	0.8	13.1
C3-4	na	na	-0.8	14.9
Exhaust Fan Top and Screen				
Data Point	Total Alpha	Total Beta	Loose Alpha	Loose Beta
EF-1	18.8	66.7	0.8	16.0
EF-2	-6.3	326.7	-0.8	6.3
EF-3	0.0	266.7	-0.8	12.6

NOTE: Loose smear results are for 5 minute sample count times.

Completed 9-10-99
Survey# 091099003

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF - Room #3 Interior

All results are dpm/100cm2

Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045 Cal: 6-10-99

East Wall

North Wall

GRID - A1 (1/2M2)			GRID - B1 (1/2M2)			GRID - A1			GRID - B1		
Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta
A1-1	0.8	-2.9	B1-1	0.0	-3.4	A1-1	-0.8	2.3	B1-1	-0.8	-1.7
A1-2	1.6	12.0	B1-2	0.8	5.1	A1-2	0.0	1.7	B1-2	0.0	6.3
A1-3	0.8	5.7	B1-3	-0.8	-5.7	A1-3	-0.8	13.1	B1-3	-0.8	0.6
A1-4	0.8	1.1	B1-4	-0.8	-0.6	A1-4	-0.8	-2.9	B1-4	0.0	-13.7
GRID - A2			GRID - B2			A1-5	0.8	-6.9	B1-5	0.8	6.3
A2-1	2.4	21.7	B2-1	0.0	0.6	A1-6	-0.8	7.4	B1-6	-0.8	6.9
A2-2	0.0	9.1	B2-2	0.0	16.0	A1-7	2.4	6.9	B1-7	0.0	-8.9
A2-3	0.0	5.1	B2-3	0.0	-14.9	GRID - A2			GRID - B2		
A2-4	0.0	16.0	B2-4	0.0	-6.9	A2-1	1.6	-21.1	B2-1	0.0	-9.7
A2-5	-0.8	16.6	B2-5	-0.8	-4.6	A2-2	0.8	-13.1	B2-2	0.8	6.3
A2-6	0.0	6.9	B2-6	-0.8	-4.0	A2-3	0.0	-4.0	B2-3	-0.8	-12.6
A2-7	0.0	2.9	B2-7	0.0	-8.0	A2-4	1.6	-2.3	B2-4	-0.8	6.9
GRID - A3			GRID - B3			A2-5	-0.8	13.7	B2-5	-0.8	-2.9
A3-1	-0.8	17.1	B3-1	0.8	9.7	A2-6	0.0	-9.1	B2-6	-0.8	12.6
A3-2	0.0	-7.4	B3-2	0.8	-17.7	A2-7	1.6	-6.3	B2-7	0.0	16.0
A3-3	0.0	0.6	B3-3	0.0	-12.0	GRID - A3 (1/2M2)			GRID - B3 (1/2M2)		
A3-4	-0.8	2.9	B3-4	0.0	22.9	A3-1	0.0	-4.6	B3-1	-0.8	8.6
A3-5	0.0	-4.6	B3-5	0.0	-2.9	A3-2	0.0	-4.0	B3-2	-0.8	-4.0
A3-6	-0.8	-4.6	B3-6	-0.8	5.1	A3-3	-0.8	4.0	B3-3	-0.8	5.1
A3-7	0.0	0.0	B3-7	0.0	-9.7	A3-4	1.6	-13.7	B3-4	0.0	-1.1
Completed 9-13-99			Completed 9-13-99			Completed 9-13-99			Completed 9-13-99		
Survey# 091399005			Survey# 091399005			Survey# 091399005			Survey# 091399005		

NOTE: Loose smear results are for 5 minute sample count times.

See survey # 060998004 for results of fixed activity surveys.

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF - Room#3 Interior

All results are dpm/100cm2

Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045 Cal: 6-10-99

West Wall

South Wall

GRID - A1			GRID - B1			GRID - A1 (1/2M2)			GRID - B1 (1/2M2)		
Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta
A1-1	-0.8	1.7	B1-1	0.8	1.1	A1-1	0.8	-10.3	B1-1	2.4	-8.0
A1-2	1.6	8.6	B1-2	-0.8	-6.9	A1-2	-0.8	-9.1	B1-2	-0.8	-16.6
A1-3	0.0	-8.6	B1-3	0.0	10.3	A1-3	-0.8	1.7	B1-3	-0.8	-3.4
A1-4	0.8	-1.1	B1-4	0.8	-0.6	A1-4	-0.8	-10.9	B1-4	0.0	0.0
A1-5	0.0	-16.6	B1-5	-0.8	12.0	GRID - A2			GRID - B2		
A1-6	0.8	-10.3	B1-6	-0.8	-0.6	A2-1	0.0	-2.9	B2-1	0.0	-10.9
A1-7	-0.8	0.6	B1-7	-0.8	1.1	A2-2	0.8	-10.9	B2-2	0.0	4.0
GRID - A2			GRID - B2			A2-3	0.0	2.4	B2-3	0.0	-3.4
A2-1	0.8	-8.0	B2-1	-0.8	2.3	A2-4	0.8	-8.0	B2-4	0.0	0.6
A2-2	0.8	11.4	B2-2	0.0	10.3	A2-5	-0.8	5.1	B2-5	0.0	-16.6
A2-3	0.0	0.0	B2-3	0.0	-5.7	A2-6	0.0	-0.6	B2-6	-0.8	0.0
A2-4	-0.8	4.6	B2-4	-0.8	6.9	A2-7	0.8	-3.4	B2-7	1.6	18.9
A2-5	-0.8	-5.1	B2-5	0.0	2.3	GRID - A3			GRID - B3		
A2-6	0.0	21.1	B2-6	-0.8	-9.7	A3-1	0.8	-4.0	B3-1	-0.8	-18.3
A2-7	1.6	-12.6	B2-7	-0.8	-0.6	A3-2	0.8	-8.9	B3-2	1.6	-10.9
GRID - A3 (1/2M2)			GRID - B3 (1/2M2)			A3-3	0.8	-11.4	B3-3	0.0	-8.9
A3-1	0.0	24.0	B3-1	0.0	1.7	A3-4	-0.8	22.9	B3-4	-0.8	1.7
A3-2	0.8	-2.9	B3-2	-0.8	-6.9	A3-5	2.4	-8.0	B3-5	-0.8	-4.6
A3-3	-0.8	14.9	B3-3	-0.8	10.3	A3-6	0.8	-9.1	B3-6	0.8	20.0
A3-4	-0.8	5.1	B3-4	-0.8	4.0	A3-7	1.6	16.6	B3-7	-0.8	8.0
Completed 9-14-99			Completed 9-14-99			Completed 9-14-99			Completed 9-14-99		
Survey# 091499006			Survey# 091499006			Survey# 091499006			Survey# 091499006		

NOTE: Loose smear results are for 5 minute sample count times.

See survey # 060998004 for results of fixed activity surveys.

Mixed Waste Storage Facility - LEHR / U.C. Davis - Project #774079

Release for Unrestricted Use Survey Results / Prepared by: David W. Duffey - IT Group

MWSF - Room #3 Interior

All results are dpm/100cm2

Lud Model -2929 s/n126145 w/ Lud 43-10-1 s/n PR129045 Cal: 6-10-99

Floor

GRID - A1			GRID - B1			GRID - C1 (1/2M2)		
Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta	Data Point	Loose Alpha	Loose Beta
A1-1	2.4	11.4	B1-1	-0.8	17.7	C1-1	4.8	33.7
A1-2	2.4	36.0	B1-2	3.2	26.3	C1-2	3.2	28.6
A1-3	1.6	36.6	B1-3	0.8	15.4	C1-3	1.6	8.6
A1-4	0.8	4.6	B1-4	-0.8	27.4	C1-4	0.8	31.4
A1-5	1.6	16.0	B1-5	2.4	26.3	GRID - C2 (1/2M2)		
A1-6	0.0	17.1	B1-6	3.2	21.7	C2-1	2.9	26.1
A1-7	0.8	20.6	B1-7	0.0	10.9	C2-2	2.4	25.7
GRID - A2			GRID - B2			C2-3	0.0	17.1
A2-1	0.0	26.3	B2-1	0.8	28.0	C2-4	0.8	33.1
A2-2	1.6	28.0	B2-2	0.0	41.1	GRID - C3 (1/2M2)		
A2-3	0.8	20.0	B2-3	0.8	25.1	C3-1	4.0	18.3
A2-4	1.6	25.7	B2-4	3.2	26.3	C3-2	0.8	14.9
A2-5	0.8	24.6	B2-5	1.6	13.7	C3-3	0.8	16.6
A2-6	0.8	24.0	B2-6	0.8	13.7	C3-4	0.8	33.7
A2-7	0.8	27.4	B2-7	0.0	25.7			
GRID - A3 (1/2M2)			GRID - B3 (1/2M2)					
A3-1	2.4	20.6	B3-1	0.8	40.6			
A3-2	2.4	21.7	B3-2	-0.8	18.9			
A3-3	5.0	26.3	B3-3	1.6	28.0			
A3-4	0.8	16.0	B3-4	-0.8	34.3			
Completed 9-15-99 Survey# 091599001			Completed 9-15-99 Survey# 091599001			Completed 9-15-99 Survey# 091599001		

NOTE: Loose smear results are for 5 minute sample count times.

See Survey # 06098004 results of fixed activity surveys.

**Daily Instrument Check Sheet
Radiation Monitor Instruments**

α

PROJECT NAME/# LEHR RESTORATION / 774079

Instrument Type / SN: Luo-2224 / 146714

Technician D.W. DUFFY

Probe Type / SN: Luo 43-68 / PR12674

Source Type / # TH-330 / 2041-95

Calibrated: 8/19/99 due 2/19/00

Source Activity 18,700 dpm

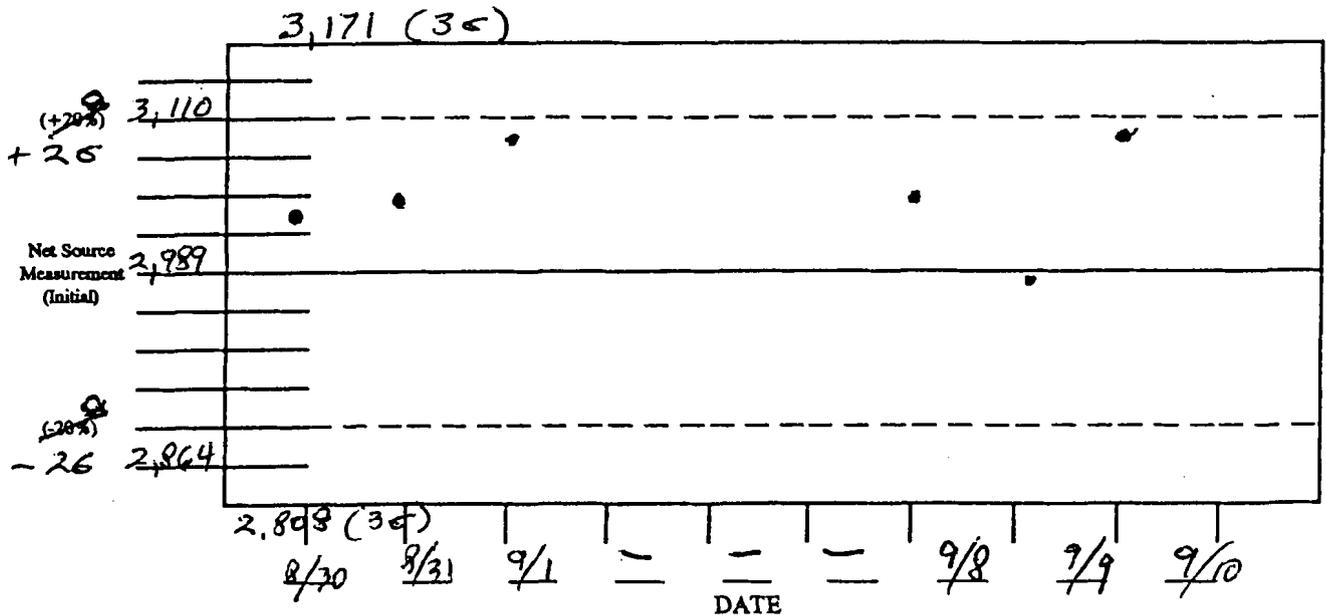
* Initial Source Measurement (cnts or mrem/hr): 2,989.4 (+20%) ^{8/27/99} 3,110.4 (-20%) ^{9/2/99} 2,868.4
+25 -25

Date	Calibration Check (sat / unsat)	Battery Check (sat / unsat)	Background Measurement (cnts or mrem/hr)	Net Source Measurement (cnts or mrem/hr)	Bkg; Net Results (sat / unsat)	Technician Signature	Remarks or Comments Adjustments, Corrective Actions, etc.
8/30/99	SAT	SAT	0.5	3,071	SAT	<i>[Signature]</i>	
8/31/99	SAT	SAT	0	3,068	SAT	<i>[Signature]</i>	
9/1/99	SAT	SAT	0	3,092	SAT	<i>[Signature]</i>	
9/2/99	NOT	USED	<i>[Signature]</i>				
9/3/99	NOT	USED	<i>[Signature]</i>				
9/7/99	NOT	USED	<i>[Signature]</i>				
9/8/99	SAT	SAT	0	3,050	SAT	<i>[Signature]</i>	
9/9/99	SAT	SAT	0	2,981	SAT	<i>[Signature]</i>	
9/10/99	SAT	SAT	1	3,006	SAT	<i>[Signature]</i>	

* SOURCE LETTERING
UPSIDE DOWN

RCS Review *[Signature]* 10/1/99
Signature / Date

CONTROL GRAPH



α

INSTRUMENT EFFICIENCY

Project: 774079 Date/Time: 8/30/99 00800
 Instrument: LM-2224 Serial #: 146714
 Source Ser.#: 2041-95 / S-13 Activity: 18,700 dpm (TH-230)
 Performed By: DAVID W. DUFFY

Background Determination

DETERMINE AVERAGE BACKGROUND COUNT RATE

Background Count Time: 1 MIN

Background: $\bar{C}_b = \frac{1}{30} \sum C_b$ $\dot{C}_b = \frac{C_b}{t}$

<u>60</u>	<u>1</u>	<u>0</u>	<u>0</u>	<u>1</u>	<u>1</u>
<u>0</u>	<u>0</u>	<u>1</u>	<u>2</u>	<u>0</u>	<u>0</u>
<u>0</u>	<u>0</u>	<u>2</u>	<u>0</u>	<u>1</u>	<u>0</u>
<u>0</u>	<u>0</u>	<u>2</u>	<u>1</u>	<u>1</u>	<u>0</u>
<u>1</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>	<u>0</u>

$\bar{C}_b = \underline{0.5}$

$\dot{C}_b = \underline{0.5}$

Source Determination

DETERMINE AVERAGE SOURCE COUNT RATE

Source Count Time: 1 MIN

Source Counts: $\bar{C}_s = \frac{1}{30} \sum C_s$ $\dot{C}_s = \frac{C_s}{t}$

<u>2,954</u>	<u>2,949</u>	<u>3,048</u>	<u>2,927</u>	<u>3,052</u>	<u>2,960</u>
<u>2,983</u>	<u>2,953</u>	<u>3,053</u>	<u>3,046</u>	<u>2,932</u>	<u>3,032</u>
<u>2,950</u>	<u>2,994</u>	<u>3,041</u>	<u>3,053</u>	<u>2,970</u>	<u>2,943</u>
<u>3,026</u>	<u>3,019</u>	<u>3,039</u>	<u>3,062</u>	<u>3,000</u>	<u>3,043</u>
<u>2,857</u>	<u>2,870</u>	<u>2,961</u>	<u>3,031</u>	<u>2,877</u>	<u>3,072</u>

$\bar{C}_s = \underline{2,989.9}$ $\dot{C}_s = \underline{2,989.9}$ $\dot{C}_n = \underline{2,989.4}$

$\dot{C}_n = \dot{C}_s - \dot{C}_b$

Efficiency Determination

DETERMINE INSTRUMENT EFFICIENCY

$E_{II} = \underline{0.159}$ CF = 6.26

$E_{eff} = \frac{\dot{C}_n}{A_c}$ CF = $\frac{1}{E_{eff}}$

INSTRUMENT MDA and LLD

DETERMINE LOWER LIMIT OF DETECTION

$$LLD = 2.71 + 4.65\sqrt{C_b t}$$

$$LLD = \underline{5.998}$$

DETERMINE MINIMUM DETECTABLE ACTIVITY

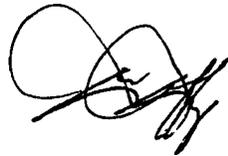
$$MDA = \frac{LLD}{(E_{ff}) (t) (Quantity)}$$

$$MDA = \underline{37.7}$$

$$R.F. = \frac{S}{\sqrt{R}}$$

$$S = 60.52$$

$$R.F. = \frac{60.52}{\sqrt{2,989.4}} = 1.106$$

 8/30/99

**Daily Instrument Check Sheet
Radiation Monitor Instruments**

B

PROJECT NAME/# LEHR RESTORATION/774079

Instrument Type / SN: LVD-2224/1416714

Technician D.W. DUFFEY

Probe Type / SN: LVD 43-68/PR126794

Source Type / # SR-90/2040-95

Calibrated: 8/19/99 due 2/19/00

Source Activity 20,600 dpm

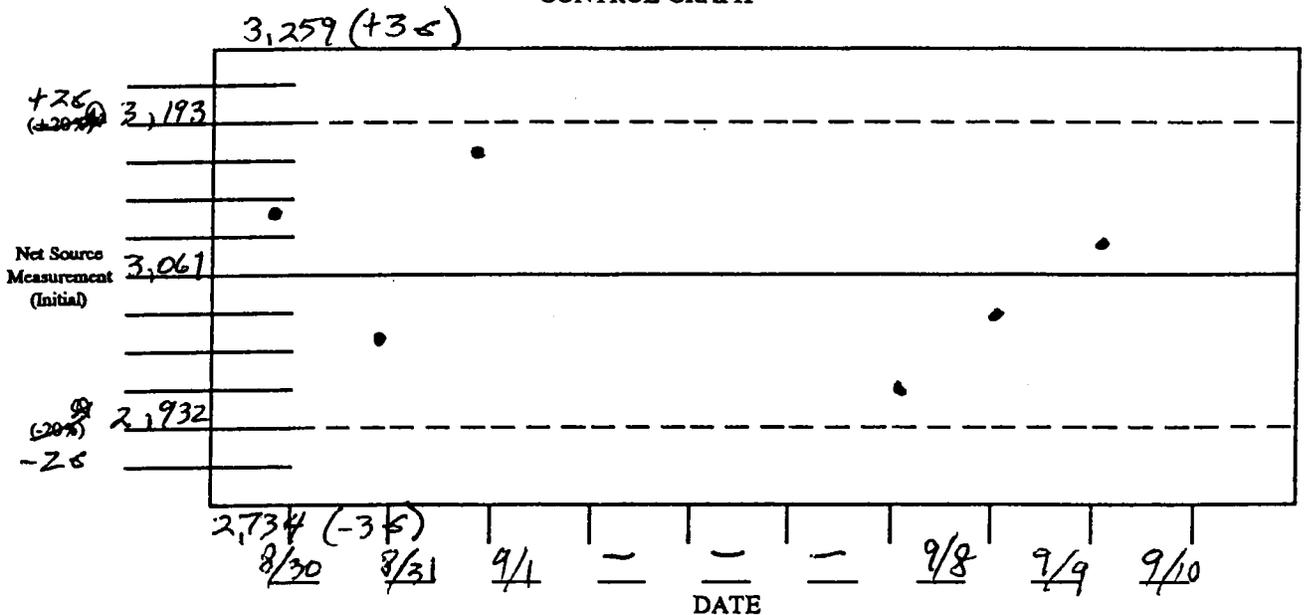
* Initial Source Measurement (cnts or mrem/hr): 3,060.8 ^{8/30/99} (+26%) 3,192.8 ^{8/31/99} (-20%) 2,931.8
+26 -20

Date	Calibration Check (sat / unsat)	Battery Check (sat / unsat)	Background Measurement (cnts or mrem/hr)	Net Source Measurement (cnts or mrem/hr)	Bkg; Net Results (sat / unsat)	Technician Signature	Remarks or Comments Adjustments, Corrective Actions, etc.
8/30/99	SAT	SAT	60	3,134	SAT	<i>[Signature]</i>	
8/31/99	SAT	SAT	65	3,017	SAT	<i>[Signature]</i>	
9/1/99	SAT	SAT	44	3,174	SAT	<i>[Signature]</i>	
9/2/99	NOT USED		<i>[Signature]</i>				
9/3/99	NOT USED		<i>[Signature]</i>				
9/7/99	NOT USED		<i>[Signature]</i>				
9/8/99	SAT	SAT	62	2,964	SAT	<i>[Signature]</i>	
9/9/99	SAT	SAT	61	3,031	SAT	<i>[Signature]</i>	
9/10/99	SAT	SAT	72	3,077	SAT	<i>[Signature]</i>	

* SOURCE LETTERING UP/SLIDE DOWN

RCS Review *[Signature]* 10/1/99
 Signature / Date

CONTROL GRAPH



INSTRUMENT EFFICIENCY

Project: 774079 Date/Time: 8/30/99 @ 0900
 Instrument: LMD-2224 Serial #: 146714
 Source Ser.#: 2040-95/5-15 Activity: 20,600 dpm (SR-90)
 Performed By: DAVID W. DUFFY (For ~~SR-90~~ 8/30/99)

Background Determination

DETERMINE AVERAGE BACKGROUND COUNT RATE

Background Count Time: 1 MIN

Background:
$$\bar{C}_b = \frac{1}{30} \sum_{i=1}^{30} C_b \quad \dot{C}_b = \frac{\bar{C}_b}{t}$$

<u>59</u>	<u>64</u>	<u>61</u>	<u>65</u>	<u>59</u>	<u>52</u>
<u>55</u>	<u>56</u>	<u>65</u>	<u>69</u>	<u>50</u>	<u>68</u>
<u>61</u>	<u>54</u>	<u>59</u>	<u>57</u>	<u>59</u>	<u>64</u>
<u>60</u>	<u>61</u>	<u>64</u>	<u>60</u>	<u>56</u>	<u>62</u>
<u>51</u>	<u>54</u>	<u>62</u>	<u>76</u>	<u>60</u>	<u>61</u>

$\bar{C}_b = \underline{60.1} \quad \dot{C}_b = \underline{60.1}$

Source Determination

DETERMINE AVERAGE SOURCE COUNT RATE

Source Count Time: 1 MIN

Source Counts:
$$\bar{C}_s = \frac{1}{30} \sum_{i=1}^{30} C_s \quad \dot{C}_s = \frac{\bar{C}_s}{t}$$

<u>3,107</u>	<u>3,076</u>	<u>3,090</u>	<u>2,984</u>	<u>3,093</u>	<u>3,183</u>
<u>3,203</u>	<u>3,131</u>	<u>3,067</u>	<u>3,140</u>	<u>3,155</u>	<u>3,030</u>
<u>3,232</u>	<u>3,173</u>	<u>3,203</u>	<u>3,168</u>	<u>3,004</u>	<u>3,213</u>
<u>3,099</u>	<u>3,132</u>	<u>3,176</u>	<u>3,142</u>	<u>3,160</u>	<u>3,134</u>
<u>3,057</u>	<u>3,130</u>	<u>3,084</u>	<u>3,171</u>	<u>3,111</u>	<u>2,979</u>

$\bar{C}_s = \underline{3,120.9} \quad \dot{C}_s = \underline{3,120.9} \quad \dot{C}_n = \underline{3,060.8} \quad \dot{C}_n = \dot{C}_s - \dot{C}_b$

Efficiency Determination

DETERMINE INSTRUMENT EFFICIENCY

$E_{ff} = \underline{0.148} \quad CF = \underline{0.73}$

$E_{ff} = \frac{\dot{C}_n}{A_c} \quad CF = \frac{1}{E_{ff}}$

INSTRUMENT MDA and LLD

DETERMINE LOWER LIMIT OF DETECTION

$$LLD = 2.71 + 4.65\sqrt{C_b t}$$

$$LLD = \underline{38.76}$$

DETERMINE MINIMUM DETECTABLE ACTIVITY

$$MDA = \frac{LLD}{(E_{ff}) (t) (Quantity)}$$

$$MDA = \underline{261.9}$$

$$R.F. = \frac{\sigma}{\sqrt{x}}$$

$$\sigma = 66.0$$

$$R.F. = \frac{66.0}{\sqrt{3,120.9}} = 1.18$$

 8/30/99



CONTROL CHART

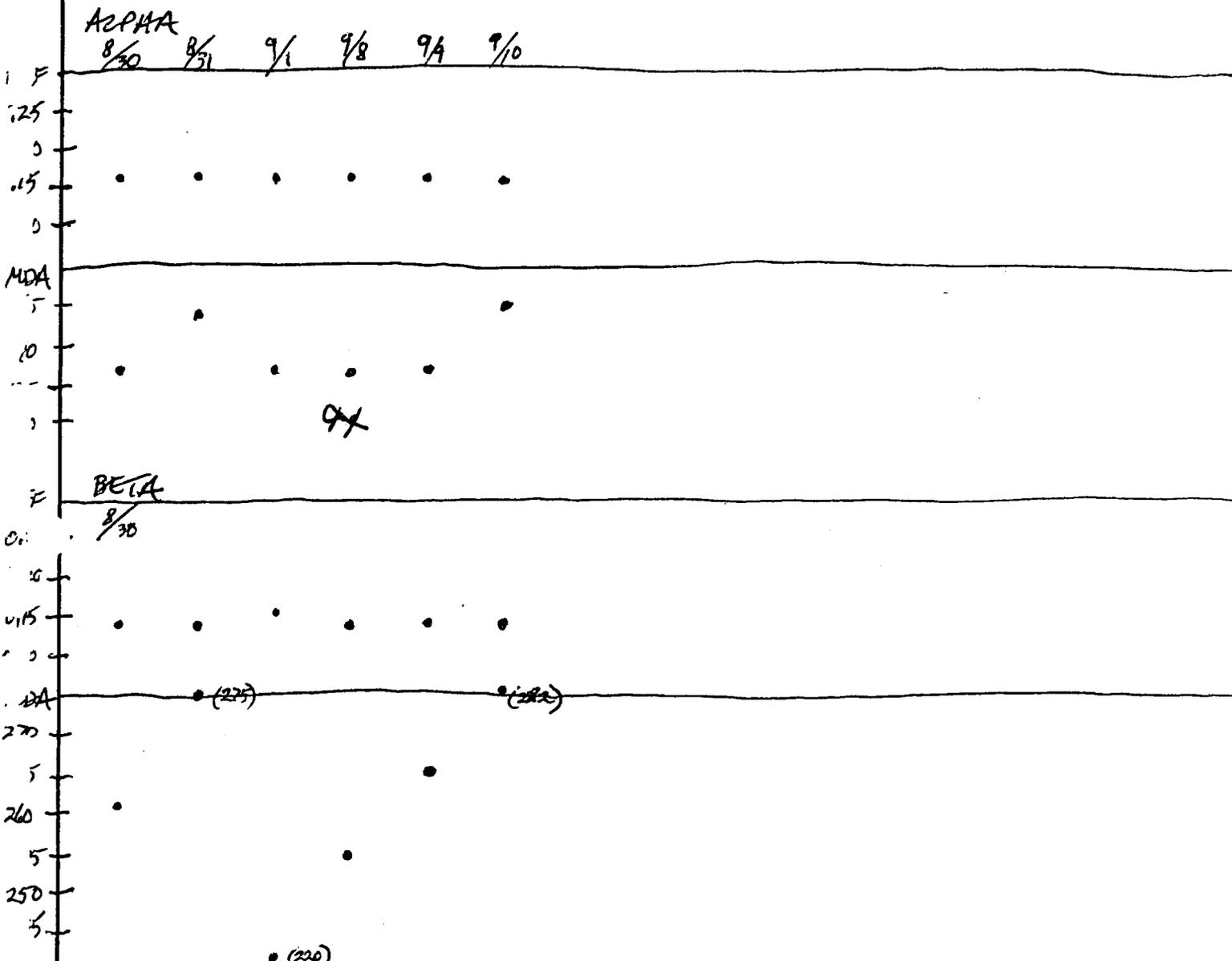
DAILY LOG	DATE	8	30	99
	NO.			
	SHEET	1 OF 1		

FIELD ACTIVITY DAILY LOG

PROJECT NAME LEHR RESTORATION PROJECT NO. 774079

FIELD ACTIVITY SUBJECT: Lup-2324 *146714 EFF & MDA TRENDS

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:



VISITORS ON SITE:	CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS.
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WEATHER CONDITIONS:	IMPORTANT TELEPHONE CALLS:
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IT PERSONNEL ON SITE:

SIGNATURE  DATE: 9/21/99

Certificate of Calibration

Voltage Plateau

Environmental Restoration Group, Inc.
 12809 Arroyo de Vista NE
 Albuquerque, NM 87111
 (505) - 298 - 4224

Detector Mfg.: Lucium Model: 43-68 Serial No.: PR 126794
 Counter Mfg.: Lucium Model: 2224 Serial No.: 146714
 Counter Input Sensitivity: (Alpha) 130 mV (Beta) 4 mV
 Temp.: 80 F Rel. Humidity 56 % Bar. Pressure 26.8 in. of Hg

Alpha Source: Th-230 Activity: 26,400 dpm Serial No.: 92TH4700933
 Geometry: ± 3 mm from face
 Comments:

Beta Source: Tc-99 Activity: 22,100 dpm Serial No.: 97 TC4701286
 Geometry: ± 3 mm from face
 Comments: of detector

Count Time: ONE minute(s)

High Voltage	Alpha Source Counts		Beta Source Counts		Background Counts	
	Alpha	Beta	Alpha	Beta	Alpha	Beta
1400	2463	1690	1	1849	1	20
1450	3233	1767	0	2838	0	62
1500	4218	1876	2	4710	0	86
1550	4893	2052	1	5623	2	161
1600	5279	2091	6	5749	1	301

Recommended Operating Voltage: 1550 volts

Calibrated By: Kenneth K. Bahr

Calibration Date: 8/19/99

Calibration Due: 2/19/00

Reviewed By: Patricia Bahr

Date: 8-19-99

Certificate of Calibration

Environmental Restoration Group, Inc.
 12809 Arroyo De Vista
 Albuquerque, NM 87111
 (505) - 298 - 4224

Manufacturer: Ludlum Model: 2224 Serial No.: 146714
 All Ranges Calibrated Electronically; Ludlum Pulser Generator S.N. 97747
 Temp.: 80 F Rel. Humidity 5-6 % Bar. Pressure 26.5 in. of Hg

FUNCTION CHECKS:

Reset Audio Window Operation Mechanical Battery
 High Voltage 500v 1000v 1500v

Instrument found within tolerance (+/- 10%) YES NO

COMMENTS:

*B threshold = 4 mV
 B window = 120 mV
 L threshold = 130 mV*

Reference Setting	Ratemeter	Instrument "As found reading"
400 Kcpm	400K	± 60%
100 Kcpm	100K	
40 Kcpm	40K	
10 Kcpm	10K	
4 Kcpm	4K	
1 Kcpm	1K	
400 cpm	400	
100 cpm	100	

Reference Setting	Digital Readout	Log Scale	Instrument Received
400 Kcpm	399667	N/A	N/A
40 Kcpm	40058	↓	↓
4 Kcpm	3996	↓	↓
400 cpm	399	↓	↓

Calibrated By: Kenneth R. Bahr Calibration Date: 8/19/89

Calibration Due: 2/19/90

Reviewed By: Patricia Bahr Date: 8-19-89

**Daily Instrument Check Sheet
Radiation Monitor Instruments**

2

PROJECT NAME/# LEHR RESTORATION / 774079

Instrument Type / SN: LUD-2929 / 126145

Technician D. W. DUFFY

Probe Type / SN: LUD 43-10-1 / PR 129045

Source Type / # TH-230 / 1888-94

Calibrated: 6/10/99 due 6/10/00

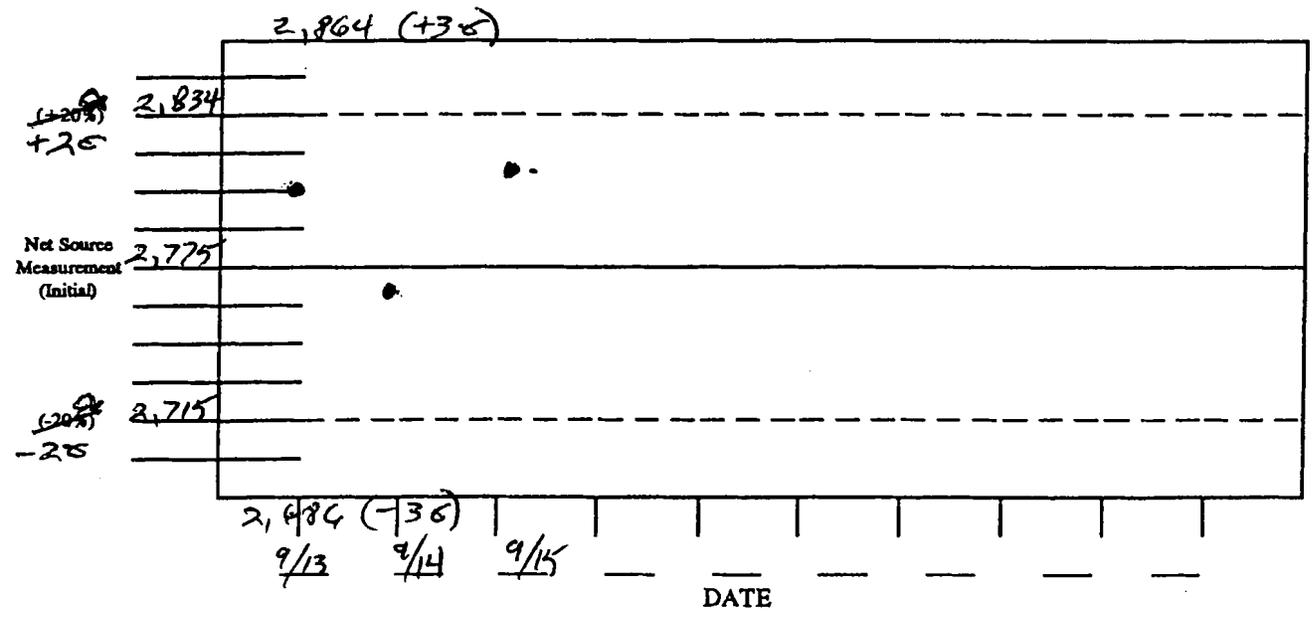
Source Activity 11,300 dpm

Initial Source Measurement (cnts or mrem/hr): 2,774.5 cpm ^{9/13/99} ~~(+20%)~~ 2,834 ^{9/13/99} ~~(-20%)~~ 2,715
⁺²⁰ ~~(-20)~~

Date	Calibration Check (sat / unsat)	Battery Check (sat / unsat)	Background Measurement (cnts or mrem/hr)	Net Source Measurement (cnts or mrem/hr)	Bkg; Net Results (sat / unsat)	Technician Signature	Remarks or Comments Adjustments, Corrective Actions, etc.
9/13/99	SAT	N/A	0.2	2,799	SAT	<i>[Signature]</i>	
9/14/99	SAT	N/A	0.2	2,766	SAT	<i>[Signature]</i>	
9/15/99	SAT	N/A	0.2	2,820	SAT	<i>[Signature]</i>	

RCS Review *[Signature]* 10/1/99
Signature / Date

CONTROL GRAPH



Daily Instrument Check Sheet
Radiation Monitor Instruments

α

PROJECT NAME/ # LEHR RESTORATION / 774079

Instrument Type / SN: LMD 2929 / 12-6145

Technician D.W. DUFFEY

Probe Type / SN: LMD 43-10-1 / PR129045

Source Type / # TU-230 / 1888-94

Calibrated: 6/10/99 due 6/10/00

Source Activity 11,300 dpm

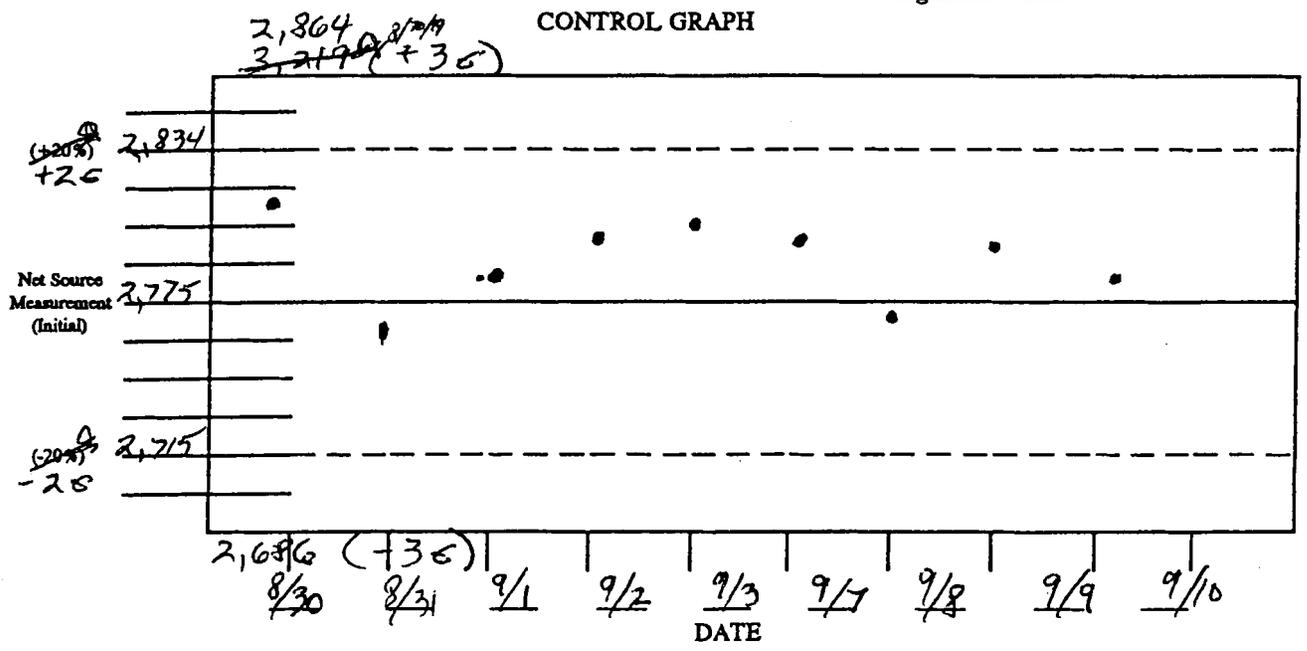
FOR 5 MIN COUNT TIME

Initial Source Measurement (cnts or mrem/hr): 2,774.5 cpm (+20%) 2,834 2,715
8/30/99 8/30/99
+25 -25

Date	Calibration Check (sat / unsat)	Battery Check (sat / unsat)	Background Measurement (cnts or mrem/hr)	Net Source Measurement (cnts or mrem/hr)	Bkg; Net Results (sat / unsat)	Technician Signature	Remarks or Comments Adjustments, Corrective Actions, etc.
8/30/99	SAT	N/A	0.1	2827	SAT	[Signature]	
8/31/99	SAT	N/A	0	2762	SAT	[Signature]	
9/1/99	SAT	N/A	0	2789	SAT	[Signature]	
9/2/99	SAT	N/A	0.2	2804	SAT	[Signature]	
9/3/99	SAT	N/A	0.2	2820	SAT	[Signature]	
9/7/99	SAT	N/A	0.2	2816	SAT	[Signature]	
9/8/99	SAT	N/A	0.2	2756	SAT	[Signature]	
9/9/99	SAT	N/A	0.4	2797	SAT	[Signature]	
9/10/99	SAT	N/A	0.2	2782	SAT	[Signature]	

RCS Review [Signature] 10/1/99
Signature / Date

CONTROL GRAPH



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INSTRUMENT EFFICIENCY

Project: 774079 Date/Time: 8/30/99 @ 0730
 Instrument: Geo 2929 Serial #: 126145
 Source Ser.#: 1888-94 Activity: 11,300 dpm (Tl-230)
 Performed By: David W. Duffey

Background Determination

DETERMINE AVERAGE BACKGROUND COUNT RATE

Background Count Time: 5 MIN

Background: $\bar{C}_b = \frac{1}{30} \sum C_b$ $\dot{C}_b = \frac{\bar{C}_b}{t}$
 * READINGS ARE CPM

<u>0.4</u>	<u>0.4</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
<u>0.0</u>	<u>0.2</u>	<u>0.0</u>	<u>0.4</u>	<u>0.0</u>	<u>0.0</u>
<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>	<u>0.4</u>	<u>0.0</u>
<u>0.2</u>	<u>0.2</u>	<u>0.2</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>
<u>0.0</u>	<u>0.0</u>	<u>0.6</u>	<u>0.0</u>	<u>0.0</u>	<u>0.0</u>

$\bar{C}_b = 0.1$ * $\dot{C}_b = 0.1$

Source Determination

DETERMINE AVERAGE SOURCE COUNT RATE

Source Count Time: 5 MIN

Source Counts: $\bar{C}_s = \frac{1}{30} \sum C_s$ $\dot{C}_s = \frac{\bar{C}_s}{t}$

<u>13,818</u>	<u>13,844</u>	<u>13,861</u>	<u>13,931</u>	<u>13,920</u>	<u>13,483</u>
<u>13,685</u>	<u>13,880</u>	<u>14,003</u>	<u>14,039</u>	<u>13,990</u>	<u>13,940</u>
<u>13,744</u>	<u>13,873</u>	<u>13,680</u>	<u>13,566</u>	<u>13,843</u>	<u>13,998</u>
<u>14,047</u>	<u>13,872</u>	<u>13,844</u>	<u>13,842</u>	<u>13,814</u>	<u>13,673</u>
<u>13,878</u>	<u>14,069</u>	<u>13,961</u>	<u>13,968</u>	<u>13,981</u>	<u>14,137</u>

$\bar{C}_s = 13,872.8$ $\dot{C}_s = 2,774.6$ $\dot{C}_n = 2,774.5$ $\dot{C}_n = \dot{C}_s - \dot{C}_b$

Efficiency Determination

DETERMINE INSTRUMENT EFFICIENCY

$E_{if} = 0.246$ CF = 4.07

$$E_{if} = \frac{\dot{C}_n}{A_c} \quad CF = \frac{1}{E_{if}}$$

INSTRUMENT MDA and LLD

DETERMINE LOWER LIMIT OF DETECTION

$$LLD = 2.71 + 4.65\sqrt{C_b t}$$

$$LLD = \underline{5.99}$$

DETERMINE MINIMUM DETECTABLE ACTIVITY

$$MDA = \frac{LLD}{(E_{ff}) (t) (Quantity)}$$

$$MDA = \frac{\overset{8/30/99}{\cancel{24.3}}}{4.9}$$

$$R.F. = \frac{5}{\sqrt{x}} \quad \sigma = 148.1 \quad R.F. = \frac{148.1}{\sqrt{13,872.8}} \quad R.F. = 1.26$$

 8/30/99

Daily Instrument Check Sheet
Radiation Monitor Instruments

13

PROJECT NAME/# LEHR RESTORATION / 774079

Instrument Type / SN: L40-2928/126145

Technician D.W. Duffey

Probe Type / SN: L40 43-10-1 / PR 129045

Source Type / # SR-90 / 1887-94

Calibrated: 6 110 199 due 6 1101 00

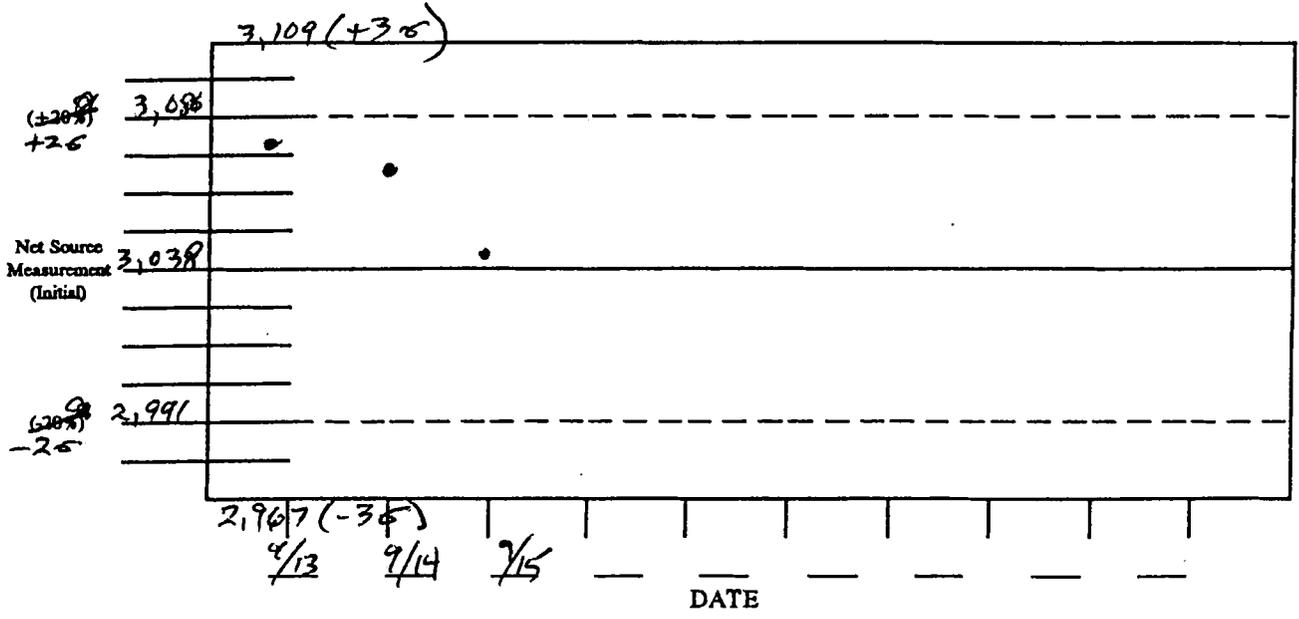
Source Activity 8,730 dpm

Initial Source Measurement (cnts or mrem/hr): 3,038 cpm (+20%) 3,086 2,991
For 5 min count
4/13/99 +20% 4/14/99 -20%
+20% -20%

Date	Calibration Check (sat / unsat)	Battery Check (sat / unsat)	Background Measurement (cnts or mrem/hr)	Net Source Measurement (cnts or mrem/hr)	Bkg; Net Results (sat / unsat)	Technician Signature	Remarks or Comments Adjustments, Corrective Actions, etc.
9/13/99	SAT	N/A	50	3076	SAT	<i>[Signature]</i>	
9/14/99	SAT	N/A	50	3054	SAT	<i>[Signature]</i>	
9/15/99	SAT	N/A	45	3042	SAT	<i>[Signature]</i>	
N/A							

RCS Review *[Signature]* 10/1/99
Signature / Date

CONTROL GRAPH



**Daily Instrument Check Sheet
Radiation Monitor Instruments**

B

PROJECT NAME/# LEHR RESTORATION / 774079

Instrument Type / SN: LUD-2929 / 126145

Technician D.W. DUFFEY

Probe Type / SN: LUD 43-10-1 / PR129045

Source Type / # SR-90 / 1887-94

Calibrated: 6/10/99 due 6/10/00

Source Activity 8,730 dpm

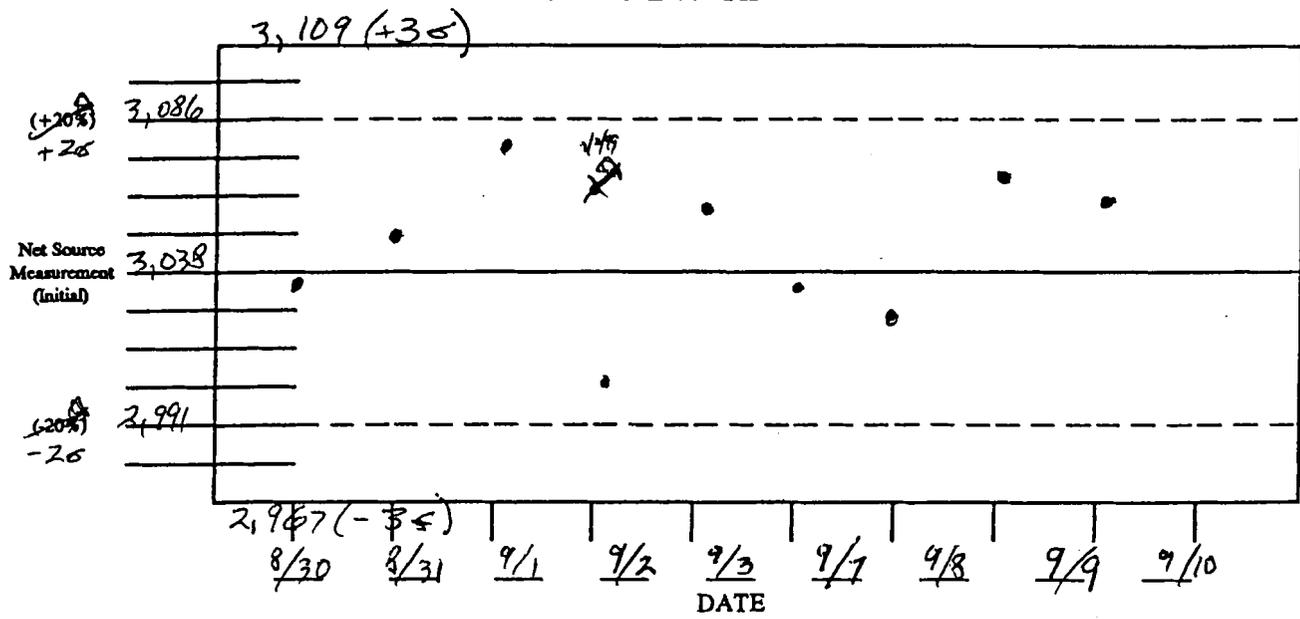
FOR 5 MIN COUNT

Initial Source Measurement (cnts or mrem/hr): 3,038 cpm ^{9/30/99} 3,086 ^{9/20/99} 2,991
(+20%) -20%
+25 -25

Date	Calibration Check (sat / unsat)	Battery Check (sat / unsat)	Background Measurement (cnts or mrem/hr)	Net Source Measurement (cnts or mrem/hr)	Bkg; Net Results (sat / unsat)	Technician Signature	Remarks or Comments Adjustments, Corrective Actions, etc.
8/30/99	SAT	N/A	56	3032	SAT	[Signature]	
8/31/99	SAT	N/A	52	3047	SAT	[Signature]	
9/1/99	SAT	N/A	54	3066	SAT	[Signature]	
9/2/99	SAT	N/A	50 47 ^{7/2/99}	3016	SAT	[Signature]	
9/3/99	SAT	N/A	50	3047	SAT	[Signature]	
9/7/99	SAT	N/A	54	3030	SAT	[Signature]	
9/8/99	SAT	N/A	49	3023	SAT	[Signature]	
9/9/99	SAT	N/A	46	3077	SAT	[Signature]	
9/10/99	SAT	N/A	44	3057	SAT	[Signature]	

RCS Review [Signature] 10/1/99
Signature / Date

CONTROL GRAPH



INSTRUMENT EFFICIENCY

Project: 774079 Date/Time: 8/30/99 @ 0730
 Instrument: Lucas 2929 Serial #: 126/45
 Source Ser.# 18871888-94 Activity: 41,200 @ 8,730dpm (Sr-90)
 Performed By: David W. Duffey

Background Determination

DETERMINE AVERAGE BACKGROUND COUNT RATE

Background Count Time: 5 min

Background: $\bar{C}_b = \frac{\sum_{i=1}^{30} C_b}{30}$ $\dot{C}_b = \frac{C_b}{t}$

* READINGS ARE CPM

<u>64.4</u>	<u>56.2</u>	<u>42.4</u>	<u>58.6</u>	<u>61.2</u>	<u>59.8</u>
<u>54.0</u>	<u>50.0</u>	<u>48.6</u>	<u>64.4</u>	<u>57.6</u>	<u>60.4</u>
<u>62.8</u>	<u>54.4</u>	<u>49.2</u>	<u>57.4</u>	<u>49.4</u>	<u>58.4</u>
<u>61.0</u>	<u>46.8</u>	<u>52.8</u>	<u>58.2</u>	<u>61.0</u>	<u>56.6</u>
<u>62.8</u>	<u>52.6</u>	<u>52.2</u>	<u>56.0</u>	<u>61.6</u>	<u>48.2</u>

$\bar{C}_b = \underline{56.0}$ * $\dot{C}_b = \underline{56.0}$

Source Determination

DETERMINE AVERAGE SOURCE COUNT RATE

Source Count Time: 5 min

Source Counts: $\bar{C}_s = \frac{\sum_{i=1}^{30} C_s}{30}$ $\dot{C}_s = \frac{C_s}{t}$

<u>15,694</u>	<u>15,468</u>	<u>15,396</u>	<u>15,370</u>	<u>15,682</u>	<u>15,574</u>
<u>15,316</u>	<u>15,323</u>	<u>15,406</u>	<u>15,444</u>	<u>15,484</u>	<u>15,623</u>
<u>15,541</u>	<u>15,354</u>	<u>15,533</u>	<u>15,523</u>	<u>15,354</u>	<u>15,523</u>
<u>15,380</u>	<u>15,181</u>	<u>15,511</u>	<u>15,425</u>	<u>15,351</u>	<u>15,705</u>
<u>15,428</u>	<u>15,442</u>	<u>15,549</u>	<u>15,456</u>	<u>15,438</u>	<u>15,511</u>

$\bar{C}_s = \underline{15,469.5}$ $\dot{C}_s = \underline{3,093.9}$ $\dot{C}_n = \underline{4,119.6}$ $\dot{C}_n = \dot{C}_s - \dot{C}_b$

Efficiency Determination

DETERMINE INSTRUMENT EFFICIENCY

$E_{ff} = \frac{0.35}{0.47}$

$CF = \frac{2.87}{2.12}$

$E_{ff} = \frac{\dot{C}_n}{A_c}$ $CF = \frac{1}{E_{ff}}$

INSTRUMENT MDA and LLD

DETERMINE LOWER LIMIT OF DETECTION

$$LLD = 2.71 + 4.65 \sqrt{\hat{C}_b t}$$

$$LLD = \underline{37.5}$$

DETERMINE MINIMUM DETECTABLE ACTIVITY

$$MDA = \frac{LLD}{(E_{eff}) (t) (Quantity)}$$

$$MDA = \frac{79.8^{8/20/99}}{107}$$

$$R.F. = \frac{\sigma}{\bar{X}}$$

$$\sigma = \frac{118.7}{23.74^{8/20/99}}$$

$$R.F. = \frac{118.7}{\sqrt{15,469.5}}$$

$$R.F. = 0.95$$

 8/30/99



**INTERNATIONAL
TECHNOLOGY
CORPORATION**

CONTROL CHART

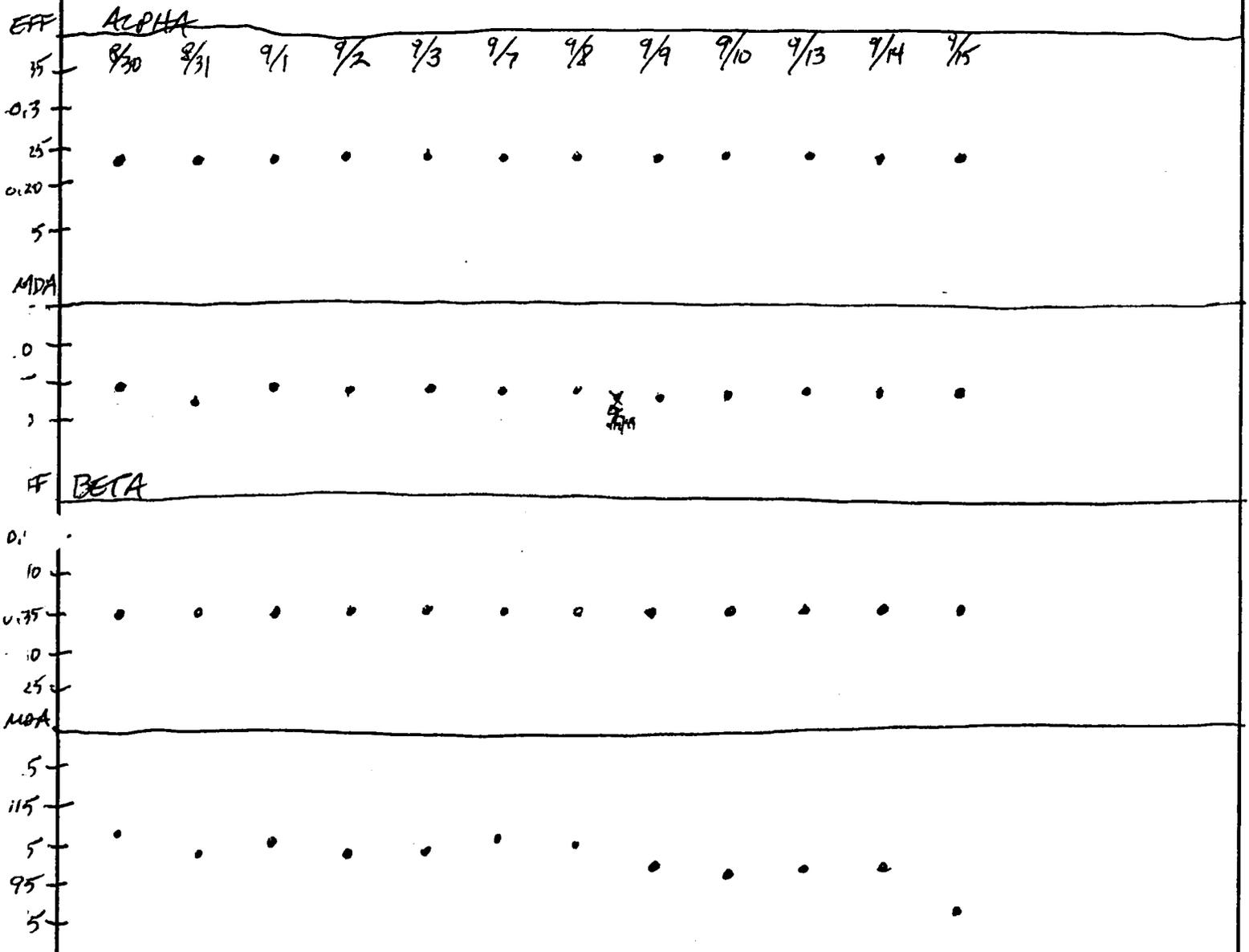
FIELD ACTIVITY DAILY LOG

DAILY LOG	DATE	8	30	99
	NO.			
	SHEET	1 OF 1		

PROJECT NAME LEHR RESTORATION PROJECT NO. 774079

FIELD ACTIVITY SUBJECT: Luo-2929 EFF & MDA CONTROL CHART

DESCRIPTION OF DAILY ACTIVITIES AND EVENTS:



VISITORS ON SITE:

CHANGES FROM PLANS AND SPECIFICATIONS, AND OTHER SPECIAL ORDERS AND IMPORTANT DECISIONS.

WEATHER CONDITIONS:

IMPORTANT TELEPHONE CALLS:

IT PERSONNEL ON SITE:

SIGNATURE  DATE: 9/21/99

RADIOLOGICAL SURVEY FORM

5 SURVEY / 2 SURVEYS AT GRID

Survey Number

083199 - 0000

Survey Description: MUSE ROOM 1 (INT)
PERFORM SURVEY ON CEILING
(GRIDS A1, A2, A3, B1, B2, B3)

Drawing Attached: Yes No

Survey Date: 8/31/99
 Survey by: [Signature]
 Print Name: DAVID W. DUFFY
 Review By: ALAN M. [Signature]
 Date: 8/11/99

Instrument Model: Geo-2929
 Instrument Ser. #: 126145
 Calibration Due: 6/10/00
 Efficiency: A: 0.25 B: 0.35
 CF: A: 4.9 BKG: A: 0
 CF: B: 107 BKG: B: 52
 MDA: B: 107

Instrument Model: Geo-2224
 Instrument Ser. #: 146714
 Calibration Due: 3/19/00
 Efficiency: A: 0.16 B: 0.15
 CF: A: 6.26 BKG: A: 0
 CF: B: 6173 BKG: B: 65
 MDA: B: 262

Instrument Model: [Blank]
 Instrument Ser. #: [Blank]
 Calibration Due: [Blank]
 Efficiency: [Blank]
 CF: [Blank] BKG: [Blank]

Instrument Model: [Blank]
 Instrument Ser. #: [Blank]
 Calibration Due: [Blank]
 Efficiency: [Blank]
 CF: [Blank] BKG: [Blank]

5 min Count Time

Survey	Survey Point	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	Fixed Contamination	Radiation Level (mR/hr)	Level	Used	Additional Comments
1-A1-1	21.1	1.6	166.5	166.5	13.5	0	13.5	1.3		CEILING GRID A1
1-A1-2	21.1	1.6	-39.6	13.5	0	0	13.5			
1-A1-3	36.6	0.8	-26.4	66	13.5	0	13.5			
1-A1-4	29.1	1.6	66	13.5	0	0	13.5			
1-A1-5	20.0	1.6	-19.8	6.25	13.5	0	13.5			
1-A1-6	21.7	1.6	13.5	13.5	0	0	13.5			
1-A1-7	17.7	0.0	0	0	0	0	0			
1-A2-1	24.6	0.8	-85.8	6.25	13.5	0	13.5			CEILING GRID A2
1-A2-2	24.0	1.6	-19.8	18.75	0	0	18.75			
1-A2-3	24.6	0.0	-46.2	66	6.25	0	6.25			
1-A2-4	24.0	0.0	66	6.25	6.25	0	6.25			
1-A2-5	9.1	0.0	0	13.5	0	0	13.5			
1-A2-6	17.7	0.8	13.5	13.5	0	0	13.5			
1-A2-7	15.4	0.0	0	0	0	0	0			

RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

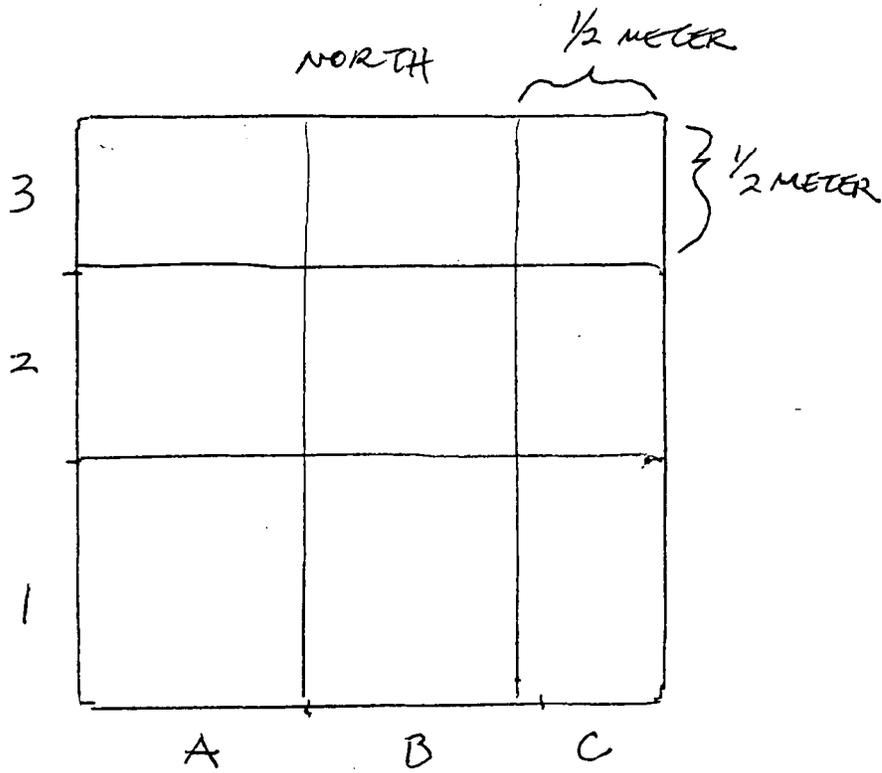
Survey Number 083199-006

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma dpm/100cm ²	alpha dpm/100cm ²			
1-A3-1	-5.1	1.6	26.4	0	N/A	1,2	CEILING GRID A3 (1/2 M)
1-A3-2	-4.0	0.8	99	0			↓ ↓ ↓ ↓
1-A3-3	-10.3	0.0	19.8	12.5			↓ ↓ ↓ ↓
1-A3-4	-12.6	0.0	N/A	N/A			↓ ↓ ↓ ↓
1-B1-1	8.0	0.0	73.3	0			CEILING GRID B1
1-B1-2	23.4	0.8	0	6.3			↓ ↓ ↓ ↓
1-B1-3	6.3	1.6	-119.9	0			↓ ↓ ↓ ↓
1-B1-4	17.7	0.8	-66.6	0			↓ ↓ ↓ ↓
1-B1-5	14.3	0.8	-59.9	12.5			↓ ↓ ↓ ↓
1-B1-6	2.9	0.8	N/A	N/A			↓ ↓ ↓ ↓
1-B1-7	14.3	0.8	N/A	N/A			↓ ↓ ↓ ↓
1-B2-1	13.1	0.0	-6.7	6.3			CEILING GRID B2
1-B2-2	8.6	0.8	6.7	6.3			↓ ↓ ↓ ↓
1-B2-3	3.4	4.0	-20.0	6.3			↓ ↓ ↓ ↓
1-B2-4	-2.9	0.8	-40.0	6.3			↓ ↓ ↓ ↓
1-B2-5	-4.6	0.8	-13.3	6.3			↓ ↓ ↓ ↓
1-B2-6	-17.1	0.0	N/A	N/A			↓ ↓ ↓ ↓
1-B2-7	-9.1	0.0	N/A	N/A			↓ ↓ ↓ ↓
1-B3-1	-7.4	0.0	59.9	0			CEILING GRID B3 (1/2 M)
1-B3-2	-5.7	0.8	-33.3	6.3			↓ ↓ ↓ ↓
1-B3-3	-8.6	0.8	66.6	12.5			↓ ↓ ↓ ↓
1-B3-4	-2.9	0.0	N/A	N/A	✓	✓	↓ ↓ ↓ ↓

A3
N/A

RADIOLOGICAL SURVEY FORM

Survey Number 083199-006



MIXED WASTE STORAGE FACILITY
ROOM # 1
CEILING

RADIOLOGICAL SURVEY FORM

Survey Number 090199-003

Survey Description: MINIF Room 1 (INT)
RELEASE SURVEY CEILING
(GRIDS C1, C2, & C3) &
EAST WALL (GRIDS A1, A2, & A3)
& SHELVING

Drawing Attached: Yes No

Instrument (1)
 Instrument Model: LWD-2929
 Instrument Ser. #: 126145
 Calibration Due: 6/10/00
 Efficiency: A- 0.25 B- 0.35
 MDA: A- 4.9 CF: A- 4.07 BKG: A- 0
 MDA: B- 107 CF: B- 2.87 BKG: B- 54

Instrument (2)
 Instrument Model: LWD-2224
 Instrument Ser. #: 146714
 Calibration Due: 2/19/00
 Efficiency: A- 0.16 B- 0.15
 MDA: A- 37.7 CF: A- 6.3 BKG: A- 0
 MDA: B- 262 CF: B- 6.7 BKG: B- 62

Survey Date: 9/1/99
 Survey by: [Signature] 19/1/99
 Signature: [Signature] Date: 19/1/99
 Print Name: DANIEL DUNCAN P. MANNING
 Review By: [Signature] 10/1/99
 Signature: [Signature] Date: 10/1/99

Instrument (3)
 Instrument Model: N/A
 Instrument Ser. #: N/A
 Calibration Due: N/A
 Efficiency: N/A
 MDA: N/A CF: N/A BKG: N/A

Instrument (4)
 Instrument Model: N/A
 Instrument Ser. #: N/A
 Calibration Due: N/A
 Efficiency: N/A
 MDA: N/A CF: N/A BKG: N/A

5 minute Counts

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/hr)	Instrument Used	Additional Comments
	beta/gamma $\mu\text{Ci}/100\text{cm}^2$	alpha $\mu\text{Ci}/100\text{cm}^2$	beta/gamma $\text{dpm}/100\text{cm}^2$	alpha $\text{dpm}/100\text{cm}^2$			
1-C1-1	19.6	1.6	20.0	0	N/A	1, 2	CEILING GRID C1 (1/2 M)
1-C1-2	9.3	4	33.3	6.3			
1-C1-3	4.1	0.8	26.6	6.3			
1-C1-4	10.4	2.4	N/A	N/A			
1-C2-1	8.7	1.6	79.9	0			CEILING GRID C2 (1/2 M)
1-C2-2	9.3	0.8	113.3	0			
1-C2-3	27.3	0	26.6	12.5			
1-C2-4	26.7	0.8	N/A	N/A			
1-C3-1	10.44	0.8	20.0	12.5			CEILING GRID C3 (1/2 M)
1-C3-2	5.8	1.6	33.3	6.3			
1-C3-3	12.76	0.8	33.3	6.3			
1-C3-4	28.42	0	N/A	N/A			
E1	10.44	0	6.7	12.5			EAST WALL SHELVING (3)
E2	29	0.8	40.0	6.3			
E3	26.1	0.8	20.0	6.3			

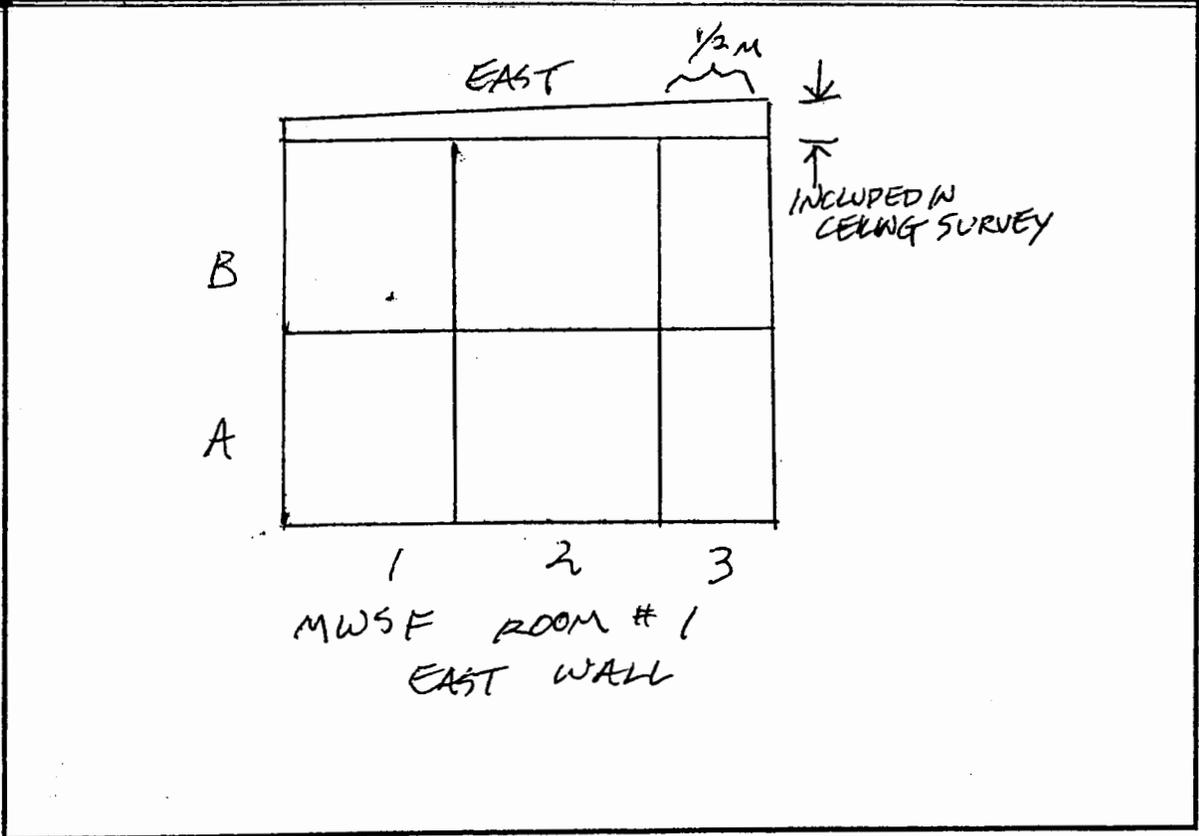
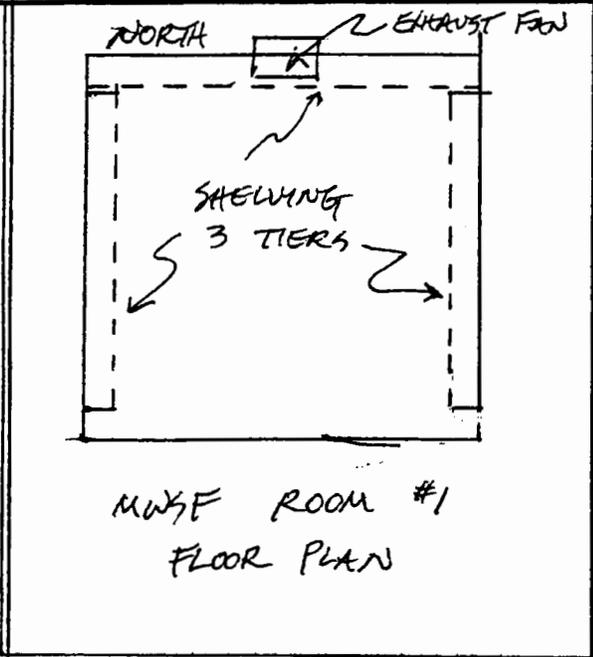
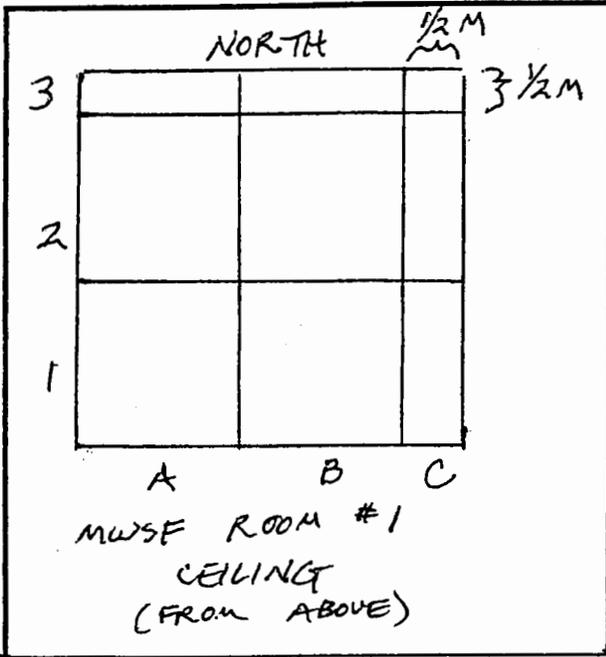
RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 090199-003

Survey Point	Smearable Contamination		Fixed Contamination ^{9/1/99}		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma dpm/100cm ²	alpha dpm/100cm ²			
E4	12.6	1.6	106.6	6.3	N/A	152	EAST WALL SHELVING (3)
E5	2.9	1.6	-46.6	0			
E6	19.4	0.8	79.9	12.5			
E7	13.1	1.6	59.9	12.5			
E8	17.1	2.4	73.3	6.3			
E9	12.0	0.8	86.6	0			
N1	-6.4	2.4	6.7	0			NORTH WALL SHELVING (3)
N2	12.76	1.6	159.8	0			
N3	15.08	1.6	93.2	12.5			
N4	18.44	0	119.9	6.3			
N5	11.6	1.6	33.3	6.3			
N6	11.02	1.6	-6.7	0			
N7	42.34	0.8	139.9	6.3			
N8	11.6	0.8	40.0	6.3			
N9	2.9	0	-26.6	0			
W1	40.6	1.6	20.0	0			WEST WALL SHELVING (3)
W2	23.75	1.6	26.6	6.3			
W3	13.92	0	13.3	0			
W4	13.1	1.6	106.6	0			
W5	36.0	0	20.0	0			
W6	13.7	0	93.2	6.3			
W7	16.0	0	0	6.3			
W8	5.1	0.8	53.3	6.3			
W9	13.7	0	99.9	6.3			
1-EF-1	0	1.6	-6.7	12.5			EXH FAN - TOP
1-EF-2	10.44	2.4	153.2	0			EXH FAN - INTAKE SCREEN
1-EF-3	21.46	1.6	239.8	6.3			↓ ↓ ↓ ↓
1-A1-1	21.87	1.6	N/A	N/A			EAST WALL (1/2 METER)
1-A1-2	21.46	0					
1-A1-3	13.34	2.4					
1-A1-4	-9.28	1.6					
1-A2-1	-12.76	2.4					EAST WALL
1-A2-2	-4.64	0.8					
1-A2-3	-25.52	0.8					
1-A2-4	-15.66	0.8					
1-A2-5	-13.92	0					
1-A2-6	-6.38	0.8					
1-A2-7	-26.68	0.8					
1-A3-1	-15.66	2.4					
1-A3-2	-27.84	1.6					
1-A3-3	-5.1	1.6					
1-A3-4	-3.48	3.2					
1-A3-5	-2.4	2.4					
1-A3-6	-2.3	3.2					
1-A3-7	-14.3	3.2					
					N/A		

RADIOLOGICAL SURVEY FORM

Survey Number 09199-003



RADIOLOGICAL SURVEY FORM

Survey Number 090299-007

Survey Description: MUSE ROOM 1 (INT)
RELEASE SURVEY - EAST WALL
(GRIDS B1, B2, & B3), NORTH
WALL (GRIDS A1, A2, A3, B1,
B2 & B3)
 Drawing Attached: Yes No

Instrument (1)
 Instrument Model: LMA-2929
 Instrument Ser. #: 126145
 Calibration Due: 6/10/00
 Efficiency: A- 0.25 B-
 MDA: A- 3.8 CF: A- 4.0 BKO: A- 0.2
 MDA: B- 106 CF: B- 2.9 BKO: B- 50

Instrument (2)
~~Instrument Model: _____~~
~~Instrument Ser. #: _____~~
~~Calibration Due: _____~~
~~Efficiency: A- _____ B- _____~~
~~MDA: A- _____ CF: A- _____ BKO: A- _____~~
~~MDA: B- _____ CF: B- _____ BKO: B- _____~~

Survey Date: 9-2-99
 Survey By: [Signature] 19/2/99
 Signature: _____ Date: _____
 Print Name: DANN W. DUFFY
 Review By: [Signature] 10/1/99
 Signature: _____ Date: _____

Instrument (3)
~~Instrument Model: _____~~
~~Instrument Ser. #: _____~~
~~Calibration Due: _____~~
~~Efficiency: _____~~
~~MDA: _____ CF: _____ BKO: _____~~

Instrument (4)
~~Instrument Model: _____~~
~~Instrument Ser. #: _____~~
~~Calibration Due: _____~~
~~Efficiency: _____~~
~~MDA: _____ CF: _____ BKO: _____~~

5 MIN COUNT

Survey Point	Stearable Contamination		Fixed Contamination		Radiation Level (uR/hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cpm/100cm ²	alpha cpm/100cm ²			
1-B1-1	17.1	0.8	N/A	N/A	N/A	1	EAST WALL (1/2 METER)
1-B1-2	2.9	0.8					
1-B1-3	12.6	0.8					
1-B1-4	1.1	0.8					
1-B2-1	1.7	0.8					EAST WALL (1 M)
1-B2-2	14.9	0.8					
1-B2-3	2.3	0					
1-B2-4	4.0	0					
1-B2-5	21.1	0					
1-B2-6	3.4	0.8					
1-B2-7	12.3	0.8					
1-B3-1	14.9	0.8					
1-B3-2	16.6	0					
1-B3-3	20.0	0.8					
1-B3-4	37.1	0					

RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

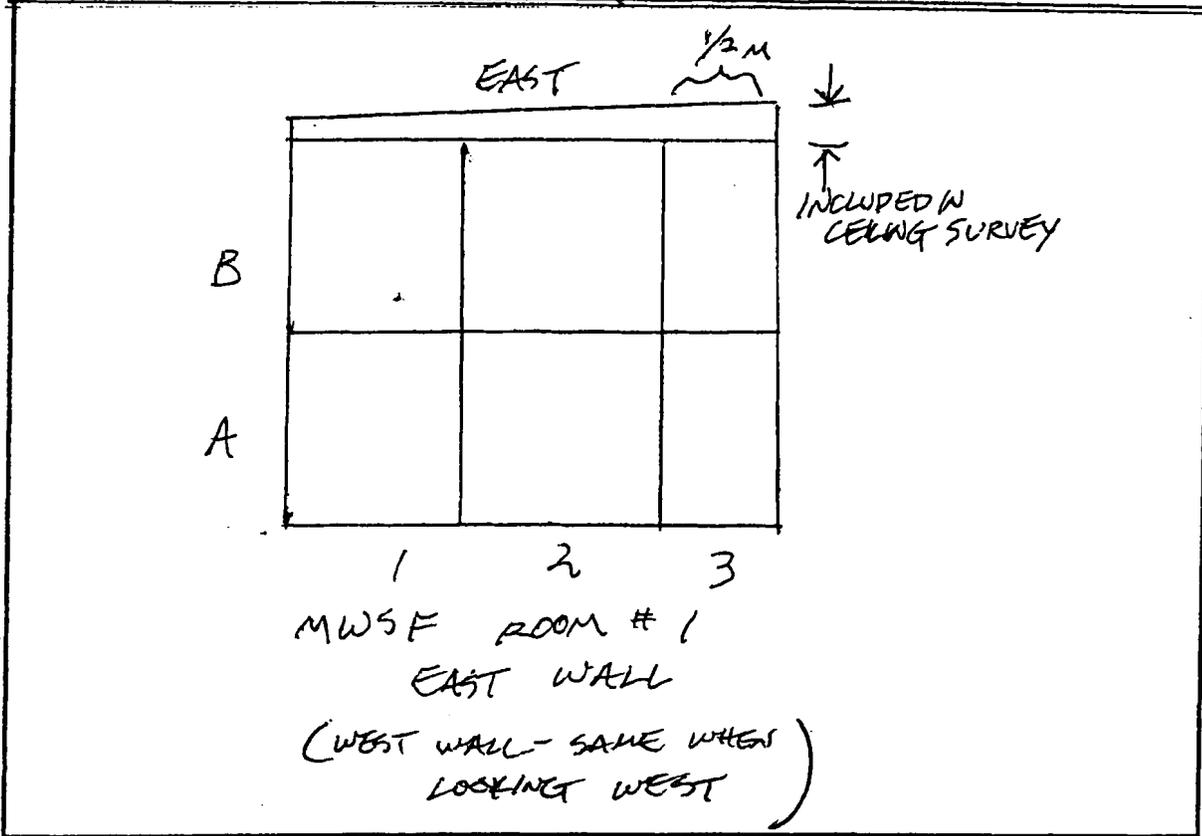
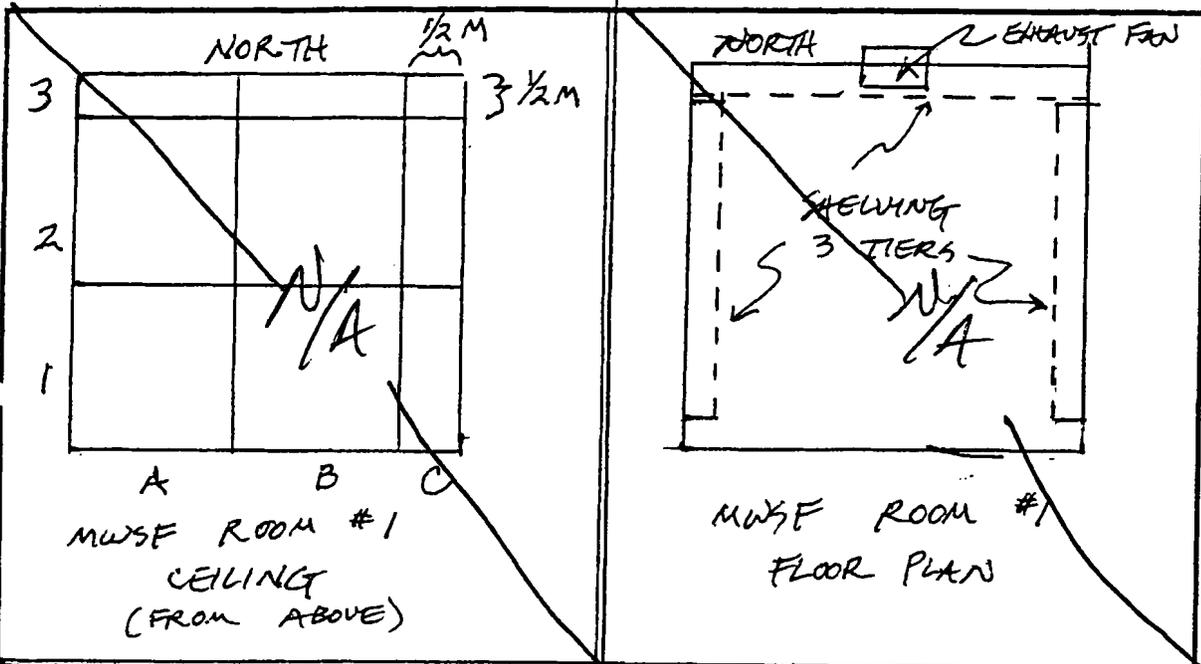
Survey Number 090299-007

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cpm/100cm ²	alpha cpm/100cm ²			
1-B3-5	46.3	0	N/A	N/A	N/A		EAST WALL (1M)
1-B3-6	4.6	-0.8					↓ ↓ ↓
1-B3-7	27.4	-0.8					
1-A1-1	21.7	0					NORTH WALL (1M)
1-A1-2	4.0	-0.8					↓ ↓ ↓
1-A1-3	8.6	2.4					
1-A1-4	22.3	2.4					
1-A1-5	26.3	0.8					
1-A1-6	20.6	0					
1-A1-7	13.1	0					
1-A2-1	14.9	0.8					
1-A2-2	-2.3	0.8					
1-A2-3	18.3	-0.8					
1-A2-4	6.3	0					
1-A2-5	12.0	0.8					↓ ↓ ↓
1-A2-6	26.9	-0.8					
1-A2-7	12.6	0					NORTH WALL (1/2 M)
1-A3-1	25.7	-0.8					↓ ↓ ↓
1-A3-2	29.7	0					
1-A3-3	11.4	0.8					↓ ↓ ↓
1-A3-4	9.1	-0.8					
1-B1-1	7.7	-0.8					NORTH WALL (1M)
1-B2-1	24.0	0					NORTH WALL (1M)
1-B2-2	26.9	0					↓ ↓ ↓
1-B2-3	32.0	-0.8					
1-B2-4	32.6	-0.8					
1-B2-5	28.0	0					
1-B2-6	-17.7	-0.8					↓ ↓ ↓
1-B2-7	1.7	0					
1-B3-1	0.6	-0.8					NORTH WALL (1/2 M)
1-B3-2	-10.3	-0.8					↓ ↓ ↓
1-B3-3	6.3	0.8					
1-B3-4	-8.6	-0.8					↓ ↓ ↓
1-B1-2	-4.6	0.8					NORTH WALL (1M) TO COMPLETE
1-B1-3	-11.4	-0.8					↓ ↓ ↓
1-B1-4	-11	0.8					
1-B1-5	-31.4	-0.8					
1-B1-6	0	-0.8					
1-B1-7	5.7	0	↓	↓	↓	↓	↓ ↓ ↓

→

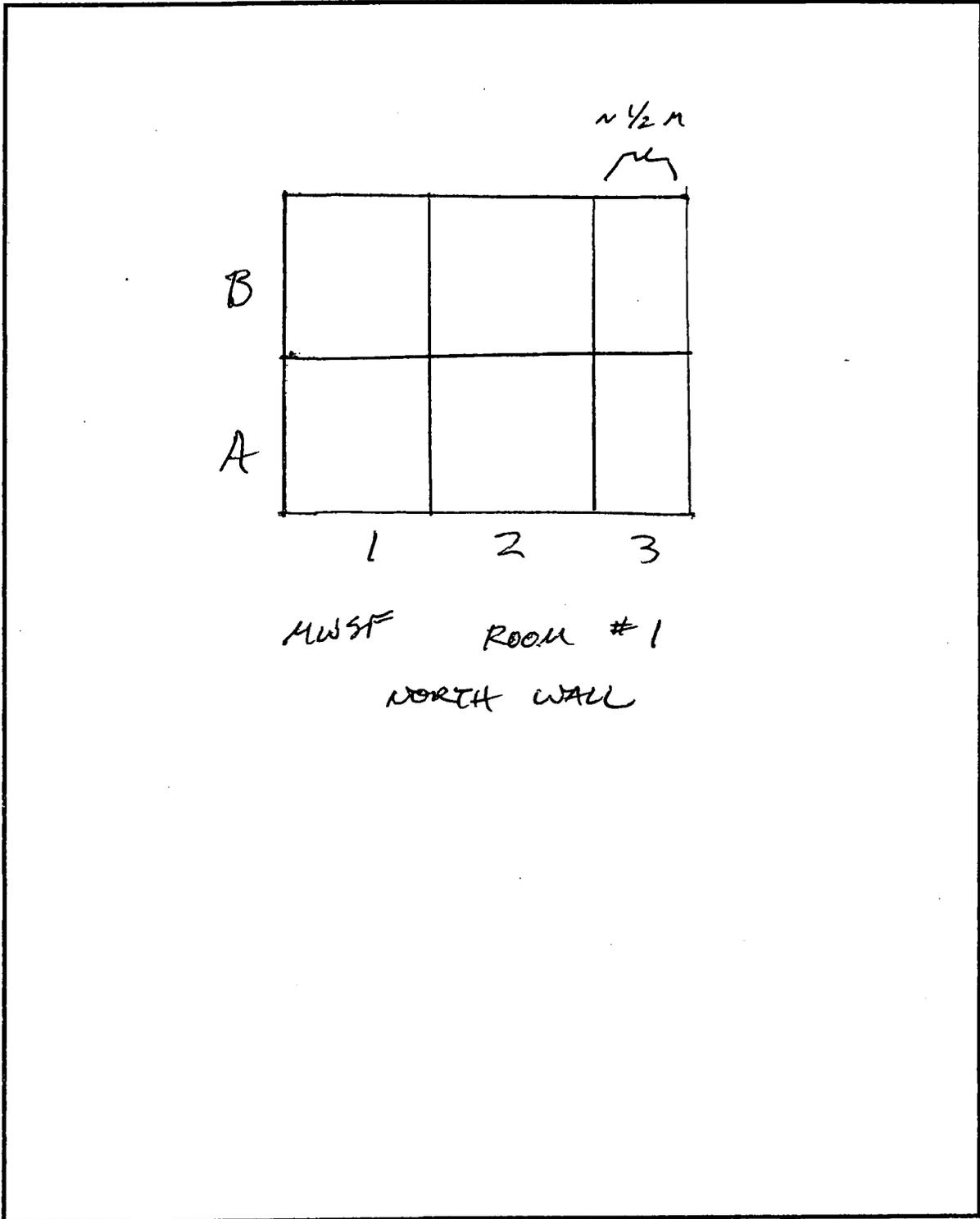
RADIOLOGICAL SURVEY FORM

Survey Number 090299-007



RADIOLOGICAL SURVEY FORM

Survey Number 090299-007



RADIOLOGICAL SURVEY FORM

Survey Number 090399-001

Survey Description: MWSE ROOM (INT)
RETENEF SURVEY - WEST WALL
(GRIDS A1, A2, A3, B1, B2, B3)
SUBSTRATE (BRASS A1, A2, A3, A4,
B1, B2, B3)
 Drawing Attached No

Survey Date: 9-3-99 Date
 Survey by: [Signature]
 Title Name: Raymond J. Perry
 Review By: [Signature] Date 10/1/99

Instrument (1)
 Instrument Model: _____
 Instrument Ser. #: _____
 Calibration Due: _____
 Efficiency: _____
 MDA: A- _____ B- _____
 CF: A- _____ B- _____
 NDAB: _____ BKGA: _____
 BKGB: _____

Instrument (4)
 Instrument Model: _____
 Instrument Ser. #: _____
 Calibration Due: _____
 Efficiency: _____
 MDA: _____ BKGA: _____
 BKGB: _____

Instrument (1)
 Instrument Model: LUD-2929
 Instrument Ser. #: 126145
 Calibration Due: 6/10/00
 Efficiency: _____
 MDA: A- 3.8 B- 0.35
 CF: A- 4.0 BKGA: 0.2
 NDAB: 104 BKGB: 50

Instrument (3)
 Instrument Model: _____
 Instrument Ser. #: _____
 Calibration Due: _____
 Efficiency: _____
 MDA: _____ BKGA: _____
 BKGB: _____

5 MW CORNUS

Survey Point	Shimable Contamination		Fixed Contamination		Radionuclide Level (uR/hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma spm/100cm ²	alpha spm/100cm ²			
1-A1-1	5.7	0.8	N/A	N/A	N/A	1	WEST WALL (1M)
1-A1-2	-0.6	0					
1-A1-3	4.6	-0.8					
1-A1-4	9.1	0					
1-A1-5	1.7	-0.8					
1-A1-6	1.7	-0.8					
1-A1-7	6.9	-0.8					
1-A2-1	9.1	-0.8					
1-A2-2	-0.6	2.4					
1-A2-3	13.6	0.8					
1-A2-4	0	0					
1-A2-5	5.2	0					
1-A2-6	2.9	0					
1-A2-7	13.18	0					

RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 090399-001

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cpm/100cm ²	alpha cpm/100cm ²			
1-A3-1	-9.7	0	N/A	N/A	N/A	1	WEST WALL (1/2 M)
1-A3-2	6.3	0					
1-A3-3	-11.2	0					
1-A3-4	-0.58	16					
1-B1-1	-15.08	0					WEST WALL (1 M)
1-B1-2	22.62	0					
1-B1-3	11.02	8					
1-B1-4	-11.6	0					
1-B1-5	-5.8	0					
1-B1-6	-20.88	2.4					
1-B1-7	1.6	3.2					
1-B2-1	-10.44	0.8					
1-B2-2	0	3.2					
1-B2-3	-20.3	3.2					
1-B2-4	-4.06	0.8					
1-B2-5	-2.32	3.2					
1-B2-6	-4.0	1.6					
1-B2-7	-9.1	-0.8					
1-B3-1	16.0	0					WEST WALL (1/2 M)
1-B3-2	2.3	0					
1-B3-3	2.9	0					
1-B3-4	9.1	-0.8					
1-A1-1	6.9	-0.8					SOUTH WALL (1/2 M)
1-A1-2	1.7	1.6					
1-A1-3	0	0					
1-A1-4	0	0.8					
1-A2-1	3.4	0.8					SOUTH WALL (1 M)
1-A2-2	-12.6	0.8					
1-A2-3	4.6	-0.8					
1-A2-4	-1.7	0					
1-A2-5	4.6	-0.8					
1-A2-6	-4.6	0					
1-A2-7	6.3	0					
1-A3-1	-1.7	0					
1-A3-2	-4.6	0					
1-A3-3	-13.7	-0.8					
1-A3-4	-3.4	0					
1-A3-5	2.9	0.8					
1-A3-6	4.6	-0.8					
1-A3-7	-2.9	0					
1-B1-1	9.1	0					SOUTH WALL (1/2 M)
1-B1-2	16.0	0					
1-B1-3	0.6	-0.8					
1-B1-4	-4.6	0.8					
N/A							

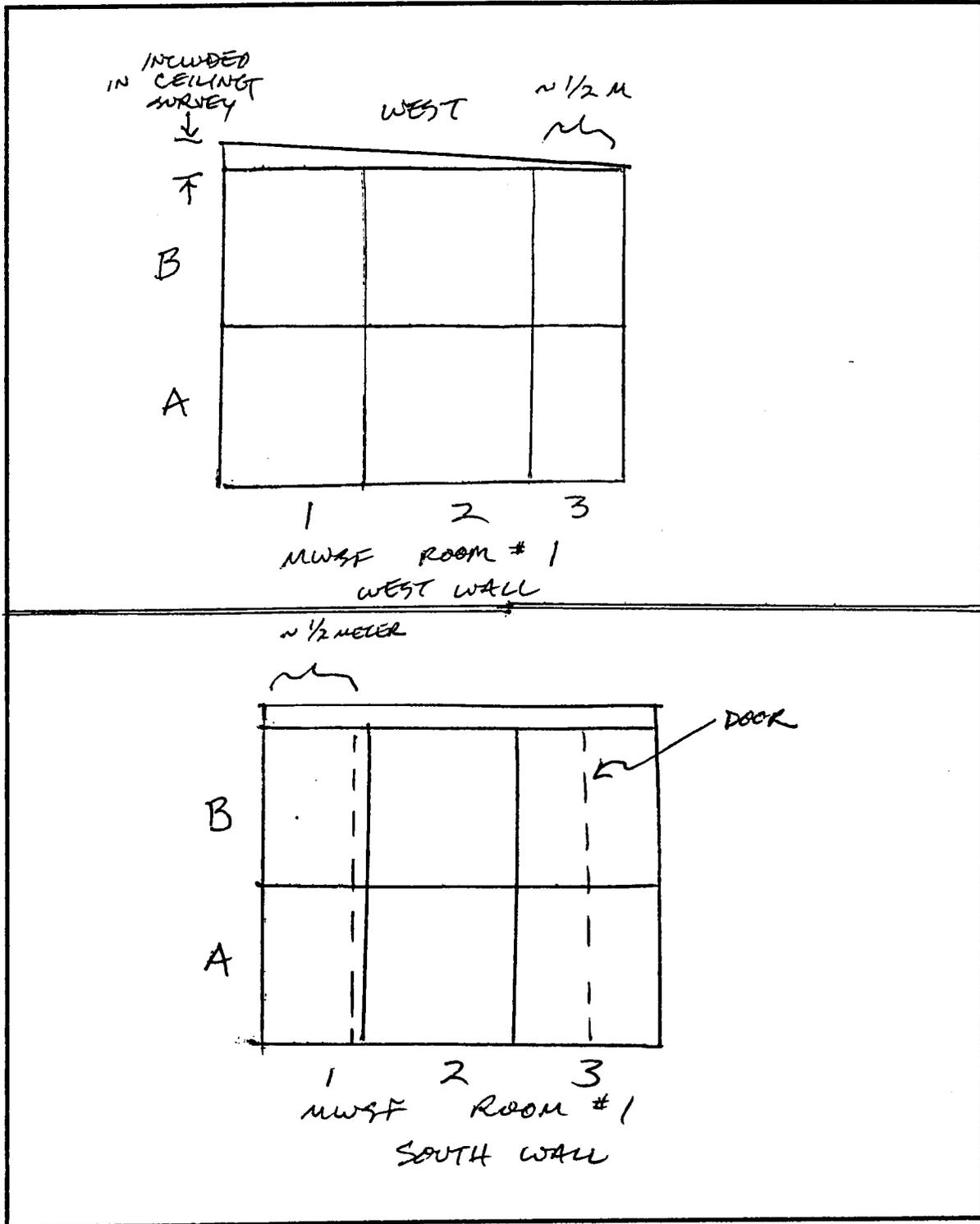
RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 090399-001

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cpm/100cm ²	alpha cpm/100cm ²			
1-B2-1	-4.6	0.9	NDA	NDA	NDA	I	South Wall (M)
1-B2-2	-4.6	-0.8	↓	↓	↓	↓	↓
1-B2-3	2.6	-0.8	↓	↓	↓	↓	↓
1-B2-4	18.3	1.6	↓	↓	↓	↓	↓
1-B2-5	-1.7	1.6	↓	↓	↓	↓	↓
1-B2-6	-10.9	1.6	↓	↓	↓	↓	↓
1-B2-7	-2.3	0	↓	↓	↓	↓	↓
1-B3-1	-2.9	-0.8	↓	↓	↓	↓	↓
1-B3-2	8.0	-0.8	↓	↓	↓	↓	↓
1-B3-3	16.0	0	↓	↓	↓	↓	↓
1-B3-4	1.7	0	↓	↓	↓	↓	↓
1-B3-5	6.9	0	↓	↓	↓	↓	↓
1-B3-6	13.7	0	↓	↓	↓	↓	↓
1-B3-7	-2.3	0.8	↓	↓	↓	↓	↓
N/A							

RADIOLOGICAL SURVEY FORM

Survey Number 090399-001



RADIOLOGICAL SURVEY FORM

Survey Number

090799-017

Survey Description: MUST ROOM #1 (M)
FLOOR (GRAB A1, A2, A3)
B1, B2, B3, C1, C2, C3)

Transmitting Attached: Yes No

Survey Title: 9-7-99
 Survey By: [Signature]
 Date: 9/7/99
 Facility Name: [Signature]
 Review By: [Signature] 10/1/99
 Date: [Signature]

Instrument Model: LUD-2929
 Instrument Ser. #: 126145
 Calibration Due: 6-10-00
 Efficiency: A-0.25 B-0.35
 CF: A-4 B-4
 RDA-A: 0.25 RDA-B: 0.25
 RDA-B: 106 CF-B: 206 BKD-B: 54

Instrument Model: [Signature]
 Instrument Ser. #: [Signature]
 Calibration Due: [Signature]
 Efficiency: A- [Signature] B- [Signature]
 CF: A- [Signature] B- [Signature]
 RDA-A: [Signature] RDA-B: [Signature]

Instrument Model: [Signature]
 Instrument Ser. #: [Signature]
 Calibration Due: [Signature]
 Efficiency: [Signature]
 CF: [Signature] BKD: [Signature]

Instrument Model: [Signature]
 Instrument Ser. #: [Signature]
 Calibration Due: [Signature]
 Efficiency: [Signature]
 CF: [Signature] BKD: [Signature]

5 MIN COUNTS

Survey	alpha dpm/100cm ²	beta/gamma dpm/100cm ²	Fixed Contamination alpha grm/100cm ²	Radiation Level (uR/h):	Instrument	Additional Comments
1-A1-1	11.6	0	NA	0.25	NA	FLOOR (M)
1-A1-2	14.5	0	NA	0.25	NA	FLOOR (M)
1-A1-3	4.1	0	NA	0.25	NA	FLOOR (M)
1-A1-4	174	2.4	NA	0.25	NA	FLOOR (M)
1-A1-5	22.04	1.6	NA	0.25	NA	FLOOR (M)
1-A1-6	10.44	2.4	NA	0.25	NA	FLOOR (M)
1-A1-7	5.8	4	NA	0.25	NA	FLOOR (M)
1-A2-1	12.76	0.8	NA	0.25	NA	FLOOR (M)
1-A2-2	16.24	0.8	NA	0.25	NA	FLOOR (M)
1-A2-3	9.28	0	NA	0.25	NA	FLOOR (M)
1-A2-4	5.8	0.8	NA	0.25	NA	FLOOR (M)
1-A2-5	3.32	0.8	NA	0.25	NA	FLOOR (M)
1-A2-6	2.9	0	NA	0.25	NA	FLOOR (M)
1-A2-7	11.6	0	NA	0.25	NA	FLOOR (M)
1-A3-1	11.6	1.6	NA	0.25	NA	FLOOR (1/2 Meter)

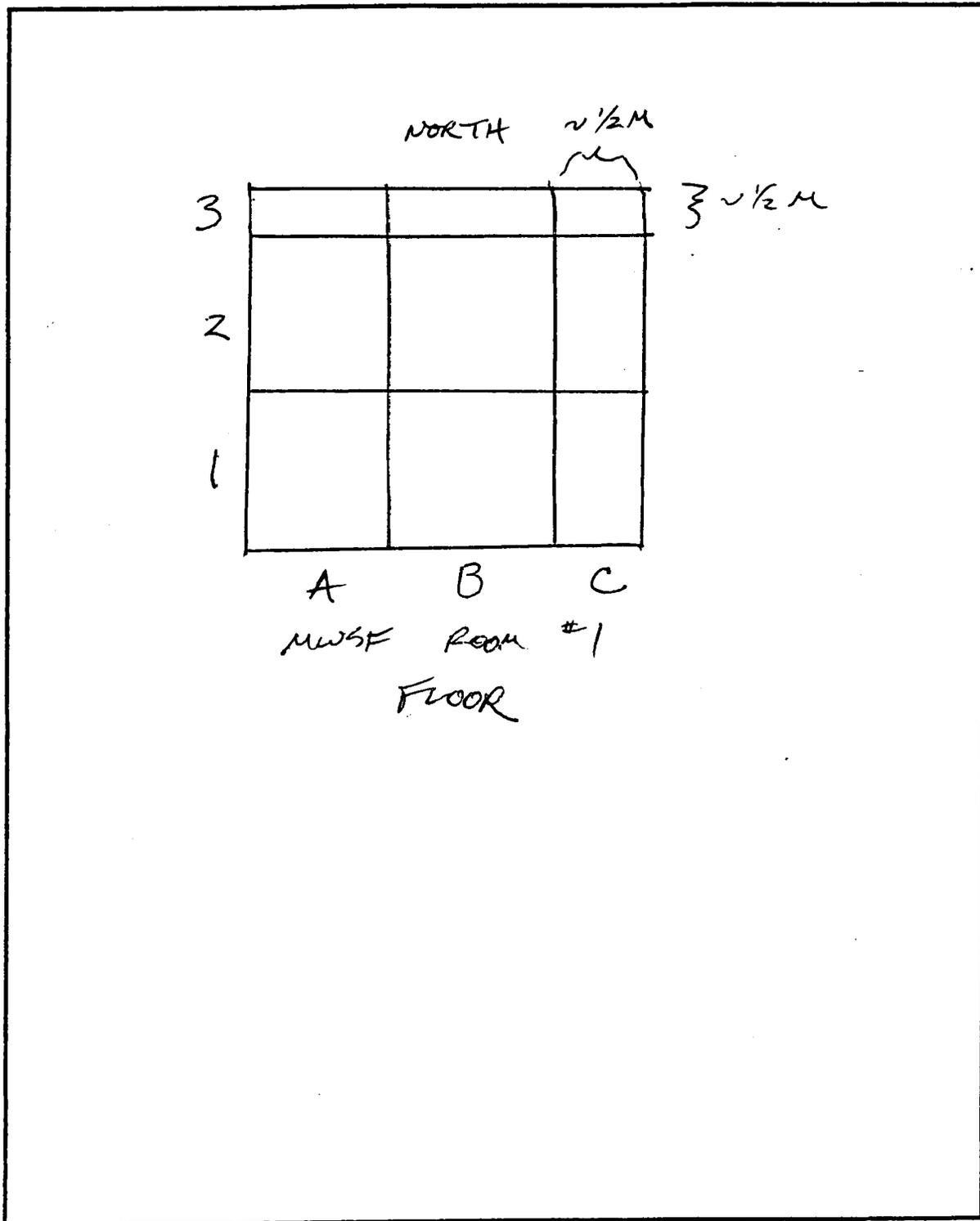
RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 090799-017

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cpm/100cm ²	alpha cpm/100cm ²			
1-A3-2	-7.54	0.8	N/A	N/A	N/A	1	FLOOR (1/2M)
1-A3-3	-10.44	1.6	↓	↓	↓	↓	↓
1-A3-4	2.9	0.8	↓	↓	↓	↓	↓
1-B1-1	-5.8	0	N/A	N/A	N/A	1	FLOOR (1M)
1-B1-2	9.86	0.8	↓	↓	↓	↓	↓
1-B1-3	-17.4	-0.8	↓	↓	↓	↓	↓
1-B1-4	-1.16	-0.8	↓	↓	↓	↓	↓
1-B1-5	-13.34	2.5	↓	↓	↓	↓	↓
1-B1-6	-11.6	0.8	↓	↓	↓	↓	↓
1-B1-7	-24.94	2.5	↓	↓	↓	↓	↓
1-B2-1	-14.5	0	↓	↓	↓	↓	↓
1-B2-2	-8.7	1.6	↓	↓	↓	↓	↓
1-B2-3	-14.5	-0.8	↓	↓	↓	↓	↓
1-B2-4	-14.5	1.6	↓	↓	↓	↓	↓
1-B2-5	-5.8	0	↓	↓	↓	↓	↓
1-B2-6	-14.5	0.8	↓	↓	↓	↓	↓
1-B2-7	-2.9	0	↓	↓	↓	↓	↓
1-B3-1	0	0.8	N/A	N/A	N/A	1	FLOOR (1/2M)
1-B3-2	-8.7	0	↓	↓	↓	↓	↓
1-B3-3	-8.7	0.8	↓	↓	↓	↓	↓
1-B3-4	-11.6	0.8	↓	↓	↓	↓	↓
1-C1-1	-8.7	0	N/A	N/A	N/A	1	FLOOR (1M)
1-C1-2	-2.32	1.6	↓	↓	↓	↓	↓
1-C1-3	0	-0.8	↓	↓	↓	↓	↓
1-C1-4	-8.7	1.6	↓	↓	↓	↓	↓
1-C2-1	5.8	0.8	↓	↓	↓	↓	↓
1-C2-2	-2.9	1.6	↓	↓	↓	↓	↓
1-C2-3	-29	-0.8	↓	↓	↓	↓	↓
1-C2-4	-29	0	↓	↓	↓	↓	↓
1-C3-1	-8.7	-0.8	N/A	N/A	N/A	1	FLOOR (1/2M)
1-C3-2	-14.5	0	↓	↓	↓	↓	↓
1-C3-3	-20.3	0	↓	↓	↓	↓	↓
1-C3-4	-8.7	0.8	↓	↓	↓	↓	↓
N/A							

RADIOLOGICAL SURVEY FORM

Survey Number 090799-017



RADIOLOGICAL SURVEY FORM

Survey Number 090889-002

Survey Description: MUSE ROOM #2 (INT)
CELLING (GRIDS A1, A2, A3)
B1, B2, B3, C1, C2, C3)
EAST WALL (GRIDS A1, A2, A3,
B1, B2, C1, C2, C3)
 No _____

Survey Date: 9/8/99
 Survey by: Joseph P. Manning
 Print Name: Joseph P. Manning
 Review By: Alvin Miller
 Date: 9/8/99

Instrument (1)
 Instrument Model: L40-2839
 Instrument Ser. #: 126145
 Calibration Due: 6-10-00
 Efficiency: A: 0.25 B: 0.35
 NDA-A: 3.8 BKO-A: 0.2
 NDA-B: 106 BKO-B: 49

Instrument (2)
 Instrument Model: LWP-2224
 Instrument Ser. #: 146714
 Calibration Due: 2-19-00
 Efficiency: A: 0.16 B: 0.14
 NDA-A: 37.7 BKO-A: 0
 NDA-B: 254 BKO-B: 62

Instrument (3)
 Instrument Model: _____
 Instrument Ser. #: _____
 Calibration Due: _____
 Efficiency: _____
 NDA: _____ BKO: _____

Instrument (4)
 Instrument Model: _____
 Instrument Ser. #: _____
 Calibration Due: _____
 Efficiency: _____
 NDA: _____ BKO: _____

Survey Point	Scramble Contamination		Fixed Contamination		Radiation Level (uR/hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma dpm/100cm ²	alpha dpm/100cm ²			
2-A1-1	5.8	2.4	28.6	6.3	N/A	132	CELLING (1M ²)
2-A1-2	5.8	0	7.4	0			
2-A1-3	8.7	1.6	7.1	6.3			
2-A1-4	0	0	14.3	0			
2-A1-5	8.7	0	14.3	6.3			
2-A1-6	20.3	0.8	N/A	N/A			
2-A1-7	11.6	2.4					
2-A2-1	2.9	0	14.3	6.3			
2-A2-2	5.8	0	78.6	6.3			
2-A2-3	8.7	0.8	107.1	12.5			
2-A2-4	0	0.8	92.9	12.5			
2-A2-5	5.8	2.4	14.3	18.8			
2-A2-6	2.9	1.6	N/A	N/A			
2-A2-7	0	0.8					

RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 090899-002

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma dpm/100cm ²	alpha dpm/100cm ²			
2-A3-1	17.4	0	121.4	0	N/A	132	CEILING (1/2 M)
2-A3-2	-5.8	1.6	28.6	12.5			
2-A3-3	-2.9	0	107.1	6.3			
2-A3-4	2.9	0.8	N/A	N/A			
2-B1-1	2.9	0	50.0	0			CEILING (1 M)
2-B1-2	-8.7	0	28.6	6.3			
2-B1-3	2.9	1.6	35.7	0			
2-B1-4	5.8	0	-2.1	0			
2-B1-5	0	0.8	57.1	12.5			
2-B1-6	5.8	0	N/A	N/A			
2-B1-7	-4.64	0	↓	↓			
2-B2-1	11.6	0.8	42.9	0			
2-B2-2	-8.7	0	150.0	6.3			
2-B2-3	-0.6	0	92.9	6.3			
2-B2-4	-16.0	2.4	64.3	0			
2-B2-5	1.7	0	142.9	6.3			
2-B2-6	4.0	0.8	N/A	N/A			
2-B2-7	0	0.8	↓	↓			
2-B3-1	-8.6	0	100.0	0			CEILING (1/2 M)
2-B3-2	-4.0	0	128.6	6.3			
2-B3-3	6.9	0	107.1	0			
2-B3-4	1.7	-0.8	N/A	N/A			
2-C1-1	2.8	0	42.9	0			
2-C1-2	2.9	1.6	185.7	6.3			
2-C1-3	20.3	0.8	78.6	0.28			
2-C1-4	14.5	-0.8	N/A	N/A			
2-C2-1	8.7	1.6	164.3	12.5			
2-C2-2	0	-0.8	178.6	6.3			
2-C2-3	26.1	0	78.6	12.5			
2-C2-4	0	0.8	N/A	N/A			
2-C3-1	-17.4	0	50.0	6.3			
2-C3-2	5.8	0.8	157.1	6.3			
2-C3-3	-5.8	-0.8	85.7	0			
2-C3-4	8.7	0	N/A	N/A			
2-A1-1	-11.6	-0.8				(1)	EAST WALL (1/2 M)
2-A1-2	0	0					
2-A1-3	14.9	2.4					
2-A1-4	2.9	0					
2-A2-1	8.7	0					
2-A2-2	-4.0	2.4					EAST WALL (1 M)
2-A2-3	13.1	0					
2-A2-4	1.1	4.8					
2-A2-5	14.5	-0.8					
2-A2-6	-17.4	0.8					
2-A2-7	11.6	-0.8					
				N/A			

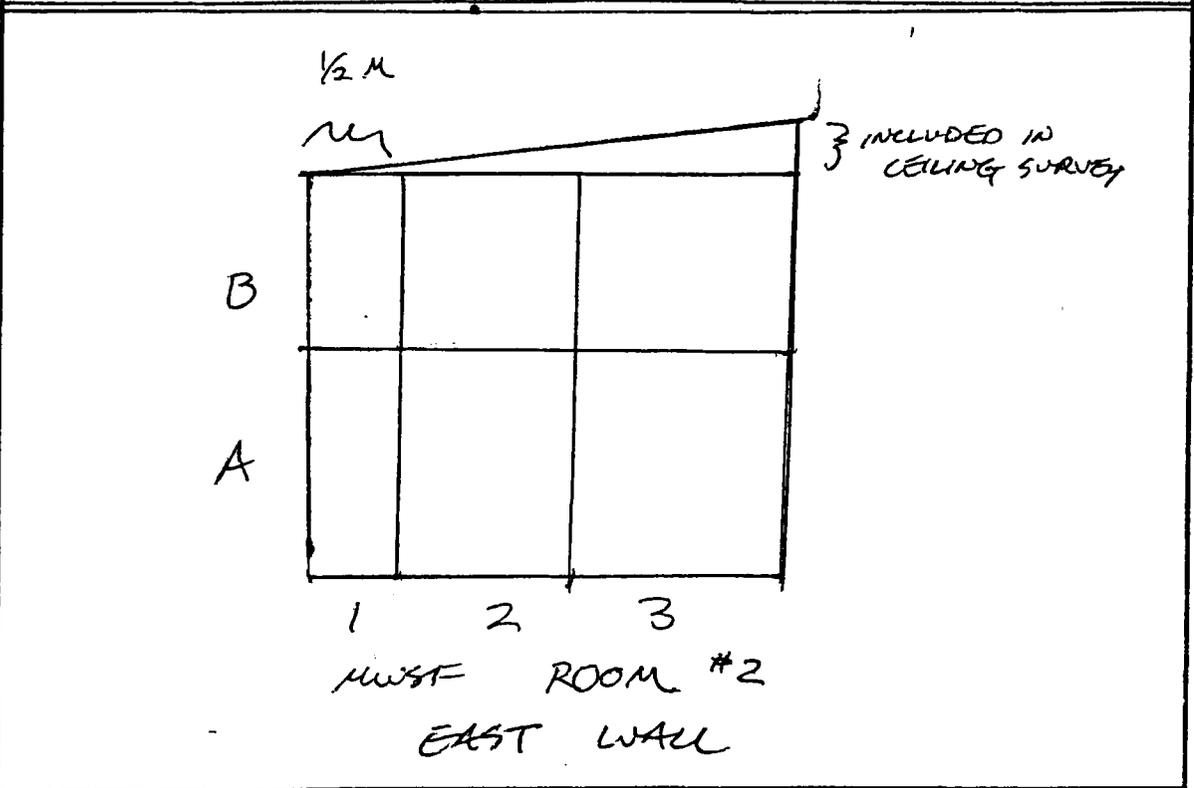
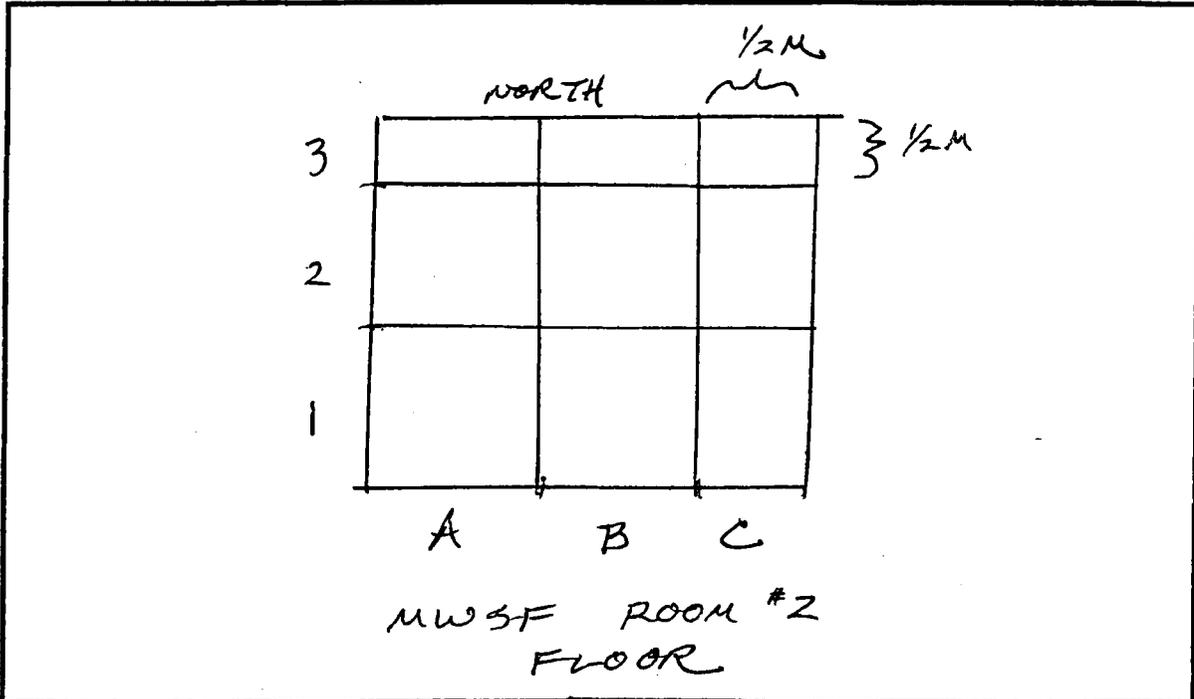
RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 090999-002

Survey Point	Smearable Contamination		Fixed Contamination		Radianon Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cpm/100cm ²	alpha cpm/100cm ²			
2-A3-1	-0.6	-0.8	N/A	N/A	N/A		EAST WALL (1M)
2-A3-2	-14.5	0					
2-A3-3	5.1	0					
2-A3-4	1.7	1.6					
2-A3-5	1.7	0.8					
2-A3-6	0	0.8					
2-A3-7	0	0.8					
2-B1-1	2.9	-0.8					EAST WALL (1/2M)
2-B1-2	2.3	-0.8					
2-B1-3	1.7	-0.8					
2-B1-4	4.6	0					
2-B2-1	20.6	-0.8					EAST WALL (1M)
2-B2-2	2.9	-0.8					
2-B2-3	8.6	0					
2-B2-4	6.3	0.8					
2-B2-5	5.1	0					
2-B2-6	2.9	0.8					
2-B2-7	1.1	-0.8					
2-B3-1	-0.6	0					
2-B3-2	5.7	0					
2-B3-3	3.4	2.4					
2-B3-4	-9.7	0.8					
2-B3-5	9.1	1.6					
2-B3-6	2.9	0					
2-B3-7	4.6	-0.8	∇	∇	∇	∇	∇

RADIOLOGICAL SURVEY FORM

Survey Number 090899-002



RADIOLOGICAL SURVEY FORM

Survey Number 090999-001

Survey Description: MUSSE ROOM # 2 (INT)
ALONGER WALL (GROSS A1, A2, A3,
B1, B2, B3)

Drawing Attached No

Survey Date: 9-9-99 Date
 Survey by: [Signature] Date
 Instrument Name: Thermo-Duress P. Manning
 Review By: [Signature] Date

Instrument (1)
 Instrument Model: LVD-2929
 Instrument Ser. #: 176645
 Calibration Due: 6-10-00
 Efficiency: A-0.25 B-0.35
 MDA: A- 3.8 BKG.A- 0.4
 NDA: B- 9.7 BKG.B- 4.6

Instrument (2)
 Instrument Model: [Signature]
 Instrument Ser. #: [Signature]
 Calibration Due: [Signature]
 Efficiency: [Signature]
 NDA: [Signature] BKG: [Signature]

Instrument (3)
 Instrument Model: LVD-2224
 Instrument Ser. #: 146714
 Calibration Due: 2-19-00
 Efficiency: A-0.16 B-0.17
 MDA: A- 37.4 BKG.A- 0
 NDA: B- 20.5 BKG.B- 6.1

Instrument (4)
 Instrument Model: [Signature]
 Instrument Ser. #: [Signature]
 Calibration Due: [Signature]
 Efficiency: [Signature]
 NDA: [Signature] BKG: [Signature]

5 MW COUNTS

Survey Point	Scramble Contamination		Fixed Contamination		Radiation Level (uR/hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma dpm/100cm ²	alpha dpm/100cm ²			
2-A1-1	7.4	~0.8	NDA	NDA	NDA	(North Wall (1m ²)
2-A1-2	13.7	0					
2-A1-3	25.1	0					
2-A1-4	2.9	0.8					
2-A1-5	15.4	~0.8					
2-A1-6	26.9	-1.6					
2-A1-7	16.6	1.6					
2-A2-1	-1.7	-0.8					
2-A2-2	4.6	-1.6					
2-A2-3	-3.7	-1.6					
2-A2-4	9.7	~0.8					
2-A2-5	12.0	-1.6					
2-A2-6	2.9	-1.6					
2-A2-7	5.1	~0.8					

RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 090999-001

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cps/100cm ²	alpha cps/100cm ²			
2-B1-1	26.1	-1.6	N/A	N/A	N/A	1	WEST WALL (1M)
2-B1-2	8.7	-1.6					
2-B1-3	17.4	-1.6					
2-B1-4	11.6	-1.6					
2-B1-5	5.8	-1.6					
2-B1-6	11.6	-0.8					
2-B1-7	43.5	-1.6					
2-B2-1	23.2	0					
2-B2-2	26.1	-0.8					
2-B2-3	29	-0.8					
2-B2-4	26.1	-0.8					
2-B2-5	17.4	0					
2-B2-6	20.3	-1.6					
2-B2-7	20.3	-1.6					
2-B3-1	17.4	-1.6					WEST WALL (1/2M)
2-B3-2	11.6	0					
2-B3-3	2.9	-0.8					
2-B3-4	8.7	-0.8					
2-A1-1	14.5	-0.8					SOUTH WALL (1/2M)
2-A1-2	5.8	-0.8					
2-A1-3	11.6	0.8					
2-A1-4	12.6	-1.6					
2-A2-1	19.4	-0.8					SOUTH WALL (1M)
2-A2-2	20.6	0.8					
2-A2-3	22.9	0.8					
2-A2-4	17.7	-0.8					
2-A2-5	20.0	-1.6					
2-A2-6	28.6	0.8					
2-A2-7	9.1	-0.8					
2-A3-1	5.1	-0.8					
2-A3-2	16.6	-0.8					
2-A3-3	6.3	-1.6					
2-A3-4	24.6	-1.6					
2-A3-5	4.0	-1.6					
2-A3-6	12.6	0					
2-A3-7	22.9	-0.8					
2-B1-1	4.0	-1.6					SOUTH WALL (1/2M)
2-B1-2	11.4	-1.6					
2-B1-3	2.9	0					
2-B1-4	10.3	-1.6	✓	✓	✓	✓	✓
2-B1-5							
2-B1-6							
2-B1-7							

4/2/99

N/A

N/A

RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

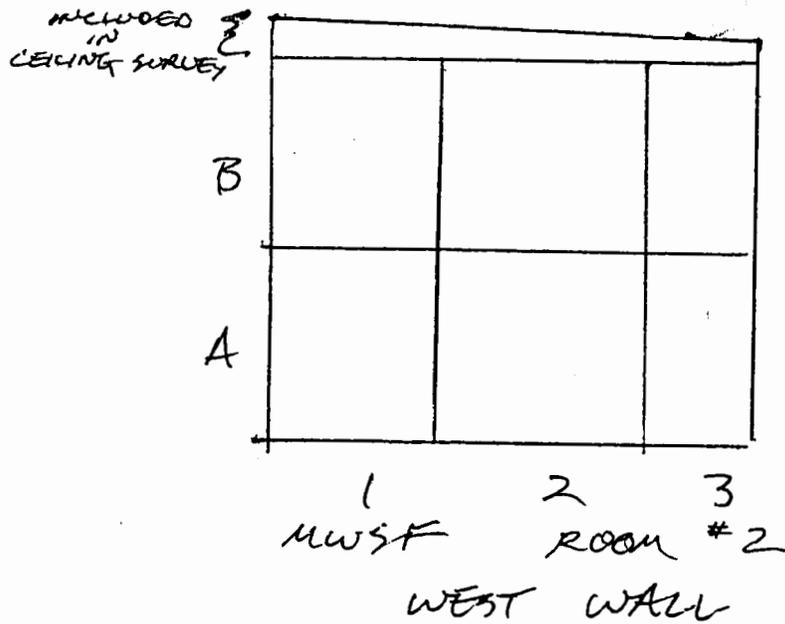
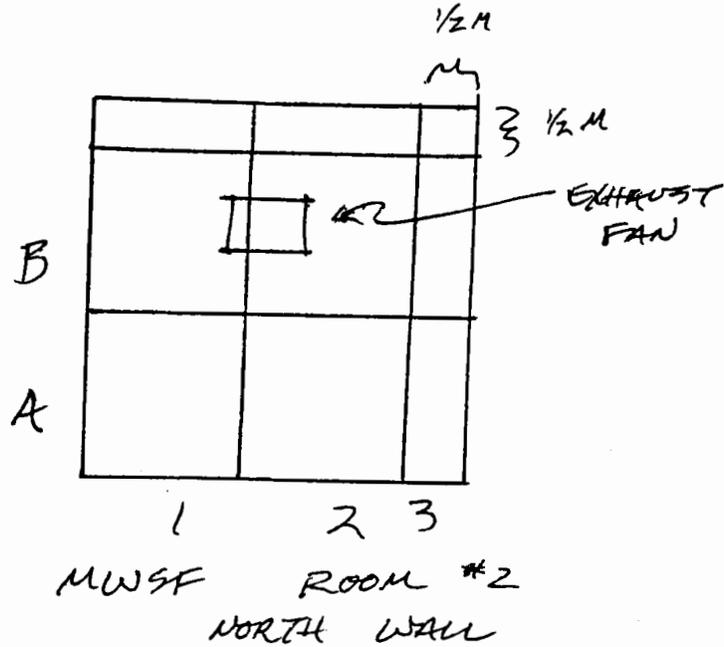
Survey Number 090999-001

Survey Point	Smearable Contamination dpm/100cm ²	alpha dpm/100cm ²	beta/gamma dpm/100cm ²	Total Contamination dpm/100cm ²	alpha dpm/100cm ²	Radiation Level (uR/Hr)	Instruments Used	Additional Comments
2-B2-1	9.1	-1.6	N/A	N/A	N/A	N/A	1	Source Unknown (LM ²)
2-B2-2	8.6	-1.6	-0.8	N/A	N/A	N/A		
2-B2-3	6.3	-0.8	-1.6	N/A	N/A	N/A		
2-B2-4	6.3	-1.6	0	N/A	N/A	N/A		
2-B2-5	14.3	0	-1.6	N/A	N/A	N/A		
2-B2-6	13.7	-1.6	-0.8	N/A	N/A	N/A		
2-B2-7	9.1	-0.8	-1.6	N/A	N/A	N/A		
2-B3-1	3.4	-1.6	-0.8	N/A	N/A	N/A		
2-B3-2	5.1	-0.8	0.6	N/A	N/A	N/A		
2-B3-3	0.6	-0.8	-0.8	N/A	N/A	N/A		
2-B3-4	12.6	-0.8	-0.8	N/A	N/A	N/A		
2-B3-5	18.9	-0.8	0	N/A	N/A	N/A		
2-B3-6	4.6	0	-1.6	N/A	N/A	N/A		
2-B3-7	18.9	-1.6	-0.8	N/A	N/A	N/A		

10/11

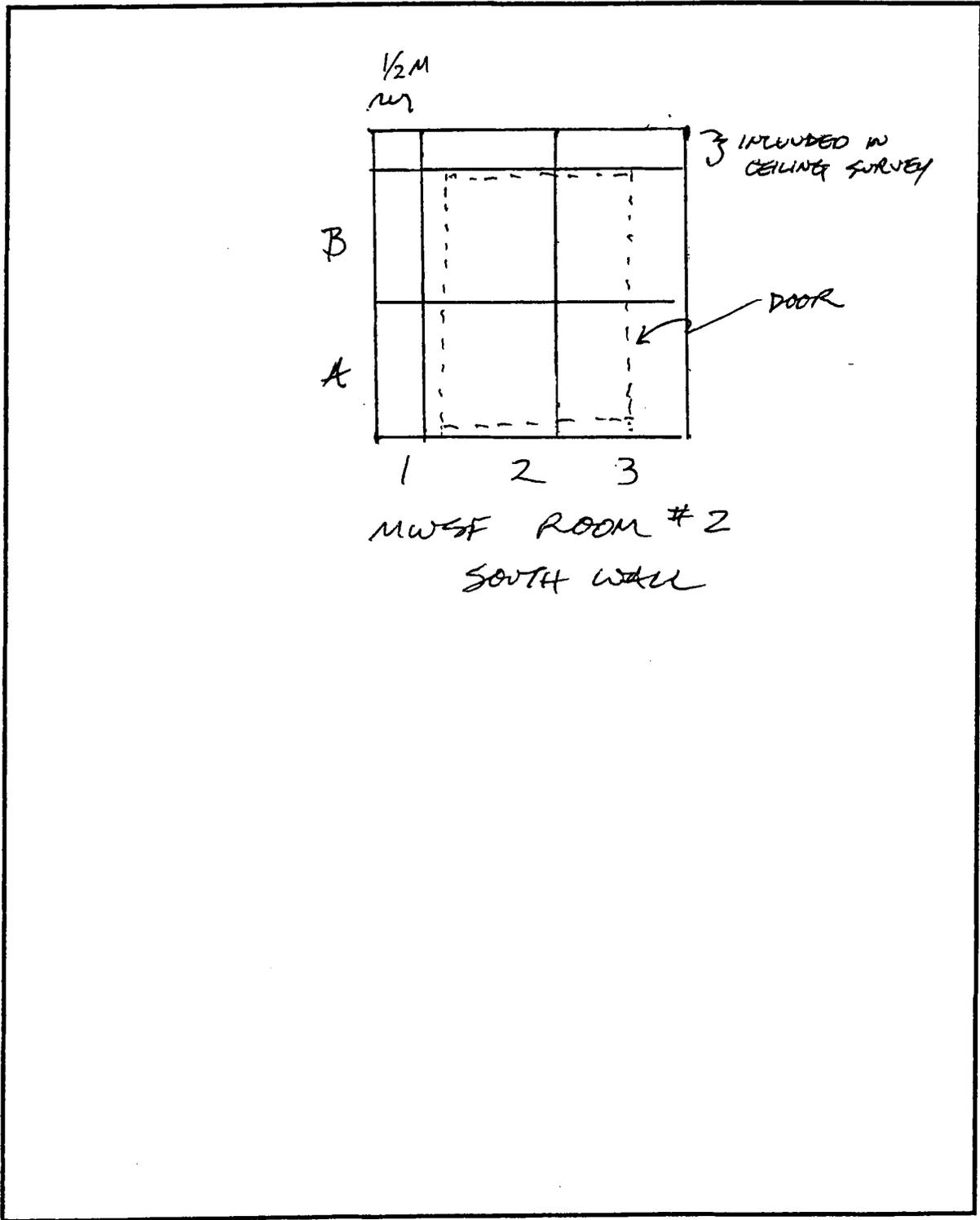
RADIOLOGICAL SURVEY FORM

Survey Number 090999-001



RADIOLOGICAL SURVEY FORM

Survey Number 090999-001



RADIOLOGICAL SURVEY FORM

Survey Number 091099-003

Survey Description: MUSEE ROOM # 2 (A1)
FLOOR (GRAB # A1, A2, A3)
B1, B2, B3 (C1, C2, C3) ROOM
3 CEILING (GRAB # A1, A2, A3,
B1, B2, B3, C1, C2, C3)
 Drawing Attached: Yes No

Survey Date: 9-10-99
 Survey by: [Signature] Date: 9-10-99
 Print Name: DAVID W. DUNN
 Review By: [Signature] Date: 10/1/99

Instrument (1)
 Instrument Model: 620-2929
 Instrument Ser. #: 126145
 Calibration Due: 6-10-00
 Efficiency: A: 0.25 B: 0.35
 MDA: A: 3.9 BKG.A: 0.2
 MDA: B: 9.7 BKG.B: 4.4

Instrument (1)
 Instrument Model: [Signature]
 Instrument Ser. #: [Signature]
 Calibration Due: [Signature]
 Efficiency: [Signature]
 MDA: [Signature] BKG: [Signature]

Instrument (2)
 Instrument Model: 620-2224
 Instrument Ser. #: 146714
 Calibration Due: 2-19-00
 Efficiency: A: 0.16 B: 0.15
 MDA: A: 6.3 BKG.A: 1
 MDA: B: 28.2 BKG.B: 7.2

Instrument (4)
 Instrument Model: [Signature]
 Instrument Ser. #: [Signature]
 Calibration Due: [Signature]
 Efficiency: [Signature]
 MDA: [Signature] BKG: [Signature]

5 MIN COUNTS

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma spm/100cm ²	alpha spm/100cm ²			
2-A1-1	5.7	0	NDA	NDA	NDA	1	FLOOR (1M)
2-A1-2	14.3	-0.8					
2-A1-3	25.7	0.8					
2-A1-4	5.7	0.8					
2-A1-5	16.6	0					
2-A1-6	14.3	0.8					
2-A1-7	36.6	0.8					
2-A2-1	24.6	-0.8					
2-A2-2	24.0	0.8					
2-A2-3	16.6	1.7					
2-A2-4	19.4	-0.8					
2-A2-5	14.3	0.8					
2-A2-6	26.3	0.8					
2-A2-7	12.0	-0.8					

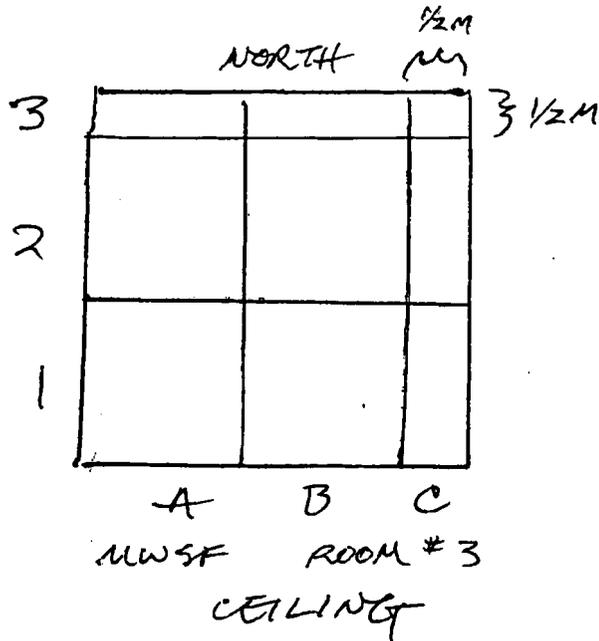
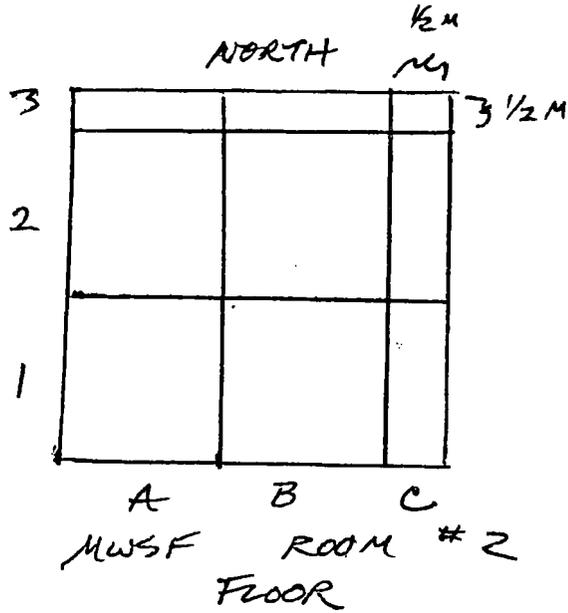
RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 091099-003

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cpm/100cm ²	alpha cpm/100cm ²			
3-A2-1	20.3	0	180.0	6.3	N/A	152	ROOM #3 CEILING (1M)
3-A2-2	14.5	0	93.3	0			
3-A2-3	5.8	1.6	106.7	-6.3			↓
3-A2-4	11.6	-0.8	180.0	-6.3			
3-A2-5	27.0	-0.8	166.7	-6.3			↓
3-A2-6	14.5	0	N/A	N/A			
3-A2-7	17.4	0	↓	↓			↓
3-A3-1	11.6	0	73.3	-6.3			
3-A3-2	31.9	-0.8	86.7	-6.3			↓
3-A3-3	-8.7	-0.8	33.3	6.3			
3-A3-4	20.3	0	N/A	N/A			↓
3-B1-1	5.8	0	20.0	6.3			
3-B1-2	12.6	0	106.7	6.3			↓
3-B1-3	14.5	0	20.0	0			
3-B1-4	11.6	0	166.7	0			↓
3-B1-5	17.1	0	60.0	0			
3-B1-6	23.4	1.6	N/A	N/A			↓
3-B1-7	8.6	2.4	↓	↓			
3-B2-1	24.0	-0.8	186.7	0			↓
3-B2-2	16.6	0.8	166.7	0			
3-B2-3	26.9	0	146.7	0			↓
3-B2-4	17.1	0	73.3	-6.3			
3-B2-5	12.6	-0.8	113.3	-6.3			↓
3-B2-6	22.9	1.6	N/A	N/A			
3-B2-7	6.3	-0.8	↓	↓			↓
3-B3-1	20.0	0	106.7	0			
3-B3-2	9.1	0	113.3	-6.3			↓
3-B3-3	8.6	0.8	73.3	-6.3			
3-B3-4	25.7	-0.8	N/A	N/A			↓
3-C1-1	5.1	-0.8	26.7	-6.3			
3-C1-2	13.7	0	86.7	-6.3			↓
3-C1-3	8.0	1.6	40.0	-6.3			
3-C1-4	32.0	1.6	N/A	N/A			↓
3-C2-1	17.1	0	20.0	0			
3-C2-2	1.1	0	160.0	-6.3			↓
3-C2-3	26.3	-0.8	153.3	0			
3-C2-4	5.7	-0.8	N/A	N/A			↓
3-C3-1	29.1	0	66.7	-6.3			
3-C3-2	6.9	-0.8	166.7	-6.3			↓
3-C3-3	13.1	0.8	140.0	-6.3			
3-C3-4	14.9	-0.8	N/A	N/A			↓
EF-1	16.0	0.8	66.7	18.8			
EF-2	26.7	-0.8	326.7	-6.3			↓
EF-3	12.6	-0.8	266.7	0			
					N/A		ROOM #3 EXHAUST FAN / TOP INTAKE SCREEN

RADIOLOGICAL SURVEY FORM

Survey Number 091099-003



RADIOLOGICAL SURVEY FORM

Survey Number

091399005

Survey Description: MUSEE ROOM # 3 (INT)
EAST WALK (GROSS A1, A2, A3,
B1, B2, B3)
ALONG WALK
(GROSS A1, A2, A3, B1, B2, B3)

Drawing Attached: Yes No

Survey Date: 9-13-99
 Survey by: [Signature]
 Date: 10/13/99
 Title Name: DAVID W. BUCKEN
 Review by: [Signature]
 Date: 10/11/99
 Signature: _____
 Date: _____

Instrument Model: 120-2929
 Instrument Ser. #: 120145
 Calibration Due: 6-10-00
 Efficiency: A- 0.35 B- 0.35
 CF: 0.55 DKG-A: 0.2
 CF: 0.35 DKG-B: 0.50
 NDA-B: 101
 NDA-A: 3.8

Instrument Model: _____
 Instrument Ser. #: _____
 Calibration Due: _____
 Efficiency: _____
 CF: _____ DKG: _____
 NDA: _____

Instrument Model: _____
 Instrument Ser. #: _____
 Calibration Due: _____
 Efficiency: _____
 CF-A: _____ DKG-A: _____
 CF-B: _____ DKG-B: _____
 NDA-A: _____
 NDA-B: _____

Instrument Model: _____
 Instrument Ser. #: _____
 Calibration Due: _____
 Efficiency: _____
 CF: _____ DKG: _____
 NDA: _____

5 WALK CENTERS

Survey	alpha dpm/100cm ²	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma dpm/100cm ²	Fixed Contamination alpha gpm/100cm ²	Radiation Level (uR/h):	Instrument	Additional Comments
3-A1-1	~2.9	12.0	0.8	1.6	NDA	NDA	1	EAST WALK (1/2 M)
3-A1-2	5.7	0.8	0.8	0.8	NDA	NDA		EAST WALK (1 M)
3-A1-3	4.1	0.8	0.8	0.8	NDA	NDA		
3-A1-4	21.7	2.4	0.8	0.8	NDA	NDA		
3-A2-1	9.1	0.8	0.8	0.8	NDA	NDA		
3-A2-2	5.1	0.8	0.8	0.8	NDA	NDA		
3-A2-3	5.1	0.8	0.8	0.8	NDA	NDA		
3-A2-4	16.0	0.8	0.8	0.8	NDA	NDA		
3-A2-5	16.6	0.8	0.8	0.8	NDA	NDA		
3-A2-6	4.9	0.8	0.8	0.8	NDA	NDA		
3-A2-7	2.9	0.8	0.8	0.8	NDA	NDA		
3-A2-1	17.1	0.8	0.8	0.8	NDA	NDA		
3-A3-2	-7.4	0	0	0	NDA	NDA		
3-A3-3	0.6	0	0	0	NDA	NDA		
3-A3-4	2.9	0.8	0.8	0.8	NDA	NDA		

RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 091399005

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cpm/100cm ²	alpha cpm/100cm ²			
3-A3-5	-4.6	0	NDA	NDA	NDA	1	EAST WALL (1M)
3-A3-6	-4.62	-0.8					↓
3-A3-7	0	0					↓
3-B1-1	-3.4	0					EAST WALL (1/2M)
3-B1-2	5.1	0.8					↓
3-B1-3	-5.7	-0.8					↓
3-B1-4	-0.6	-0.8					EAST WALL (1M)
3-B2-1	0.6	0					↓
3-B2-2	16.0	0					↓
3-B2-3	-14.9	0					↓
3-B2-4	-6.9	0					↓
3-B2-5	-4.6	-0.8					↓
3-B2-6	-4.0	-0.8					↓
3-B2-7	-8.0	0					↓
3-B3-1	9.7	0.8					↓
3-B3-2	-17.7	0.8					↓
3-B3-3	-12.0	0					↓
3-B3-4	22.9	0					↓
3-B3-5	-2.9	0					↓
3-B3-6	5.1	-0.8					↓
3-B3-7	-9.7	0					↓
3-A1-1	2.3	-0.8					NORTH WALL (1M)
3-A1-2	4.7	0					↓
3-A1-3	13.1	-0.8					↓
3-A1-4	-2.9	-0.8					↓
3-A1-5	-6.9	0.8					↓
3-A1-6	7.4	-0.8					↓
3-A1-7	6.9	2.4					↓
3-A2-1	-21.1	1.6					↓
3-A2-2	-13.1	0.8					↓
3-A2-3	-4.0	0					↓
3-A2-4	-2.3	1.6					↓
3-A2-5	13.7	-0.8					↓
3-A2-6	-9.1	0					↓
3-A2-7	-6.3	1.6					↓
3-A3-1	-4.6	0					NORTH WALL (1/2M)
3-A3-2	-4.0	0					↓
3-A3-3	4.0	-0.8					↓
3-A3-4	-13.7	1.6					↓
3-B1-1	-1.7	-0.8					NORTH WALL (1M)
3-B1-2	6.3	0					↓
3-B1-3	0.6	-0.8					↓
3-B1-4	-13.7	0					↓
3-B1-5	6.3	0.8					↓
3-B1-6	6.9	-0.8	✓	✓	✓	✓	↓
3-B1-7	-8.9	0					↓

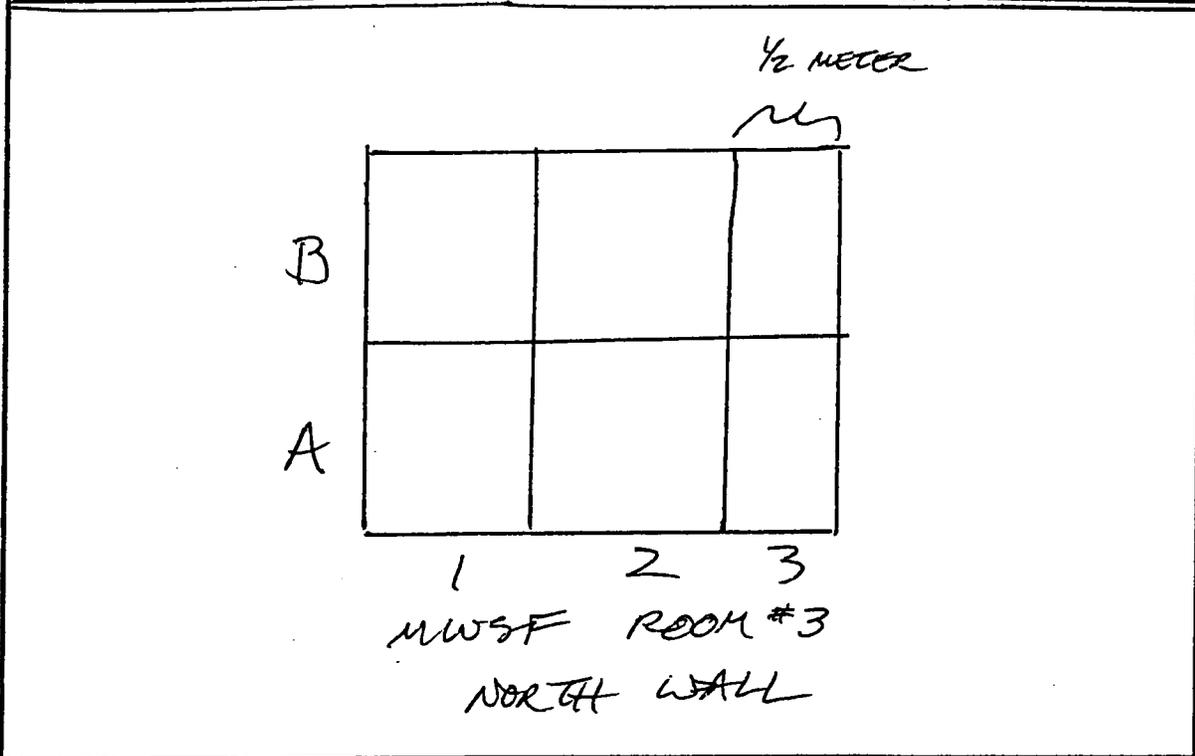
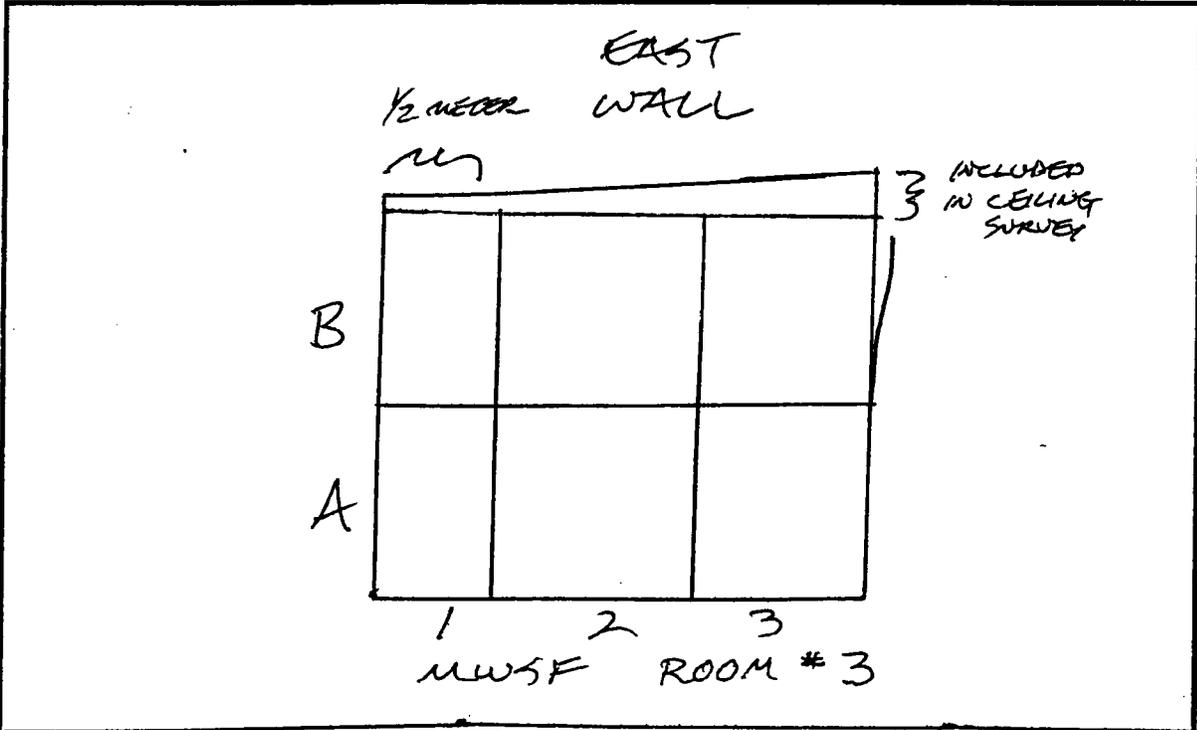
RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 091399005

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cpm/100cm ²	alpha cpm/100cm ²			
3-B2-1	-9.7	0	N/A	N/A	N/A		NORTH WALL (1M)
3-B2-2	6.3	0.8	↓	↓	↓	↓	↓
3-B2-3	-12.6	-0.8	↓	↓	↓	↓	↓
3-B2-4	6.9	-0.8	↓	↓	↓	↓	↓
3-B2-5	-2.9	-0.8	↓	↓	↓	↓	↓
3-B2-6	12.6	-0.8	↓	↓	↓	↓	↓
3-B2-7	16.0	0	↓	↓	↓	↓	↓
3-B3-1	8.6	-0.8	↓	↓	↓	↓	NORTH WALL (1/2M)
3-B3-2	-4.0	-0.8	↓	↓	↓	↓	↓
3-B3-3	5.1	-0.8	↓	↓	↓	↓	↓
3-B3-4	-1.1	0	↓	↓	↓	↓	↓
N/A							

RADIOLOGICAL SURVEY FORM

Survey Number 091399005



RADIOLOGICAL SURVEY FORM

Survey Number 091499006

Survey Description: MUSE ROOM #3 (M)
W. WALL (GRIDS A1, A2, A3,
B1, B2, & B3) SOUTH WALL
(GRIDS A1, A2, A3, B1, B2, & B3)

Drawing Attached: Yes No

Survey Date: 9-14-99
 Survey by: [Signature] Date: 10/1/99
 Field Name: DAVID W. RUSSELL
 Review By: [Signature] Date: 10/1/99

Instrument (1)
 Instrument Model: 1200-2929
 Instrument Ser. #: 126145
 Calibration Due: 6-10-00
 Efficiency: A: 0.25 B: 0.35
 MDA: A: 3.8 B: 0.2
 MDA: B: 101 BKG: 50

Instrument (3)
 Instrument Model: [Signature]
 Instrument Ser. #: [Signature]
 Calibration Due: [Signature]
 Efficiency: [Signature]
 MDA: [Signature] BKG: [Signature]

Instrument (2)
 Instrument Model: [Signature]
 Instrument Ser. #: [Signature]
 Calibration Due: [Signature]
 Efficiency: [Signature]
 MDA: A: [Signature] B: [Signature]
 MDA: B: [Signature] BKG: [Signature]

Instrument (4)
 Instrument Model: [Signature]
 Instrument Ser. #: [Signature]
 Calibration Due: [Signature]
 Efficiency: [Signature]
 MDA: [Signature] BKG: [Signature]

5 MIN COUNT

Survey Point	Meas/gamma dpm/100cm ²	Meas/alpha dpm/100cm ²	Fixed Contamination beta/gamma cpm/100cm ²	alpha cpm/100cm ²	Radiation Level (uR/hr)	Instrument Used	Additional Comments
3-A1-1	1.7	-0.8	N/A	N/A	N/A	1	W. WALL (M)
3-A1-2	8.6	1.6					
3-A1-3	-8.6	0					
3-A1-4	-1.1	0.8					
3-A1-5	-16.6	0					
3-A1-6	-10.3	0.8					
3-A1-7	0.6	-0.8					
3-A2-1	-8.0	0.8					
3-A2-2	11.4	0.8					
3-A2-3	0	0					
3-A2-4	4.6	-0.8					
3-A2-5	-5.1	-0.8					
3-A2-6	21.1	0					
3-A2-7	-12.6	1.6					

RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 091499006

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cpm/100cm ²	alpha cpm/100cm ²			
3-A3-1	24.0	0	N/A	N/A	N/A	1	9/1/88 WEST WALL (1/2M)
3-A3-2	-2.9	0.8					↓
3-A3-3	14.9	-0.8					↓
3-A3-4	5.1	-0.8					↓
3-B1-1	1.1	0.8					WEST WALL (1M)
3-B1-2	-6.9	-0.8					↓
3-B1-3	10.3	0					↓
3-B1-4	-0.6	0.8					↓
3-B1-5	12.0	-0.8					↓
3-B1-6	-0.6	-0.8					↓
3-B1-7	1.1	-0.8					↓
3-B2-1	2.3	-0.8					↓
3-B2-2	10.3	0					↓
3-B2-3	-5.7	0					↓
3-B2-4	6.9	-0.8					↓
3-B2-5	2.3	0					↓
3-B2-6	-9.7	-0.8					↓
3-B2-7	-0.6	-0.8					WEST WALL (1/2M)
3-B3-1	1.7	0					↓
3-B3-2	-6.9	-0.8					↓
3-B3-3	10.3	-0.8					↓
3-B3-4	4.0	-0.8					↓
3-A1-1	-10.3	0.8					SOUTH WALL (1/2M)
3-A1-2	-9.1	-0.8					↓
3-A1-3	1.7	-0.8					↓
3-A1-4	-10.9	-0.8					↓
3-A2-1	-2.9	0					SOUTH WALL (1M)
3-A2-2	-10.9	0					↓
3-A2-3	0	2.4					↓
3-A2-4	-8.0	0.8					↓
3-A2-5	5.1	-0.8					↓
3-A2-6	-0.6	0					↓
3-A2-7	-3.4	0.8					↓
3-A3-1	-4.0	0.8					↓
3-A3-2	-8.9	0.8					↓
3-A3-3	-11.4	0.8					↓
3-A3-4	22.9	-0.8					↓
3-A3-5	-8.0	2.4					↓
3-A3-6	-9.1	0.8					↓
3-A3-7	16.6	1.6					↓
3-B1-1	-8.0	2.4					SOUTH WALL (1/2M)
3-B1-2	-16.6	-0.8					↓
3-B1-3	-3.4	-0.8					↓
3-B1-4	0	0	✓	↓	↓	↓	↓
N/A							

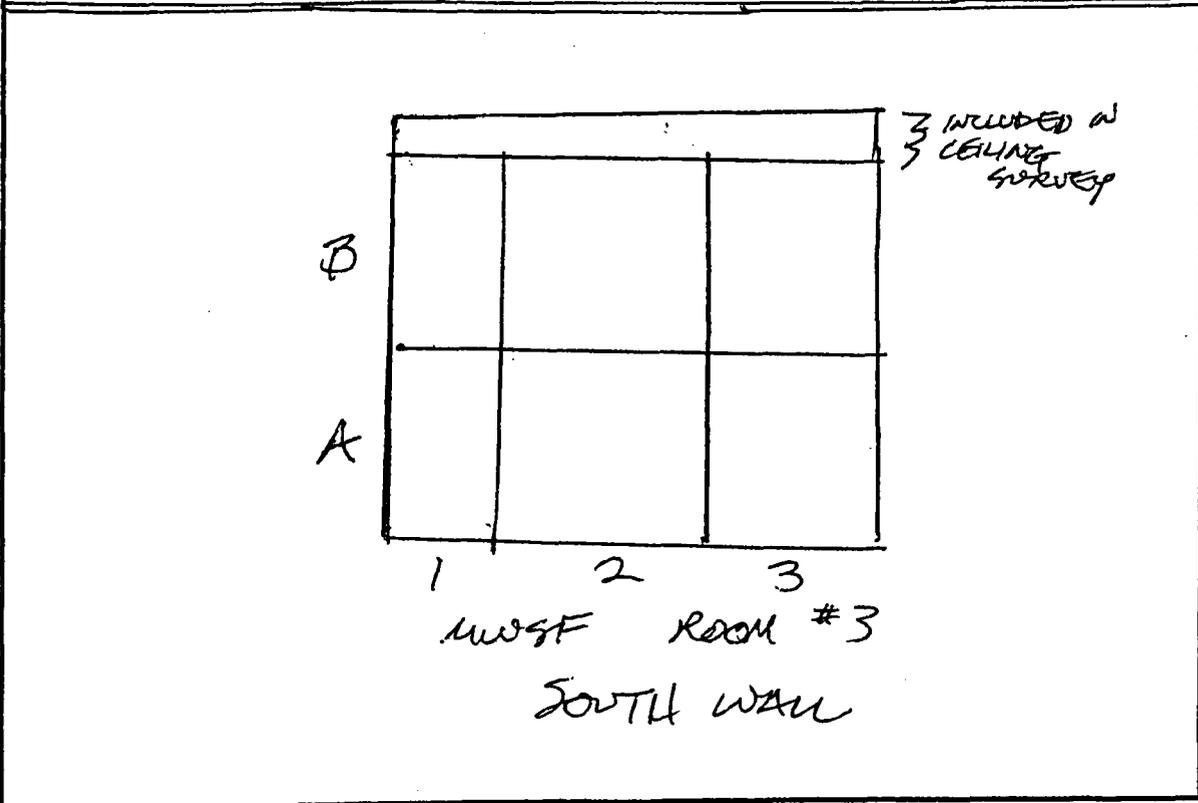
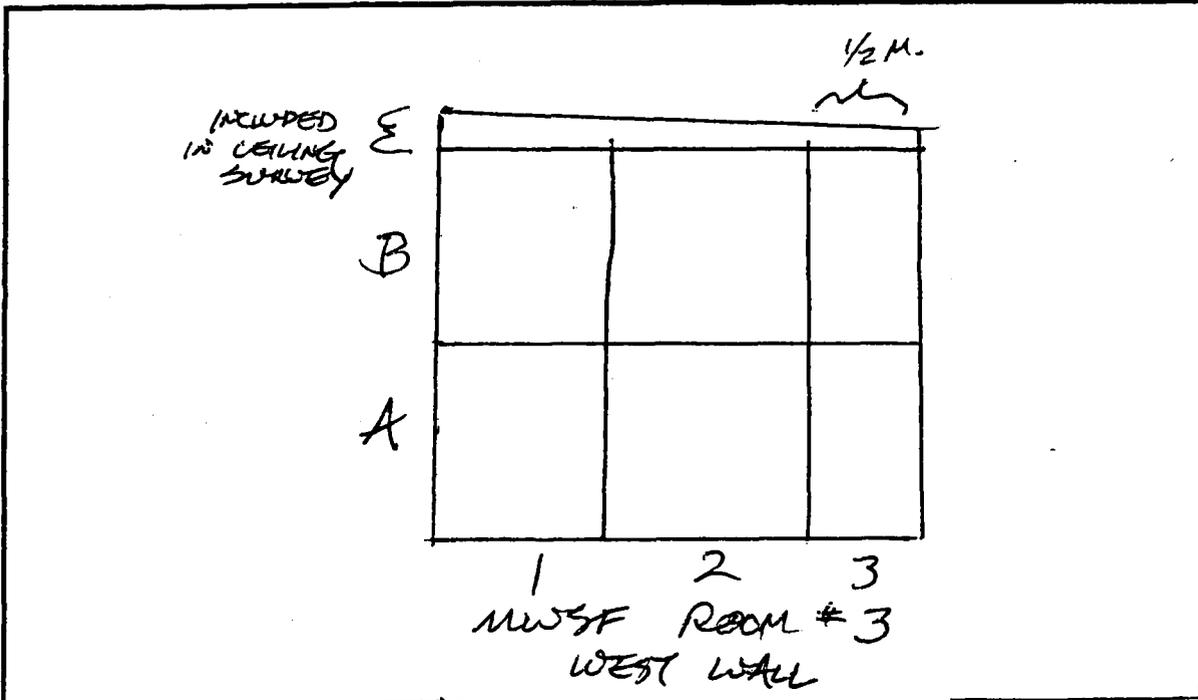
RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 091499006

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cpm/100cm ²	alpha cpm/100cm ²			
3-B2-1	-10.9	0	N/A	N/A	N/A	1	SOUTH WALL (1K)
3-B2-2	4.0	0	↓	↓	↓	↓	↓
3-B2-3	-3.4	0	↓	↓	↓	↓	↓
3-B2-4	0.6	0	↓	↓	↓	↓	↓
3-B2-5	-16.6	0	↓	↓	↓	↓	↓
3-B2-6	0	-0.8	↓	↓	↓	↓	↓
3-B2-7	18.9	1.6	↓	↓	↓	↓	↓
3-B3-1	-18.3	-0.8	↓	↓	↓	↓	↓
3-B3-2	-10.9	1.6	↓	↓	↓	↓	↓
3-B3-3	-8.9	0	↓	↓	↓	↓	↓
3-B3-4	1.7	-0.8	↓	↓	↓	↓	↓
3-B3-5	-4.6	-0.8	↓	↓	↓	↓	↓
3-B3-6	20.0	0.8	↓	↓	↓	↓	↓
3-B3-7	8.0	-0.8	↓	↓	↓	↓	↓
N/A							

RADIOLOGICAL SURVEY FORM

Survey Number 091499006



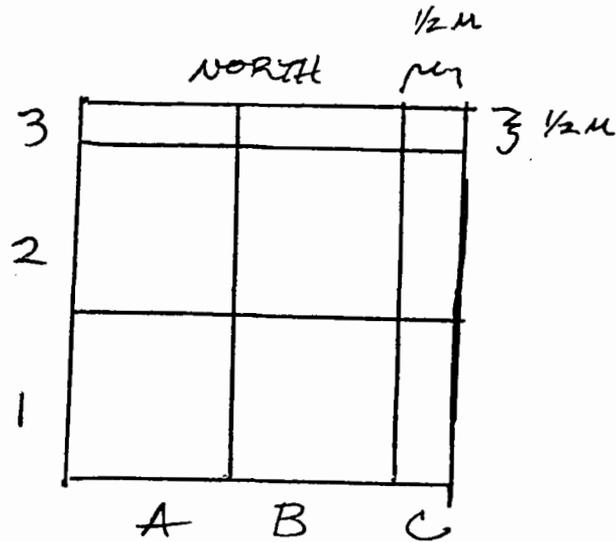
RADIOLOGICAL SURVEY FORM CONTINUATION SHEET

Survey Number 091599001

Survey Point	Smearable Contamination		Fixed Contamination		Radiation Level (uR/Hr)	Instrument Used	Additional Comments
	beta/gamma dpm/100cm ²	alpha dpm/100cm ²	beta/gamma cpm/100cm ²	alpha cpm/100cm ²			
3-3A-1	20.6	2.4	N/A	N/A	N/A	1	FLOOR (1/2M)
3-3A-2	21.7	2.4					
3-3A-3	26.3	5.0					
3-3A-4	16.0	0.8					
3-B1-1	17.7	-0.8					FLOOR (1M)
3-B1-2	26.3	3.2					
3-B1-3	15.4	0.8					
3-B1-4	27.4	-0.8					
3-B1-5	26.3	2.4					
3-B1-6	21.7	3.2					
3-B1-7	10.9	0					
3-B2-1	28.0	0.8					
3-B2-2	41.1	0					
3-B2-3	25.1	0.8					
3-B2-4	26.3	3.2					
3-B2-5	13.7	1.6					
3-B2-6	13.7	0.8					
3-B2-7	25.7	0					
3-B3-1	40.6	0.8					FLOOR (1/2M)
3-B3-2	18.9	-0.8					
3-B3-3	28.0	1.6					
3-B3-4	34.3	-0.8					
3-C1-1	33.7	4.8					
3-C1-2	28.6	3.2					
3-C1-3	8.6	1.6					
3-C1-4	31.4	0.8					
3-C2-1	26.1	2.9					
3-C2-2	25.7	2.4					
3-C2-3	17.1	0					
3-C2-4	33.1	0.8					
3-C3-1	18.3	4.0					
3-C3-2	14.9	0.8					
3-C3-3	16.6	0.8	✓	✓	✓	✓	✓
3-C3-4	33.7	0.8	✓	✓	✓	✓	✓
N/A							

RADIOLOGICAL SURVEY FORM

Survey Number 091599001



MWSF Room # 3
FLOOR

APPENDIX C

INDEPENDENT CALIFORNIA-REGISTERED PROFESSIONAL ENGINEER CERTIFICATION



Engineering/Remediation
Resources Group, Inc.
4070 Nelson Avenue
Suite B
Concord, CA 94520

Main: (925) 969-0750
Fax: (925) 969-0751

November 11, 1999

Mr. Michael J. Zimmerman, P.E., R.E.A.
Senior Project Engineer
Weiss Associates
5801 Christie Avenue, Suite 600
Emeryville, CA 94608-1827

Certification of Closure, Mixed Waste Storage Facility
LEHR Site, Davis California

Dear Mr. Zimmerman:

Engineering/Remediation Resources Group, Inc. (ERRG) is pleased to submit the completed Certification of Closure form provided by your office for the Laboratory for Energy-Related Health Research (LEHR) Mixed Waste Storage Facility (MWSF) located at UC Davis. My scope of work for this project is summarized below.

I initially reviewed the following documents provided by Weiss Associates:

- Closure Report dated September 30, 1997
- Final Sampling Plan dated April 30, 1998
- Addendum To Final Sampling Plan dated September 16, 1998
- Draft Summary Report dated July 24, 1998
- Summary Data Report dated January 29, 1999
- Closure Certification Report (Rev. C) dated November 4, 1999

I also met with Dr. Salem Attiga, Ph.D. of Environmental Management Services in Concord, California on November 3, 1999 and Mr. Bill Schaal of IT Corporation also in Concord, California on November 5, 1999. We discussed preparation of the various plans and related documents as well as the sequence of closure activities for the facility during these meetings.

Mr. Michael Zimmerman, P.E., REA
November 11, 1999
Page 2

In addition, I made two visits to the site. On November 5, 1999, I met you and two IT Corporation representatives, Mr. Dave Ochs (Project Regulatory Specialist) and Mr. John Wolf. We walked through the LEHR site and inspected the former and current location of the MWSF as well as the MWSF itself. Following the field inspection, we returned to the Weiss field office and discussed various aspects of how the closure had been performed and documented. At this time, the placards had been removed but the fire suppression system was still in-place.

On November 9, 1999, I returned to the LEHR site and confirmed (by visual observation) that the fire suppression system had been disconnected (the pressurized bottle had been removed). In addition, I reviewed the Weekly Inspection forms for the MWSF on file at the Weiss field office. I met briefly with Mr. Dave Ochs and discussed removal of the fire suppression pressure bottle.

Having satisfied myself that the MWSF had been closed in accordance with the Closure Plan, I executed the attached closure certification form. If you have any further questions or comments, please do not hesitate to contact me at (925) 969-0750.

Sincerely,



William W. Moore, P.E., G.E.
Principal

Enclosure

WWM/



**INDEPENDENT CALIFORNIA-REGISTERED PROFESSIONAL
ENGINEER CERTIFICATION**
LABORATORY FOR ENERGY-RELATED HEALTH RESEARCH (LEHR)
MIXED WASTE STORAGE FACILITY (MWSF) CLOSURE

As required in 22 CCR 66265.115, I certify under penalty of law that the LEHR MWSF at UC Davis was closed in accordance with the specifications in the Closure Plan approved by the Department of Toxic Substances Control on June 23, 1999.

This certification is based on my inspection or assessment of the MWSF, the Closure Plan, other related documents, and the results of closure sampling for radiological and chemical parameters.

Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information including the possibility of fine and imprisonment for knowing violations.

Name of Engineer: William W. Moore, P.E.

Signature: *William W. Moore* Engineer No. C 18340

Date of Certification: November 11, 1999

Owner/Operator's Name: Agent for DOE
Michael Zimmerman, Weiss Associates

Signature: *Michael Zimmerman*

Date: November 16, 1999

