ESG-DOE-13507
REMEDIAL ACTION AND
DECOMMISSIONING PROGRAM
UC-70A

INTERIM STORAGE FACILITY DECOMMISSIONING FINAL REPORT

By
R. P. Johnson
D. L. Speed

Rockwell International
Rocketdyne Division
6633 Canoga Avenue
Canoga Park, California 91304

CONTRACT: DE-AT03-82SF11669
ISSUED: 15 MARCH 1985

RD99-158

Printed in the United States of America
Available from
National Technical Information Service
U.S. Department of Commerce
5285 Port Royal Road
Springfield, Virginia 22161

NTIS price codes
Printed copy: $8.50
Microfiche copy: A01

DISTRIBUTION

This report has been distributed according to the category "Remedial Action and Decommissioning Program," as given in the Standard Distribution for Unclassified Scientific and Technical Reports, DOE/TIC-4500, Rev. 73.

ABSTRACT

Decontamination and decommissioning of the Interim Storage Facility were completed. Activities included performing a detailed radiation survey of the facility, removing surface and imbedded contamination, excavating and removing the fuel storage cells, restoring the site to natural conditions, and shipping waste to Hanford, Washington, for burial. The project was accomplished on schedule and 30% under budget with no measurable exposure to decommissioning personnel.

CONTENTS

	Page
1.0 Background	1
1.1 Facility History	1
1.2 Project Purpose	1
2.0 Facility Description	1
2.1 Buildings and Systems	1
2.2 Predecommissioning Status	3
3.0 Decommissioning Objectives and Work Scope	3
4.0 Work Performed	4
4.1 Project Management	4
4.2 Project Engineering	6
4.3 Site Preparation	6
4.4 Decommissioning Operations	7
4.4.1 Phase I D&D	7
4.4.2 Phase II D&D	9
4.5 Waste Disposition	13
4.6 Decommissioning Radiological Survey	16
4.7 Postdecommissioning Radiological Survey	16
4.8 Postdecommissioning Hazardous Chemical Condition	26
5.0 Cost and Schedule	26
6.0 Waste Volumes Generated	26
7.0 Occupational Exposure to Personnel	27
8.0 Final Facility or Site Condition	27
9.0 Lessons Learned	28
References	28

FIGURES

		Page
1.	Interim Storage Facility (T654)	2
2.	ISF Trench Area	2
3.	Cross Section of ISF Storage Cell	4
4.	Contaminated Areas at ISF	5
5.	Dummy Fuel Element Basket Removal	8
6.	Dummy Fuel Element Basket Transfer	8
7.	ISF Cell Water Levels	9
8.	ISF Survey Area	10
9.	Broken Concrete Retention Area	11
10.	Soil and Rock Retention Area	11
11.	ISF Excavation Staging Trench	12
12.	Damage to Cell 7 During Excavation	12
13.	ISF Storage Cell Removal	14
14.	ISF Storage Cell Transfer	14
15.	Collecting Dirt Sample at Bottom of Cell Shaft	15
16.	ISF Storage Tube Cutting	15
17.	ISF Storage Tube Cutting	16
18.	ISF Gross Gamma Survey Locations	20
19.	Cumulative Probability Distribution of Uncorrected Ambient Exposure Rate	24
20.	Cumulative Probability Distribution of Ambient Exposure Rate, Adjusted for Skyshine from RMDF	25
21.	ISF Decommissioning Schedule	26
22.	Postdecommissioning Condition of the ISF Site	27

TABLES

1.	ISF Gamma Spectroscopy--Soil Screening	19
2.	ISF Background Gamma, Background and Gradient Determination	21
3.	ISF Final Gamma Survey Data	22
4.	Statistical Analysis of Data Set	23

1.0 BACKGROUND

1.1 FACILITY HISTORY

The Interim Storage Facility (ISF) (DOE Facility 654) was constructed in 1958 at the Santa Susana Field Laboratory (SSFL) to support the Sodium Reactor Experiment (SRE). It was originally used to store dummy and spent fuel elements, shipping and storage casks, and hot waste generated at the SRE. Since SRE ceased operating, it has also been used to store a variety of items from two other DOE waste generating programs: Organic Moderated Reactor Experiment (OMRE) and Systems for Nuclear Auxiliary Power (SNAP). The seals and packing on some of the casks and equipment stored at ISF had deteriorated from exposure to the elements to such an extent that low-level contamination had been released. This release contaminated the asphalt surface near the casks and soil just outside the ISF fence. The casks and other sources of potential contamination were subsequently removed and sent to burial. Radioactive core components and material placed in the eight storage tubes contaminated the internal storage baskets and surfaces of the storage cells. The facility was kept in a surveillance and maintenance mode until decommissioning began in 1984.

1.2 PROJECT PURPOSE

The purpose of decommissioning the ISF was to clean up a contaminated facility that was not being used by an active program and that had the potential for spreading contamination to surrounding areas. The intent was to remove contamination to the extent that no further maintenance and surveillance would be required and there would be no controls, limitations, or conditions on the future use of the ISF area due to the presence of radioactive material.

2.0 FACILITY DESCRIPTION

2.1 BUILDINGS AND SYSTEMS

The ISF (Figures 1 and 2) was located at Rockwell International's SSFL approximately 35 miles northwest of downtown Los Angeles. The ISF was near

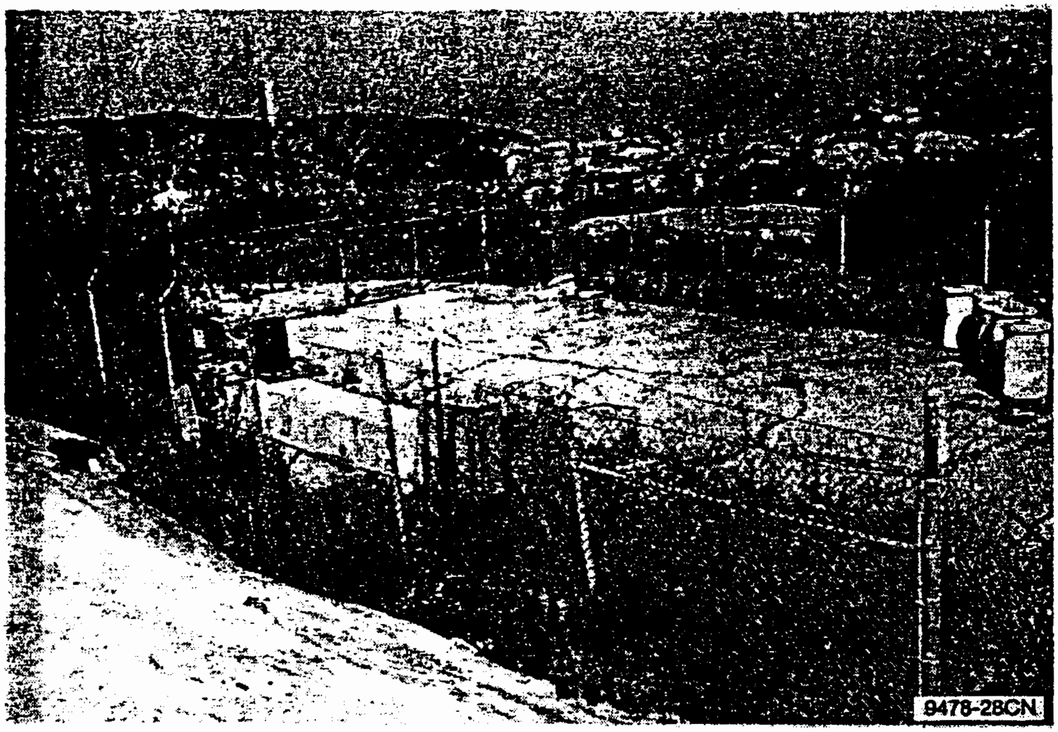


Figure 1. Interim Storage Facility (T654)

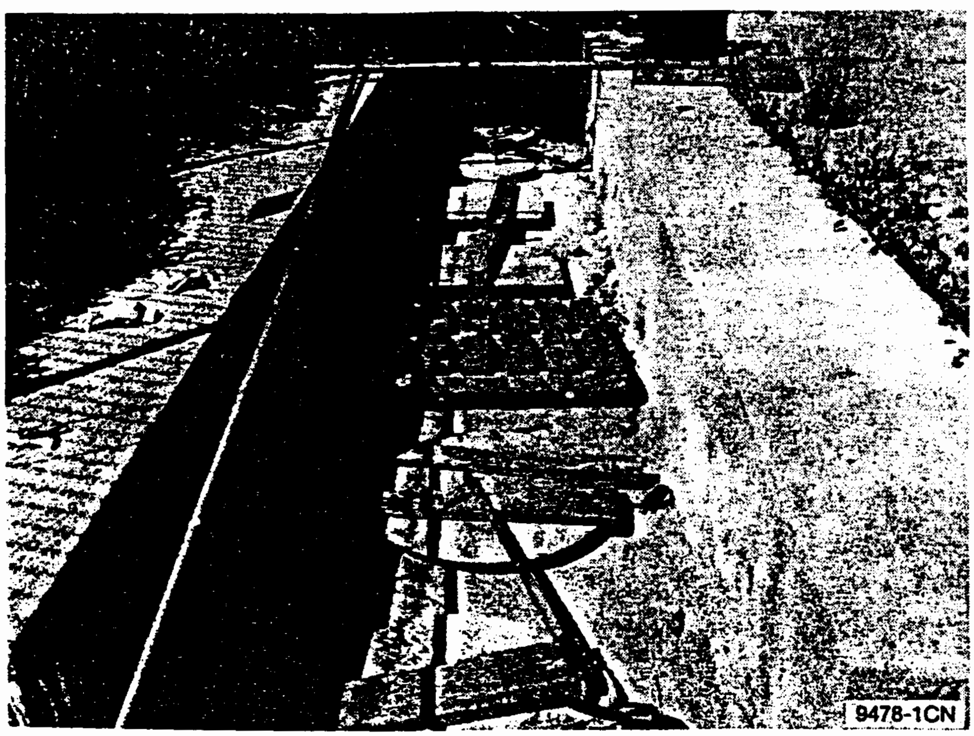


Figure 2. ISF Trench Area

the SRE and had been used to store SRE dummy fuel elements and moderator assemblies. The storage facility comprised eight 20-in.-diameter galvanized steel cells, extending 25 ft into 32-in.-diameter wells drilled into rock strata. A concrete berm encased the cells at ground level. A cross-sectional view of a single storage cell is shown in Figure 3. In the approximately 20 years during which the ISF was not used, it remained as an exclusion area (as areas of contamination were known). Surveillance and periodic maintenance were performed to contain the contamination and prevent its spread into adjoining, unrestricted areas.

2.2 PREDECOMMISSIONING STATUS

The facility had been shut down for approximately 20 years, and all stored equipment and material were removed. A radiation survey was made of the ISF area prior to decommissioning. Areas of contamination were plotted on the site map as shown in Figure 4. Fixed surface contamination ranged from 50 to 1000 cpm above background. A few localized spots in the northeast corner of the controlled area were found to be 20 mrad/h above background. The highest contamination level inside the storage cells was 7.5×10^5 dpm.

3.0 DECOMMISSIONING OBJECTIVES AND WORK SCOPE

The objective was the decontamination and decommissioning (D&D) of the ISF such that the facility could be returned to its natural state and released for unrestricted use. The work scope included removing all surface and imbedded contamination from the ISF controlled and surrounding areas, removing the dummy fuel element baskets from the storage tubes, removing structural concrete from the storage cell structure, and removing the storage cells from their imbedded positions. When all surface and imbedded contamination had been removed, the site was to be returned to a natural state. Accumulated waste was to be shipped to the Hanford Reservation in Washington State for burial.

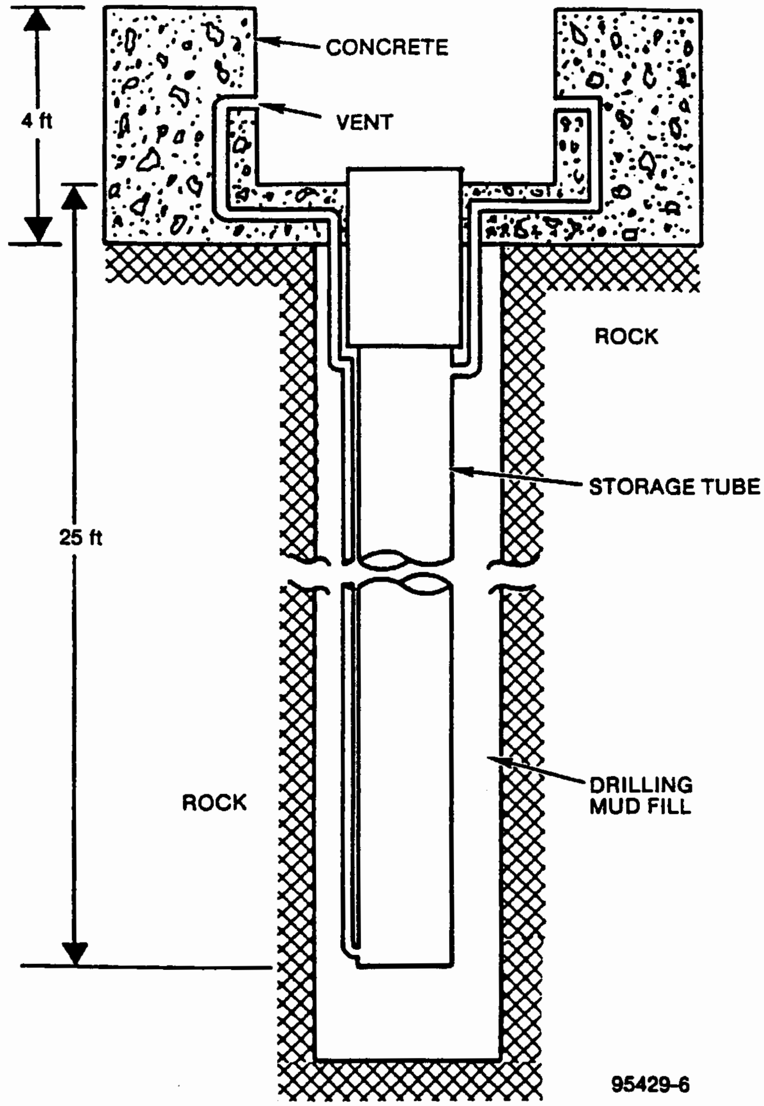


Figure 3. Cross Section of
ISF Storage Cell

4.0 WORK PERFORMED

4.1 PROJECT MANAGEMENT

The ISF decommissioning was administered by the Surplus Facilities Management Program (SFMPO) of DOE-RL working through DOE-SAN, who managed ESG's activities on the project. ESG's program office managed the implementation of the project, which began with the preparation of the top level guidance and project plans and concludes with this final decommissioning report.

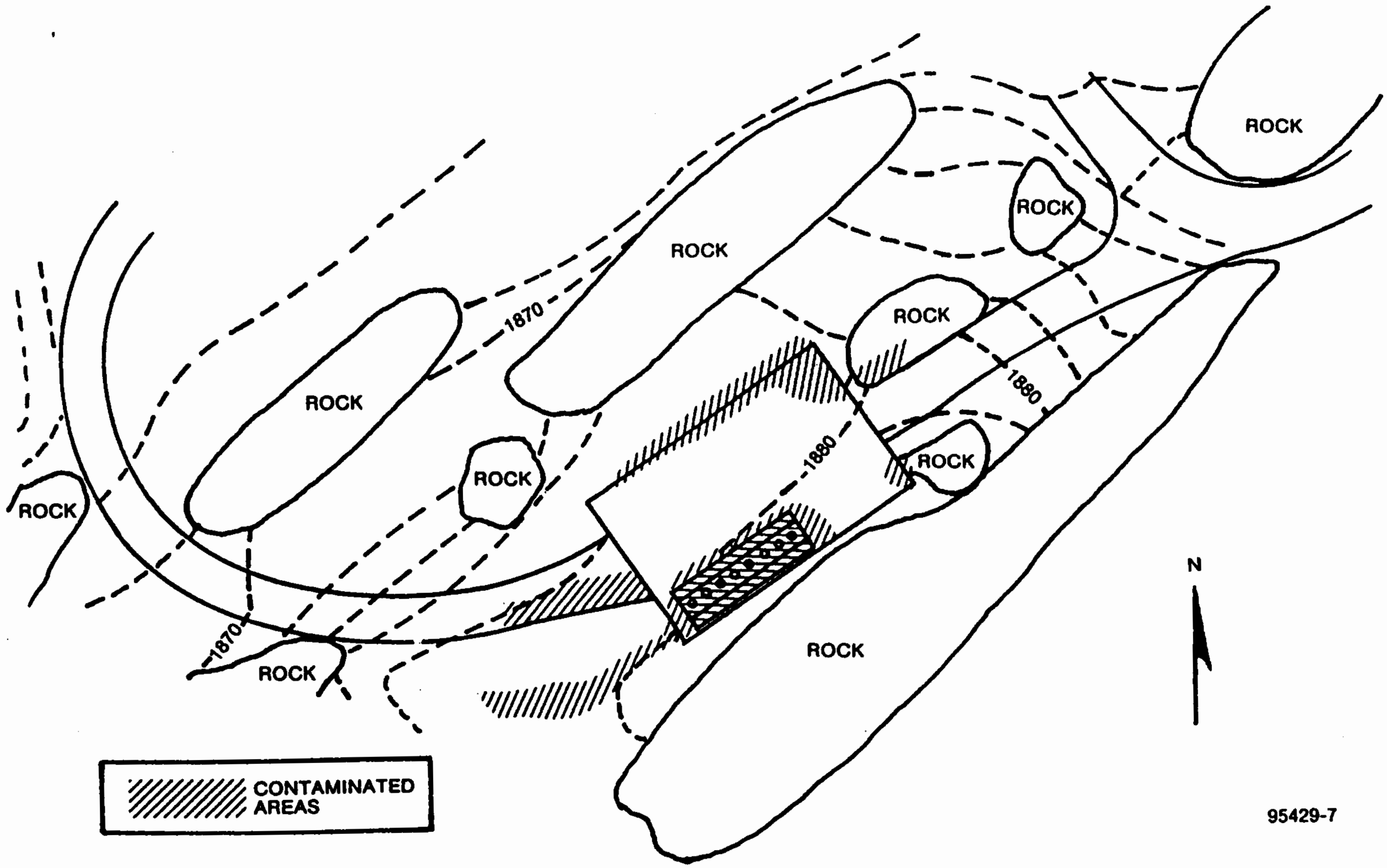


Figure 4. Contaminated Areas at ISF (pre-D&D)

The program office acted as liaison with the DOE representatives who monitored the project and with all organizations that were involved during the project. The program office was also responsible for the overall schedule and budget performance and for the submission of the schedules and budgets.

All reporting was done to DOE-SAN by the program office, including monthly, technical, and final reports.

4.2 PROJECT ENGINEERING

Project Engineering within ESG followed the guidance of the program plan and prepared the necessary documents to decommission the ISF. The top level document prepared by Project Engineering was the "Relevant Information to Support RMDF and Interim Storage Facility Decommissioning."[1] The second level document prepared for the ISF decommissioning was "Interim Storage Facility Decommissioning Plan."[2]

Project Engineering was also responsible for developing techniques to be used during the decommissioning of the ISF. Project Engineering was responsible for the technical adequacy and completeness of program documents.

Project Engineering acted as liaison with the Engineering Department and the Health, Safety, and Radiation Services Department in obtaining support for the monitoring of subcontracted efforts during decommissioning.

4.3 SITE PREPARATION

The ISF had been in a controlled surveillance mode for about 20 years. The preparation required before decommissioning could begin included:

- Procuring King-Pac solid waste disposal boxes
- Fabricating King-Pac solid waste disposal boxes
- Initiating RFQ for the excavation, removal, and landfilling of ISF storage tubes
- Performing a predecommissioning radiation survey.

4.4 DECOMMISSIONING OPERATIONS

The D&D was completed in two phases. The first phase involved removing surface contamination from the ISF concrete berm and surrounding area. The second phase required contractor equipment to excavate dirt and rock surrounding the ISF storage tubes and removal of the tubes. All D&D efforts were performed in accordance with Ref. 1.

4.4.1 Phase I D&D

A thorough radiation survey was made of the surface of the concrete berm (top, sides, and ends) to locate areas of contamination. These areas were then decontaminated using pneumatic scabblers. The concrete dust was removed by vacuuming using HEPA-filtered vacuum systems. The concrete surfaces were resurveyed and rescabbled until all surface contamination was removed. Dirt removed to expose concrete surfaces below grade level was transferred to King-Pac boxes and retained for disposal.

Sections of the asphalt within the exclusion area and a portion of the east and west entry roads were found to be contaminated. The asphalt was lifted and broken into small pieces and loaded into King-Pac containers for disposal. A survey of the soil exposed by the asphalt removal indicated local areas of contamination. This material was also removed for disposal.

Contaminated dummy fuel element baskets were found in five of the storage cells. These were removed using a Grove crane as shown in Figures 5 and 6. Each basket was drawn into a plastic bag as it was removed from its respective storage cell. These packaged baskets were transferred to the Radioactive Materials Disposal Facility (RMDF) for disassembly and disposal.

Four of the eight storage cells were found to contain water. Because the water was found to be contaminated with ^{137}Cs, it was fixed in place by adding Redimix concrete. Figure 7 shows the depth of water found in cells 2, 3, 4, and 6 and the quantity of Redimix added to fix the water.

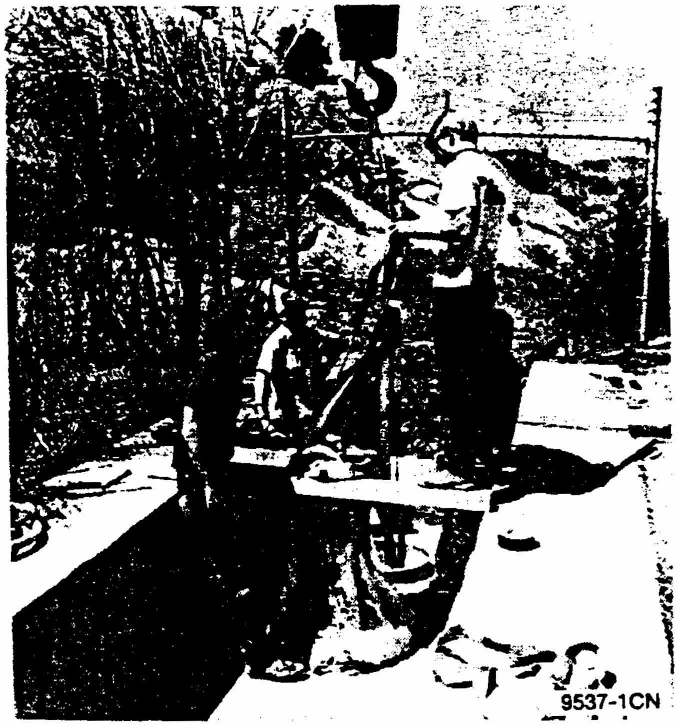


Figure 5. Dummy Fuel Element Basket Removal

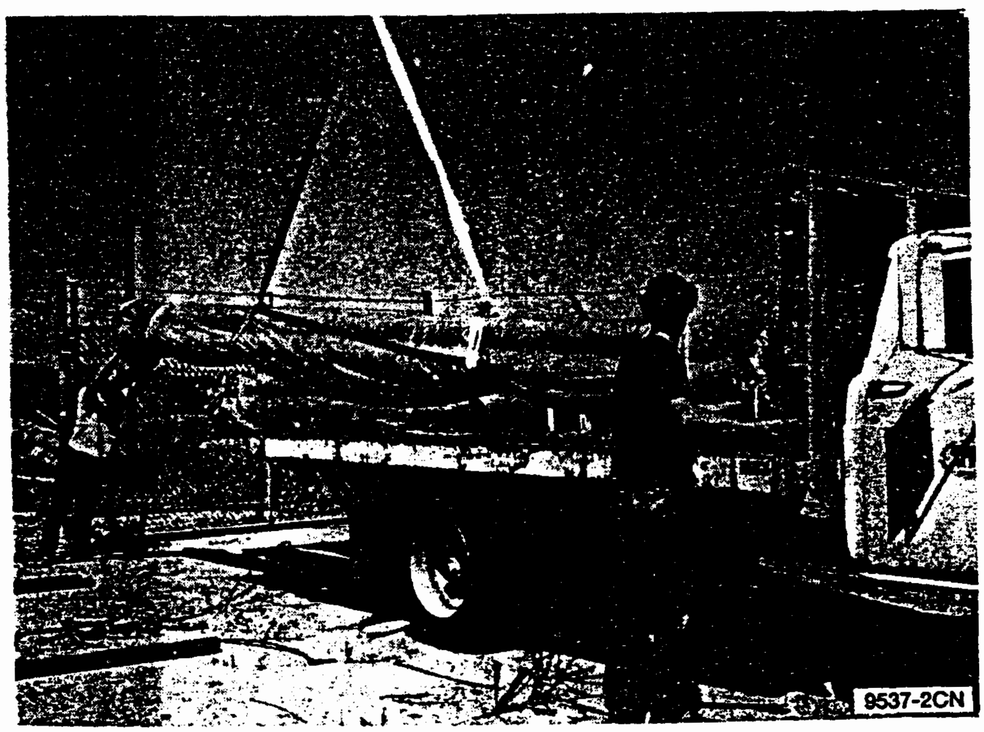


Figure 6. Dummy Fuel Element Basket Transfer

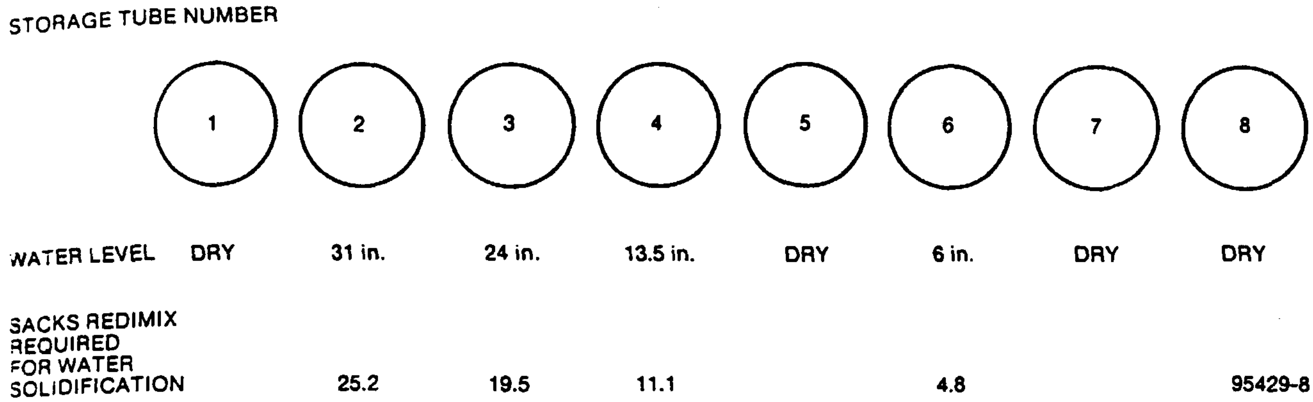


Figure 7. ISF Cell Water Levels

The ISF controlled area and the surrounding area were resurveyed, and additional soil was found to be contaminated; this was removed and loaded into King-Pac containers for disposal. Less than 6 in. of soil in approximately 10% of the total area and up to 18 in. of soil in approximately 1% of the total area were removed during Phase I D&D operations. The final radiation survey before Phase II (see Figure 8) indicated that all surface contamination had been removed (all radiation levels were within acceptable levels).

4.4.2 Phase II D&D

Concrete Cutting International, Inc., was awarded a fixed-price contract to remove the storage tube structural concrete, perform the excavation required to remove the storage tubes, and perform backfill operations.

The first excavation operation required removing the concrete trench that contained the upper portion of the storage tubes. This uncontaminated material was temporarily stored in a retention area (Figure 9), then later used for backfill material.

The excavation of soil and rock from the north side of the storage tubes exposed the tubes for removal (Figures 10 and 11) to a depth of 23 ft. At approximately 15 ft, the hydraulic hammer mounted on the end of a backhoe punctured storage tube 7 (see Figure 12). The area was surveyed for contamination.

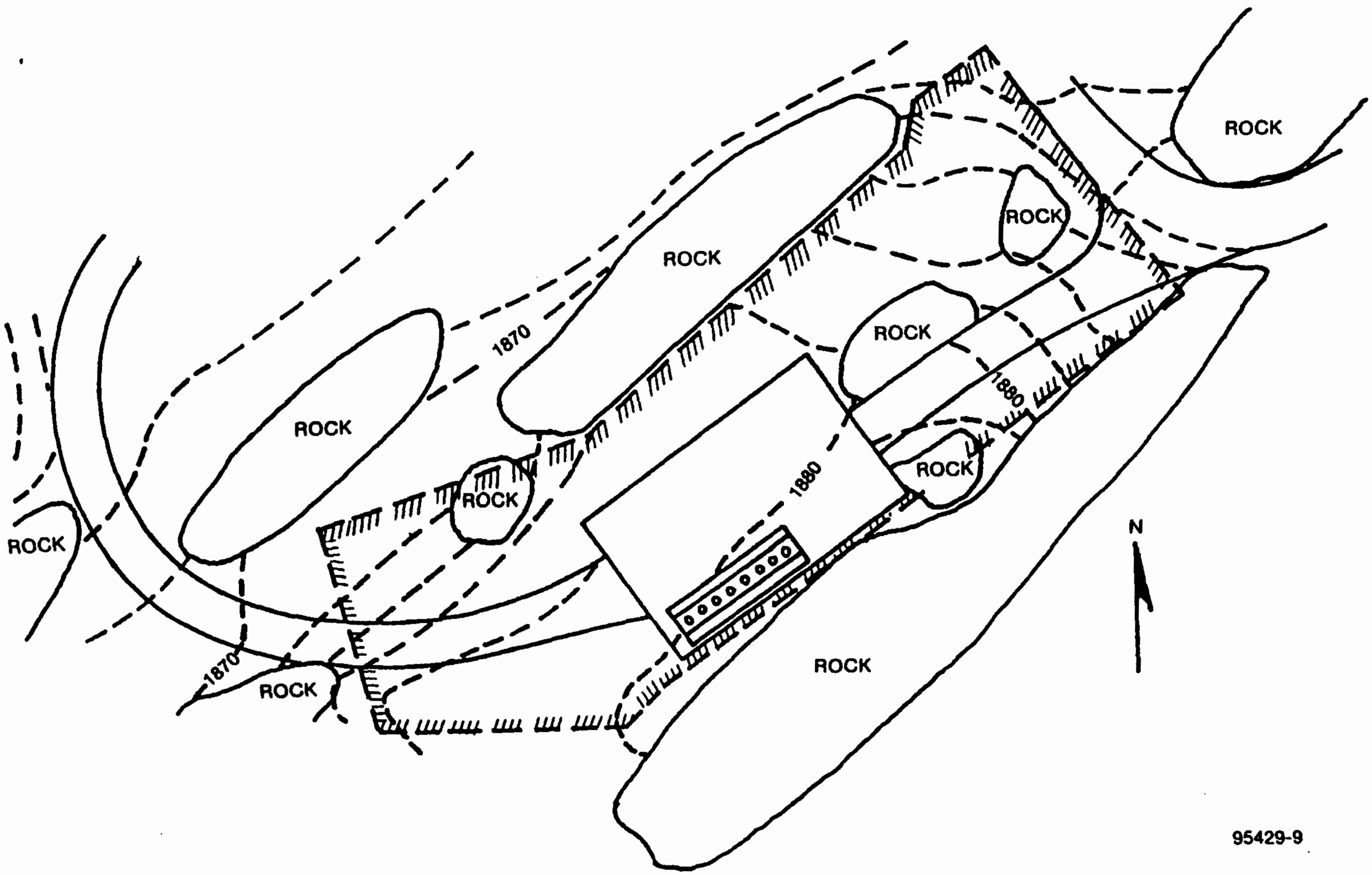


Figure 8. ISF Survey Area

Figure 9. Broken Concrete Retention Area

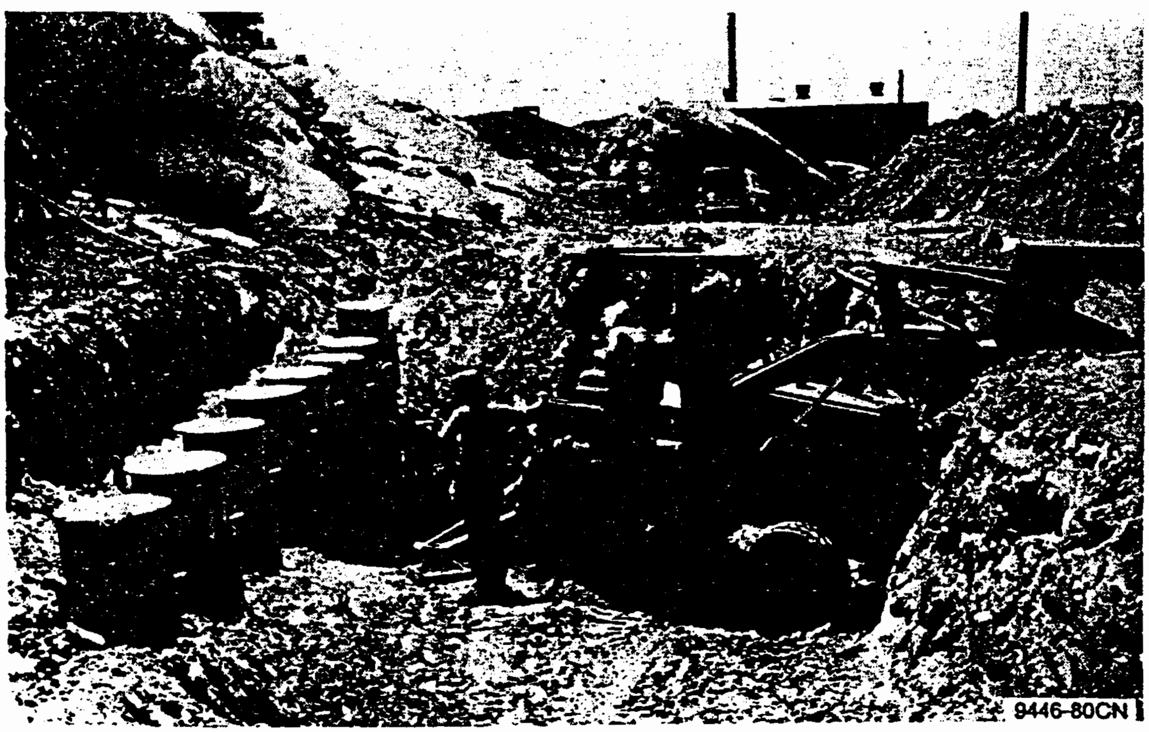


Figure 10. Soil and Rock Retention Area

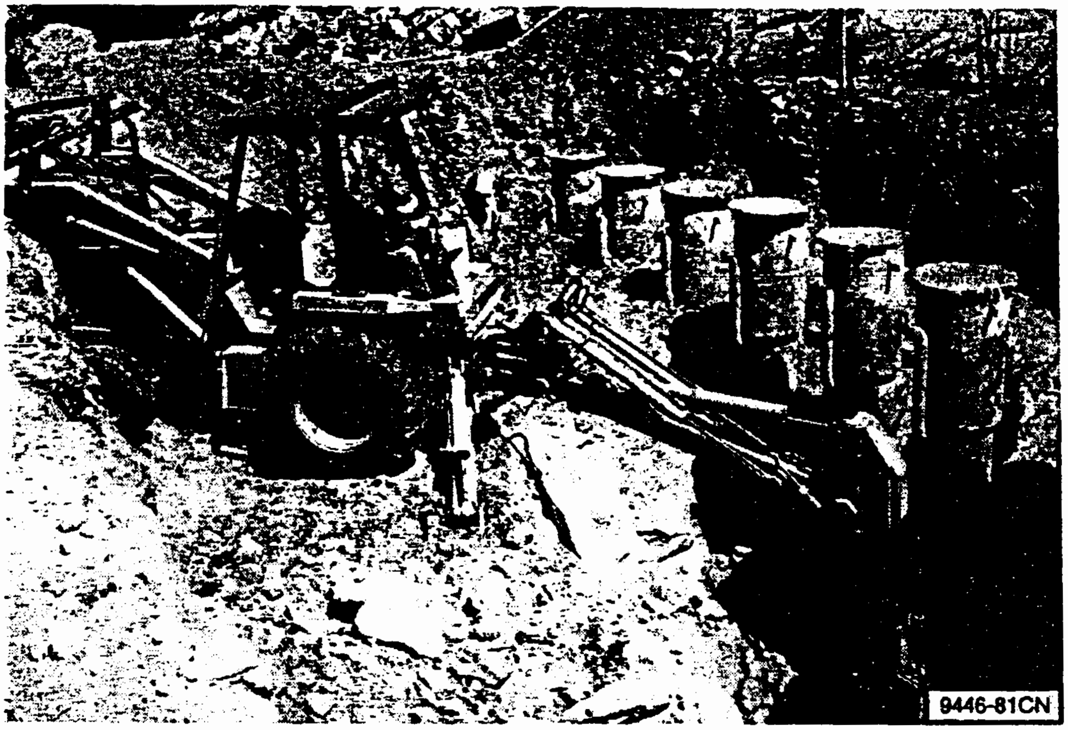


Figure 11. ISF Excavation Staging Trench

Figure 12. Damage to Cell 7 During Excavation

None was found and the excavation continued. All the dirt and rock removed during this operation were found to be free of contamination and were stored and later used as backfill material. (Samples were analyzed for ^{60}Co, ^{137}Cs, and other gamma emitters.)

A mobile crane was used to transfer each storage tube to a flatbed truck for transport to the RMDF (Figures 13 and 14). As each storage tube was removed, it was surveyed (no external contamination was detected), and a plastic bag was placed around the lower section. This secondary precaution was to prevent the spread of contamination during transit. A soil sample was taken from each of the emptied storage tube wells as the tube was removed (Figure 15). These samples were analyzed for ^{60}Co, ^{137}Cs, and other gamma emitters; the results are presented in Section 4.7.

4.5 WASTE DISPOSITION

One hundred twenty-seven King-Pacs (approximately 1 m^3 each) of soil, rock, asphalt, and concrete from the excavation were transported to RMDF for final disposition before shipment. Container integrity was verified, and plastic liners were sealed. Boxes were labeled and banded to transport and loading pallets. Six truckloads of King-Pacs were shipped to the DOE site at Richland, Washington (operated by Rockwell-Hanford). All the waste was classified as "low specific activity waste."

The 25-ft-long fuel element baskets and storage cells were transferred to RMDF for size reduction and packaging. Both storage cells and baskets were sectioned into approximately 4-ft lengths using an oxygen acetylene cutting torch in Building 021. Figures 16 and 17 show the cutting operation. A special prefilter smoke retention housing was fabricated to prevent the facility's absolute filters from plugging with the large amount of particulate matter generated during cutting activity.

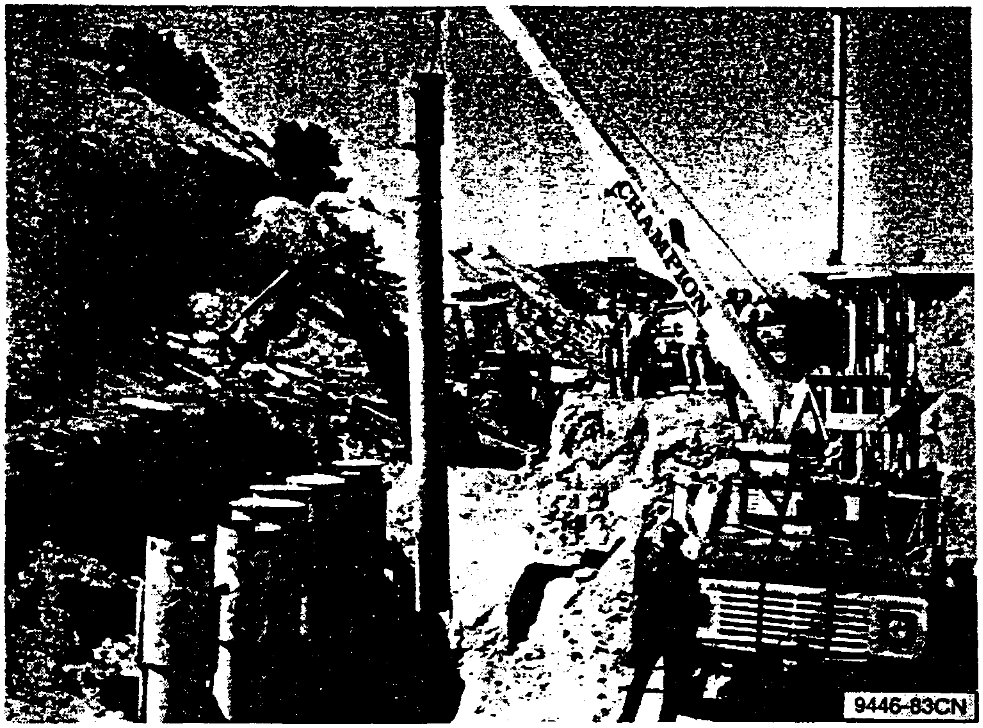


Figure 13. ISF Storage Cell Removal

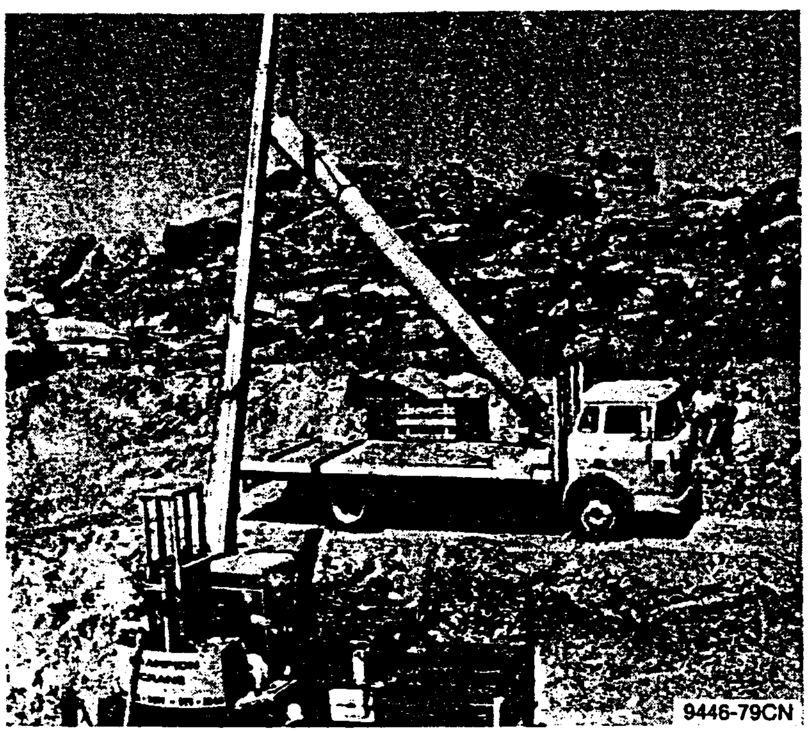


Figure 14. ISF Storage Cell Transfer

Figure 15. Collecting Dirt Sample at Bottom of Cell Shaft

Figure 16. ISF Storage Tube Cutting

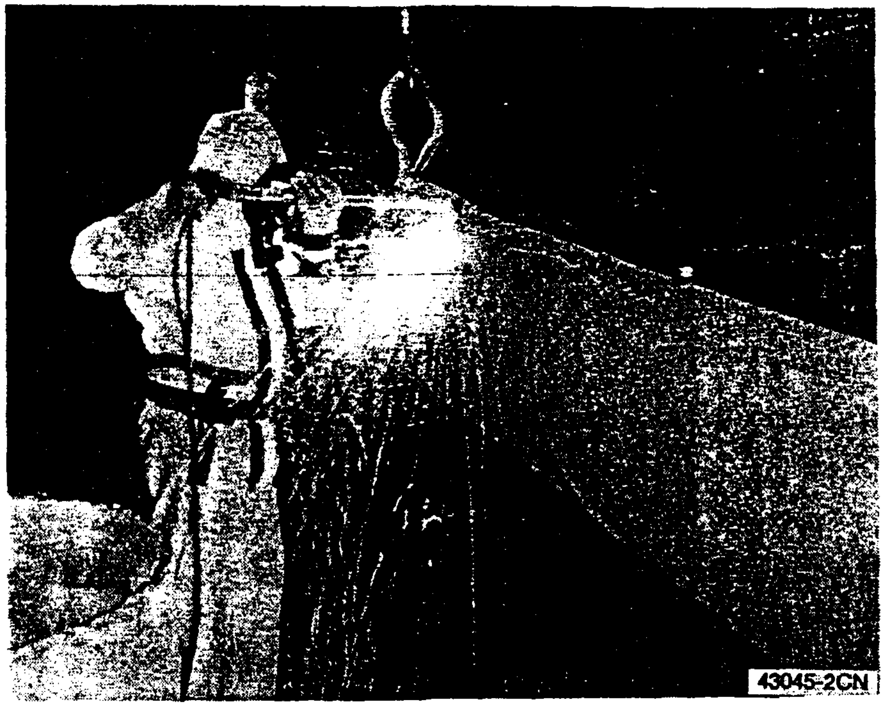


Figure 17. ISF Storage Tube Cutting

4.6 DECOMMISSIONING RADIOLOGICAL SURVEY

All soil, rock, concrete, and storage tubes and baskets were surveyed with portable radiation survey instruments, and any material with an indicated surface radiation in excess of 50 cpm of beta activity or with any detectable alpha activity was deemed to be contaminated. Soil samples with indicated ^{60}Co or ^{137}Cs net levels above 1 pCi/g activity measured on a multichannel analyzer were also considered contaminated.

4.7 POSTDECOMMISSIONING RADIOLOGICAL SURVEY

Throughout this project, Health, Safety, and Radiation Services monitoring was fully utilized. Much of this effort was directed toward discovering and eliminating residual radioactive contamination. The final radiologic survey can be broken into three phases:

- Phase A: constant monitoring of soil and structure surfaces during final phases of structure removal

- Phase B: radiometric screening and analysis of soil samples taken from excavation by gamma spectroscopy

- Phase C: Final statistical survey of ISF area including surrounding fringe areas for gross gamma activity.

Since all structural surfaces were removed, the criteria for release relate only to soil activity and ambient radiation. Each phase and its findings are discussed below.

Phase A. Constant surveillance of removed and onsite materials was conducted by Health, Safety, and Radiation Services personnel to monitor for possible alpha, beta, and gamma emitting radionuclides. No measurable contamination was found on the soil or surrounding native rock. Logical paths of possible contaminant migration (e.g., runoff channels) were followed by soil sampling and radioactive analysis as well as in situ gamma radiation surveys. No measurable contamination was found.

Phase B. Soil samples were obtained both during the soil removal process and also at the maximum extent of the excavation project. The samples were submitted to Health, Safety, and Radiation Services for radiometric screening by gamma spectroscopy.

A Canberra Series 85 multichannel analyzer with an intrinsic germanium solid-state detector system was used. Because the ISF area had been used to store spent fuel and previous in situ gamma spectroscopic measurements (made with a portable Canberra Series 10 MCA system) had identified only ^{137}Cs as present, an isotope identification library of fission-produced radionuclides was used.

Soil samples were screened for contamination by placing each bag, containing roughly 2 to 5 kg of soil, on the germanium detector housing. Any sample showing a measurable quantity of any fission-produced radionuclides was then aliquoted into a standard mass and geometry for quantitative analysis. The only nonnaturally occurring isotope encountered was ^{137}Cs. The samples with measurable cesium contamination were further investigated by placing a carefully weighed amount in a Marinelli beaker to provide a standard calibrated geometry. None of the samples contained activity in excess of 2.0 pCi/g, as shown in Table 1. Assuming a natural activity of 30 pCi/g and any undetected activity of ^{90}Sr equal to twice the measured ^{137}Cs activity, the maximum beta activity would be 36 pCi/g. This value was less than the release criterion of 100 pCi/g gross detectable beta activity.

Phase C. After completion of the final backfilling, a statistical survey was made at the surface in both the area previously occupied by the ISF facility and its environs. As in all phases of the project, particular attention was paid to routes of possible migration. Since the contamination had been previously identified as primarily ^{137}Cs, a Ludlum 2200 scaler was equipped with a 2-in. by 2-in. sodium iodide gamma scintillation crystal. A survey map was prepared, and a 10% sample of the available 1-meter-square grids was scanned. (Figure 18 gives the measurement location map.) Measurements were accomplished by moving the detector crystal back and forth across the selected square for a 1-min period and recording the gamma rays detected by the NaI crystal. Some complications to this approach were noted during the data acquisition phase of this survey. The instrumentation being used for radiation measurement was sufficiently sensitive that the scattered "skyshine" radiation from the RMDF contributed significantly to the ambient exposure rate. To compensate for this effect, linear interpolation was used to estimate local background. A Ludlum Model 12S "Micro R" meter was used in two separate locations in the ISF area to determine the mean environmental exposure rate. These data were correlated with the gross gamma measurements obtained in the same two areas to determine a conversion factor from the gross gamma measurements to relate the scaler count-rate data to exposure rate in μR/h, background exposure rate, and a background gradient from skyshine from operations at the nearby RMDF. These data are given in Table 2. After adjustment for this skyshine, background radiation was found to average 12 μR/h, slightly above the 10 μR/h found at background point 1.

TABLE 1

ISF GAMMA SPECTROSCOPY--SOIL SCREENING

Sample No.	ID No.[a]	Date (1984)	Mass (g)	^{137}Cs (pCi/g)
1	1	24 Aug	2240	ND[b]
2	2	24 Aug	2438	0.007
3	3	22 Aug	~2000	0.134
4	4	22 Aug	-	Trace
5	5	21 Aug	~2000	0.353
6	6	21 Aug	~2000	2.145
7	6-1	21 Aug	956	1.63
8	7	21 Aug	~2000	0.84
9	7-1	21 Aug	890	1.18
10	7-2	21 Aug	935	1.87
11	7-3	21 Aug	1056	1.16
12	7-4	21 Aug	812	1.56
13	8	21 Aug	~5000	0.458
14	9	22 Aug	3787	0.244
15	10	22 Aug	3426	ND
16	11	21 Aug	2700	0.063
17	12	21 Aug	4011	Trace
18	13	21 Aug	2892	ND
19	15	21 Aug	3787	0.055
20	16	21 Aug	3186	0.015
21	1	30 Aug	2593	0.006
22	ISFI	31 Aug	4528	ND
23	ISF2	31 Aug	3847	ND
24	ISF3	31 Aug	-	ND
25	ISF4	31 Aug	4026	ND
26	ISF5	31 Aug	3226	ND
27	ISF6	31 Aug	4548	ND
28	ISF7	31 Aug	4415	ND
29	ISF8	31 Aug	4181	ND
30	ISFFS1	04 Sep	3828	ND
31	ISFFS2	04 Sep	4725	ND
32	ISFFS3A	04 Sep	3186	0.016
33	ISFFS3B	04 Sep	3337	ND
34	ISFFS4	04 Sep	3714	ND
35	ISFFS5	04 Sep	3295	0.003
36	ISFFS6	04 Sep	3028	ND
37	ISFFS7	04 Sep	3467	ND
38	ISFFS8	04 Sep	3906	ND
39	1	19 Oct	3074	ND
40	2	19 Oct	2920	0.027
41	3	19 Oct	2442	0.044
42	4	19 Oct	2814	0.069
43	5	19 Oct	2943	0.069
44	6	19 Oct	2934	0.028

[a]Dash numbers (e.g., 6-1, 7-1) indicate quantitative determinations using a Marinelli beaker.
[b]ND = No detectable activity.

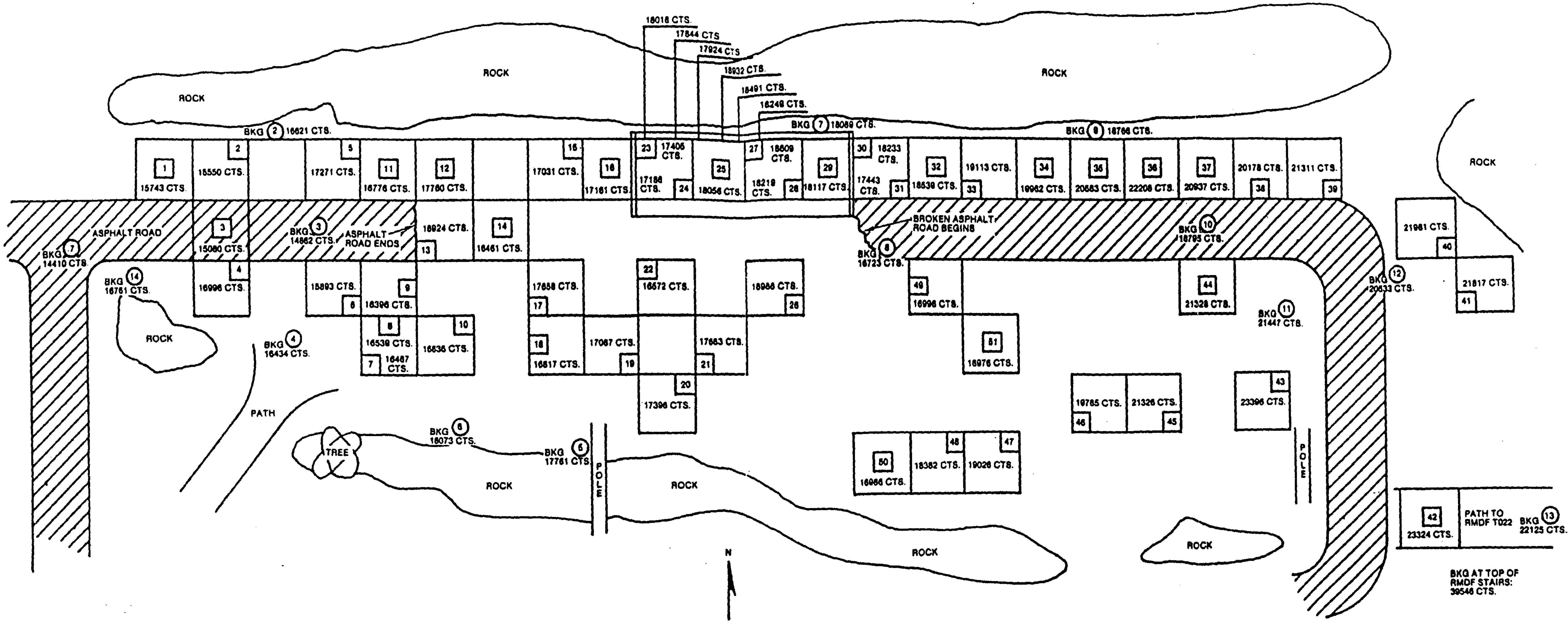


Figure 18. ISF Gross Gamma Survey Locations

TABLE 2

ISF BACKGROUND GAMMA, BACKGROUND AND GRADIENT DETERMINATION

Gamma Count Rate (cpm)	Exposure Rate (μR/h)	Conversion Factor (10^{-4} μR/h per cpm)
Background point 1		
13156	10.5	7.98
13561	10.2	7.52
13376	10.5	7.85
13415	10.2	7.60
13558	10.0	7.38
Average		7.76 ± 0.245
Background point 2		
33291	22.5	6.76
33057	24.0	7.26
33560	23.0	6.85
33304	25.0	7.51
33521	25.0	7.61
Average		7.20 ± 0.382
Combined average		7.43 ± 0.390

The entire data set is reproduced in Table 3, and a statistical analysis of these data is shown in Table 4. The data have been further analyzed and graphic representations produced. In Table 3, the uncorrected counts for each location shown in Figure 18 are listed, along with a "distance factor" to indicate the approximate relationship in moving from areas in which the skyshine is negligible toward areas in which it is significant. The distance factor was used in the linear interpolation to reduce the contribution of skyshine to the local exposure rate. The uncorrected counts were connected to exposure rate (in μR/h) using the conversion factor shown in Table 2. Similarly, after correction for skyshine, the corrected counts were converted to exposure rate. This provides, within the accuracy of the measurements, the best estimate of the local exposure rate. Figures 19 and 20 are for the uncorrected exposure rate and corrected exposure rate, respectively. These figures show cumulative probability distributions of the exposure rate data. In Figure 20, the values

TABLE 3
ISF FINAL GAMMA SURVEY DATA

Survey Point	Distance Factor	Uncorrected Counts	Uncorrected μR/h	Corrected Counts	Corrected μR/h
1	1	15743	11.69	15579	11.57
2	2	15550	11.55	15222	11.30
3	2	15080	11.20	14752	10.96
4	2	16996	12.62	16668	12.38
5	4	17271	12.83	16615	12.34
6	4	15893	11.80	15237	11.32
7	5	16467	12.23	15647	11.62
8	5	16539	12.28	15719	11.67
9	5	16396	12.18	15576	11.57
11	5	16770	12.46	15950	11.85
10	6	16835	12.50	15851	11.77
12	6	17760	13.19	16776	12.46
13	6	16924	12.57	15940	11.84
14	7	16461	12.23	15313	11.37
15	8	17031	12.65	15719	11.67
17	8	17658	13.11	16346	12.14
18	8	16817	12.49	15505	11.52
16	9	17161	12.75	15685	11.65
19	9	17087	12.69	15611	11.59
23	10	17405	12.93	15765	11.71
23	10	18018	13.38	16378	12.16
24	10	17186	12.76	15546	11.55
24	10	17844	13.25	16204	12.03
22	10	16572	12.31	14932	11.09
20	10	17396	12.92	15756	11.70
21	11	17685	13.13	15881	11.79
25	11	18056	13.41	16252	12.07
25	11	17924	13.31	16120	11.97
25	11	18932	14.06	17128	12.72
25	11	18491	13.73	16687	12.39
26	12	18609	13.82	16641	12.36
27	12	18609	13.82	16641	12.36
27	12	18249	13.55	16281	12.09
28	12	18219	13.53	16251	12.07
29	13	18117	13.46	15985	11.87
30	14	18233	13.54	15937	11.84
31	14	17443	12.96	15147	11.25
50	14	16986	12.62	14690	10.91
32	15	18539	13.77	16079	11.94
48	15	18328	13.61	15868	11.78
49	15	16996	12.62	14536	10.80
33	16	19113	14.20	16489	12.25

TABLE 3

ISF FINAL GAMMA SURVEY DATA
(Continued)

Survey Point	Distance Factor	Uncorrected Counts	Uncorrected μR/h	Corrected Counts	Corrected μR/h
47	16	19026	14.13	16402	12.18
51	16	18976	14.09	16352	12.14
34	17	19962	14.83	17174	12.76
35	18	20583	15.29	17631	13.09
46	18	19785	14.70	16833	12.50
36	19	22208	16.50	19092	14.18
45	19	21326	15.84	18210	13.53
37	20	20937	15.55	17657	13.11
44	20	21328	15.84	18048	13.40
38	21	20178	14.99	16734	12.43
43	21	23396	17.38	19952	14.82
39	22	21311	15.83	17703	13.15
40	24	21981	16.33	18045	13.40
42	24	23324	17.32	19388	14.40
41	25	21817	16.21	17717	13.16

TABLE 4

STATISTICAL ANALYSIS OF DATA SET

Value	Mean	Standard Deviation
Uncorrected counts	18343	1954
Uncorrected μR/h	13.62	1.45
Corrected counts	16383	1125
Corrected μR/h	12.17	0.84

have been adjusted to correct for the skyshine from RMDF. The resulting distribution is somewhat smoother and has less variability, indicating that the adjustment method is reasonably appropriate. (In these graphs, a perfect Gaussian distribution would show as points along a straight line. The steeper the slope, the greater the variability of the data.) Figure 20 shows that:

- The values displayed are from a single population
- The criterion of 5 μR/h above background existing under NRC guidance was met.

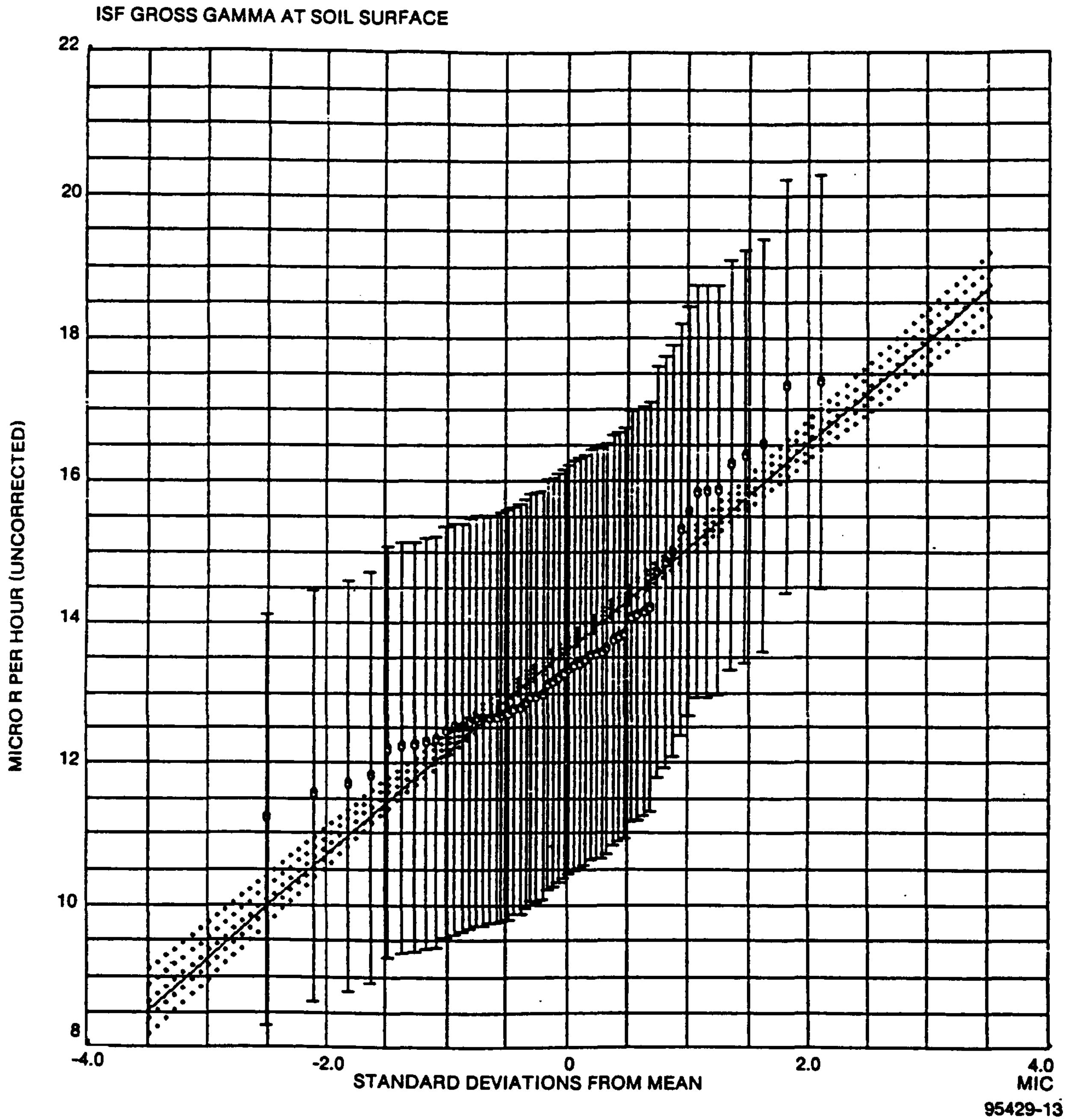


Figure 19. Cumulative Probability Distribution of Uncorrected Ambient Exposure Rate

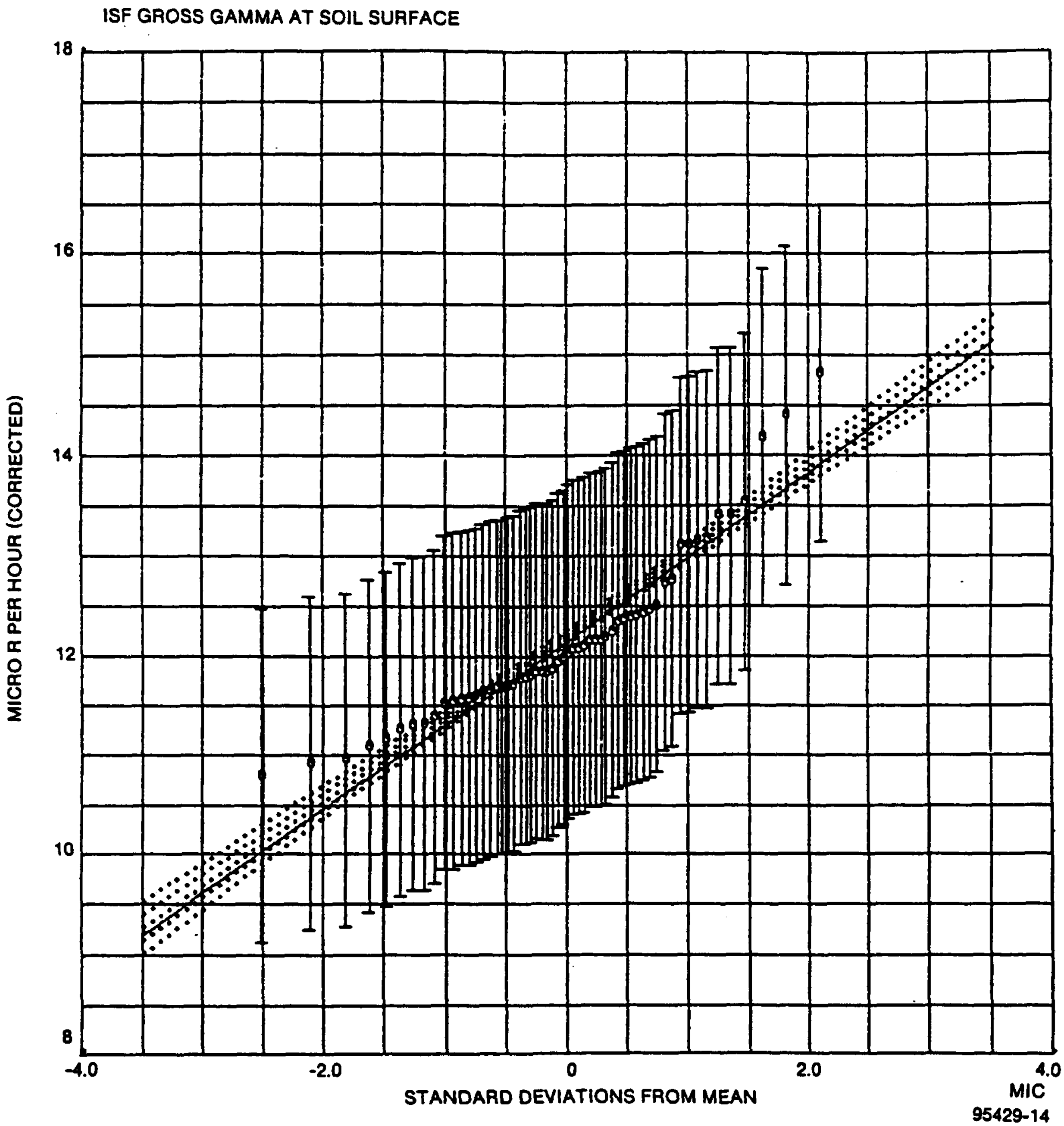


Figure 20. Cumulative Probability Distribution of Ambient Exposure Rate, Adjusted for Skyshine from RMDF

4.8 POSTDECOMMISSIONING HAZARDOUS CHEMICAL CONDITION

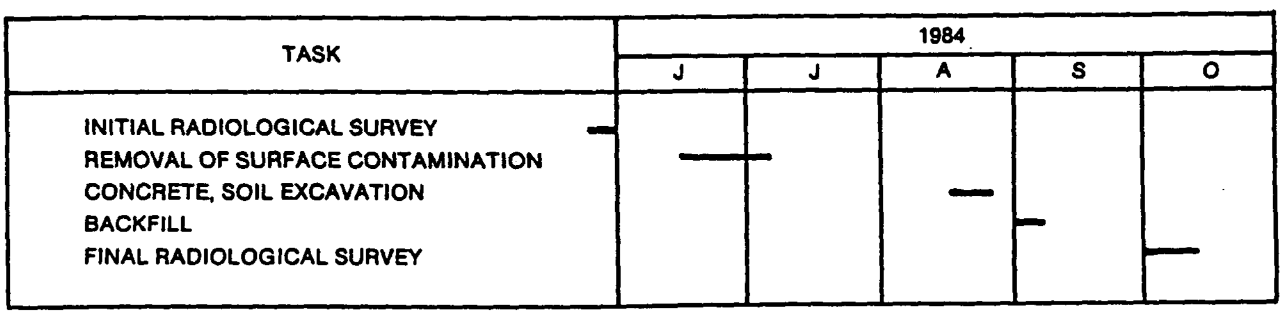
No hazardous chemical conditions existed in or resulted from the ISF decommissioning operation.

5.0 COST AND SCHEDULE

The budget for the ISF decommissioning was $430,000. The total cost of the ISF decommissioning was $267,000. A breakdown of the cost is as follows:

ISF decommissioning labor	$170,000
Demolition contract	48,000
Waste transportation burial	40,000
Program management	9,000
	$267,000

The schedule for the decommissioning of the ISF is given in Figure 21. The work was accomplished in accordance with this original schedule.



95429-15

Figure 21. ISF Decommissioning Schedule

6.0 WASTE VOLUMES GENERATED

A total of 168.5 m^3 of low specific activity (LSA) waste consisting of 126 King-Pac containers (1 m^3 each) containing soil, asphalt, and concrete and 12 wood box containers (3.54 m^3 each) containing storage tube and basket sections was generated during the decommissioning of the ISF. It was shipped by truck as radioactive waste to the DOE disposal site.

7.0 OCCUPATIONAL EXPOSURE TO PERSONNEL

None of the Engineering or Health, Safety, and Radiation Services personnel assigned to the ISF decommissioning project received any measurable exposure to ionizing radiation during the decommissioning.

8.0 FINAL FACILITY OR SITE CONDITION

The ISF site was restored to its natural state after the decommissioning was complete. The excavation was backfilled and the surface graded to match the contours of the surrounding land. Figure 22 shows the postdecommissioning condition of the ISF site.

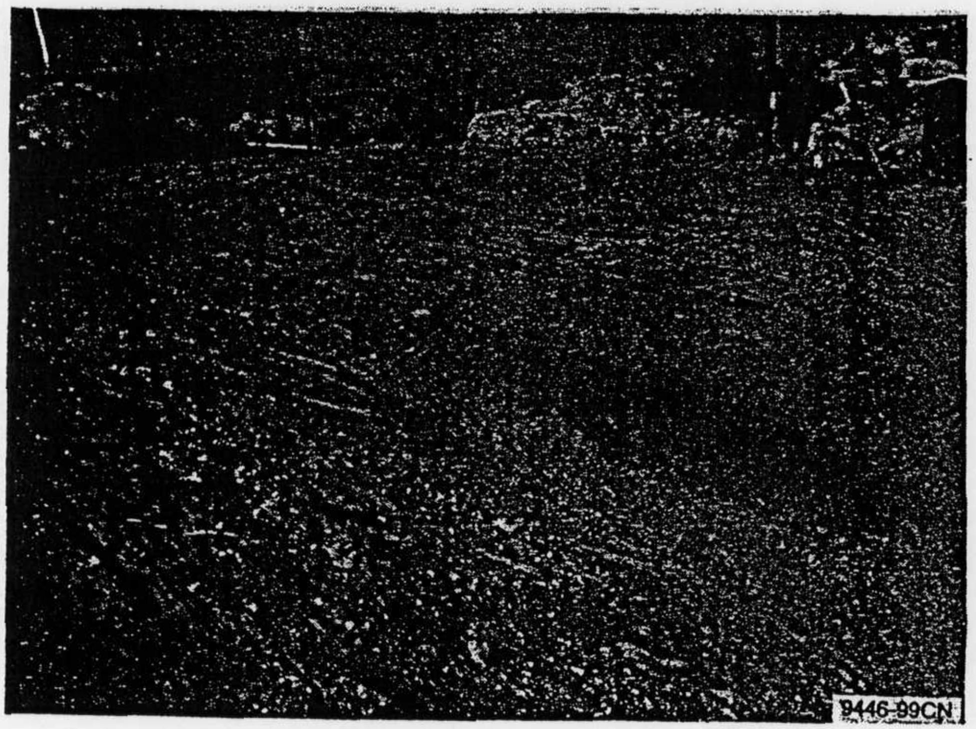


Figure 22. Postdecommissioning Condition of the ISF Site

The final survey shows that the site is suitable for unrestricted release.

9.0 LESSONS LEARNED

During the project, several observations were made that qualify as lessons learned:

- The galvanized carbon steel storage tubes did not leak, and they properly contained the contamination within the tubes even though they periodically contained water.
- The storage tubes could not be pulled from the oversized holes drilled in the sandstone without first exposing 45% of the storage tube surface and removing the backfill drilling mud.
- The backhoe and hydraulic ram equipment proved to be effective and economical for removing the tubes.
- The packaging and handling facilities at RMDF were very useful for cutting up and packaging the storage tubes.
- A special prefilter smoke retention housing was required to prevent the RMDF absolute filters from plugging due to the large quantities of particulates generated during the activity to cut up the storage tubes and internal baskets.

REFERENCES

1. J. Harris, "Relevant Information to Support RMDF and Interim Storage Facility Decommissioning," N704TI990059 (5 November 1981)
2. J. F. Lang, "Interim Storage Facility Decommissioning Plan," N001TI000188 (6 June 1983)

5874F/nth