300502-0608300001

CH2M HILL Mound, Inc.
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Miamisburg, OH 45343-0750

CH2MHILL

SMO-475/06
August 2, 2006

Mr. Don Pfister, Director
Miamisburg Closure Project
U. S. Department of Energy
175 Tri-County Parkway
Springdale, OH 45246

ATTENTION: Paul Lucas

SUBJECT: **Contract No. DE-AC24-03OH20152:** Deliverable #36 Building Data Package; Section C.2.1.2 Facility Transfer; T Building Structure OSC Report, Final

Dear Mr. Pfister:

Attached is the following Final document for your records.

- T Building Structure OSC Report, Final

If you or members of your staff have any questions regarding the document, or if additional support is needed, please contact Dave Rakel at 937-865-4203.

Sincerely,

Michael D. Ebben
Site Manager

ME/jg

Enclosures

cc: T. Fischer, USEPA, (1) w/attachments
B. Nickel, OEPA, (1) w/attachments
S. Helmer, ODH, (1) w/attachments
J. Crombie, ODH, (1) w/attachments
M. Wojciechowski, Tetra Tech, (1) w/attach
G. Gorsuch, DOE/MCP, (1) w/attachments
R. Tormey, DOE/OH, (1) w/attachments
G. Desai, DOE/HQ, (1) w/attachments
C. Kline, CH2M Hill, (1) w/attachments
Public Reading Room (1) w/attachments
Admin Records, CH2M Hill, (2) w/attachs
ER Records, CH2M Hill, (1) w/attachs
DCC (1) w/attachments
M. Ebben, CH2M Hill, w/o attachments
K. Armstrong, CH2M Hill, w/o attachments
D. Rakel, CH2M Hill, w/o attachments
D. Kramer, CH2M Hill, w/o attachments
A. Upshaw, CH2M Hill, w/o attachments
S. Barr, CH2M Hill, w/o attachments
S. Brindle, CH2M Hill, w/o attachments
file, CH2M Hill, w/o attachments

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T BUILDING STRUCTURE REMOVAL ACTION

OSC REPORT

This OSC Report closes out PRSs 213-233 and 339-344 and T Building Structure

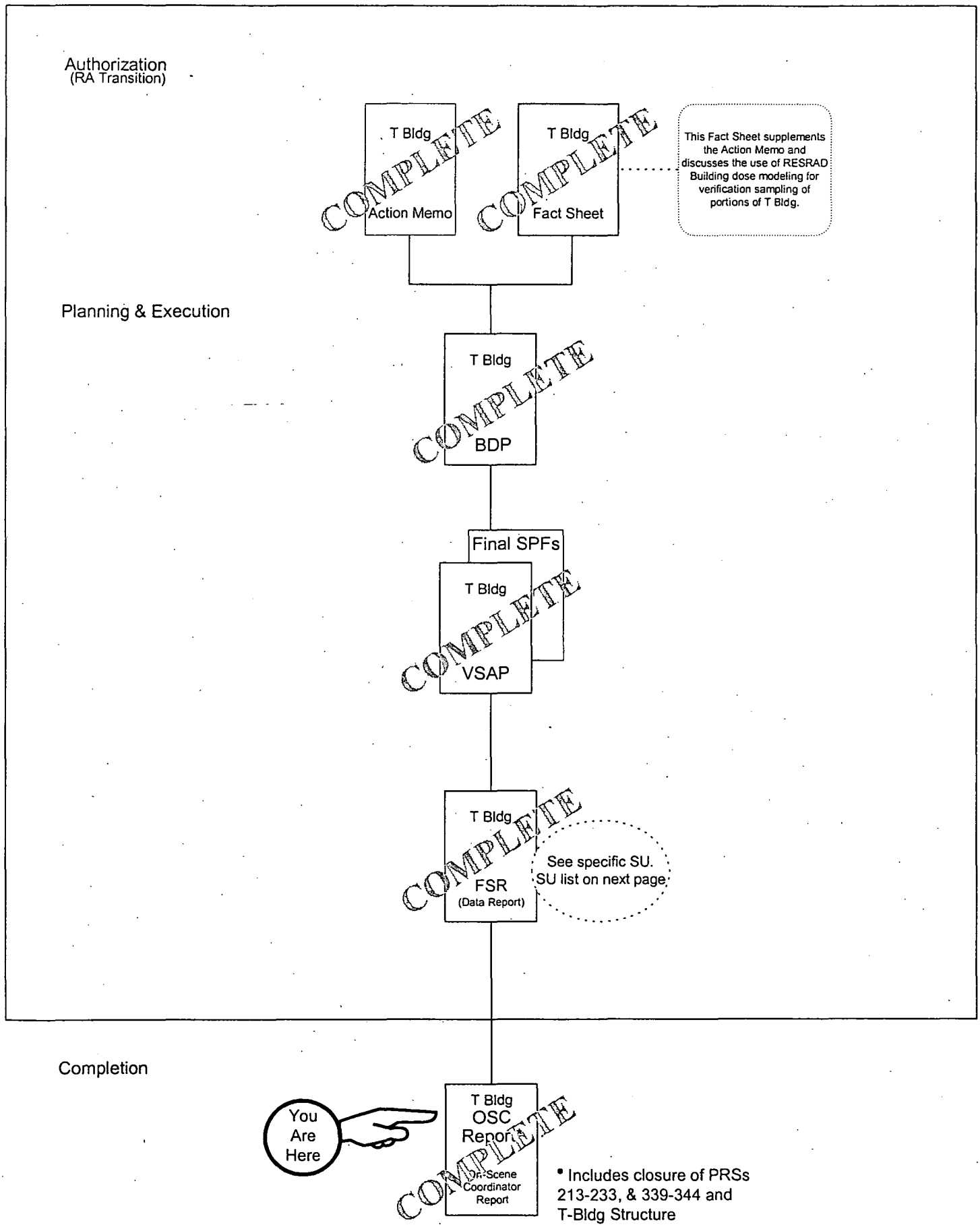
July 2006

FINAL

Department of Energy
Miamisburg Closure Project

CH2MHILL

T Building & PRSs 213-233, & 339-344



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T Building, Final Status Report, Survey Unit List

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1C-04
1C-05
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1CS-01-01
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Acronyms

AM	Action Memorandum
ARARs	Applicable or Relevant and Appropriate Requirements
BDP	Building Data Package
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
COS	Central Office Support
CRA	Contingent Removal Action
CSAP	Confirmation Sampling and Analysis Plan
cy	Cubic Yard
DAC	Derived Air Concentration
D&D	Decontamination & Decommissioning
DOE	Department of Energy
DS	Developmental & Standards
EPA	Environmental Protection Agency
FA	Further Assessment
FSS	Final Status Survey
FSR	Final Status Survey Report
FFA	Federal Facility Agreement
HASP/ JSHA	Health and Safety Plan/ Job Safety Hazard Analysis
HEPA	High Efficiency Particulate Air
LSA	Low Specific Activity
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MCP	Miamisburg Closure Project
MMCIC	Miamisburg Mound Community Improvement Corporation
MSR	Maintenance Service Request
NA	Non-applicable
NTS	Nevada Test Site
NFA	No Further Assessment
NORM	Naturally Occurring Radioactive Material
OEPA	Ohio Environmental Protection Agency
OSC	On-Scene Coordinator
PRS	Potential Release Site
RA	Removal Action
RASS	Remedial Action Support Survey
ROD	Record of Decision
RRE	Residual Risk Evaluation
RWP	Radiological Work Permit
T	Technical (Building)
TERF	Tritium Emissions Recovery Facility
TRU	Transuranic
USEPA	United States Environmental Protection Agency
VSAP	Verification Sampling and Analysis Plan
WP	Work Package

Recommendation: T Building Structure & PRSs 213-233 & 339-344

The Mound T Building Structure Removal Action (RA) (authorized via the Action Memorandum Engineering Evaluation / Cost Analysis for the T Building Removal Action, (Final, June 2003) was performed based on possible radiological contamination resulting from the processing of polonium and tritium.

This Structure On-Scene Coordinator (OSC) Report documents the completion of the Removal Action for the T Building Structural contamination. No soils were remediated as part of this Removal Action. This Removal Action resulted in the disposal of 980 cubic yards (cy) of radioactive waste that was sent to Envirocare. Approximately 20 cy of asbestos waste was sent to the Stoney Hollow Landfill, Dayton, Ohio; approximately 10,000 gallons of ethylene glycol (cooling system chiller coolant) were disposed of through Clean Harbors, Inc.; and 390 cy of Construction Debris (Concrete/Brick/Wood/Other) that met surface release criteria were disposed of at Stoney Hollow Landfill, Dayton, Ohio. There were several small TRU sources and Mixed Waste (Contaminated lead waste) disposed of at Envirocare.

PRSs 213-233 and 339-344 include sumps, a tank, solidification unit, and waste compactor. PRSs 213 and 214 were removed and disposed of (Envirocare or NTS) prior to the RA. The following PRSs were decontaminated and left in-place: PRSs 215-224, 226, 231, and 341-344. All PRSs left in-place met the cleanup criteria documented in the T Building Final Status Reports. The following PRSs were removed and disposed of at Envirocare: PRSs 213, 214, 225, 227-230, 232, 233, 339, and 340.

Of the surface area surveyed, 98.4% met the surface release criteria (Mound 2000) and required no further action. The remaining 1.6% met the volumetric release criteria and the Core Team agrees that the Institutional Controls (locations shown on Figure 3 of Appendix A to this OSC Report) will be implemented via the Parcel 6, 7, and 8 Record of Decision. The following institutional controls will be adopted, and when applied, yield a maximum dose less than 15 mRem/year to any future occupant when considering the collective dose from all affected areas.

- Prohibition against the removal of concrete floor material in specified rooms of T Building without prior approval from US EPA and Ohio EPA. Approval requires a waste disposal plan that meets all state and federal rules and regulations.
- Prohibition against the penetration of concrete floors in specified rooms of T Building locations without prior approval from US EPA and Ohio EPA.

After a thorough review of the Mound T Building On-Scene Coordinator Report, the Core Team agrees that the Removal Action for the T Building structure and PRSs 213-233 and 339-344 is complete.

Paul L 7/26/06

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7/26/06

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7/27/06

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1.0 SUMMARY OF EVENTS

This section describes the background and events leading up to the removal action, parties involved in supporting the removal action, chronological narrative of the removal action, and resources committed to complete the project.

1.1 Site Conditions and Background

T Building is a heavily reinforced subterranean concrete structure. The Core Team authorized the Removal Action via the T Building Action Memorandum, Mound T Building Removal Action, June 2003, Final (Reference 1) due to radiological contamination from various missions and projects in the building. A complete list of contaminants of concern (COCs) is provided in Appendix B, Table 1A.

This Structure On-Scene Coordinator (OSC) Report documents the completion of the Removal Action for the T Building structure. No soils were remediated as part of this Removal Action. The levels of radiological contamination present in T Building warranted a Removal Action under CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act).

T Building Background

This section describes the physical site location, site characteristics, release of contaminants into the environment, and the site's National Priorities List (NPL) status.

The Miamisburg Closure Project (MCP) Site is located on the southern border of the city of Miamisburg in Montgomery County, Ohio, approximately 10 miles south-southwest of Dayton and 45 miles north of Cincinnati.

The location of T (Technical) Building is shown in Appendix A, Figure 1. A photograph of the T Building East Tunnel Entrance is shown in Appendix A, Figure 2. The building is located on the south side of the Main Hill area of the plant and was constructed directly into the hillside. Buildings E and M (both demolished) once bordered T Building on the north. R Building (demolished) bordered the T Building to the north, Building 48 (demolished) to the west, and COS Building, to the south. COS Building was constructed against the exterior wall of the T East Tunnel. DS Building (demolished) was located above T Building.

Building Characteristics

Construction of T Building, a heavily reinforced, underground structure, began in February 1947. Construction was completed in December 1948. The building has two floors that are compartmentalized into three general areas by two 30-inch thick firewalls. The reinforced concrete exterior structure has a 15-foot thick roof,

16.5-foot thick walls on an 8-foot slab further supported by a 2-foot thick slab (Reference 3).

The roof was designed to resist damage from a 2,000-pound semi-armor piercing jet-assisted aerial bomb. The floor structure was built to withstand an explosion of a bomb at some point below the floor should it reach that point by a curved path through the soil surrounding the building. The entrances and air intake shafts, as designed and constructed, had sufficient angle turns and blast pockets to absorb the force of a concussion from a bombing through the doors in the entrance. The air filters within the building would likely not be damaged from such an explosion. The tunnel doors are "steel blast doors". "Steel blast doors" were also installed at the tower entrances. All blast doors were designed to withstand a blast pressure wave of five pounds per square inch. Associated building structures include two exhaust airshafts each with two hundred-foot tall brick and mortar exhaust stacks (demolished). The building has three towers, along the north wall, one at each end and one at the center. The end towers contain stairways, passenger elevators, airshafts for intake ventilation air and pedestrian entrances at grade level. The center tower was used for providing intake ventilation air. There are two head houses near the ends of the building that contain airshafts that are part of the exhaust air ventilation system. A vehicular tunnel extends the length of the south side of the building.

Access to the building is through the elevator towers at the east and west ends of the building or by the vehicle access tunnel. There are two entrances into the tunnel from the outside. The central steam system was utilized for heat but has since been removed. A chilled water station and an electrical substation, within the structure, service the building.

T Building was host to a multitude of research, development and production programs with various radioisotopes. The two major radionuclide programs were the polonium and tritium programs. T Building was designed as a facility to purify polonium-210 for use in initiators in early nuclear weapons. From 1949 to 1973 polonium-210 programs included a processing and separation program, a fuels research and development program, neutron source program, and a variety of other research, development, and production programs with polonium. Radioactive elements associated with T Building operations included uranium, polonium, cobalt, plutonium, americium, radium, radon, bismuth, cesium, strontium, and tritium.

Decontamination work was done from 1971 to 1973 on the polonium processing area. The facility was later used for tritium projects. Other operations included a nickel carbonyl vapor deposition plating process and neutron activation analysis. T Building was renovated and most recently used for tritium recovery and purification operations, calorimetry production, heat source calibration, x-ray and gamma scanning, and liquid scintillation counting. Trace quantities of americium were associated with the count lab. Certain areas of the building have been used

for the storage of Transuranic (TRU) materials. The T Building footprint is 173,000 square feet. Usable floor area, including the tunnel, is 150,000 square feet.

As part of the ongoing decontamination and decommissioning (D&D) process at the MCP Site, limited volumes of CERCLA hazardous/mixed waste were stored in T Building in accordance with Applicable or Relevant and Appropriate Requirements (ARARs) presented in Appendix B of the Action Memorandum. Waste Management packaged and shipped the CERCLA hazardous/mixed waste from T Building to an appropriate disposal site.

Associated Potential Release Sites (PRSs) and Previous Investigations
Twenty-seven Potential Release Sites (PRSs) are associated with T Building include a solidification unit, a waste compactor, and twenty-five sumps/tanks. The PRSs are listed in Table 2A, Appendix B.

PRSs 213-233 and 339-344 include sumps, a tank, solidification unit, and waste compactor. The following PRSs were decontaminated and left in-place: PRSs 213-224, 226, 231, and 341-344. All PRSs left in-place met the cleanup criteria as documented in the T Building Final Status Reports. The following PRSs were removed and disposed of at Envirocare: PRSs 225, 227-230, 232, 233, 339, and 340.

Since DOE is the sole responsible party for cleanup of contamination at the T Building, no Potentially Responsible Parties (PRPs) were sought to clean up the site. Monsanto Research Corporation, EG&G Mound Applied Technologies, and BWXT of Ohio, Inc. were the operating contractors at the site from 1948 to 30 September 1988, from 1 October 1988 until 30 September 1997, and from 1 October 1997 until 31 December 2002 respectively. CH2M Hill Mound, Inc. became the site contractor for the Miamisburg Closure Project (MCP) effective January 1, 2003.

1.2 Organization of the Removal Action

Table 3A (Appendix B) lists the parties supporting the removal action and their responsibilities.

1.3 Objectives

Documentation Objective The objective of this T Building Structure OSC Report is to describe the Removal Action fieldwork, and document successful completion of the T Building RA. Demolition debris quantities and disposition locations are presented in Table 4A, Appendix B.

Removal Action Objectives The objectives of the Removal Action, as outlined in the Action Memorandum, Mound T Building Removal, June 2003, Final, and documented in this T Building Removal Action OSC Report include:

- **Project Planning**
- **General Approach**
- **Decontamination**
- **Verification/ Confirmation**
- **Facility Release**
- **Documentation Completion**

Cleanup Criteria

Individual Final Status Survey Reports for the various rooms were prepared and approved as they were completed.

Included in each FSR is
Attachment A – T Building COCs and surface Release Criteria
Attachment B – Direct and Removable Activity Graphs
Attachment C – Retrospective Power Curves
Attachment D – Data Analysis Worksheets
Attachment E – Survey Plan Form
Attachment F – Summary of RSDS

Each FSR is specific to the area, room or system being evaluated.

1.4 Chronological Narrative of the Removal Action

The following is a chronological narrative of events surrounding the T Building structure RA.

Table 1- Chronological Events

Timeframe	Activity
1948	T Building initial construction complete, facility becomes operational.
1994	Began shipping Tritium to SRS and Tritium System Safe Shutdown
1996	T Building Environmental Appraisal of Mound Plant Compiled
1997	Waste Management Compliance Assessment for T Building
2003	T Building Operations Shutdown / TERF Flushing Begins
June 2003	T Building Final Action Memorandum issued.
2003	T Building facility safe shutdown/decontamination begins.
May 2006	T Building Structural Remediation Completed
June 2006	T Building Final Verification Surveys Completed
June 2006	T Building Structure OSC Report generated.

2.0 EFFECTIVENESS OF THE REMOVAL ACTION

The T Building structure has been remediated, and the debris removed and properly disposed of utilizing MSRs (Maintenance Service Requests) and Work Packages. Photographs taken before, during, and after remediation are included in Appendix D.

2.1 Actions Taken by Site Contractor

CH2M HILL Mound, Inc. personnel planned and performed Removal Action oversight, building/structure decontamination, building/structure dismantlement and remediation, and onsite transportation and staging of debris. The project met the Removal Action objectives as related to the T Building structure per the outline of the Action Memorandum, T Building Removal Action, June 2003, Final, and the T Building Public Fact Sheet, April 2006, Final.

In accordance with the RA, the following actions were taken: project planning, public participation, T Building/structures decontamination, T Building/structure partial demolition, and proper disposal of the debris. This Structure OSC Report provides the documentation of completion for the Removal Action for the T Building structural remediation, building floor removal, tanks, waste compactor solidification unit and in-ground piping and conduit removal, including PRSs 213-233 and 339-344.

The remediation of T Building is complete. A total of 178 Survey Units were evaluated and determined to meet release criteria. Surface Release Criteria was applied to 164 Survey Units. Volumetric Release Criteria was applied to 14 Survey Units. These are highlighted in Figure 3 with the institutional control requirements. Individual FSRs address the exposure scenarios, assumptions used, characterization for the model, and formed the conclusion that each area meets the release criteria.

Verification

Sampling and analysis of areas identified in the T Building Verification Sampling and Analysis Plan (VSAP) were performed to verify that the residual contamination concentration is within acceptable limits. This document defines the confirmation/verification sampling and analysis process and includes the contaminants of concern (COCs) and cleanup objectives. Sampling for verification of contaminant removal followed a Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)-like approach. The Core Team made up of the OEPA, EPA and DOE reviewed and approved the VSAP. Table 2 provides the radiological surface cleanup objectives for T Building as defined in the Work Plan for Environmental Restoration (Reference 5). A 15 mrem/yr dose

limit, excluding NORM in building materials was used as the contamination clean-up objective where volumetric contamination was found (Reference 5).

Table 2: Surface Release Criteria Clean-Up Objectives

Allowable Total Residual Surface Contamination (dpm/100 cm^2)[1]			
Radionuclides[2]	Averag[3,4] ($DCGL_w$)	Maximum[5,6] ($DCGL_{EMC}$)	Removable[6]
Group 1: Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100	300	20
Group 2: Th-natural, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1,000	3,000	200
Group 3: U-Natural, U235, U238 and associated decay products, alpha emitters	5,000	15,000	1,000
Group 4: Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous[7] fission) except Sr-90 and others listed above. Includes mixed fission products containing Sr-90.	5,000	15,000	1,000
Tritium	N/A	N/A	10,000

Note: Refer to Work Plan for Environmental Restoration of the DOE Mound Site, The Mound 2000 Approach, Table 1, "Surface Contamination Guidelines".

There are five rooms/areas in T-Building with residual volumetric contamination. Surveys in these areas have resulted in the identification of contamination at levels exceeding the surface release guidelines established in Mound 2000. The RESRAD-Build computer code has been used to estimate the maximum dose to any future building occupant in each of these 5 areas. Calculations in each area were done independently, without any consideration for additive dose contributions from the other areas. The purpose of this narrative is to consider the significance of additive dose contributions from all areas to receptors in each area modeled with RESRAD-Build. This is necessary to ensure that the maximum dose to future building occupants is less than 15 mrem/year from all building sources combined.

Any potential dose contributions from areas where the levels of surface contamination are below the release criteria are assumed to contribute insignificantly to the dose of future building occupants. The following quotation is from Work Plan For Environmental Restoration of the DOE Mound Site, The Mound 2000 Approach, Final February 1999, Appendix A, "Surface and Volumetric Release Criteria for Building Disposition:"

> "If there is no surface contamination above the surface contamination criteria (Table 1), it is reasonable to assume that there is no significant exposure

due to existence of residual volumetric contamination."

This discussion is therefore limited to the 5 areas where surface contamination is above the Mound 2000 Table 1 values. The following table summarizes the results of the independent dose calculations for each area.

Table 3: Independent Dose Calculation

Area Description	Occupancy Scenario Dose (mrem/yr)			Renovation Scenario Dose (mrem/yr)		
	External	Internal	Total	External	Internal	Total
1S-10 (Room 16)	10.5	0.02	**10.5**	3.05	0.05	**3.1**
1C-15 (Room 61)	0.12	0.76	**0.9**	0.03	1.62	**1.7**
1C-16 (Room 63)	0.13	0.74	**0.9**	0.03	1.60	**1.6**
T-Cap* (Rooms 48, 57, 58, and 59)	8.87	0.02	**8.9**	1.83	0.04	**1.9**
SYS-02A** (West Head House)	0.2	5.2	**5.4**	0.0	11.1	**11.1**

* T Cap includes SU#s 1C-07, 1C-08, 1C-09, 1C-10, 1C-11, 1C-12, 1C-21, SYS-PRS 227, SYS-PRS 228, SYS-PRS 229, SYS-PRS 230, and SYS-PRS 339.

** SYS-02A includes SU #s SYS-02A, SYS-02B, and SYS-02C

In this analysis, it is important to point out that T-Building is divided into 3 bays, each bay separated by a 3-feet thick concrete wall. Of the 5 areas listed in the above table, only 1C-15, 1C-16, and T-Cap share the same bay. Although it is possible for airborne contamination to pass freely between bays, the 3-feet thick concrete walls effectively shield the external dose between bays, i.e., reducing the dose rate by more than a factor of 1000. For simplification in this analysis, computed doses from 1C-15, 1C-16, and T-Cap will simply be combined, leaving only 3 areas to consider.

Table 4: Areas Combined for Simplicity

Area Description	Occupancy Scenario Dose (mrem/yr)			Renovation Scenario Dose (mrem/yr)		
	External	Internal	Total	External	Internal	Total
1S-10	10.5	0.02	**10.5**	3.05	0.05	**3.1**
1C-15, 1C-16, and T-Cap combined for simplicity	9.12	1.52	**10.6**	1.88	3.25	**5.1**
SYS-02A	0.2	5.2	**5.4**	0.05	11.02	**11.1**

Since these 3 areas are isolated from each other with regard to external dose due to the 3-feet thick concrete wall that separates them, external dose components between the different areas may be ignored. Although some small component of the computed internal doses are from direct ingestion, for the purpose of this analysis, it is assumed that internal dose is all due to airborne contamination that may pass freely throughout the building. Therefore, the internal dose component to the building as a whole from each of the affected areas can be estimated using a ratio of the air volume of the affected area to the total building air volume. The total building air volume is approximately 42,000 m^3.

Table 5: Air Modeling

Area Description	Modeled room air volume (m^3)	Ratio (modeled room air volume/building air volume)
1S-10	155	0.0037
1C-15, 1C-16, and T-Cap (combined for simplicity)	2480	0.059
West Head House	500	0.012

The computed internal dose from each area can then be multiplied by this ratio to estimate the internal dose component that could affect other areas. Internal dose contributions from each area to other parts of the building are given in the table below.

Table 6: Internal Dose Contribution

Area Description	Occupancy Scenario Dose (mrem/yr)	Renovation Scenario Dose (mrem/yr)
1S-10	0.00008	0.0002
1C-15, 1C-16, and T-Cap	0.09	0.192
West Head House	0.06	0.131
Total	0.15	0.32

As can be seen in the table, the total internal dose component to other parts of the building from all of the affected areas combined, including both occupancy and renovation scenarios at the same time, is less than 0.5 mrem. Therefore, since the maximum dose computed for any area independently was 10.6 mrem (1C-15, 1C-16, and T-Cap combined) and the addition of 0.5 mrem is still less than 15 mrem, it may be concluded that the maximum dose to any future building occupant will be less than 15 mrem when considering the collective dose from all 5 affected areas in T Building.

Beginning in January 2000 Global Dosimetry Solutions Badge 760 TLDs were placed in T Building as area monitors in 17 locations. Placements were selected judgmentally for full coverage of traffic areas and TLDs were changed out

quarterly. These TLDs routinely monitored areas outside Radiation Areas that were transited by personnel. This effort was discontinued in December 2004 due to data showing the lack of need.

Although the specific areas described in the dose modeling above were not routinely monitored in this manner, results of monitoring Corridor 1 (just outside these areas) are summarized as follows. During operations, Corridor 1 was monitored on a quarterly basis from May 14, 2001 until December 2, 2004. All TLD results at this location were reported as zero (0) mrem for each monitoring period (24 hr/day for one quarter of the year). These 3 ½ years of monitoring results are therefore representative of T Building general area dose during operation. This is further supported by TLD monitoring of radiological workers in the building during operations.

Routine surveys of Corridor 1 during operation reported dose rates equal to background with the Bicron uRem meter at 0.005 mRem/hr. A review of the RSDS documentation contained in the FSRs Appendix F of 1S-10, 1C-15, 1C-16, T –Cap and West Head House recorded dose rates of the RESRAD-Build areas were 0.005 mRem/hr which equals natural background recorded in the building during operations and post decontamination. Based on this comparison any dose monitoring of these areas would yield results equal to background.

The estimated dose (provided above) in the RESRAD-Build Model is an ultra conservative estimate to bound the upper limit of possible exposure. The Core Team agreed to the conservative parameters assigned to the program. An independent review of the T Building radiological contamination characterization and RESRAD-Build modeling analysis by Argonne National Laboratory showed no major issues that impacted the results or resulted in changing the dose model. The quantities of volumetric contamination used were MDA values where results are reported less than or equal to the MDA for COCs; again a very conservative scenario. Adjacent rooms were modeled together (as a single room) using assumptions presented in the applicable FSR to ensure that the estimated dose to future occupants is conservatively estimated. Sr-90 was assumed to be present at an equal activity concentration as Cs-137. All RESRAD-Build Model assumptions are conservative; hence, the estimated dose modeled is overestimated due to the cumulative effect of the conservative assumptions.

Therefore, future institutional control of monitoring the dose in T Building is not warranted.

Close-Out Verification RSDSs of High Traffic Areas and Passage Zones, Survey No. 06-T-0309 (First Floor) and No. 06-T-0321 (Second Floor) were not included in the FSR documentation for T Building. These are presented here as Appendix F. Although these areas had been previously released in their applicable FSR, they could not be isolated from personnel traffic and these surveys were performed to assure the areas were un-impacted. These RSDSs confirmed that the spread of contamination was prevented and the area continues to meet the release criteria as described in the applicable FSR.

2.2 Project Costs

The cost to perform the Removal Action is shown in Table 3. Costs include the construction activities, all engineering, and construction management.

Table 7 – Removal Action Cost

Activity	Cost
Safe shutdown and removal of Radioactive Material Management Areas and Radioactive Material Areas.	$4,827,654
General building support, final decontamination, hazard mitigation, characterization and verification activities.	$14,845,602
Disposal and Transportation Costs	$135,000
Project Close-Out	$50,000
TOTAL	**$19,858,256**

2.3 Actions Taken by Local, State, and Federal Agencies

The DOE/MCP was the lead agency for the RA and provided the funding. DOE, USEPA and OEPA have oversight responsibility for the RA and review of the Action Memorandum, VSAP and FSS Reports to ensure that the objectives were met.

2.4 Actions Taken by Subcontractor

Subcontractors involved in the T Building structure demolition project included the following:

- American Services Group (Cleves, Ohio) performed asbestos abatement,
- Clean Harbors (Cincinnati, Ohio) treated and disposed of the light ballasts and ethylene glycol,
- Envirocare (Salt Lake City, Utah) received radioactive waste via rail and truck,

- Shonka Research Associates (Atlanta, Georgia) performed radiological surveys of T Building interior surfaces,
- Quanta Flux Radiological Services (Dayton, Ohio.) provided radiological Engineering support and in-situ gamma spec services,
- Nevada Test Site (Las Vegas, Nevada) received radioactive waste via truck,
- Envirocare (Salt Lake City, Utah) Disposal of Contaminated Lead Waste.

3.0 DIFFICULTIES ENCOUNTERED

3.1 Items that Affect the Removal Action

The difficulties encountered consisted of areas of contamination that could not meet the surface release criteria. However, these surfaces meet the 15 mrem/yr dose limit criteria required in Mound 2000 for volumetric release as modeled by RESRAD-Build. The final status of the total T Building structural surface area after decon, is as follows:

8,300 ft^2 - The amount of area that did require RESRAD-Build modeling and will have some form of institutional control.
150,000 ft^2 - The released floor area in T Building.
504,000 ft^2 - The amount of surface area that was surveyed inside T Building.
The balance of the released area is floors, ceiling, and crawl space.
OR
5.5% of the usable floor space will have an institutional control.
1.6% of the surface area surveyed did not meet surface free release criteria.

The floor areas (See Figure 3) that had Volumetric Release Criteria applied require specific institutional controls. These must be in place to ensure the building is protective of human health under the reuse restrictions. These institutional controls are as follows and shall be conveyed in the final Record of Decision (ROD) for the property:

- Prohibition against the removal of concrete floor material in specified rooms of T Building without prior approval from US EPA and Ohio EPA. Approval requires waste disposal plan that met all state and federal rules and regulations.
- Prohibition against the penetration of concrete floors in specified rooms of T Building locations without prior approval from US EPA and Ohio EPA.

3.2 Issues of Intergovernmental Coordination

All DOE/USEPA/OEPA interactions were good. The agencies were updated informally on a regular basis, and formally at monthly Core Team meetings. The Mound 2000 Process worked well.

4.0 RECOMMENDATIONS

4.1 Means to Prevent a Recurrence

The debris from the T Building remediation was removed and/or properly dispositioned per the Core Team-approved work plans; therefore, the spread of contamination was prevented. Removal of the services (except potable water) of the T Building Structure concludes the scope of the structure portion of this RA.

The T Building structure has been remediated of all it's process lines and inventory that might cause a recurrence of contamination. The building is also being put in shutdown mode as not to be used for any process or storage until deemed necessary by the new owner.

After the removal actions and the CERCLA process for the parcel are complete, the area will be transferred from federal to private ownership. All State and Federal disposal rules will apply.

5.0 REFERENCES

1. Action Memorandum T Building Removal Action, Final CH2M Hill Mound, June 2003.

2. MD-22153, Mound Site Radionuclides by Location, March 2001.

3. CH2M Hill Mound Inc. White Paper: T Building, Structural History and Process History Summary Background Document, November 2002.

4. T Building Verification Sampling and Analysis Plan, Final, October 2004.

5. Work Plan for Environmental Restoration of the DOE Mound Site, The Mound 2000 Approach, BWXT of Ohio, February 1999.

6. NUREG 1575, Rev. 1, August 2000, Multi-Agency Radiation Survey & Site Investigation Manual, (MARSSIM).

7. MARSSIM Implementing Procedures, Field Quality Control for Building Contamination Surveys, MD-80046, Op. 402.

8. FFA Federal Facilities Agreement under CERCLA Section 120,

USEPA, October 12, 1990.

9. FFA Federal Facilities Agreement under CERCLA Section 120, USEPA, July 15, 1993.

APPENDIX A

FIGURES

FIGURE 1- T Building Location

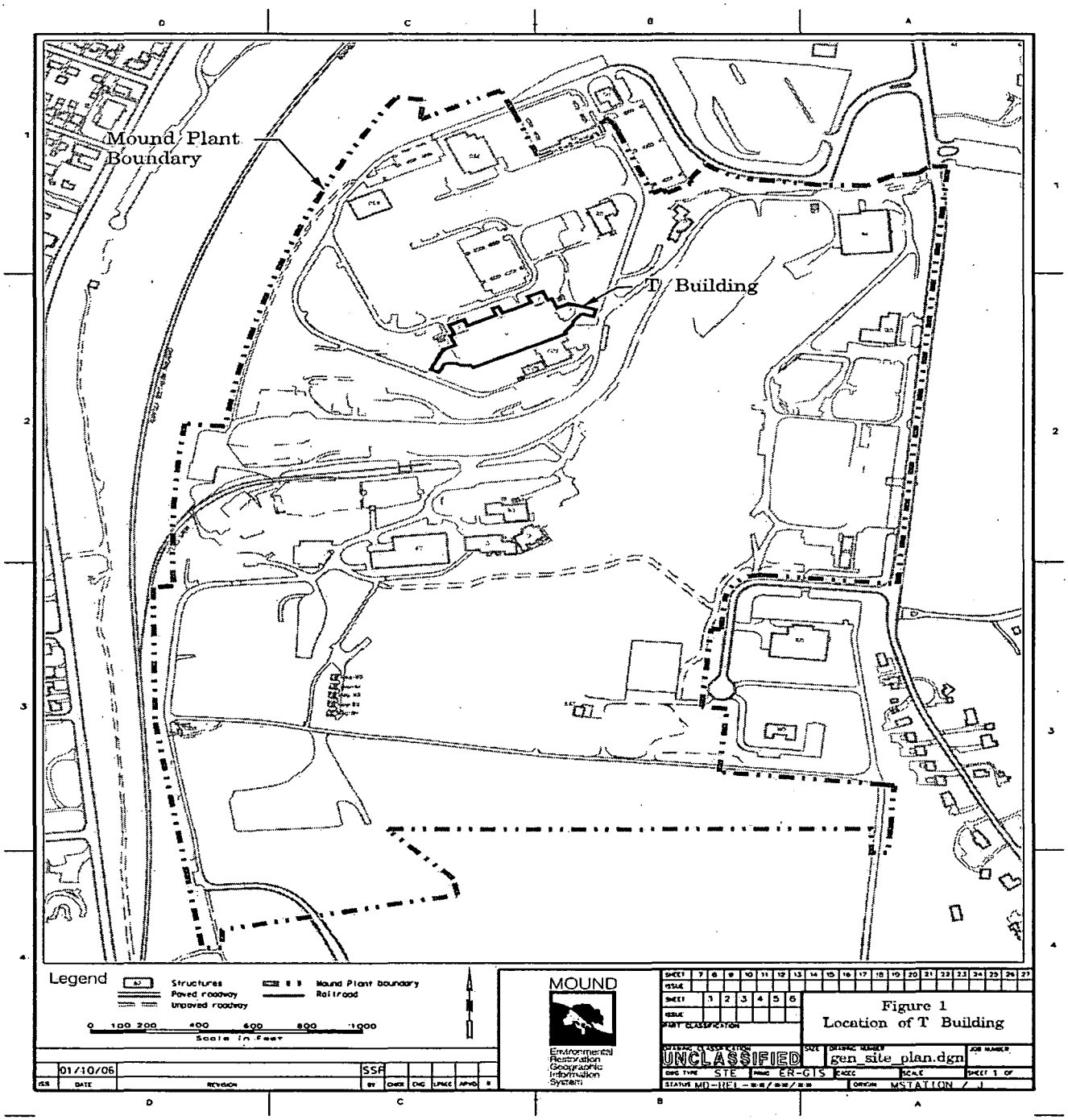
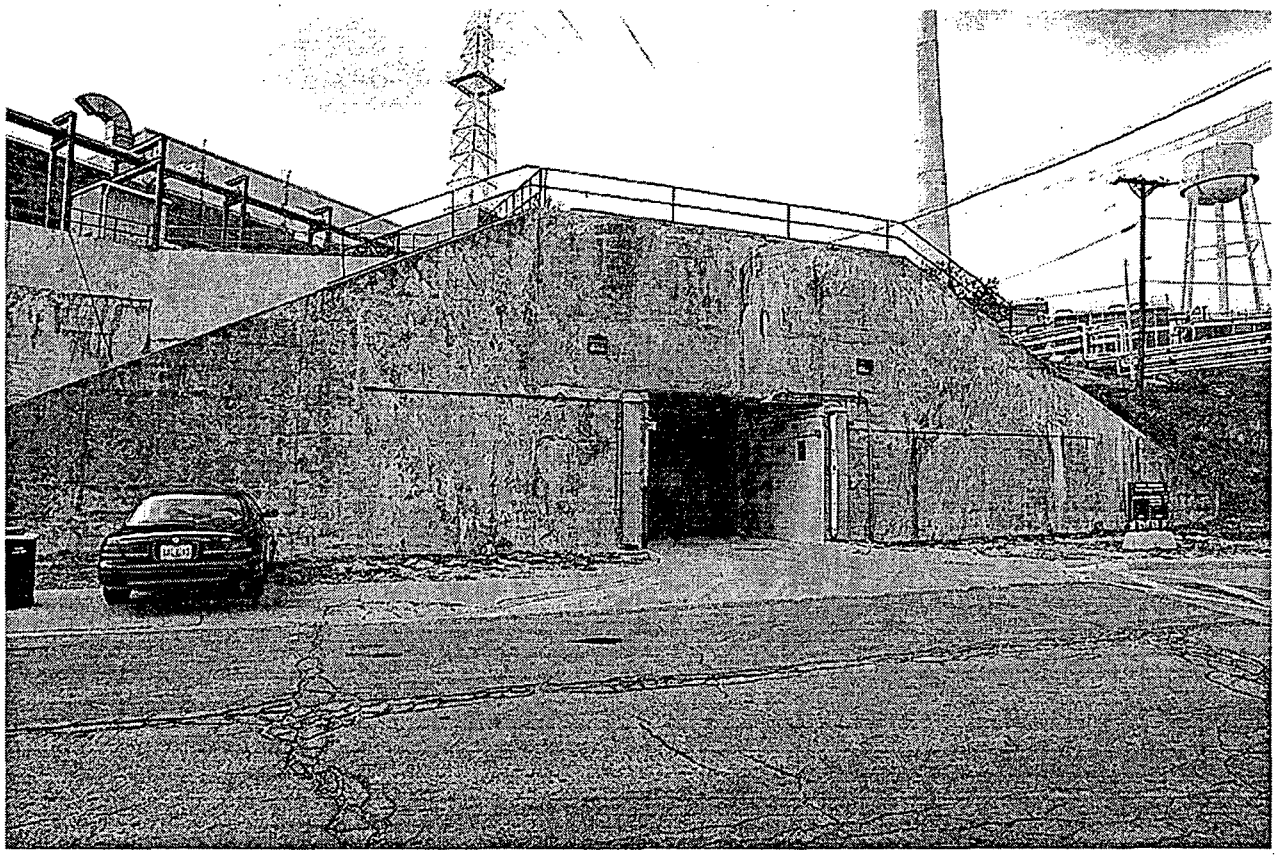
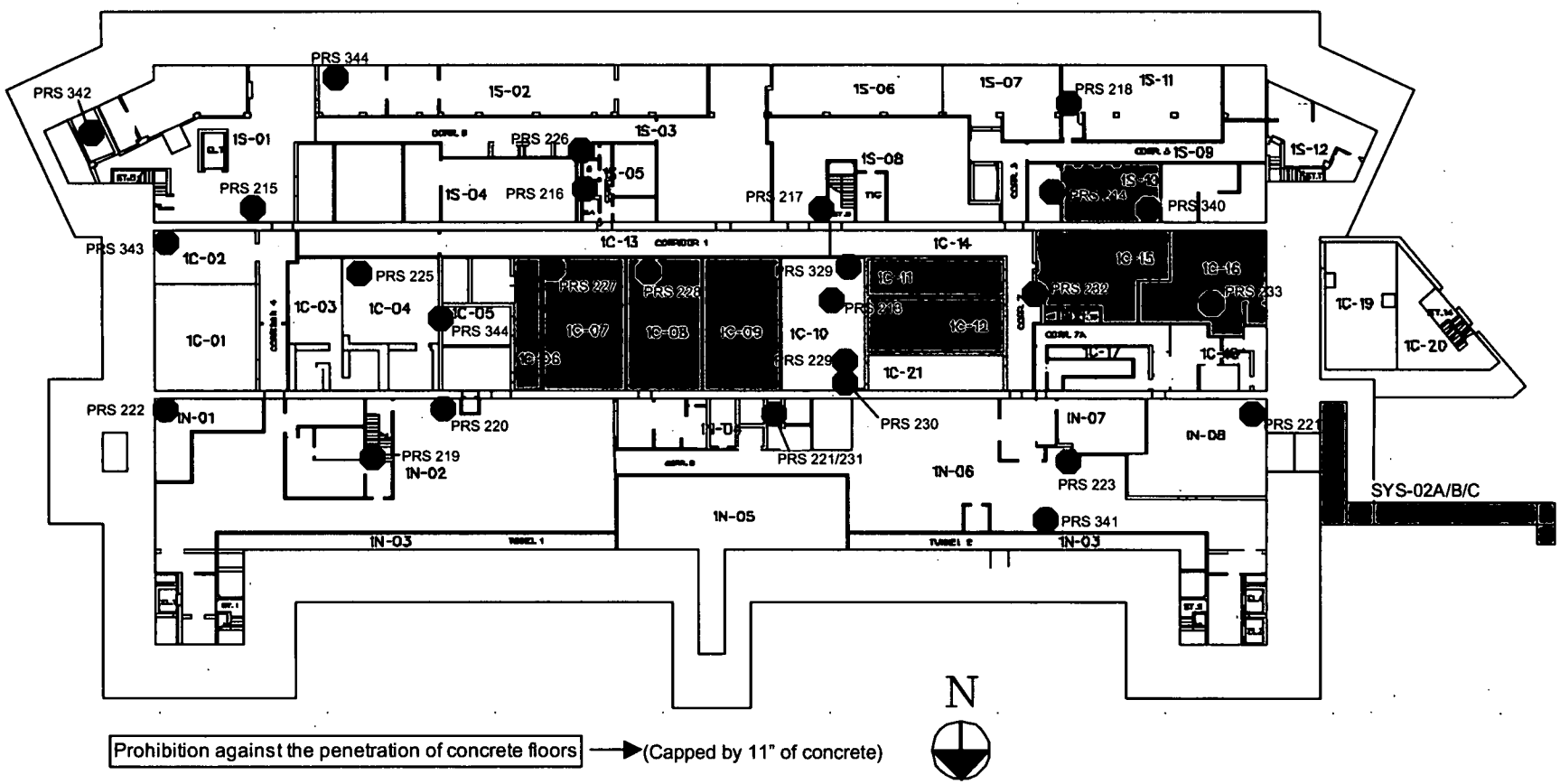


Figure 2 - Photograph of T Building East Tunnel Entrance



T - BLDG. FIRST FLOOR



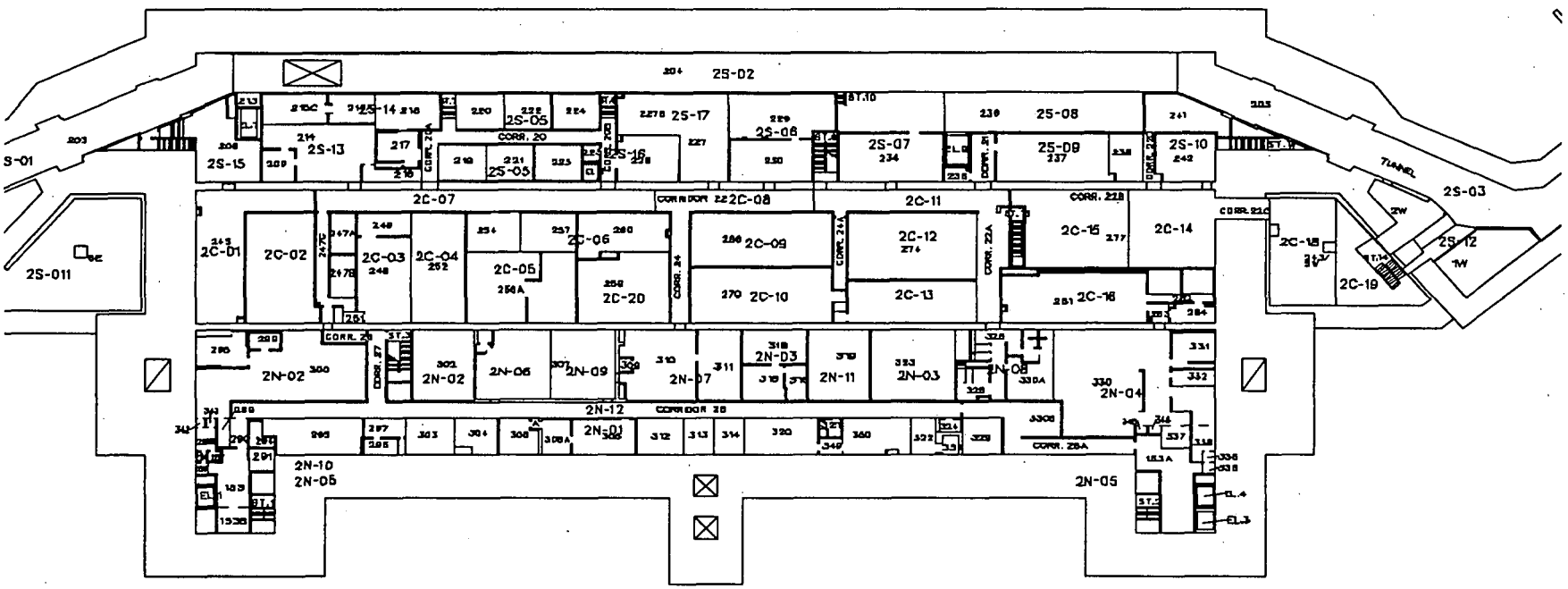
Prohibition against the penetration of concrete floors → (Capped by 11" of concrete)

Prohibition against the removal of concrete floor material

● PRS location

Figure 3

A3/4



T - BLDG. SECOND FLOOR

N

0 25 50 100

Figure 4

APPENDIX B

TABLES

Table 1A: T Building Contaminants of Concern

Radionuclide	Name	Half Life	Principal Decay Emissions
H-3	Tritium	12.3 yr	β_{max} (0.0185 MeV)
Co-60	Cobalt-60	5.3 yr	β_{max} (0.318 MeV) γ (1.332, 1.173 MeV)
Sr/Y-90	Strontium-90 Yttrium-90	28.8 yr 2.67d	β_{max} (0.546 MeV) β_{max} (2.281 MeV)
Ag-108m	Silver-108m (metastable)	127 yr	γ (0.434, 0.614, 0.723 MeV)
Cs-137	Cesium-137	30.07 yr	β_{max} (0.514 MeV) γ (0.662 MeV) from Ba-137m
Bi-207	Bismuth-207	33.7 yr	γ (0.569, 1.063 MeV)
Bi-210m	Bismuth-210m	3.0E6 yr	α (4.910, 4.949 MeV) γ (0.266, 0.305 MeV)
Po-209	Polonium-209	103 yr	α (4.866 MeV)
Ra-226	Radium-226	1599 yr	α (4.784, 4.602 MeV) γ (0.1862 MeV)
Ac-227	Actinium-227	21.7 yr	α (several from progeny) β_{max} (0.043 MeV)
Th-230	Thorium-230	7.7E4 yr	α (4.621, 4.688 MeV)
U-234	Uranium- 234	2.47E5 yr	α (4.77, 4.72 MeV)
U-235	Uranium-235	7.04E8 yr	α (4.364, 4.396 MeV) γ (0.144, 0.184 MeV)
U-238	Uranium-238	4.47E9 yr	α (4.197, 4.147 MeV)
Pu-238	Plutonium-238	87.75 yr	α (5.456, 5.499 MeV)
Pu-239	Plutonium-239	2.41E4 yr	α (5.15 MeV)
Pu-240	Plutonium-240	6.58E3 yr	α (5.17, 5.12 MeV)
Pu-241	Plutonium-241	13.2 yr	β_{max} (0.021 MeV)
Pu-242	Plutonium-242	3.79E5 yr	α (4.90, 4.86 MeV)
Am-241	Americium-241	432.7 yr	α (5.486, 5.443 MeV) γ (0.0595 MeV)

Table 2A: PRSs Associated with T Building

PRS	Description
213	Solidification unit
214	Solid radioactive waste compactor
215	Cooling water sump (Tank 124) Room T-1
216	Sanitary waste sump (Tank 125) Corridor 2
217	Sanitary waste sump (Tank 126) Corridor 2
218	Sanitary waste sump (Tank 127) Corridor 2
219	Cooling water sump (Tank 128) Stair 3
220	Steam condensate sump (Tank 129) T-78
221	Sanitary waste sump (Tank 130)
222	Sanitary waste sump (Tank 131)
223	Cooling system condensate sump (Tank 132)
224	Sanitary waste sump (Tank 133)
225	Beta waste water sump (Tank 227) T-23
226	Floor drain sump (Tank 228) T-3
227	Alpha waste water sump (Tank 229)
228	Alpha waste water sump (Tank 230)
229	Alpha waste water sump (Tank 231)

PRS	Description
230	Alpha waste water sump (Tank 232)
231	Alpha waste water sump (Tank 233)
232	Alpha waste water sump (Tank 234)
233	Alpha waste water sump (Tank 235)
339	Waste water sump (Tank 250)
340	Waste water sump (Tank 251)
341	Condensate sump (Tank 269) T-90
342	Hot side fire water tank (Tank 271) T-1
343	Fire water sump (Tank 272)
344	Fire water sump (Tank 273)

Table 3A: Organization of the Removal Action

Agency or Party Involved	Contact	Description of Participation
US EPA (SR-6J) 77 W. Jackson Chicago, IL 60604 312-886-7058	Timothy Fischer USEPA Remedial Project Manager	Federal agency responsible for MCP oversight.
Ohio EPA 410 E. Fifth Street Dayton, OH 45402-2911 937-285-6468	Brian Nickel OEPA Remedial Project Manager	State agency responsible for MCP oversight.
DOE/ MCP 175 Tri-County Parkway Springdale, OH 45246 513-246-0071	Paul Lucas DOE/MCP Remedial Project Manager	DOE is responsible for project oversight and success.
CH2M Hill Mound, Inc. 1075 Mound Road P.O. Box 750 Miamisburg, OH 45343-7050 937-673-2874	Allen Upshaw CH2M Hill, MCP Project Manager	Performed demolition, provided the DOE/ MCP Project Manager with technical assistance, administrative support, sampling, decontamination, site safety, and report preparation.

Table 4A: Materials and Disposition

T Building Structure Material	Quantity	Disposal Method	Destination
Asbestos Debris	20 cubic yards	Treatment	Stoney Hollow Landfill, Dayton, Ohio
Ethylene Glycol	10,000 gallons	Recycle	Clean Harbors, Cincinnati, Ohio
Polychlorinated biphenyl (PCB) Light Ballast	* 0 cubic yards	Treatment	Clean Harbors, Cincinnati, Ohio
Construction Debris (Concrete/Brick/Wood/ Other)	390 cubic yards	Landfill	Stoney Hollow Landfill, Dayton, Ohio
Metal Construction Debris (Recycled)	* 0 cubic yards	Recycle	Metal Shredders, West Carrollton, Ohio
Low Level Radioactive Waste	980 cubic yards	Rail/Truck	Envirocare, Salt Lake City, Utah
Hazardous Waste (Lead)	10,000 lbs.	Truck	Nevada Test Site, Las Vegas, Nevada

*Note 1.This waste volume was combined with similar waste from other buildings and the T Building volume was not tracked separately.

APPENDIX C

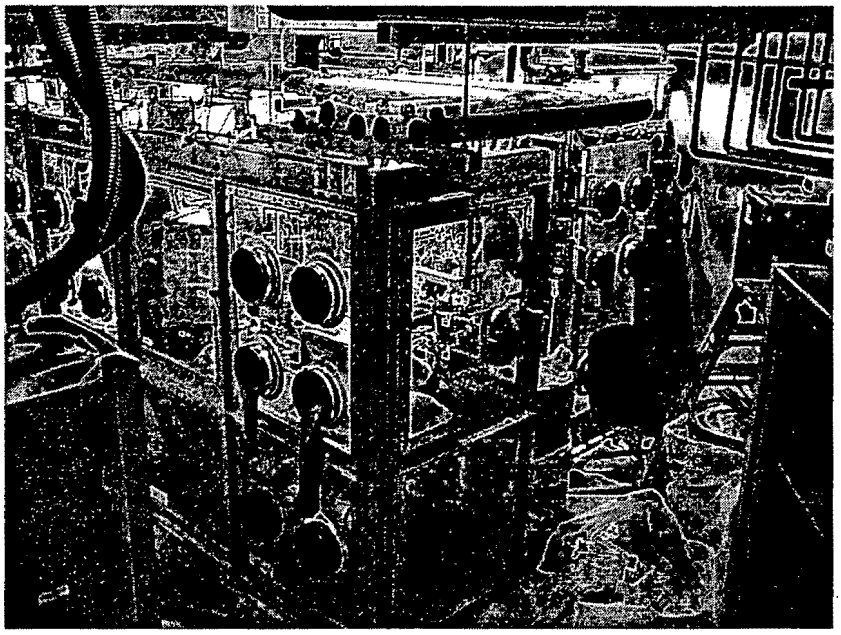
GENERAL MEDIA INFORMATION

No Media Information Exists

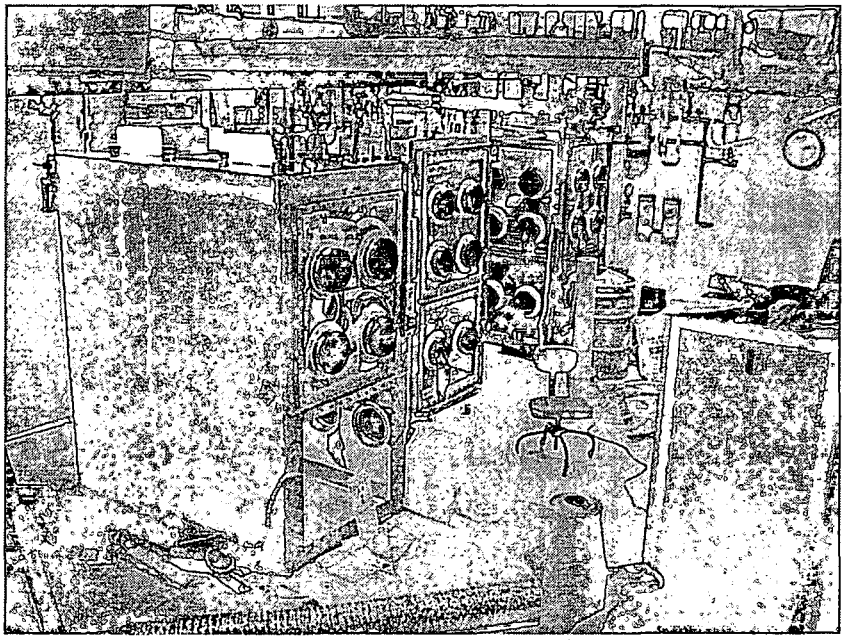
APPENDIX D

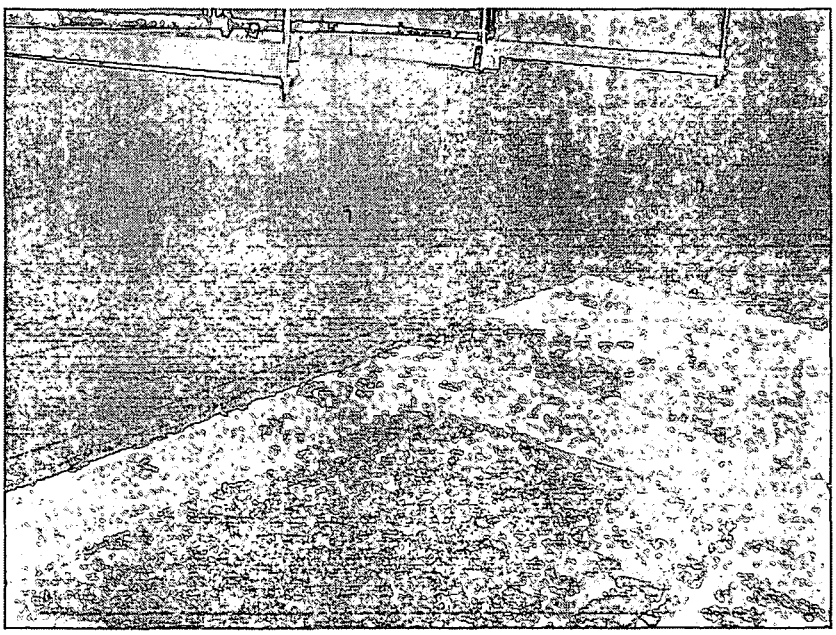
PHOTOGRAPH DOCUMENTATION

TERF OIL AND OIL PROCESSING GLOVE BOXES BEFORE/AFTER

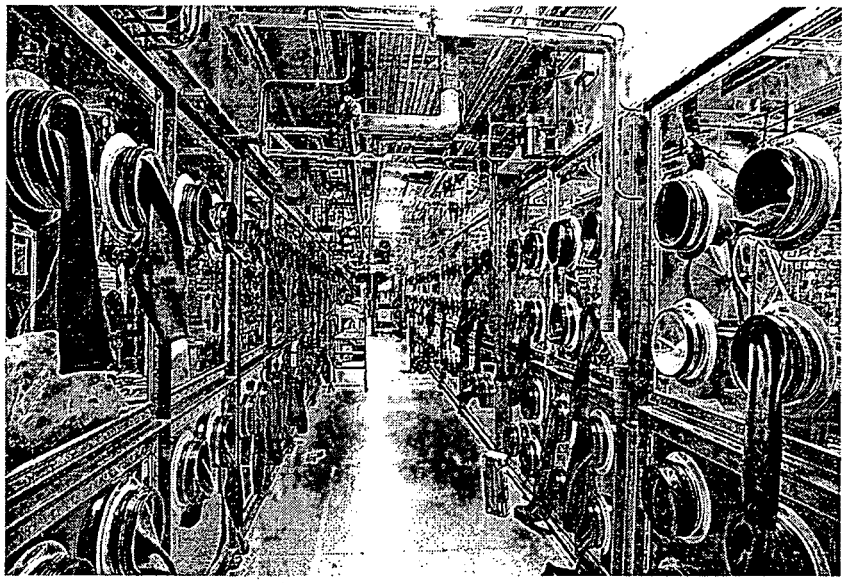


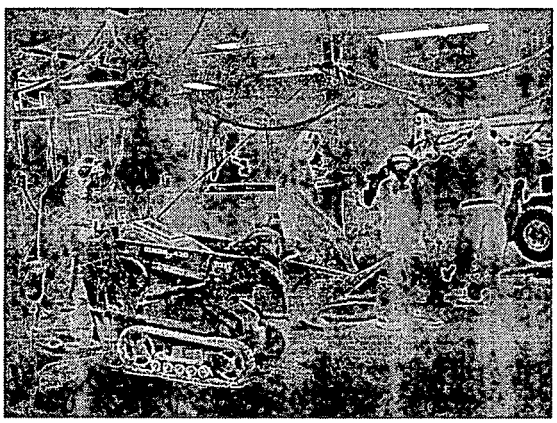
TERF COMPRESSOR AND VALVE GLOVE BOXES BEFORE/AFTER



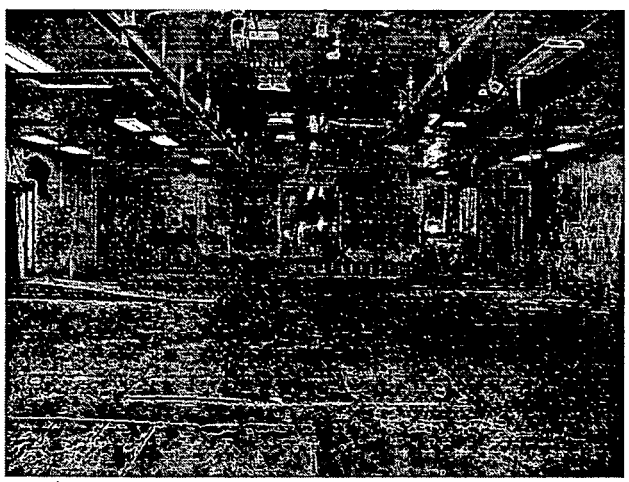


T48 AND T50 PROCESS GLOVE BOXES BEFORE/AFTER

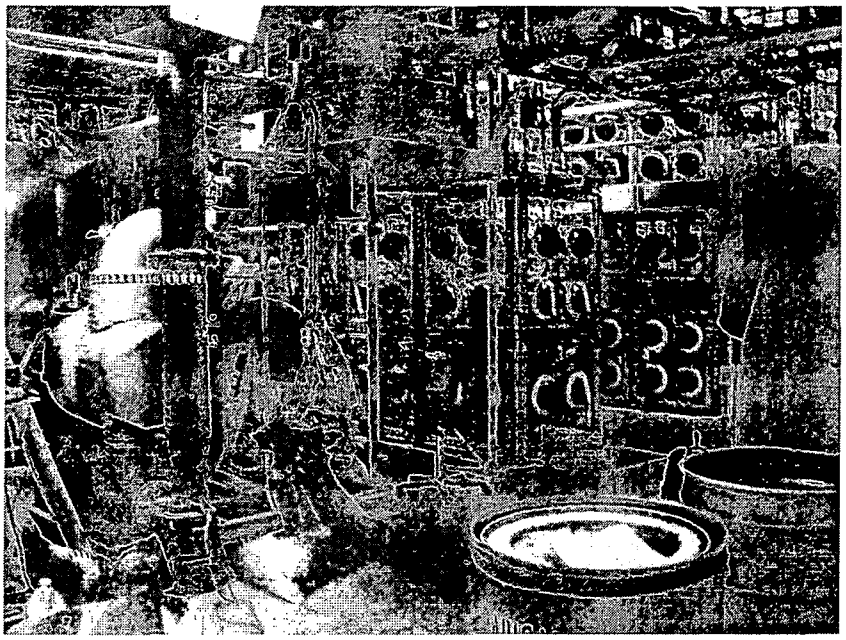


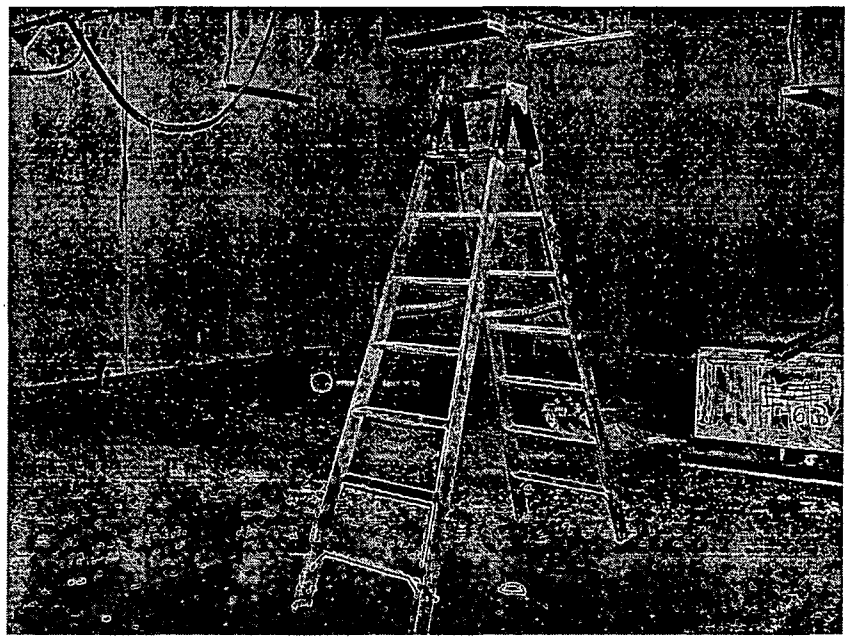


Workers Removing Concrete



T63 WATER SOLIDIFICATION GLOVE BOX BEFORE/AFTER





APPENDIX E

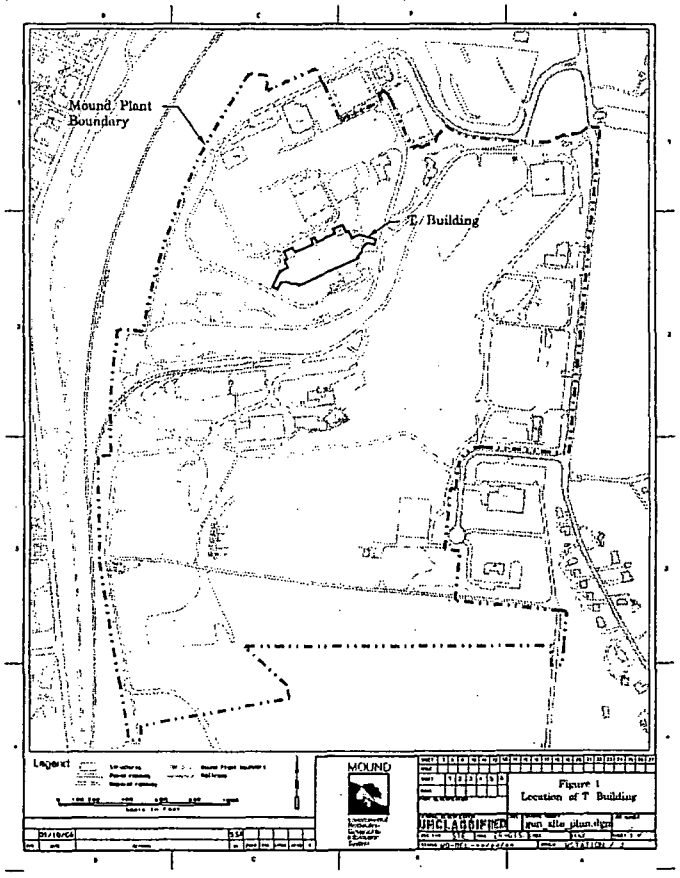
T BUILDING PUBLIC FACT SHEET

PUBLIC FACT SHEET

T Building - Use of Dose Modeling and Institutional Controls

This Fact Sheet supplements the Action Memorandum Engineering Evaluation / Cost Analysis for the T Building Removal Action[1] (Final, June 2003) and discusses the need to use RESRAD Build dose modeling for the verification sampling of portions of T Building as per the Work Plan for Environmental Restoration of the DOE Mound Site, Mound 2000 Approach[2] (Mound 2000). Based on the modeling, additional protective measures may be taken to assure the building is protective for reuse.

Background. T Building is a heavily reinforced subterranean concrete structure located adjacent to the Central Operations Support (COS) Building near the center of the Mound Site. Construction was completed in 1948 at which time the facility was used to process radioactive polonium and other radionuclides. From 1949 to 1973, polonium programs included a processing and separation program, fuels research and development (R&D) program, neutron source program, and a variety of other polonium R&D and production programs. In the early 1980s, T Building underwent modifications to accommodate tritium-processing operations. Other activities conducted in T Building were nondestructive and environmental testing, gamma and mass spectroscopy, calorimetry, neutron activation analysis, and safeguards R&D.



Since the early 1990's, T Building has undergone extensive sampling and remediation activities in an attempt to achieve radiological contamination levels below free release criteria specified in the T Building Action Memorandum[1] and Mound 2000[2].

Characterization. Isotopes such as cobalt-60, bismuth-207/210m, cesium-137 and americium-241, have been found as expected in areas of the building associated with the early polonium and radioactive source work. After extensive remediation, the majority of these areas have been verified to be free of volumetric contamination and below the surface contamination guidelines given in Appendix A of Mound 2000. However, some isolated areas contain volumetric contamination even after extensive remediation. A professional structural evaluation of the second floor of the building has shown that further remediation in these areas could render the building unsafe for reuse.

The Core Team (see Recommendation Page on page 2) has determined that a dose based approach (RESRAD-Build Computer Code, Argonne National Laboratories) can be used to verify that these areas are protective of human health under the re-use restrictions placed on the site (Industrial use only). The use of this code is outlined by the Mound 2000 process and is accepted by the Nuclear Regulatory Commission[3]. In addition, other restrictions such as institutional controls may be used to ensure that future site workers are not exposed to greater than 15 mrem per year. A dose of 15 mrem per year is protective of human health according to USEPA guidance "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" and "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Operating Licenses for Nuclear Reactors".

The **Verification Sampling and Analysis Plan** for T Building includes Survey Plan Forms detailing the approach to be taken for verification of the structure and utilities within the T Building. A new Survey Plan Form was generated using a dose based RESRAD-Build approach. This approach is a dose modeling method used by the DOE, NRC, and accepted by the Core Team. This method will be used to verify that future building occupants under conservative scenarios will not receive a dose greater than 15 mrem per year. Analysis of these areas may require, additional protective measures such as a layer of cap and/or institutional controls to ensure the building is protective of human health. Institutional controls, if required, will be proposed in the Proposed Plan for Parcels 6, 7, and 8. Consistent with previous proposed plans, there will be a 30-day public review period.

Schedule. This Fact Sheet will be in public review for 30 days, ending March 29, 2006. Verification sampling is ongoing at the present time. A summary of the verification data will be included in the On-Scene Coordinator Report and placed in the public reading room after the conclusion of the verification sampling and approval by the Core Team.

Additional information can be found in the public reading room, or by contacting Paul Lucas at 513-246-0071.

1: Action Memorandum Engineering Evaluation/ Cost Analysis for the T Building, June 2003, Final
2: The Work Plan for Environmental Restoration of the DOE Mound Site, Mound 2000 Approach February 1999, Final
3: NUREG/CR-5512, PNL-7994, Vol. 1, Residual Radioactive Contamination from Decommissioning, Technical Basis for Translating Contamination Levels to Annual Total Dose Equivalent, Final Report.

Recommendation for T Building Fact Sheet

The Core Team originally recommended in the Action Memorandum Engineering Evaluation/ Cost Analysis for the T Building Removal Action[1] that remediation of T Building be accomplished and that the building be verified to be free of volumetric contamination and below the surface contamination guidelines given in Appendix A of Mound 2000. However, some isolated areas contain volumetric contamination even after extensive remediation. Further remediation in these areas could render the building unsafe for reuse.

The Core Team has determined that a dose based approach (RESRAD-Build) as outlined in the Mound 2000[2] process can be used to verify that these areas are protective of human health under the re-use restrictions placed on the site (Industrial use only). In addition, other restrictions such as institutional controls may be used to ensure that future site workers are not exposed to greater than 15 mrem per year. A dose of 15 mrem per year is protective of human health according to USEPA guidance "Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination" and "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Operating Licenses for Nuclear Reactors".

A public Fact Sheet along with this recommendation, signed by the Core Team, will be placed in the Public Reading Room for a 30-day review period. Upon closure of the public review comments, if any, the Fact Sheet will be issued as a final document and made available in the Public Reading Room.

CONCURRENCE:

DOE/MCP:	Paul Lucas, Remedial Project Manager	2/22/06 (Date)
USEPA:	Tim Fischer, Remediation Project Manager	2/21/06 (Date)
OEPA:	Brian Nickel, Project Manager	2/21/06 (Date)

1: Action Memorandum Engineering Evaluation/ Cost Analysis for the T Building, June 2003, Final
2: The Work Plan for Environmental Restoration of the DOE Mound Site, Mound 2000 Approach February 1999, Final
3: NUREG/CR-5512, PNL-7994, Vol. 1, Residual Radioactive Contamination from Decommissioning, Technical Basis for Translating Contamination Levels to Annual Total Dose Equivalent, Final Report.

APPENDIX F

T Building RSDSs for Closeout Verification of High Traffic Areas and Passage Zones

RADIOLOGICAL SURVEY DATA SHEET

LOCATION: (BLDG./AREA/ROOM) T-BLDG. FIRST FLOOR	SURVEY NO. 06-T-0309
PURPOSE: HIGH TRAFFIC AREAS, CHANGE ROOMS AND HALLWAYS - LOOSE SURFACE FINAL CONTAMINATION VERIFICATION	RWP NO. N/A
	DATE: 6-16-06
	TIME: 1130 HRS.

MAP / DRAWING

SEE FOLLOWING MAP AND CONTINUATION SHEETS FOR SURVEY LOCATIONS AND RESULTS -

COPY

LEGEND:

= mrem/hr (γ) whole body

#E = mrem/hr (β+η+γ) extremity on contact

K = factor of 1000

— · — : · — · · = radiological boundary

- mrem/hr neutron

- swipe number

- air sample number

#/α or /β - direct contamination measurement in dpm/100cm²

INSTRUMENTS USED

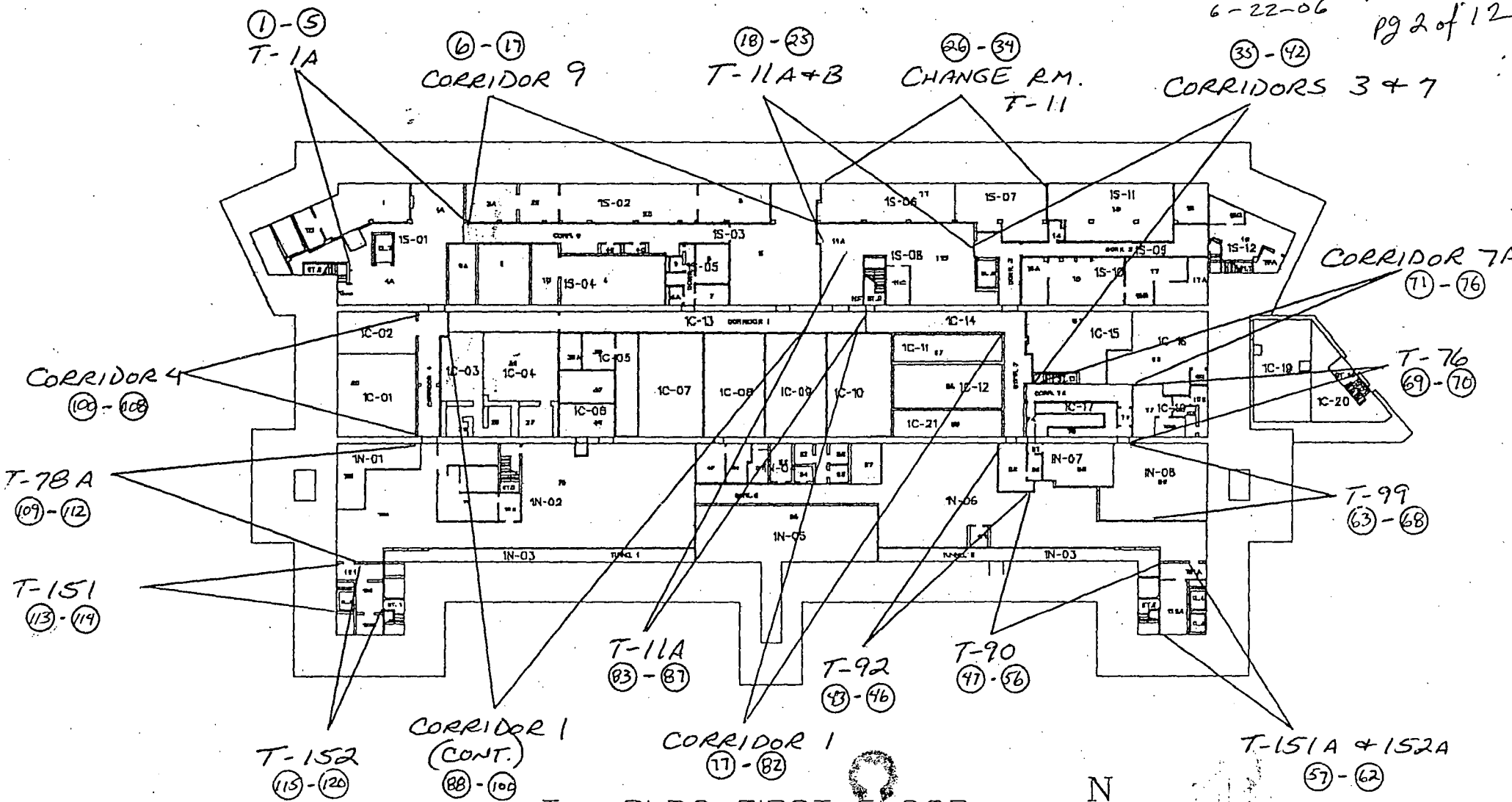
Instrument	Serial Number	Cal. Due Date
SEE	LAB	
	ANALYSIS	
RECORDS	FOR	
INSTRUMENTS	USED	

[redacted]

HP# 7347	Date: 6-16-06
[redacted]	
HP# LAB	Date:
SIS RECORDS	
HP# 5891	Date: 6-19-06
[redacted]	

ML-9620 (2-98)

6-22-06



T - BLDG. FIRST FLOOR

0 25 50 100

TRAVEL PATHS AND CHANGE RMS.

SMEARS TAKEN EVERY

15 TO 20 FEET -

T 2/26

COPY

Survey No.
RSDS 06-T-0309

RADIOLOGICAL SURVEY DATA SHEET (cont.)

Removable Contamination				
Swipes (dpm/100cm^2)				
Sample #	β/γ	Alpha	Tritium	Comments
1	REFERENCE			T-1A
2	LAB	ANALYSIS		
3	RECORDS			
4	FOR DATA-			
5		PAGES		T-1A
6				CORRIDOR 9
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				CORRIDOR 9
18				T-11A+T11B
19				
20				
21				
22				
23				
24				
25				T-11A+T11B
26				T-11
27				
28				
29				
30				
31				
32				
33				
34				T-11
35				CORRIDOR 7+3

Removable Contamination				
Swipes (dpm/100cm^2)				
Sample #	β/γ	Alpha	Tritium	Comments
36	REFERENCE			CORRIDOR 7+3
37	LAB	ANALYSIS		
38	RECORDS			
39	FOR DATA-			
40		PAGES		
41				
42				CORRIDOR 7+3
43				T-92
44				
45				
46				T-92
47				T-90
48				
49				
50				
51				
52				
53				
54				
55				
56				T-90
57				151A+152A
58				
59				
60				
61				
62				151A+152A
63				T-99
64				
65				
66				
67				
68				T-99
69				T-76
70				T-76

COMMENTS: N/A

COPY

NOTES:

1. See MD-80036 10002 for calculations of WB, extremity and skin dose rates.
2. To request RO Count Room analysis for β/γ, alpha or tritium, leave column blank. Mark column N/A if not needed. If count room printout of results is attached, write "see attached" in column.
3. Annotate special sample type (e.g., soil, water), special identifiers or otherwise in Comments. If not needed, mark N/A.

ML-9620A (4-98)

F 3/26

Survey No. 06-T-0309

RADIOLOGICAL SURVEY DATA SHEET (cont.)

COPY

Removable Contamination				
Swipes (dpm/100cm²)				
Sample #	β/γ	Alpha	Tritium	Comments
71	REFERENCE			CORRIDOR 7A
72	LAB			
73	ANALYSIS			
74	RECORDS			
75	FOR			
76	DATA -			CORRIDOR 7A
77	PAGES			CORRIDOR 1
78				
79				
80				
81				
82				CORRIDOR 1
83				T-11A
84				
85				
86				
87				T-11A
88				CORRIDOR 1
89				
90				
91				
92				
93				
94				
95				
96				
97				
98				
99				
100				CORRIDOR 1
101				CORRIDOR 4
102				
103				
104				
105				CORRIDOR 4

Removable Contamination				
Swipes (dpm/100cm²)				
Sample #	β/γ	Alpha	Tritium	Comments
106	REFERENCE			CORRIDOR 4
107	LAB			
108	ANALYSIS			CORRIDOR 4
109	RECORDS			T-78A
110	FOR			
111	DATA -			
112	PAGES			T-78A
113				T-151
114				T-151
115				T-152
116				
117				
118				
119				
120	N/A			T-152
121				
122				
123				
124				
125				
126				
127				
128				
129				
130				
131				
132				
133				
134				
135				
136				
137				
138				
139				
140				

COMMENTS: N/A

NOTES:

1. See MD-80036 10002 for calculations of WB, extremity and skin dose rates.

2. To request RO Count Room analysis for β/γ, alpha or tritium, leave column blank. Mark column N/A if not needed. If count room printout of results

3. Annotate special sample type (e.g., soil, water), special identifiers or otherwise in Comments. If not needed, mark N/A.

ML-9620A (4-98)

F4/26

Smear Analysis

COPY

Unit Type: LB4100/W
Counting Unit ID: Green
Data file name: SMEAR077
Batch Ended: 6/16/06 10:50
Cal. Due Date: 11/17/06
Serial Number: 26966-3

Batch ID: 06-T-0309 AL DICK (120) AG

Detector ID	Sample ID	Alpha Activity			Beta Activity		
		DPM	σ	flags	DPM	σ	flags
A1	1	0.00	2.20		0.38	1.85	
A2	2	0.00	2.01		0.36	1.65	
A3	3	0.00	2.26		0.00	1.27	
A4	4	0.00	2.10		0.00	1.21	
B1	5	3.43	2.65		0.00	1.68	
B2	6	0.00	1.89		1.59	1.93	
B3	7	0.00	2.22		1.59	2.30	
B4	8	0.00	1.95		0.00	1.20	
C1	9	0.00	2.09		1.11	2.18	
C2	10	0.00	1.94		0.48	1.63	
C3	11	0.00	2.15		1.71	2.19	
C4	12	1.64	1.99		0.30	1.61	
D1	13	1.73	2.05		0.00	1.26	
D2	14	0.00	2.15		0.00	1.20	
D3	15	0.00	2.10		0.26	1.76	
D4	16	0.00	2.05		0.40	1.66	
A1	17	0.00	2.21		1.68	2.26	
A2	18	0.00	2.00		0.00	1.17	
A3	19	2.01	2.28		0.12	1.78	
A4	20	0.00	2.10		0.00	1.21	
B1	21	0.00	1.89		0.25	1.68	
B2	22	0.00	1.93		3.82	2.50	
B3	23	0.00	2.20		0.27	1.88	
B4	24	0.00	1.95		0.00	1.20	
C1	25	0.00	2.09		1.11	2.18	
C2	26	0.00	1.98		3.92	2.58	
C3	27	0.00	2.15		1.71	2.19	

SOP 12

6-16-06

F5/26

Smear Analysis

Unit Type: LB4100/W
Counting Unit ID: Green
Data file name: SMEAR077
Batch Ended: 6/16/06 10:50
Cal. Due Date: 11/17/06
Serial Number: 26966-3

COPY

Batch ID: 06-T-0309 AL DICK (120) AG

Detector ID	Sample ID	Alpha Activity			Beta Activity		
		DPM	σ	flags	DPM	σ	flags
C4	28	3.60	2.81		1.28	1.97	
D1	29	0.00	2.05		0.00	1.26	
D2	30	0.00	2.15		0.00	1.20	
D3	31	0.00	2.09		0.00	1.25	
D4	32	0.00	2.05		0.40	1.66	
A1	33	0.00	2.20		0.38	1.85	
A2	34	0.00	2.00		0.00	1.17	
A3	35	0.00	2.30		1.55	2.18	
A4	36	0.00	2.11		0.58	1.71	
B1	37	0.00	1.91		1.44	2.06	
B2	38	1.69	1.89		1.39	1.93	
B3	39	0.00	2.22		1.59	2.30	
B4	40	1.68	1.97		0.45	1.69	
C1	41	1.73	2.10		0.95	2.18	
C2	42	0.00	1.95		1.63	1.99	
C3	43	0.00	2.12		0.00	1.27	
C4	44	0.00	1.98		0.00	1.14	
D1	45	0.00	2.10		4.03	2.80	
D2	46	0.00	2.18		1.51	2.07	
D3	47	0.00	2.12		1.50	2.15	
D4	48	0.00	2.08		2.74	2.35	
A1	49	1.95	2.22		1.50	2.26	
A2	50	0.00	2.03		1.52	2.02	
A3	51	0.00	2.26		0.00	1.26	
A4	52	0.00	2.14		2.99	2.42	
B1	53	0.00	1.89		0.25	1.68	
B2	54	0.00	1.85		0.00	1.12	
B3	55	0.00	2.24		2.91	2.65	
B4	56	0.00	1.95		0.00	1.20	

ACD ACD

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ACD
6-16-06

F6/26

Smear Analysis

COPY

Unit Type: LB4100/W
Counting Unit ID: Green
Data file name: SMEAR077
Batch Ended: 6/16/06 10:50
Cal. Due Date: 11/17/06
Serial Number: 26966-3

Batch ID: 06-T-0309 AL DICK (120) AG

Detector ID	Sample ID	Alpha Activity DPM	Alpha Activity σ	Alpha Activity flags	Beta Activity DPM	Beta Activity σ	Beta Activity flags
C1	57	0.00	2.08		0.00	1.78	
C2	58	0.00	1.97		2.78	2.30	
C3	59	0.00	2.15		1.71	2.19	
C4	60	0.00	2.00		1.58	1.97	
D1	61	0.00	2.07		1.53	2.17	
D2	62	0.00	2.15		0.00	1.20	
D3	63	1.68	2.10		0.10	1.76	
D4	64	0.00	2.05		0.40	1.66	
A1	65	1.95	2.20		0.20	1.85	
A2	66	0.00	2.03		1.52	2.02	
A3	67	0.00	2.33		4.06	2.82	
A4	68	0.00	2.19		6.60	3.20	
B1	69	0.00	1.89		0.25	1.68	
B2	70	0.00	1.89		1.59	1.93	
B3	71	1.91	2.20		0.05	1.88	
B4	72	0.00	1.95		0.00	1.20	
C1	73	0.00	2.07		0.00	1.27	
C2	74	3.52	2.74		1.31	1.99	
C3	75	0.00	2.15		1.71	2.19	
C4	76	0.00	2.04		4.97	2.78	
D1	77	1.73	2.09		2.63	2.50	
D2	78	4.07	3.08		3.59	2.67	
D3	79	0.00	2.10		0.26	1.76	
D4	80	0.00	2.06		1.57	2.03	
A1	81	0.00	2.21		1.68	2.26	
A2	82	1.79	2.00		0.00	1.17	
A3	83	0.00	2.30		1.55	2.18	
A4	84	0.00	2.13		1.78	2.09	
B1	85	1.58	1.89		0.04	1.68	

JAD JAD

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JAO
6-16-06

F7/26

Smear Analysis

COPY

Unit Type: LB4100/W
Counting Unit ID: Green
Data file name: SMEAR077
Batch Ended: 6/16/06 10:50
Cal. Due Date: 11/17/06
Serial Number: 26966-3

Batch ID: 06-T-0309 AL DICK (120) AG

Detector ID	Sample ID	Alpha Activity			Beta Activity		
		DPM	σ	flags	DPM	σ	flags
B2	86	1.69	1.85		0.00	1.12	
B3	87	0.00	2.22		1.59	2.30	
B4	88	0.00	2.03		4.24	2.68	
C1	89	0.00	2.11		2.36	2.52	
C2	90	0.00	1.95		1.63	1.99	
C3	91	0.00	2.12		0.00	1.27	
C4	92	0.00	1.99		0.45	1.61	
D1	93	0.00	2.07		1.53	2.17	
D2	94	0.00	2.18		1.51	2.07	
D3	95	0.00	2.12		1.50	2.15	
D4	96	1.71	2.07		1.43	2.03	
A1	97	0.00	2.24		4.29	2.93	
A2	98	0.00	2.00		0.00	1.17	
A3	99	0.00	2.26		0.00	1.27	
A4	100	0.00	2.13		1.78	2.09	
B1	101	0.00	1.87		0.00	1.20	
B2	102	0.00	1.95		4.93	2.74	
B3	103	0.00	2.20		0.27	1.88	
B4	104	0.00	1.97		0.66	1.69	
C1	105	0.00	2.12		3.62	2.82	
C2	106	0.00	1.94		0.48	1.63	
C3	107	0.00	2.12		0.00	1.27	
C4	108	0.00	1.99		0.45	1.61	
D1	109	1.73	2.06		0.14	1.77	
D2	110	0.00	2.15		0.00	1.20	
D3	111	0.00	2.09		0.00	1.25	
D4	112	1.71	2.05		0.25	1.66	
A1	113	0.00	2.24		4.29	2.93	
A2	114	0.00	2.04		2.68	2.33	

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6-16-06

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Smear Analysis

COPY

Unit Type: LB4100/W
Counting Unit ID: Green
Data file name: SMEAR077
Batch Ended: 6/16/06 10:50
Cal. Due Date: 11/17/06
Serial Number: 26966-3

Batch ID: 06-T-0309 AL DICK (120) AG

Detector ID	Sample ID	Alpha Activity			Beta Activity		
		DPM	σ	flags	DPM	σ	flags
A3	115	0.00	2.28		0.30	1.78	
A4	116	0.00	2.10		0.00	1.21	
B1	117	1.58	1.93		2.41	2.38	
B2	118	0.00	1.87		0.48	1.58	
B3	119	0.00	2.26		4.24	2.97	
B4	120	0.00	1.97		0.66	1.69	

AGD AGD

F9/26

AGD
6-16-06

AM

16 Jun 2006 13:51 ALPHA/BETA - 1.09 Page #1
Protocol #: 2 PW H3 #403727 User : 21386-16-

Time: 2.00
Data Mode: DPM Nuclide: SMGLS02 Quench Set: SMGLS02
Background Subtract: 1st Vial

	LL	UL	LCR	2S%	BKG
Region A:	0.5	- 18.6	0	0.0	8.34
Region B:	2.0	- 18.6	0	0.0	7.95
Region C:	40.0	- 2000	0	0.0	10.88

Quench Indicator: tSIE/AEC
Ext Std Terminator: Count
06-T-0309 AL DICK (120) AG
Luminescence Correction On
Coincidence Time(ns): 18
Delay Before Burst(ns): Normal
Protocol Data Filename: C:\DATA\PROT2.DAT
Count Data Filename: C:\DATA\SDATA2.DAT

COPY

S#	TIME	CPMA	CPMB	LUM	FLAG	tSIE	DPM1	2SIGMA	CPMC
-1	10.00	8.34	7.95	1	B	619.57		0.00	10.88
0	2.00	304.06	291.79	0		543.00	673.59	74.25	0.12
1	2.00	0.41	0.02	11		385.91	1.13	12.61	0.00
2	2.00	0.00	0.00	11		376.99	0.00	0.00	0.00
3	2.00	1.35	1.74	10		353.02	4.02	14.20	1.12
4	2.00	0.00	0.00	29		271.40	0.00	0.00	0.00
5	2.00	0.63	1.26	15		310.33	2.08	16.67	0.00
6	2.00	0.00	0.00	23		292.73	0.00	0.00	0.00
7	2.00	0.00	0.00	20		356.86	0.00	0.00	0.62
8	2.00	0.00	0.00	50		378.06	0.00	0.00	0.00
9	2.00	0.00	0.00	25		328.36	0.00	0.00	0.62
10	2.00	0.00	0.00	7		520.42	0.00	0.00	0.00
11	2.00	0.00	0.00	14		430.67	0.00	0.00	0.00
12	2.00	0.00	0.00	8		418.38	0.00	0.00	0.00
13	2.00	0.16	0.55	6		356.08	0.49	13.34	0.00
14	2.00	0.00	0.00	27		318.04	0.00	0.00	0.12
15	2.00	0.00	0.00	13		302.68	0.00	0.00	0.00
16	2.00	0.00	0.00	18		271.58	0.00	0.00	0.62
17	2.00	0.00	0.00	20		270.32	0.00	0.00	0.00
18	2.00	0.00	0.00	18		294.26	0.00	0.00	0.00
19	2.00	0.00	0.03	12		228.63	0.00	0.00	0.61
20	2.00	3.16	3.55	9		308.13	10.56	17.14	0.00
21	2.00	0.00	0.00	14		362.78	0.00	0.00	0.00
22	2.00	4.16	4.06	4		308.01	13.90	17.79	0.00
23	2.00	1.61	1.26	5		309.29	5.36	16.03	0.00
24	2.00	2.69	2.80	9		328.11	8.53	15.97	0.00
25	2.00	0.66	0.55	0		470.77	1.60	11.12	0.00
26	2.00	3.47	4.14	12		330.65	10.93	17.53	0.12
27	2.00	6.16	6.87	13		346.84	18.64	18.28	0.00
28	2.00	0.00	0.00	13		360.84	0.00	0.00	0.00
29	2.00	0.00	0.00	9		316.99	0.00	0.00	0.12
30	2.00	0.00	0.00	18		274.38	0.00	0.00	0.00
31	2.00	1.66	2.31	18		316.85	5.43	17.05	0.00
32	2.00	0.00	0.00	0		467.53	0.00	0.00	0.00
33	2.00	1.03	1.41	0		575.15	2.21	10.11	0.00
34	2.00	1.87	2.16	0		501.73	4.31	11.24	0.00
35	2.00	0.00	0.00	7		353.52	0.00	0.00	0.00

RSDS# 06-T-0309 11 of 12

16 Jun 2006 15:50 ALPHA/BETA - 1.09 Page #2 6-16
Protocol #: 2 PW H3 #403727 User : 2138

S#	TIME	CPMA	CPMB	LUM FLAG	tSIE	DPM1	2SIGMA	CPMC
36	2.00	11.55	11.93	5	353.27	34.38	19.71	2.12
37	2.00	5.20	5.59	4	314.74	17.06	18.12	0.00
38	2.00	3.16	3.55	9	243.32	13.19	21.42	0.00
39	2.00	3.16	3.55	9	276.35	11.62	18.87	0.00
40	2.00	0.16	0.55	16	234.44	0.71	21.37	2.90
41	2.00	3.88	4.27	8	236.65	16.64	22.63	0.00
42	2.00	6.16	6.55	24	335.48	19.17	21.66	0.00
43	2.00	1.19	1.57	5	372.89	3.38	13.46	0.62
44	2.00	7.94	8.33	3	299.49	27.13	20.55	0.00
45	2.00	2.16	2.93	13	383.31	6.01	14.80	0.00
46	2.00	14.09	14.17	2	337.42	43.59	21.71	0.00
47	2.00	2.38	2.39	5	384.55	6.61	13.80	1.62
48	2.00	0.00	0.00	0	444.26	0.00	0.00	0.00
49	2.00	6.16	6.55	3	435.89	15.62	14.46	0.00
50	2.00	5.65	6.04	4	430.02	14.46	14.35	0.00
51	2.00	7.66	8.04	3	450.39	19.01	14.81	0.00
52	2.00	10.16	10.13	5	401.88	27.15	17.08	0.00
53	2.00	14.43	14.82	2	446.34	36.00	17.64	0.00
54	2.00	5.27	4.89	4	451.90	13.05	13.71	0.00
55	2.00	14.37	14.04	2	472.45	34.52	16.96	0.00
56	2.00	9.69	9.19	3	416.64	25.29	16.48	1.62
57	2.00	4.02	4.08	11	352.61	12.00	16.91	0.00
58	2.00	4.54	4.23	4	363.94	13.17	15.69	0.00
59	2.00	5.66	6.05	7	345.33	17.19	17.04	0.00
60	2.00	6.03	6.41	7	333.83	18.81	17.73	0.00
61	2.00	1.66	2.05	0	348.38	5.01	14.56	0.00
62	2.00	1.58	1.72	14	307.47	5.28	17.42	0.00
63	2.00	10.66	11.05	3	362.36	31.08	18.88	0.62
64	2.00	10.93	11.05	3	406.51	28.99	17.29	0.00
65	2.00	16.50	16.89	2	425.79	42.46	18.99	0.00
66	2.00	6.66	7.05	7	311.69	22.02	19.15	0.12
67	2.00	22.86	22.93	2	347.83	68.97	24.97	0.62
68	2.00	19.76	19.29	2	329.96	62.28	24.75	0.00
69	2.00	23.46	22.98	2	409.74	61.88	22.05	0.00
70	2.00	17.16	16.58	4	306.60	57.49	25.05	2.62
71	2.00	14.60	14.99	2	427.00	37.51	18.23	0.00
72	2.00	12.66	12.69	2	371.34	36.15	19.40	0.00
73	2.00	10.16	10.55	5	331.01	31.96	20.11	0.00
74	2.00	2.16	2.55	5	392.65	5.89	13.44	0.62
75	2.00	7.66	7.23	3	323.41	24.57	19.14	0.00
76	2.00	8.16	8.29	3	317.90	26.54	19.69	0.36
77	2.00	0.90	1.28	5	326.24	2.86	14.86	0.00
78	2.00	1.16	1.55	5	354.15	3.46	14.05	0.00
79	2.00	0.00	0.00	17	383.07	0.00	0.00	0.00
80	2.00	0.00	0.00	8	304.17	0.00	0.00	0.12
81	2.00	0.00	0.00	7	334.63	0.00	0.00	0.00
82	2.00	0.16	0.55	6	429.62	0.42	11.54	0.00
83	2.00	0.00	0.00	7	320.32	0.00	0.00	1.12
84	2.00	0.00	0.00	0	321.63	0.00	0.00	0.62
85	2.00	0.00	0.00	40	301.41	0.00	0.00	0.00
86	2.00	0.00	0.00	14	242.15	0.00	0.00	0.00
87	2.00	0.16	0.55	12	232.63	0.72	19.70	0.00
88	2.00	59.73	58.56	0	316.11	195.09	41.13	0.00
89	2.00	0.00	0.00	20	264.88	0.00	0.00	0.00
90	2.00	0.00	0.05	0	337.20	0.00	0.00	0.00
91	2.00	0.00	0.00	9	305.86	0.00	0.00	0.00

COPY

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RSDS# 06-T-0309 12 of 12

16 Jun 2006 18:49 ALPHA/BETA - 1.09 Page #3 ~~4~~ 0
Protocol #: 2 PW H3 #403727 User : 2138 6-16-

S#	TIME	CPMA	CPMB	LUM FLAG	tSIE	DPM1	2SIGMA	CPMC
92	2.00	0.66	1.05	6	342.91	2.03	14.10	0.00
93	2.00	0.00	0.00	17	320.78	0.00	0.00	0.00
94	2.00	5.46	5.84	4	359.34	16.02	16.37	1.62
95	2.00	0.00	0.05	13	234.58	0.00	0.00	1.40
96	2.00	0.00	0.00	8	336.06	0.00	0.00	2.12
97	2.00	0.00	0.00	10	297.93	0.00	0.00	0.12
98	2.00	0.00	0.00	11	274.69	0.00	0.00	1.12
99	2.00	0.00	0.00	18	289.78	0.00	0.00	0.00
100	2.00	0.00	0.00	6	302.75	0.00	0.00	0.62
101	2.00	0.00	0.00	0	378.20	0.00	0.00	1.12
102	2.00	0.66	0.79	6	312.12	2.17	15.24	0.00
103	2.00	0.00	0.00	13	374.84	0.00	0.00	0.00
104	2.00	0.79	0.86	5	349.62	2.38	13.96	0.00
105	2.00	0.83	0.94	11	322.11	2.66	14.97	2.62
106	2.00	5.98	5.97	3	390.08	16.37	15.53	5.62
107	2.00	0.00	0.00	8	360.45	0.00	0.00	0.00
108	2.00	0.00	0.00	7	306.83	0.00	0.00	0.00
109	2.00	2.72	3.11	4	434.01	6.92	12.83	0.00
110	2.00	0.00	0.00	7	336.00	0.00	0.00	0.00
111	2.00	1.16	1.26	5	333.51	3.64	14.77	0.00
112	2.00	0.40	0.40	6	385.56	1.11	12.62	2.40
113	2.00	0.00	0.00	8	353.27	0.00	0.00	0.00
114	2.00	0.66	0.78	11	322.20	2.14	14.85	0.00
115	2.00	0.00	0.00	18	335.65	0.00	0.00	0.12
116	2.00	0.00	0.00	25	239.67	0.00	0.00	0.00
117	2.00	0.00	0.00	27	287.52	0.00	0.00	1.47
118	2.00	0.00	0.00	20	298.56	0.00	0.00	0.12
119	2.00	0.00	0.00	13	314.61	0.00	0.00	0.00
120	2.00	0.00	0.00	15	314.89	0.00	0.00	0.12

400

COPY

AM

F12/26

RADIOLOGICAL SURVEY DATA SHEET

LOCATION: (BLDG./AREA/ROOM) T-BLDG 2ND FLOOR	SURVEY NO. 06-T-0321
PURPOSE: CLOSE-OUT CONTAMINATION VERIFICATION OF HIGH TRAFFIC AREAS AND PASSAGE ZONES-	RWP NO. N/A
	DATE: 6-23-06
	TIME: 1000 HRS.

MAP / DRAWING

SEE PAGE 2 MAP
AND PAGES -
FOR LAB ANALYSIS
DATA -

COPY

LEGEND:
= mrem/hr (γ) whole body
#E = mrem/hr (β+η+γ) extremity on contact
K = factor of 1000
—·—·—·- = radiological boundary

- mrem/hr neutron
- swipe number
- air sample number
#/α or /β - direct contamination measurement in dpm/100cm²

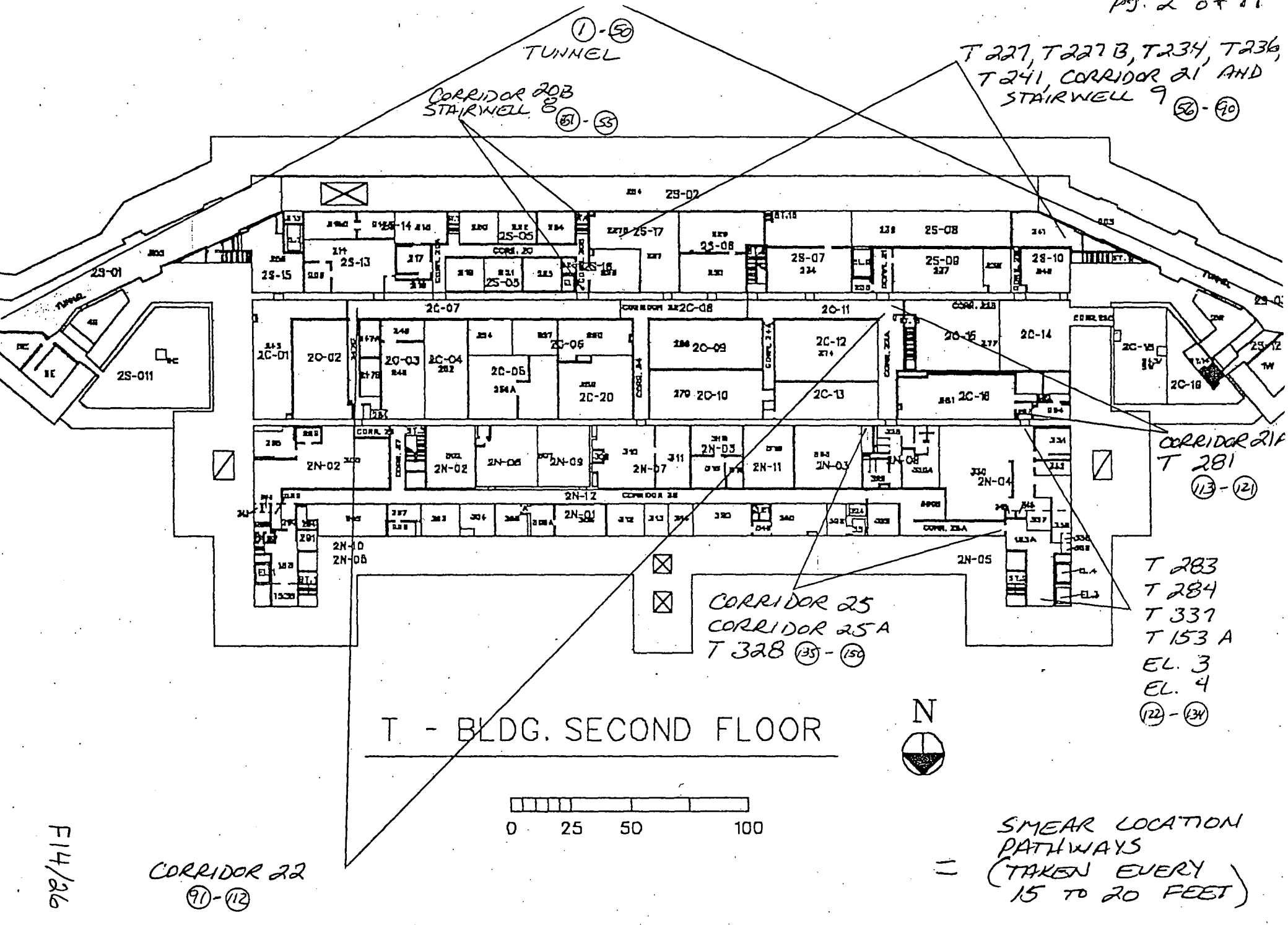
INSTRUMENTS USED

Instrument	Serial Number	Cal. Due Date
SEE		
	LAB	
	ANALYSIS	
		RECORDS

HP#	Date:
7347	6-23-06
[redacted]	
HP#	Date:
PRINTOUTS	
HP# 5891	Date: 6-26-06
[redacted]	

ML-9620 (2-98)

F13/26



T - BLDG. SECOND FLOOR

F14/26

Survey No.
RSDS 06-T-0321

RADIOLOGICAL SURVEY DATA SHEET (cont.)

Removable Contamination				
Swipes (dpm/100cm²)				
Sample #	β/γ	Alpha	Tritium	Comments
1	SEE	LAB		TUNNEL
2		ANALYSIS		
3		RECORDS		
4		PAGES		
5		6-14		
6				
7				
8				
9				
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27				
28				
29				
30				
31				
32				
33				
34				
35				TUNNEL

Removable Contamination				
Swipes (dpm/100cm²)				
Sample #	β/γ	Alpha	Tritium	Comments
36	SEE	LAB		TUNNEL
37		ANALYIS		
38		RECORDS		
39		PAGES		
40		6-14		
41				
42				
43				
44				
45				
46				
47				
48				
49				
50				TUNNEL
51				CORRIDOR 20B
52				STAIRWELL 8
53				
54				
55				
56				T 227
57				T 227B
58				T 234
59				T 236, T241
60				CORRIDOR 21
61				STAIRWELL 9
62				
63				
64				
65				
66				
67				
68				
69				
70				

COMMENTS: N/A

NOTES:

1. See MD-80036 10002 for calculations of WB, extremity and skin dose rates.
2. To request RO Count Room analysis for β/γ, alpha or tritium, leave column blank. Mark column N/A if not needed. If count room printout of results is attached, write "see attached" in column.
3. Annotate special sample type (e.g., soil, water), special identifiers or otherwise in Comments. If not needed, mark N/A.

ML-9620A (4-98)

F15/26

Survey No. 06-T-0321

RADIOLOGICAL SURVEY DATA SHEET (cont.)

Removable Contamination				
Swipes (dpm/100cm²)				
Sample #	β/γ	Alpha	Tritium	Comments
71	SEE			T227+227B
72		LAB		T234, T236
73		ANALYSIS		T241
74		RECORDS		CORRIDOR 2
75		PAGES		STAIRWELL 9
76		6-14		
77				
78				
79				
80				
81				
82				
83				
84				
85				
86				
87				
88				
89				
90				
91				CORRIDOR 22
92				
93				
94				
95				
96				
97				
98				
99				
100				
101				
102				
103				
104				
105				

Removable Contamination				
Swipes (dpm/100cm²)				
Sample #	β/γ	Alpha	Tritium	Comments
106	SEE			CORRIDOR 22
107		LAB		
108		ANALYSIS		
109		RECORDS		
110		PAGES		
111		6-14		
112				
113				CORRIDOR 21A
114				T-281
115				
116				
117				
118				
119				
120				
121				
122				T283-T284
123				T337-T153A
124				EL.3-EL.4
125				
126				
127				
128				
129				
130				
131				
132				
133				
134				
135				CORRIDOR 25
136				CORRIDOR 25A
137				T 328
138				
139				
140				

COMMENTS: N/A

NOTES:

1. See MD-80036 10002 for calculations of WB, extremity and skin dose rates.

2. To request RO Count Room analysis for β/γ, alpha or tritium, leave column blank. Mark column N/A if not needed. If count room printout of results

3. Annotate special sample type (e.g., soil, water), special identifiers or otherwise in Comments. If not needed, mark N/A.

ML-9620A (4-98)

F16/26

Survey No. 06-T-0321

RADIOLOGICAL SURVEY DATA SHEET (cont.)

Removable Contamination				
Swipes (dpm/100cm^2)				
Sample #	β/γ	Alpha	Tritium	Comments
141	SEE LAB			CORRIDOR 25
142	RECORDS			CORRIDOR 25A
143	PGS.			T 328
144	6-14			
145				
146				
147				
148				
149				
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173				
174				
175				

Removable Contamination				
Swipes (dpm/100cm^2)				
Sample #	β/γ	Alpha	Tritium	Comments
176	N			
177				
178	A			
179				
180				
181				
182				
183				
184				
185				
186				
187				
188				
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190				
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207				
208				
209				
210				

COMMENTS: N
A

NOTES:

1. See MD-80036 10002 for calculations of WB, extremity and skin dose rates.

2. To request RO Count Room analysis for β/γ, alpha or tritium, leave column blank. Mark column N/A if not needed. If count room printout of results

3. Annotate special sample type (e.g., soil, water), special identifiers or otherwise in Comments. If not needed, mark N/A.

ML-9620A (4-98)

F17/26

Smear Analysis

Unit Type: LB4100/W
Counting Unit ID: Aqua
Data file name: SMEAR017
Batch Ended: 6/23/06 12:22

Crosstalk correction performed.

Recalibration Date: 11/03/06
Serial Number: 26966-1

Batch ID: 06-T-0321 AL DICK (150) AG

Detector ID	Sample ID	Alpha Activity DPM	Alpha Activity σ	Alpha Activity flags	Beta Activity DPM	Beta Activity σ	Beta Activity flags
A1	1	0.00	2.10		1.39	2.17	
A2	2	0.00	2.19		0.00	1.77	
A3	3	0.00	1.93		0.00	1.18	
A4	4	0.00	1.96		0.52	2.04	
B1	5	1.63	1.89		0.00	1.12	
B2	6	0.00	2.03		0.00	1.18	
B3	7	0.00	1.86		0.69	2.09	
B4	8	0.00	1.85		0.00	1.10	
C1	9	0.00	2.13		0.00	2.13	
C2	10	0.00	2.14		0.00	1.25	
C3	11	0.00	2.00		0.00	1.27	
C4	12	0.00	1.92		0.00	1.26	
D1	13	0.00	2.12		0.00	1.77	
D2	14	0.00	1.95		0.00	1.17	
D3	15	1.40	1.82		0.00	1.18	
D4	16	0.00	1.87		0.00	1.11	
A1	17	0.00	2.10		1.39	2.17	
A2	18	0.00	2.17		0.00	1.25	
A3	19	1.63	1.93		0.00	1.18	
A4	20	0.00	1.95		0.00	1.67	
B1	21	0.00	1.91		0.20	1.58	
B2	22	0.00	2.05		0.00	1.67	
B3	23	0.00	1.87		1.90	2.42	
B4	24	0.00	1.89		1.53	2.19	
C1	25	0.00	2.14		1.09	2.46	
C2	26	0.00	2.17		1.46	2.16	
C3	27	0.00	2.00		0.00	1.27	
C4	28	0.00	1.95		0.56	2.17	
D1	29	1.86	2.16		2.19	2.51	
D2	30	0.00	2.00		2.31	2.35	
D3	31	0.00	1.83		0.00	1.66	
D4	32	0.00	1.89		0.84	1.92	
A1	33	0.00	2.11		2.64	2.51	
A2	34	0.00	2.24		3.73	2.80	

AGD AGD

6 of 14

AGD 6-23-06

F18/26

Smear Analysis

Unit Type: LB4100/W
Counting Unit ID: Aqua
Data file name: SMEAR017
Batch Ended: 6/23/06 12:22

Crosstalk correction performed.

Recalibration Date: 11/03/06
Serial Number: 26966-1

Batch ID: 06-T-0321 AL DICK (150) AG

Detector ID	Sample ID	Alpha Activity DPM	Alpha Activity σ	Alpha Activity flags	Beta Activity DPM	Beta Activity σ	Beta Activity flags
A3	35	0.00	1.96		1.06	2.04	
A4	36	0.00	1.95		0.00	1.67	
B1	37	0.00	1.89		0.00	1.12	
B2	38	0.00	2.03		0.00	1.18	
B3	39	0.00	1.87		1.90	2.42	
B4	40	0.00	1.87		0.00	1.55	
C1	41	0.00	2.14		1.09	2.46	
C2	42	0.00	2.17		1.46	2.16	
C3	43	0.00	2.00		0.00	1.27	
C4	44	0.00	1.92		0.00	1.26	
D1	45	0.00	2.12		0.00	1.77	
D2	46	0.00	1.95		0.00	1.17	
D3	47	0.00	1.82		0.00	1.17	
D4	48	0.00	1.89		0.84	1.92	
A1	49	0.00	2.09		0.14	1.77	
A2	50	0.00	2.19		0.00	1.77	
A3	51	1.63	1.93		0.00	1.18	
A4	52	0.00	1.95		0.00	1.67	
B1	53	0.00	1.92		1.31	1.93	
B2	54	0.00	2.07		0.70	2.04	
B3	55	0.00	1.83		0.00	1.21	
B4	56	1.48	1.88		0.29	1.90	
C1	57	0.00	2.13		0.00	2.13	
C2	58	0.00	2.19		2.70	2.49	
C3	59	0.00	2.01		0.00	1.79	
C4	60	0.00	1.95		0.56	2.17	
D1	61	0.00	2.12		0.00	1.77	
D2	62	1.25	1.98		0.97	2.03	
D3	63	0.00	1.82		0.00	1.17	
D4	64	1.67	1.90		1.81	2.22	
A1	65	0.00	2.11		2.64	2.51	
A2	66	0.00	2.20		1.23	2.17	
A3	67	0.00	1.98		3.42	2.64	
A4	68	1.59	1.96		0.37	2.04	
B1	69	0.00	1.91		0.20	1.58	
B2	70	0.00	2.11		3.05	2.64	

AGD 7 of 14 AGD

AGD 6-23-06

F19/26

Smear Analysis

Unit Type: LB4100/W
Counting Unit ID: Aqua
Data file name: SMEAR017
Batch Ended: 6/23/06 12:22

Crosstalk correction performed.

Recalibration Date: 11/03/06
Serial Number: 26966-1

Batch ID: 06-T-0321 AL DICK (150) AG

Detector ID	Sample ID	Alpha Activity DPM	Alpha Activity σ	Alpha Activity flags	Beta Activity DPM	Beta Activity σ	Beta Activity flags
B3	71	0.00	1.86		0.69	2.09	
B4	72	0.00	1.87		0.00	1.55	
C1	73	0.00	2.14		1.09	2.46	
C2	74	0.00	2.17		1.46	2.16	
C3	75	0.00	2.02		0.27	2.19	
C4	76	1.57	1.94		0.00	1.77	
D1	77	0.00	2.10		0.00	1.26	
D2	78	0.00	2.03		4.65	2.88	
D3	79	1.40	1.86		1.92	2.35	
D4	80	0.00	1.93		4.17	2.72	
A1	81	0.00	2.08		0.00	1.26	
A2	82	1.87	2.17		0.00	1.26	
A3	83	0.00	1.94		0.00	1.67	
A4	84	0.00	1.95		0.00	1.67	
B1	85	0.00	1.89		0.00	1.12	
B2	86	0.00	2.05		0.00	1.67	
B3	87	1.49	1.87		1.74	2.42	
B4	88	0.00	1.85		0.00	1.10	
C1	89	0.00	2.16		2.32	2.75	
C2	90	3.78	3.02		0.00	1.25	
C3	91	0.00	2.00		0.00	1.27	
C4	92	0.00	1.96		1.81	2.51	
D1	93	0.00	2.10		0.00	1.26	
D2	94	0.00	2.03		4.65	2.88	
D3	95	1.40	1.84		0.00	1.66	
D4	96	0.00	1.88		0.00	1.57	
A1	97	0.00	2.11		2.64	2.51	
A2	98	0.00	2.20		1.23	2.17	
A3	99	1.63	1.96		0.90	2.04	
A4	100	1.59	1.98		1.55	2.36	
B1	101	0.00	1.92		1.31	1.93	
B2	102	0.00	2.03		0.00	1.18	
B3	103	0.00	1.84		0.00	1.71	
B4	104	0.00	1.88		0.44	1.90	
C1	105	0.00	2.13		0.00	2.13	
C2	106	0.00	2.16		0.21	1.76	

AaO 8 of 14 AaO

AaO 6-23-06

F20/26

Smear Analysis

Unit Type: LB4100/W
Counting Unit ID: Aqua
Data file name: SMEAR017
Batch Ended: 6/23/06 12:22

Crosstalk correction performed.

Recalibration Date: 11/03/06
Serial Number: 26966-1

Batch ID: 06-T-0321 AL DICK (150) AG

Detector ID	Sample ID	Alpha Activity DPM	Alpha Activity σ	Alpha Activity flags	Beta Activity DPM	Beta Activity σ	Beta Activity flags
C3	107	1.59	2.00		0.00	1.27	
C4	108	0.00	1.95		0.56	2.17	
D1	109	1.87	2.12		0.00	1.77	
D2	110	0.00	1.95		0.00	1.17	
D3	111	0.00	1.83		0.00	1.66	
D4	112	0.00	1.89		0.84	1.92	
A1	113	0.00	2.08		0.00	1.25	
A2	114	0.00	2.19		0.00	1.77	
A3	115	0.00	1.94		0.00	1.67	
A4	116	0.00	1.94		0.00	1.19	
B1	117	0.00	1.92		1.31	1.93	
B2	118	1.48	2.05		0.00	1.67	
B3	119	0.00	1.89		4.31	2.96	
B4	120	0.00	1.88		0.44	1.90	
C1	121	0.00	2.16		2.32	2.75	
C2	122	0.00	2.14		0.00	1.25	
C3	123	1.59	2.03		1.38	2.53	
C4	124	1.57	1.95		0.41	2.17	
D1	125	0.00	2.10		0.00	1.26	
D2	126	0.00	1.98		1.13	2.03	
D3	127	0.00	1.82		0.00	1.17	
D4	128	1.67	1.89		0.70	1.92	
A1	129	0.00	2.14		5.14	3.07	
A2	130	1.87	2.27		6.06	3.32	
A3	131	0.00	1.96		1.06	2.04	
A4	132	0.00	1.95		0.00	1.67	
B1	133	1.62	1.94		2.25	2.23	
B2	134	0.00	2.14		4.23	2.89	
B3	135	0.00	1.83		0.00	1.21	
B4	136	0.00	1.89		1.53	2.19	
C1	137	0.00	2.14		1.09	2.46	
C2	138	0.00	2.14		0.00	1.25	
C3	139	0.00	2.00		0.00	1.28	
C4	140	0.00	1.95		0.56	2.17	
D1	141	0.00	2.15		2.37	2.51	
D2	142	1.25	1.98		0.97	2.03	

JGD 9 of 14 JGD

JGD 6-23-06

F21/26

Smear Analysis

Unit Type: LB4100/W
Counting Unit ID: Aqua
Data file name: SMEAR017
Batch Ended: 6/23/06 12:22

Crosstalk correction performed.

Recalibration Date: 11/03/06
Serial Number: 26966-1

Batch ID: 06-T-0321 AL DICK (150) AG

Detector ID	Sample ID	Alpha Activity			Beta Activity		
		DPM	σ	flags	DPM	σ	flags
D3	143	0.00	1.82		0.00	1.17	
D4	144	0.00	1.89		0.84	1.92	
A1	145	0.00	2.09		0.14	1.77	
A2	146	0.00	2.19		0.00	1.77	
A3	147	1.63	1.97		2.08	2.36	
A4	148	0.00	1.95		0.00	1.67	
B1	149	0.00	1.89		0.00	1.12	
B2	150	0.00	2.05		0.00	1.67	

AGD AGD

F22/26

10 of 14

AGD 6-23-06

23 Jun 2006 13:50 ALPHA/BETA - 1:09 Page #1 6-23-06
Protocol #: 4 PW H3 403727 User : 2138

Time: 2.00
Data Mode: DPM Nuclide: SMGLS02 Quench Set: SMGLS02
Background Subtract: 1st Vial

	LL	UL	LCR	2S%	BKG
Region A:	0.5	18.6	0	0.0	7.29
Region B:	2.0	18.6	0	0.0	7.09
Region C:	40.0	2000	0	0.0	11.10

Quench Indicator: tSIE/AEC
Ext Std Terminator: Count
06-T-0321 AL DICK (150) AG
Luminescence Correction On
Coincidence Time(ns): 18
Delay Before Burst(ns): Normal
Protocol Data Filename: C:\DATA\PROT4.dat
Count Data Filename: C:\DATA\SDATA4.DAT

S#	TIME	CPMA	CPMB	CPMC	tSIE	LUM	FLAG	DPM1	2SIGMA
-1	10.00	7.29	7.09	11.10	636.38	3	B		0.00
0	2.00	300.51	290.37	0.00	568.84	0		650.27	71.85
1	2.00	0.00	0.00	0.00	504.57	18		0.00	0.00
2	2.00	1.86	1.88	0.00	498.44	5		4.30	10.67
3	2.00	0.00	0.00	0.90	309.03	29		0.00	0.00
4	2.00	0.00	0.00	0.00	395.05	14		0.00	0.00
5	2.00	0.00	0.00	0.00	573.83	13		0.00	0.00
6	2.00	0.21	0.41	1.40	446.67	7		0.52	10.56
7	2.00	0.00	0.00	0.00	290.92	18		0.00	0.00
8	2.00	0.00	0.00	1.90	417.50	11		0.00	0.00
9	2.00	0.00	0.00	0.00	499.58	0		0.00	0.00
10	2.00	1.21	1.35	0.00	458.93	0		2.96	10.93
11	2.00	0.00	0.00	0.00	476.13	13		0.00	0.00
12	2.00	0.00	0.00	0.00	509.47	8		0.00	0.00
13	2.00	0.21	0.03	0.00	382.36	7		0.58	11.79
14	2.00	0.00	0.00	0.00	404.48	7		0.00	0.00
15	2.00	1.64	1.14	0.90	367.60	0		4.72	13.13
16	2.00	0.00	0.00	0.40	397.81	0		0.00	0.00
17	2.00	0.00	0.00	0.00	447.10	0		0.00	0.00
18	2.00	0.00	0.00	0.00	385.21	10		0.00	0.00
19	2.00	0.00	0.00	0.00	469.42	8		0.00	0.00
20	2.00	0.00	0.00	0.00	403.16	10		0.00	0.00
21	2.00	0.00	0.00	0.00	470.45	11		0.00	0.00
22	2.00	0.04	0.24	0.00	420.50	0		0.09	10.88
23	2.00	1.87	2.07	0.00	381.18	5		5.22	12.88
24	2.00	0.00	0.00	0.40	339.69	0		0.00	0.00
25	2.00	0.00	0.00	0.90	405.62	9		0.00	0.00
26	2.00	1.21	1.41	0.00	463.88	0		2.94	10.86
27	2.00	0.06	0.26	0.00	421.84	7		0.15	10.87
28	2.00	0.00	0.00	0.00	408.27	9		0.00	0.00
29	2.00	1.71	1.91	0.00	424.06	0		4.40	11.80
30	2.00	0.00	0.00	0.00	373.59	11		0.00	0.00
31	2.00	0.00	0.00	0.00	369.34	0		0.00	0.00
32	2.00	0.00	0.00	0.00	377.84	10		0.00	0.00
33	2.00	0.00	0.00	0.00	377.15	0		0.00	0.00
34	2.00	1.71	1.91	0.00	386.50	0		4.71	12.63
35	2.00	0.00	0.00	0.00	349.15	0		0.00	0.00

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Protocol #: 4 PW H3 403727 User : 2138 AQC

S#	TIME	CPMA	CPMB	CPMC	tSIE	LUM	FLAG	DPM1	2SIGMA
36	2.00	0.00	0.00	0.00	382.40	0		0.00	0.00
37	2.00	0.00	0.00	0.00	432.25	0		0.00	0.00
38	2.00	0.00	0.00	0.00	369.21	0		0.00	0.00
39	2.00	1.71	1.91	0.00	430.62	0		4.36	11.69
40	2.00	0.00	0.00	0.00	445.79	0		0.00	0.00
41	2.00	1.21	1.41	0.00	485.52	0		2.85	10.53
42	2.00	0.00	0.00	0.00	418.05	0		0.00	0.00
43	2.00	0.00	0.00	0.00	301.84	8		0.00	0.00
44	2.00	0.00	0.00	0.00	448.97	0		0.00	0.00
45	2.00	0.00	0.00	0.00	372.78	8		0.00	0.00
46	2.00	0.00	0.00	0.00	314.98	8		0.00	0.00
47	2.00	0.86	1.06	0.00	439.48	0		2.16	11.05
48	2.00	0.00	0.00	0.00	359.21	11		0.00	0.00
49	2.00	0.00	0.00	0.40	351.16	8		0.00	0.00
50	2.00	0.00	0.00	0.00	286.46	9		0.00	0.00
51	2.00	0.00	0.00	0.00	431.69	0		0.00	0.00
52	2.00	1.91	1.64	0.40	436.74	5		4.84	11.70
53	2.00	0.00	0.00	0.00	322.37	0		0.00	0.00
54	2.00	0.00	0.00	2.90	343.14	9		0.00	0.00
55	2.00	0.00	0.00	1.90	303.15	11		0.00	0.00
56	2.00	0.00	0.00	0.00	424.88	0		0.00	0.00
57	2.00	2.50	2.71	0.90	424.55	0		6.45	12.24
58	2.00	0.00	0.00	0.00	362.37	8		0.00	0.00
59	2.00	0.00	0.00	0.00	428.38	9		0.00	0.00
60	2.00	0.00	0.00	0.00	412.05	9		0.00	0.00
61	2.00	0.00	0.00	0.00	418.53	7		0.00	0.00
62	2.00	2.44	2.15	0.40	444.61	0		6.11	11.85
63	2.00	0.46	0.67	0.00	416.19	6		1.21	11.21
64	2.00	3.92	4.12	0.00	413.56	4		10.28	13.22
65	2.00	0.00	0.00	3.40	450.14	0		0.00	0.00
66	2.00	0.00	0.00	0.00	342.10	0		0.00	0.00
67	2.00	0.00	0.00	0.00	332.51	0		0.00	0.00
68	2.00	1.61	1.31	0.00	486.72	6		3.78	10.72
69	2.00	0.00	0.00	0.00	445.62	0		0.00	0.00
70	2.00	0.00	0.00	0.00	441.95	7		0.00	0.00
71	2.00	0.00	0.00	0.00	385.51	0		0.00	0.00
72	2.00	0.21	0.41	0.00	350.14	0		0.62	12.70
73	2.00	0.00	0.00	1.40	347.56	13		0.00	0.00
74	2.00	0.71	0.91	1.90	403.33	0		1.88	11.59
75	2.00	0.71	0.91	0.00	431.66	6		1.80	11.09
76	2.00	0.00	0.00	1.90	379.21	0		0.00	0.00
77	2.00	0.00	0.00	0.00	373.23	0		0.00	0.00
78	2.00	0.00	0.07	0.00	258.11	0		0.00	0.00
79	2.00	0.00	0.00	0.00	381.61	11		0.00	0.00
80	2.00	0.00	0.00	0.00	407.55	0		0.00	0.00
81	2.00	0.00	0.00	0.00	351.56	0		0.00	0.00
82	2.00	1.21	1.06	0.00	368.46	0		3.47	12.83
83	2.00	0.51	0.41	0.00	338.73	6		1.56	13.27
84	2.00	0.00	0.00	0.00	406.12	7		0.00	0.00
85	2.00	0.21	0.00	0.00	355.02	13		0.61	12.55
86	2.00	0.00	0.00	0.00	286.46	0		0.00	0.00
87	2.00	4.71	4.91	0.90	359.23	4		13.82	15.27
88	2.00	0.51	0.71	3.90	389.33	0		1.39	11.80
89	2.00	0.99	1.20	2.40	299.89	6		3.39	15.06
90	2.00	0.00	0.00	0.40	360.77	17		0.00	0.00
91	2.00	0.00	0.00	0.00	356.46	7		0.00	0.00

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Protocol #: 4 PW H3 403727 User : 2138 ~~HAD~~

S#	TIME	CPMA	CPMB	CPMC	tSIE	LUM FLAG	DPM1	2SIGMA
92	2.00	0.00	0.00	2.90	329.36	13	0.00	0.00
93	2.00	1.71	1.62	0.00	333.44	6	5.34	14.30
94	2.00	0.00	0.00	0.97	303.23	9	0.00	0.00
95	2.00	0.00	0.00	0.00	327.46	7	0.00	0.00
96	2.00	0.00	0.00	0.00	304.87	15	0.00	0.00
97	2.00	0.00	0.00	0.00	348.23	10	0.00	0.00
98	2.00	0.00	0.00	0.00	329.50	8	0.00	0.00
99	2.00	0.00	0.00	0.00	314.30	8	0.00	0.00
100	2.00	0.00	0.00	0.00	366.09	17	0.00	0.00
101	2.00	0.00	0.19	0.00	329.13	7	0.00	0.00
102	2.00	0.00	0.14	0.00	355.49	0	0.00	0.00
103	2.00	0.00	0.00	0.00	319.95	0	0.00	0.00
104	2.00	0.23	0.44	0.00	328.04	0	0.74	13.43
105	2.00	0.00	0.00	0.40	270.41	10	0.00	0.00
106	2.00	2.68	2.74	1.40	251.87	5	10.80	19.28
107	2.00	0.00	0.00	2.40	283.79	10	0.00	0.00
108	2.00	0.00	0.00	0.00	283.95	0	0.00	0.00
109	2.00	0.00	0.00	0.85	394.86	7	0.00	0.00
110	2.00	0.00	0.00	0.00	416.15	0	0.00	0.00
111	2.00	0.00	0.00	0.00	255.24	0	0.00	0.00
112	2.00	0.00	0.00	0.00	331.88	0	0.00	0.00
113	2.00	0.00	0.00	0.00	345.62	0	0.00	0.00
114	2.00	0.00	0.00	0.00	349.61	0	0.00	0.00
115	2.00	0.00	0.00	0.00	286.21	11	0.00	0.00
116	2.00	0.00	0.00	0.00	326.13	8	0.00	0.00
117	2.00	3.71	3.91	0.00	343.65	5	11.30	15.23
118	2.00	0.55	0.75	0.00	332.69	0	1.72	13.50
119	2.00	0.00	0.00	0.00	323.36	8	0.00	0.00
120	2.00	1.21	1.41	0.00	359.72	0	3.54	13.09
121	2.00	0.00	0.00	0.40	313.45	20	0.00	0.00
122	2.00	0.00	0.00	0.00	418.00	8	0.00	0.00
123	2.00	0.00	0.00	0.00	321.10	29	0.00	0.00
124	2.00	0.71	0.34	0.00	278.95	6	2.57	15.83
125	2.00	0.00	0.00	1.55	449.26	9	0.00	0.00
126	2.00	3.53	2.77	0.00	436.92	0	8.92	12.56
127	2.00	0.00	0.00	0.00	390.83	8	0.00	0.00
128	2.00	0.00	0.12	1.82	354.27	0	0.00	0.00
129	2.00	0.00	0.00	0.00	251.62	10	0.00	0.00
130	2.00	0.00	0.00	0.00	292.98	9	0.00	0.00
131	2.00	0.00	0.00	3.68	293.40	11	0.00	0.00
132	2.00	0.00	0.00	0.00	364.27	9	0.00	0.00
133	2.00	0.00	0.00	0.00	423.38	0	0.00	0.00
134	2.00	1.71	1.91	0.00	509.43	6	3.90	10.46
135	2.00	0.00	0.00	0.00	483.07	0	0.00	0.00
136	2.00	1.21	1.41	0.00	489.29	0	2.83	10.47
137	2.00	0.00	0.00	0.00	391.39	7	0.00	0.00
138	2.00	0.00	0.00	0.00	431.96	0	0.00	0.00
139	2.00	0.00	0.00	0.00	708.35	0	0.00	0.00
140	2.00	1.12	1.33	0.00	425.67	0	2.89	11.44
141	2.00	0.00	0.00	0.00	399.71	11	0.00	0.00
142	2.00	0.00	0.00	0.00	376.63	0	0.00	0.00
143	2.00	0.00	0.00	0.00	356.81	0	0.00	0.00
144	2.00	0.00	0.00	0.00	387.73	0	0.00	0.00
145	2.00	1.63	1.84	0.00	426.26	6	4.20	11.72
146	2.00	0.00	0.00	0.90	410.48	0	0.00	0.00
147	2.00	0.00	0.00	0.00	437.18	0	0.00	0.00

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Protocol #: 4 PW H3 403727 User : 2138 JAD

S#	TIME	CPMA	CPMB	CPMC	tSIE	LUM FLAG	DPM1	2SIGMA
148	2.00	0.15	0.05	0.00	338.65	0	0.46	13.02
149	2.00	0.00	0.00	0.00	306.64	0	0.00	0.00
150	2.00	6.23	5.43	0.00	357.33	0	18.36	16.20

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