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Rupture Loop Annex Ion Exchange (RLAIX) Vault Deactivation

J. E. Ham
Westinghouse Hanford Company, Richland, WA 99352
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Abstract: This engineering report documents the deactivation, stabilization and final conditions of the Rupture Loop Annex Ion Exchange (RLAIX) Vault located northwest of the 309 Building's Plutionium Recycle Test Reactor (PRTR). Twelve ion exchange columns, piping debris, and column liquid were removed from the vault, packaged and shipped for disposal. The vault walls and floor were decontaminated, and portions of the vault were painted to fix loose contamination. Process piping and drains were plugged, and the cover blocks and rain cover were installed. Upon closure, the vault was empty, stabilized, isolated.

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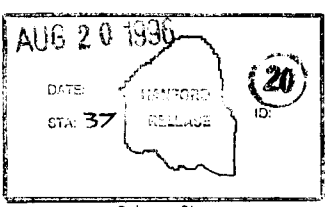

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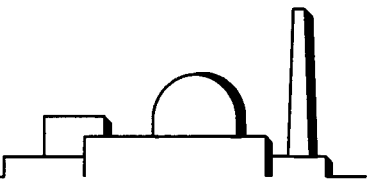

Rupture Loop Annex Ion Exchange (RLAIX) Vault Deactivation

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Date Published
August 1996

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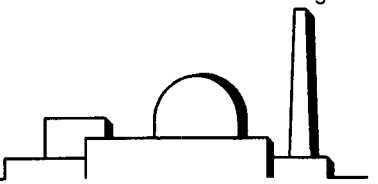


EXECUTIVE SUMMARY

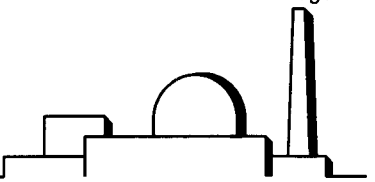
This report documents the deactivation of the Rupture Loop Annex Ion Exchange (RLAIX) vault. The RLAIX vault, located northwest of the 309 Building dome within the 300 Area, is part of the Plutonium Recycle Test Reactor (PRTR). The PRTR has been declared surplus by the U.S. Department of Energy (DOE) and is scheduled for transition to decontamination and decommissioning (D&D). Advanced Fuel Facilities Transition (AFFT), previously known as PRTR Transition, of Westinghouse Hanford Company (WHC) is responsible for the transition of the PRTR to D&D in 1998.

The RLAIX vault was part of a test loop that tested intentionally defected fuel in the reactor. The vault, measuring 3.96m x 7.10m x 4.57m (13' x 23.3' x 15'), was expected to contain three to four columns approximately 3.3m (11') in height and ranging from 0.53m to 0.71m (1.75' to 2.3') in diameter. The vault was opened in August, 1995 for initial characterization (Ham 1996a), approximately three decades after the reactor's initial use. Twelve ion exchange (IX) columns were found in the vault along with miscellaneous piping equipment and debris. Seven of the twelve columns were found to contain process liquid. Upon initial entry radiological surveys indicated a maximum dose rate of 2.5 rem/hr, and contamination levels of 350 dpm/100 cm^2 smearable alpha, 7,000 dpm direct alpha, and 1,000 dpm/100 cm^2 smearable beta-gamma.

The RLAIX vault was again reopened on May 1, 1996 for cleanout. Cleanout of the vault entailed: removing, sampling, packaging, and disposing the liquid taken from seven IX columns; preparing, removing, packaging, and disposing all twelve IX columns and miscellaneous debris/equipment; and, stabilizing smearable contamination remaining within the RLAIX vault. During decontamination, smearable contamination levels up to 70,000 dpm/100 cm^2 beta-gamma and 28,000 dpm/100 cm^2 alpha were found.

Approximately 2,650 liters (700 gallons) of slightly radiologically contaminated, nonhazardous water was removed from the seven columns and shipped to the 340 Liquid Waste Handling Facility for disposal. The twelve IX columns and miscellaneous debris were packed into three 1.83m x 1.83m x 3.66m (6' x 6' x 12') waste containers and shipped to the Solid Waste burial grounds. Stabilization efforts reduced the RLAIX vault's smearable contamination levels to <1,000 dpm/100 cm^2 beta-gamma and less than background alpha (<3 cpm). The vault's background dose rate dropped to <0.5 mrem/hr.

Cleanout of the RLAIX vault was performed safely and without incident. The task was officially completed on May 30, 1996, finishing two months prior to the DOE Richland Field Office (DOE-RL) Milestone # B79-96-903 (Hulvey 1995) date of July 31, 1996.



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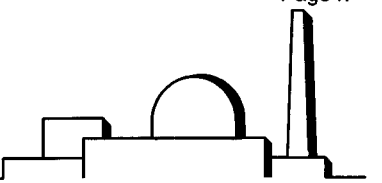

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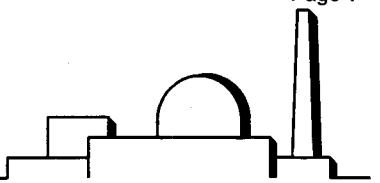
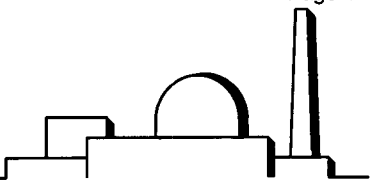


ACRONYMS AND ABBREVIATIONS

AFFT	Advanced Fuel Facilities Transition
AGEC	Applied Geotechnical Engineering and Construction Inc.
AHA	activity hazard analysis
ALARA	as low as reasonably achievable
ATG	Allied Technology Group
BHI	Bechtel Hanford Inc.
cm^2	centimeters squared
cpm	counts per minute
D&D	Decontamination and Decommissioning
DOE	U. S. Department of Energy
DOE-RL	DOE Richland Field Office
DOT	U. S. Department of Transportation
dpm	disintegration per minute
ERC	Environmental Restoration Contractor
FERTF	Fuel Element Rupture Test Facility
HEPA	High-Efficiency Particulate Air
hr	hour
ICF-KH	Inner City Finance - Kaiser Hanford
IX	ion exchange
km	kilometer
mrem	milli-rem
PIC	person-in-charge
PNNL	Pacific Northwest National Laboratory
PPE	personal protective equipment
PRTR	Plutonium Recycle Test Reactor
PTRAEU	Portable Temporary Radioactive Air Exhaust Unit
RCA	Radiologically Controlled Area
RCT	Radiological Control Technician
rem	Roentgen-equivalent man
RLA	Rupture Loop Annex
RLAIX	Rupture Loop Annex Ion Exchange
RSR	radiation survey report
RWP	radiation work permit
SAP	sampling and analysis plan
SEP	safety evaluation for packaging
SML	Sampling Mobile Labs
WEO	Waste Environmental Operations
WHC	Westinghouse Hanford Company



1.0 INTRODUCTION

1.1 OBJECTIVE

This report documents the deactivation of the RLAIX vault. The RLAIX vault is part of the PRTR which has been declared surplus by the DOE and is scheduled for transisiton to D&D. This supporting document provides details of the activities taken to properly deactivate and stabilize the RLAIX vault in preparation for turnover to the Hanford Site Environmental Restoration Contractor (ERC) (Cornwell 1996).

1.2 WORK SCOPE

Deactivation and stabilization of the vault entailed:

- Removing, sampling, and packaging liquid from seven IX columns for disposal;
- Preparing, removing, and packaging twelve IX columns for disposal;
- Removing and packaging miscellaneous debris and dirt from the vault, and;
- Stabilizing smearable contamination remaining within the vault.

A detailed work description is provided in work procedure 309-WP-96-002, Revision 0, *Rupture Loop Annex Ion Exchange (RLAIX) Vault Cleanout* (Ham 1996b).

1.3 BACKGROUND

The RLAIX vault is located northwest of the 309 Building PRTR containment dome within the 300 Area (Figure 1). The 300 Area is located within the Hanford Site on the west bank of the Columbia River approximately 1.6 river km (1 river mile) upstream and 1.6 road km (1 road mile) north from the City of Richland, in the southeastern corner of Washington state.

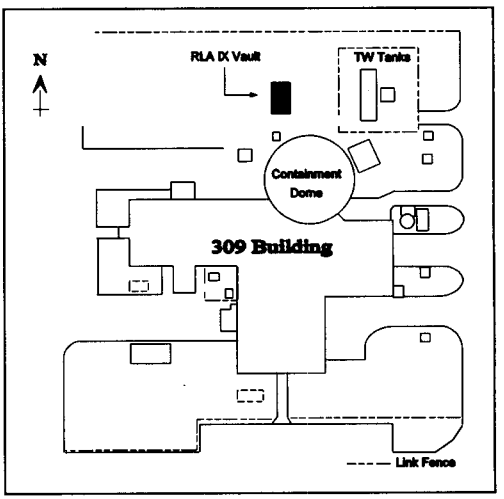
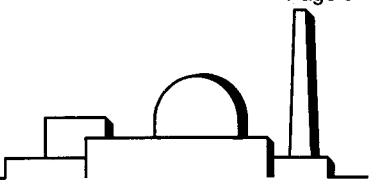


Figure 1 RLAIX Vault Location.

The PRTR was completed in early 1960 as the operating test reactor in the Hanford Works Plutonium Fuels Utilization Program. Criticality was achieved in October 1960, and full power was reached in May 1961. In 1963, operations of the Fuel Element Rupture Test Facility (FERTF) began. The FERTF was a pressurized, light-water-cooled loop which used one of the 85 process tubes within the PRTR calandria to test pre-defective fuel elements. The RLAIX vault contained IX columns used to clean-up the fuel and fission products from the test loop. An accident occurred in 1965 when some test fuel failed excessively, causing failure of the process tube which contaminated the reactor's moderator coolant system. The RLAIX test loop and the PRTR main cleanup systems were both contaminated with fuel residual and fission products.

The RLAIX vault was opened in August 1995 for entry and characterization. A detailed description of this task and the vault contents are provided in WHC-SD-NEL-ER-002, Revision 0, *RLA Ion Exchange Vault Entry and Characterization* (Ham 1996a). This document served as the basis for the RLAIX vault deactivation activities contained in this supporting document.



2.0 DESCRIPTION

2.1 PROJECT MANAGEMENT

Advanced Fuel Facilities Transition (AFFT) of WHC provided project management oversight and control of the RLAIX vault deactivation activities. The AFFT Manager has overall responsibility for the RLAIX vault and approval authority for RLAIX vault related work documents and permits. The AFFT Cognizant Engineer developed and approved deactivation plans, work packages, and procedures; directed project management activities; and, coordinated support work forces.

Applied Geotechnical Engineering and Construction, Inc. (AGEC) provided the staff and equipment that performed the grouting and stabilization activities.

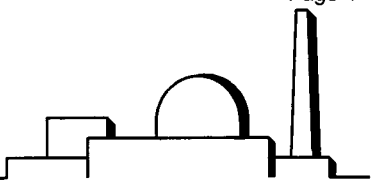
Bechtel Hanford Inc. (BHI), Environmental Restoration Contractor (ERC) for the Hanford Site, provided the following personnel along with associated equipment: Senior Engineer, person-in-charge (PIC), field safety monitoring representative, and D&D workers.

Department of Energy-Richland Operations Office (DOE-RL) provided project surveillants to monitor performance objectives (Chapin and Ruhlman 1996).

Inner City Finance-Kaiser Hanford (ICF-KH) provided the crane and associated equipment along with the crane and rigging services crew and supervisor.

Pacific Northwest National Laboratory (PNNL) provided the necessary sample analysis.

Westinghouse Hanford Company (WHC) provided support from the following organizations: 340 Liquid Waste Handling Facility; Air and Water Services; Environmental Compliance; Liquid Effluent Services; Project Services; Radiological Control; Safety; Sampling Mobile Labs (SML); Solid Waste Services; Transportation and Packaging, and; Waste Environmental Operations (WEO).



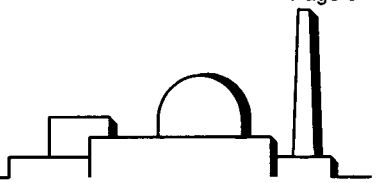
2.2 WASTE PACKAGING AND SHIPMENT REQUIREMENTS

The planning for this project was divided into two essential categories: (1) RLAIX vault cleanout and (2) waste packaging, transportation, and disposal. In addition to project management and oversight, AFFT also planned and implemented the vault cleanout activities. Waste Environmental Operations was selected to manage the waste packaging, transportation, and disposal under AFFT's direction and field work coordination.

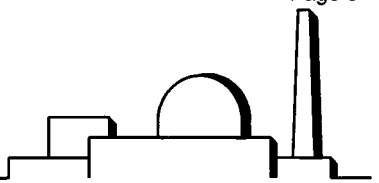
Due to the nature of the waste, a safety evaluation for packaging (SEP) would be necessary. The SEP (Mercado 1996) analyzed transportation and packaging conditions of the onsite shipment of waste. It evaluated package contents, radiological risk, containment, shielding, criticality, package structure, thermal properties, gas generation, package tie down, and accident scenarios. The SEP also developed requirements that rigidly defined the packaging and shipment of the RLAIX vault waste. A summary of these requirements are shown as a road closure checklist in Table 1.

Table 1 Road Closure Checklist

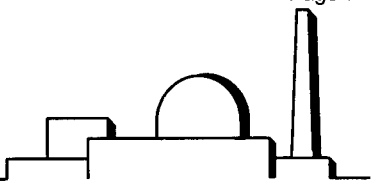
Requirement	SEP Source
This SEP will be used to support the shipment of three boxes from the rupture loop annex vault near the 309 building in the 300 Area to LLW burial in the 200 West Area.	pg A7-1, sec 7.2
Based on the weight of the loaded boxes and the isotopic inventory, the section of road on which the shipment will be transported that normally is open to public access shall be closed to exclude the public and nonessential workers from access to the shipment.	pg A1-1, sec 1.1
The transport route will use normal Hanford Site paved roadway.	pg A4-1, sec 4.3
The requirements of WHC-CM-2-14, *Hazardous Material Packaging and Shipping* (WHC 1995), will be followed while transferring the boxes.	pg A4-2, sec 4.3
All boxes are properly marked and labeled, the shipping papers are prepared, and all vehicles are properly placarded.	
Each box and contents are assumed to weigh a minimum of 18,144 kg (40,000 lb).	pg B3-1, sec 3.1



Requirement	SEP Source
The maximum gross weight of a single box is 27,216 kg (60,000 lb).	pg A2-1, sec 2.4
The boxes shall be surveyed prior to shipment. Localized hot spots shall be identified, and appropriate administrative controls shall be implemented as necessary to assure as low as reasonably achievable (ALARA) practices.	pg B1-1, sec 1.2
During transfer conditions, removable contamination on the exterior surfaces of the boxes shall not exceed the U. S. Department of Transportation (DOT) limits shown in Table A4-1 when measured per 49 CFR 173.443(a) (CFR 1995a).	pg A4-2, sec 4.3
The shipment will require an overweight load permit.	pg A4-2, sec 4.3
Three transport vehicles, 13,608 kg (30,000 lb) minimum weight per truck and trailer, 1 box per trailer.	pg B3-1, sec 3.1
Each box shall be transported on a trailer of appropriate capacity for the package weight 27,216 kg (60,000 lb).	pg A4-1, sec 4.1
Each transport vehicle shall conform to DOT annual inspection requirements found in 49 CFR 396.3 (CFR 1995b) and 49 CFR 396.17 (CFR 1995c).	pg A4-1, sec 4.3
Each transport vehicle will be equipped with a fire extinguisher capable of extinguishing a Class A, B, or C fire. The driver of the vehicle will be trained and qualified to use the fire extinguisher.	pg A4-2, sec 4.3
In addition, bracing shall be used to prevent longitudinal shifting during deceleration. Bracing will include an I beam at the front of the box, attached to the trailer. The bracing assembly (beam, attachment devices and attachment points) shall be able to withstand a load of 17,237 kg (38,000 lb) without yielding.	pg A4-1, sec 4.2
Each box shall be tied down using six nylon straps with binders. The straps and binders shall have a minimum working load of 5,443 kg (12,000 lb).	pg A4-1, sec 4.2
The rigging for each box shall remain with the box, prepared for hoisting and placement of each box in the burial grounds.	
All rigging hardware, tie down straps, tension devices, attachments, and associated equipment will be visually inspected to ensure that there is no damage or deterioration.	pg A4-1, sec 4.3
Each box shall be oriented with its long axis in the direction of travel. The straps shall run over the top of the box in a direction perpendicular to the direction of travel and shall be placed at regular intervals.	pg A4-1, sec 4.2



Requirement	SEP Source
The offsite limit of 2 mrem/hr in any normally occupied space in each transport vehicle shall not be exceeded.	pg B1-1, sec 1.2
Transport vehicle speed will be limited to 48 km (30 miles) per hour unless a lower speed is posted.	pg A4-1, sec 4.3
The boxes will not be transferred during periods of inclement weather; i.e., winds in excess of 56 km (35 miles) per hour, heavy driving rain, blowing dust or fog that results in poor visibility, or slippery roads.	pg A4-1, sec 4.3
In the event of an accident involving the transport vehicle, onsite emergency response guidelines will be followed.	pg A4-2, sec 4.3



2.3 VAULT CLEANOUT ACTIVITIES

Work was conducted in accordance with work package 3B-96-00014/W, which contained facility work plans and procedures, data tables, checklists, figures, activity hazard analysis (AHA), radiation survey reports (RSR), radiation work permits (RWP), etc. Work procedure 309-WP-96-002, Revision 0, *Rupture Loop Annex Ion Exchange (RLAIX) Vault Cleanout* (Ham 1996b) provided instruction for the cleanout activities.

A prejob meeting was held on April 30, 1996 and cleanout activities began on May 1, 1996. Prejob briefings were also performed daily by the PIC to discuss the workday activities and safety issues. An agreement was made to start work earlier in the morning to avoid the higher temperatures of late afternoon. Every morning, the rain cover was removed, guardrails were assembled, and a portable exhauster was installed and activated. Vault oxygen and gas measurements were taken on days when entries were made.

Continuous support was provided by a Radiological Control Technician (RCT) and the PIC. The cognizant engineer, safety personnel, SML, crane and rigging services, D&D workers, and others also provided support. Boundaries were established for access control to the general work area and radiologically controlled areas (RCA). Personal protective equipment (PPE) required for the general work area (hard hats, substantial footwear, safety eyeglasses) was posted on boundary signs. The PPE required for the RCA was stated in the RWPs.

At the end of the workday's activities, the vault was secured. The inner guardrails were removed to allow for the replacement of the rain cover. Equipment and material were stored in designated areas, and tools were picked up. Barricades and signs were checked to ensure access was limited and warnings were posted.

Day 1 (May 1, 1996)

This day was dedicated to job site preparation. Equipment and materials were staged and cover blocks were removed from the RLAIX vault and placed in the Tank Farm laydown area to be used as shielding for the waste containers once filled. A Portable Temporary Radioactive Air Exhaust Unit (PTRAEU) was used to exchange the air in the vault and provide High-Efficiency Particulate Air (HEPA) filtration. The 12 RLAIX columns were moved into position for the

pumping of the internal liquids of seven columns. The working platform was set-up and the waste container boxes [1.83m x 1.83m x 3.66m (6' x 6' x 12')] were staged. Refer to Figures A-1 through A-4 of Appendix A, and Figure 2 below.

Day 2 (May 2, 1996)

Liquid was pumped, using a peristaltic pump, from two columns, R2 and R5/RLIX-1 (Figure 2), into 208 liter (55 gallon) drums which were staged on spill pallets. An in-line filter was used to reduce solids. An absorbent was added to each column to meet burial requirement. See Figures A-5 and A-6 of Appendix A.

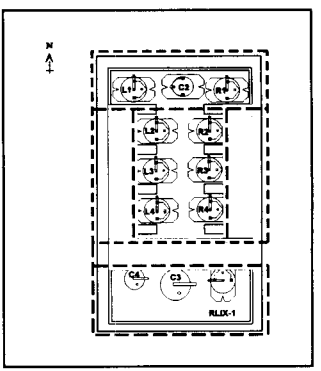


Figure 2 RLAIX Vault.

Day 3 (May 3, 1996)

Liquid was pumped from two more RLAIX columns, L3 and R3. Pumping continued with columns L1, L2, and R3, however, resin beads were encountered. A decision was made to rotate subsequent pumping between the three columns in order to allow the beads time to settle and thus maximize the amount of liquid obtained. Five centimeter (two inch) spacers were delivered and installed on the sides of the three waste container boxes to ensure the waste would meet packaging requirements.

Day 4 (May 6, 1996)

Pumping of liquid from the three remaining RLAIX columns was completed and absorbent was added to the columns. A total of 14 208 liter (55-gallon) drums were filled with column liquid. Five centimeters (two inches) of grout was poured into the bottom of the waste container boxes in preparation for column loading.

Day 5 (May 7, 1996)

The 14 drums of liquid were each sampled and then the samples were combined to form a composite sample. This sample was transported to PNNL's 325 Laboratory for analysis. Due to high wind gusts, the loading of columns into the waste container boxes was postponed until the following workday.

Day 6 (May 8, 1996)

The 12 columns were loaded into the three waste container boxes (four columns to one box): L1, L3, R1, and R2 into Waste Container Box #1 (Figure 3); C2, L2, L3, and R3 into Waste Container Box #2 (Figure 4), and; C3, C4, R4, and R5 into Waste Container Box #3 (Figure 5). For ALARA reasons, the three boxes were hoisted and moved east of the RLAIX vault area to the tank farm storage area (Figure 1) where they were shored and shielded from the west with RLAIX vault cover blocks. Waste Container Box #3 also contained the miscellaneous jumpers, filter, and debris from the RLAIX vault. The vault was now clear of columns, debris, etc., and was ready for dirt removal and decontamination. Refer to Figures A-7 through A-9 of Appendix A.

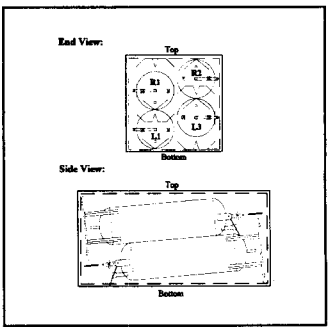


Figure 3 Waste Container Box #1

Day 7 (May 9, 1996)

Grout was injected into two empty columns, C3 and C4, to fill the void space. The waste container lid was then replaced. The first lift of grout [3.4 m^3 (120 ft^3)] was poured into each of the three waste containers through nozzle fittings in the lid. The displaced air in the container passed through a HEPA filter also installed to the container lid. See Figures A-11 and A-12 of Appendix A.

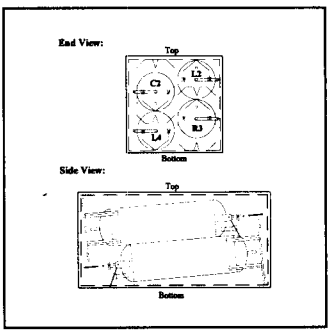


Figure 4 Waste Container Box #2

Dirt and small, loose material were removed from the vault in two steps. First, based on radiation surveys, the non-radioactive material was removed using a large Euroclean HEPA vacuum. Then,

the "hot spots" were cleaned using a small hand-held Euroclean HEPA Vacuum. Radiological surveys indicated that the south section of the vault had the highest amount of contamination located on the wall below the ledge with the pipe jumper nozzles. After removing material and decontaminating by wipe down, a layer of paint was applied to the floor and walls of the south section of the vault where loose contamination was found. See Figures A-13 and A-14.

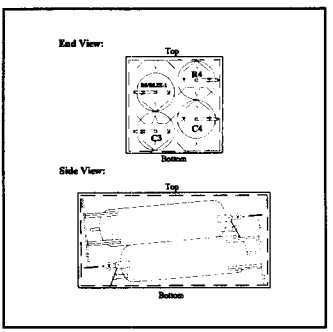


Figure 5 Waste Container Box #3

Day 8 (May 13, 1996)

After allowing the first lift of grout to cure, the second lift was poured [3.4 m^3 (120 ft^3)]. The grout was poured in lifts to keep the columns from floating and to keep the container from bulging. Smear surveys of the vault indicated that another layer of fixative would be necessary. However, due to rain, work activities were postponed until the next workday.

Day 9 (May 14, 1996)

The third and final lift of grout was poured [<1.6 m^3 (<55 ft^3)]. An additional layer of paint was applied to the walls of the south section of the vault and to the nozzels on the south ledge. Smear surveys taken in the afternoon indicated that the contamination levels had been fixed to satisfactory conditions. The vault drain, which dumps to a sump in the Rupture Loop Annex (RLA) of the 309 Building, was plugged and grouted. Nozzles without plugs were plugged and all nozzels were painted. Refer to Figure A-15 of Appendix A.

Day 10 (May 15, 1996)

Dose rates from the three grouted waste containers were obtained by the RCT. Surveys indicated that the hottest spot on the three containers was 180 mrem/hr on the side of Waste Container #2. Survey information was passed on to the burial grounds for waste receiving. Cover blocks from the vault were continued to be used as shielding.

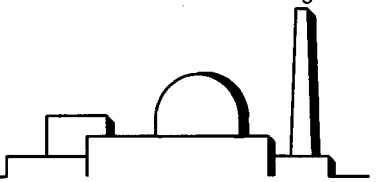
Day 11 (May 23, 1996)

One last entry was made into the RLAIX vault to clean-up the floor due to the mess made by rain a week earlier. The vault cover blocks and rain cover were replaced on the RLAIX vault (Figure A-16 of Appendix A) and equipment and material were removed from the job site.

Day 12 (May 30, 1996)

The three waste containers carrying 12 IX columns and debris from the RLAIX vault were weighed and loaded during swing shift (Figures A-17 and A-18). Each waste container was loaded onto a low-boy trailer and strapped down to transport specifications. Verification of the appropriate requirements were made and the three waste containers were transported to the Solid Waste burial grounds.

Activities to perform minor tasks occurred on May 16, 22, and 29, 1996. These activities took minimal time to complete and required only a few personnel. The associated RSRs for the entire task are in chronological order in Appendix C. The final condition of the RLAIX vault is recorded on RSR #234322 dated May 14, 1996.



3.0 RESULTS AND DISCUSSION

3.1 RLAIX COLUMN LIQUID

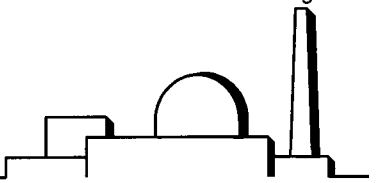
Advanced Fuel Facilities Transition requested PNNL to provide analytical support for the disposal of the RLAIX column liquids. A sampling and analysis plan (SAP) detailed the required analysis in Appendix D of 309-WP-96-002 (Ham 1996b). The RLAIX column liquid sample analysis results (Appendix B) were compared to limits set forth by the 340 Liquid Waste Handling Facility of the 300 Area. It was determined that the liquid was slightly radiologically contaminated non-hazardous water and met the requirements for transfer to the 340 Liquid Waste Handling Facility. The 340 Liquid Waste Handling Facility serves as an accumulation point for radiologically contaminate liquid. The liquid is further analyzed and then transferred to Tank Farms via railcar shipments.

The 14 drums of RLAIX column liquid were then shipped to the 340 Liquid Waste Handling Facility. The liquid was pumped from the drums and the drums were dried for transportation purposes. The empty drums were shipped to Allied Technology Group (ATG) for compaction and disposal at the Solid Waste burial grounds.

3.2 VAULT CLOSURE

The RLAIX vault was closed (cover blocks and rain cover installed) on May 23, 1996. The DOE-RL Milestone # B79-96-903 (Hulvey 1995) was met on May 30, 1996, two months ahead of schedule when the waste containers were weighed and loaded onto trailers for shipment. A total of 12 IX columns, piping debris, filter, jumpers, and dirt were removed from the vault. Loose contamination was fixed in place by layers of paint and entrance and exits to the vault were plugged or grouted. The final condition of the RLAIX vault consisted of a cleaned out, stabilized environment which was confirmed by pictures (Appendix A), video, and radiological survey data reports (Appendix C).

The survey reports show radiological contamination levels were as high as 70,000 dpm/100 cm^2/beta-gamma and 28,000 dpm/100 cm^2/alpha and with contact dose rates up to 2.5 rem/hr at Column L3. After cleanout and stabilization, contamination levels



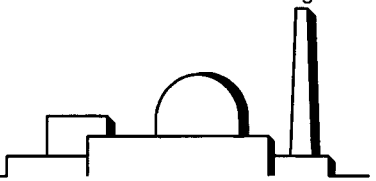
dropped to 1,000 dpm/100 cm^2/beta-gamma and less than detectable alpha with a background dose rate of <0.5 mrem/hr.

The RLAIX vault cleanout task was completed in a safe, ALARA manner consistent with WHC management practices. No injuries occurred.

3.3 WASTE ACCEPTANCE

The acceptance of the RLAIX vault waste by Solid Waste, which allowed the shipment to the Solid Waste burial grounds, was obtained through the Waste Specification System (Kirkpatrick and Oswald 1995). This system requires that generators characterize their waste with sufficient accuracy to allow for proper management. Additional information was necessary to complete the characterization of RLAIX vault waste. This information is documented in a Final Characterization Report located in Appendix D. The vault contents were determined to be low-level, category I and category III, nonhazardous waste.

The characterization of each waste stream was documented on a Waste Certification Summary and Waste Specification Record. A Waste Stream Requirements Summary was used to ensure each waste stream (i.e. IX columns, step-off pad waste, etc.) met specific requirements. These summaries and records were submitted to Solid Waste in a Waste Portfolio for acceptance. A portion of the information contained in the Waste Portfolio submitted to Solid Waste is provided in Appendix E. To minimize duplication of information located in this supporting document, not all of the referenced attachments cited in the original Waste Portfolio are present in Appendix E, but they can, however, be found in 309-WP-96-002 (Ham 1996b).

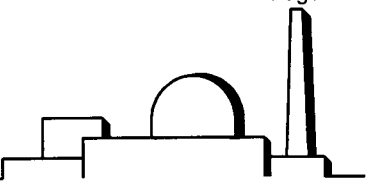


4.0 CONCLUSION

Westinghouse Hanford Company was successful in its efforts to deactivate and stabilize the RLAIX vault. Cleanout was accomplished by removing 12 IX columns (including liquid), miscellaneous piping equipment, and debris. Stabilization was reached by reducing contamination levels to <1,000 dpm/100 cm^2 beta-gamma, less than background (<3cpm) alpha, and a dose rate of <0.5 mrem/hr. In addition, the RLAIX vault floor drain, which leads to a sump in the 309 Building, was grouted.

The RLAIX vault solid waste was properly disposed of through the Waste Specification System and was determined to be non-hazardous, low level, category I and III waste. The liquid was determined to be non-hazardous, slightly radiologically contaminated water, and was properly disposed of via the 340 Liquid Waste Handling Facility.

The RLAIX vault cleanout activities were performed safely and without injury. The task was also completed two months prior to DOE-RL Milestone #B79-96-903 (Hulvey 1995).



5.0 REFERENCES

CFR, 1995a, *Code of Federal Regulations: Transportation*, "Contamination Control," Title 49, Part 173.443(a), Washington D.C.

CFR, 1995b, *Code of Federal Regulations: Transportation,* "Inspection, Repair, and Maintenance," Title 49, Part 396.3, Washington D.C.

CFR, 1995c, *Code of Federal Regulations: Tranportation,* "Periodic Inspection," Title 49, Part 396.17, Washington D.C.

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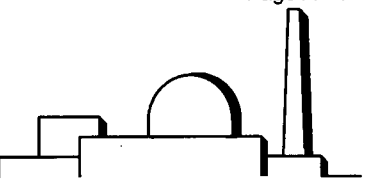
Kirkpatrick, K. L. and B. L. Oswald, 1995, *Waste Specification System*, WHC-EP-0846, UC-2020, Westinghouse Hanford Company, Richland, Washington.

Mercado, M. S., 1996, *Safety Evaluation for Packaging for Onsite Transfer of 12 Ion Exchange Columns*, WHC-SD-TP-SEP-047, Revision 0, Westinghouse Hanford Company, Richland, Washington.

WHC, 1995, *Hazardous Material Packaging and Shipping*, WHC-CM-2-14, Release 13, Westinghouse Hanford Company, Richland, Washington.



APPENDIX A - PROJECT PHOTOGRAPHS

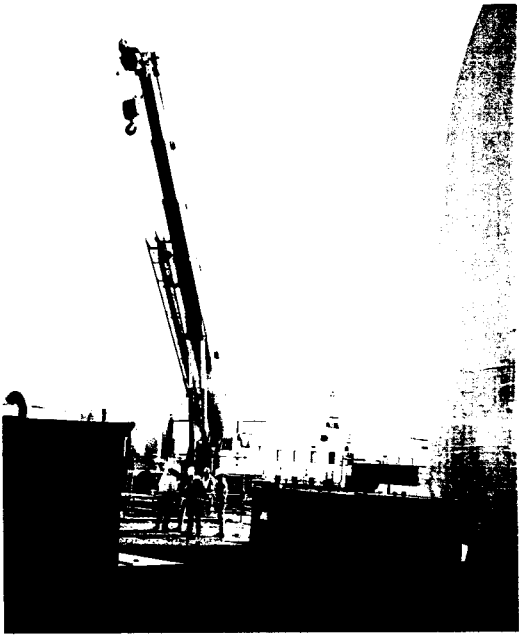
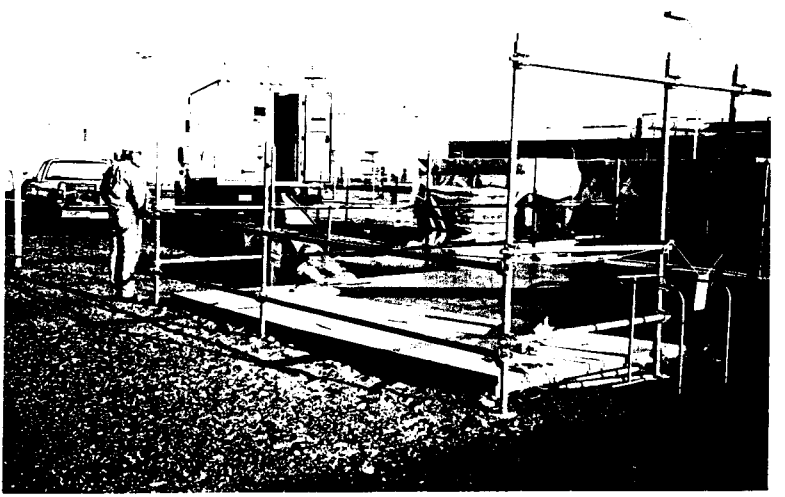


Figure A-1 Crane positioned to begin RLAIX vault deactivation.
(96050172-19CN)

Figure A-2 Equipment staged to sample IX column liquids.
(96050172-1CN)



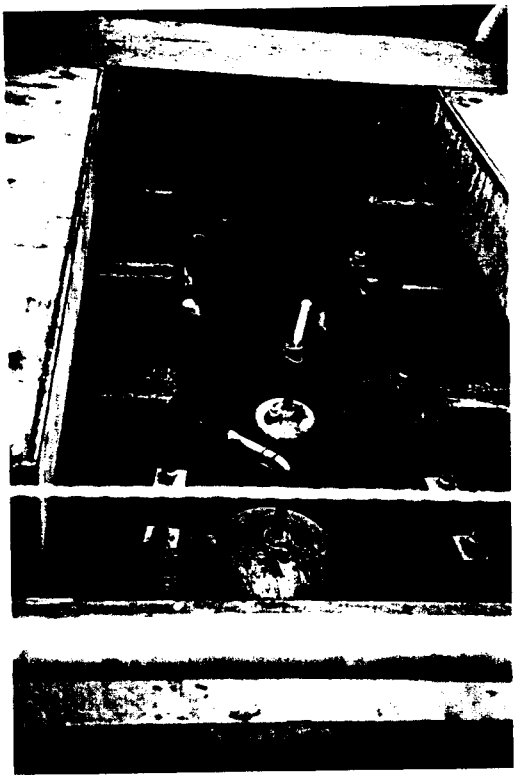


Figure A-3 Ion exchange columns to be removed from RLAIX vault.
(96050172-56CN)

Figure A-4 Miscellaneous debris and equipment to be removed from RLAIX vault.
(96050241-4)

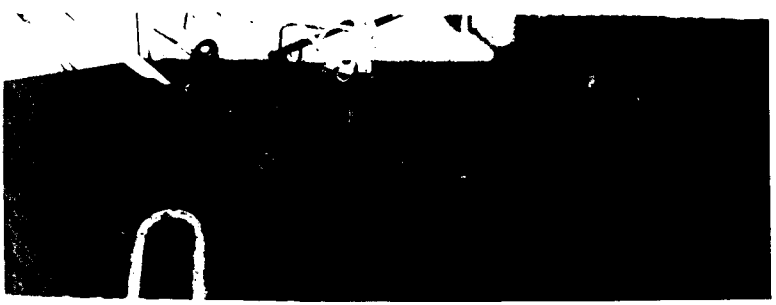


Figure A-5 Liquid pumped from IX columns by SML personnel. (96050241-23)

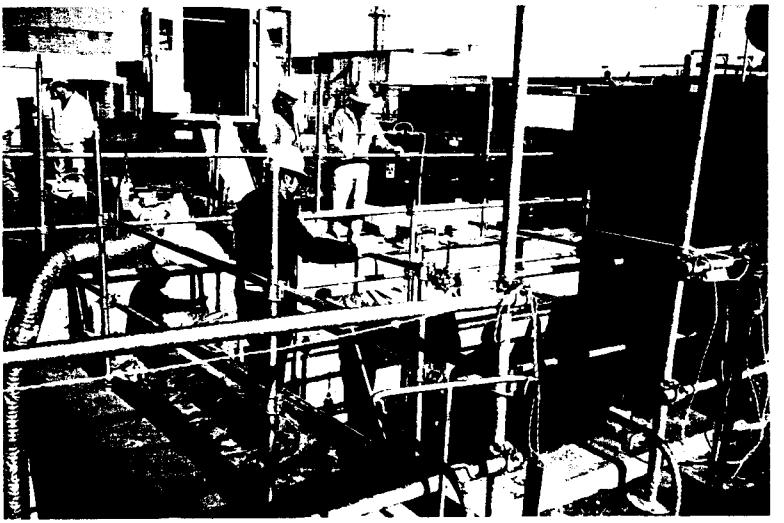


Figure A-6 Absorbent added to empty IX columns. (96050172-11CN)

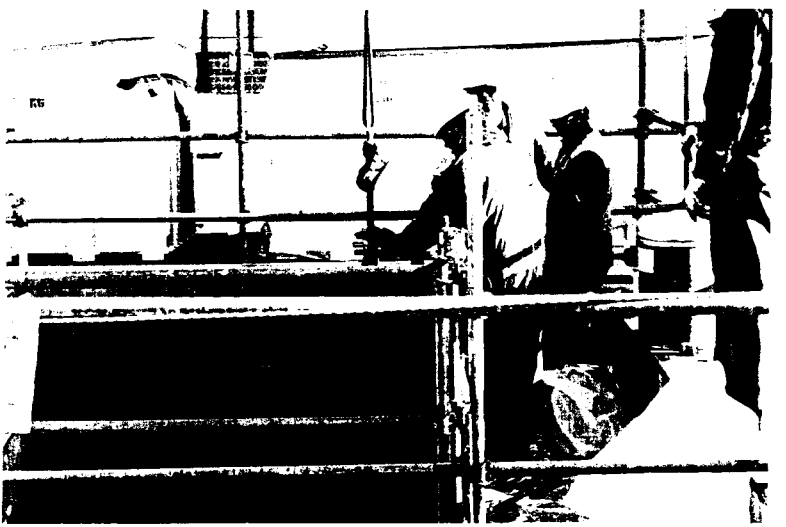


Figure A-7 Column removed from RLAIX vault. (96050243-29CN)

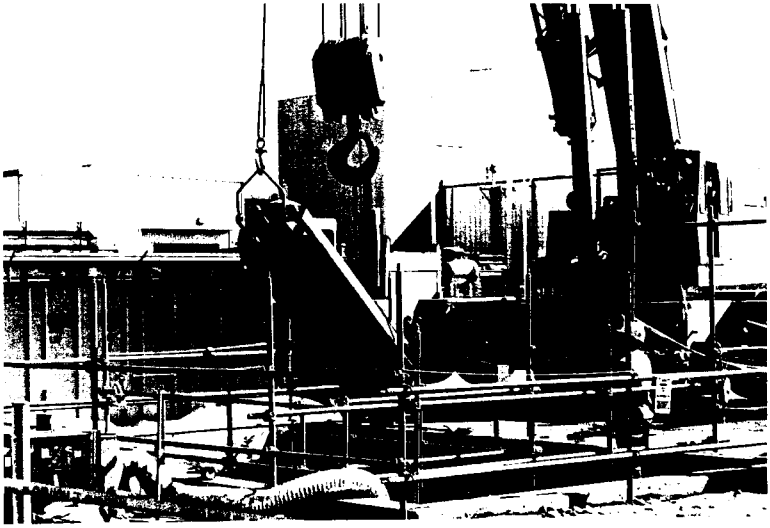


Figure A-8 Column positioned in waste container. (96050243-33CN)

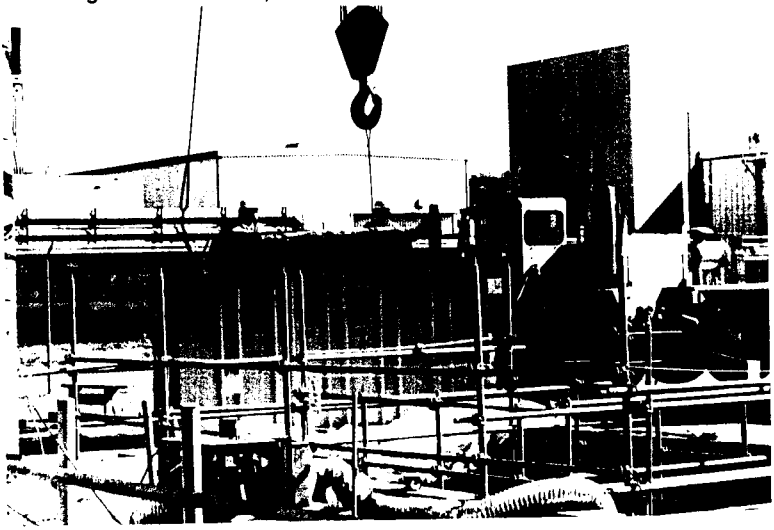


Figure A-9 Three of four IX columns positioned in waste container.
(96050241-15)

Figure A-10 Waste container moved to shielding area.
(96050243-27CN)

Figure A-11 Columns void filled with grout. (96050318-14)

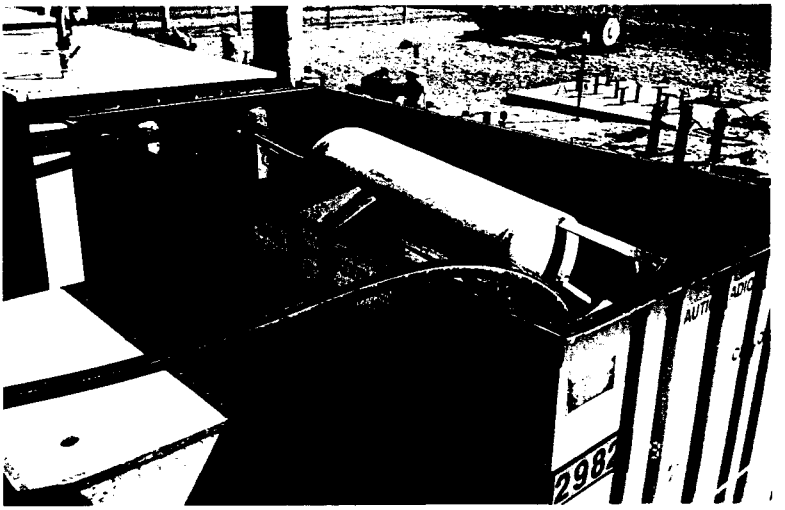


Figure A-12 Waste container stabilized with grout. (96050456-72CN)

Figure A-13 Miscellaneous debris removed from RLAIX vault. (96050318-23)

Figure A-14 RLAIX vault after removal of IX columns and debris. (96060178-38CN)

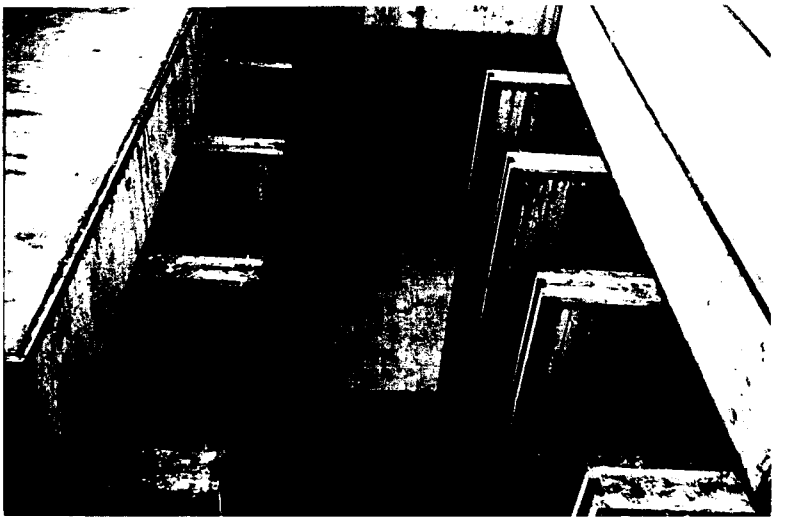


Figure A-15 Smearable contamination stabilized within RLAIX vault. (96060178-45CN)

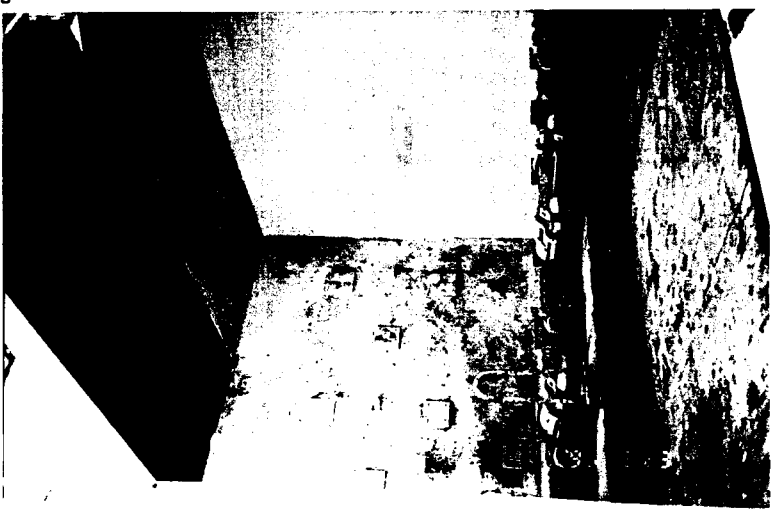
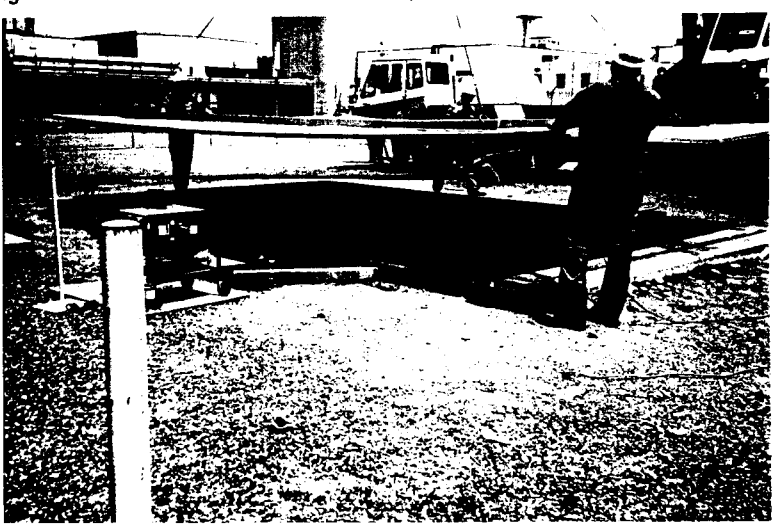


Figure A-16 Cover blocks and rain cover replaced on RLAIX vault. (96060178-56CN)



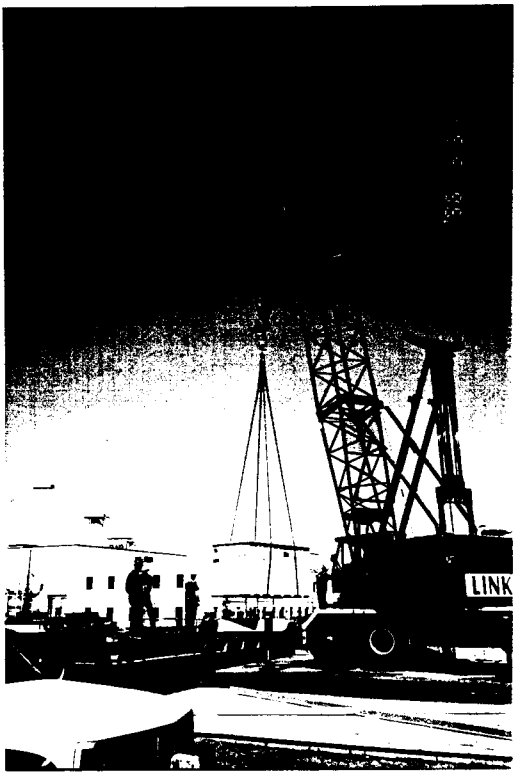


Figure A-17 Waste containers positioned on trailer in preparation for disposal.
(96060178-30CN)

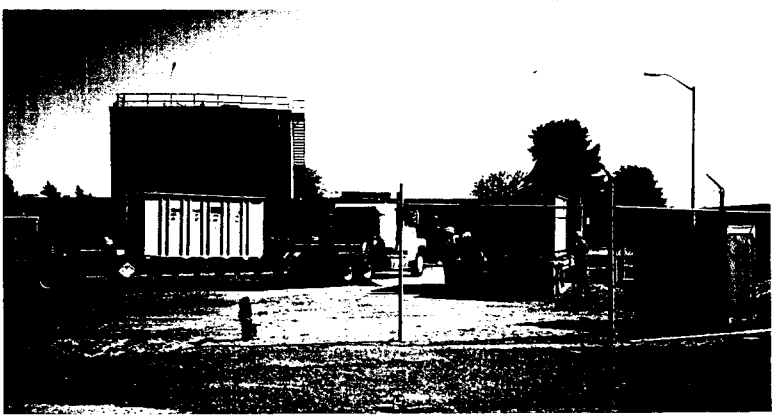
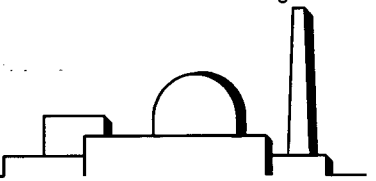


Figure A-18 Waste containers prepared for transport to waste disposal site.
(96060178-15CN)



APPENDIX B - LIQUID SAMPLE RESULTS

Battelle Pacific Northwest National Laboratory
Analytical Chemistry Laboratory
Radiochemistry Group - 325 Bldg.

May 24, 1996

JE Ham/FJ Carvo/BC Cornwell ED6391

Cognizant Scientist: LR Greenwood Date: 5/24/96

Reviewer: Richard T. Tse Date: 5/24/96

A 100 ml of the sample was directly counted on a high efficiency germanium gamma detector. Smaller aliquots were then dried for dual alpha/beta couning on a low background gas proportional counter, and analyzed for chloride and other cations by Ion Chromatography (IC), pH, and RCRA metals by Inductively Coupled Plasma Mass Spectrometry (ICP-MS). Results are given below and on the attached report sheets.

Measured Activities (pCi/ml)

Analysis	RLAX-1 96-4330		Quality Control Blank	Standard	Spike
Gross Alpha	5.41E+0	6%	<2.4E-2	105%	123%
Gross Beta (as 90-Sr/90-Y)	6.16E+1	4%	3.3E-2 ±35%	89%	76%
Gamma Energy Analysis:					
60-Co	3.26E-1	8%			
137-Cs	7.17E+1	4%			
241-Am	2.68E+0	10%			
pH	10.8				

BATTELLE-PNL

*****ION CHROMATOGRAPHY*****
******ANALYTICAL RESULTS******

Client : FJ. Carvo

Archive: IC-325-400-SYS-1 File #: 96.20

WP #: ED6391

LAB NUMBER / SAMPLE ID	DL	F (0.25)	Cl (0.25)	NO2 (0.50)	Br (0.25)	NO3 (0.50)	PO4 (0.50)	SO4 (0.50)
		>>>>>>>>>>>>>>>>> CONCENTRATION (a) <<<<<<<<<<<<<<<<<<<<<						
96-04330		0.3 (1)	1.4	<0.50	<0.25	<0.50	1.0	8.4
RLAX-1								
Spike Recovery (%)								
Multiplier		1	1	1	1	1	1	1
Date of Analysis		05/17/96	05/17/96	05/17/96	05/17/96	05/17/96	05/17/96	05/17/96
Spike Recovery (%)								
Multiplier								
Date of Analysis								
Spike Recovery (%)								
Multiplier								
Date of Analysis								
Spike Recovery (%)								
Multiplier								
Date of Analysis								

Comments: (1) This value may be biased low by as much as 25%.

Analyst : [illegible] Date : 5-23-96
Reviewer : [illegible] Date : 6/3/96

M & TE: PN-900902 WD25214
Method : PNL-MA599-ALO-212

(a) Units = ug/mL (liquids), ug/g (solids), unless otherwise noted.
(b) Spike recovery analysis requirements as per by ALO-212, MCS-033--or at analysts discretion.
(c) Calibration, Verification, & Spike Std. data in IC Std. binder.
(d) Multiply Detection Limit (DL) values by multiplier used to determine a Sample DL value for a particular analyte.
(e) See attached "Client Information Sheet" for accuracy/precision guidelines, unless otherwise noted.

Battelle PNNL/ACL/Inorganic Analysis Group: ICPAES Analytical Report

WO/Project: ED6391/20063
Client: FJ Carvo
Impact Level: II

ACL Nmbr(s): 96-004330

Client ID: "RLAX-1"

ASR Nmbr 3070

Total Samples: 1

Procedure: PNNL-ALO-211, "Determination of Elements by Inductively Coupled Argon Plasma Atomic Emission Spectrometry" (ICP-AES).

Analyst: DR Sanders

Analysis Date (Filename): 05/24/96 (A0122)

See ALO System File: "ICP-325-405-1" for traceability to Calibration, Quality Control, Verification, and Raw Data.

M&TE Number: ICPAES instrument -- WB73520
Mettler AT400 Balance -- Ser.No. 360-06-01-029

Larry G Wagner 5-28-96
Reviewed by)

M W Lin 5-29-96
Concur

5/28/96

Battelle PNNL/ACL/Inorganic Analysis Group: ICPAES Analytical Report

One radioactive liquid sample was processed, in duplicate, by 325 SRPL using PNL-ALO-128 acid extraction procedure. Twenty mL aliquots were treated and diluted to a final volume of 25 mL. The sample, before processing, appeared to be a brown stained liquid with visible sediment present. After processing the sample appeared clear and free of sediment. No additional dilution during ICPAES analysis was required.

Sample duplicates, serial dilution, matrix spike, post-digestion spikes and quality control check standards were within control limits except for Silver in the matrix spike. Recovery of Silver in the blank-spike was approximately 30%. Control limit is 75 to 125%. The presence of HCl used to prepare the sample is known to cause low recovery in spiked samples. Several reports in the literature have confirmed this observation.

None of the TCLP analytes exceed regulatory limits for the analytes measured in the sample (Ag, As, Ba, Cd, Cr, Pb, and Se). Ag was below detection limit even when adjusted for apparent low spike-recovery (e.g. 0.020 μg/mL / 0.030 = 0.067μg/mL). Regulatory limit for Ag in liquids is 5 μg/mL.

Please see the attached "ICPAES Data Report" for measurement results, detection limits, and etc.

Note, bracketed values listed in the attached data report are within ten times instrument detection limit. Those measurement values have a potential uncertainty much greater than 15%.

5/28/96

Battelle PNNL/ACL/Inorganic Analysis Group: ICPAES Analytical Report

Comments:

1) "Final Results" have been corrected for all laboratory dilution performed on the sample during processing and analysis.

2) Detection limits (DL) shown are for acidified water. Detection limits for other matrices may be determined if requested.

3) Routine precision and bias is typically ± 15% or better for samples in dilute, acidified water (eg. 2% v/v HNO_3 or less) at analyte concentrations greater than ten times detection limit up to the upper calibration level. This also presumes that the total dissolved solids concentration in the sample is less than 5000 µg/mL (0.5 per cent by weight).

4) Absolute precision, bias and detection limits may be determined on each sample if required by the client.

5) The maximum number of significant figures for all ICP measurements is 2.

6) To convert "WT%" to "mg/Kg" or "µg/g", multiply concentration value by 10,000.

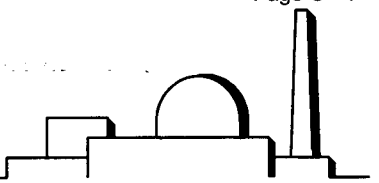
7) To convert "mg/Kg" or "µg/g" to "WT%", divide concentration value by 10,000.

5/28/96

Battelle PNL/ACL/Inorganic Analysis Group: ICPAES Data Report

	Multiplier=	1.3	1.3	1.0	
	ALO#=	96-4330	96-4330 DUP	BLANK	
	Client ID=	*RLAX-1*	*RLAX-1*	*(96-4330)*	
Det. Limit	*Run Date=*	5/24/96	5/24/96	5/24/96	
(ug/mL)	(Analyte)	(ug/mL)	(ug/mL)	(ug/mL)	
0.015	Ag	--	--	--	--
0.060	Al	1.16	1.12	[0.18]	--
0.080	As	--	--	--	--
0.050	B	3.66	3.17	2.36	--
0.010	Ba	[0.01]	--	--	--
0.005	Be	--	--	--	--
0.100	Bi	--	--	--	--
0.250	Ca	[0.70]	[0.56]	--	--
0.015	Cd	--	--	--	--
0.100	Ce	--	--	--	--
0.050	Co	--	--	--	--
0.020	Cr	--	--	--	--
0.050	Cu	--	--	--	--
0.050	Dy	--	--	--	--
0.100	Eu	--	--	--	--
0.050	Fe	13.7	13.3	--	--
2.000	K	--	--	--	--
0.050	La	--	--	--	--
0.030	Li	25.4	25.0	--	--
0.100	Mg	--	--	--	--
0.050	Mn	[0.08]	[0.08]	--	--
0.030	Mo	--	--	--	--
0.250	Na	17.6	16.9	2.84	--
0.100	Nd	--	--	--	--
0.030	Ni	[0.07]	--	[0.18]	--
0.250	P	[0.36]	[0.34]	--	--
0.100	Pb	--	--	--	--
0.300	Pd	--	--	--	--
0.300	Rh	--	--	--	--
0.300	Ru	--	--	--	--
0.100	Sb	--	--	--	--
0.100	Se	--	--	--	--
0.500	Si	9.06	9.15	[2.56]	--
1.000	Sn	--	--	--	--
0.015	Sr	--	--	--	--
0.500	Te	--	--	--	--
0.800	Th	--	--	--	--
0.025	Ti	--	--	--	--
0.500	Tl	--	--	--	--
2.000	U	--	--	--	--
0.015	V	--	--	--	--
0.500	W	--	--	--	--
0.010	Y	--	--	--	--
0.020	Zn	[0.19]	[0.17]	--	--
0.025	Zr	--	--	--	--

Note: 1) Overall error greater than 10-times detection limit is estimated to be within +/- 15%.
2) Values in brackets [] are within 10-times detection limit with errors likely to exceed 15%
3) "--" indicate measurement is below detection. Sample detection limit may be found by multiplying "det. limit" (far left column) by "multiplier" (top of each column).



APPENDIX C - RADIOLOGICAL SURVEY REPORTS

DATE	RADIOLOGICAL SURVEY REPORT #	CODE	PAGE #
5/1/96	234284	Vault	C-2
5/2/96	234287	Vault	C-6
5/3/96	234292	Vault	C-10
5/6/96	234296	Vault	C-13
5/7/96	234299	Vault	C-16
5/8/96	234302	Vault	C-18
5/9/96	234309	Vault	C-25
5/9/96	234313	Vault	C-30
5/13/96	234315	Vault	C-32
5/13/96	234320	Vault	C-35
5/14/96	234322	Vault	C-37
5/14/96	234327	Tank Farm	C-41
5/15/96	234328	Tank Farm	C-43
5/16/96	234333	Tank Farm	C-46
5/22/96	234345	Containment	C-48
5/23/96	234349	Tank Farm	C-50
5/29/96	234351	Tank Farm	C-52
5/30/96	234355	Tank Farm	C-57

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234284

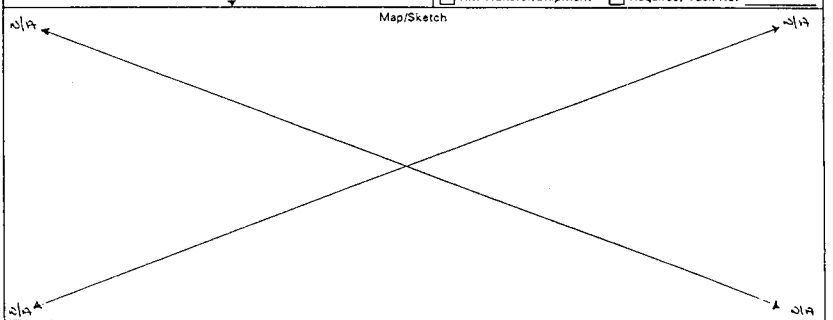
Date	Time	RWP No.(s)	Page	of
May 1, 1996	0630-1500	R-150	1	4

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop Vault — F.C.: R.

Job Description: Entry into Radiation Area / Radioactive Material Area to remove and reposition coverblocks and iron columns - N/A

Purpose of Survey (check appropriate box[es]):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No. ____

Map/Sketch



No.	Description	Dist.	DOSE RATE: β (non-pen) mrad/h	DOSE RATE: γ (pen) mR/h	DOSE RATE: η mrem/h	CONTAMINATION LEVELS: Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	Dose rate on pallet (max.)	4 feet	—	6	—	—	—	—	—	—
2	Dose rate on rail at End of Shift	1 inch	—	2	—	—	—	—	—	—
3	Coverblocks Removed	Smears	—	—	—	—	—	<1000	<BKG	—
4	Rigging Equipment	Smear	—	—	—	<5000	<500	<1000	<BKG	—
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
△# - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R | Page 2 of 4 | Survey No. Nº 234284

No.	Description	Dist.	DOSE RATE: ß (non-pen) mrad/h	DOSE RATE: γ (pen) mR/h	DOSE RATE: n mrem/h	CONTAMINATION LEVELS: Direct (dpm/probe) ß	Direct (dpm/probe) α	Smear (/100cm 2): ß (dpm)	Smear (/100cm 2): α (dpm)	Smear (/100cm 2): mrad/h
N/A	N/A									N/A
N/A										N/A

Comments

Working area set up in vault. at the end of shift the rain cover were put back on vault. One rigger received a whole body dose of 5 mrem for day, rest of personnel Ø. No problems were encountered. N/A

Samples Counted with portable instruments for .25 minutes.

Instr./Probe Model	RO-38 (CP)	E-140/Pancake (GM/Probe)	Surveyor X	N/A	N/A	N/A	N/A
Serial No.	6462	1516/84	2201				
Efficiency	100%	10%	14%				
Correction Factor	1	1	7				

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) N/A

RSR No. N/A | . . . Contamination - Skin N/A | Procedure: WHC-IP-0718 Appendix I 2.1

. . . Contamination - Clothing | Other(s) N/A

HPT:

Payroll No.: 95906

Name (Print): Carl Meinecke

Signature: C Meinecke

First-Line HP Manager:

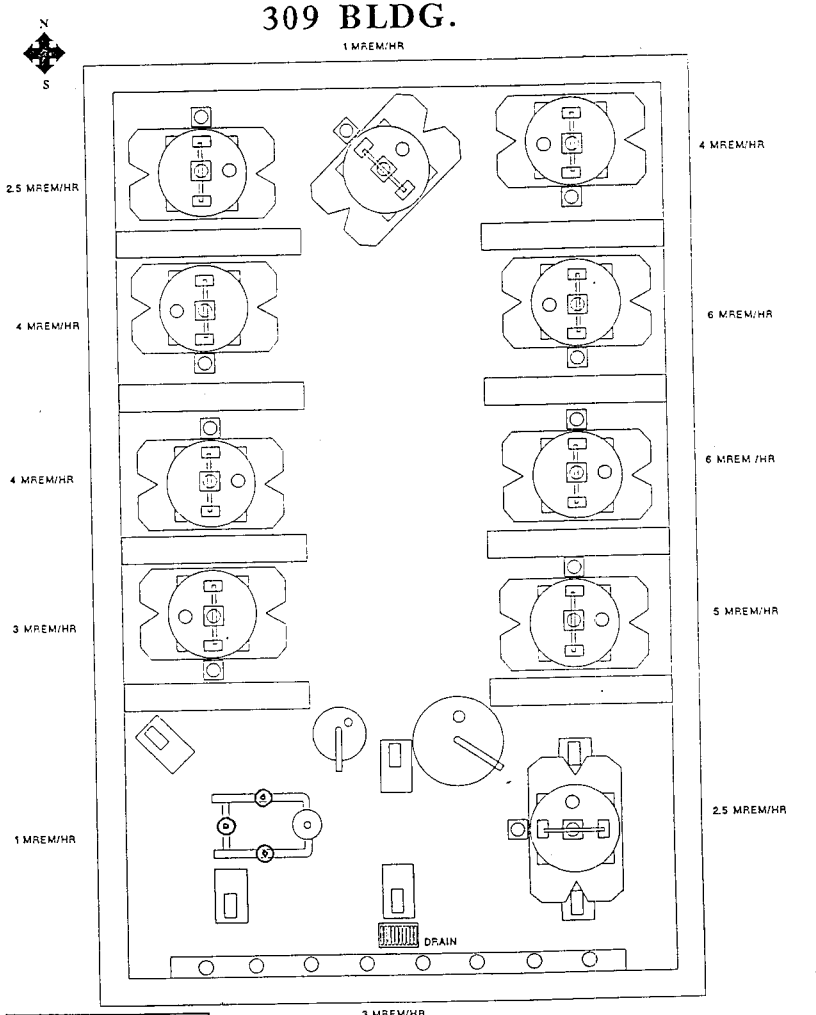
Date: 8-7-96 | Payroll No.: 95691

Name (Print): E A Dyuri

Signature:

BD-8000-010R (03/95)

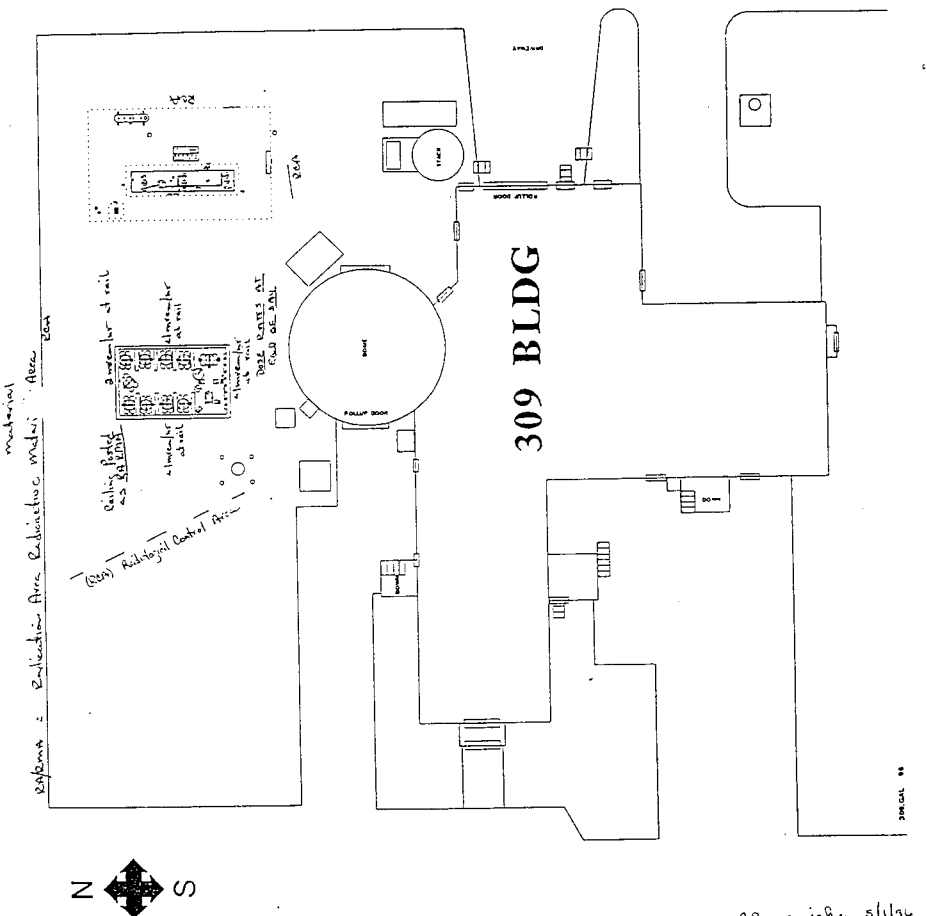
309 BLDG.



HPT CRmueller, Date 5-1-96

page 3 of 4

Survey # 234284



Comments 5/1/96
page 4 of 4
Survey # 234284

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234287

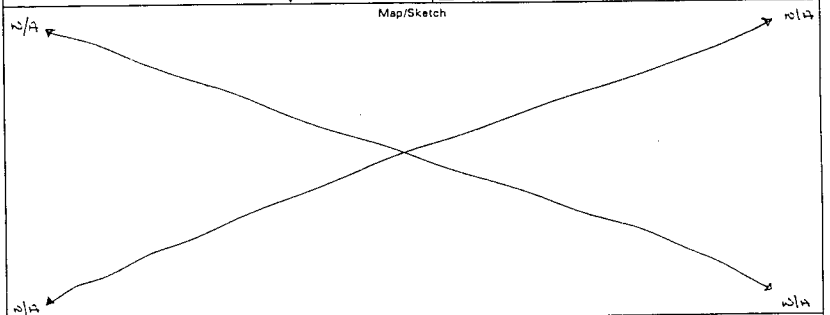
Date	Time	RWP No.(s)	Page
May 2, 1996	0630/1600	R-151	1 of 2

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop Vault — F.C. R.

Job Description: Coverage to pump liquid from columns, addition of rad sob, and rigging operations n/A

Purpose of Survey (check appropriate box(es)):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No. _____

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE η mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	Top of L3 column	C	—	25	—	—	—	<1000	< 8K6	—
2	Dose Rate to remove plug	field	—	10	—	—	—	—	—	—
3	Dose Rate to sample (max)	field	—	5	—	—	—	—	—	—
4	Dose Rate to remove R-3 Plug	field	—	10	—	—	—	—	—	—
5	Work Area	Smears	—	—	—	<5000	<500	4600	<20	—
6	Equipment	Smears	—	—	—	<5000	<500	<1000	<20	—

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1		X	1.9×10^{-13}	n/A
β 1		X	4×10^{-12}	n/A
α 2	n/A		→	→
β 2	n/A		→	→

Legend
(#) - Smear Location ⟨#⟩ - Air Sample Location
[#] - Large Area Smear * - Contact Reading
Other n/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R | Page 2 of 5/3/96 B4 | Survey No. № 234287

No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	mrad/h
	N/A									N/A
	N/A									N/A

Comments

Started sampling/pumping of column L-3 with PAPR respirator. After completing sampling/pumping L-3 the use of PAPR was down graded. No contamination was found on tools, equipment, or work area.

Samples Counted with portable instruments for 1 minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	Surveyor X	N/A	N/A	N/A	N/A
Serial No.	6462	1516/84	2983				
Efficiency	100%	10%	14%				
Correction Factor	1	10	7				

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) R-0502 1996-219

RSR No. N/A | . . . Contamination - Skin N/A | Procedure: WHC-IP-0719 Appendix I 2.1

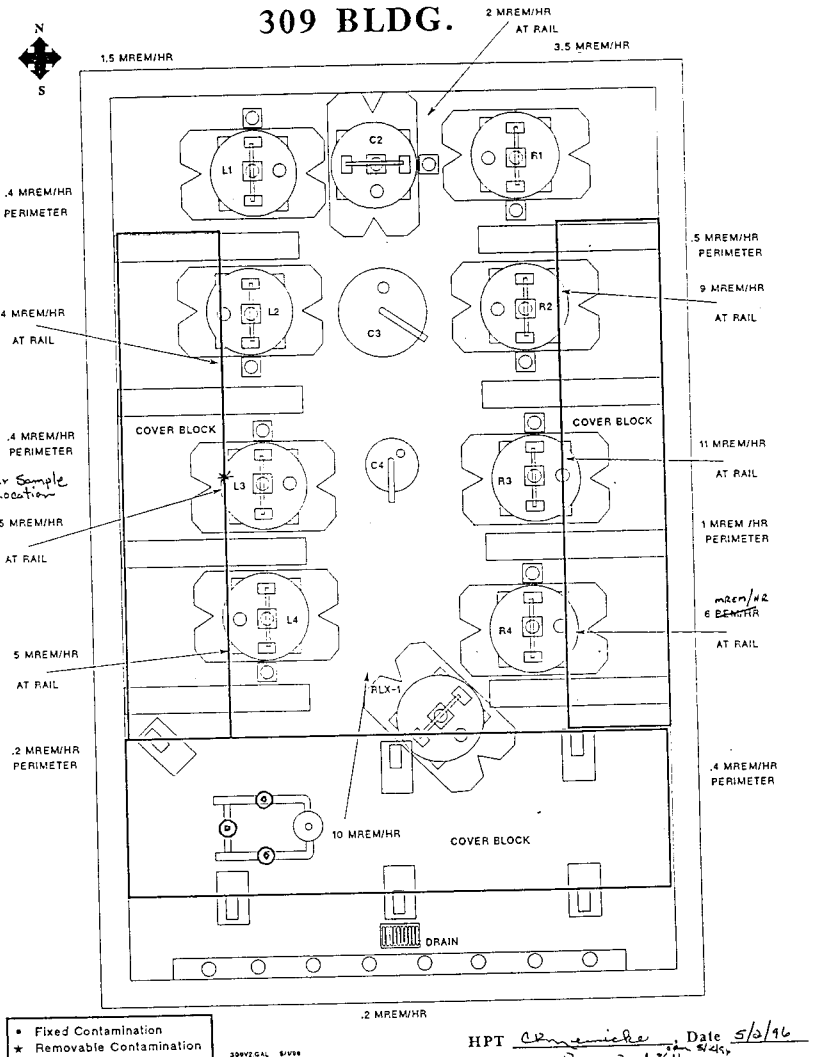
. . . Contamination - Clothing N/A | Other(s) N/A

HPT:
Payroll No.: 95906
Name (Print): C R Meinecke
Signature: C R Meinecke

First-Line HP Manager:
Date: 5/3/96 | Payroll No.: 6A783
Name (Print): D. R. Ekstrom
Signature: D. R. Ekstrom

BD-6000-010R (03/95)

309 BLDG.



HPT CRmenicke Date 5/3/96

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Survey # 234287

WHC RC DAILY AIR SAMPLE COUNTER LOG

Log No. (FC-MMDDYYYY-PI): R-0502196-219

Page: 1 of 1

Counter:

Alpha: 5226 | MS-3 (Instrument ID No./Model) | 182 (Detector ID No.) | 30% / 3.33 (E_C/CF) | 3 | 5 (N_B (counts)/T_B (min.)) | .6 (n_B (cpm)) | 300 | 328 | 219 (Counter Location (i.e., Area/Facility/Room))

Beta: 5212 | MS-3 (Instrument ID No./Model) | 91 (Detector ID No.) | 27% / 3.7 (E_C/CF) | 148 | 5 (N_B (counts)/T_B (min.)) | 29.6 (n_B (cpm)) | 300 | 328 | 219 (Counter Location (i.e., Area/Facility/Room))

No.	Sampling Location and EDP Code or Sampler Model/ID No. GA or BZ (Circle One)	Filter Media (Circle one)	ON: Date/Time/Flow Rate* / OFF: Date/Time/Flow Rate*		T_S (Start Time)	T_G (min.)	MDC (μCi/ml)	N_G (counts)	n_N (cpm)	C (μCi/ml)	HPT: Signature and Payroll No.	Survey No.
1	GA	HV-70 LB-5211 AN-3000	5/2/96 1000 2 cfm	α	1630	1	2.67×10^{-12}	1	.4	1.9×10^{-11}	95837	
	(BZ) 309 VAULT		5/2/96 1200 2 cfm	β	1634	1	1.2×10^{-11}	37	7.4	4×10^{-12}	95837	234287
2	GA N/A	HV-70 LB-5211 AN-3000		α								
	BZ			β								
3	GA	HV-70 LB-5211 AN-3000		α								
	BZ			β								
4	GA	HV-70 LB-5211 AN-3000		α								
	BZ			β								
5	GA	HV-70 LB-5211 AN-3000		α								
	BZ			β								
6	GA	HV-70 LB-5211 AN-3000		α								
	BZ			β								
7	GA	HV-70 LB-5211 AN-3000		α								
	BZ			β								
8	GA	HV-70 LB-5211 AN-3000		α								
	BZ			β								

NOTE: For all filter media (i.e., Hollingsworth & Vose HV-70, LB-5211, or Gelman Versapor AN-3000), the fractional filter (collection) efficiency E_F = 91.0%/100 = 0.91.

*NOTE: Record the Flow Rate units (i.e., cfm, scfh, or lpm).

$$MDC = \frac{2.71 + \left(3.29\sqrt{n_B T_G \left(1 + \frac{T_G}{T_B}\right)}\right)}{E_F E_C V_A k T_G}, \quad C = \frac{n_N}{E_F E_C V_A k}$$

Definitions: E_C = Counting efficiency (cpm/dpm); CF = Correction Factor (1/E_C); N_B = Number of background counts observed; T_B = Background counting time (min.); n_B = Background count rate (cpm, N_B / T_B); GA = General Area; BZ = Breathing Zone; T_S = Time sample counting started (24-hr clock); T_G = Gross (sample) counting time (min.); MDC = Minimum detectable concentration (μCi/ml); N_G = Number of gross (sample) counts observed; n_N = Net sample count rate (cpm, $N_G/T_G - n_B$); C = Concentration (μCi/ml); E_F = 0.91, Filter media collection efficiency; V_A = Volume of air sampled; k = 6.28E+10 if V_A is in ft^3, or k = 2.22E+9 if V_A is in liters or k = 2.22E+12 if V_A is in m^3.

Log Validated By (Print Name and Sign): CR Meincke CR Meincke Date: 5-2-96

A-6000-274 (02/95)

page 4 of 4

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234292

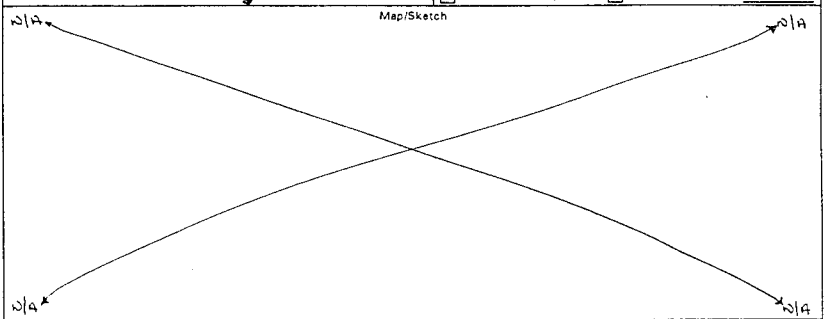
Date	Time	RWP No.(s)	Page
May 3, 1996	0630/1530	R-150 Rev 001	1 of 3

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop Vault — F.C.: R

Job Description: Carriage to pump liquids from ion columns to drums. N/A

Purpose of Survey (check appropriate box[es]):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSO
☐ HRA/VHRA Work ☐ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No. ____

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	General Area to sample	field	—	6	—	—	—	<1000	<BKG	—
2	Sample equipment	C	—	—	—	—	—	<1000	<BKG	—
3	Max on drums (8) drums	C	—	1	—	—	—	<1000	<20	—
4	Radiation Area at Rope	C	—	3	—	—	—	—	—	—
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
[#] - Large Area Smear
△ - Air Sample Location
* - Contact Reading
Other N/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R | Page 2 of 3 | Survey No. Nº 234292

No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE ¶ mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
N/A										N/A
N/A										N/A

Comments: Performed Unmonitored Use low potential release survey on drums & sample equip. < BKG for alpha in < 3cpm. No contamination was detected on equipment, tools, work area or gloves. N/A

Samples Counted with portable instruments for 1 minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	Surveyor X	N/A	N/A	N/A	N/A
Serial No.	6202	1206/1521	2201				
Efficiency	100%	10%	14%				
Correction Factor	1	10	7				

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) R0503196-219

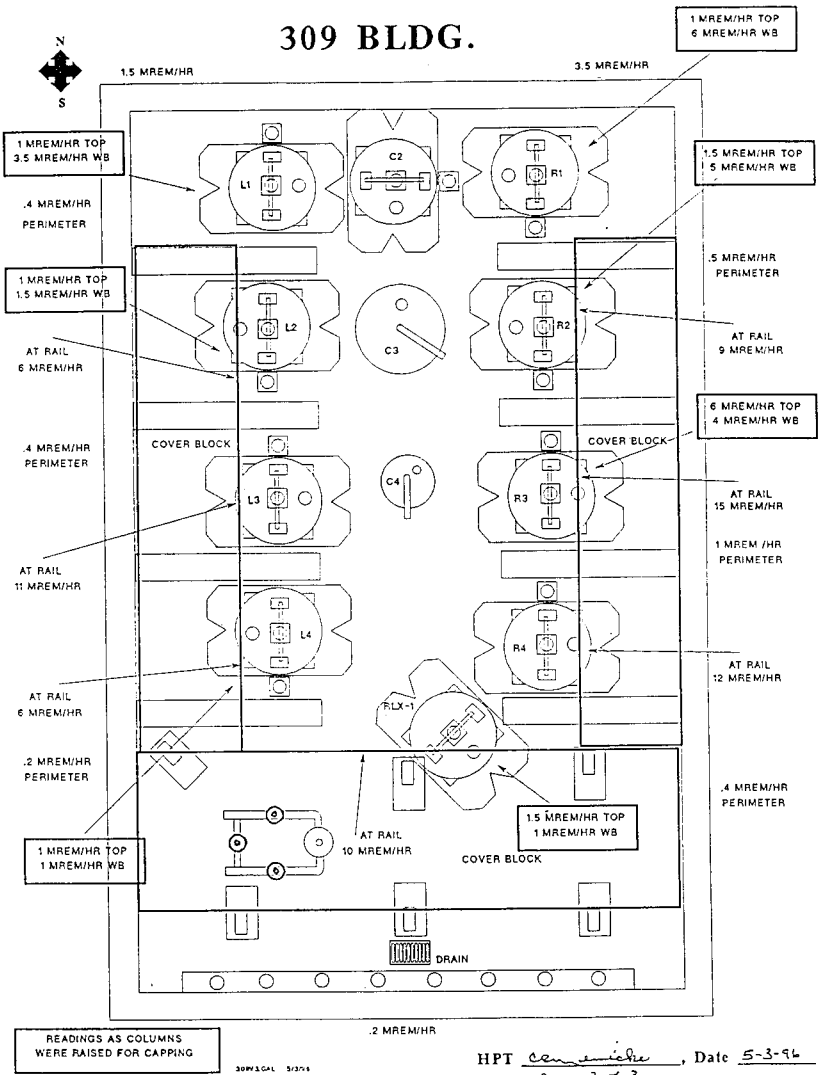
RSR No. N/A | . . . Contamination - Skin N/A | Procedure: WHC-IP0718 Appendix I. 2.1

. . . Contamination - Clothing N/A | Other(s) N/A

HPT:
Payroll No.: 95906
Name (Print): C R Meinecke
Signature: C R Meinecke

First-Line HP Manager:
Date: 5-10-96 | Payroll No.: 95644
Name (Print): G. A. DAVIS
Signature:

BD-8000-010R (03/95)



HPT Cervenka, Date 5-3-96

page 3 of 3

Survey # 234292

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234296

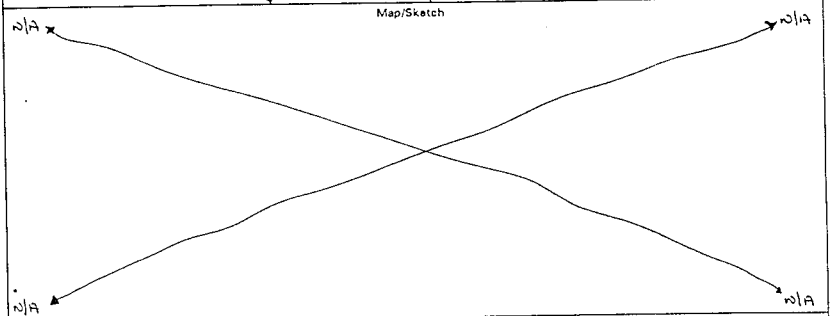
Date	Time	RWP No.(s)	Page
May 6, 1996	0630 - 1500	R-150 Rev 001	1 of 3

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop Vault — F.C.: R

Job Description: Coverage to finish pumping on ion columns and addition of radeak. N/A

Purpose of Survey (check appropriate box[es]):
- Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
- Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
- ☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
- ☐ Exposure Incident ☐ Material Release
- ☐ RM Transfer/Shipment ☐ Required, Task No. _____

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE η mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	Pumping work Area (mat) (LAND DIRECT)	field	—	6	—	—	—	—	—	—
2	Smears of drums (mat)	C	—	1	—	—	—	<1000	<20	—
3	Equipment Used / Gloves	C	—	—	—	—	—	<1000	<BKG	—
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
- (#) - Smear Location
- #△ - Air Sample Location
- [#] - Large Area Smear
- * - Contact Reading
- Other N/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R | Page 2 of 3 | Survey No. № 234296

No.	Description	Dist.	DOSE RATE ß (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE ¶ mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) ß	Direct (dpm/probe) α	Smear (/100cm²) ß (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
N/A										N/A
N/A										N/A

Comments BEC = Alpha < 3 cpm.

Completed pumping on L-1, L-2 and R-1. grouted first 12 inches of burial box. N/A

Samples Counted with portable instruments for 1 minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	Survey X	N/A	N/A	N/A	N/A
Serial No.	6202	1516/84	2201				
Efficiency	100%	10%	14%				
Correction Factor	1	10	7				

ADDITIONAL REPORTS

RPR No. N/A Sample Counter Log(s) R-05061996-219

RSR No. N/A . . . Contamination - Skin N/A Procedure: WHC-IP-0718 Appendix I 2.1

. . . Contamination - Clothing N/A Other(s) N/A

HPT:

Payroll No.: 95906

Name (Print): CR Meinecke

Signature: CR Meinecke

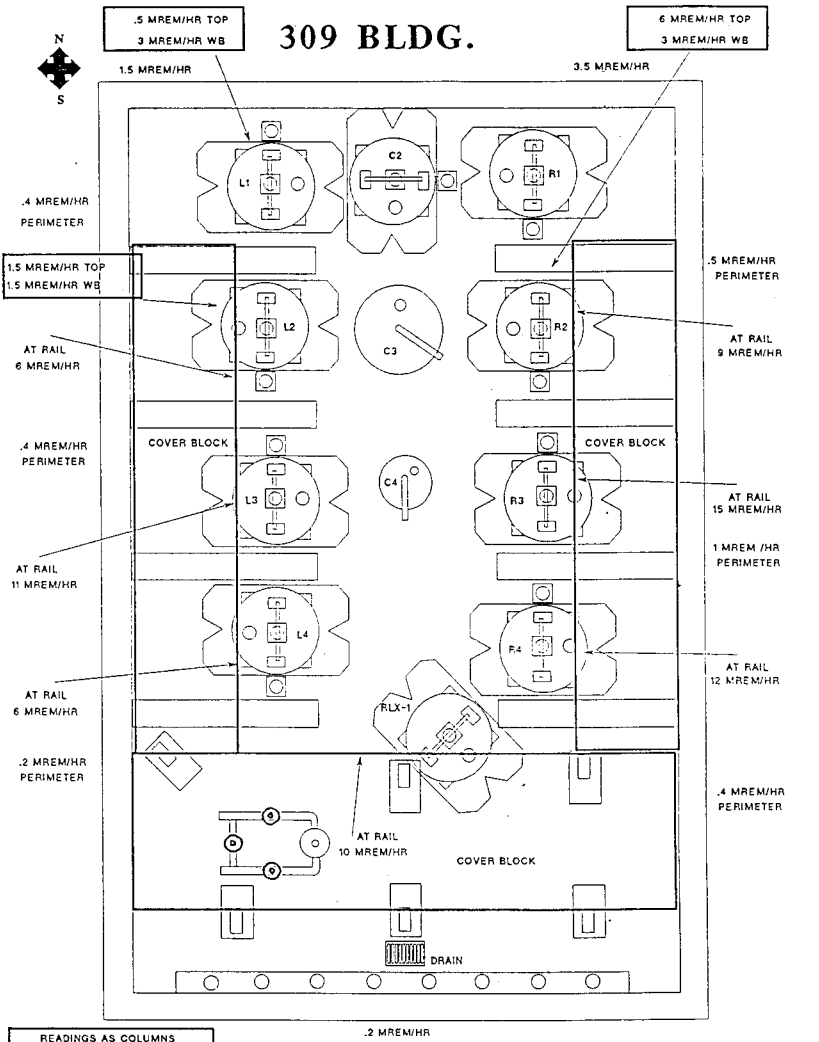
First-Line HP Manager:

Date: 5/6/96 Payroll No.: 6A783

Name (Print): D. R. Ebstens N/A

Signature: D. R. Ebstens

BD-6000-010R (03/95)



HPT CBrunemeier, Date 5-6-96

Survey 234296

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Westinghouse Hanford Company - Radiological Control

RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234299

Date	Time	RWP No.(s)	Page
May 7, 1996	0630-1300	R-150 Rev 001	1 of 2

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop Vault — F.C.: R.

Job Description: Coverage to double up radsorb on ion columns and sample drums. N/A

Purpose of Survey (check appropriate box[es]):

Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill

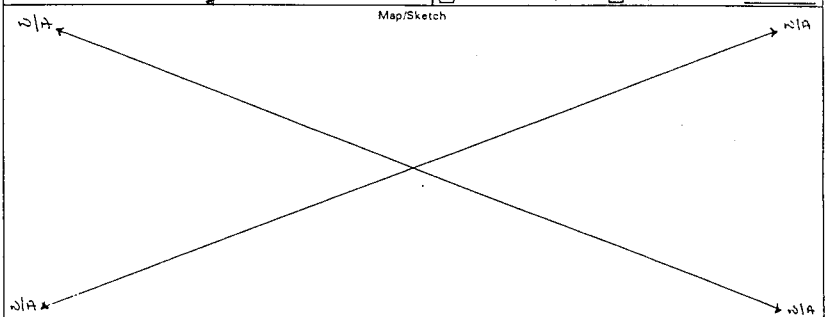
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD

☐ HRA/VHRA Work ☒ Job Coverage ☐ Other

☐ Exposure Incident ☐ Material Release

☐ RM Transfer/Shipment ☐ Required, Task No. ____

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE η mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	To add radsorb	field	—	10	—	—	—	—	—	—
2	To sample drums	field	—	<1	—	—	—	<1000	<BKG	—
3	To ship sample	C	—	<0.5	—	—	—	<1000	<20	—
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend

(#) - Smear Location ⟨#⟩ - Air Sample Location

[#] - Large Area Smear * - Contact Reading

Other N/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

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No.	Description	Dist.	DOSE RATE: β (non-pen) mrad/h	γ (pen) mR/h	n mrem/h	CONTAMINATION LEVELS: Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
n/a										n/a
n/a										n/a

Comments

Sampled drum and shipped sample to 325 lab. Added radcork to (4) columns, this doubled radcork for all (7) columns pumped. Concrete was tested to 460 psi and okked for loading. Job was shut down for loading columns at 1210 due to high winds. n/a

Samples Counted with portable instruments for 1 minutes.

Instr./Probe Model	RO-38 (CP)	E-140/Pancake (GM/Probe)	Surveyor X	n/a	n/a	n/a	n/a
Serial No.	6628	1206/1521	2983				
Efficiency	100%	10%	14%				
Correction Factor	1	10	7				

ADDITIONAL REPORTS

RPR No. n/a | Sample Counter Log(s) R-0507996-219

RSR No. Site-04-Sample | . . . Contamination - Skin n/a | Procedure: WHC-IP-0718 Appendix I 2.1

. . . Contamination - Clothing n/a | Other(s) n/a

HPT:
Payroll No.: 95906
Name (Print): CRMeinecke
Signature: CRMeinecke

First-Line HP Manager:
Date: 5-10-96 | Payroll No.: 95064
Name (Print): G. A. DAVIS
Signature:

BD-6000-010R (03/95)

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234302

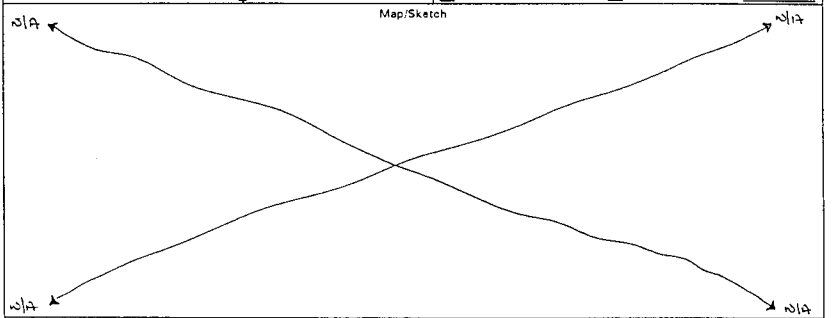
Date	Time	RWP No.(s)	Page	of
May 8, 1996	0630 - 1600	R-152	1	7

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop Vault — F.C.: R

Job Description: Coverage to load columns into burial boxes, and jumpers/ coveralls waste. N/A

Purpose of Survey (check appropriate box[es]):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No.

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	Column L-1 (max)	C	—	<1	—	—	—	<1000	<BKG	—
2	Column L-2 (max)	C	—	25	—	—	—	<1000	<BKG	—
3	Column L-3 (max)	C	—	3000	—	—	—	<1000	<BKG	—
4	Column L-4 (max)	C	—	1	—	—	—	<1000	<BKG	—
5	Column R-1 (max)	C	—	1	—	—	—	<1000	<BKG	—
6	Column R-2 (max)	C	—	125	—	—	—	<1000	<BKG	—
7	Column R-3 (max)	C	—	1500	—	—	—	<1000	<BKG	—
8	Column R-4 (max)	C	—	<1	—	—	—	<1000	<BKG	—
9	Column RL1X-1 / R-5 (max)	C	—	<1	—	—	—	<1000	<BKG	—
10	Column C-2 / C-3 & C-4	C	—	≤1	—	—	—	<1000	<BKG	—

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
⚠ - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R | Page 2 of 7 | Survey No. № 234302

No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	mrad/h
11	Burial Box # 1	C	—	1500	—	—	—	—	—	—
12	Burial Box # 2	C	—	700	—	—	—	—	—	—
13	Burial Box # 3 (max)	C	—	~1	—	—	—	—	—	—
14	Smear of vault (max)	c/s	—	—	—	—	70,000	70,000	21,000	—
15	Smear general area	c/s	—	—	—	—	—	~~1000~~ 1400	1400	
16	Smear general area	c/s	—	—	—	—	—	~1000	< BKG	—
N/A										N/A
N/A										N/A

Comments

Total person mrem received for day was 132. One spot in vault (south portion) smeared 21,000 dpm/100cm², rest of vault on spot 1400 dpm/100 cm². North storage area initial smears ~ 1000 dpm/100cm² beta gamma < BKG alpha. < BKG = < 3 cpm. Will continue to survey vault & grout boxes 5/9/96. N/A

Samples Counted with portable instruments for 1 minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	Surveyor X	N/A	N/A	N/A	N/A
Serial No.	6628	1516/84	2201				
Efficiency	100%	10%	14%				
Correction Factor	1	10	7				

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) R-05081996-219

RSR No. N/A | ... Contamination - Skin N/A | Procedure: WHC-IP-0718 APPENDIX I 2.1

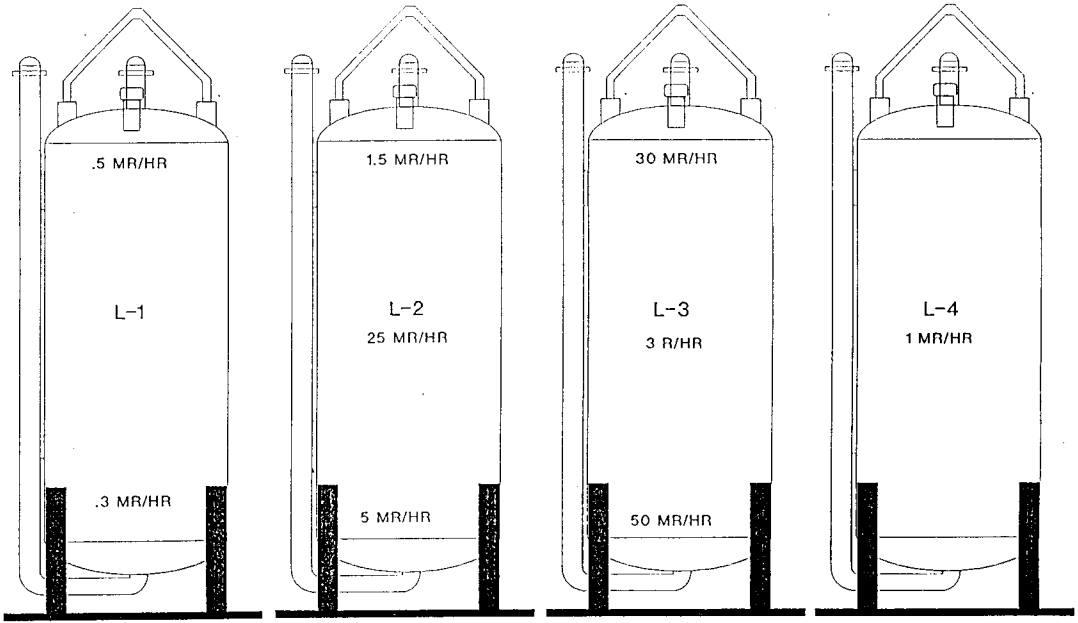
... Contamination - Clothing N/A | Other(s) N/A

HPT:
Payroll No.: 95906
Name (Print): C R Meinecke
Signature: C R Meinecke

First-Line HP Manager:
Date: 5-8-96 | Payroll No.: 95641
Name (Print): G. A. DAVIS
Signature: G. A. DAVIS

BD-8000-010R (03/95)

ION COLUMN



• Fixed Contamination
★ Removable Contamination

HPT Chrzanowski, Date 5-8-96
Survey # 234302
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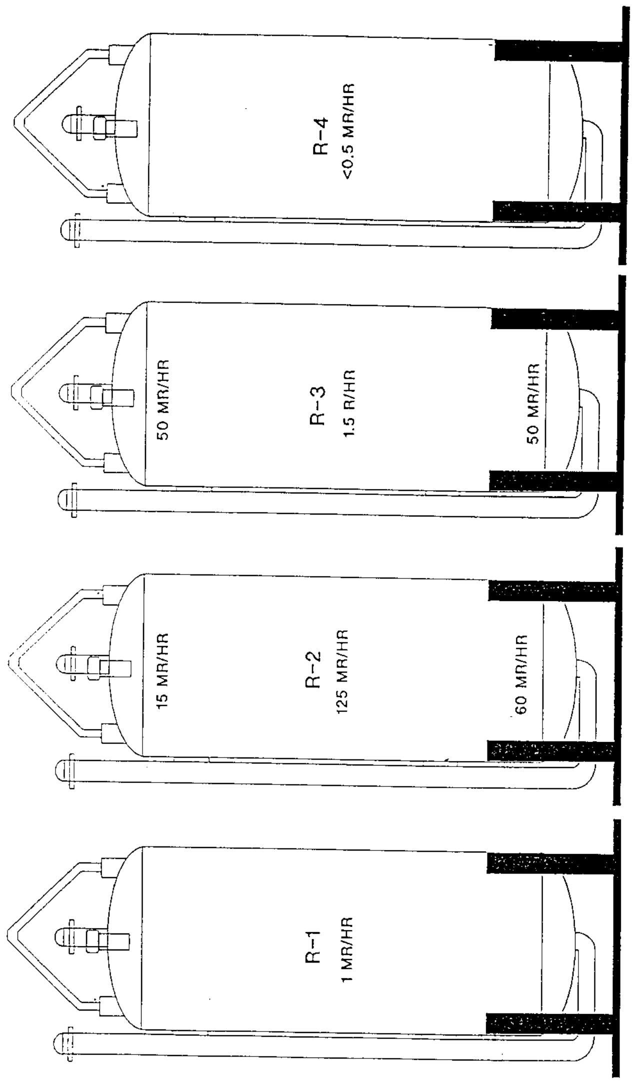
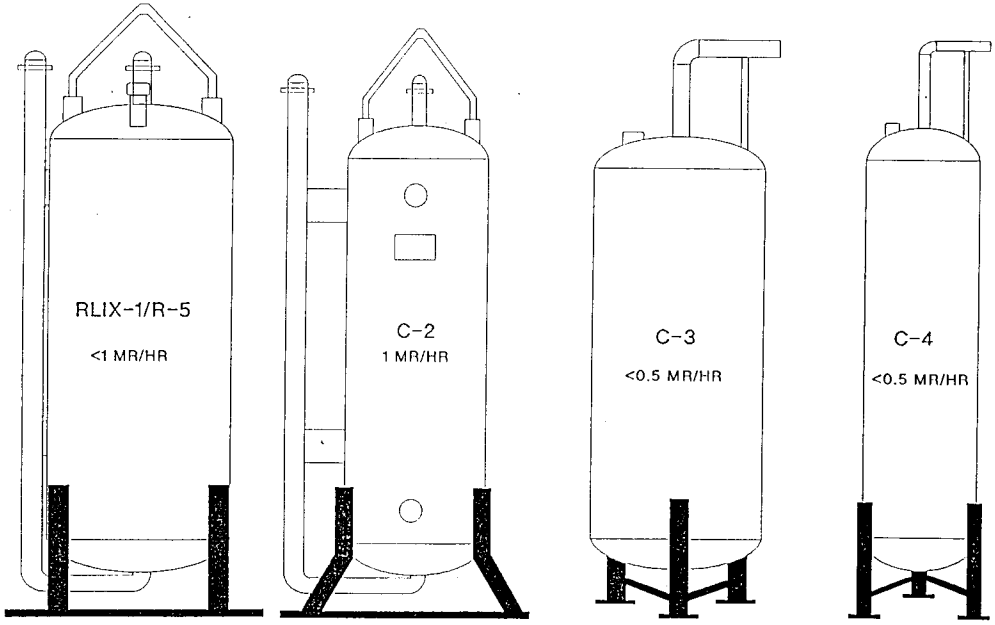
ION COLUMN



HPT [illegible], Date 5-8-96
Page 4 of 7
Survey # 234302

ION COLUMN

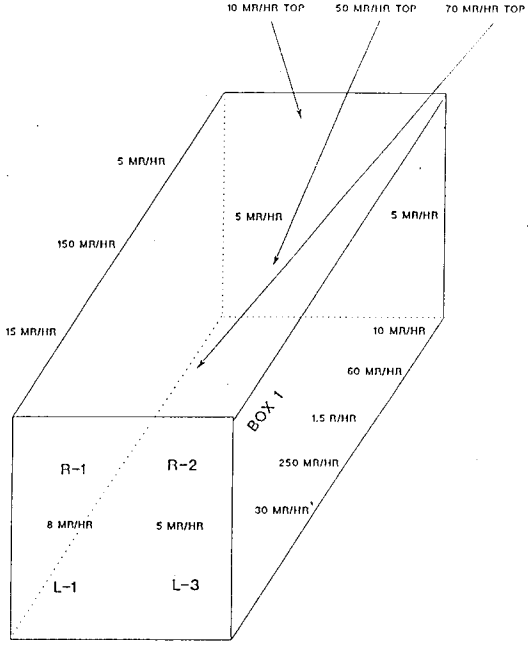


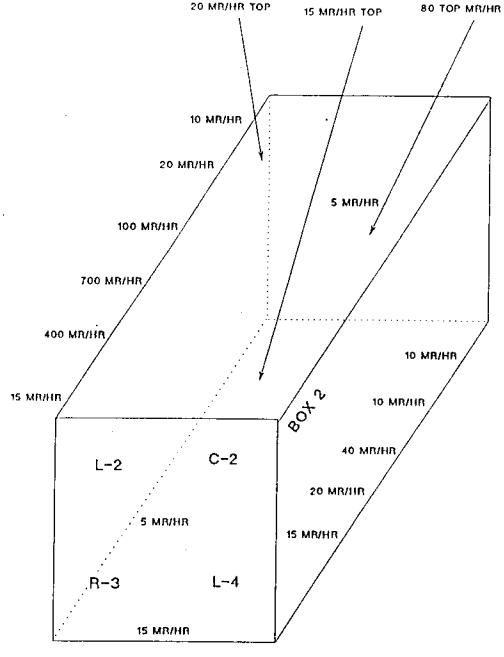
30/40/120 GAL 5/95

HPT C Kryzaniecki, Date 5-8-96

Page 5 of 7
Survey # 23430Z

309 VAULT BOXES





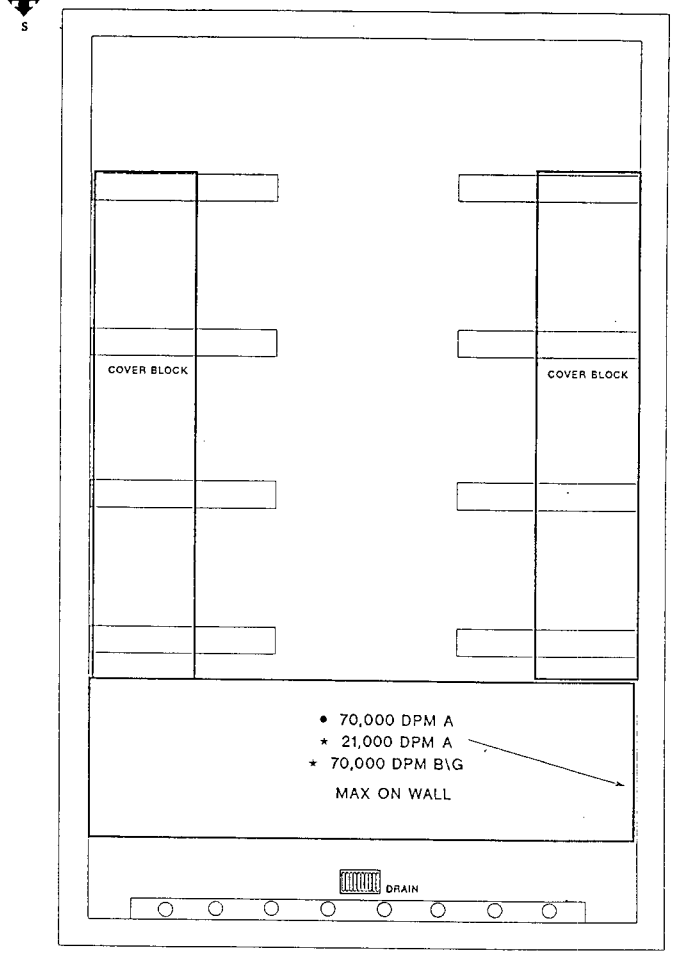
30MBOX.CAL 5/96

HPT C Wiemiecki, Date 5-8-96

page 6 of 7

Survey # 254302

309 ION COLUMN VAULT



309VIO.CAL 5/8/96

HPT C Rumerick, Date 5-8-96
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Survey # 234302

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. № 234309

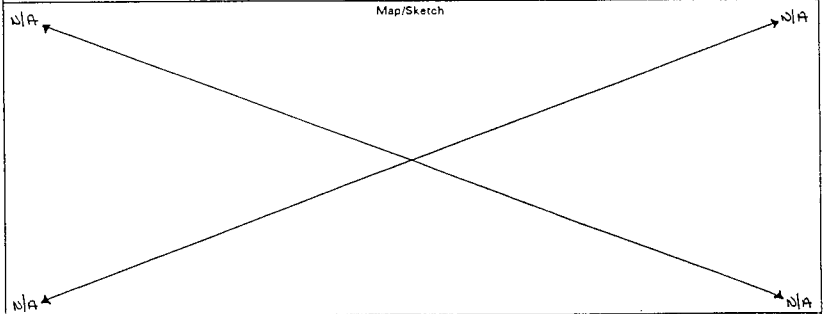
Date	Time	RWP No.(s)	Page	of
May 9, 1996	0630-1500	R-153	1	5

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop Vault — F.C.: R

Job Description: Coverage to perform vault clean out and stabilization. Housekeeping decontamination and painting vault.
N/A

Purpose of Survey (check appropriate box(es)):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No. ____

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	(8) North Storage Areas	c/s	—	<0.5	—	<5000	<500	<1000	<BKG	—
2	South Area (max) on floor	c/s	—	—	—	7,000	42,000	1000	2,800	—
3	South Area (max) on wall	c/s	—	<0.5	—	85,000	140,000	55,000	28,000	—
4	Wall after decon. (max)	c/s	—	—	—	—	42,000	—	2,100	—
5	Broom, Shovel, HEPA hosing	c/s	—	—	—	<5000	<500	<1000	<20	—
6	Laundry Bag, HP Inst.	c/s	—	—	—	<5000	<500	<1000	<20	—

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
△ # - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R. | Page 2 of ____ | Survey No. № 234309

No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE ¶ mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
N/A										N/A
N/A										N/A

Comments < BKG for alpha is <5 cpm. Performed Unrestricted Use (low potential) release surveys. North storage area of vault had no fixed or removable contamination. After vacuuming vault with a HEPA vacuum, wet rags were used on floor and walls to decon. 1 coat of paint was applied to walls & floor at end of day. The rain cover was put on vault & area clean-up. a survey will be performed again, once paint is dry. Rupture Loop Vault debris was put into a 55 gallon drum into the Radioactive Material Storage at 309 Building Containment. Paint roller & can will be placed into the drum when they are dry. N/A

Samples Counted with portable instruments for 1 minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	Surveyor X	N/A	N/A	N/A	N/A
Serial No.	6628	1206/1521	2871				
Efficiency	100%	10%	14%				
Correction Factor	1	10	7				

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) R-0509 1996-219

RSR No. N/A | . . . Contamination - Skin N/A | Procedure: WHC-IP-0718 Appendix I 2.1

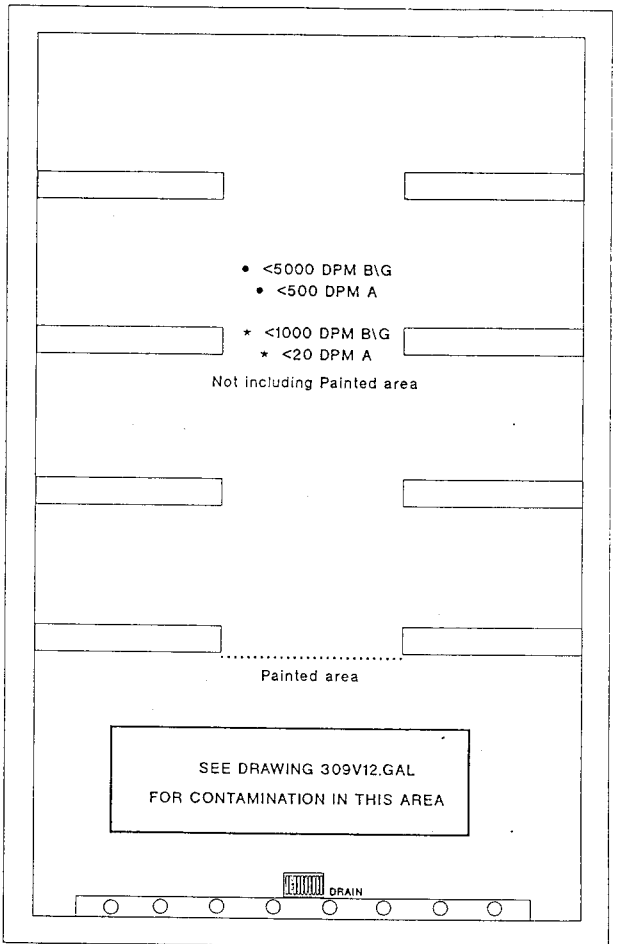
. . . Contamination - Clothing N/A | Other(s) N/A

HPT:
Payroll No.: 95906
Name (Print): Carl R. Meinecke
Signature: C R Meinecke

First-Line HP Manager:
Date: 5-10-96 | Payroll No.: 95641
Name (Print): C. A. DAVIS
Signature:

BD-6000-010R (03/95)

309 ION COLUMN VAULT



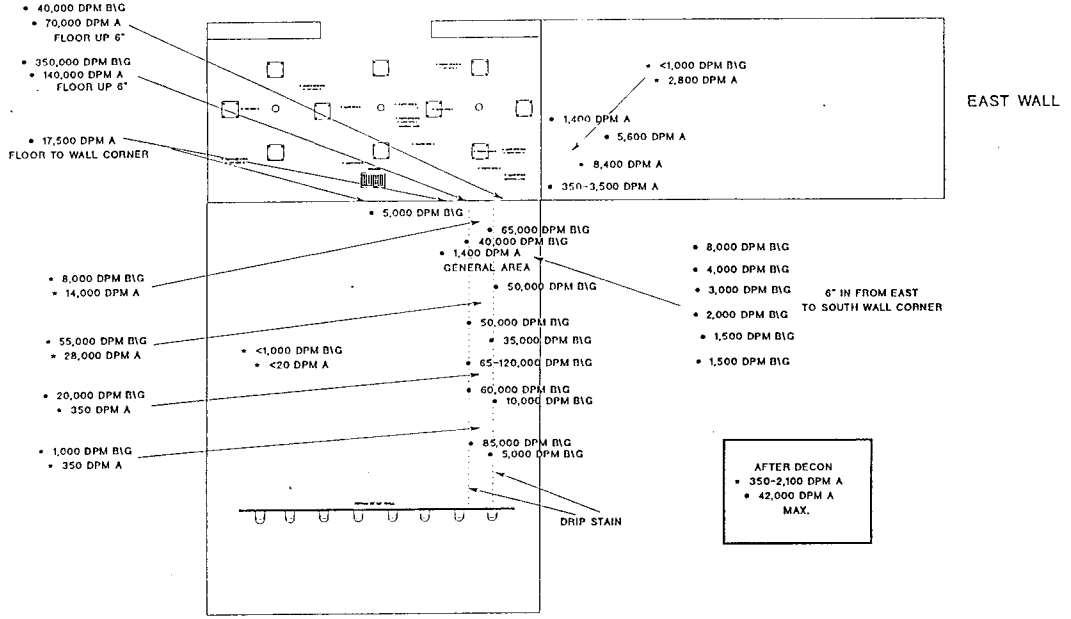
309V11.GAL 5/9/96

• Fixed Contamination
* Removable Contamination

HPT C. Jaimes, Date 5-9-96

Survey # 234309
page 3 of 5

309 ION COLUMN VAULT
PAINTED AREA

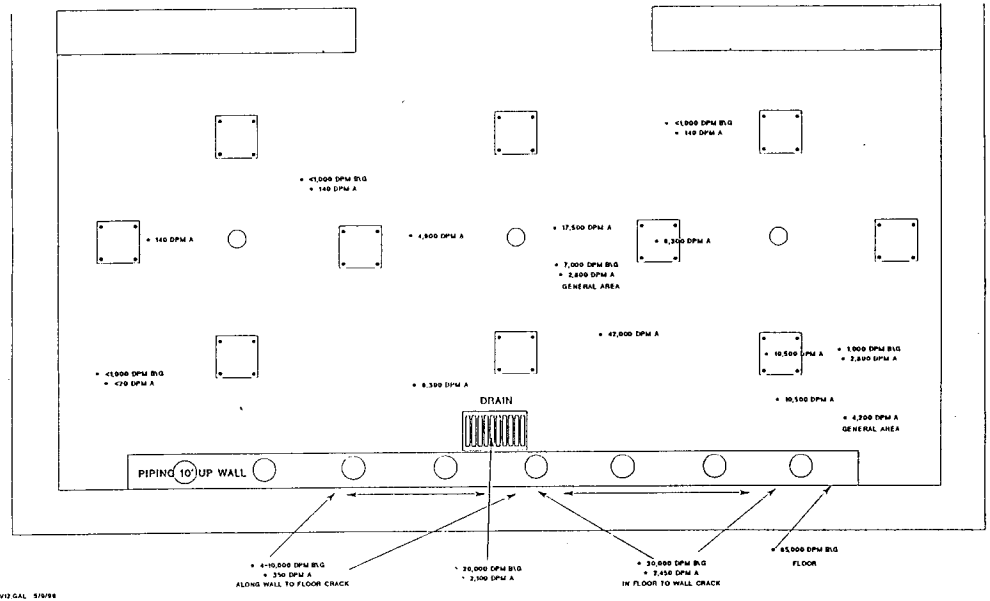


30W113 GAL 5/9/96

• Fixed Contamination
* Removable Contamination

HPT C.M. Schleicher, Date 5-9-96
Survey # 234509
page 4 of 5

309 ION COLUMN VAULT
PAINTED AREA



309V13.GAL 5/8/96

- Fixed Contamination
- ★ Removable Contamination

REFER TO DRAWING 309V13.GAL
FOR WALL SURVEY RESULTS

HPT CPmeinke, Date 5-9-96
Survey # 254309
page 5 of 5

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234313

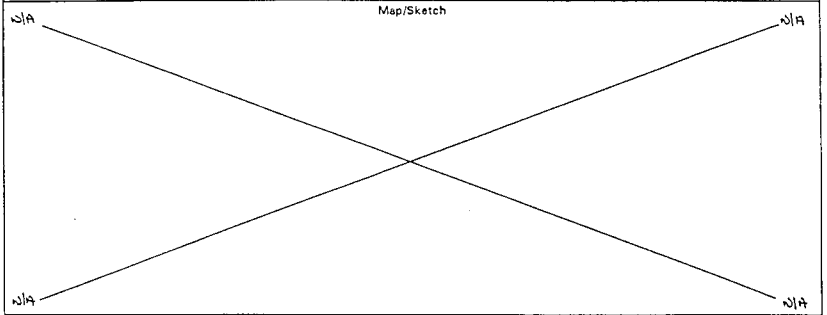
Date	Time	RWP No.(s)	Page
May 9, 1996	0900 / 1230	R-152	1 of 2

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop Vault — F.C.: R.

Job Description: Coverage to fill two columns with grout and fill burial boxes approximately ½ with grout. N/A

Purpose of Survey (check appropriate box[es]):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No. ____

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	Box # 1 max. on TOP	c	—	70	—	—	—	—	—	—
2	Box # 1 whole body	field	—	20	—	—	—	—	—	—
3	Box #2 max on top	c	—	80	—	—	—	—	—	—
4	Box #2 whole body	field	—	20	—	—	—	—	—	—
5	Box #3 max on top	c	—	<1	—	—	—	—	—	—
6	Box #3 whole body	field	—	<1	—	—	—	—	—	—
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
⟨#⟩ - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R | Page 2 of 2 | Survey No. № 234313

No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
N/A										
N/A										

N/A

N/A

Comments

After the two columns were filled the two grout lines were put into the burial box. The lid was then put on and later was grouted to approximately ⅓ filled. One grout person received 10 mrem for job. N/A

Samples Counted with portable instruments for N/A minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	N/A	N/A	N/A	N/A	N/A
Serial No.	4628	N/A					
Efficiency	100%						
Correction Factor	1						

ADDITIONAL REPORTS

RPR No. N/A Sample Counter Log(s) N/A

RSR No. N/A . . . Contamination - Skin N/A Procedure: WHC-IP-0718 Appendix I 2.1

. . . Contamination - Clothing N/A Other(s) N/A

HPT:

Payroll No.: 95906

Name (Print): CR Meinecke

Signature: CR Meinecke

First-Line HP Manager:

Date: 5-10-96 G.A. DAVIS Payroll No.: 95641

Name (Print):

Signature:

BD-6000-010R (03/95)

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. № 234315

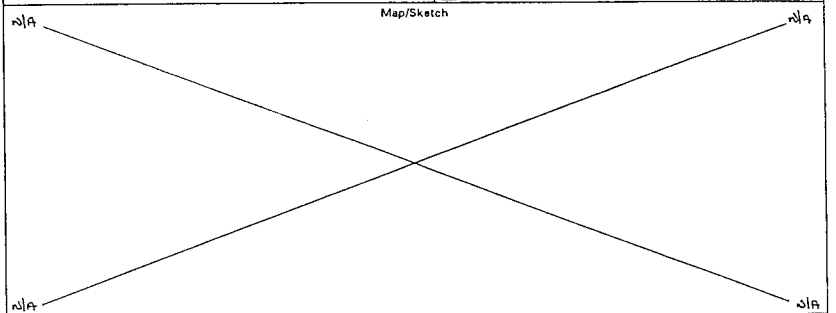
Date	Time	RWP No.(s)	Page
May 13, 1996	0630/1500	R-153	1 of 3

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture hoop Vault — F.C.: R.

Job Description: Coverage to survey vault after initial paint job. Coverage to spray paint on connectors.

Purpose of Survey (check appropriate box(es)):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No. _____

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE η mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	Floor Area	c/s	—	—	—	—	2900	<1000	<BKG	—
2	South Lower Wall	c/s	—	—	—	150,000	21,000	<1000	140	—
3	South Upper Wall	c/s	—	—	—	—	2900	15,000	1400	—
4	Laundry Bag	c/s	—	—	—	<5000	<500	<1000	<20	—
5	HP Equipment	c/s	—	—	—	<5000	<500	<1000	<20	—
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
△ - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R. | Page 2 of 3 | Survey No. № 234315

No.	Description	Dist.	DOSE RATE: β (non-pen) mrad/h	γ (pen) mR/h	n mrem/h	CONTAMINATION LEVELS: Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
N/A										N/A
N/A										N/A

Comments < BKG for alpha = < 3 cpm.
Survey of vault indicated a need to paint higher, all the way to the connectors. Stated painting connector when it started to rain. Job shut down approximately 13:15. Will try to paint 5/14/96.

N/A

Samples Counted with portable instruments for 1 minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	Surveyor X	N/A	N/A	N/A	N/A
Serial No.	6202	1516/84	2201				
Efficiency	100%	10%	14%				
Correction Factor	1	10	7				

ADDITIONAL REPORTS

RPR No. N/A Sample Counter Log(s) 2-0513/996-219

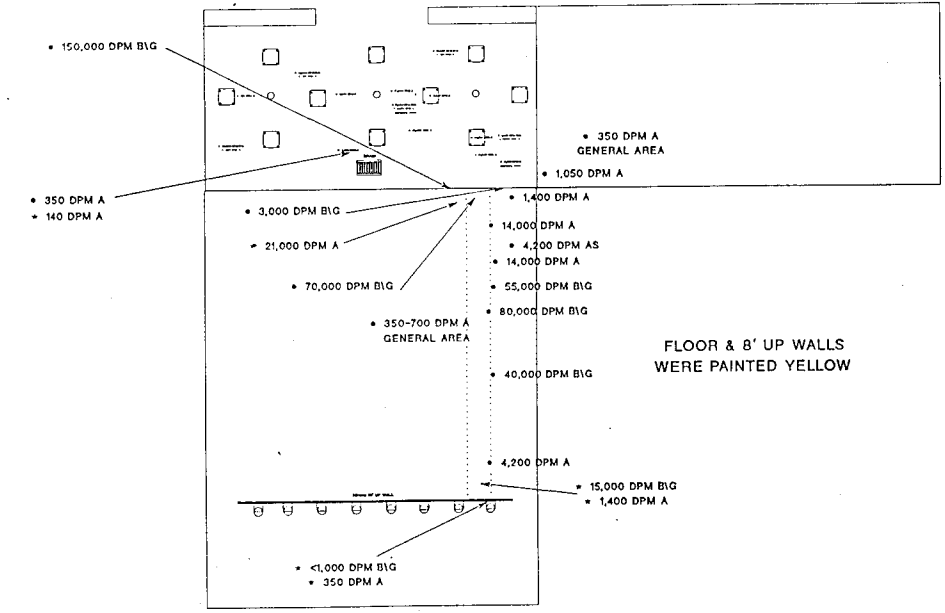
RSR No. N/A . . . Contamination - Skin N/A Procedure: WHC-IP-0718 Appendix I. 2.1

. . . Contamination - Clothing N/A Other(s) N/A

HPT:
Payroll No.: 95906
Name (Print): C Cemeincake
Signature: C Cemeincake

First-Line HP Manager:
Date: 5-17-96 Payroll No.: 95611
Name (Print): G A DAVIS
Signature:

309 ION COLUMN VAULT
PAINTED AREA



309VIS.GAL 5/13/96

• Fixed Contamination
* Removable Contamination

HPT CR Smeaton, Date 5-13-96
Survey # 234315
page 3 of 3.

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234320

Date: May 13, 1996 | Time: 0630-1300 | RWP No.(s): R-152 | Page 1 of 2

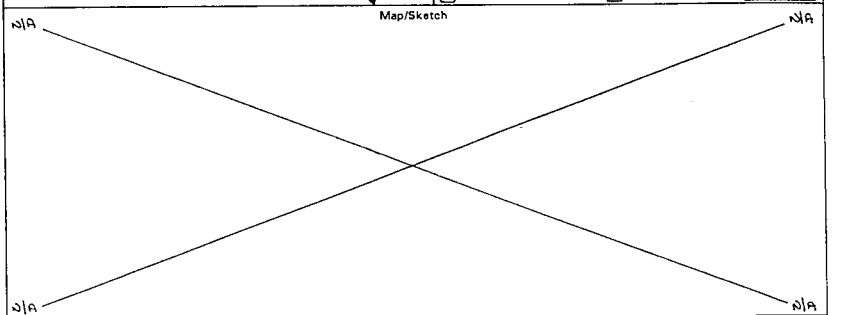
Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop Vault | F.C. R

Job Description: Coverage to grout three burial boxes at the 309 tank farm area.

N/A

Purpose of Survey (check appropriate box[es]):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No.

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE η mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	Box #1 Whole Body	field	—	~~<10~~ <5	—	—	—	—	—	—
2	Box #1 Top max.	c	—	25	—	—	—	—	—	—
3	Box #2 Whole Body	field	—	10	—	—	—	—	—	—
4	Box #2 Top (max)	c	—	30	—	—	—	—	—	—
5	Box #3 Whole Body	field	—	<1	—	—	—	—	—	—
6	Box #3 Top (max)	c	—	<1	—	—	—	—	—	—
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
 - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R | Page 2 of 3 | Survey No. № 234320

No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
N/A										N/A
N/A										N/A

Comments

Grouted boxes # 1 & 3 to within 8 inches of top, grouted box # 2 to within 21 inches of top. They plan on finishing grouting burial boxes on 5/14/96. N/A

Samples Counted with portable instruments for N/A minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	N/A	N/A	N/A	N/A	N/A
Serial No.	6202	N/A					
Efficiency	100% N/A 5-18-96						
Correction Factor	1						

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) N/A

RSR No. N/A | . . . Contamination - Skin N/A | Procedure: WHC-IP-0718 Appendix I 2.1

. . . Contamination - Clothing N/A | Other(s) N/A

HPT:

Payroll No.: 95906

Name (Print): C R Meinecke

Signature: C R Meinecke

First-Line HP Manager:

Date: 5-17-96 | Payroll No.: 95641

Name (Print): G. A. DAVIS

Signature:

BD-6000-010R (03/95)

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234322

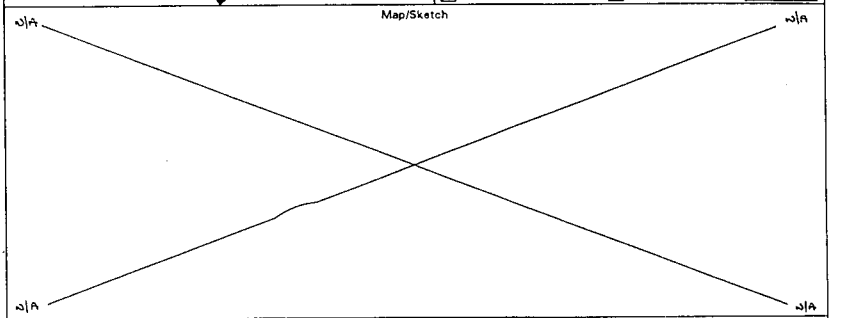
Date	Time	RWP No.(s)	Page
May 14, 1996	0630-1500	R-153	1 of 4

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop Vault — F.C.: R.

Job Description: Coverage to resume vault after second coating. N/A

Purpose of Survey (check appropriate box[es]):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No.

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE η mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	Smears on walls	c/s	—	—	—	—	—	<1000	<BKG	—
2	HP Instruments	c/s	—	—	—	—	—	<1000	<20	—
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
 - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R | Page 2 of 4 | Survey No. 5-19-96 | № 234322

No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
N/A										N/A
N/A										N/A

Comments Tritium samples taken and sent to FFTF for analysis.

Coverage to paint vault, south end only. Performed smear survey at end of shift. (Plugged drain with grout.) All areas smeared were < 1000 dpm / 100 cm² and < BKG for alpha. Background (BKG) for alpha in less than 3 cpm. Access to the vault will be restricted by the placement of overblocks and rain cover. If additional entries are required, a survey shall be performed prior to any inspection, tours or work. N/A

Samples Counted with portable instruments for 1 minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	Surveyor X	N/A	N/A	N/A	N/A
Serial No.	6207	1206/1521	2871				
Efficiency	100%	10%	14%				
Correction Factor	1	10	7				

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) R-05141996-219

RSR No. N/A | . . . Contamination - Skin N/A | Procedure: WHC-IP-0718 Appendix I 2.1

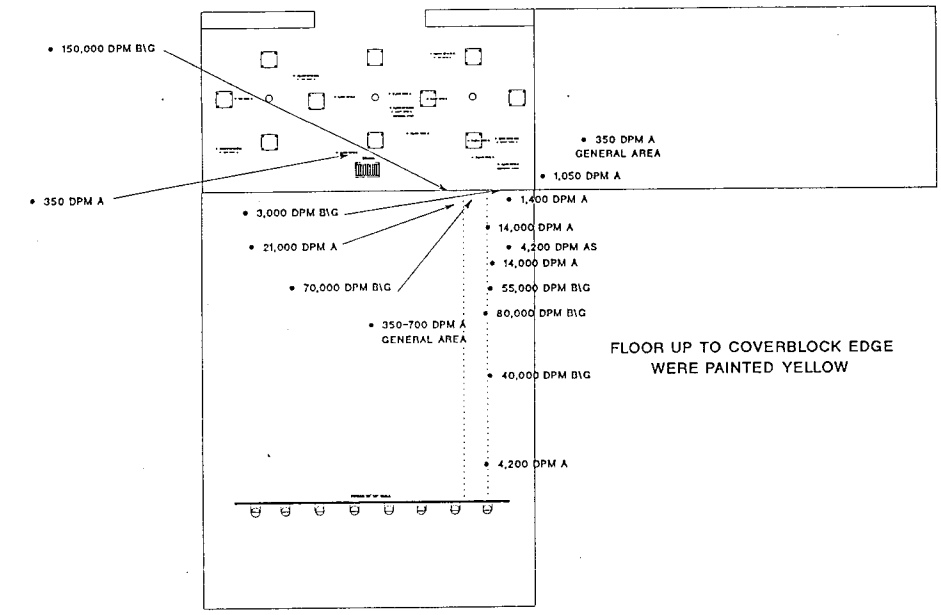
. . . Contamination - Clothing N/A | Other(s) N/A

HPT:
Payroll No.: 95906
Name (Print): CR Meinecke
Signature: CR Meinecke

First-Line HP Manager:
Date: 5-17-96 | Payroll No.: 95647
Name (Print): G. A. DAVIS
Signature:

BD-8000-010R (03/95)

309 ION COLUMN VAULT
PAINTED AREA



309V18.GAL 5/14/96

• Fixed Contamination
★ Removable Contamination

note: No removable contamination found.

HPT CRoeinecke, Date 5-14-96
Survey # 234322
Page 3 of 34 Entries

Protocol #: 2 Name:H-3 DPM 13-May-96 17:17
Region A: LL-UL= 0.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Region B: LL-UL= 2.0-18.6 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Region C: LL-UL= 0.0- 0.0 Lcr= 0 Bkg= 0.00 %2 Sigma=0.00
Time = 4.00 QIP = tSIE ES Terminator = Count
CR analysis performed by Bruce Combs. Payroll No 95906
Conventional DPM
Nuclide 1 = 170961
Luminescence Correction On

Sample		Loc.	DPM	95% CL	FLAG	tSIE
	1 Blank		0.00	0.00	B	396.
#1	2		0.00	0.00		390.
#2	3		5.88	20.17		390.
#3	4		16.20	22.21		349.
#4	5		3.44	22.24		372.
#5	6		0.00	0.00		379.
#6	7		9.07	22.13		390.
#7	8		0.00	0.00		373.
#8	9		0.00	0.00		336.
#9	10		11.89	20.43		379.
#10	11		13.26	22.75		376.

page 4 of 4
Survey # 234322

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234327

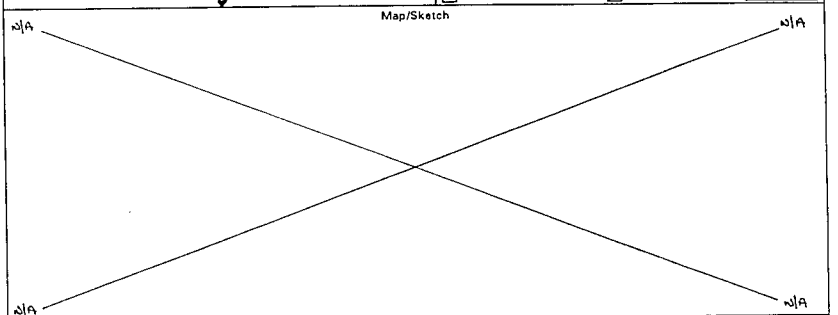
Date	Time	RWP No.(s)	Page	of
May 14, 1996	11:00 - 1300	R-152	1	2

Area/Bldg./Room/Location (Code): 300/309 / Rupture Loop - Tank Farm — F.C. R

Job Description: Coverage to grout burial boxes, third and final pour. N/A

Purpose of Survey (check appropriate box[es]):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No. _____

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE η mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	DOSE RATE OF BOX # 1 (TOP) PRIOR TO BEING GROUTED	c	—	25	—	—	—	—	—	—
2	DOSE RATE OF BOX # 1 (TOP) PRIOR TO BEING GROUTED (S/B)	field	—	6	—	—	—	—	—	—
3	DOSE RATE OF BOX # 2 (TOP) PRIOR TO BEING GROUTED	c	—	30	—	—	—	—	—	—
4	DOSE RATE OF BOX # 2 (S/B) PRIOR TO BEING GROUTED	field	—	8	—	—	—	—	—	—
5	DOSE RATE OF BOX # 3 (TOP) PRIOR / AFTER GROUTED	c	—	<1	—	—	—	—	—	—
6	DOSE RATE OF BOX # 1 (TOP) AFTER GROUTED	c	—	10	—	—	—	—	—	—
7	DOSE RATE OF BOX # 2 TOP AFTER GROUTED	c	—	1	—	—	—	—	—	—
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
△(#) - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R | Page 2 of 2 | Survey No. № 234327

No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	mrad/h
N/A										N/A
N/A										N/A

Comments

Third and final grouting completed. No problems were encountered. N/A

Samples Counted with portable instruments for N/A minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	N/A	N/A	N/A	N/A	N/A
Serial No.	6207	N/A					
Efficiency	100%						
Correction Factor	1						

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) N/A

RSR No. N/A | . . . Contamination - Skin N/A | Procedure: WHC-IP-0718 Appendix I. 2.1

. . . Contamination - Clothing N/A | Other(s) N/A

HPT:

Payroll No.: 95906

Name (Print): C R Meineke

Signature: C R Meineke

First-Line HP Manager:

Date: 5-17-96 | Payroll No.: 95641

Name (Print): G. A. DAVIS

Signature:

BD-6000-010R (03/95)

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234328

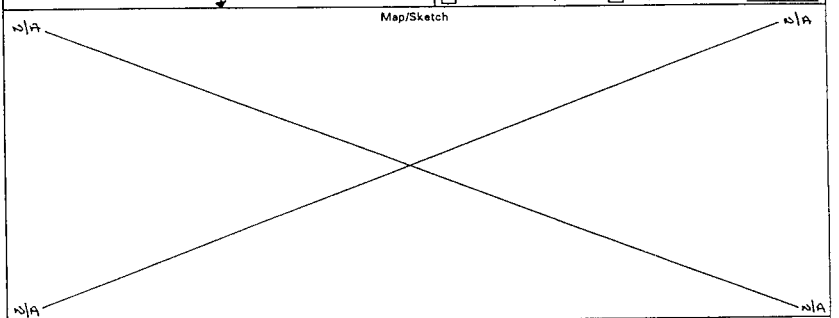
Date	Time	RWP No.(s)	Page
May 15, 1996	1230-1500	R-150 Rev 001	1 of 3

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop - Tank Farm — F.C.: R.

Job Description: Coverage to remove shoring from around burial boxes and perform radiological surveys. N/A

Purpose of Survey (check appropriate box[es]):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No. ____

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	MAX DOSE RATE OF BOX #1 (ON SIDE)	C.	—	130	—	—	—	<1000	<D	—
2	Box # 1 1'	30cm	—	95	—	—	—	<1000	<D	—
3	Box # 1. 3'	90cm	—	15	—	—	—	<1000	<D	—
4	MAX DOSE RATE OF BOX #2 (ON SIDE)	C.	—	180	—	—	—	<1000	<D	—
5	Box # 2	30cm	—	90	—	—	—	<1000	<D	—
6	Box # 2.	90cm	—	23	—	—	—	<1000	<D	—
7	Box # 3	C.	—	<1	—	—	—	<1000	<D	—
N/A										
N/A										

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
<#> - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R. | Page 2 of 3 | Survey No. Nº 234328

No.	Description	Dist.	DOSE RATE: β (non-pen) mrad/h	γ (pen) mR/h	n mrem/h	CONTAMINATION LEVELS: Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
N/A										N/A
N/A										N/A

Comments

Moved along to perform dose rate surveys. No problems were encountered. N/A

Samples Counted with portable instruments for 1.25 minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	Surveyor X	N/A	N/A	N/A	N/A
Serial No.	6202	1206/1521	2871				
Efficiency	100%	10%	14%				
Correction Factor	1	10	7				

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) N/A

RSR No. N/A | . . . Contamination - Skin N/A | Procedure: WHC-IP-0718 Appendix X. 2.1

. . . Contamination - Clothing N/A | Other(s) N/A

HPT:

Payroll No.: 95906

Name (Print): C Rmeineke

Signature: C Rmeineke

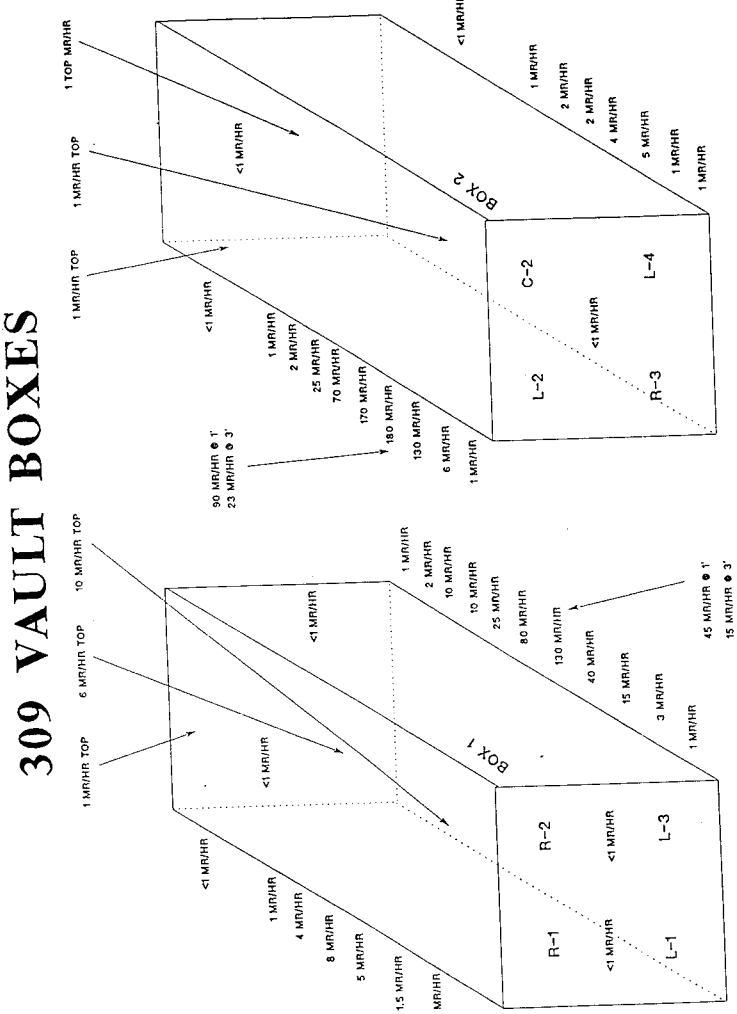
First-Line HP Manager:

Date: 5-17-96 | Payroll No.: 95691

Name (Print): G. A. DAVIS

Signature:

BD-6000-010R (03/95)


309 VAULT BOXES
BOX 1
BOX 2
R-1
R-2
L-1
L-3
L-2
C-2
R-3
L-4
1 MR/HR TOP
6 MR/HR TOP
10 MR/HR TOP
1 TOP MR/HR
1 MR/HR TOP
<1 MR/HR
1 MR/HR
4 MR/HR
8 MR/HR
5 MR/HR
1.5 MR/HR
2 MR/HR
10 MR/HR
25 MR/HR
80 MR/HR
130 MR/HR
40 MR/HR
15 MR/HR
3 MR/HR
45 MR/HR @ 1'
15 MR/HR @ 3'
90 MR/HR @ 1'
23 MR/HR @ 3'
70 MR/HR
170 MR/HR
180 MR/HR
130 MR/HR
6 MR/HR
2 MR/HR
4 MR/HR
5 MR/HR
HPT
Date 5-15-96

Information Only

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234333

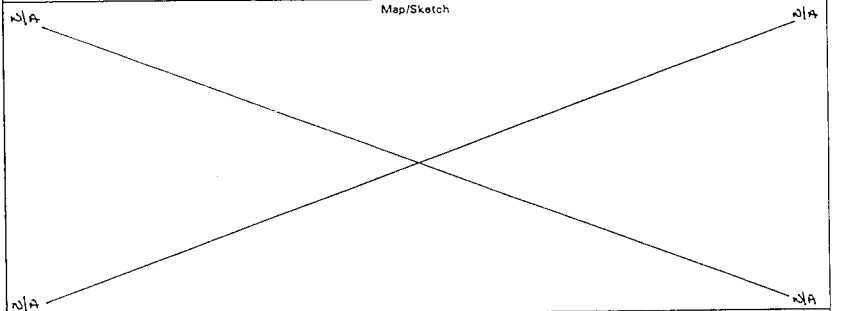
Date	Time	RWP No.(s)	Page
May 16, 1996	0630 - 1100	R-150 Rev 001	1 of 2

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop Vault - Tank Farm — F.C.: R

Job Description: Coverage to finish putting nuts/bolts/washers on the thie Burial boxes. N/A

Purpose of Survey (check appropriate box(es)):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No. _____

Map/Sketch



No.	Description	Dist.	DOSE RATE: β (non-pen) mrad/h	DOSE RATE: γ (pen) mR/h	DOSE RATE: η mrem/h	CONTAMINATION LEVELS: Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	mrad/h
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
△# - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. 12 | Page 2 of 2 | Survey No. № 234333

No.	Description	Dist.	DOSE RATE: β (non-pen) mrad/h	γ (pen) mR/h	n mrem/h	CONTAMINATION LEVELS: Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	max dose rate on top-box	c	—	10	—	—	—	—	—	—
2	whole body DOSE RATE on top-box	field	—	2.5	—	—	—	—	—	—
3	max dose rate on side	c	—	180	—	—	—	—	—	—
4	side 3' from box	90cm field	—	23	—	—	—	—	—	—
N/A										N/A
N/A										N/A

Comments

See survey report # 234328 — for additional radiological readings. Most of the work was done from the top of the burial box. Box # 3 is <0.5 mrem/hr at top, Box # 2 reads 1 mrem/hr at top and Box # 1 general area is 1 mrem/hr with two spots reading 6 & 10 mrem/hr at c. No whole body - 0 person mrem received. Cleaned up work site. N/A

Samples Counted with portable instruments for N/A minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	N/A	N/A	N/A	N/A	N/A
Serial No.	6202	N/A					
Efficiency	100%						
Correction Factor	1						

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) N/A

RSR No. N/A | . . . Contamination - Skin N/A | Procedure: WHC-IP-0718 Appendix I 2.1

. . . Contamination - Clothing | Other(s) N/A

HPT:

Payroll No.: 95906

Name (Print): C R Meinecke

Signature: C R Meinecke

First-Line HP Manager:

Date: 5-17-96 | Payroll No.: 95641

Name (Print): G. A. DAVIS

Signature:

BD-6000-010R (03/95)

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234345

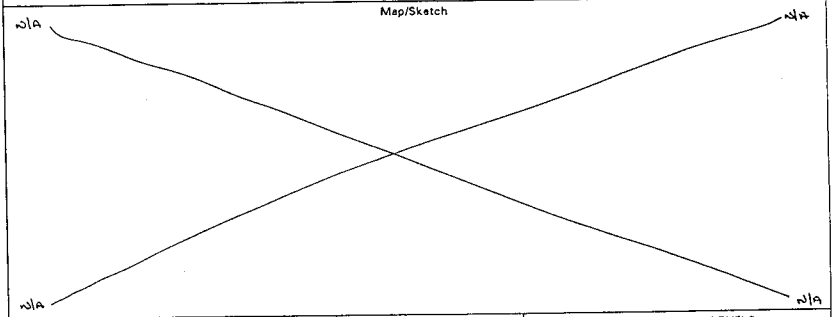
Date	Time	RWP No.(s)	Page
May 22, 1996	0800 - 0900	N/A	1 of 2

Area/Bldg./Room/Location (Code): 300 / 309 / Containment — F.C.: R.

Job Description: Coverage to put potentially contaminated dried paint material from Rupture Loops vault stabilization into a drum. N/A

Purpose of Survey (check appropriate box[es]):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No. ____

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	Paint cans, rollers, plastic	C	—	—	—	<5000	<500	<D	<D	—
2	Gloves, step-off-pad waste	C	—	—	—	<5000	<500	<D	<D	—
3	Dose Rate of 2 drums (filled)	C	—	<0.5	—	—	—	<D	<D	—
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
△# - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R | Page 2 of 2 | Survey No. Nº 234345

No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
N/A										N/A
N/A										N/A

Comments < D = two audible counts above background.
Paint cans, rollers, paint trays were being stored in two plastic bags inside the Radioactive Material Area, 309 building containment. The paint equipment was dirt so it was put into two waste drums. No problems were encountered. N/A

Samples Counted with portable instruments for .25 minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	Surveyor X	N/A	N/A	N/A	N/A
Serial No.	6847	1452/414	2201				
Efficiency	100%	10%	14%				
Correction Factor	1	10	7				

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) N/A

RSR No. N/A | . . . Contamination - Skin N/A | Procedure: N/A

. . . Contamination - Clothing N/A | Other(s) N/A

HPT:
Payroll No.: 95906
Name (Print): CR Meinecke
Signature: CR Meinecke

First-Line HP Manager:
Date: 6-24-96 | Payroll No.: 95611
Name (Print): G. A. DAVIS
Signature:

BD-6000-010R (03/95)

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234349

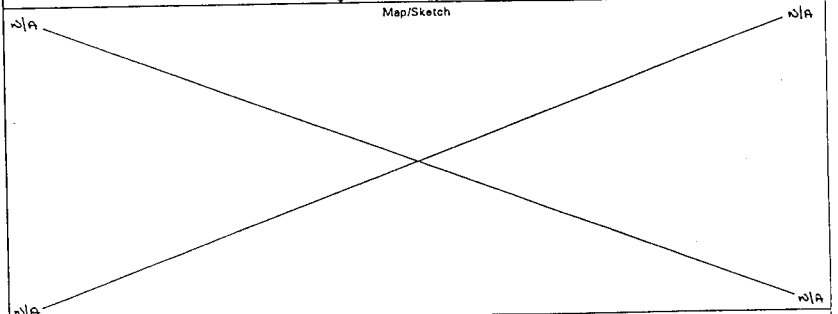
Date: May 23, 1996 | Time: 0630-1500 | RWP No.(s): R-150 Rev 001 | Page 1 of 2

Area/Bldg./Room/Location (Code): 300 / 309 / Rupture Loop - Tank Farm | F.C.: R.

Job Description: Coverage to close up Rupture Loop Jacket and torque burial bolts. N/A

Purpose of Survey (check appropriate box(es)):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No.

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	Map on box # 1	c	—	140	—	—	—	—	—	—
2	Map on box # 2	c	—	210	—	—	—	—	—	—
3	Map on box # 3	c	—	<1	—	—	—	—	—	—
4	whole body dose - general	field	—	5	—	—	—	—	—	—
5	plastic from base for coverblocks	c	—	—	—	<5000	<500	<D	<D	—
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
 - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R. | Page 2 of 2 | Survey No. № 234349

No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
N/A										N/A
N/A										N/A

Comments

« D = 2 inches/sec 1/4 inch from item 50% of item surveyed, No audible counts above background. No Radiological problems were encountered. Vault was closed up. N/A

Samples Counted with portable instruments for .25 minutes.

Instr./Probe Model	RO-38 (CP)	E-140/Pancake (GM/Probe)	Surveyor X	N/A	N/A	N/A	N/A
Serial No.	6947	1206/1521	2983 2983				
Efficiency	100%	10%	14%				
Correction Factor	1	10	7				

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) N/A

RSR No. N/A | . . . Contamination - Skin N/A | Procedure: WHC-IP-0718 Appendix I. 2.1

. . . Contamination - Clothing N/A | Other(s) N/A

HPT:
Payroll No.: 95906
Name (Print): CR Meincke
Signature: CR Meincke

First-Line HP Manager:
Date: 5-24-96 | Payroll No.: 95691
Name (Print): G A DAVIS
Signature: G A Davis

BD-6000-010R (03/95)

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234351

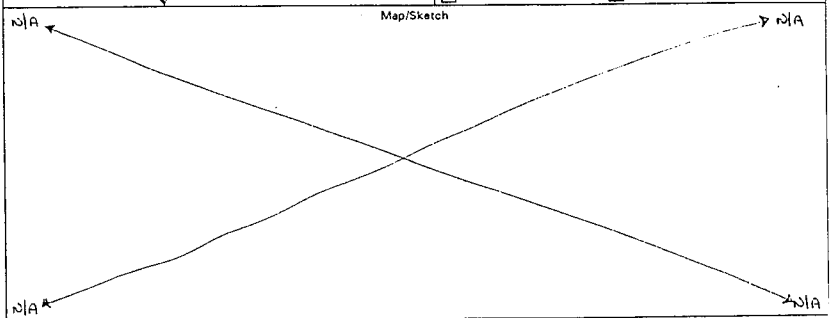
Date: May 29, 1996 | Time: 0800/1000 | RWP No.(s): R-150, Rev 001 | Page 1 of 5

Area/Bldg./Room/Location (Code): 300 / 309 / Tank Farm | F.C.: R.

Job Description: Coverage to finish tightening bolts on burial boxes. Performed Dose Rate and smear survey on burial box. N/A

Purpose of Survey (check appropriate box[es]):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☒ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☐ RM Transfer/Shipment ☐ Required, Task No. _____

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE η mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	Burial Box # 1	C	—	140	—	—	—	< D	< D	—
2	Box # 1	30cm	—	N5	—	—	—	—	—	—
3	Burial Box # 2	C	—	210	—	—	—	< D	< D	—
4	Box # 2	30cm	—	90	—	—	—	—	—	—
5	Burial Box # 3	C	—	< 1	—	—	—	< D	< D	—
6	Box # 3	30cm	—	< 0.5	—	—	—	—	—	—
N/A										N/A
N/A										N/A

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location ⟨#⟩ - Air Sample Location
[#] - Large Area Smear * - Contact Reading
Other N/A

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R. | Page 2 of 5 | Survey No. № 234351

No.	Description	Dist.	DOSE RATE: β (non-pen) mrad/h	γ (pen) mR/h	n mrem/h	CONTAMINATION LEVELS: Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	mrad/h
N/A										N/A
N/A										N/A

Comments: While body dose to tighter belt (one) on box #2 1 mrem/hr, Two minutes. < D = No audible counts above background. Took large area Smears of burial boxes finding < D contamination. I took 30 100 cm² Smears finding < MDA for mini scaler. MDA = 14.4 dpm. Burnie Berks will be shipped out on 5/30/96. N/A

Samples Counted with portable instruments for 1 minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	Surveyor X	MINI SCALER	N/A	N/A	N/A
Serial No.	6547	1592/1674	2983	5226/132			
Efficiency	100%	10%	14%	30%			
Correction Factor	1	10	7	3.33			

ADDITIONAL REPORTS

RPR No. N/A | Sample Counter Log(s) R-05291996-219

RSR No. N/A | ... Contamination - Skin N/A | Procedure: WHC-IP-0719 Appendix I, 2.1

... Contamination - Clothing N/A | Other(s) N/A

HPT:
Payroll No.: 95906
Name (Print): CR Meinecke
Signature: CR Meinecke

First-Line HP Manager:
Date: 5-29-96 | Payroll No.: 93641
Name (Print): C.A. [illegible]
Signature: [illegible]

BD-6000-010R (03/95)

WHC RC DAILY SWIPE COUNTER LOG

Log No. (FC-MMDDYYYY-P): R-05291996-219

Counter:

Alpha: 5226/MS-3 (Instrument ID No./Model) | 182 (Detector ID No.) | .30/3.33 (E_C/CF) | 1/5 (N_B (counts)/T_B (min.)) | .2 (R_B (cpm)) | 1 (T_G (min)) | 14.4 (MDA (dpm)) | 300 5/29/96 dpm 309/323/219 (Counter Location (i.e., Area/Facility/Room))

Beta: N/A (Instrument ID No./Model) | (Detector ID No.) | (E_C/CF) | (N_B (counts)/T_B (min.)) | (R_B (cpm)) | (T_G (min)) | (MDA (dpm)) | (Counter Location (i.e., Area/Facility/Room))

No.	*Identify Swipe (Location, Serial No., etc.)	T_S (Start Time)	N_G (counts) α	N_G (counts) β	R_N (cpm) α	R_N (cpm) β	A (**dpm/100 cm²) α	A (**dpm/100 cm²) β	HPT: Signature and Payroll No.	Comments	Survey No.
1	Burial Box #1 north end	1014	1	N/A	.8	N/A	2.6	N/A	CPmeineke 95906	OK	234351
2	Box #1 northend	1015	0		0		0		CPmeineke 95106	OK	234351
3	Box #1 west side	1017	0		0		0		CPmeineke 95106	OK	234351
4	Box #1 west side	1018	1		.8		2.6		CPmeineke 95106	OK	234351
5	Box #1 south end	1019	0		0		0		CPmeineke 95906	OK	234351
6	Box #1 south end	1020	1		.8		2.6		CPmeineke 95106	OK	234351
7	Box #1 east side	1022	0		0		0		CPmeineke 95906	OK	234351
8	Box #1 east side	1023	0		0		0		CPmeineke 95906	OK	234351
9	Box #1 Top	1025	0		0		0		CPmeineke 95906	OK	234351
10	Box #1 Top	1027	1		.8		2.6		CPmeineke 95906	OK	234351
11	Burial Box #2 north end	1029	0		0		0		CPmeineke 95106	OK	234351
12	Burial Box #2 north end	1031	0		0		0		CPmeineke 95106	OK	234351
13	Box #2 west	1035	0		0		0		CPmeineke 95106	OK	234351
14	Box #2 west	1036	0		0		0		CPmeineke 95106	OK	234351
15	Box #2 south	1037	0		0		0		CPmeineke 95906	OK	234351
16	Box #2 south	1038	0	↓	0	↓	0	↓	CPmeineke 95106	OK	234351

*NOTE: For Swipes: Indicate approximate size of swipe, area, and location. For Nasal Swipes: Record the employee's name and payroll number, and which nostril was swiped.

**NOTE: Record the approximate smear area, when it is less than 100 cm².

$$MDA = \frac{2.71 + \left(3.29\sqrt{R_B T_G\left(1+\frac{T_G}{T_B}\right)}\right)}{E_C T_G}, \quad A = R_N \times CF = \frac{R_N}{E_C}$$

Definitions: E_C = Counting efficiency (cpm/dpm); CF = Correction Factor ($1/E_C$); N_B = Number of background counts observed; T_B = Background counting time (min.); R_B = Background count rate (cpm, N_B/T_B); T_G = Gross (sample) counting time (min.); MDA = Minimum detectable activity (dpm); T_S = Time sample counting started (24-hr clock); N_G = Number of gross (sample) counts observed; R_N = Net sample count rate (cpm, $N_G/T_G - R_B$); A = Activity (dpm/100 cm², unless stated otherwise); dpm = disintegrations per minute; cpm = counts per minute.

Log Validated By (Print Name and Sign): _____ Date: _____

A-6000-273 (12/95)

Survey # 234351
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WHC RC DAILY SWIPE COUNTER LOG

Log No. (FC-MMDDYYYY-P): R-05291996-219 | Page: 2 of 2

Counter:

Alpha:	Detector ID No.	E_C/CF	N_B (counts)/T_B (min.)	R_B (cpm)	T_G (min)	MDA (dpm)	Counter Location (i.e., Area/Facility/Room)
5226 / MS-3 Instrument ID No./Model	152	.30/3.33	1/5	.2	1	14.4	~~300~~ 5/24/96 cpm ~~328~~/325/2.19
Beta: N/A							
Instrument ID No./Model	Detector ID No.	E_C/CF	N_B (counts)/T_B (min.)	R_B (cpm)	T_G (min)	MDA (dpm)	Counter Location (i.e., Area/Facility/Room)

No.	*Identify Swipe (Location, Serial No., etc.)	Ts (Start Time)	N_G (counts) α	N_G (counts) β	R_N (cpm) α	R_N (cpm) β	A (**dpm/100 cm²) α	A (**dpm/100 cm²) β	HPT: Signature and Payroll No.	Comments	Survey No.
1	Burial Box #2 east	1040	0	N/A	0	N/A	0	N/A	CR Jemieke 95906	OK	234351
2	Box # 2 east	1042	0		0		0		CR Jemieke 95906	OK	234351
3	Box # 2 top	1043	0		0		0		CR Jemieke 95906	OK	234351
4	Box # 2 top	1044	0		0		0		CR Jemieke 95906	OK	234351
5	Burial Box #3 north	1046	0		0		0		CR Jemieke 95906	OK	234351
6	Box # 3 north	1048	0		0		0		CR Jemieke 95906	OK	234351
7	Box # 3 west	1050	0		0		0		CR Jemieke 95906	OK	234351
8	Box # 3 west	1051	1		.8		2.6		CR Jemieke 95906	OK	234351
9	Box # 3 south	1053	0		0		0		CR Jemieke 95906	OK	234351
10	Box # 3 south	1054	1		.8		2.6		CR Jemieke 95906	OK	234351
11	Box # 3 east	1055	0		0		0		CR Jemieke 95906	OK	234351
12	Box # 3 east	1056	1		.8		2.6		CR Jemieke 95906	OK	234351
13	Box # 3 top	1058	1		.8		2.6		CR Jemieke 95906	OK	234351
14	Box # 3 top	1059	0		0		0		CR Jemieke 95906	OK	234351
15	N/A	N/A	N/A		N/A		N/A		N/A	N/A	N/A
16	N/A	N/A	N/A		N/A		N/A		N/A	N/A	N/A

*NOTE: For Swipes: Indicate approximate size of swipe, area, and location. For Nasal Swipes: Record the employee's name and payroll number, and which nostril was swiped.

**NOTE: Record the approximate smear area, when it is less than 100 cm².

$$MDA = \frac{2.71 + \left(3.29\sqrt{R_B T_G\left(1+\frac{T_G}{T_B}\right)}\right)}{E_C T_G}, \quad A = R_N \times CF = \frac{R_N}{E_C}$$

Definitions: E_C = Counting efficiency (cpm/dpm); CF = Correction Factor ($1/E_C$); N_B = Number of background counts observed; T_B = Background counting time (min.); R_B = Background count rate (cpm, N_B/T_B); T_G = Gross (sample) counting time (min.); MDA = Minimum detectable activity (dpm); T_S = Time sample counting started (24-hr clock); N_G = Number of gross (sample) counts observed; R_N = Net sample count rate (cpm, $N_G/T_G - R_B$); A = Activity (dpm/100 cm², unless stated otherwise); dpm = disintegrations per minute; cpm = counts per minute.

Log Validated By (Print Name and Sign): _____ Date: _____

A-6000-273 (12/95)

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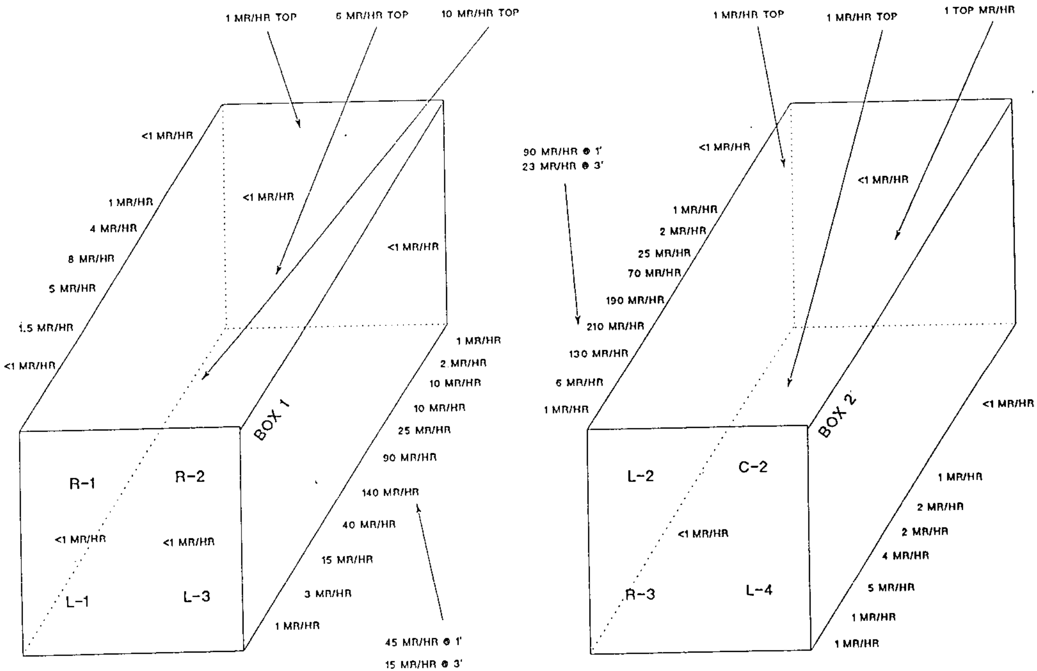
309 VAULT BOXES



309BOXLGAL 5/15/96

HPT C[illegible], Date 5-29-96

Survey # 234351
page 5 of 5

NOTE: BURIAL BOX # 3 <1 mrem

Westinghouse Hanford Company - Radiological Control
RADIOLOGICAL SURVEY REPORT

Survey No. Nº 234355

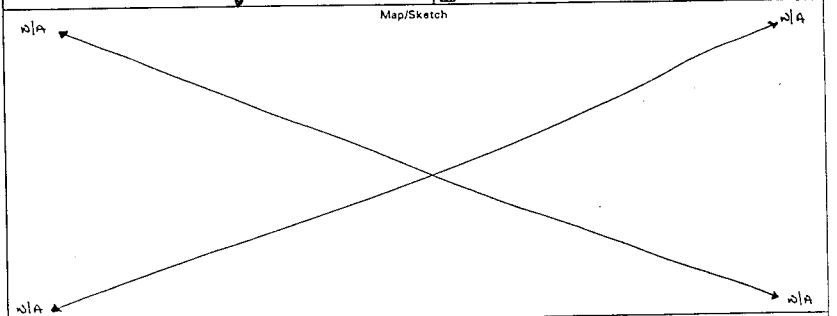
Date: May 30, 1996 | Time: 1500/2100 | RWP No.(s): R-161 | Page 1 of 2

Area/Bldg./Room/Location (Code): 300 / 309 / Tank Farm | F.C.: R

Job Description: Coverage to weight and load burial boxes for shipment. N/A

Purpose of Survey (check appropriate box(es)):
Contamination Incident: ☐ Skin, ☐ Clothing, ☐ Spill
Alarm Response: ☐ CAM, ☐ ARM(RAM), ☐ PSD
☐ HRA/VHRA Work ☐ Job Coverage ☐ Other
☐ Exposure Incident ☐ Material Release
☒ RM Transfer/Shipment ☐ Required, Task No. ____

Map/Sketch



No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
1	Burial Box # 1	C	—	140	0	—	—	<D	<D	—
2	Box 1	1 meter	—	15 23 ~~25~~	—	—	—	—	—	—
3	Box 1 Vehicle - 6'	2 meters	—	3.5	—	—	—	—	—	—
4	Burial Box # 2	C	—	200	0	—	—	<D	<D	—
5	Box 2	1 meter	—	23 ~~25~~ 18	—	—	—	—	—	—
6	Box 2 Vehicle 6'	2 meters	—	7	—	—	—	—	—	—
7	Box 3	C	—	<0.5	0	—	—	<D	<D	—
8	Box # 1 Side of Vehicle	C	—	22	—	—	—	—	—	—
9	Box # 2 Side of Vehicle	C	—	70	—	—	—	—	—	—
N/A										

Continued on page 2

Air Sample Results (μCi/ml)

	BZ	GA	Initial	Decay
α 1	N/A			N/A
β 1				
α 2				
β 2	N/A			N/A

Legend
(#) - Smear Location
△# - Air Sample Location
[#] - Large Area Smear
* - Contact Reading
Other N/A

BD-6000-010 (03/95)

WHC - Radiological Control
RADIOLOGICAL SURVEY REPORT

F.C. R | Page 2 of 2 | Survey No. № 234355

No.	Description	Dist.	DOSE RATE β (non-pen) mrad/h	DOSE RATE γ (pen) mR/h	DOSE RATE n mrem/h	CONTAMINATION LEVELS Direct (dpm/probe) β	Direct (dpm/probe) α	Smear (/100cm²) β (dpm)	Smear (/100cm²) α (dpm)	Smear (/100cm²) mrad/h
n/a										n/a
n/a										n/a

Comments

#8 Whole Body dose rate to tie box down, approximately 10 min.
#9 Whole Body dose rate to tie box down, approximately 10 min.
#7 Whole Body dose rate to tie box down.
Took large area swipes of burial boxes. Areas were tech. smeared
5/25/96 Sample Log R-05291996-219. n/a

Samples Counted with portable instruments for .25 minutes.

Instr./Probe Model	RO-3B (CP)	E-140/Pancake (GM/Probe)	Surveyor X	Snoopy	n/a	n/a	n/a
Serial No.	6947	1892/1674	2983	3041			
Efficiency	100%	10%	14%	100%			
Correction Factor	1	10	7	1			

ADDITIONAL REPORTS

RPR No. n/a Sample Counter Log(s) n/a

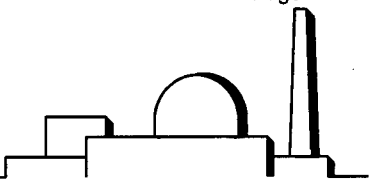
RSR No. #1 36827 / #2 36828 / #3 36829 ... Contamination - Skin n/a Procedure: WHC-IP-0718 3.2.1 Appendix I. 2.1

... Contamination - Clothing n/a Other(s) n/a

HPT:
Payroll No.: 95904
Name (Print): C Remeincere
Signature: C Remeincere

First-Line HP Manager:
Date: 5-3-96 Payroll No.: 93641
Name (Print): G. A. DAVIS
Signature:

BD-6000-010R (03/95)



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ACRONYMS AND ABBREVIATIONS

FERTF	Fuel Elements Rupture Test Facility
g	grams
IX	ion exchange
kg	kilograms
MSDS	material safety data sheet
nCI	nano-curies
NDA	nondestructive assay
NDE	nondestructive examination
PNNL	Pacific Northwest National Laboratory
PRTR	Plutonium Recycle Test Facility
RLAIX	Rupture Loop Annex Ion Exchange
TRU	transuranic (waste)

1.0 INTRODUCTION

1.1 OBJECTIVE

This report provides documentation for the final characterization, packaging, and disposal of waste generated as a result of the cleanup activity in the Rupture Loop Annex Ion Exchange (RLAIX) vault.

1.2 WORK SCOPE

The work scope involved packaging, shipping, and disposal of all waste generated during RLAIX vault cleanup.

1.3 BACKGROUND

The 309 Plutonium Recycle Test Reactor (PRTR) used a contained system for testing called Fuel Element Rupture Test Facility (FERTF). The FERTF was a pressurized, light-water-cooled loop, which used one of the 85 process tubes within the main, heavy-water-cooled PRTR calandria. It could be operated in a recirculating or once through cooling mode. The FERTF was a pilot irradiation facility to test new fuel element designs and new operating regimes. Many of its tests involved testing of pre-defective fuel elements, containing natural uranium and 1% to 4% PuO_2 (plutonium oxide), with pinhole breaks to study the stability of various defected material under irradiation. The RLAIX vault design had positions for three active ion exchange (IX) columns and storage space for 12 spent IX columns. The operating IX columns were connected in series for removal of the fuel and fission products in the FERTF coolant.

The RLAIX cleanup test loop and the PRTR main cleanup system were both contaminated with fuel residual and fission products. This contamination was filtered out of the system using the IX columns. Sample results from the PRTR IX columns resin indicated that the contents are not hazardous. Similar radiological contents are expected since the cleanup system IX columns in both vaults have similar resin media.

Entry and characterization were performed as documented in WHC-SD-NEL-ER-002, *RLA Ion Exchange Vault Entry and Characterization*. Table 1 summarizes the results of that report, as well as final characterization that occurred subsequent to the report.

Table 1 Characterization Summary

Item	IX Weight: Design Empty/ Actual (kg)	Peak Dose Rate (mR/hr)	Resin?	Liquid?	TRU Waste?	Low-Level Waste?	Dangerous Waste?	Notes
IX R1	-	15	YES	YES	NO	YES	NO	3
IX R2	-	100	YES	YES	NO	YES	NO	3
IX R3	-	1,300	YES	YES	NO	YES	NO	2,3,4
IX R4	-	35	YES	NO	NO	YES	NO	3,6
IX R5/ RLIX-1	-	2	YES	YES	NO	YES	NO	3
IX L1	-	5	YES	YES	NO	YES	NO	3
IX L2	-	35	YES	YES	NO	YES	NO	3
IX L3	-	2,500	YES	YES	NO	YES	NO	2,3,4
IX L4	-	30	YES	NO	NO	YES	NO	2,3,4,6
IX C2	-	35	YES	NO	NO	YES	NO	2,3,4,6
IX C3	227/240	2	NO	NO	NO	YES	NO	1,3,5,7
IX C4	82/82	3	NO	NO	NO	YES	NO	1,3,5,7
Filter Assembly and Debris	-	bckgrnd	NO	?	NO	YES	NO	

(1) The estimated design weight without resin of the IX is based upon H-3 drawings (Attachment I).

(2) Uncertainty total for transuranic (TRU) waste is based on the square root of the sum of the squares of individual uncertainties.

(3) Due to the similarity of the RLAIX Vault and the PRTR IX Vault's resin type, cleanup process, and common accidental test failure, it has been concluded that the data presented in WHC-SD-NEL-ER-002 for the PRTR IX columns sample analysis is a valid source in the determination that the RLAIX column contents would not be regulated as dangerous waste.

(4) The IX column contains less than 100 nCi-alpha/g TRU material, therefore it is not TRU waste, but is designated as low-level waste.

(5) Based upon the process knowledge that the IX column was not used along with the fact that the estimated design weight and actual weight of the IX column are approximately the same, the IX column is empty of resin and liquid.

(6) Based upon nondestructive examination (NDE), the IX is empty of liquid.

(7) When columns C3 and C4 were moved to different positions away from columns L3, R3, and L4, C4 was recounted and shown to have no TRU. This is contrary to the initial count done when the IX columns were in their original positions. The initial count is contributed to shine from columns R3, L3, and L4. The dose rates of columns C3 and C4 dropped to background levels after moving them to the new positions in the RLAIX vault. Based upon this and the fact that columns C3 and C4 were shown to be empty, columns C3 and C4 have no TRU.

2.0 CHARACTERIZATION

2.1 PHYSICAL CHARACTERIZATION

The waste that was removed from the RLAIX vault consisted of 12 IX columns (10 of which contained resin); piping, connector heads, jumpers, valving, metal blow down filter, other metal debris, wood, plastic, rubber, and sweepings off of the floor of the RLAIX vault (dirt, rust, scrap material); equipment used to pump liquids from the IX columns; small quantities of inorganic, nonregulated absorbed liquids; and other non-regulated materials. Metal materials are made of aluminum, carbon steel, and stainless steel. Attachment I provides additional physical characterization information.

2.2 RADIOLOGICAL CHARACTERIZATION

The IX columns received a Gamma analysis with results showing ^{60}Co (cobalt), ^{137}Cs (cesium), ^{90}Sr (strontium). The value for ^{90}Sr was derived from a ratio of ^{90}Sr to ^{137}Cs based on laboratory analysis of PRTR IX columns. The TRU distribution was a result of a Pacific Northwest National Laboratory (PNNL) assay and the decay calculations from the documented original fuel burn in the reactor (WHC-SD-NEL-ER-002). The resulting isotopic distributions consisted of ^{241}Am (americium), ^{237}Np (neptunium), ^{233}Pa (protactinium), ^{234}U (uranium), ^{235}U, ^{236}U, ^{238}U, ^{238}Pu (plutonium), ^{239}Pu, ^{240}Pu, ^{241}Pu, and ^{242}Pu. This is an industrial standard method for isotopic distribution. Attachment II provides additional radiological characterization information.

The IX columns were segregated into three waste container boxes and the curies were totaled for the point source and category calculations. Refer to Attachment II for radiological waste category calculations, per WHC-EP-0063-4, *Hanford Site Solid Waste Acceptance Criteria*. Four IX columns were placed in each 12.23 m^3 (432 ft^3) [1.83m x 1.83m x 3.66m (6' x 6'x 12')] waste container box. Waste container boxes #1 and #2 were category III and waste container box #3 was category I. Box #1 contained IX columns L1, L3, R1, and R2 (category III). Box #2 contained IX columns L2, L4, C2, and R3 (category III). Box #3 contained IX columns C3, C4, R4, R5/RLIX-1, and other debris taken from the RLAIX Vault (category I). All waste added to box #3 that was not an IX column contained less than 1% of the IX columns activity and therefore, had no activity contribution to the waste container box.

2.3 CHEMICAL CHARACTERIZATION

The cation RLAIX column (RLIX-1) contained an AMBERLITE® IRN-163 resin. The mixed bed RLAIX column (RLIX-2) contained an AMBERLITE® IRN-154 resin, which is a combination of AMBERLITE® IRN-163 and AMBERLITE® IRN-78 resins. The de-oxygenator (RLIX-3) contained a Duolite S-10 and AMBERLITE® IRN-154 mixture. These resins are not regulated as dangerous waste. Analysis from the PRTR IX column resins was used as historical knowledge for the RLAIX columns due to the similarity of the resins, water process, and common accidental test failure of the total system. Supporting document WHC-SD-NEL-ER-002 contains PRTR resin material safety data sheets (MSDS) and PRTR resin analysis results. The analysis that was performed on the PRTR IX column resins and shown to be non-hazardous, was used to designate the RLAIX resins as non-hazardous. The final waste designation per WAC 173-303 is shown in Attachment III.

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3.0 SEGREGATION AND PACKAGING

Segregation of the waste into the proper containers was performed using work procedure 309-WP-96-002, *Rupture Loop Annex Ion Exchange (RLAIX) Vault Cleanout.* This procedure also ensured the packaging requirements were met.

The IX columns were packaged in three Type A metal boxes. The reference for the packaging is WHC-SD-TP-SEP-047, *Safety Evaluation for Packaging for Onsite Transfer of 12 Ion Exchange Columns.*

The waste, as packaged, was classified as low-level waste. The IX columns placed in waste container boxes #1 and #2 were stabilized with grout to meet the requirements for category III waste disposal. The grout formulation was grout mix number 4 as required by internal memo sent from B. A. Mayancsik to E. J. Bitten, "Plutonium Recycle Test Facility Ion Exchange Columns Stabilization," dated May 6, 1996. It was not necessary to stabilize waste container box #3, since it was category I waste. However, the grout was used in the same manner in waste container box #3 to meet void space requirements.

The IX columns had as much liquid removed as was reasonably achievable using a peristaltic pump. The only IX columns that would have had liquid remaining after pumping were the IX columns with spargers. Based on process knowledge, the maximum free liquid that would have remained in a given sparger IX column is 26.5 liters (7 gallons). Polymeric sorbent (RADSORB) was added to all of the IX columns in sufficient amounts to sorb 53 liters (14 gallons) of liquid. The IX columns were then oriented horizontally to allow all the liquid to drain into the sorbent.

Plastic liners were not used to line the boxes. All waste in waste container boxes #1, #2, and #3 were encased in at least 5.08cm (2") of grout between the waste and the inner surface of each box to provide one containment barrier. The waste container box itself served as the other containment barrier.

The maximum free void space in each IX column that contained resin was 0.13m^3 (4.56 ft^3), based on process knowledge. This calculates to be a total free void space in each 12.23m^3 (432 ft^3) waste container box of 4.22%. This is below the maximum free void space limit of 10% set by WHC-EP-0063-4. Since the resin chambers in IX columns C3 and C4 were empty of resin, the void spaces were also filled with the same grout used in the waste container boxes.

All waste in waste container boxes #1 and #2 were encased in at least 5.08cm (2") of grout to meet stabilization requirements. Grout was not required for stabilization in waste container box #3. There was no aluminum in contact with the grout in waste container boxes #1 and #2. Column C4 was the only IX column made of aluminum or with aluminum dunnage, thus, column C4, located in waste container box #3, was in contact with grout.

Waste container boxes #1 and #2 allowed for the off-gassing of hydrogen that is generated in the IX columns. The fill pipe of each IX column was not hermetically sealed. The grout and the Type A box will allow the diffusion of the hydrogen, thus, gas pressurization problems will be nonexistent.

4.0 FINAL WASTE INVENTORY

The total waste that was generated as a result of this cleanup operation is documented in Table 2 below.

Table 2 Final Waste Inventory Summary

Waste	Amount	Treatment, Storage, Disposal Facility
IX Column Category 3 Low-Level Waste	Two 1.8m x 1.8m x3.6m (6' x 6' x 12') boxes.	Hanford Site Low-Level Burial Grounds for disposal.
IX Column and Vault Debris Category 1 Low-Level Waste	One 1.8m x 1.8m x 3.6m (6' x 6' x 12') box.	Hanford Site Low-Level Burial Grounds for disposal.
Additional Low-Level Debris from Cleanup Operation	Two 208 liter (55 gallon) drums.	Accumulated with other 309 facility step-off pad waste.
Radiologically Contaminated Water from IX Columns	Fourteen 208 liter (55 gallon) drums.	340 Facility for storage.
Empty Liquid Drums used in PRTR and RLAIX Vault cleanup operations.	Twenty-One empty 208 liter (55 gallon) drums.	ATG for size reduction. Hanford Site Low-Level Burial Grounds for disposal.

5.0 REFERENCES

Ham, J.E., 1995, *RLA Ion Exchange Vault Entry and Characterization*, WHC-SD-NEL-ER-002, Rev. 0, Westinghouse Hanford Company, Richland, Washington.

Mayancsik, B. A., 1996, internal memo sent to E. J. Bitten, "Plutonium Recycle Test Facility Ion Exchange Columns Stabilization," May 6, 1996, Richland, Washington.

Mercado, M. S., 1996, *Safety Evaluation for Packaging for Onsite Transfer of 12 Ion Exchange Columns*, WHC-SD-TP-SEP-047, Revision 0, Westinghouse Hanford Company, Richland, Washington.

PRTR Transition, 1996, *Rupture Loop Annex Ion Exchange (RLAIX) Vault Cleanout*, 309-WP-96-002, Revision 0, Westinghouse Hanford Company, Richland, Washington.

WAC, 1995, *Dangerous Waste Regulations*, WAC 173-303, Washington Administrative Code, Washington D.C.

WHC, 1996, *Hanford Site Solid Waste Acceptance Criteria,* WHC-EP-0063-4, UC-721, Westinghouse Hanford Company, Richland, Washington.

ATTACHMENT I: Physical Characterization

RLAIX Vault Contents

The items in the RLAIX Vault consist of three types of ion exchange columns that were used in the PRTR Rupture Loop, two types of ion exchange columns that were used in the PRTR Loop, as well as piping, connector heads, jumpers, valving, metal blow down filter, other metal debris, wood, plastic, rubber, and sweepings off the floor (dirt, rust, scrap material).

Process

The ion exchangers were designed to: (1) continuously purify coolant at 10-200 gpm and remove oxygen from coolant at 10 gpm operating in a recirculating mode; (2) remove radioactive materials from the entire coolant stream at 200 gpm during intermittent 6 hour single pass operating periods during failed fuel experiments. Fuel was natural U with 2% or 4% PuO_2 (plutonium-oxide).

Ion Exchangers

Ion exchangers which were used in the RLAIX system included three units: a mixed bed exchanger, a cation exchanger, and a deoxygenating exchanger. The ion exchangers purified and deoxygenated water at a pH of 9-11. Ion exchange resins are in the LiOH form. These ion exchangers and resins are similar in function and use to those from the PRTR vault.

MECHANICAL DATA REFERENCE INFORMATION

RLIX-1 AND RLIX-2
(latest: H-3-14005, reissue)
Cation and Mixed Bed
~3,800 lbs (gross wt.)
10'-10 ½" Max. Height
Shell:
2'4.75" O.D., 8'0" Long
~33 ft^3 Total Volume
Resin Chamber:
4'2.5" Long, 28" I.D.
volume ~18 ft^3
Gravel Chamber:
28.5" Long, 28" I.D.
volume ~10 ft^3

RLIX-1 AND RLIX-2
(pre-1964: H-3-14005, rev. 6)
Cation and Mixed Bed
~3,500 lbs (gross wt.)
11' Max. Height
Shell:
2'4.75" O.D., 8' Long
~33 ft^3 Total Volume
Resin Chamber:
6'6" Long, 28" I.D.
volume 27 ft^3
(Ref HW-61236 sup 5 pg 19)

RLIX-3
Deoxygenator
~1,800 lbs (gross wt.)
11' Max. Height
Shell:
1'9.75" O.D., 8'0" Long
~18 ft^3 Total Volume
Resin Chamber:
6'6" Long, 21" I.D.
volume ~16 ft^3

IX-1 AND IX-4
~230 lbs (empty wt.)
9'10.5" Max. Height
Shell:
2'6" O.D., 6'5" Long
~32 ft^3 Total Volume
Resin Chamber:
4'11" Long 29.75" I.D.
volume ~24 ft^3

IX-2 AND IX-3
~90 lbs (empty wt.)
9'10.5" Max. Height
Shell:
1'6" O.D., 6'5" Long
~12 ft^3 Total Volume
Resin Chamber:
5'6" Long, 17.5" I.D.
volume ~10 ft^3

IX Column	Resin
Cation	AMBERLITE® XE-163 (AMBERLITE® IRN-163) Sulfonated polystyrene/divinylbenzene copolymer
Mixed Bed	AMBERLITE® XE-154 (AMBERLITE®-R IRN-154) (Mixture of AMBERLITE® IRN-163 and AMBERLITE® IRN-78) (AMBERLITE® IRN-78 is a quaternary ammonium hydroxide styrene/divinylbenzene copolymer)
Deoxygenator	AMBERLITE® XE-154 Duolite S-10 3 to 5 Ratio Duolite S-10 is either a phenol/formaldehyde or epoxy condensate resin.)

Physical Examination Results						
IX Column	Drawing Number	Column Type	IX Wt.: Design Empty/ Actual (kg)	Resin?	Liquid?	Notes
R1	H-3-14005	RLIX-1 or RLIX-2	-	YES	YES	1
R2	H-3-14005	RLIX-1 or RLIX-2	-	YES	YES	1
R3	H-3-14005	RLIX-1 or RLIX-2	-	YES	YES	1
R4	H-3-14005	RLIX-1 or RLIX-2	-	YES	NO	1,4
R5/ RLIX-1	H-3-14005	RLIX-1	-	YES	YES	1
L1	H-3-14005	RLIX-1 or RLIX-2	-	YES	YES	1
L2	H-3-14005	RLIX-1 or RLIX-2	-	YES	YES	1
L3	H-3-14005	RLIX-1 or RLIX-2	-	YES	YES	1
L4	H-3-14005	RLIX-1 or RLIX-2	-	YES	NO	1,4
C2	H-3-14006	RLIX-3	-	YES	NO	4
C3	H-3-13990	IX-1 or IX-4	230/240	NO	NO	2,3,4
C4	H-3-13989	IX-2 or IX-3	90/82	NO	NO	2,3,4

(1) Two designs for RLIX-1 and RLIX-2 ion exchangers are present in the RLAIX vault. Early column design (pre-1964) used upper and lower flow distribution grids. The last column design incorporated upper and lower spargers for flow distribution (see H-3-14005, later revision).
(2) The estimated design weight of the IX without resin is based upon the H-3 drawings.
(3) Based upon the process knowledge that the IX was not used, and fact that the estimated design weight of the IX and the actual weight of the IX are approximately the same, the IX is empty of resin and liquid.
(4) Based upon NDE, the IX is empty of liquid.

Filter Assembly

The filter assembly was used during rupture loop decontamination conducted in 1966, (Ref H-3-15245 Shts 1&2, "Rupture Loop Decontamination Details."

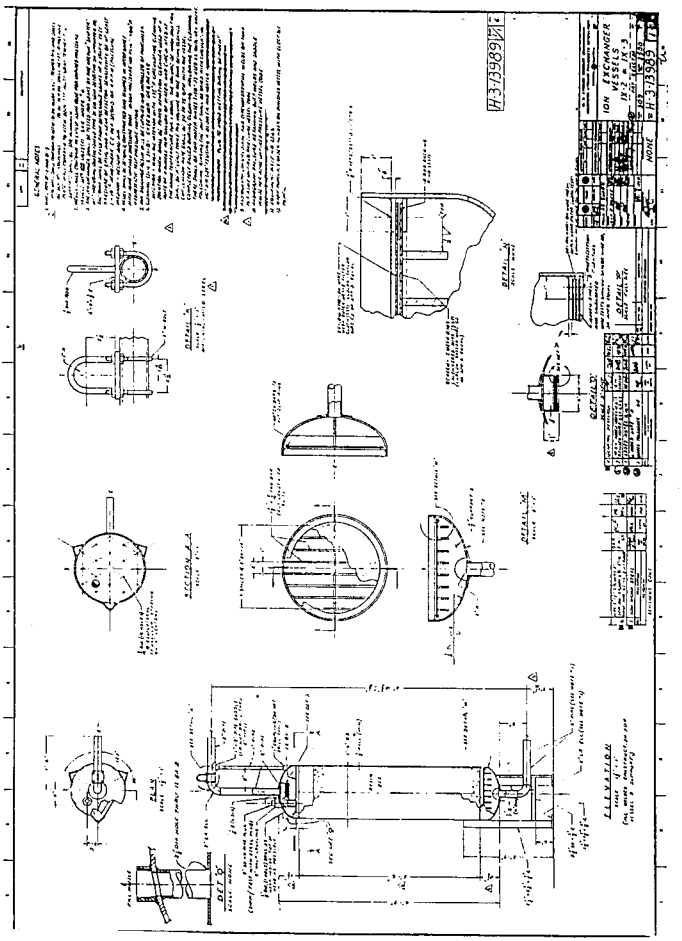
References

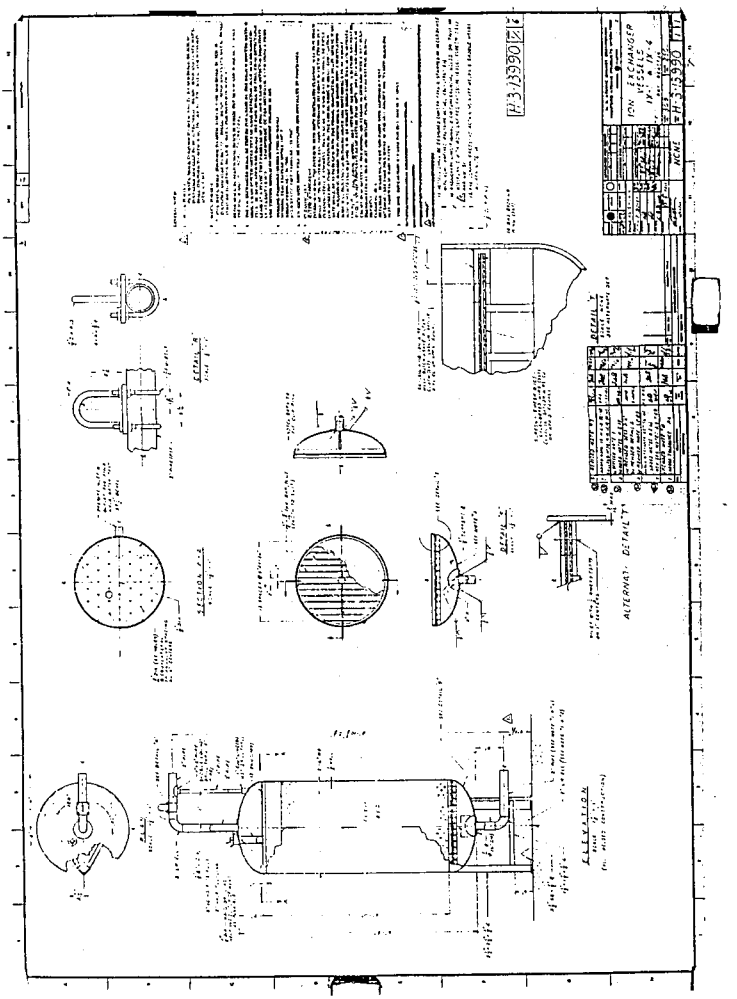
HW-63863, "Design Criteria for PRTR Fuel Element Rupture Test Facility".

HW-61236 Sup5, "PRTR Final Safeguards Analysis, Fuel Element Rupture Testing Analysis".

BNWL-40, "PRTR Fuel Element Rupture Test Facility Capabilities and Project History".

HWS-7928, "Proc. Spec. for Cleanup System Ion Exchangers, PRTR FERTF"





ATTACHMENT II: Radiological Characterization

Battelle

Pacific Northwest Laboratories
Battelle Boulevard
P.O. Box 999
Richland, Washington 99352
Telephone (509) 376-0433

February 20, 1996

J. E. Ham
Westinghouse Hanford Company
P. O. Box 1970
Mail Stop L5-70
Richland, WA 99352

Dear Mr. Ham:

SUPPLEMENTAL RESULTS OF PNNL ASSAY OF 309 BUILDING RUPTURE LOOP IX COLUMNS

Mr. Doug Duvon (WHC) called recently asking me to clarify an activity level provided for ion exchange (IX) column C2 as contained on page 18 of my report to Mr. E. J. Bitten, dated November 10, 1995. The table provides the estimated α-particle activity concentration as measured using the PNNL NDA Passive Neutron Counter. Mr. Duvon pointed out that the activity level exceeded the 100 nCi-α/g level that defines TRU waste on the Hanford site[a].

I pointed out that the α-particle activity levels quoted are based on measured neutron emissions from the IX column and represent conservative values since they are based on weapons-grade PuO_2, which "yields the lowest neutron emission rate of any TRU material that can reasonably be expected in Hanford waste." The IX column in question was not identified in the summary report as exceeding the TRU limit because the PuO_2 in question was known to be fuels-grade PuO_2 (11.65% ^{240}Pu); fuels-grade PuO_2 emits more neutrons per gram than weapons-grade and would be overestimated as a result. In addition, during the last 29 years, 75% of the initial minor quantities of ^{241}Pu, a β-particle emitting isotope with a relatively short radioactive decay half life of 14.4 years, would have decayed to ^{241}Am, an α-particle emitting isotope with a moderate half life of 434 years. The additional α-particle activity would also cause the apparent quantity of weapons-grade PuO_2 to be overestimated.

The purpose of this letter is to attach a revised table of results of the PNNL Passive Neutron Counter based on the actual isotopic ratios present in the failed PRTR fuel, corrected for the build-up of ^{241}Am in the intervening 29 years since fuel fabrication. The plutonium isotopic ratios were provided by Mr. Bruce Cornwell (WHC) as identified in a published Hanford report[b].

The ^{241}Am accounts for roughly 38% of the α-particle activity observed in the IX columns. This additional source of neutrons, together with the higher neutron

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[a] Section 5 of N. P. Willis, "Hanford Site Solid Waste Acceptance Criteria," WHC-EP-0063-4, October 1993.

[b] D. E. Christensen, D. A. Kottwitz, D. R. Oden, and R. P. Matsen, July 1972. "Plutonium Recycle Burnup Data and Results from the Batch Core Experiment," BNWL-1674, Battelle, Pacific Northwest Laboratories, Richland, Washington. Refer to Table IV, page 21, for particulars.

J. E. Ham
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emission rate from the spontaneous fission of the 11.65% ^{240}Pu, led to an estimate of plutonium weight 89% higher than the actual weight. The revised results are provided in Exhibit 1. Please note that the two columns previously identified as exceeding the TRU limit (C3 and C4), still exceed the TRU limit. However, column C2 is now correctly identified as being below the 100 nCi-α/g limit.

Any further questions may be directed to me at Mail Stop P8-08, by cc:Mail, by FAX at 376-2329, or by phone at 376-0405.

Sincerely,

Richard J. Arthur
Sr. Research Scientist

Enclosures & Attachments

cc w/attachments:
PW Griffin, X5-53
DE Robertson, P8-01
MD Winterrose, P8-01
File /LB

Date: 2/20/96 2:56 PM Excel 4.0 File: 9508JXTX.XLS

Results of Passive Neutron Count; PNL Box Assayer Data

ID:	C2	L3	C3	R3	L4	C4
PNL Run No.:	95083104	95090104	95090106	95090105	95083105	95090103
Gross Wt.(kg):	816.5	1520.7	235.9	1520.7	1520.7	81.6
	Activity Level* (nCi-alpha/g)	Activity Level (nCi-alpha/g)	Activity Level (nCi-alpha/g)	Activity Level (nCi-alpha/g)	Activity Level (nCi-alpha/g)	Activity Level (nCi-alpha/g)
Pu-238	3.3	2.5	7.9	0.2	0.7	24.4
Pu-239	36.2	27.3	86.4	2.7	7.7	266.8
Pu-240	17.6	13.2	42.0	1.3	3.7	129.7
Pu-241	0.0	0.0	0.0	0.0	0.0	0.0
Pu-242	0.0	0.0	0.0	0.0	0.0	0.1
Am-241	34.7	26.1	82.8	2.6	7.4	255.4
TRU (nCi-alpha/g)	91.9	69.1	219.2	6.9	19.5	676.3
± 1 σ	± 7.6	± 10.1	± 6.2	± 3.8	± 5.1	± 6.0
Pu-238 (g)	1.58E-04	2.21E-04	1.09E-04	2.20E-05	6.24E-05	1.16E-04
Pu-239 (g)	4.77E-01	6.68E-01	3.29E-01	6.67E-02	1.89E-01	3.51E-01
Pu-240 (g)	6.34E-02	8.88E-02	4.37E-02	8.86E-03	2.51E-02	4.66E-02
Pu-241 (g)	2.72E-03	3.81E-03	1.87E-03	3.80E-04	1.08E-03	2.00E-03
Pu-242 (g)	7.78E-04	1.09E-03	5.36E-04	1.09E-04	3.08E-04	5.72E-04
Am-241 (g)	8.26E-03	1.16E-02	5.69E-03	1.15E-03	3.27E-03	6.08E-03
TRU (g)	0.55	0.77	0.38	0.08	0.22	0.41
	± 0.09	± 0.12	± 0.07	± 0.04	± 0.06	± 0.07

* Transuranic (TRU) "Activity Level" is based upon the assumption of plutonium oxide that is intimately in contact with ion exchange resin composed of 53% oxygen, 22.5% lithium or boron, 20% sodium, and 6% silicon; weapons-grade Pu oxide is a conservative estimate since it yields the lowest neutron emission rate of any TRU material that can reasonably be expected in Hanford waste.

† The plutonium oxide is based upon data found in Table IV of DE Christensen, et al, BNWL-1675 (July after a 29 year decay, the resulting plutonium-isotopic ratio is Pu-238 (0.03%), Pu-239 (87.68%), Pu-240 (11.65%), Pu-241 (0.05%), and Pu-242 (0.14%) and Am-241 (1.52% of Pu wt.)

RLAIX Fuel Isotope Content

Isotope	Column R3 (grams)	Column R3 (curies)	Column L3 (grams)	Column L3 (curies)	Column L4 (grams)	Column L4 (curies)	Column C2 (grams)	Column C2 (curies)
NDA Results (1)	0.12	-	0.89	-	0.28	-	0.64	-
Am-241	0.01	3.23E-02	0.07	2.40E-01	0.02	7.54E-02	0.05	1.72E-01
Np-237	<0.01	3.13E-07	<0.01	2.32E-06	<0.01	7.31E-07	<0.01	1.67E-06
Pa-233	<0.01	3.13E-07	<0.01	2.32E-06	<0.01	7.31E-07	<0.01	1.67E-06
U-234	<0.01	2.04E-06	<0.01	1.51E-05	<0.01	4.76E-06	<0.01	1.09E-05
U-235	0.04	9.01E-08	0.31	6.69E-07	0.10	2.10E-07	0.22	4.81E-07
U-236	<0.01	4.65E-08	0.01	3.45E-07	<0.01	1.09E-07	<0.01	2.48E-07
U-238	6.22	2.09E-06	46.12	1.55E-05	14.51	4.88E-06	33.17	1.12E-05
Pu-238	<0.01	5.73E-04	<0.01	4.25E-03	<0.01	1.34E-03	<0.01	3.06E-03
Pu-239	0.11	6.62E-03	0.79	4.91E-02	0.25	1.55E-02	0.57	3.53E-02
Pu-240	0.01	2.99E-03	0.10	2.22E-02	0.03	6.99E-03	0.07	1.60E-02
Pu-241	<0.01	6.11E-02	<0.01	4.53E-01	<0.01	1.43E-01	<0.01	3.26E-01
Pu-242	<0.01	8.59E-07	<0.01	6.37E-06	<0.01	2.00E-06	<0.01	4.58E-06

(1) Conservative values calculated by using the nondestructive assay (NDA) value and adding the maximum error.

RLAIX Fission and Activation Product Isotope Content

IX Column	Cs^{137} (Ci)	Sr^{90} (Ci)	Co^{60} (Ci)	Notes
R1	1.0094E-02	1.6E-03	8.19E-05	1
R2	4.66546E-01	7.5E-02	7.52E-04	1
R3	1.1	1.8E-01	1.567E-03	1
R4	3.7635E-02	6.0E-03	5.32E-04	1
R5/RLIX-1	0.0	0.0	7.7E-05	1
L1	4.302E-03	6.9E-04	4.2E-05	1
L2	1.3613E-01	2.2E-02	1.73E-04	1
L3	2.1	3.4E-01	1.33E-04	1
L4	1.0786E-02	1.7E-03	1.24E-04	1
C2	0.003354	5.4E-04	8.94E-05	1
C3	1.36E-09	2.2E-10	1.55E-08	1,2
C4	1.36E-09	2.2E-10	1.55E-08	1,2
Filter Assembly and Debris	bckgrnd	bckgrnd	bckgrnd	3

(1) ^{90}Sr to ^{137}Cs ratio is 0.16. This ration is based on PRTR IX column laboratory analysis 222-S Lab RSA #5804 (WHC-SD-NEL-ER-002).

(2) Columns C3 and C4 were moved to different positions in the RLAIX vault. Column C4 was recounted and shown to have lower ^{137}Cs and ^{60}Co levels than on the initial count done with the IXs in the positions near columns R3, L3, and R4. Dose rates of columns C3 and C4 dropped to background levels after moving them. Based upon this and the fact that both columns C3 and C4 were shown to be empty, column C3 is characterized as having the same radionuclide content as column C4.

(3) Readings were in the fractions of E-12 curies.

Category Calculation Worksheet					Cont.Vol=	12.23						
Isotope	*Grams	*Curies	~Cv/ft^3	Ci/gram	*Ci/m^3	*Ci/m^3	~Ci/m^3	Cat 1 Limit	Cat 3 Limit	Cat 1 Fraction	Cat 3 Fraction
H-3(f)				9.65E+03	0.00E+00	0.00E+00	0.00E+00	9.90E+04	1.00E+99	0	0
Be-10				2.24E-02	0.00E+00	0.00E+00	0.00E+00	1.10E+00	2.40E+02	0	0
C-14				4.46E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-02	2.10E+01	0	0
C-14(a)				4.46E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-01	2.10E+02	0	0
Cl-36				3.30E-02	0.00E+00	0.00E+00	0.00E+00	6.40E-05	1.40E-01	0	0
K-40				6.98E-06	0.00E+00	0.00E+00	0.00E+00	1.80E-03	3.80E-01	0	0
Ni-59				7.58E-02	0.00E+00	0.00E+00	0.00E+00	3.90E+00	8.50E+02	0	0
Ni-59(a)				7.58E-02	0.00E+00	0.00E+00	0.00E+00	3.90E+01	8.50E+03	0	0
Co-60		1.01E-03		1.13E+03	0.00E+00	8.25E-05	0.00E+00	7.50E+01	1.00E+99	1.09992E-06	8.2494E-104
Co-60(af)				1.13E+03	0.00E+00	0.00E+00	0.00E+00	7.50E+02	1.00E+99	0	0
Ni-63				6.17E+01	0.00E+00	0.00E+00	0.00E+00	5.90E+00	2.00E+04	0	0
Ni-63(a)				6.17E+01	0.00E+00	0.00E+00	0.00E+00	5.90E+01	2.00E+05	0	0
Se-79				6.97E-02	0.00E+00	0.00E+00	0.00E+00	5.10E-01	1.10E+02	0	0
Sr-90		4.17E-01		1.36E+02	0.00E+00	3.41E-02	0.00E+00	1.60E-02	5.40E+04	2.132512265	6.31855E-07
Zr-93				2.51E-03	0.00E+00	0.00E+00	0.00E+00	2.50E+00	5.40E+02	0	0
Mo-93				1.10E+00	0.00E+00	0.00E+00	0.00E+00	8.70E-01	2.00E+02	0	0
Nb-94				1.87E-01	0.00E+00	0.00E+00	0.00E+00	2.20E-04	4.80E-02	0	0
Nb-94(a)				1.87E-01	0.00E+00	0.00E+00	0.00E+00	2.20E-03	4.80E-01	0	0
Tc-99				1.70E-02	0.00E+00	0.00E+00	0.00E+00	2.30E-02	5.00E+00	0	0
Pd-107				5.14E-04	0.00E+00	0.00E+00	0.00E+00	1.50E+01	3.30E+03	0	0
Cd-113m				2.17E+02	0.00E+00	0.00E+00	0.00E+00	7.60E-01	1.00E+99	0	0
Sn-121m				5.91E+01	0.00E+00	0.00E+00	0.00E+00	6.70E-01	2.20E+04	0	0
Sn-126				2.84E-02	0.00E+00	0.00E+00	0.00E+00	1.60E-04	3.40E-02	0	0
I-129				1.77E-04	0.00E+00	0.00E+00	0.00E+00	8.50E-03	1.80E+00	0	0
Ba-133				2.50E+02	0.00E+00	0.00E+00	0.00E+00	7.10E-01	1.00E+99	0	0
Cs-135				1.15E-03	0.00E+00	0.00E+00	0.00E+00	1.60E-01	3.50E+01	0	0
Cs-137		2.58E+00		8.70E+01	0.00E+00	2.11E-01	0.00E+00	5.50E-03	1.20E+04	38.36976139	1.75861E-05
Sm-147				2.27E-08	0.00E+00	0.00E+00	0.00E+00	1.70E-02	3.70E+00	0	0
Eu-150				6.66E+01	0.00E+00	0.00E+00	0.00E+00	1.40E-03	6.70E+02	0	0
Sm-151				2.63E+01	0.00E+00	0.00E+00	0.00E+00	4.60E+01	2.10E+05	0	0
Eu-152				1.73E+02	0.00E+00	0.00E+00	0.00E+00	4.80E-02	1.00E+99	0	0
Gd-152				2.18E-11	0.00E+00	0.00E+00	0.00E+00	6.40E-03	1.40E+00	0	0
Eu-154				2.70E+02	0.00E+00	0.00E+00	0.00E+00	7.50E-01	1.00E+99	0	0
Re-187				4.07E-08	0.00E+00	0.00E+00	0.00E+00	3.60E+01	7.80E+03	0	0
Po-209				1.68E+01	0.00E+00	0.00E+00	0.00E+00	9.80E-03	3.20E+01	0	0
Pb-210				7.65E+01	0.00E+00	0.00E+00	0.00E+00	3.70E-02	2.10E+06	0	0
Ra-226				9.89E-01	0.00E+00	0.00E+00	0.00E+00	1.70E-04	4.30E-02	0	0
Ac-227				4.24E+01	0.00E+00	0.00E+00	0.00E+00	4.20E-03	3.00E+05	0	0
Ra-228				2.73E+02	0.00E+00	0.00E+00	0.00E+00	1.70E+01	1.00E+99	0	0
Th-229				2.13E+01	0.00E+00	0.00E+00	0.00E+00	4.40E-04	9.80E-02	0	0
Th-230				2.01E-02	0.00E+00	0.00E+00	0.00E+00	2.10E-03	1.50E-01	0	0
Pa-231				4.73E-02	0.00E+00	0.00E+00	0.00E+00	1.40E-04	3.00E-02	0	0
Th-232				1.10E-07	0.00E+00	0.00E+00	0.00E+00	1.10E-04	2.30E-02	0	0
U-232				2.14E+01	0.00E+00	0.00E+00	0.00E+00	4.60E-04	4.60E+00	0	0
U-233(b)				9.64E-03	0.00E+00	0.00E+00	0.00E+00	7.40E-03	9.70E-01	0	0
U-234		1.51E-05		6.25E-03	0.00E+00	1.23E-06	0.00E+00	8.90E-03	1.90E+00	0.000138727	6.49826E-07
U-235		6.69E-07		2.16E-06	0.00E+00	5.47E-08	0.00E+00	2.80E-03	5.00E-01	1.95363E-05	1.09403E-07
U-236		3.45E-07		6.47E-05	0.00E+00	2.82E-08	0.00E+00	9.50E-03	2.00E+00	2.9694E-06	1.41047E-08
Np-237(b)		2.32E-06		7.05E-04	0.00E+00	1.90E-07	0.00E+00	6.80E-04	1.50E-01	0.000278967	1.26455E-06
U-238		1.55E-05		3.36E-07	0.00E+00	1.27E-06	0.00E+00	5.70E-03	1.20E+00	0.000222347	1.05815E-06
Pu-238(b)		4.25E-03		1.71E+01	0.00E+00	3.48E-04	0.00E+00	4.70E-03	2.40E+01	0.073937475	1.44794E-05
Pu-239(b)		4.91E-02		6.20E-02	0.00E+00	4.01E-03	0.00E+00	1.90E-03	4.20E-01	2.113009425	0.009558852
Pu-240(b)		2.22E-02		2.27E-01	0.00E+00	1.82E-03	0.00E+00	1.90E-03	4.30E-01	0.955372897	0.004221415
Am-241(b)		2.40E-01		3.42E+00	0.00E+00	1.96E-02	0.00E+00	2.10E-03	8.50E-01	9.344702722	0.023086913
Pu-241		4.53E-01		1.03E+02	0.00E+00	3.70E-02	0.00E+00	6.10E-02	2.50E+01	0.607214187	0.001481603
Am-242m(b)				9.72E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-03	1.60E+00	0	0
Cm-242(f)				3.31E+03	0.00E+00	0.00E+00	0.00E+00	1.00E+00	1.00E+99	0	0
Pu-242(b)		6.37E-06		3.82E-03	0.00E+00	5.21E-07	0.00E+00	2.00E-03	4.30E-01	0.000260425	1.21128E-06
Am-243(b)				1.99E-01	0.00E+00	0.00E+00	0.00E+00	1.00E-03	2.30E-01	0	0
Cm-243(b)				5.16E+01	0.00E+00	0.00E+00	0.00E+00	1.80E-02	3.40E+02	0	0
Cm-244				8.10E+01	0.00E+00	0.00E+00	0.00E+00	1.40E-01	1.60E+02	0	0
Pu-244(b)				1.77E-05	0.00E+00	0.00E+00	0.00E+00	6.10E-04	1.30E-01	0	0
Cm-245(b)				1.72E-01	0.00E+00	0.00E+00	0.00E+00	1.30E-03	2.20E-01	0	0
Cm-246(b)				3.07E-01	0.00E+00	0.00E+00	0.00E+00	1.80E-03	4.20E-01	0	0
Cm-247(b)				9.28E-05	0.00E+00	0.00E+00	0.00E+00	5.60E-04	1.20E-01	0	0
Cm-248(b)				4.25E-03	0.00E+00	0.00E+00	0.00E+00	5.10E-04	1.10E-01	0	0
										Category 1	Category 3
									Sum of the Fractions =	53.59743443	0.038385785

Box 1: L3, L1, R1, R2
TRU<100 nCi/g

Category Calculation Worksheet					Cont.Vol=	12.23						
Isotope	*Grams	*Curies	~Cu/ft^3	Ci/gram	*Ci/m^3	*Cu/m^3	~Cu/m^3	Cat 1 Limit	Cat 3 Limit	Cat 1 Fraction	Cat 3 Fraction
H-3(f)				9.65E+03	0.00E+00	0.00E+00	0.00E+00	9.90E+04	1.00E+99	0	0
Be-10				2.24E-02	0.00E+00	0.00E+00	0.00E+00	1.10E+00	2.40E+02	0	0
C-14				4.46E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-02	2.10E+01	0	0
C-14(a)				4.46E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-01	2.10E+02	0	0
Cl-36				3.30E-02	0.00E+00	0.00E+00	0.00E+00	6.40E-05	1.40E-01	0	0
K-40				6.98E-06	0.00E+00	0.00E+00	0.00E+00	1.80E-03	3.80E-01	0	0
Ni-59				7.58E-02	0.00E+00	0.00E+00	0.00E+00	3.90E+00	8.50E+02	0	0
Ni-59(a)				7.58E-02	0.00E+00	0.00E+00	0.00E+00	3.90E+01	8.50E+03	0	0
Co-60		1.95E-03		1.13E+03	0.00E+00	1.60E-04	0.00E+00	7.50E+01	1.00E+99	2.12963E-06	1.5972E-103
Co-60(af)				1.13E+03	0.00E+00	0.00E+00	0.00E+00	7.50E+02	1.00E+99	0	0
Ni-63				8.17E+01	0.00E+00	0.00E+00	0.00E+00	5.90E+00	2.00E+04	0	0
Ni-63(a)				8.17E+01	0.00E+00	0.00E+00	0.00E+00	5.90E+01	2.00E+05	0	0
Se-79				6.97E-02	0.00E+00	0.00E+00	0.00E+00	5.10E-01	1.10E+02	0	0
Sr-90		2.04E-01		1.36E+02	0.00E+00	1.67E-02	0.00E+00	1.60E-02	5.40E+04	1.04374489	3.09258E-07
Zr-93				2.51E-03	0.00E+00	0.00E+00	0.00E+00	2.50E+00	5.40E+02	0	0
Mo-93				1.10E+00	0.00E+00	0.00E+00	0.00E+00	8.70E-01	2.00E+02	0	0
Nb-94				1.87E-01	0.00E+00	0.00E+00	0.00E+00	2.20E-04	4.80E-02	0	0
Nb-94(a)				1.87E-01	0.00E+00	0.00E+00	0.00E+00	2.20E-03	4.80E-01	0	0
Tc-99				1.70E-02	0.00E+00	0.00E+00	0.00E+00	2.30E-02	5.00E+00	0	0
Pd-107				5.14E-04	0.00E+00	0.00E+00	0.00E+00	1.50E+01	3.30E+03	0	0
Cd-113m				2.17E+02	0.00E+00	0.00E+00	0.00E+00	7.60E-01	1.00E+99	0	0
Sn-121m				5.91E+01	0.00E+00	0.00E+00	0.00E+00	6.70E-01	2.20E+04	0	0
Sn-126				2.84E-02	0.00E+00	0.00E+00	0.00E+00	1.60E-04	3.40E-02	0	0
I-129				1.77E-04	0.00E+00	0.00E+00	0.00E+00	8.50E-03	1.80E+00	0	0
Ba-133				2.50E+02	0.00E+00	0.00E+00	0.00E+00	7.10E-01	1.00E+99	0	0
Cs-135				1.15E-03	0.00E+00	0.00E+00	0.00E+00	1.60E-01	3.50E+01	0	0
Cs-137		1.25E+00		8.70E+01	0.00E+00	1.02E-01	0.00E+00	5.50E-03	1.20E+04	18.58722961	8.51915E-06
Sm-147				2.27E-08	0.00E+00	0.00E+00	0.00E+00	1.70E-02	3.70E+00	0	0
Eu-150				6.66E+01	0.00E+00	0.00E+00	0.00E+00	1.40E-03	6.70E+02	0	0
Sm-151				2.63E+01	0.00E+00	0.00E+00	0.00E+00	4.60E+01	2.10E+05	0	0
Eu-152				1.73E+02	0.00E+00	0.00E+00	0.00E+00	4.80E-02	1.00E+99	0	0
Gd-152				2.18E-11	0.00E+00	0.00E+00	0.00E+00	6.40E-03	1.40E+00	0	0
Eu-154				2.70E+02	0.00E+00	0.00E+00	0.00E+00	7.50E-01	1.00E+99	0	0
Re-187				4.07E-08	0.00E+00	0.00E+00	0.00E+00	3.60E+01	7.80E+03	0	0
Po-209				1.68E+01	0.00E+00	0.00E+00	0.00E+00	9.80E-03	3.20E+01	0	0
Pb-210				7.65E+01	0.00E+00	0.00E+00	0.00E+00	3.70E-02	2.10E+06	0	0
Ra-226				9.89E-01	0.00E+00	0.00E+00	0.00E+00	1.70E-04	4.30E-02	0	0
Ac-227				4.24E+01	0.00E+00	0.00E+00	0.00E+00	4.20E-03	3.00E+05	0	0
Ra-228				2.73E+02	0.00E+00	0.00E+00	0.00E+00	1.70E+01	1.00E+99	0	0
Th-229				2.13E+01	0.00E+00	0.00E+00	0.00E+00	4.40E-04	9.80E-02	0	0
Th-230				2.01E-02	0.00E+00	0.00E+00	0.00E+00	2.10E-03	1.50E-01	0	0
Pa-231				4.73E-02	0.00E+00	0.00E+00	0.00E+00	1.40E-04	3.00E-02	0	0
Th-232				1.10E-07	0.00E+00	0.00E+00	0.00E+00	1.10E-04	2.30E-02	0	0
U-232				2.14E+01	0.00E+00	0.00E+00	0.00E+00	4.60E-04	4.60E+00	0	0
U-233(b)				9.64E-03	0.00E+00	0.00E+00	0.00E+00	7.40E-03	9.70E-01	0	0
U-234		1.77E-05		6.25E-03	0.00E+00	1.45E-06	0.00E+00	8.90E-03	1.90E+00	0.000162614	7.61716E-07
U-235		7.81E-07		2.16E-06	0.00E+00	6.39E-08	0.00E+00	2.60E-03	5.00E-01	2.28098E-05	1.27735E-07
U-236		4.04E-07		6.47E-05	0.00E+00	3.30E-06	0.00E+00	9.50E-03	2.00E+00	3.47291E-06	1.64963E-08
Np-237(b)		2.71E-06		7.05E-04	0.00E+00	2.22E-07	0.00E+00	6.80E-04	1.50E-01	0.000325862	1.47724E-06
U-238		1.82E-05		3.36E-07	0.00E+00	1.49E-06	0.00E+00	5.70E-03	1.20E+00	0.000260648	1.23808E-06
Pu-238(b)		4.97E-03		1.71E+01	0.00E+00	4.07E-04	0.00E+00	4.70E-03	2.40E+01	0.086515544	1.69426E-05
Pu-239(b)		5.74E-02		6.20E-02	0.00E+00	4.70E-03	0.00E+00	1.90E-03	4.20E-01	2.471059087	0.011178601
Pu-240(b)		2.60E-02		2.27E-01	0.00E+00	2.12E-03	0.00E+00	1.90E-03	4.30E-01	1.118044498	0.004940197
Am-241(b)		2.80E-01		3.42E+00	0.00E+00	2.29E-02	0.00E+00	2.10E-03	8.50E-01	10.8904723	0.026905873
Pu-241		5.30E-01		1.03E+02	0.00E+00	4.33E-02	0.00E+00	6.10E-02	2.50E+01	0.710561237	0.001733769
Am-242m(b)				9.72E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-03	1.60E+00	0	0
Cm-242(f)				3.31E+03	0.00E+00	0.00E+00	0.00E+00	1.00E+00	1.00E+99	0	0
Pu-242(b)		7.44E-06		3.82E-03	0.00E+00	6.08E-07	0.00E+00	2.00E-03	4.30E-01	0.000304129	1.41455E-06
Am-243(b)				1.99E-01	0.00E+00	0.00E+00	0.00E+00	1.00E-03	2.30E-01	0	0
Cm-243(b)				5.16E+01	0.00E+00	0.00E+00	0.00E+00	1.80E-02	3.40E+02	0	0
Cm-244				8.10E+01	0.00E+00	0.00E+00	0.00E+00	1.40E-01	1.60E+02	0	0
Pu-244(b)				1.77E-05	0.00E+00	0.00E+00	0.00E+00	6.10E-04	1.30E-01	0	0
Cm-245(b)				1.72E-01	0.00E+00	0.00E+00	0.00E+00	1.30E-03	2.20E-01	0	0
Cm-246(b)				3.07E-01	0.00E+00	0.00E+00	0.00E+00	1.80E-03	4.20E-01	0	0
Cm-247(b)				9.28E-05	0.00E+00	0.00E+00	0.00E+00	5.60E-04	1.20E-01	0	0
Cm-248(b)				4.25E-03	0.00E+00	0.00E+00	0.00E+00	5.10E-04	1.10E-01	0	0
										Category 1	Category 3
									Sum of the Fractions =	34.90870883	0.044789246

Box 2: R3, C2, L2, L4
TRU < 100 nCi/g

Category Calculation Worksheet					Cont.Vol=	12.23						
Isotope	*Grams	*Curies	=Cu/m^3	Ci/gram	*Cu/m^3	*Cu/m^3	=Cu/m^3	Cat 1 Limit	Cat 3 Limit	Cat 1 Fraction	Cat 3 Fraction
H-3(f)				9.65E+03	0.00E+00	0.00E+00	0.00E+00	9.90E+04	1.00E+99	0	0
Be-10				2.24E-02	0.00E+00	0.00E+00	0.00E+00	1.10E+00	2.40E+02	0	0
C-14				4.46E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-02	2.10E+01	0	0
C-14(a)				4.46E+00	0.00E+00	0.00E+00	0.00E+00	9.10E-01	2.10E+02	0	0
Cl-36				3.30E-02	0.00E+00	0.00E+00	0.00E+00	6.40E-05	1.40E-01	0	0
K-40				6.98E-06	0.00E+00	0.00E+00	0.00E+00	1.80E-03	3.80E-01	0	0
Ni-59				7.58E-02	0.00E+00	0.00E+00	0.00E+00	3.90E+00	8.50E+02	0	0
Ni-59(a)				7.58E-02	0.00E+00	0.00E+00	0.00E+00	3.90E+01	8.50E+03	0	0
Co-60		6.09E-04		1.13E+03	0.00E+00	4.98E-05	0.00E+00	7.50E+01	1.00E+99	6.63975E-07	4.9798E-104
Co-60(af)				1.13E+03	0.00E+00	0.00E+00	0.00E+00	7.50E+02	1.00E+99	0	0
Ni-63				6.17E+01	0.00E+00	0.00E+00	0.00E+00	5.90E+00	2.00E+04	0	0
Ni-63(a)				6.17E+01	0.00E+00	0.00E+00	0.00E+00	5.90E+01	2.00E+05	0	0
Se-79				6.97E-02	0.00E+00	0.00E+00	0.00E+00	5.10E-01	1.10E+02	0	0
Sr-90		6.00E-03		1.36E+02	0.00E+00	4.91E-04	0.00E+00	1.60E-02	5.40E+04	0.030662308	9.08513E-09
Zr-93				2.51E-03	0.00E+00	0.00E+00	0.00E+00	2.50E+00	5.40E+02	0	0
Mo-93				1.10E+00	0.00E+00	0.00E+00	0.00E+00	8.70E-01	2.00E+02	0	0
Nb-94				1.87E-01	0.00E+00	0.00E+00	0.00E+00	2.20E-04	4.80E-02	0	0
Nb-94(a)				1.87E-01	0.00E+00	0.00E+00	0.00E+00	2.20E-03	4.80E-01	0	0
Tc-99				1.70E-02	0.00E+00	0.00E+00	0.00E+00	2.30E-02	5.00E+00	0	0
Pd-107				5.14E-04	0.00E+00	0.00E+00	0.00E+00	1.50E+01	3.30E+03	0	0
Cd-113m				2.17E+02	0.00E+00	0.00E+00	0.00E+00	7.60E-01	1.00E+99	0	0
Sn-121m				5.91E+01	0.00E+00	0.00E+00	0.00E+00	6.70E-01	2.20E+04	0	0
Sn-126				2.84E-02	0.00E+00	0.00E+00	0.00E+00	1.60E-04	3.40E-02	0	0
I-129				1.77E-04	0.00E+00	0.00E+00	0.00E+00	8.50E-03	1.80E+00	0	0
Ba-133				2.50E+02	0.00E+00	0.00E+00	0.00E+00	7.10E-01	1.00E+99	0	0
Cs-135				1.15E-03	0.00E+00	0.00E+00	0.00E+00	1.60E-01	3.50E+01	0	0
Cs-137		3.76E-02		8.70E+01	0.00E+00	3.08E-03	0.00E+00	5.50E-03	1.20E+04	0.559503497	2.56439E-07
Sm-147				2.27E-08	0.00E+00	0.00E+00	0.00E+00	1.70E-02	3.70E+00	0	0
Eu-150				6.66E+01	0.00E+00	0.00E+00	0.00E+00	1.40E-03	6.70E+02	0	0
Sm-151				2.63E+01	0.00E+00	0.00E+00	0.00E+00	4.60E+01	2.10E+05	0	0
Eu-152				1.73E+02	0.00E+00	0.00E+00	0.00E+00	4.80E-02	1.00E+99	0	0
Gd-152				2.18E-11	0.00E+00	0.00E+00	0.00E+00	6.40E-03	1.40E+00	0	0
Eu-154				2.70E+02	0.00E+00	0.00E+00	0.00E+00	7.50E-01	1.00E+99	0	0
Re-187				4.07E-08	0.00E+00	0.00E+00	0.00E+00	3.60E+01	7.80E+03	0	0
Po-209				1.68E+01	0.00E+00	0.00E+00	0.00E+00	9.80E-03	3.20E+01	0	0
Pb-210				7.65E+01	0.00E+00	0.00E+00	0.00E+00	3.70E-02	2.10E+06	0	0
Ra-225				9.89E-01	0.00E+00	0.00E+00	0.00E+00	1.70E-04	4.30E-02	0	0
Ac-227				4.24E+01	0.00E+00	0.00E+00	0.00E+00	4.20E-03	3.00E+05	0	0
Ra-228				2.73E+02	0.00E+00	0.00E+00	0.00E+00	1.70E+01	1.00E+99	0	0
Th-229				2.13E+01	0.00E+00	0.00E+00	0.00E+00	4.40E-04	9.80E-02	0	0
Th-230				2.01E-02	0.00E+00	0.00E+00	0.00E+00	2.10E-03	1.50E-01	0	0
Pa-231				4.73E-02	0.00E+00	0.00E+00	0.00E+00	1.40E-04	3.00E-02	0	0
Th-232				1.10E-07	0.00E+00	0.00E+00	0.00E+00	1.10E-04	2.30E-02	0	0
U-232				2.14E+01	0.00E+00	0.00E+00	0.00E+00	4.60E-04	4.60E+00	0	0
U-233(b)				9.64E-03	0.00E+00	0.00E+00	0.00E+00	7.40E-03	9.70E-01	0	0
U-234				6.25E-03	0.00E+00	0.00E+00	0.00E+00	8.90E-03	1.90E+00	0	0
U-235				2.16E-06	0.00E+00	0.00E+00	0.00E+00	2.80E-03	5.00E-01	0	0
U-236				6.47E-05	0.00E+00	0.00E+00	0.00E+00	9.50E-03	2.00E+00	0	0
Np-237(b)				7.05E-04	0.00E+00	0.00E+00	0.00E+00	6.80E-04	1.50E-01	0	0
U-238				3.36E-07	0.00E+00	0.00E+00	0.00E+00	5.70E-03	1.20E+00	0	0
Pu-238(b)				1.71E+01	0.00E+00	0.00E+00	0.00E+00	4.70E-03	2.40E+01	0	0
Pu-239(b)				6.20E-02	0.00E+00	0.00E+00	0.00E+00	1.90E-03	4.20E-01	0	0
Pu-240(b)				2.27E-01	0.00E+00	0.00E+00	0.00E+00	1.90E-03	4.30E-01	0	0
Am-241(b)				3.42E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-03	8.50E-01	0	0
Pu-241				1.03E+02	0.00E+00	0.00E+00	0.00E+00	6.10E-02	2.50E+01	0	0
Am-242m(b)				9.72E+00	0.00E+00	0.00E+00	0.00E+00	1.90E-03	1.60E+00	0	0
Cm-242(f)				3.31E+03	0.00E+00	0.00E+00	0.00E+00	1.00E+00	1.00E+99	0	0
Pu-242(b)				3.82E-03	0.00E+00	0.00E+00	0.00E+00	2.00E-03	4.30E-01	0	0
Am-243(b)				1.99E-01	0.00E+00	0.00E+00	0.00E+00	1.00E-03	2.30E-01	0	0
Cm-243(b)				5.16E+01	0.00E+00	0.00E+00	0.00E+00	1.80E-02	3.40E+02	0	0
Cm-244				8.10E+01	0.00E+00	0.00E+00	0.00E+00	1.40E-01	1.60E+02	0	0
Pu-244(b)				1.77E-05	0.00E+00	0.00E+00	0.00E+00	6.10E-04	1.30E-01	0	0
Cm-245(b)				1.72E-01	0.00E+00	0.00E+00	0.00E+00	1.30E-03	2.20E-01	0	0
Cm-246(b)				3.07E-01	0.00E+00	0.00E+00	0.00E+00	1.80E-03	4.20E-01	0	0
Cm-247(b)				9.28E-05	0.00E+00	0.00E+00	0.00E+00	5.60E-04	1.20E-01	0	0
Cm-248(b)				4.25E-03	0.00E+00	0.00E+00	0.00E+00	5.10E-04	1.10E-01	0	0
										Category 1	Category 3
									Sum of the Fractions =	0.590166459	2.65524E-07

Box 3: C3, C4, R4, R5
TRU < 100 *nCi/g*

ATTACHMENT III: Chemical Characterization

SOLID WASTE ENGINEERING ANALYSIS

HAZARDOUS ANALYSIS SMART (HAS) SYSTEM
HAS SYSTEM REPORT FOR REQUEST # PRTR RLA

CURRENT DATE -- 2/23/96
MATERIAL -- IX columns for PRTR Rupture Loop Annex

ANALYSIS DATE - 2/23/96 CONTAINER - IX COLUMN
WASTE PHYSICAL STATE - S TC PHYSICAL STATE - S

pH - 5.27 DESIGNATOR - VLB
FLASHPOINT - °F WASTE WEIGHT - 1320.00 K
DENSITY - g/CC WASTE STATUS - U

CONSTITUENT LIST FOR ITEM #1

CAS# MSDS#/RGH	CHEMICAL NAME	WEIGHT PERCENT	TOX	EC I	PERS/ LDR	SOURCES Use-Code-cls	SOURCES LDR (NW/OT)	PRODUCT	40 CFR D1	40 CFR D2	40 CFR D3	TOXICITY CHARACTERISTIC Code-DM conc.	TOXICITY CHARACTERISTIC -LDR conc.	GENERAL INFORMATION
7439-92-1	LEAD	.0005	N	0.0000		- -		CODE - CLASS - LDR- - POISON -				D008-100 ppm - -	-100 ppm -	RQ- K FP- °F RD-10/03/94
FORM-														
TOT. I OF CHEM. IN WASTE MATRIX		.0005										NOTES:		
7440-22-4	SILVER	.0000	N	0.0000		- -		CODE - CLASS - LDR- - POISON -				D011-100 ppm - -	-100 ppm -	RQ- K FP- °F RD-10/20/94
FORM-														
TOT. I OF CHEM. IN WASTE MATRIX		.0000										NOTES:		
7440-39-3	BARIUM	.0001	N	0.0000		- -		CODE - CLASS - LDR- - POISON -				D005-2,000 ppm - -	-2,000 ppm -	RQ- K FP- °F RD-9/01/94
FORM-														
TOT. I OF CHEM. IN WASTE MATRIX		.0001										NOTES:		
7440-43-9	CADMIUM	.0002	A	.0000		- -		CODE - CLASS - LDR- - POISON -				D006-20 ppm - -	-20 ppm -	RQ- K FP- °F RD-1/18/95
FORM-														
TOT. I OF CHEM. IN WASTE MATRIX		.0002										NOTES:		
7440-47-3	CHROMIUM	.0017	N	0.0000		- -		CODE - CLASS - LDR- - POISON -				D007-100 ppm - -	-100 ppm -	RQ- K FP- °F RD-3/21/95
FORM-														
TOT. I OF CHEM. IN WASTE MATRIX		.0017										NOTES:		
GCH055	INERT MATERIAL (RESINS)	99.9900	N	0.0000		- -		CODE - CLASS - LDR- - POISON -				- -	-	RQ- K FP- °F RD-6/01/92
FORM-														
TOT. I OF CHEM. IN WASTE MATRIX		99.9900										NOTES:		

HAS SYSTEM REPORT FOR REQUEST # PRTR RLA

CURRENT DATE -- 2/23/96
MATERIAL -- 1X columns for PRTR Rupture Loop Annex

ANALYSIS DATE - 2/23/96 CONTAINER - 1X COLUMN
WASTE PHYSICAL STATE - S TC PHYSICAL STATE - S

pH - 5.27 DESIGNATOR - VLB
FLASHPOINT - °F WASTE WEIGHT - 1520.00 K
DENSITY - g/CC WASTE STATUS - U

CONSTITUENT LIST FOR ITEM #1

CAS# MSDS#/RGN	CHEMICAL NAME	WEIGHT PERCENT	TOX	EC ?	PERS/ LDR	SOURCES Use-Code-cls	LDR (WW/OT)	PRODUCT	40 CFR D1	D2	D3	TOXICITY CHARACTERISTIC Code-DW conc. -LDR conc.	GENERAL INFORMATION

CONSTITUENT SUM% 99.9928
WT01-EHW ____ WT02-DW ____ Total EC? .00002
No Data ____ or EC? <0.001 ____ Non-Regulated ____
WAC-173-303-101

Flashpoint (FP) < 140°F IGNITABLE (I) ____
If RCRA D001, see Note* OXIDIZER (O) ____
WAC-173-303-090, 5 (Always LDR) D001-DW ____

pH ≤ 2 or pH ≥ 12.5 (Liquid) D002-DW ____
WAC-173-303-090, 6 (All Liquids Are LDR)
Corrosive Solid WAC2-DW ____

WAC-173-303-090, 7 (Always LDR) D003-DW ____

TC Codes ____
____
DW ____
LDRs ____
WAC 173-303-090, 8

WASTE SHIPPING SUMMARY
DOT Req. ____ Is Waste RQ? ____
TSCA Req. ____ RCRA Req. ____ State Req. ____

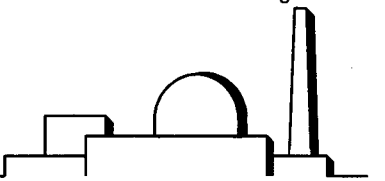
HH > 1.01, WP01-EHW ____ 0.011 ≤ HH ≤ 1.01, WP02-DW ____
PAH > 1.01, WP03-EHW ____ Non-regulated ____
WAC-173-303-102 (LDR-Land Ban HH > 1000 ppm If Fed. Reg.)
40 CFR 268.32 (LDR-Land Ban CL ≥ 1000 ppm If Fed. Reg.)

* Reference 49 CFR 173.120, and 173.121 for DOT Proper Shipping Name and Group
† Halogenated Hydrocarbons (HH) not applicable per the testing methods described in WAC 173-303-110

DESIGNATION INFORMATION FOR ITEM # 1 OF REQUEST #PRTR RLA

APPLICABLE WASTE CODES Not Regulated WASTE CLASS N/A LDR CODES N/A
PROPER SHIPPING NAME ____ HAZARD CLASS ____ DOT ID NO ____
LABELS ____ PACKAGING REQUIREMENTS ____ PG ____
SHIP TO ____ CELL (IF APPLICABLE) ____

CL California List Halogenated Organic Compounds subject to LDR if concentration of CL compound ≥ 1000 ppm and RCRA hazardous waste



APPENDIX E - WASTE PORTFOLIO

WASTE CERTIFICATION SUMMARY

GENERATOR:	**ADVANCED FUEL FACILITIES TRANSITION**
WASTE TYPE:	**SOLID WASTE FROM RUPTURE LOOP ANNEX IX VAULT**
WSRd NUMBER:	**100-00, 101-00**
REVISION:	**REV. 1. APRIL 22, 1996**

Waste Generating Process Description: The 309 Plutonium Recycle Test Reactor (PRTR) used a contained system for testing called Fuel Element Rupture Test Facility (FERTF) which was a pressurized, light-water-cooled loop, using one of the 85 process tubes within the main, heavy-water-cooled PRTR calandria. The FERTF could be operated in a recirculating or once through cooling mode. It was a pilot irradiation facility to test new fuel element designs and new operating regimes. Many of its tests involved testing of pre-defective fuel elements, containing natural uranium and 1% to 4% PuO_2, with pinhole breaks to study the stability of various defected material under irradiation. The Rupture Loop Annex (RLA) Ion Exchanger (IX) Vault design had positions of three active RLAIX columns and storage space for 12 spent RLAIX columns. The operating RLAIX columns were connected in series for removal of the fuel and fission products in the FERTF coolant.

The RLAIX cleanup test loop and the PRTR main cleanup system were both contaminated with fuel residual and fission products. This contamination was filtered out of the system using the IX columns. Sample results from the PRTR IX columns resin indicated that the contents are not Hazardous. Since the cleanup system IX columns in both vaults have similar resin media, similar isotopic material contents are expected.

Physical Characterization: The waste that will be removed from the RLAIX vault will consist of 12 IX columns, 10 of which contain resin; piping, connector heads, jumpers, valving, metal blow down filter, other metal debris, wood, plastic, rubber, and sweepings off of the floor of the RLAIX Vault (dirt, rust, scrap material); equipment used to pump liquids from the IX columns; small quantities of inorganic, nonregulated absorbed liquids; and other materials as described in WSRd 100-00 and 101-00. Metal materials are made of aluminum, carbon steel, and stainless steel.

The shell and dunnage dimensions for nine of the IX columns are 0.71m diameter and 3.30m high. Variations of this type include internal baffle/plate or sparger system with the shell and dunnage constructed of carbon steel. The shell and dunnage dimensions for one of the IX columns are 0.53m diameter and 3.35m high. The IX column and dunnage is constructed of carbon steel. There are two empty IX columns one constructed of stainless steel and the other one constructed of aluminum. The aluminum IX column and dunnage is 0.457m diameter and 2.692m high and the stainless steel IX column and dunnage is 0.762m diameter and 2.692m high. Please see attachments for drawings.

Radiological Characterization: The IX columns received a Gamma analysis with results showing ^{60}Co, ^{137}Cs, ^{90}Sr. The value for ^{90}Sr was derived from a ratio of ^{90}Sr to ^{137}Cs based on laboratory analysis of PRTR IX columns. The TRU distribution is a results of a PNL assay and the decay calculations from the documented original fuel burn in the reactor. The resulting isotopic distributions consists of ^{241}Am, ^{237}Np, ^{233}Pa, ^{234}U, ^{235}U, ^{236}U, ^{238}U, ^{238}Pu, ^{239}Pu, ^{240}PU, ^{241}Pu, and ^{242}PU. This is a industrial standard method for isotopic distribution. Please see the attachment for the radiological inventory.

The IX columns are segregated into three boxes and the curies have been totaled for the point source and category calculations. Please see the attachment for category calculations. Four IX columns are placed in each 12.23 cubic meter box (6'x 6'x 12'). Two of the boxes are category 3 and one is category 1. Box 1 contains IX columns L1, L3, R1, and R2 (catIII). Box 2 contains IX

columns L2, L4, C2, and R3 (catIII). Box 3 contains IX columns C3, C4, R4, R5/RLIX-1, and other debris taken from the RLAIX Vault. All waste added to box 3 that is not an IX column contains less than 1% of the IX columns activity and therefore has no activity contribution to the box.

Chemical Characterization: The cation RLAIX column (RLIX-1) contains an AMBERLITE® IRN-163 resin. The mixed bed RLAIX column (RLIX-2) contains an AMBERLITE® IRN-154 resin, which is a combination of AMBERLITE® IRN-163 and AMBERLITE® IRN-78 resins. The de-oxygenator (RLIX-3 contains a Duolite S-10 and AMBERLITE® IRN-154 mixture. These resins are not regulated as dangerous waste. Process knowledge tells us that only water was allowed in the reactor and process loops, and with this knowledge we would only look for heavy metals from the crud products of the system. The analysis from the PRTR IX column resins was used as process knowledge for the RLAIX columns due to the similarity of the resins, water process, and common accidental test failure of the total system. Please see attachments of MSDS and analysis.

AMBERLITE® is a trademark of Rohm and Haas Company or one of its subsidiaries or affiliates.

Waste Designation: The analysis that was done on the PRTR IX column resins was used to designate the RLAIX resins. The results show that the resin is not regulated as dangerous waste. Please see the attachment for the designation.

Segregation: Segregation of the waste into the proper containers will be performed using work procedure 309-WP-96-002, "Rupture Loop Annex Ion Exchange (RLAIX) Vault Cleanout." This procedure will also ensure the packaging requirements are met.

Packaging: The IX columns will be packaged in three Type A metal boxes. The reference for the packaging is WHC-SD-TP-SEP-047, "Safety Evaluation for Packaging for Onsite Transfer of 12 Ion Exchange Columns."

The waste as packaged is classified as low-level waste. IX columns placed in boxes 1 and 2 will be stabilized with grout to meet the requirements for category 3 waste disposal. The grout formulation will be the same used for the first shipment of IX columns from PRTR for disposal at Hanford's burial grounds (118 lb/ft^3). It is not necessary to stabilize box 3, since it is category 1 waste. The distribution of the IX columns, curies, and weight are as follows:

Box 1: IX column L3, L1, R1, and R2
Total curies = 3.77
L3: 3800 lbs (33 cubic feet; filled with resin)
L1: 3800 lbs (33 cubic feet; filled with resin)
R1: 3800 lbs (33 cubic feet; filled with resin)
R2: 3800 lbs (33 cubic feet; filled with resin)
Grout: 35,400 lbs (300 cubic feet; 118 lbs/cubic foot)
Estimated Contents Weight: 50,600 lbs
Box: 4000 lbs (432 cubic feet)
ESTIMATED TOTAL PACKAGE WEIGHT: 54,600 lbs

Box 2: IX columns R3, C2, L2, and L4
Total curies = 2.35
R3: 3800 lbs (33 cubic feet; filled with resin)
C2: 1800 lbs (18 cubic feet; filled with resin)
L2: 3800 lbs (33 cubic feet; filled with resin)
L4: 3800 lbs (33 cubic feet; filled with resin)
Grout: 37200 lbs (315 cubic feet; 118 lbs/cubic foot)

Estimated Contents Weight: 50,400 lbs
Box: 4000 lbs (432 cubic feet)
ESTIMATED TOTAL PACKAGE WEIGHT: 54,400 lbs

Box 3: IX columns C3, C4, R4, and R5/RLIX-1
Total curies = 0.0442
C3: 530 lbs (empty: fill with grout)
C4: 180 lbs (empty: fill with grout)
R4: 3800 lbs (33 cubic feet; filled with resin)
R5/RLIX-1: 3800 lbs (33 cubic feet; filled with resin)
Debris added will be insignificant contribution to the weight.
Grout: 43200 lbs (366 cubic feet; 118 lbs/cubic foot))
Estimated Contents Weight: 51,510 lbs
Box: 4000 lbs (432 cubic feet)
ESTIMATED TOTAL PACKAGE WEIGHT: 55,510 LBS

A copy of the characterization is attached.

All waste in boxes 1 and 2 will have to be encased in at least two inches of grout to meet stabilization requirements. No aluminum will be in contact with the grout used for stabilization. IX column C4 is the only one made of aluminum or with aluminum dunnage. Since IX column C4 will be in box 3, it will not be in contact with grout required for stabilization.

The maximum free void space in each IX column that is filled with resin is 4.56 cubic feet, based on process knowledge. This calculates to be a total free void space in each 6'x 6'x 12' (432 ft^3) box of 4.22 percent. This is below the maximum free void space limit of 10%. Since the resin chambers in IX columns C3 and C4 are empty of resin, these void spaces will be filled with the same type of grout as used on boxes 1 and 2. Void space filler for box 3 will also be filled with the same type of grout.

Plastic liners will not be used to line the boxes. All waste in boxes 1, 2, and 3 will be encased in at least two inches of grout between the waste and the inner surface of each box to provide one containment barrier. The box will be the other containment barrier.

The IX columns must have as much liquid removed as is reasonably achievable. The only IX columns that will have liquid remaining after pumping will be the IX columns with spargers. Based on process knowledge, the maximum free liquid that will remain in a given sparger IX column will be 7 gallons. Polymeric sorbent will be added to the tops of these IX columns in sufficient amounts to sorb twice the amount of liquid that is potentially present. The IX columns will then be oriented horizontally to allow all the liquid to drain into the sorbent.

Boxes 1 and 2 must allow for the off-gassing of hydrogen that is generated in the IX columns. The fill pipe of each IX column must not be sealed. The grout and the Type A box will allow the diffusion of the hydrogen. Thus, there will be no gas pressurization problems.

Waste Minimization: Minimization of waste through use of non-regulated products or materials is the preferred waste management tool. Source reduction for dangerous products/chemicals has been implemented. Source reduction, recycling, and treatment opportunities for all waste streams including sanitary, dangerous, radioactive, and mixed has been implemented.

Please see attachments:

WASTE SPECIFICATION RECORD No. 1 0 0 - 0 0

A. WASTE MATRIX DESCRIPTION

Miscellaneous Compactible and Non Compactible Solids: Solid compactible and non-compactible waste materials including paper, plastic, rubber, debris, cloth, leather, vinyl, equipment, metal, concrete, glass, ceramic or brick materials, roofing debris, rocks/gravel, soil, wood, plastic, rubber, sludges or absorbed liquids (<1% organic), animal carcasses, and asbestos.

B. RADIOLOGICAL DESCRIPTION

- ❑ TRU
- ■ Low-Level Waste (LLW)
  - ■ Category 1
  - ❑ Category 3
  - ❑ > Category 3
  - ❑ < 10 nCi/g alpha activity
- ■ Contact Handled
- ■ Remote Handled*

C. HAZARDOUS CONSTITUENTS

- ■ Non-Hazardous LLW
- ❑ RCRA/EPA Regulated Hazardous Organics
  - ❑ w/o halogenated organics
- ❑ RCRA/EPA Regulated Hazardous Metals
  - ❑ w/o mercury
- ❑ Ignitables
  - ❑ liquids
  - ❑ oxidizers
- ❑ Corrosives
- ❑ Reactives
  - ❑ cyanides
  - ❑ sulfides
  - ❑ water reactive
- ❑ PCB's- ❑ PCB1 ❑ PCB2 ❑ State Only
- ❑ State-Only Regulated Waste
- ❑ RCRA/EPA regulated based on "Derived- From or Mixture Rule"
- ❑ Sub ect to Land Disposal Restrictions

D. ALLOWABLE WASTE CODES

State Waste Codes NONE

EPA Waste Codes NONE

E. pH RANGES

- ❑ pH ≤ 2
- ❑ pH ≥ 12.5
- ❑ pH > 2 & <12.5
- ■ N/A

F. FLASHPOINT RANGES

- ❑ < 38 °C
- ❑ 38 - 60 °C
- ❑ > 60 °C
- ■ N/A

G. RECOMMENDED PACKAGING

- UN1A2 208 liter (55 gallon) painted drum,
- DOT 7A 122x122x244 cm (4x4x8 ft) metal box, or
- For < Type A Waste Only - Fire Retardant Strong Tight Container 122x122x244 cm (4x4x8 ft).

H. SPECIAL INSTRUCTIONS

* Remote handled (RH) radioactive packages shall include sacrificial rigging provided by the shipper.

I. STORAGE/DISPOSAL LOCATION

- ❑ Transuranic Storage (TRUSAF/CWC)
- ■ Low-Level Burial Grounds
- ❑ Central Waste Complex (CWC)
  - ❑ Acid Storage
  - ❑ Caustic Storage
  - ❑ Combustible Storage
  - ❑ Low-Flashpoint Storage
  - ❑ Other RMW Storage
  - ❑ Oxidizer Storage
  - ❑ Sodium Storage
  - ❑ PCB Storage
  - ❑ Non-Mixed Storage
- ❑ Direct Offsite Shipment
- ❑ Mixed Waste Trench

J. VIABLE TREATMENT AND/OR DISPOSAL METHOD(S)

- ❑ Organic Destruction
- ❑ Organic Removal
- ❑ Organic Treatment-Aqueous
- ❑ Metal Removal
- ❑ Amalgamation
- ❑ Stabilization
- ❑ Deactivation
- ■ Disposal
- ❑ Decontamination
- ❑ Metal Recovery
- ❑ Mercury Separation
- ❑ Neutralization
- ❑ Waste Isolation Pilot Plant

WASTE SPECIFICATION RECORD No. 1 0 1 - 0 0

A. WASTE MATRIX DESCRIPTION

Miscellaneous Compactible and Non Compactible Solids: Solid compactible and non-compactible waste materials including paper, plastic, rubber, debris, cloth, leather, vinyl, equipment, metal, concrete, glass, ceramic or brick materials, roofing debris, rocks/gravel, soil, wood, plastic, rubber, sludges or absorbed liquids (<1% organic), animal carcasses, and asbestos.

B. RADIOLOGICAL DESCRIPTION

- ☐ TRU
- ■ Low-Level Waste (LLW)
  - ☐ Category 1
  - ■ Category 3*
  - ☐ > Category 3
  - ☐ < 10 nCi/g alpha activity
- ■ Contact Handled
- ■ Remote Handled**

C. HAZARDOUS CONSTITUENTS

- ■ Non-Hazardous LLW
- ☐ RCRA/EPA Regulated Hazardous Organics
  - ☐ w/o halogenated organics
- ☐ RCRA/EPA Regulated Hazardous Metals
  - ☐ w/o mercury
- ☐ Ignitables
  - ☐ liquids
  - ☐ oxidizers
- ☐ Corrosives
- ☐ Reactives
  - ☐ cyanides
  - ☐ sulfides
  - ☐ water reactive
- ☐ PCB's- ☐ PCB1 ☐ PCB2 ☐ State Only
- ☐ State-Only Regulated Waste
- ☐ RCRA/EPA regulated based on "Derived- From or Mixture Rule"
- ☐ Subject to Land Disposal Restrictions

D. ALLOWABLE WASTE CODES

State Waste Codes NONE

EPA Waste Codes NONE

E. pH RANGES

- ☐ pH ≤ 2
- ☐ pH ≥ 12.5
- ☐ pH > 2 & <12.5
- ■ N/A

F. FLASHPOINT RANGES

- ☐ < 38 °C
- ☐ 38 - 60°C
- ☐ > 60°C
- ■ N/A

G. RECOMMENDED PACKAGING

- UN1A2 208 liter (55 gallon) painted drum,
- DOT 7A 122x122x244 cm (4x4x8 ft) metal box, or
- For < Type A Waste Only - Fire Retardant Strong Tight Container 122x122x244 cm (4x4x8 ft).

H. SPECIAL INSTRUCTIONS

* > Class C waste is not allowed under this WSRd.

** Remote handled (RH) radioactive packages shall include sacrificial rigging provided by the shipper.

I. STORAGE/DISPOSAL LOCATION

- ☐ Transuranic Storage (TRUSAF/CWC)
- ■ Low-Level Burial Grounds
- ☐ Central Waste Complex (CWC)
  - ☐ Acid Storage
  - ☐ Caustic Storage
  - ☐ Combustible Storage
  - ☐ Low-Flashpoint Storage
  - ☐ Other RMW Storage
  - ☐ Oxidizer Storage
  - ☐ Sodium Storage
  - ☐ PCB Storage
  - ☐ Non-Mixed Storage
- ☐ Direct Offsite Shipment
- ☐ Mixed Waste Trench

J. VIABLE TREATMENT AND/OR DISPOSAL METHOD(S)

- ☐ Organic Destruction
- ☐ Organic Removal
- ☐ Organic Treatment-Aqueous
- ☐ Metal Removal
- ☐ Amalgamation
- ☐ Stabilization
- ☐ Deactivation
- ■ Disposal
- ☐ Decontamination
- ☐ Metal Recovery
- ☐ Mercury Separation
- ☐ Neutralization
- ☐ Waste Isolation Pilot Plant

Waste Stream Requirements Summary No. RLA-IXV-01 D

GENERATION LOCATION	Rupture Loop Annex Ion Exchanger Vault at the 309 Building
PHYSICAL DESCRIPTION	1) Ion exchangers R4, R5/RLIX-1, C3, and C4, with resin and absorbed liquid. 2) Contaminated equipment used in cleanup operation. 3) Plastic, tumble weeds, piping, connector heads, jumpers, valving, filter with metal housing, wooden ladder, contained floor sweepings, and absorbed liquid from vault.
RADIOLOGICAL CHARACTERISTICS	1) Category 1 Low-Level Waste
DANGEROUS CHARACTERISTICS	1) Non-Hazardous
DOT HAZARD CLASSIFICATION	1) Hazard Class 7; Radioactive material, n.o.s.
PACKAGING REQUIREMENTS	Safety Evaluation for Packaging and Hanford Site requirements: 1) USA DOT 7A Type A, 6x6x12 ft metal box, Capital Industries part S 0710-0710-1420-0187. 2) Void fill the resin chambers of ion exchangers C3 and C4 with grout. 3) Using grout as a void filler, pour a layer of at least two inches of grout in the bottom and adhere two inch standoffs with waterstops to the interior sides of the box prior to placing waste in the box; after the box is filled with waste, fill the void spaces in a minimum of three lifts; seal the grout ports. 4) Remove liquid from ion exchanger R5/RLIX-1 to the maximum extent practicable. 5) Add a minimum of .5 gallons of RADSORB to ion exchangers R4 and R5/RLIX-1 through the resin fill ports. Best Management Practice: 1) Non-combustible, non-regulated material may be used as necessary to brace the waste to prevent shifting and loss of containment integrity during packing, transportation, and storage.
MARKING AND LABELING REQUIREMENTS	Safety Evaluation for Packaging requirements: 1) Obliterate USA DOT 7A Type A markings and maximum gross weight markings. 2) Mark localized radiation "hot spots." DOT requirements: 1) UN 2982 orange panel markings on 4 sides. 2) Applicable DOT radioactive labels on 2 opposing sides. 3) Gross weight markings on top and on the side with the CIN barcode. Hanford Site requirements (all markings will be in 2 inch letters): 1) Radioactive Waste label on four sides and top. 2) Caution, Radioactive Material tag on the side with the CIN barcode. 3) CAUTION, RADIOACTIVE MATERIAL marking on four sides and top. 4) CATEGORY 1 WASTE marking on the side with the CIN barcode. 5) THIS SIDE UP marking on top. 6) CIN barcode on one small side. Best Management Practice: 1) CIN marking on lid.
TRANSPORTATION REQUIREMENTS	Safety Evaluation for Packaging requirements: 1) Perform a road closure with shipment. See attached road closure checklist. DOT requirements: 1) Removable contamination on the exterior of the box shall not exceed the DOT limits in 49 CFR 173.443(a). 2) Shipping papers. 3) Placards, as applicable.
SPECIAL INSTRUCTIONS	Safety Evaluation for Packaging requirements: 1) Install sacrificial rigging capable of hoisting 60,000 lb, to be shipped in a ready to hoist configuration, approachable for hook up from the side of the box with the lowest radiation levels. 2) The minimum gross weight of the box is 40,000 lb. The maximum gross weight of the box is 60,000 lb. 3) Install the box lid according to the manufacturers closure instructions. Tamper-indicating features are not required. 4) Grout must be cured to 1000 psi test strength prior to movement of the box. Hanford Site requirements: 1) Submit complete pre-shipment portfolio to Acceptance Services.

TREATMENT STORAGE DISPOSAL LOCATION(S)	1)	Disposal at Hanford Site Low-Level Burial Grounds
REFERENCE INFORMATION	1) 2) 3) 4) 5)	309 Building Waste Management Program Plan, 309-WM-96-001 Safety Evaluation for Packaging for Onsite Transfer of Twelve Ion Exchange Columns, WHC-SD-TP-SEP-047 Waste Certification Summary: SOLID WASTE FROM RUPTURE LOOP ANNEX IX VAULT, Rev. 1 Waste Specification Record No. 100-00 Hanford Site Solid Waste Acceptance Criteria, WHC-EP-0063-4

Waste Stream Requirements Summary No. RLA-IXV-02 D

GENERATION LOCATION	Rupture Loop Annex Ion Exchanger Vault at the 309 Building
PHYSICAL DESCRIPTION	1) Ion exchangers identified as R1, R2, R3, L1, L2, L3, L4 and C2, with resin and absorbed liquid. 2) Contaminated tubing and fasteners used to pump liquid from the ion exchangers.
RADIOLOGICAL CHARACTERISTICS	1) Category 3 Low-Level Waste
DANGEROUS CHARACTERISTICS	1) Non-Hazardous
DOT HAZARD CLASSIFICATION	1) Hazard Class 7; Radioactive material, n.o.s.
PACKAGING REQUIREMENTS	Safety Evaluation for Packaging and Hanford Site requirements: 1) USA DOT 7A Type A, 6x6x12 ft metal box, Capital Industries part S 0710-0710-1420-0187. 2) Using Grout Mix Number Four as a stabalizer, pour a layer of at least two inches of grout in the bottom and adhere two inch standoffs with waterstops to the interior sides of the box prior to placing waste in the box; after the box is filled with waste, fill the void spaces in a minimum of three lifts; seal the grout ports. 3) Remove liquid from ion exchangers R1, R2, R3, L1, L2, and L3 to the maximum extent practicable. 4) Add a minimum of .5 gallons of RADSORB to ion exchangers R4 and R5/RLIX-1 through the resin fill ports. Best Management Practice: 1) Non-combustible, non-regulated material may be used as necessary to brace the waste to prevent shifting and loss of containment integrity during packing, transportation, and storage.
MARKING AND LABELING REQUIREMENTS	Safety Evaluation for Packaging requirements: 1) Obliterate USA DOT 7A Type A markings and maximum gross weight markings. 2) Mark localized radiation "hot spots." DOT requirements: 1) UN 2982 orange panel markings on 4 sides. 2) Applicable DOT radioactive labels on 2 opposing sides. 3) Gross weight markings on top and on the side with the CIN barcode. Hanford Site requirements (all markings will be in 2 inch letters): 1) Fissile label and ____ GRAMS FISSILE U-235/PU marking on four sides and top. 2) Radioactive Waste label on four sides and top. 3) Caution, Radioactive Material tag on the side with the CIN barcode. 4) CAUTION, RADIOACTIVE MATERIAL marking on four sides and top. 5) CATEGORY 3 WASTE marking on the side with the CIN barcode. 6) THIS SIDE UP marking on top. 7) CIN barcode on one small side. Best Management Practice: 1) CIN marking on lid.

TRANSPORTATION REQUIREMENTS	Safety Evaluation for Packaging requirements: 1) Perform a road closure with shipment. See attached road closure checklist. DOT requirements: 1) Removable contamination on the exterior of the box shall not exceed the DOT limits in 49 CFR 173.443(a). 2) Shipping papers. 3) Placards, as applicable.
SPECIAL INSTRUCTIONS	Safety Evaluation for Packaging requirements: 1) Ion exchangers L1, L3, R1, and R2 will be packaged together. Ion exchangers L2, L4, C2, and R3 will be packaged together. 2) Install sacrificial rigging capable of hoisting 60,000 lb, to be shipped in a ready to hoist configuration, approachable for hook up from the side of the box with the lowest radiation levels. 3) The minimum gross weight of the box is 40,000 lb. The maximum gross weight of the box is 60,000 lb. 4) Install the box lid according to the manufacturers closure instructions. Tamper-indicating features are not required. 5) Grout must be cured to 1000 psi test strength prior to movement of the box. Hanford Site requirements: 1) Submit complete pre-shipment portfolio to Acceptance Services.
TREATMENT STORAGE DISPOSAL LOCATION(S)	1) Disposal at Hanford Site Low-Level Burial Grounds
REFERENCE INFORMATION	1) 309 Building Waste Management Program Plan, 309-WM-96-001 2) Safety Evaluation for Packaging for Onsite Transfer of Twelve Ion Exchange Columns, WHC-SD-TP-SEP-047 3) Waste Certification Summary: SOLID WASTE FROM RUPTURE LOOP ANNEX IX VAULT, Rev. 1 4) Waste Specification Record No. 100-01 5) Hanford Site Solid Waste Acceptance Criteria, WHC-EP-0063-4 6) Internal Memo, B. A. Mayancsik to E. J. Bitten, PLUTONIUM RECYCLE TEST FACILITY ION EXCHANGE COLUMNS STABALIZATION, dated May 6, 1996

WASTE CERTIFICATION SUMMARY

GENERATOR:	**ADVANCED FUEL FACILITIES TRANSITION**
WASTE TYPE:	**STEP-OFF PAD WASTE AND LOW-LEVEL DEBRIS FROM PRTR DEACTIVATION**
WSRd NUMBER:	**100-00A**
REVISION:	**REV. 1. MAY 2, 1996**

Waste Generating Process Description: The 309 Plutonium Recycle Test Reactor (PRTR) used a contained system for testing called Fuel Element Rupture Test Facility (FERTF) which was a pressurized, light-water-cooled loop, using one of the 85 process tubes within the main, heavy-water-cooled PRTR calandria. The FERTF could be operated in a recirculating or once through cooling mode. It was a pilot irradiation facility to test new fuel element designs and new operating regimes. Many of its tests involved testing of pre-defective fuel elements, containing natural uranium and 1% to 4% PuO_2, with pinhole breaks to study the stability of various defected material under irradiation. The PRTR designed positions for two vaults for spent ion exchange columns. The operating columns were connected in series for removal of the fuel and fission products in the FERTF coolant. The Rupture Loop Annex (RLAIX) contained columns connected in series for removal of products from the test loop.

The waste that will be created under this Waste Certification Summary will be from the process of removing the reactor hardware and miscellaneous materials that are left in the reactor facility. All characterization information and process knowledge is documented in WHC-SD-NEL-ER-002.

Physical Characterization: The waste consists of paper, cloth, rubber, plastic, metal, wood and leather. The forms of waste could be small pieces of equipment and reactor system components, tools, tygon tubing copper wire, metal signs, mazalan cloth, rubber gloves, shoe covers, mask cartridges, leather gloves, mop heads and handles brooms, tape, cardboard, and plastic (bottles-bags), glass (bottles and sampling equipment), filters, sampling equipment, sweepings (dirt, rust, scrap material); small quantities of inorganic, nonregulated absorbed liquids; empty Amercoat Waterborne Acrylic, Product #220 (MSDS 25821) paint containers; painting equipment with less than 10% Amercoat paint content; and other materials as described in WSRd 100-00. There will be no free liquids.

Radiological Characterization: The characterization is based on process knowledge from the fuel burn up analysis and decay calculations. A gamma energy, alpha energy and beta analysis was performed on the IX columns and vault water to confirm the process knowledge. Through the use of process knowledge and analysis, decay calculations can be used to derive all of the isotopes that would be present. The following are the isotopes of concern: ^{234}U, ^{235}U, ^{236}U, ^{238}U, ^{241}Am, ^{233}Pa, ^{237}Np, ^{238}Pu, ^{239}Pu, ^{240}PU, ^{241}Pu, ^{242}Pu, ^{90}Sr, ^{60}Co, ^{137}Cs and trace amounts of ^{14}C and ^{3}H. The other isotopes are either less than one percent of the total curies, not listed on the category table or less than one percent of the category 1 limits. Radiological analysis is attached as appendix A. The containers will contain low level category 1 waste. Radiological characterization of each container for disposal will be done either by dose to curie and scaling factors or by assay and scaling factors.

Chemical Characterization: The waste consists of reactor components, personal protective equipment (PPE), and solid waste material contaminated by the reactor or reactor water which through process knowledge and chemical analysis contained no dangerous/hazardous material. See appendix B for analysis.

Empty Amercoat Waterborne Acrylic, Product #220 (MSDS 25821) paint containers and painting equipment with less than 10% Amercoat paint content will be in the waste stream.

Waste Designation: All materials used in the deactivation and packaging of the facilities waste will be pre-designated in accordance with the Washington State Dangerous Waste Regulations Chapter 173-303.

A pre-designation of the Amercoat, listed above, was performed. In the quantities stated above, the Amercoat waste is non-regulated. Reference appendix B.

Segregation: Segregation of the waste into the proper containers will be performed using work procedure 309-WM-96-003, "Low-Level Waste Packing Procedures."

Packaging: The low-level waste debris will be packaged in UN1A2 208 liter (55 gallon) painted drums, DOT 7A 122x122x244 cm (4x4x8 ft) metal boxes, and, for < Type A waste only, 122x122x244 cm (4x4x8 ft) Fire Retardant Strong Tight Containers, as allowed per WSRd 100-00

Containers with Department of Transportation (DOT) Type A quantities of waste will be lined with a ten mil polyethylene reinforced liner. Containers with DOT Limited Quantity and Low Specific Activity quantities may or may not be lined per Hanford Site Solid Waste Acceptance Criteria chapter 3 section 3.7 section 3.7.1.2.5.b. Containers with a liner will have all sharp edges and corners padded to protect the liner. The liner will be pigtailed and sealed with plastic reinforced tape. Hanford approved void space filler will be added to the containers, if needed, to assure less than 10% free void space. Plastic or glass containers that previously contained liquid will be drained and filled with RADSORB.

Waste Minimization: Waste minimization during decommissioning is accomplished through the use of non-regulated products or materials. The other methods are implementation of source reduction, recycling, and treatment opportunities for all waste streams including sanitary, dangerous, radioactive and mixed.

Please see attachment:

WASTE SPECIFICATION RECORD No. 1 0 0 - 0 0

A. WASTE MATRIX DESCRIPTION

Miscellaneous Compactible and Non Compactible Solids:
Solid compactible and non-compactible waste materials including paper, plastic, rubber, debris, cloth, leather, vinyl, equipment, metal, concrete, glass, ceramic or brick materials, roofing debris, rocks/gravel, soil, wood, plastic, rubber, sludges or absorbed liquids (<1% organic), animal carcasses, and asbestos.

B. RADIOLOGICAL DESCRIPTION

- ☐ TRU
- ■ Low-Level Waste (LLW)
  - ■ Category 1
  - ☐ Category 3
  - ☐ > Category 3
  - ☐ < 10 nCi/g alpha activity
- ■ Contact Handled
- ■ Remote Handled*

C. HAZARDOUS CONSTITUENTS

- ■ Non-Hazardous LLW
- ☐ RCRA/EPA Regulated Hazardous Organics
  - ☐ w/o halogenated organics
- ☐ RCRA/EPA Regulated Hazardous Metals
  - ☐ w/o mercury
- ☐ Ignitables
  - ☐ liquids
  - ☐ oxidizers
- ☐ Corrosives
- ☐ Reactives
  - ☐ cyanides
  - ☐ sulfides
  - ☐ water reactive
- ☐ PCB's- ☐ PCB1 ☐ PCB2 ☐ State Only
- ☐ State-Only Regulated Waste
- ☐ RCRA/EPA regulated based on "Derived- From or Mixture Rule"
- ☐ Sub ect to Land Disposal Restrictions

D. ALLOWABLE WASTE CODES

State Waste Codes NONE
EPA Waste Codes NONE

E. pH RANGES

☐ pH≤ 2 ☐ pH≥ 12.5
☐ pH> 2 & <12.5 ■ N/A

F. FLASHPOINT RANGES

☐ <38 °C ☐ 38 - 60°C
☐ >60°C ■ N/A

G. RECOMMENDED PACKAGING

- UN1A2 208 liter (55 gallon) painted drum,
- DOT 7A 122x122x244 cm (4x4x8 ft) metal box, or
- For < Type A Waste Only - Fire Retardant Strong Tight Container 122x122x244 cm (4x4x8 ft).

H. SPECIAL INSTRUCTIONS

* Remote handled (RH) radioactive packages shall include sacrificial rigging provided by the shipper.

I. STORAGE/DISPOSAL LOCATION

- ☐ Transuranic Storage (TRUSAF/CWC)
- ■ Low-Level Burial Grounds
- ☐ Central Waste Complex (CWC)
  - ☐ Acid Storage
  - ☐ Caustic Storage
  - ☐ Combustible Storage
  - ☐ Low-Flashpoint Storage
  - ☐ Other RMW Storage
  - ☐ Oxidizer Storage
  - ☐ Sodium Storage
  - ☐ PCB Storage
  - ☐ Non-Mixed Storage
- ☐ Direct Offsite Shipment
- ☐ Mixed Waste Trench

J. VIABLE TREATMENT AND/OR DISPOSAL METHOD(S)

☐ Organic Destruction	☐ Organic Removal	☐ Organic Treatment-Aqueous	☐ Metal Removal	☐ Amalgamation
☐ Stabilization	☐ Deactivation	■ Disposal	☐ Decontamination	☐ Metal Recovery
☐ Mercury Separation	☐ Neutralization	☐ Waste Isolation Pilot Plant		

309 Waste Stream Requirements Summary	**STEP-OFF PAD-01** B
GENERATION LOCATION	Rooms and areas associated with and containing the PRTR systems in the 309 Building and on the 309 Building grounds.
PHYSICAL DESCRIPTION	1) The waste consists of paper, cloth, rubber, plastic, metal, wood and leather. The forms of waste could be small pieces of equipment and reactor system components, tools, tygon tubing copper wire, metal signs, mazalan cloth, rubber gloves, shoe covers, mask cartridges, leather gloves, mop heads and handles brooms, tape, cardboard, and plastic (bottles-bags), filters, sampling equipment, sweepings (dirt, rust, scrap material); small quantities of inorganic, nonregulated absorbed liquids; and other materials as described in WSRd 100-00. 2) Waste containing Amercoat paint, limited to empty paint containers and other waste in which the Amercoat paint makes up < 10% of the waste matrix.
RADIOLOGICAL CHARACTERISTICS	1) Category 1 Low-Level Waste
DANGEROUS CHARACTERISTICS	1) Non-Hazardous
DOT HAZARD CLASSIFICATION	1) Hazard Class 7; Radioactive material, n.o.s. 2) Hazard Class 7; Radioactive material, LSA, n.o.s. 3) Hazard Class 7; Radioactive material, excepted package-limited quantity of material.
PACKAGING REQUIREMENTS	Hanford Site requirements: 1) Hanford approved void space filler will be added to the containers, if needed, to assure less than 10% free void space. 2) Containers with Department of Transportation (DOT) Type A quantities of waste will be lined with a ten mil polyethylene reinforced liner. Containers with DOT Limited Quantity and Low Specific Activity quantities may or may not be lined per Hanford Site Solid Waste Acceptance Criteria chapter 3 section 3.7 section 3.7.1.2.5.b. The liner will be pigtailed and sealed with plastic reinforced tape. 3) Containers with a liner will have all sharp edges and corners of contents padded to protect the liner. 4) No free liquids or dangerous/hazardous waste will be commingled in the container. 5) Plastic containers that previously contained liquid will be drained and filled with a Hanford approved sorbent. DOT requirements for Radioactive material, n.o.s.: 1) UN1A2 55 gallon painted drums (spec HS-V-P-0045) -OR- DOT 7A 122x122x244 cm (4x4x8 ft) metal boxes. DOT requirements for Radioactive material, LSA, n.o.s.: 1) UN1A2 55 gallon painted drums (spec HS-V-P-0045) -OR- DOT 7A 122x122x244 cm (4x4x8 ft) metal boxes -OR- 122x122x244 cm (4x4x8 ft) Fire Retardant Strong Tight Containers. DOT requirements for Radioactive material, excepted package-limited quantity of material: 1) UN1A2 55 gallon painted drums (spec HS-V-P-0045) -OR- DOT 7A 122x122x244 cm (4x4x8 ft) metal boxes -OR- 122x122x244 cm (4x4x8 ft) Fire Retardant Strong Tight Containers. 2) The package does not contain more than 15 grams of uranium-235.

309 Waste Stream Requirements Summary	**STEP-OFF PAD-01** B
MARKING AND LABELING REQUIREMENTS	Hanford Site requirements for all: 1) Radioactive Waste sticker, two on sides in opposition and one on top. 2) Caution, Radioactive Material sticker. 3) Category 1 marking on one side. 4) CIN barcode on one side. 5) CIN marking on lid. 6) This Side Up marking on top. DOT requirements for Radioactive material, excepted package-limited quantity of material: 1) Radioactive marking. DOT requirements for Radioactive material, LSA, n.o.s.: 2) Radioactive-LSA marking. 3) RQ marking, if applicable. DOT requirements for Radioactive material, n.o.s. in UN1A2 208 liter (55 gallon) painted drums: 1) Radioactive material, n.o.s. marking on one side. 2) UN 2982 marking on one side. 3) Gross weight markings on top and one side. 4) TYPE A marking in 1/2" high or larger letters. 5) Applicable DOT radioactive labels, two 180 degrees part on side of drum. 6) RQ marking, if applicable. DOT requirements for Radioactive material, n.o.s. in DOT 7A 122x122x244 cm (4x4x8 ft) metal boxes: 1) UN 2982 orange panel markings on 4 sides. 2) Applicable DOT radioactive labels on two opposite sides. 3) Gross weight markings on top and one side.
TRANSPORTATION REQUIREMENTS	DOT requirements for Radioactive material, excepted package-limited quantity of material and Radioactive material, LSA, n.o.s.: 1) Removable radioactive surface contamination on the external surface of the package shall not exceed the DOT limits in 49 CFR 173.443(a). 2) The radiation level at any point on the external surface of the package shall not exceed 0.5 mrem/hr for limited quantity or it must comply with 49 CFR 173.441 for LSA. 3) The notice described in 49 CFR 173.421-1 (a) enclosed in the package, included with the packing list, or otherwise forwarded with the package. Additional DOT requirements for Radioactive material, LSA, n.o.s.: 4) Ship as exclusive use per 49 CFR 173.425 (b). 5) Placards. 6) Specific instructions for maintenance of exclusive use shipment controls must be provided to the carrier with the shipping paper as defined in 49 CFR 173.425 (b). DOT requirements for Radioactive material, n.o.s.: 7) Placards. Hanford Site requirements for all: 8) Shipping papers.
SPECIAL INSTRUCTIONS	Hanford Site requirements for all: 1) Radiologically characterize each container using dose to curie and scaling factors or assay and scaling factors. 2) Submit a complete pre-shipment portfolio to Acceptance Services.
TREATMENT STORAGE DISPOSAL LOCATION(S)	1) Disposal at Hanford Site Low-Level Burial Grounds
REFERENCE INFORMATION	1) Low-Level Waste Packing Procedures, 309-WM-96-003 2) 309 Building Waste Management Program Plan, 309-WM-96-001 3) Waste Certification Summary: STEP-OFF PAD WASTE AND LOW-LEVEL DEBRIS FROM PRTR DEACTIVATION, Rev. 0 4) Waste Specification Record No. 100-00 5) Hanford Site Solid Waste Acceptance Criteria, WHC-EP-0063-4

WASTE CERTIFICATION SUMMARY

GENERATOR:	**ADVANCED FUEL FACILITIES TRANSITION**
WASTE TYPE:	**VOLUME REDUCED EMPTY DRUMS BY ATG, INC.**
WSRd NUMBER:	**102-02,**
REVISION:	**REV. O. MARCH 28, 1996**

Waste Generating Process Description: The 309 Plutonium Recycle Test Reactor (PRTR) used a contained system for testing called Fuel Element Rupture Test Facility (FERTF) which was a pressurized, light-water-cooled loop, using one of the 85 process tubes within the main, heavy-water-cooled PRTR calandria. The FERTF could be operated in a recirculating or once through cooling mode. It was a pilot irradiation facility to test new fuel element designs and new operating regimes. Many of its tests involved testing of pre-defective fuel elements, containing natural uranium and 1% to 4% PuO_2, with pinhole breaks to study the stability of various defected material under irradiation. The PRTR designed positions for two vaults for spent ion exchange columns. The operating columns were connected in series for removal of the fuel and fission products in the FERTF coolant. The Rupture Loop Annex (RLAIX) contained columns connected in series for removal of products from the test loop.

The north east vault was opened in March, 1994, the vault was found to contain 57,000 liters of radioactive water. The water was due to rain and the vault not having a rain cover. The vault was pumped down to 1,900 liters of water and covered. The water was annualized and found not mixed waste. The water was than shipped to 340 for disposal. The remaining 1,900 liters of water were pumped into metal 55 gallon drums that were shipped to 340 for disposal of the water. The same drums were used in the pumping of water from the RLAIX vault's IX columns in which the drums were used to ship the water to the 340 facility for disposal.

Physical Description: The waste consists of empty, radiologically contaminated 55 gallon metal drums that were used as transport containers for non-hazardous water from the PRTR facility to the 340 facility for disposal of the water.

Radiological Characterization: The water from the north east IX column vault was analyzed showing ^{60}Co, ^{137}Cs and the beta was attributed to ^{90}Sr with trace amounts of ^{14}C and ^{3}H. The water pumped from the RLAIX IX columns could contain the following isotopes which were determined to be in the columns using non-destructive assay (NDA) and process knowledge: ^{241}Am, ^{233}Pa, ^{237}Np, ^{234}U, ^{235}U, ^{236}U, ^{238}U, ^{238}Pu, ^{239}Pu, ^{240}PU, ^{241}Pu, ^{242}Pu, ^{137}Cs, ^{90}Sr and ^{60}Co. The empty drums contain low levels of this activity and will be low-level category 1 waste. The laboratory analysis and NDA were done by Battelle. See appendix A for supporting documentation.

Chemical Characterization: The water that was in the drums came from two sources. The first source is the rain water from the north east IX column vault and the second one is water that was pumped from the columns in the RLAIX IX column vault. Laboratory analysis was performed by Battelle. See appendix B for supporting documentation.

Waste Designation: Process knowledge and analysis on the sources of water and the resin with which some of the water was in contact revealed that the water was not regulated by the Washington State Dangerous Waste Regulations Chapter 173-303. Therefore, the empty drums are not regulated for dangerous residues. See appendix B for supporting documentation.

Segregation: The waste consists only of empty radiologically contaminated drums. The drums will be transported to ATG Inc. for volume reduction. ATG Inc. will package the waste after volume reduction and will ensure proper segregation from other waste streams.

Packaging: The volume reduced drums will be placed in one of the following type of drums: 85 gal., 79 gal., 72 gal., 64 gal. Hanford approved mineral void space filler and or sorbent will be used when needed. The sorbent and void space filler material will be compatible with the waste form.

Waste Minimization: Minimization of waste through use of non-regulated products or materials is the preferred waste management tool. Source reduction for dangerous products/chemicals has been implemented. Source reduction, recycling, and treatment opportunities for all waste streams including sanitary, dangerous, radioactive, and mixed has been implemented.

Please see attachments.

WASTE SPECIFICATION RECORD No. 1 0 2 - 0 2

A. WASTE MATRIX DESCRIPTION

Miscellaneous Volume Reduced Solids*: Dry solid waste materials such as paper, plastic, rubber, naturally occurring debris, cloth (personal protective clothing, rags, canvas, tarps) leather, vinyl, concrete, metal, wood, empty non-reusable steel drums, etc. that have been volume reduced by ATG, Inc.

B. RADIOLOGICAL DESCRIPTION

- ☐ TRU
- ■ Low-Level Waste (LLW)
  - ■ Category 1
  - ☐ Category 3
  - ☐ > Category 3
  - ☐ < 10 nCi/g alpha activity
- ■ Contact Handled
- ☐ Remote Handled

C. HAZARDOUS CONSTITUENTS

- ■ Non-Hazardous LLW
- ☐ RCRA/EPA Regulated Hazardous Organics
  - ☐ w/o halogenated organics
- ☐ RCRA/EPA Regulated Hazardous Metals
  - ☐ w/o mercury
- ☐ Ignitables
  - ☐ liquids
  - ☐ oxidizers
- ☐ Corrosives
- ☐ Reactives
  - ☐ cyanides
  - ☐ sulfides
  - ☐ water reactive
- ☐ PCB's- ☐ PCB1 ☐ PCB2 ☐ State Only
- ☐ State-Only Regulated Waste
- ☐ RCRA/EPA regulated based on "Derived-From or Mixture Rule"
- ☐ Subject to Land Disposal Restrictions

D. ALLOWABLE WASTE CODES

State Waste Codes NONE

EPA Waste Codes NONE

E. pH RANGES

- ☐ pH ≤ 2
- ☐ pH ≥ 12.5
- ☐ pH > 2 & < 12.5
- ■ N/A

F. FLASHPOINT RANGES

- ☐ < 38 °C
- ☐ 38 - 60°C
- ☐ > 60°C
- ■ N/A

G. RECOMMENDED PACKAGING

- UN1A2 242 liter (64 gallon) painted drum,
- UN1A2 273 liter (72 gallon) painted drum,
- UN1A2 299 liter (79 gallon) painted drum,
- UN1A2 322 liter (85 gallon) painted drum, or
- DOT 7A 122x122x244 cm (4x4x8 ft) metal box

H. SPECIAL INSTRUCTIONS

*This waste must comply with the acceptance criteria for ATG, Inc. and the Statement of Work for Low-Level Radioactive Waste Volume Reduction Services as stated in contract number DE-AC06-95RL13129. Asbestos may be accepted for volume reduction if packaged per WHC-EP-0063. No liquids or absorbed liquids allowed except those used for the packaging of asbestos.

I. STORAGE/DISPOSAL LOCATION

- ☐ Transuranic Storage (TRUSAF/CWC)
- ■ Low-Level Burial Grounds
- ☐ Central Waste Complex (CWC)
  - ☐ Acid Storage
  - ☐ Caustic Storage
  - ☐ Combustible Storage
  - ☐ Low-Flashpoint Storage
  - ☐ Other RMW Storage
  - ☐ Oxidizer Storage
  - ☐ Sodium Storage
  - ☐ PCB Storage
  - ☐ Non-Mixed Storage
- ☐ Direct Offsite Shipment
- ☐ Mixed Waste Trench

J. VIABLE TREATMENT AND/OR DISPOSAL METHOD(S)

- ☐ Organic Destruction
- ☐ Organic Removal
- ☐ Organic Treatment-Aqueous
- ☐ Metal Removal
- ☐ Amalgamation
- ☐ Stabilization
- ☐ Deactivation
- ■ Disposal
- ☐ Decontamination
- ☐ Mercury Separation
- ☐ Neutralization
- ☐ Waste Isolation Pilot Plant
- ☐ Metal Recovery

Waste Stream Requirements Summary No. RLA-IXV-03 B

GENERATION LOCATION	Radioactive Material Storage Areas on the 309 Building grounds containing empty liquid bung drums that were used to hold PRTR Vault and RLAIX Vault liquids.
PHYSICAL DESCRIPTION	1) The waste consists of empty, radiologically contaminated 55 gallon metal drums that were used as transport containers for non-hazardous water from the PRTR facility to the 340 facility for disposal of the water.
RADIOLOGICAL CHARACTERISTICS	1) Category 1 Low-Level Waste
DANGEROUS CHARACTERISTICS	1) Non-Hazardous
DOT HAZARD CLASSIFICATION	1) Hazard Class 7; Radioactive material, excepted package-limited quantity of material.
PACKAGING REQUIREMENTS	DOT requirements for Radioactive material, excepted package-limited quantity of material: 1) UN1A2 208 liter (55 gallon) painted drums. 2) The package does not contain more than 15 grams of uranium-235. Hanford Site requirements: 3) No free liquids or dangerous/hazardous waste will be in the container.
MARKING AND LABELING REQUIREMENTS	DOT requirements for Radioactive material, excepted package-limited quantity of material: 1) Radioactive marking. Hanford Site requirements: 2) Caution, Radioactive Material Label. 3) CIN barcode or PIN on one side.
TRANSPORTATION REQUIREMENTS	DOT requirements for Radioactive material, excepted package-limited quantity of material: 1) Removable radioactive surface contamination on the external surface of the package shall not exceed the DOT limits in 49 CFR 173.443(a). 2) The radiation level at any point on the external surface of the package shall not exceed 0.5 mrem/hr for limited quantity or it must comply with 49 CFR 173.441 for LSA. 3) The notice described in 49 CFR 173.421-1 (a) enclosed in the package, included with the packing list, or otherwise forwarded with the package. Hanford Site requirements: 4) Shipping papers.
SPECIAL INSTRUCTIONS	Hanford Site requirements: 1) Radiologically characterize each container using dose to curie and scaling factors or assay and scaling factors. 2) Submit a pre-shipment portfolio containing radionuclide content of each drum to Acceptance Services.
TREATMENT STORAGE DISPOSAL LOCATION(S)	1) Volume reduction at ATG, Inc. 2) Disposal at Hanford Site Low-Level Burial Grounds.
REFERENCE INFORMATION	1) 309 Building Waste Management Program Plan, 309-WM-96-001 2) Waste Certification Summary: VOLUME REDUCED EMPTY DRUMS BY ATG, INC., Rev. 0 3) Waste Specification Record No. 102-02 4) Hanford Site Solid Waste Acceptance Criteria, WHC-EP-0063-4

Waste Stream Requirements Summary No. RLA-IXV-04 B

GENERATION LOCATION	Rupture Loop Annex Ion Exchanger Vault at the 309 Building
PHYSICAL DESCRIPTION	1) Water from the RLA Ion Exchangers.
RADIOLOGICAL CHARACTERISTICS	1) Radioactive contaminated liquid.
DANGEROUS CHARACTERISTICS	1) Non-Hazardous.
DOT HAZARD CLASSIFICATION	1) To be determined.
PACKAGING REQUIREMENTS	1) UN1A2 55 gallon painted drums.
MARKING AND LABELING REQUIREMENTS	DOT requirements: 1) To be determined. Hanford Site requirements: 2) Caution, Radioactive Material Label. 3) Radioactive Waste Label on two opposite sides and top. 4) CIN barcode or PIN on one side. 5) Others to be determined.
TRANSPORTATION REQUIREMENTS	1) To be determined.
SPECIAL INSTRUCTIONS	Hanford Site requirements: 1) Complete sampling and analysis of liquid per Rupture Loop Annex Ion Exchange (RLAIX) Vault Cleanout, 309-WP-96-002, Appendix D. 2) Submit complete Radioactive Liquid Waste Transfer Request to 300 Area LEF Facility Manager. 3) Others to be determined.
TREATMENT STORAGE DISPOSAL LOCATION(S)	1) Acceptance of liquid at 340 Facility. Empty drums will be returned.
REFERENCE INFORMATION	1) 309 Building Waste Management Program Plan, 309-WM-96-001.

DISTRIBUTION SHEET

To	From	Page 1 of 1
Distribution	Advanced Fuel Facilities Transition	Date 08-13-96
Project Title/Work Order		EDT No. 618474
Rupture Loop Annex Ion Exchange (RLAIX) Vault Deactivation **B79EE**		ECN No. N/A

Name	MSIN	Text With All Attach.	Text Only	Attach./ Appendix Only	EDT/ECN Only
E. J. Bitten	L5-70	X			
B. C. Cornwell	L5-70	X			
D. H. Chapin (RL)	R3-79	X			
* J. E. Ham	L5-70	X			
D. L. Harris	L5-70	X			
L. G. Irons	T3-04	X			
W. A. Ruhlman	R3-79	X			
J. M. Steffen	N1-47	X			
Facility File	L5-70	X			
Central Files	A3-88	X			

* Advance Copy