

VOLUME II

FINAL PROJECT REPORT

FOR THE

DECONTAMINATION AND

DECOMMISSIONING OF THE

PLUTONIUM FACILITY

AND

MULTIPLE FAILURE BUILDING

NUCLEAR LAKE

PAWLING, NEW YORK

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I. GENERAL

The following is Volume II to the original, "Final Project Report for the Decontamination and Decommissioning of the Plutonium Facility and Multiple Failure Building Nuclear Lake Pawling, New York," August 1993 (herein referred to as Volume II.)

Volume II is the direct result of:

- 1) A NES/IES response to a fax received on 8/31/93 from the National Park Service. The fax indicated the possibility that residual surface contamination could still be present in the Waste Disposal building. A scoping survey revealed a 2 ft² area of the Waste Disposal building concrete floor with fixed beta-gamma surface contamination. Volume II contains the work plan and survey documentation of that effort.
- 2) Oak Ridge Institute of Science and Research (ORISE) confirmatory survey results of the Nuclear Lake Site. The survey revealed areas of the Plutonium building still contained areas of alpha activity above release criteria.

Specifically Volume II contains:

- A narrative documenting the particular concerns of the NRC as a result of the original project report, including documentation, survey instrumentation, etc.
- Appendix A contains the Final Project Report for the Decontamination and Decommissioning of the Waste Disposal Building.
- Appendix B contains the Final Project Report for the Decontamination and Decommissioning of Additional Areas of the Plutonium Building Identified by ORISE Needing Additional Remediation.
- Appendix C contains the Alpha Re-survey of the Plutonium Building Multiple Failure Building Waste Storage Building.
- Appendix D contains the Amended Alpha Direct Survey Documentation Including Recalculated MDAs.
- Appendix E contains the Alpha Re-scan and Selected Direct Measurements of the Plutonium Building Multiple Failure Building.
- Appendix F contains QA Results of the Alpha Re-scan and Selected Direct Measurements effort in Appendix E.

II. WASTE DISPOSAL BUILDING DECONTAMINATION AND FINAL SURVEY

A. SCOPE

The building decontamination consisted of remediating the regions of elevated surface contamination as identified by the initial radiological survey of the building. A scoping survey performed on 9/3/93 in the Waste Disposal Building (WDB) by NES/IES was in response to a fax received on 8/31/93 from the National Park Service. The fax indicated the possibility that residual surface contamination could still be present in the building. The scoping survey revealed a 2 ft² area with fixed beta-gamma surface contamination. The survey also revealed that original attempts to decontaminate the floor caused the spread of radioactively contaminated concrete chips. These chips, in turn, could have potentially contaminated other building contents.

The initial radiological survey included the main level of the WDB and consisted of surface scans for alpha, beta, gamma activity, and surveys to determine the isotope(s) of concern. Also, surveys were performed to determine the extent of the fixed and removable contamination. These measurements were documented on survey forms and were used as a guide in performing the decommissioning activities.

The goal of the decontamination and decommissioning was to remove and dispose of the contaminated building materials so that the building could be released for unrestricted use. At the conclusion of the Nuclear Lake site decommissioning project, a final release survey was performed within the WDB to verify that decontamination efforts were successful in achieving the release criteria. Specifically, building surface contamination levels complied with the "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material," U.S. NRC, August 1987 (Ref. 9).

B. WDB AFFECTED AND UNAFFECTED AREAS

Throughout the initial survey and decommissioning of the WDB, the entire building was classified as affected areas.

C. WORK PLAN

1. SURVEY/REMOVE WDB CONTENTS (MAIN LEVEL ONLY)

This task included:

- Identifying the contents of the Main Level that need to be surveyed.

- Performing a survey of the contents to determine if the contents may be released as "clean" waste. All building contents were determined to be "clean" and disposed of at a local landfill.
- Releasing and removing materials in compliance with "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material" as outlined in the Decommissioning Plan for the Plutonium Facility and Multiple Failure Building at Nuclear Lake.

2. PERFORM INITIAL SURVEY OF MAIN LEVEL

This task included:

- Surface scans for alpha, beta, and gamma activity.
- Surveys to determine the isotopes of concern that are present.
- Layout of grid systems for referencing survey locations.
- Random direct and removable contamination measurements (based on the scan survey) of the floor within the WDB.
- Surveys for determining any contaminated concrete chips which may still be present.
- Baseline air monitoring.

D. INITIAL SURVEY RESULTS SUMMARY

The following table summarizes the results from the initial surveys that had indications of activity level greater than USNRC release criteria:

Waste Disposal Building

Table 1: Waste Disposal Building Floor

Grid Number	Direct β - γ
A-5	303,030
E-4	454,500
E-5	393,940
F-4	378,750
F-5	424,200

Note: Activity results are in dpm/100 cm²

E. AIR SAMPLING

Air samples were collected over the course of the Waste Disposal Building decommissioning project. Air samples with initial results near or exceeding 3E-12 μ Ci/ml for alpha emitters and 6E-8 μ Ci/ml for beta/gamma emitters were recounted within 24 hours to allow for decay of short-lived naturally-occurring radionuclides. No long lived activity was detected. The air samples collected during decontamination activities were all less than the allowable maximum permissible concentration for both Cs-137 and plutonium isotopes. Air sample results are contained in Attachment 1.

F. DECONTAMINATE CONCRETE/PACKAGE WASTE

This task required the issuance of a Radiation Work Permit (RWP) prior to task commencement. The RWP included the protective clothing requirements and the placement of air sampling locations on the perimeter of the Radiological Control Area (RCA). Personnel wore self-reading dosimeters and thermoluminescent dosimeters during the concrete decontamination.

The elevated concrete surface contamination locations were decontaminated using a chipping hammer followed by vacuuming with a HEPA filtered vacuum cleaner.

Each HEPA vacuum was DOP tested in accordance with ANSI/ASME N510-1980 to ensure that the installed HEPA filter is properly sealed within the unit.

The effectiveness of the decontamination was determined through the use of field survey instrumentation. Specifically, as the concrete was chipped, HP Technician scanned the freshly exposed concrete surface for the presence of further contamination.

The concrete chip pieces were placed into a 55 gal. drum.

G. PERFORM FINAL RELEASE SURVEY OF WDB

This task included:

- Performing the final release survey of the WDB in accordance with the "Final Release Survey Plan of the National Park Service Property Located Near Pawling, New York for Chevron USA, Inc.," June 1993.
- Providing the documentation and data sheets indicating final survey measurements and activity levels remaining in the WDB following decommissioning activities.

H. FINAL RELEASE SURVEY

The survey procedures are consistent with the recommendations of NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination" and was performed in accordance with the "Final Release Survey Plan of the National Park Service Property Located Near Pawling, NY for Chevron, USA," June 1993. One soil sample was taken under the slab of the WDB.

A. Summary of Results

The survey results presented here are a summary of the actual survey data sheets. All survey documentation is contained in Appendix A.

Waste Disposal Building

Gridded Areas

The following table provides a summary of the survey data from the final release survey of the gridded areas of the respective rooms (activity levels below MDA are reported as less than the given value for that MDA):

Table 2: Waste Disposal Building

Location	Direct $\beta\gamma$ dpm/100cm ²	Direct α dpm/100cm ²	Removable $\beta\gamma$ dpm/100cm ²	Removable α dpm/100cm ²	Exposure rate (μ Rem/h)
Upper Level Floor	< 776-2280	< 61	< 142	< 11	< 8
Upper Level Walls	< 776	< 61	< 142	< 11	< 8
Lower Level Floor	< 776-900	< 61	< 142	< 11	11
Lower Level Walls	< 776	< 61	< 142	< 11	11

Note: Activity results are in dpm/100 cm²

Survey documentation is contained in Appendix A of this Volume.

III. PLUTONIUM BUILDING RE-SCAN, DECONTAMINATION, AND FINAL SURVEY

A. SCOPE

The building decontamination consisted of remediating the regions of elevated alpha surface contamination as identified by Oak Ridge Institute For Science and Education (ORISE) during their confirmatory survey. NES/IES and ORISE determined that the remaining alpha surface contamination was the result of several factors which are listed below:

- 1) NES/IES mistakenly used an incorrect efficiency for Ludlum Model 2220 with a ZnS Model 43-5 probe. NES used the quoted 2π efficiency of 39% found on the instrument calibration data sheet. The quoted efficiency of 39% should have been halved for the correct 4π efficiency of 19.5%.
- 2) NES/IES scanned all required surfaces for alpha contamination using the Ludlum Model 2220 with the ZnS Model 43-5 probe instead of a more sensitive gas proportional large area probe. Because of a more inferior response time for the ZnS, areas containing elevated alpha activity were missed. Typically, a technician would scan an area at the required scan rate using the ZnS probe, and if elevated activity was indicated, the technician would do a direct measurement at that same location. Most of the time, no elevated activity was indicated. This is probably a result of not having the probe directly on top of the area that is contaminated. Because of the long response time of the ZnS/digital integrated readout, the area containing elevated activity would be "passed by" before the meter responded.
- 3) According to project work plans, NES/IES was not required to do a 100% scan on the upper walls and ceilings of rooms 1, 2, 4, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15A, 16, 17, and 18. These areas were only "spot checked."

Areas identified as containing residual contamination above the release criteria were resurveyed by NES/IES using the following approved procedures: (The following work plan was approved by the NRC)

- Perform an initial scan of the identified area with a Ludlum 43-37 large area gas proportional counter attached to a Ludlum 2220 count rate meter/scaler.
- Areas identified as contaminated were marked with spray paint outlining the area of elevated activity and then documented on survey forms.

- Each area of elevated activity was then quantified by a one (1) minute direct measurement using a Ludlum 43-65 ZnS probe attached to a Ludlum 2220 count rate meter/scaler.
- Concrete surfaces determined to be above release criteria were then decontaminated below release criteria using chipping hammers and surface grinders.
- A final release survey was then performed and documented for the entire room where additional decontamination activities were performed.

B. Initial Survey Results

The following tables summarize the results from the initial surveys that had indications of activity levels greater than USNRC release criteria (the detailed survey data forms are included in Appendix B, Attachment 1):

Plutonium Building

Table 1: Room 1

Grid Number	Direct α
A-3	150
A-4	150
B-3	230
B-4	120
C-3	600
C-4	850

Note: Activity results are in dpm/100 cm²

Table 2: Room 3 Wall (South)

Grid Number	Direct α
Entire Wall	120-850

Note: Activity results are in dpm/100 cm²

Table 3: Room 3 Ceiling

Grid Number	Direct
I-8	400
I-9	450
J-8	320
J-9	260
I-BEAMS	150-300

Note: Activity results are in dpm/100 cm²

Table 4: Room 4 Upper West Wall

Grid Number	Direct
E-1	990
E-2	243
E-3	450
E-4	756
F-1	657
F-2	1035
F-3	882
F-4	774
G-1	513
G-2	990
G-3	837
G-4	1053

Note: Activity results are in dpm/100 cm²

Table 5: Room 5 (Ceiling)

Grid Number	Direct
A-3 (I-BEAM)	117
A-4 (I-BEAM)	450
A-5	81
A-6 (I-BEAM)	550
B-3 (I-BEAM)	550
B-6	117
C-1	117
C-2	117
C-3	108
C-4	108
C-5	162
C-6	189
D-3 (I-BEAM)	342
D-4	108
D-5	126
E-2 (I-BEAM)	144
E-3 (I-BEAM)	153
E-6 (I-BEAM)	108

Note: Activity results are in dpm/100 cm²

Table 6: Room 5 (Walls)

Grid Number	Direct
EAST A-3	108
A-4	162
B-3	270
B-4	440
B-5	333
C-5	270
SOUTH A-2	477
A-3	603
A-5	198
A-6	180
B-2	603
B-3	153
B-4	450
B-5	603
B-6	279
SOUTH C-2	333
C-3	603
C-4	324
C-5	180
C-6	279

Note: Activity results are in dpm/100 cm²

Table 7: Room 15 (Walls)

Grid Number	Direct
NORTH C-1	126
C-2	171
C-3	441
C-5	495
EAST C-3	213
C-4	99
C-7	99
C-9	153
C-10	171
SOUTH B-2	225
WEST A-4	117
C-4	117
C-9	99
C-11	243
C-12	171
C-13	171

Note: Activity results are in dpm/100 cm²

C. AIR SAMPLING

Air samples were collected over the course of the decommissioning project. Air samples with initial results near or exceeding $3E-12$ $\mu\text{Ci/ml}$ for alpha emitters and $6E-8$ $\mu\text{Ci/ml}$ for beta/gamma emitters were recounted within 24 hours to allow for decay of short-lived naturally-occurring radionuclides. No long lived activity was detected. The air samples collected during decontamination activities including building decontamination and soil remediation were all less than the allowable maximum permissible concentration for both Cs-137 and plutonium isotopes. Air sample results are contained in Appendix B, Attachment 2.

D. FINAL RELEASE SURVEY

The survey procedures are consistent with the recommendations of NUREG/CR-5849, "Manual for Conducting Radiological Surveys in Support of License Termination" and was performed in accordance with the "Final Release Survey Plan of the National Park Service Property Located Near Pawling, NY for Chevron, USA," June 1993.

The contaminated areas identified during the initial survey, found in Appendix B, Attachment 1, were remediated and resurveyed. Survey results are found in Appendix B, Attachment 3.

IV. ALPHA RE-SURVEY OF THE PLUTONIUM BUILDING, MULTIPLE FAILURE BUILDING AND WASTE STORAGE BUILDING

A. SCOPE

Because of Nuclear Regulatory Commission (NRC) concerns about the precision of the alpha survey data contained in the "Final Project Report for the Decontamination and Decommissioning of the Plutonium Facility and Multiple Failure Building, Nuclear Lake Pawling, New York," August 1993, NES/IES performed additional alpha surveys in the Plutonium Building, the Multiple Failure Building and the Waste Disposal Building at the Nuclear Lake site. NRC concerns involved some alpha direct measurements reported in the "Addendum to the Final Project Report for the Decontamination and Decommissioning of the Plutonium Facility and Multiple Failure Building, Nuclear Lake, Pawling, New York" (draft). In particular, some alpha direct measurements were 10 to 50 times higher than the original data. Another NRC concern was that the reported alpha efficiency for a Ludlum 2220 with a 43-5 ZnS alpha probe (serial number 48409) used in the scanning and direct measurement surveys appeared to be too high. An investigation by NES/IES with Ludlum Measurements verified this to be the case. The actual efficiency for the instrument was half of the actual value stated on the calibration certificate (18% vs. 39%). NES/IES assumed it was 4 geometry, but Ludlum reported it as a 2 geometry on the calibration certificates, thereby resulting in the error.

B. WORK PLAN

All rooms in the Plutonium Building except rooms 2, 3, 4, 5, and 15, the Multiple Failure building and the Waste Disposal building were scanned with the Ludlum 43-37 gas proportional probe for alpha contamination according to the original final survey plan for Nuclear Lake. This included a 100% scan of the floor and up to two meters on the walls. Above two meters on the walls and the ceiling were "spot" scanned.

The original data set for the outlying rooms (i.e., all rooms of the Plutonium building except 2, 3, 4, 5 and 15, the Multiple Failure Building, and the Waste Disposal building) was reevaluated using the correct efficiency for the Ludlum 2220 with the 43-5 probe. This means an efficiency of 18% was used instead of 39%. Specifically, the MDAs for the new efficiencies were recalculated and compared to the old MDAs. Where there was activity above the old MDA the one meter grid was re-scanned and a one minute alpha direct reading was taken at the highest elevated reading in the grid.

C. SURVEY RESULTS

The alpha direct measurements from these areas indicated no elevated alpha activity above NRC release criteria. Survey documentation is contained in Appendix C.

The 100% alpha re-scans indicated no alpha activity above background in all areas surveyed. Survey technicians documented this on the survey forms found in Appendix D.

V. RECALCULATION OF MDAs

MDA calculations using the incorrect 39% efficiency were recalculated using 18% and alpha survey documentation for all rooms of the Plutonium building, Multiple Failure building, and the Waste Disposal building were amended.

Amended survey documentation of all areas of the Plutonium Building, the Multiple Failure Building and the Waste Disposal Building is included in Appendix D.

VI. 100% SCANS OF SELECTED GRIDS BASED ON ELEVATED READINGS FROM THE RECALCULATED DATA

A. SCOPE

Because of Nuclear Regulatory Commission (NRC) additional concerns about the

precision of the alpha survey data contained in Section IV of this report, NES/IES performed additional alpha surveys in the Plutonium Building and the Multiple Failure Building at the Nuclear Lake site. NRC concerns involved some alpha scan surveys. In particular, all alpha scan measurements were reported as "floor (or lower walls) 100% scanned, no activity above background detected." NRC concerns arise from the fact that some activity should have been indicated above background, based on the results of rooms 2, 3, 4, 5 and 15 of the Plutonium building re-scans reported in Appendix B of the Addendum. Scans from those rooms indicated isolated areas within certain grids having 10 to 50 times higher alpha activity level than the activity reported in the original report.

Because of the NRC concerns, alpha scans and alpha direct measurements were redone in all rooms of the Plutonium building except rooms 2, 3, 4, 5 and 15 (see Section III and Appendix B, Attachment 3) and the Multiple Failure building in all grids indicating alpha activity above MDA in the original report. The re-scans and direct alpha measurements were performed by Frank Rebmann, NES/IES Radiological Section Manager along with Bill Needrith NES/IES Project Site Supervisor. The Waste Disposal building did not have any grids above MDA so it was not redone.

B. WORK PLAN

One meter grids in the Plutonium Building and the Multiple Failure building that indicated alpha activity above MDA by direct measurement in the original report were re-scanned with the Ludlum 43-37 gas proportional probe for alpha contamination according to the original final survey plan for Nuclear Lake. This included a 100% scan of the grid.

A one minute alpha direct reading was taken in the grid at the highest elevated reading indicated by the scan. If activity was indicated by the direct measurement to be above the release criteria of 100 dpm/100cm², four additional readings were taken in the grid and averaged. If the alpha scan did not indicate any elevated activity, a random direct measurement was taken inside the grid. If that direct measurement indicated alpha activity above release criteria four additional measurements were also made within the grid and averaged.

C. SURVEY RESULTS

MDAs were recalculated with the correct efficiency and compared to the old MDAs (Refer to Appendix D for amended survey documentation containing new MDAs). If there was activity indicated above the old MDA on the original direct measurement survey data set the one meter grid was re-scanned with the 43-37 gas proportional probe and a one minute alpha direct reading was taken at the highest elevated reading in that grid. The additional alpha direct measurements from these areas indicated no elevated alpha activity above NRC release criteria.

Re-scan and direct measurement survey documentation is contained in Appendix E.

VII. QUALITY ASSURANCE OF RE-SCANS AND DIRECT MEASUREMENTS OF SELECTED GRIDS

As an additional measure a "QA" check was performed by Dennis Reisenweaver, NES/IES Radiological Group Department Manager and Patrick LaFrate, Nuclear Lake NES/IES Project Manager.

For quality assurance (QA) purposes, 10% of all grids were re-scanned and resurveyed by a 100% scan with the Ludlum 43-37 and a one minute alpha direct reading by a separate survey team.

QA documentation is contained in Appendix F.

VIII. REFERENCES

1. "Responses to USNRC Review of Nuclear Lake Site Final Project Report," September 17, 1993.
2. "Final Project Report for the Decontamination and Decommissioning of the Plutonium Facility and Multiple Failure Building Nuclear Lake Pawling, New York," August 1993.
3. "Final Release Survey Plan of the National Park Service Property Located Near Pawling, New York for Chevron USA, Inc.;" June 1993.
4. "Decommissioning Plan for the Plutonium Facility and Multiple Failure Building of the National Park Service Located Near Pawling, New York;" February 1993.
5. NUREG/CR-5849. "Manual for Conducting Radiological Surveys in Support of License Termination"; 1992.
6. Berger, J.D. et al. "Radiological Survey of the Nuclear Lake Site, Pawling New York," Oak Ridge Associated Universities; 1988.
7. "Final Survey Results After Decontamination, Gulf United Nuclear Fuel Corporation Plant Facility;" Pawling, NY, ATCOR Inc. 1974.
8. "Nuclear Lake A Resource in Question." Nuclear Lake Management Site Clearance Subcommittee:97; 1982.

9. USNRC "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source or Special Nuclear Material;" August 1987.