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Abstract

This document updates the information in ESG-DOE-13507, "Interim Storage Facility Decommissioning Final Report" (1985).

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FIGURES

1.0 INTRODUCTION

Boeing North American's Rocketdyne Propulsion & Power Division operates the Santa Susana Field Laboratory (SSFL). The Energy Technology Engineering Center (ETEC) was a portion of Rocketdyne which, along with the sister organization, Atomics International (Division of the Energy Systems Group), performed testing of equipment, materials, and components for nuclear and energy related programs at portions of the SSFL on behalf of the Department of Energy (DOE). Contract work for the Atomic Energy Commission (AEC) and the Energy Research and Development Administration (ERDA), predecessor agencies to the DOE, began in the early 1950's. Specific programs conducted for AEC/ERDA/DOE involved the engineering, development, testing, and manufacturing operations of nuclear reactor systems and components. Other SSFL activities have also been conducted for the National Aeronautics and Space Administration, the Department of Defense, and other government related or affiliated organizations and agencies. Some activities were under license by the Nuclear Regulatory Commission (NRC) and the State of California Radiological Health Branch of the Department of Health Services.

Some buildings and land areas became radiologically contaminated as a result of the various operations which included ten reactors, seven criticality test facilities, fuel fabrication, reactor and fuel disassembly, laboratory work, and on-site storage of nuclear material. Potential radioactive contaminants identified at the SSFL are uranium (in normal, depleted, and enriched form), plutonium, Am-241, fission products (primarily Cs-137 and Sr-90), and activation products (tritium [H-3], Co-60, Eu-152, Eu-154, Ni-63, Pm-147, and Ta-182).

Decontamination and decommissioning (D&D) of contaminated facilities began in the late 1960's and continue as the remaining DOE nuclear program operations have been terminated. As part of this D&D program, Rocketdyne performed decommissioning and final status surveys of a number of facilities that supported the various nuclear-related operations. The Interim Storage Facility (4654) is one of the facilities that was previously decontaminated and decommissioned under DOE's Surplus Facilities Management Program (SFMP). Environmental management of DOE contaminated properties continues under the new contract (DE-AC03-99SF21530) entered into between DOE and Boeing North American on 1 January 1999 to complete remediation of all liabilities associated with former DOE activities at the site.

The Decommissioning work of 4654 was documented in ESG- DOE- 13507 "Interim Storage Facility Decommissioning Final Report" in 1985 (Ref. 1). This report updates the information provided in the Decommissioning Final Report.

2.0 BACKGROUND

2.1 LOCATION

The Interim Storage Facility (ISF) 4654 was located within the Boeing North American's (formerly Rockwell International's) Rocketdyne Propulsion & Power's Santa Susana Field Laboratory (SSFL) in the Simi Hills and approximately 29 miles northwest of downtown Los Angeles, directly south of the city of Simi Valley. Location of the SSFL relative to Los Angeles and vicinities is shown in Figure 2-1. An enlarged map of neighboring SSFL communities is shown in Figure 2-2. Figure 2-3 is a plot plan of the western portion of SSFL known as Area IV, where 4654 was located. A drawing (plan view) of 4654 and its adjoining areas is shown in Figure 2-4.

2.2 FACILITY CHARACTERISTICS

The Interim Storage Facility (4654) (Figure 2-5) included eight 20-inch diameter galvanized steel tubes, extending 25 feet into 32-inch diameter bore holes drilled into rock strata. The top portions of the storage tubes were encased in a common concrete trench and berm structure, and the bottom ends were seal-welded closed. See Figure 4-1 on page 15. The remainder of the ISF fenced-in area measured 65 feet by 40 feet and was paved with approximately 2-inch thick asphalt.

2.3 OPERATING HISTORY

The ISF (DOE Facility 4654) 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 radiological waste generated at the SRE. In addition to the SRE waste storage, the ISF was also used to store a variety of items from two other DOE programs: the Organic Moderated Reactor Experiment (OMRE) and Systems for Nuclear Auxiliary Power (SNAP).

Seals and packing on some of the casks and equipment stored at ISF over the years had deteriorated from exposure to the elements. Some low-level contamination had been released into the asphalt surface near the casks and onto soil just outside the ISF fence. The casks and other sources of potential contamination were subsequently removed and sent to the DOE-Hanford (Washington) disposal site for burial. Radioactive core components and material placed in the eight storage tubes during ISF usage had also contaminated the internal storage baskets and interior surfaces of the storage tubes. Funding for the site decommissioning activity became available in 1984.

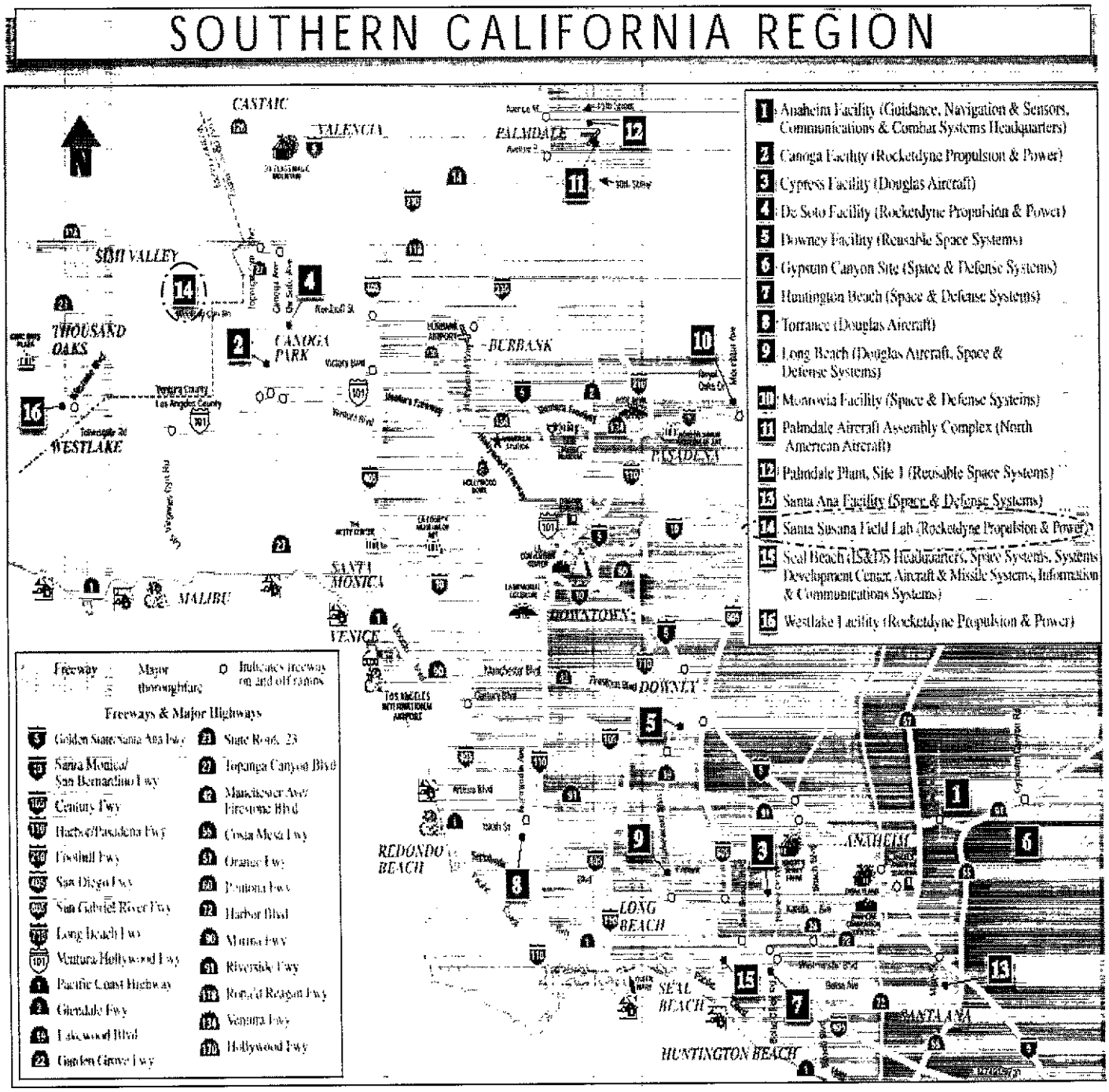


Figure 2-1. Map of Los Angeles Area

Figure 2-2. Map of Neighboring SSFL Communities

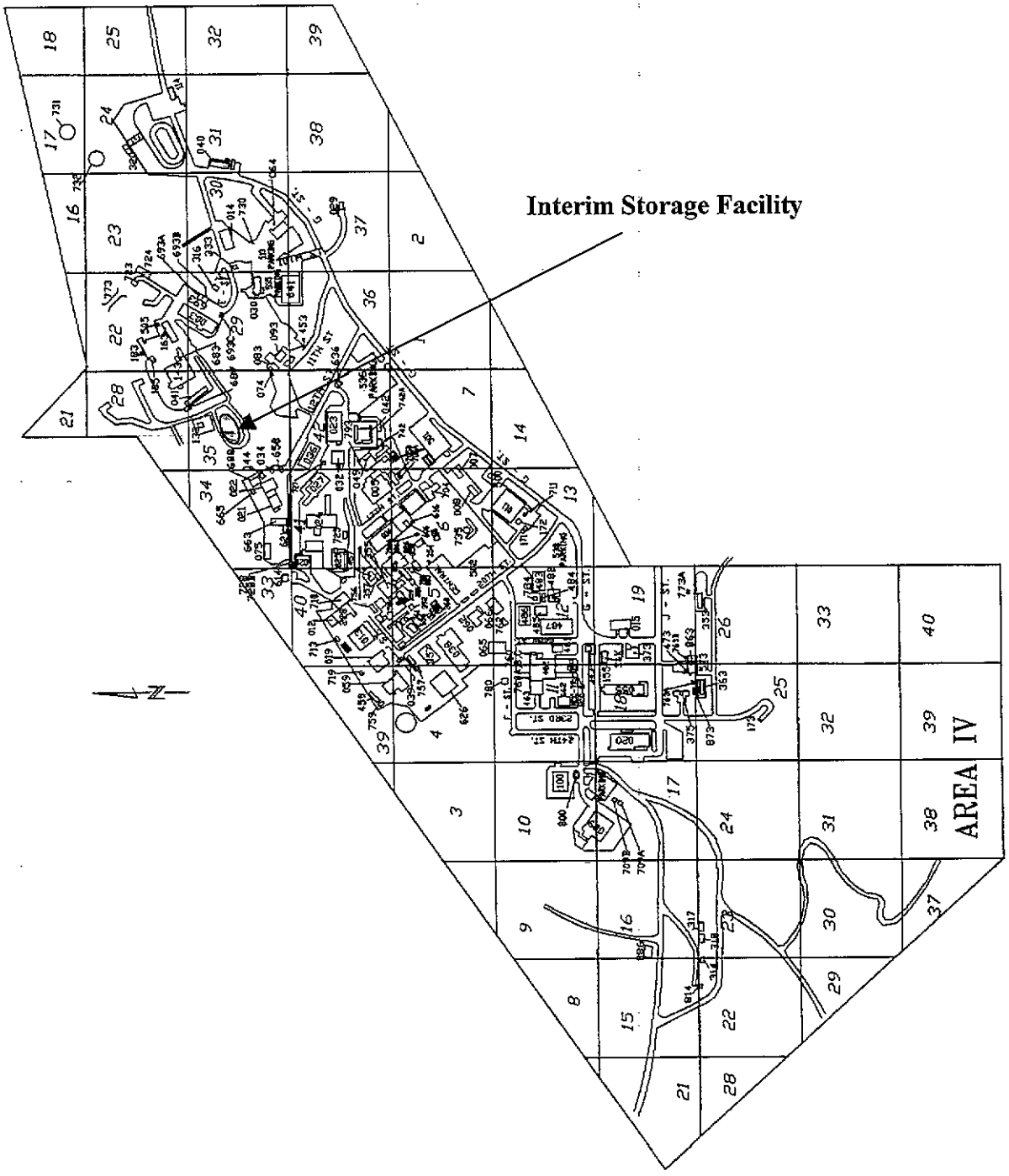


Figure 2-3. Area IV, SSFL

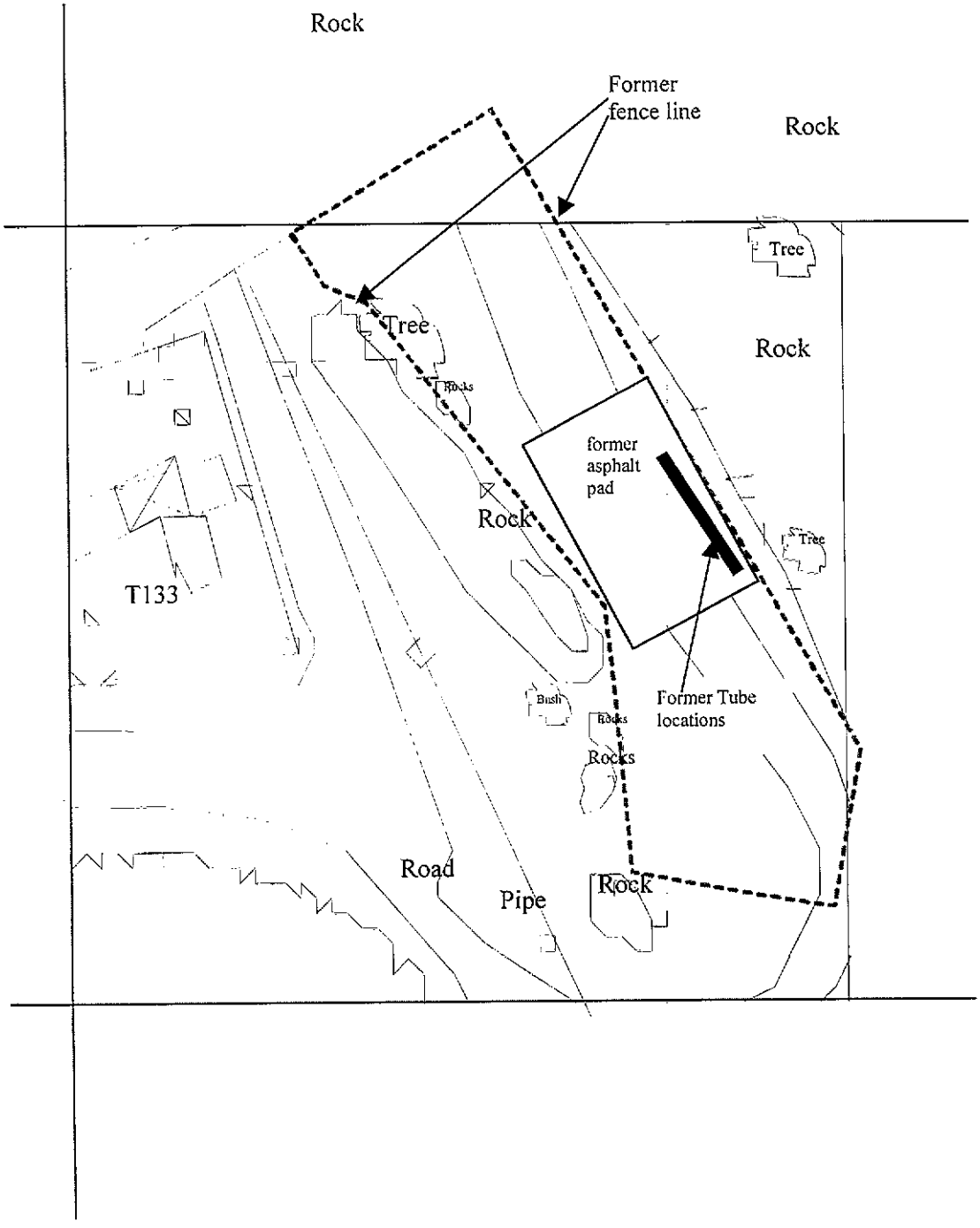


Figure 2-4. Interim Storage Facility Location

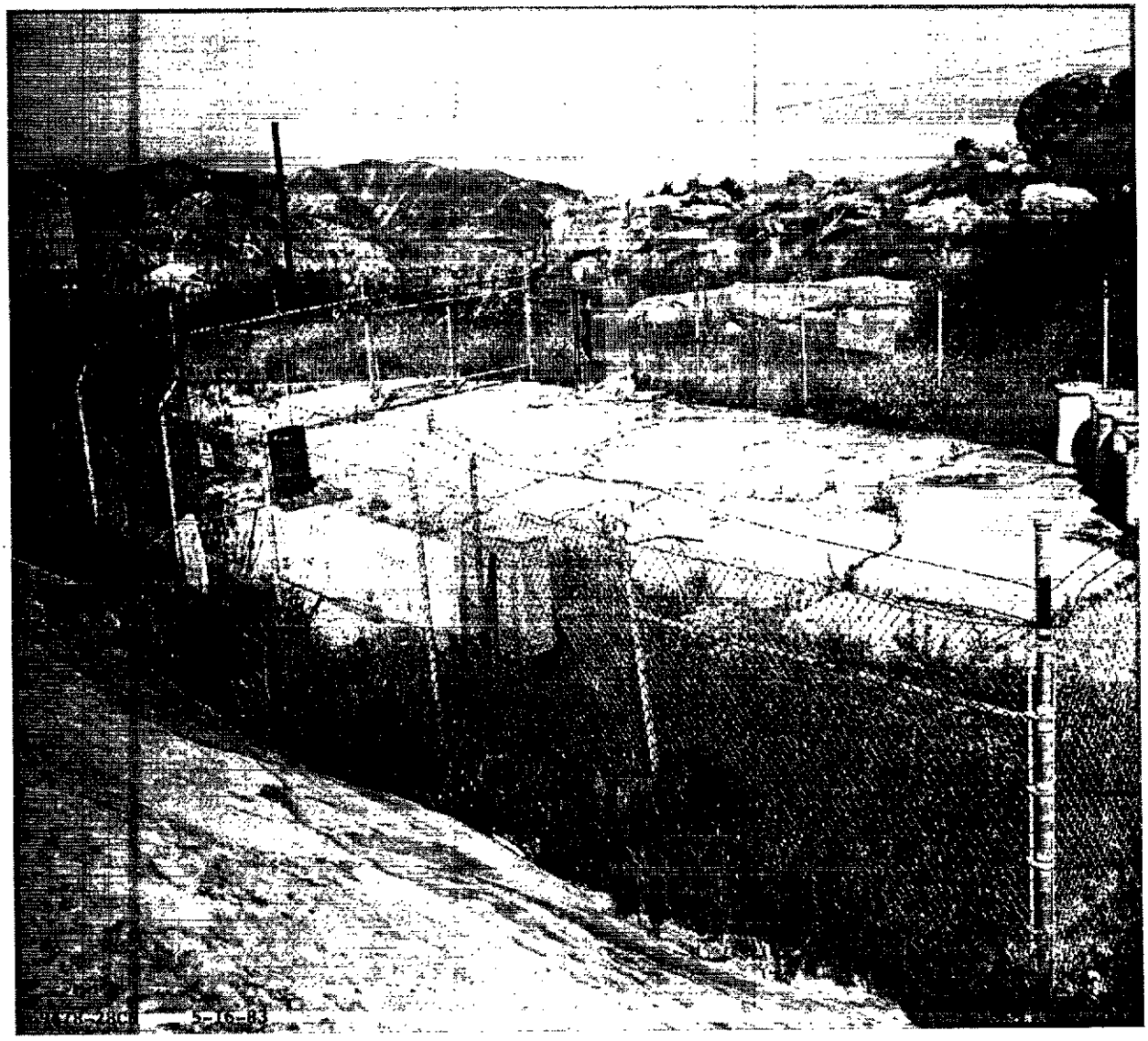


Figure 2-5. Interim Storage Facility (4654)

3.0 SUMMARY

The initial Decontamination and Decommissioning (D&D) of the Interim Storage Facility (ISF), was started in 1984 and completed in 1985. Activities included performing a detailed radiation survey of the facility, removing surface and imbedded contamination, excavating and removing the fuel storage tubes, restoring the site to natural grade, and packaging & shipping waste to the DOE-Hanford (Washington) disposal site for burial. The project was completed on schedule and under budget with no measurable radiation exposure to personnel.

ETEC's radiological survey of the ISF (Ref. 1) determined it to be suitable for release without radiological restrictions.

DOE routinely contracted with the Oak Ridge Institute for Science and Education (ORISE) to perform independent third party verification release surveys of sites throughout the nationwide DOE complex. In 1995, at the request of DOE, ORISE reviewed the 1984 survey documentation and suggested that additional sampling was required to adequately demonstrate that the facility could be released (Ref. 2 and 3). Accordingly, in 1997 Rocketdyne arranged for subsurface core samples of the area be taken at ORISE's direction and then provided the samples to ORISE for analysis. At the same time, Rocketdyne took an additional 93 surface soil samples. ORISE documented their verification survey in 1997 (Ref. 4) and Rocketdyne completed the final documentation of their final survey in 1999 (Ref. 5). Both surveys confirmed that the exposure rates and radionuclide concentration levels in soil at the ISF are less than the guideline criteria levels for release for unrestricted use.

4.0 PROJECT ACTIVITIES/RESULTS

4.1 PHASE I D&D (1984) – External Site Clean-up

The Interim Storage Facility (ISF) had not been used to support an active program from 1964 through 1984. During that period, stored material and equipment had been removed from the facility.

Phase I D&D commenced with a thorough scoping or characterization radiation survey of the ISF. The concrete trench and berm (top, sides, and ends), all soil, rock, concrete, storage-tubes/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 which indicated Co-60 or Cs-137 levels above 1 pCi/g activity measured on a multi-channel analyzer were also considered contaminated (Ref. 1).

The contaminated concrete trench and berm were decontaminated using pneumatic scabblers with HEPA-filtered vacuum systems attached to capture concrete dust. The concrete surfaces were resurveyed and rescabbled until all surface contamination was removed. Contaminated soil removed to expose below-grade concrete surfaces was transferred to waste containers for shipment to the DOE-Hanford disposal site.

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 removed, broken into small pieces and loaded into approved radioactive waste packages for off-site shipment and disposal. A survey of the soil (exposed by the asphalt removal) indicated localized areas of contamination. The contaminated soil was removed and packaged for shipment to the DOE-Hanford disposal site.

Contaminated internal storage baskets were found in five of the eight storage tubes (Ref. 1). These were removed using a Grove mobile crane. Each basket was drawn into a plastic bag as it was removed from its respective storage tube to ensure containment of any contaminants. These baskets were transferred to the Radioactive Materials Handling Facility (RMHF), then known as the Radioactive Materials Disposal Facility (RMDF), for size reduction and packaging for shipment to the DOE-Hanford disposal site.

Four of the eight storage tubes were found to contain water contaminated with Cs-137. The storage tubes were filled with Redimix concrete to absorb the contaminated water and fix the contaminant in place. Figure 4-1 shows the depth of the water found in tubes 2, 3, 4, and 6 and the quantity of Redimix used.

After completion of the above Phase I activities, the ISF controlled area and the surrounding area were resurveyed. Figure 4-2 shows the ISF area that was surveyed. During this survey, additional

soil was found to be contaminated. Less than 6 inches of soil in approximately 10 % of the total area and up to 18 inches of soil in approximately 1 % of the total area were removed and packaged into radioactive waste containers for off-site shipment and disposal. The Phase I radiation survey (Ref. 1) was performed and confirmed that all surface contamination had been removed and all radiation levels were within acceptable limits.

4.2 PHASE II D&D (1984, 1985) – Removal of the Storage Tubes and Surrounding Structure

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

The first excavation operation required removing the concrete that contained the upper portion of the storage tubes. This clean material was temporarily stored (after survey) in a retention area (Figure 4-3), 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 4-4 and 4-5) to a depth of 23 feet. During the excavation operation, at approximately 15 feet, the hydraulic hammer mounted on the end of a backhoe being used to excavate the area punctured storage tube 7 (see Figure 4-6). The storage tube and the surrounding area were surveyed and verified to be free of contamination. 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 Co-60, Cs-137, and other gamma emitters (Ref. 1).

A mobile crane was used to transfer each storage tube to a flatbed truck for transport to the RMHF (Figures 4-7 and 4-8). As each storage tube was removed, it was surveyed, and verified to be externally free of contamination. As an extra precaution, a plastic bag was placed around the lower section to prevent the potential spread of contamination during transit. A soil sample was taken from each of the emptied boreholes as the tube was removed. These samples were analyzed for Co-60, Cs-137, and other gamma emitters. Results were found to be less than the then release criterion of 100 pCi/g gross detectable activity (Ref. 1, section 4.7).

Throughout this project, Rocketdyne Radiation Safety monitored all operations. Much of this effort was directed toward detecting and eliminating residual radioactive contamination. The final D&D radiological survey can be broken into three phases:

- Phase IIA: Constant monitoring of soil and structure surfaces during final phases of structure removal
- Phase IIB: Radiometric screening and analysis of soil samples taken from excavation by gamma spectroscopy

- Phase IIC: 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 site soil activity and ambient radiation. Each phase and its findings are discussed below.

Phase IIA. Constant surveillance of removed and onsite materials was conducted by Radiation Safety personnel to monitor for possible alpha, beta, and gamma emitting radionuclides. No measurable contamination was found in 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.

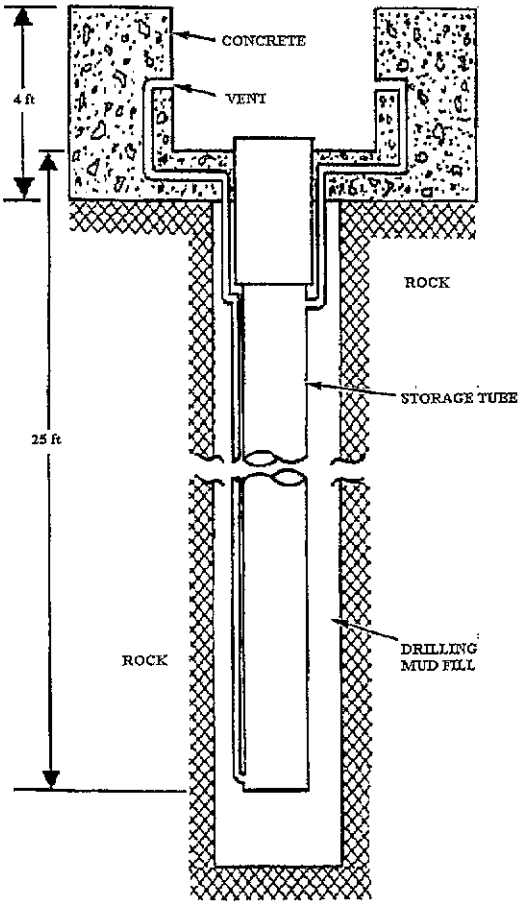
Phase IIB. Soil samples were taken both during the soil removal process and also at the maximum depth of the excavations. Soil samples were screened for detectable activity using a germanium detector. Samples indicating a measurable level of cesium (Cs-137 was the only nonnaturally occurring isotope encountered during this activity) contamination were subjected to quantitative analysis. None of the samples contained activity in excess of 2.0 pCi/g, which was calculated to be equivalent to a maximum beta activity of 36 pCi/g. This value was less than the release criterion of 100 pCi/g gross detectable beta activity.

Phase IIC. After completion of the final backfilling, a statistical survey was made at the surface in both the areas previously occupied by the ISF facility and its environs (Ref. 1). Since the instrument used for radiation measurement was sensitive to the scattered "skyshine radiation" from the nearby RMHF, a correction was applied to the data set. The corrected mean value of the survey data, 12 μR/h, met the guideline criterion of less than 5 μR/h above background (10 μR/h).

4.3 ADDITIONAL RADIOLOGICAL SURVEYS OF ISF (1997)

In 1995, the Oak Ridge Institute of Science and Education (ORISE) reviewed the 1984 survey documentation and suggested that additional sampling was required to adequately demonstrate that the facility could be released (Ref. 2 and 3). Accordingly, in 1997, Rocketdyne arranged for subsurface core samples of the area be taken at ORISE's direction and then provided the samples to ORISE for analysis. At the same time, Rocketdyne took an additional 93 surface soil samples. ORISE documented their verification survey in 1997 (Ref. 4), and Rocketdyne completed the documentation of their final survey in 1999 (Ref. 5).

Both surveys confirmed that the exposure rates and radionuclide concentration levels in soils at the ISF are less than the guidelines for release for unrestricted use.



Cross Section of ISF Storage Tube

STORAGE TUBE NUMBER

	1	2	3	4	5	6	7	8
Water Level	Dry	31 inch	24 inch	13.5 inch	Dry	6 inch	Dry	Dry
Sacks Redimix reqd for solidification		25.2	19.5	11.1		4.8		

Figure 4-1. ISF Tube Cross Section and Tube Water Levels

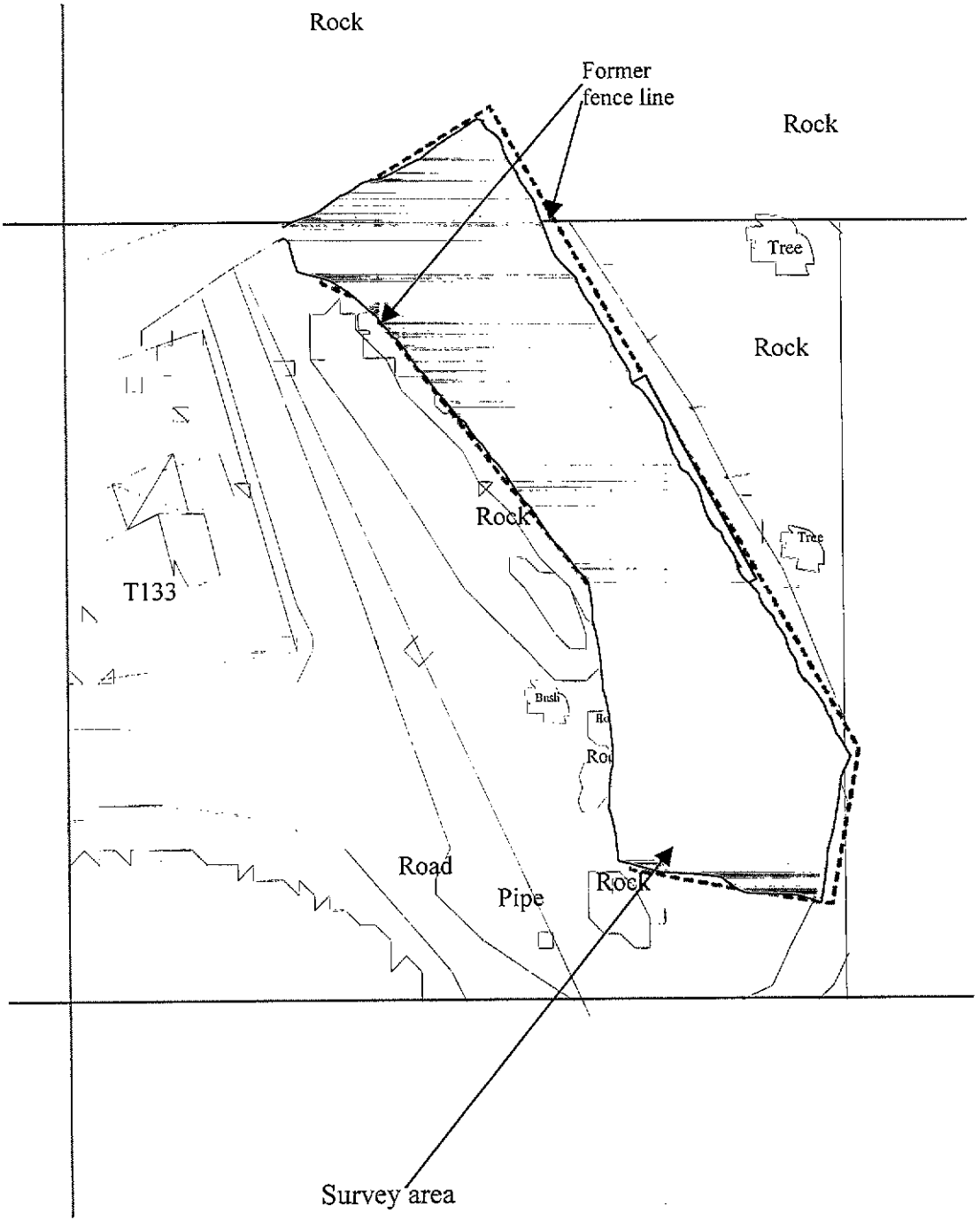


Figure 4-2. ISF Survey Area

Figure 4-3. Broken Concrete Retention Area

Figure 4-4. Soil and Rock Retention Area

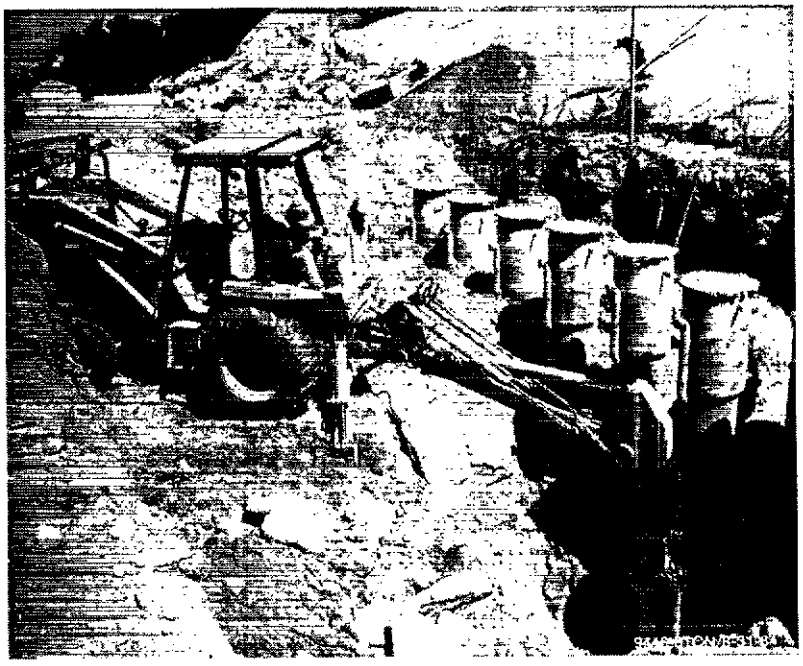


Figure 4-5. ISF Excavation Staging Trench

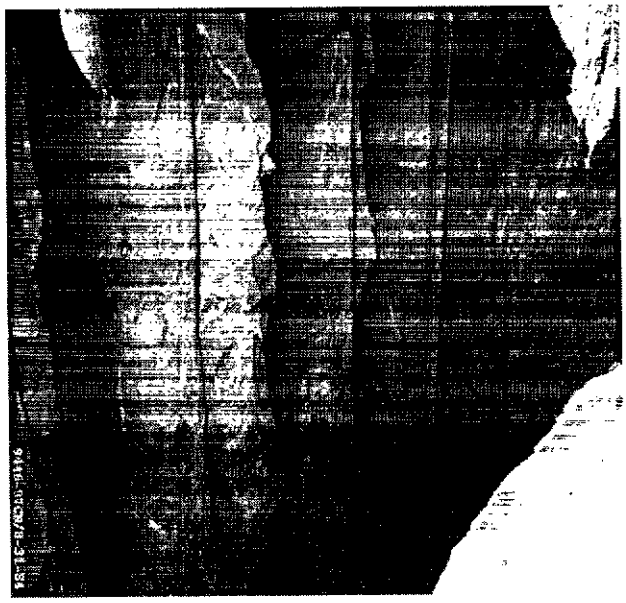


Figure 4-6. Damage to Tube # 7 During Excavation

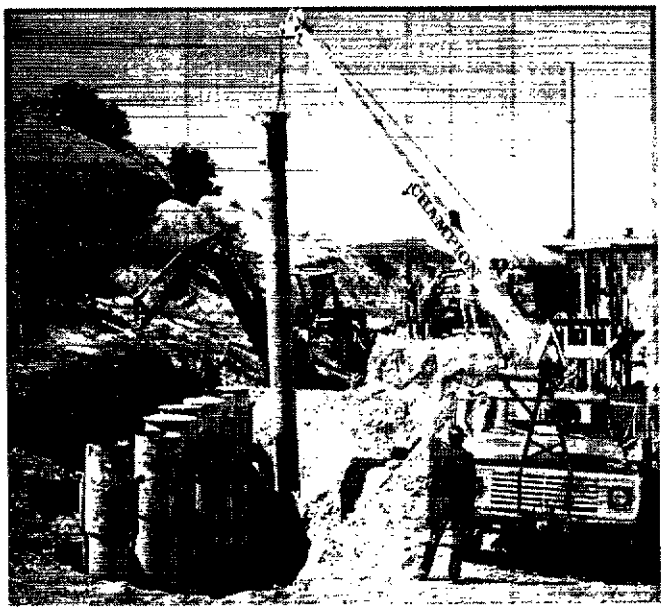


Figure 4-7. ISF Storage Tube Removal

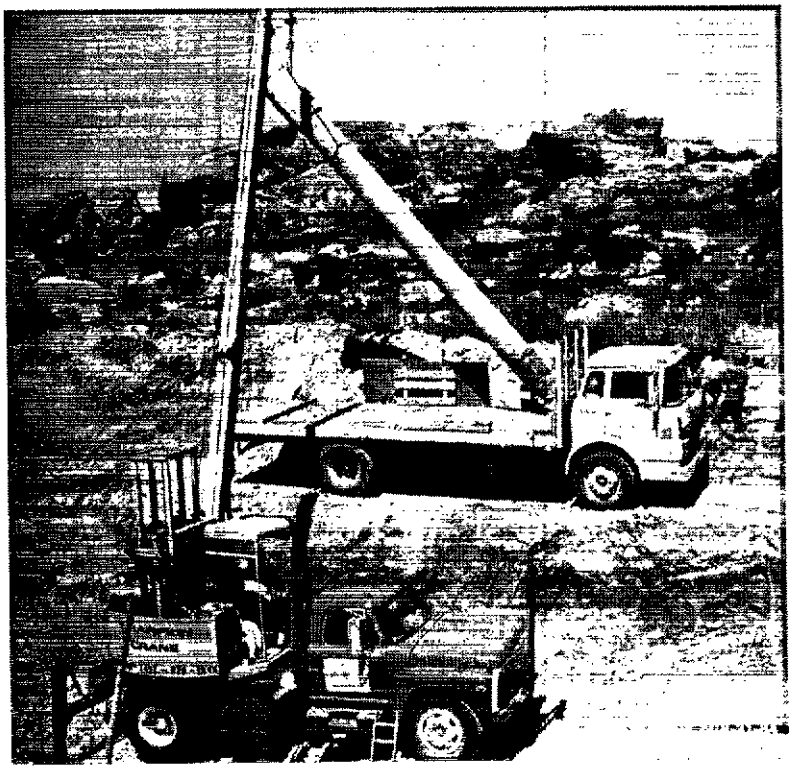


Figure 4-8. ISF Storage Tube Transfer

5.0 WASTE GENERATED AND DISPOSAL

A total of 168.5 cubic meters of low specific activity (LSA) waste consisting of 126 King-Pac containers (1 cubic meter each) containing soil, asphalt, and concrete and 12 wood box containers (3.54 cubic meters each) containing storage tube and basket sections were generated during the decommissioning of the ISF.

The King-Pac containers were transferred to the RMHF for final disposition before shipment. Container integrity was verified, and plastic liners were sealed. The containers were labeled and banded to transport and loading pallets. Six truckloads of the King-Pacs (126) were shipped to the DOE site at Hanford, Washington.

The 25-feet-long fuel element baskets and storage tubes were transferred to the RMHF for size reduction and packaging. Both the storage tubes and baskets were sectioned into approximately 4-feet lengths using an oxygen acetylene cutting torch in Building 021. Figures 5-1 and 5-2 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 the cutting activity. The tube and basket sections were packaged in 12 wooden containers and also shipped as LSA waste to the DOE-Hanford site for disposal.

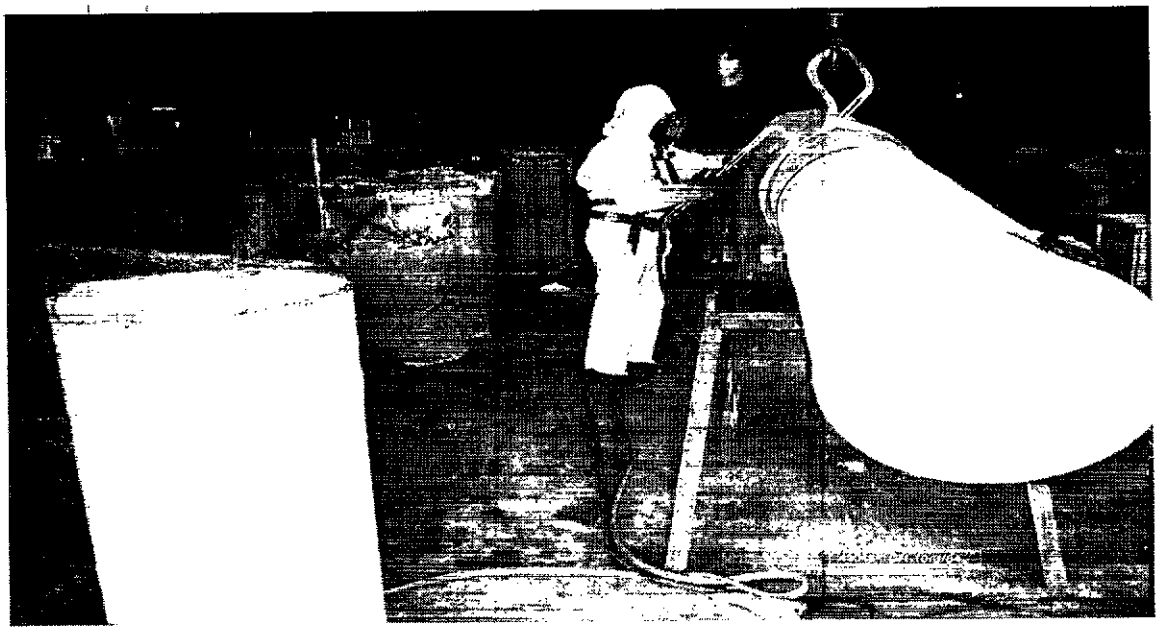


Figure 5-1. ISF Storage Tube Cutting

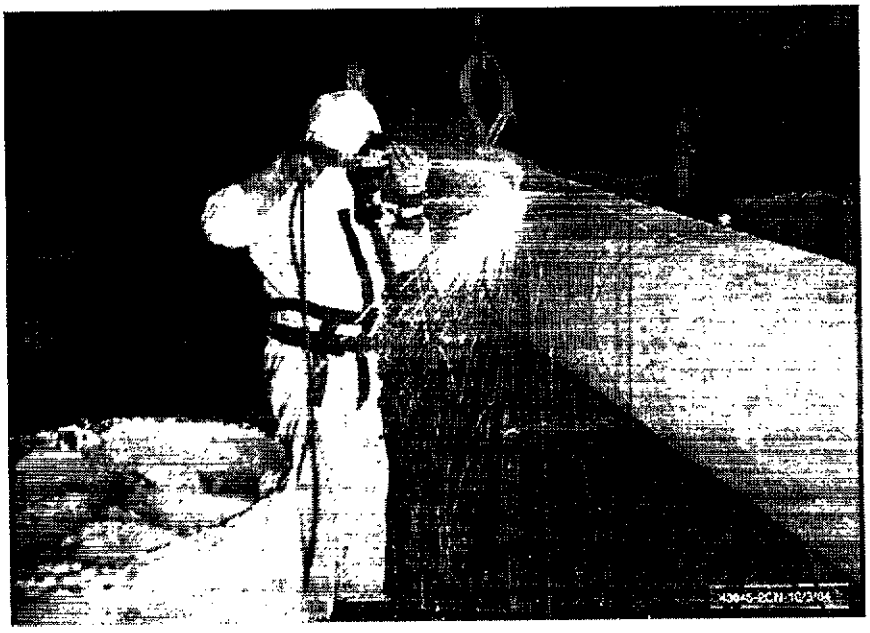


Figure 5-2. ISF Storage Tube Cutting

6.0 PERSONNEL RADIATION EXPOSURE

None of the Rocketdyne Operations and Radiation Safety or contractor personnel assigned to the ISF decommissioning project received any measurable exposure to ionizing radiation during the decommissioning (Ref. 1).

7.0 COST

Decommissioning labor included mechanics, health physicist; and direct supervisors performing the decommissioning activity. Support labor included program offices, photographic, word processing, and program administration.

The original budget for the ISF decommissioning was $430,000. The total cost of the ISF decommissioning, prior to the Final Verification surveys, was $267,000. The cost of the final verification surveys is estimated to be $50,000. A breakdown of the final cost is as follows:

ISF decommissioning labor (including Health Physics support)	$170,000
Demolition contract	48,000
Waste transportation burial	40,000
Program management and support	9,000
ISF DECOMMISSIONING	$267,000
Final Radiological Surveys	50,000
TOTAL COST	$317,000

8.0 REFERENCES

1. ESG- DOE- 13507 "Interim Storage Facility Decommissioning Final Report", March 15, 1985.

2. Letter from T. J. Vitkus (ORISE) to D. Williams (DOE-EM), "Comments on the Final Status Survey Documentation for the Interim Storage Facility; Building T013, T019, T024, T030, and T641; The Storage Yard west of Buildings T626 and T038; and the NW Area; Santa Susana Field Laboratory, Rockwell International Ventura County, California", January 11, 1996.

3. ORISE 96/C-4, "Verification Survey for the Interim Storage Facility; Buildings T030, T641, and T013; An area Northwest of Buildings T019, T013, T012, T059; and a storage yard West of Buildings T626 and T038; Santa Susana Field Laboratory, Rockwell International Ventura County, California", Oak Ridge Institute for Science and Education (ORISE), Oak Ridge, TN, February, 1996.

4. "Verification Survey of the Interim Storage Facility (4654) Santa Susana Field Laboratory Rockwell International Ventura County, California", Oak Ridge Institute for Science and Education (ORISE), Oak Ridge, TN, November, 1997.

5. RS-00004 "Building 4654 Supplemental Final Status Survey Report", March 15, 1999.