MARTIN MARIETTA ENERGY SYSTEMS LIBRARIES
3 4456 0284360 8

ORNL/RAP-51

ornl

OAK RIDGE NATIONAL LABORATORY

MARTIN MARIETTA

Maintenance and Surveillance Plan for the ORNL Surplus Facilities Management Program and Defense Facilities Decommissioning Program FY 1990–1999

T. W. Burwinkle
M. K. Ford
D. F. Hall

[redacted]

OAK RIDGE NATIONAL LABORATORY
CENTRAL RESEARCH LIBRARY
CIRCULATION SECTION
4500N ROOM 175
LIBRARY LOAN COPY
DO NOT TRANSFER TO ANOTHER PERSON
If you wish someone else to see this report, send in name with report and the library will arrange a loan.
UCN-7969 (3-9-77)

OPERATED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
FOR THE UNITED STATES
DEPARTMENT OF ENERGY

ORNL/RAP-51

ENVIRONMENTAL AND HEALTH PROTECTION DIVISION

SURPLUS FACILITIES MANAGEMENT PROGRAM
DEFENSE FACILITIES DECOMMISSIONING PROGRAM

(Activity AH 10 20 00, NEAH200)
(Activity GF 11 04 00, DPGF701)

MAINTENANCE AND SURVEILLANCE PLAN FOR THE ORNL SURPLUS FACILITIES MANAGEMENT PROGRAM AND DEFENSE FACILITIES DECOMMISSIONING PROGRAM FY 1990-1999

T. W. Burwinkle
M. K. Ford
D. F. Hall

Date of Issue - January 1989

Prepared for
The Office of Remedial Action and Waste Technology
The Office of Defense Waste and Environmental Restoration

Prepared by the
OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831
operated by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U.S. DEPARTMENT OF ENERGY
under Contract No. DE-AC05-840R21400

MARTIN MARIETTA ENERGY SYSTEMS LIBRARIES
3 4456 0284360 8

TABLE OF CONTENTS

	Page
LIST OF FIGURES	v
LIST OF TABLES	vii
ACRONYMS LIST	ix
SUMMARY	xi
1. INTRODUCTION	1
1.1 The ORNL SFMP and DFDP	1
1.2 M&S Program Objectives	6
1.3 Scope of the M&S Plan	6
2. PROGRAM DESCRIPTION	6
2.1 Structure and Responsibilities	6
2.2 M&S Requirements	7
2.2.1 Surveillance Requirements	7
2.2.1.1 Facility Surveillance	9
2.2.1.2 Radiological Surveillance	9
2.2.1.3 Safety Inspections	11
2.2.1.4 Security and Protection	11
2.2.2 Maintenance Requirements	11
2.2.2.1 Routine Maintenance	12
2.2.2.2 Major Repairs	12
2.2.2.3 Waste Management	13
2.2.3 Documentation	13
2.3 Quality Assurance	14
3. PROJECT SUMMARIES	14
4. PROGRAM COSTS AND SCHEDULES	15
5. REFERENCES	21
APPENDIX A. PROJECT M&S ACTIVITY SUMMARIES	A-1

LIST OF FIGURES

Page

Fig. 1. ORNL organizational structure for the SFMP and DFDP M&S programs 2

Fig. 2. Location map for ORNL surplus facilities - Bethel Valley area 4

Fig. 3. Location map for ORNL surplus facilities - Melton Valley area 5

Fig. 4. ORNL divisional participation in the SFMP M&S program . . 8

LIST OF TABLES

		Page
Table 1.	Facilities currently managed by the ORNL SFMP and DFDP .	3
Table 2.	Facility groupings of M&S activity summaries	16
Table 3.	SFMP M&S program costs	17
Table 4.	DFDP M&S program costs	18

ACRONYM LIST

ACh	Analytical Chemistry (Division)
AEC	Atomic Energy Commission
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
BSR	Bulk Shielding Reactor
D&D	decontamination and decommissioning
DFDP	Defense Facilities Decommissioning Program
DOE	Department of Energy
DOP	dioctypthalate
EHP	Environmental and Health Protection (Division)
ESD	Environmental Sciences Division
FPDL	Fission Product Development Laboratory
FPPP	Fission Product Pilot Plant
HEPA	high-efficiency particulate air (filter)
HRE	Homogeneous Reactor Experiment
LITR	Low-Intensity Test Reactor
LLLW	liquid low-level waste
LP	Laboratory Protection
M&S	maintenance and surveillance
MRF	Metal Recovery Facility
MSRE	Molten Salt Reactor Experiment
NQA	Nuclear Quality Assurance
OGR	Oak Ridge Graphite Reactor
ORNL	Oak Ridge National Laboratory
ORO	Oak Ridge Operations
ORR	Oak Ridge Research Reactor
P&E	Plant and Equipment
QA	Quality Assurance
QD	Quality Department
RAP	Remedial Action Program
RLO	Richland Operations Office
SFMP	Surplus Facilities Management Program
STT	Shielded Transfer Tanks
SWSA	Solid Waste Storage Area
TRU	transuranic
WOCC	Waste Operations Control Center

SUMMARY

The SFMP and DFDP at the ORNL are part of the DOE's national SFMP and DFDP. The programs are designed to provide for the decommissioning of surplus facilities which have become radioactively contaminated through past operation and to provide M&S support for facilities awaiting decommissioning. Management of the ORNL programs is guided by two programmatic documents: (1) a long-range plan which establishes decommissioning priorities based on a prescribed set of cost/benefit criteria and (2) a M&S plan which outlines facility-specific requirements for ensuring safe protective storage prior to final decommissioning.

In order to maintain a current and responsive program, both documents are periodically reviewed and updated to reflect changes in priorities that result from degrading facility conditions or increasing regulatory pressure and to reflect significant increases in costs for decommissioning and M&S. This report provides an update to the previous M&S plan,[1] which was issued in March 1987. Considerable change has taken place since that time concerning priorities for decommissioning from degrading facility conditions and regulatory pressure, and transfer of facilities from the SFMP to the DFDP. In addition, the fully implemented waste chargeback system in effect at ORNL has resulted in significant waste disposal fees for facilities that generate solid and liquid wastes from operating containment systems and special maintenance projects. Other pertinent factors which are impacting M&S activities are increased awareness and emphasis on safety-related and environmental and health protection measures. These latter factors are influencing the level of oversight and documentation required to implement special maintenance projects and to ensure that protective measures in place at surplus facilities are adequate to meet current day requirements.

This report documents these impacts on the SFMP and DFDP M&S programs for the period of FY 1990 through FY 1999. In addition, revised decommissioning priorities are also reflected in the curtailment of M&S support as these facilities complete D&D planning and actual operations are initiated.

---

*T. W. Burwinkle, The ORNL Surplus Facilities Management Program Maintenance and Surveillance Plan FY 1988-1997, ORNL/RAP-16 (March 1987).

MAINTENANCE AND SURVEILLANCE PLAN FOR THE ORNL SURPLUS FACILITIES MANAGEMENT PROGRAM AND DEFENSE FACILITIES DECOMMISSIONING PROGRAM FY 1990-1999

1. INTRODUCTION

The SFMP and DFDP at ORNL are part of the DOE's national programs, administered by DOE Headquarters and the Richland Operations Office, respectively. The purpose and objectives of these programs include (1) the M&S of facilities awaiting decommissioning; (2) planning for the orderly decommissioning of these facilities; and (3) implementation of a program to accomplish facility disposition in a safe, cost-effective, and timely manner. Participating SFMP and DFDP contractors are required to prepare formal plans that document the M&S programs established for each site. This report has been prepared to provide this documentation for those facilities included in the ORNL SFMP and DFDP.

1.1 THE ORNL SFMP AND DFDP

The SFMP was established at ORNL in 1976 in order to provide collective management of all of the surplus sites under ORNL control on the Oak Ridge Reservation. The program originally contained both civilian- and defense-related facilities and was administered by the SFMP Office in Richland, Washington, through the ORO of DOE. In 1986, the administration of the civilian program was assumed by DOE Headquarters and retained the SFMP identification. The defense surplus facilities program continues to be administered through RLO and has assumed the DFDP title to differentiate it from its civilian counterpart. Both programs continue to be coordinated through ORO and are managed by the ORNL RAP in the EHP Division (see Fig. 1).

Some 75 facilities, classified into 15 civilian- and defense-related projects, are currently managed by the ORNL programs. A listing of these projects is given in Table 1. The SFMP and DFDP oversee a variety of facilities, from abandoned waste storage tanks to large experimental reactors, located in both the main ORNL complex (Bethel Valley) and the nearby Melton Valley area, as shown in Figs. 2 and 3. Due to the operations conducted in the past at each site, the associated buildings, process equipment, piping, and surrounding environment have become contaminated with radioactivity, principally in the form of long-lived fission products (^{90}Sr, ^{137}Cs), activation products (^{60}Co), or actinides (^{244}Cm, ^{238}Pu). The extent of this residual contamination is dependent upon the operational history and shutdown procedures utilized at each facility.

The majority of the ORNL facilities managed by the SFMP and DFDP have been inactive for 10 to 20 years. Because of this time lapse and the abandoned status of the sites, structural deterioration has occurred to varying degrees. This degradation has taken the form of metal corrosion,

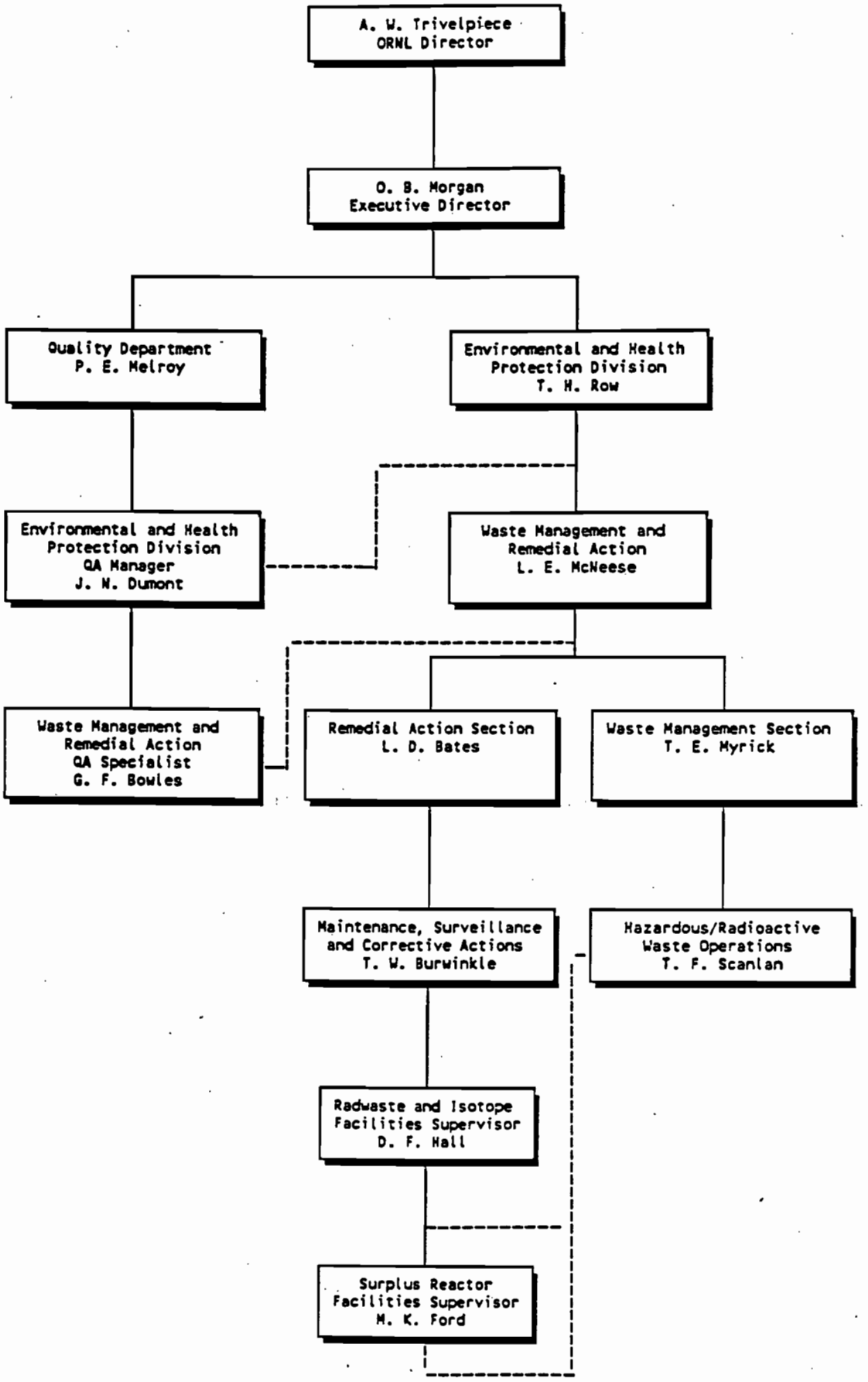

Fig. 1. ORNL organizational structure for the SFMP and DFDP M&S programs.

Table 1. Facilities currently managed by the ORNL SFMP and DFDP

Program	Administrative grouping	Project	Location[a]
SFMP	Isotope Group	Storage Garden 3033	N of Bldg. 3033
		Shielded Transfer Tanks	SWSA 4 Annex
	Reactor Group	Molten Salt Reactor Experiment	Bldg. 7503
		ORR Experimental Facilities	
		Reactor Experiments	Bldg. 3042
		ORR Heat Exchanger	Bldg. 3087
DFDP	D&D Projects Group	Fission Product Development Lab	Bldg. 3517
		Metal Recovery Facility	Bldg. 3505
	Isotope Group	Waste Evaporator Facility	Bldg. 3506
		Fission Product Pilot Plant	Bldg. 3515
	Radwaste Group	Waste Holding Basin	Site 3513
		Gunite Storage Tanks W-5 to W-10	Site 3507
		Waste Storage Tanks:	
		Waste Tank WC-1	SW of Bldg. 3037
		Waste Tanks WC-15 & WC-17	SE of Bldg. 3587
		Waste Tanks W-1 to W-4	Site 3023
		Waste Tanks W-13 to W-15	Site 3023
		Waste Tank W-11	S of Bldg. 3536
		Waste Tanks TH-1 to TH-3	S of Bldg. 3503
		Waste Tank TH-4	SW of Bldg. 3500
		Old Hydrofracture Facility	Site 7852
	Reactor Group	ORNL Graphite Reactor	Bldg. 3001
		Low-Intensity Test Reactor	Bldg. 3005
		Homogeneous Reactor Experiment	Bldg. 7500

[a]See Figs. 2 and 3 for facility locations.

ORNL-DWG 82-19187R3

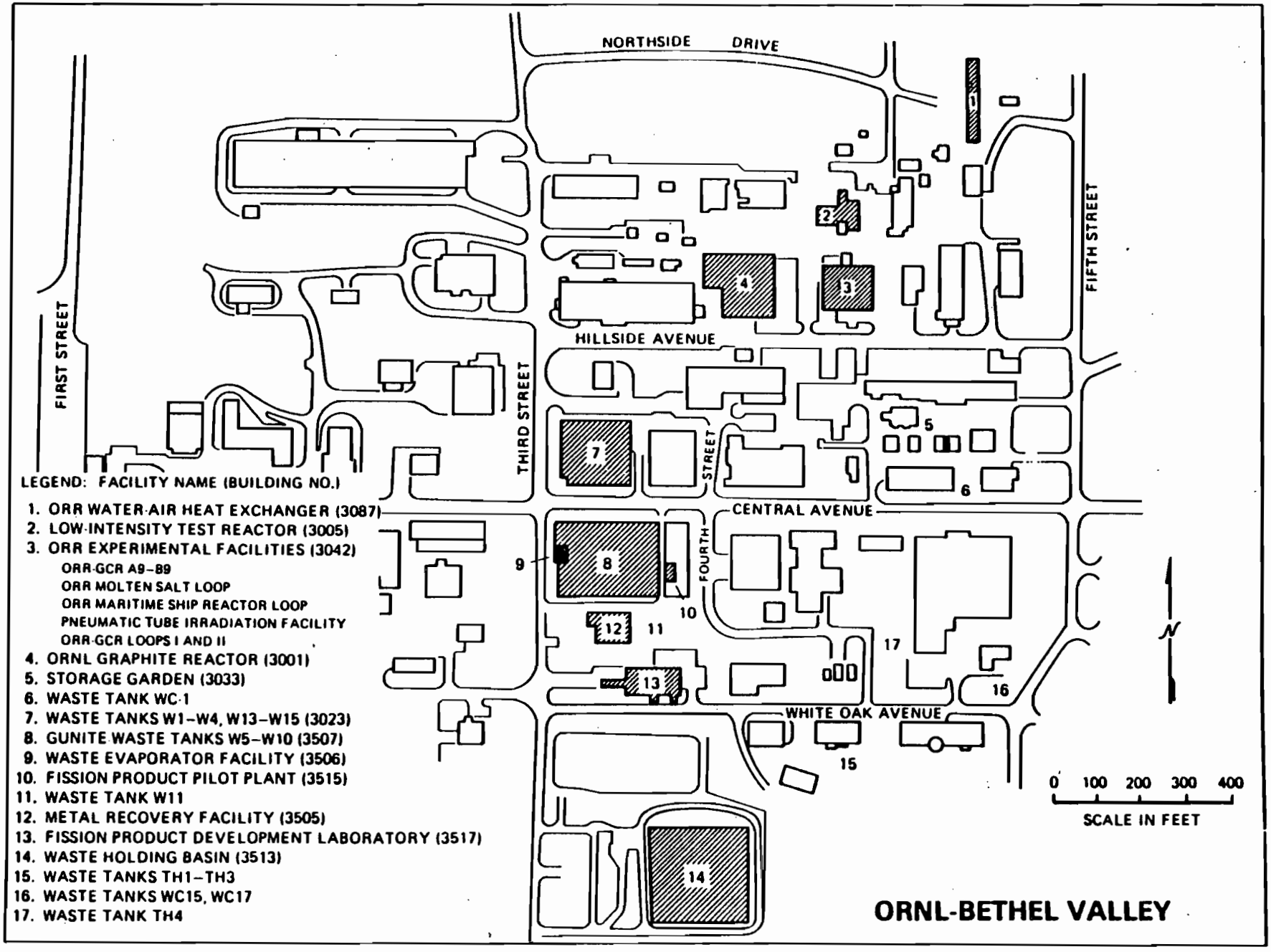

Fig. 2. Location map for ORNL surplus facilities - Bethel Valley area.

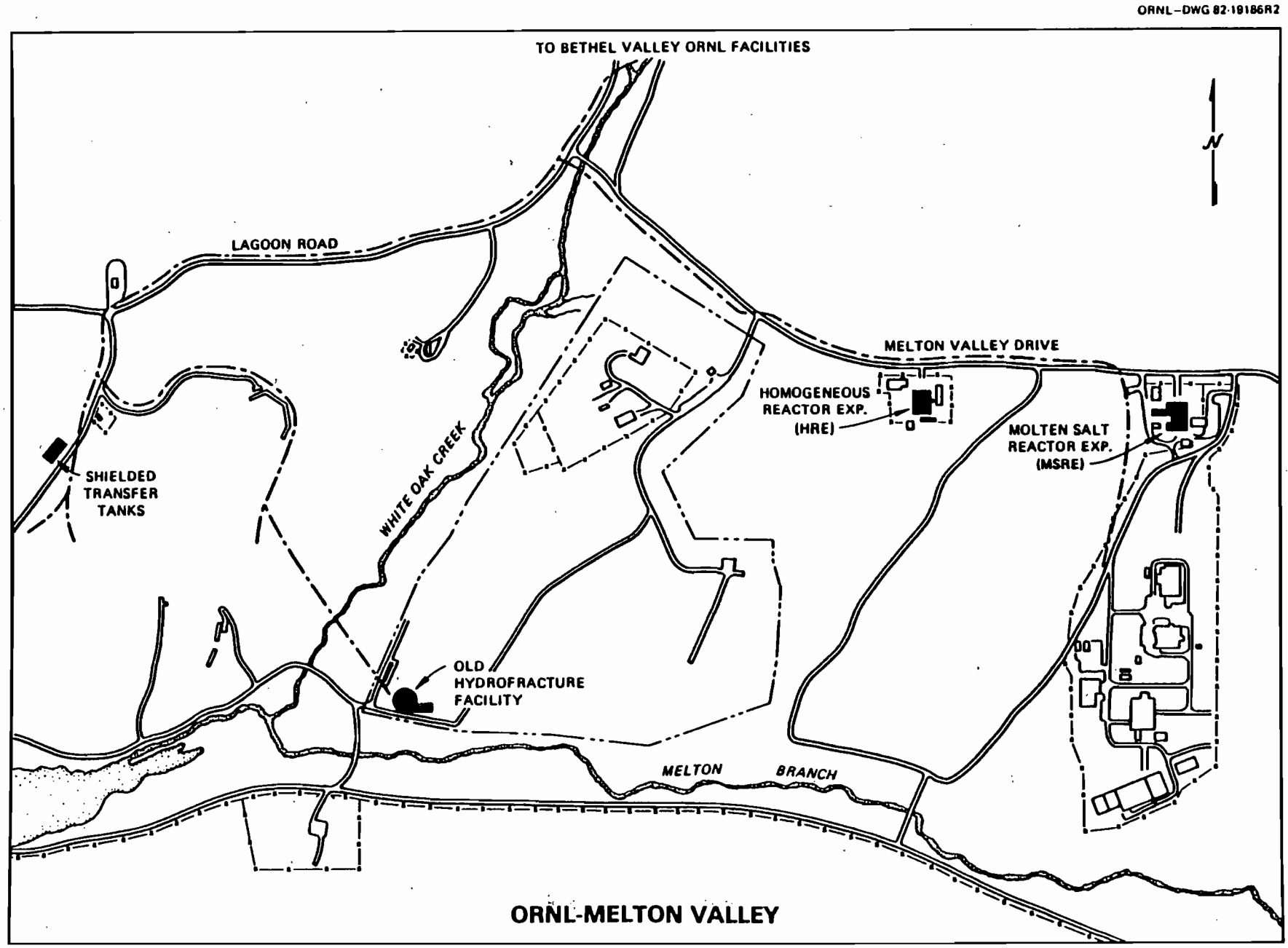

Fig. 3. Location map for ORNL surplus facilities - Melton Valley area.

leaking roofs, accumulation of debris, etcetera., resulting in a general loss of facility operability. During this time, however, no significant loss of containment or release of radioactivity has occurred.

1.2 M&S PROGRAM OBJECTIVES

The objectives of the ORNL SFMP and DFDP M&S programs are as follows:

1. to ensure adequate containment of the residual radioactive materials remaining in the surplus facilities,

2. to provide safety and security controls to minimize the potential hazards to on-site personnel and the general public, and

3. to manage these facilities in the most cost-effective manner.

These objectives are met through the unified effort of the SFMP and DFDP, facility operating personnel, ORNL health and safety staff, the Laboratory security forces, and program maintenance crews. Routine M&S is provided to ensure that all facilities are maintained in accordance with ORNL procedures and applicable national standards.

1.3 SCOPE OF THE M&S PLAN

This M&S plan has been developed to address the M&S requirements for all ORNL SFMP and DFDP facilities up to the time of initiation of decommissioning activities. This plan provides (1) an outline of the program responsibilities, interfaces, M&S guidelines and documentation requirements of the overall M&S program (Sect. 2 - "Program Description"); (2) a summary of the operational history, physical and radiological condition, occupancy, security provisions, current M&S activities and their associated costs, and estimated future major repairs and resource needs, for each facility (Sect. 3 - "Project Summaries"); and (3) an integration of the individual facility M&S requirements into an overall program budget and schedule (Sect. 4 - "Program Costs and Schedule"). This long-range planning document was designed to provide estimates of the projected resource needs for the M&S programs over a 10-year period. Such long-range estimates are useful for program planning purposes, although the confidence in the data beyond 3 years decreases.

The M&S plan will be reviewed annually and updated, as needed, in order to provide DOE with documentation of the current management philosophies and resource allocations. The updated plan forms the basis for the annual field work proposals for budget requests concerning facility M&S.

2. PROGRAM DESCRIPTION

2.1 STRUCTURE AND RESPONSIBILITIES

As described briefly in Sect. 1, the ORNL SFMP and DFDP M&S programs are administered through the EHP Division by members of the Remedial Action Section. Currently, the M&S staff consists of the Group Leader, secretary, and technical staff providing management of M&S for all facilities.

The facility supervisors are charged with the responsibility of providing adequate surveillance and maintenance of their respective facilities to ensure compliance with the objectives of the M&S program. Surveillance needs have been determined based on the operational history of each site, the current facility conditions, and the occupancy of the building or area. Some facilities require continuous monitoring of ventilation streams and process-liquid discharges, while others may need only periodic surveillance of exterior surfaces to assess the adequacy of the containment. Maintenance requirements for the surplus facilities include both routine repairs/equipment replacement (often based on surveillance reports) and major repairs of structurally deteriorating systems. Requests for maintenance manpower and resources are initiated by the appropriate facility supervisor.

Aside from the Remedial Action Section within the EHP Division, the M&S function is carried out be a multidisciplinary team consisting of personnel from other EHP Division sections and a number of other ORNL divisions. Staff from the Waste Management Section within the EHP Division play a key role in providing round-the-clock surveillance support through the WOCC. These personnel provide operational support for surveillance and upkeep of surplus tanks, and also provide continuous monitoring of critical facility parameters on the central WOCC computer. Other divisions which directly or indirectly support M&S activities include

1. Laboratory Protection,
2. Plant and Equipment,
3. Quality Department,
4. Instrumentation and Controls,
5. Analytical Chemistry,
6. Engineering,
7. Environmental Sciences, and
8. Research Reactors.

This support either is provided at the request of the facility operator or is conducted independently as part of the overall ORNL M&S program. For those activities conducted specifically for the SFMP and DFDP, direct funding must be provided through the program office. Those activities provided for as part of normal ORNL operation are funded through overhead and do not require direct program funds. A general breakdown of the level of participation provided by the support divisions is given in Fig. 4. As highlighted in this figure, the EHP Division assumes the lead role in all M&S activities.

2.2 M&S REQUIREMENTS

Brief outlines of the M&S requirements for SFMP projects are presented in the following report sections. These discussions have been formatted to correspond with the M&S activities listed in Fig. 4, in terms of (1) surveillance requirements, (2) maintenance requirements, and (3) documentation. Details of the M&S activities conducted at each facility to fulfill these requirements are provided in Sect. 3.

2.2.1 Surveillance Requirements

Routine surveillance is provided at surplus facilities in order to ensure that each site remains in a radiologically safe condition. Such inspections are used to determine the operability of critical equipment, monitor the radiological conditions, check safety-related items, provide site security controls, and for surveillance of structural integrity.

ORNL–DWG 83-10352R3

DIVISION \ M&S ACTIVITY	SURVEILLANCE				MAINTENANCE		DOCUMENTATION
	FACILITY SURVEILLANCE	RADIOLOGICAL SURVEILLANCE	SAFETY INSPECTIONS	SECURITY AND PROTECTION	ROUTINE MAINTENANCE	MAJOR REPAIRS	ACTIVITY REPORTING
ENVIRONMENTAL AND HEALTH PROTECTION	X	X	X		X	X	X
LABORATORY PROTECTION			X	X			X
PLANT AND EQUIPMENT	X				X	X	X
QUALITY DEPARTMENT	X						X
INSTRUMENTATION AND CONTROLS	X				X		X
ANALYTICAL CHEMISTRY		X					X
ENGINEERING						X	X
ENVIRONMENTAL SCIENCES		X					X
RESEARCH REACTORS	X						X

Fig. 4. ORNL divisional participation in the SFMP M&S program.

Requirements have been established for these activities in four general areas: (1) facility surveillance, (2) radiological surveillance, (3) safety inspections, and (4) security and protection. A discussion of these requirements follows.

2.2.1.1 Facility Surveillance

Periodic inspection of each facility must be conducted. The inspection frequency will be determined by the type of facility involved, the radionuclide containment provided, and the potential for personnel access to the site. As a minimum, facilities will be inspected annually. For those facilities with active containment, process, or monitoring systems, more frequent (daily, weekly, or monthly) inspections are provided.

Facility surveillance is normally carried out by the facility supervisor or his or her appointee as part of a routine inspection of his or her operating area. Such surveillance includes

1. visual inspections of the building or site for structural or system failures, material degradation, liquid leaks, radiation monitor indications, burning odors, equipment irregularities, etcetera;

2. routine checks on containment ventilation systems, in terms of pressure drop readings, observation of building or cell negative pressures, operability of auxiliary containment fans, etcetera;

3. observation of liquid levels in sump areas, storage tanks, canals, and storage pools;

4. process equipment operability checks, including air compressors, water pumps, sump pumps, etcetera.; and

5. other facility-specific needs, such as steam system checks and manipulator inspections.

In addition to these operator surveillance activities, routine inspections of the radiation detection instrumentation, building exterior and roof conditions, overhead cranes, and testing of HEPA filtration systems are provided through the Laboratory-wide surveillance program. ORNL quality assurance requirements are met through these on-site inspections and routine QA documentation and audits.

2.2.1.2 Radiological Surveillance

The requirements for radiological surveillance can be broken down into two categories: (1) radiation/contamination surveys and (2) radioactive waste stream and environmental monitoring. The radiation surveys will be conducted by Radiation Protection staff regularly on a schedule dictated by the type and levels of contamination, and the facility design or layout. Waste stream and environmental monitoring of individual facilities is provided as part of the ORNL waste management control system. Observation frequencies can range from continuous monitoring of ventilation streams to monthly sampling of waste tank dry wells. Environmental monitoring of the ORNL site as a whole is provided through the comprehensive ORNL sampling and monitoring program.

Radiation survey procedures have been established at ORNL[1] to provide adequate characterization and surveillance of radiation/contamination zones at the surplus facilities. These procedures include:

1. daily smear and direct reading surveys of occupied surface contamination areas;

2. personnel monitoring during all operations within contamination/radiation zones;

3. weekly surveying (smear and/or direct) of routinely accessed areas adjacent to contamination zones;

4. monthly, semiannual, or annual surveys of areas of radiological concern that are remote from routine personnel access;

5. surveillance of all equipment or materials removed from a surplus facility; and

6. inspection and calibration of health physics instrumentation (hand and foot monitors, continuous air monitors) on a routine schedule.

This routine surveillance is provided by Radiation Protection staff as part of their regular inspection of active and surplus facilities within each established survey area. Additional survey support is made available as the need arises upon request of the respective facility supervisor.

The ORNL WOCC provides continuous surveillance of liquid and gaseous effluents released from all operating and some inactive facilities at the Laboratory. Data from remote instrumentation are transmitted to the WOCC for monitoring and recording of the operating characteristics of the liquid and gaseous radwaste systems. A shift operator is on duty providing round-the-clock surveillance. In the event of an abnormal activity release or instrument malfunction, the shift operator alerts the appropriate supervision and the respective facility operator so that corrective action can be taken.

The WOCC monitors a variety of information, from atmospheric conditions to exit-stack flow rates. However, for the inactive facilities, only a few of which have radwaste discharges, the control center is primarily responsible for the surveillance of

1. exhaust duct gaseous effluent radioactivity,
2. cell blower status,
3. process waste water flow rates and radioactivity, and
4. LLLW collection tank inventories and transfers.

In addition to these continuous surveillance activities, periodic sampling and analysis of liquid effluents are conducted, primarily in the vicinity of the abandoned LLLW storage tanks. Monthly dry well samples are obtained to give an indication of potential radionuclide migration into the groundwater around the tanks.

Special groundwater surveillance is also conducted at sites with potential for significant environmental contamination. Groundwater monitoring wells are in place at three inactive impoundments and have been previously used to characterize area groundwater for radioactive and hazardous chemical wastes. These wells are sampled annually and analyzed for known contaminants and specific indicator parameters to determine if

significant changes have taken place in groundwater quality. Results from this surveillance will be used to assess a need for corrective action or a shift in decommissioning priority.

2.2.1.3 Safety Inspections

Safety inspections will be conducted on a routine basis for all surplus facilities in order to identify existing and potential hazards to personnel, equipment, or other property. These inspections will be done in accordance with the ORNL Safety Policy, as defined in Procedure 1.1 of the ORNL Safety Manual.[2] The EHP Division assumes the lead role in these inspections, utilizing staff from other divisions as appropriate as part of the inspection team. The semiannual facility surveillance by the safety team involves general inspections of building conditions to identify unsafe work practices, fire hazards, etcetera. More frequent (weekly, monthly, or quarterly) inspections and testing of emergency systems, such as lighting or fire protection equipment, are conducted as appropriate.

In some instances, other inspections, reviews, and audits, in addition to similar reviews by ORO organizations, may be performed by various organizations from within the Laboratory. These inspections and audits could be initiated by the ORNL Office of Operational Safety, the ORNL Radioactive Operations Committee, or the ORO Safety and Health Division. These reviews have the objective of assessing the effectiveness of the SFMP and DFDP M&S programs in protecting ORNL and off-site personnel from risks associated with surplus facilities, and compliance of activities with established ORNL/DOE practices and procedures. Results of these investigations will be used by the M&S staff to plan and implement corrective action when required and to define future resource requirements should any changes necessitate additional funding commitments.

2.2.1.4 Security and Protection

As a restricted government installation, ORNL is provided with comprehensive safeguards, security, and protection systems. These systems include exclusion fencing around the reservation perimeter, continuously manned guard posts, controlled access for sensitive and hazardous areas, fire alarm and protection systems, a continuously manned and fully equipped fire department, and a routine (random) security patrol. Because this complete protection is provided for ORNL as a whole, little additional security or protective measures are required for the surplus facilities. Access to those facilities where potential hazards exist is further restricted by the facility operators who are required to minimize nonroutine personnel entry. This is normally accomplished by maintaining abandoned buildings in a locked and secured condition and providing adequate entry restriction and radiation hazard posting for all accessible areas.

2.2.2 Maintenance Requirements

The maintenance program for surplus facilities encompasses (1) routine maintenance activities; (2) needs for major repairs of structures or equipment; and (3) disposal of solid, liquid, and gaseous radioactive waste. Guidance for these activities is provided through the P&E Division's Procedures Manual[3] and radiation protection manual.[1] The P&E Division staff is responsible for conducting the majority of the program maintenance at ORNL, according to its own routine maintenance schedule or at the request of the facility supervisors. Funding for many routine maintenance items (grounds care, exterior painting, preventative equipment maintenance) is provided through ORNL overhead charges.

Resources for other maintenance, major repairs, or improvements must be directly supplied by the SFMP or DFDP.

2.2.2.1 Routine Maintenance

Preventative maintenance requirements and schedules are established by P&E for each surplus facility based on the type of structures and equipment involved. Input from the respective P&E field engineer and the facility supervisor is used in identifying critical equipment or systems and determining the necessary maintenance frequencies. Routine and programmed maintenance activities include inspections, adjustments, lubrication, reconditioning, and other services to prevent equipment or structural failures and prolong material or equipment lifetimes.

Corrective maintenance is provided for equipment malfunction or breakdown, or when there is an indication of impending equipment failure. Equipment repair or equivalent replacement is conducted to satisfy the immediate service needs and ensure long-term operability. Users of facility equipment or systems are responsible for reporting operational failures or other concerns to the facility supervisor, who will, in turn, submit the appropriate request to the responsible P&E field engineer for action.

Modification maintenance, consisting of minor facility alterations or improvements, may be required to provide increased levels of containment or reduce safety hazards. Such modifications will normally be initiated by the facility supervisor, requiring some specialized P&E craft support. No specific program approval is required to carry out these minor alterations.

2.2.2.2 Major Repairs

In certain instances, major facility repairs or improvements may be necessary to correct material degradation problems, ensure radionuclide containment, or eliminate a significant safety concern. These improvements could include repair of leaking roofs, removal of deteriorating equipment, decontamination of recurring problem areas, and construction of temporary barriers. The scope of such projects can vary from routine construction jobs to complex tasks requiring multidivision participation, including engineering designs, safety reviews, and specialized construction forces. Because these projects can usually be anticipated and planned for, additional SFMP and DFDP requirements exist to provide adequate management control over the costs and schedules.

Requests for major repairs must be submitted to the ORNL SFMP or DFDP Program Manager for approval prior to initiation of detailed planning activities. Task plans, including cost and scheduling data, must be developed by the facility supervisor at least 6 months prior to the anticipated project start date. Long-range major repair needs should be forecasted as early as possible in order to assure adequate budget allocations. Project direction and control will be the responsibility of the facility supervisor, with routine status reporting required. The expected budget requirements for these special projects are listed in the tables in Sect. 4 as management reserve. Projects arising during a fiscal year will be estimated in cost and schedule and prioritized for funding in the subsequent year, assuming immediate attention and reprogramming of existing resources is not required. Projects with the highest priority will then be submitted to the respective sponsors for funding from the management reserve through the current year work planning process.

2.2.2.3 Waste Management

Routine M&S activities produce radioactive waste which must be managed and disposed. In addition to routine or special maintenance activity, several facilities continually produce waste in solid, liquid, or gaseous form which must be managed within the ORNL waste disposal system. The loss of hydrofracture as an economic means of LLLW disposal has had a dramatic impact on liquid disposal cost. New solid waste disposal practices aimed at greater confinement and more thorough waste certification requirements have resulted in similar increases for solid waste management. In addition, ORNL is now operating all of its waste disposal facilities by full cost recovery. This has had an even more significant impact for disposal of all waste forms.

The types of waste generated in maintaining current conditions include LLLW generated from the Graphite Reactor canal demineralizer to gaseous waste streams from the Gunite Tanks which are processed through the ORNL central gaseous waste system. Charges for these services are assessed on a monthly basis. Charges for waste generated from special maintenance projects will be included in the costs for the respective projects.

In addition to waste management charges described above, substantial quantities of contaminated groundwater are being collected and treated continuously from the North and South Tank Farms. All of the tanks in the North Tank Farm are surplus, seven of eight of which are the responsibility of the DFDP. The South Tank Farm includes the six Gunite Tanks in addition to three smaller active tanks. These groundwater waste streams are routed through the Process Waste Treatment Plant prior to discharge to the White Oak Creek watershed. Fees for this service are a part of the waste management cost recovery plan. Costs are estimated to be $2.2M in FY 1990, rising to and leveling at $2.4M in FY 1991. Charges for this service are being assessed to the Interim Waste Operations Program (Defense Programs), as part of their overall responsibilities for management of the Main Plant Area contamination.

2.2.3 Documentation

Documentation of all M&S activities conducted at SFMP and DFDP facilities is the responsibility of the respective facility supervisor. This reporting ranges from computer control cards submitted by field engineers or surveyors to detailed engineering design packages for major repairs. Facility supervisors are required to maintain a file of all facility-related M&S activities which they initiated or controlled. Health physics records are archived by the Radiation Protection section, and P&E program maintenance files are maintained on computer, with routine distribution to appropriate facility operators or division management. Quality Department inspection reports are also computer filed, with summaries distributed to division offices. The remaining M&S participants maintain permanent records of their activities within the respective divisions.

Periodic reporting is a routine function of the M&S group. Monthly status reports are provided to the respective DOE sponsors and are the responsibility of the facility supervisors. In addition, semiannual reports are provided at mid-year and at the end of each fiscal year to summarize routine activities completed and to provide status reports on special maintenance projects conducted during the reporting period. Other documents and records are produced and maintained as appropriate for the assurance of an effective and properly managed M&S program. A more

detailed description of these documentation requirements has been developed and published in the current quality assurance plan governing all M&S functions.[4] This plan addresses all quality-related documents and describes the records system for storage and archiving of vital information.

2.3 QUALITY ASSURANCE

The M&S program for surplus facilities, like all programs at ORNL, is required to adhere to the ASME/ANSI NQA-1 standard for quality assurance. To meet this requirement, a comprehensive QA plan has been developed[5] which specifically addresses each of the 18 NQA-1 elements for M&S activities. The plan encompasses all M&S functions and focuses on the key areas of functional responsibilities, document control and records management, instructions, procedures, inspections, and corrective action. The plan is sufficient to address nearly all M&S activities; however, for very large or special case M&S projects, additional QA measures may be required. These special cases will be evaluated on a case-by-case basis with appropriate QA actions taken as necessary.

3. PROJECT SUMMARIES

M&S activity summaries have been developed for all of the ORNL SFMP and DFDP facilities and are presented in Appendix A. These summaries provide brief overviews of the facility history and current conditions and give a listing of the M&S activities currently conducted. Manpower estimates and associated costs have been included for each activity. The facility-related costs are integrated for the entire program in Sect. 4.

The M&S activity summaries contain ten categories of information, defined as follows:

1. Facility Name - An ORNL-designated facility title, usually descriptive, that identifies the project.

2. Location - A building or site number as defined in the ORNL Building Directory. For those facilities where no ORNL number has been assigned, reference is made to locations relative to a numbered building. The facility is also identified as to its location in the Bethel Valley or Melton Valley portions of ORNL (see Figs. 2 and 3).

3. Service Dates - The period of time over which the facility was considered operational.

4. Facility Status - A listing of the current facility status in terms of operability, occupancy, and facility responsibility. The current facility supervisor is also identified.

5. Facility Description - A brief discussion of the facility operating history, physical description, current conditions, radiological hazards, and occupancy. In most cases, the information contained in this section is based on historical records of the facility operation and preliminary radiological and environmental characterizations conducted as part of long-range planning activities.

6. Security/Protection Systems - A description of the security and protection systems provided at each facility. Such items include fire alarms and sprinklers, exclusion fencing, access restriction and radiation/contamination zone posting, and other control measures. The systems described are in addition to the Laboratory-wide security provided by perimeter fencing, guard stations, and fire-fighting equipment.

7. Surveillance Activities - An itemized listing of surveillance tasks conducted at each facility. Specific data are provided in terms of task titles, surveillance frequencies, ORNL division responsibilities, documentation requirements, and estimated manpower or resource needs. The task listings are general in nature, reserving the details of the procedures to the appropriate ORNL operating manuals. The division responsibilities are consistent with those discussed in Sect. 2. Surveillance documentation is provided in a variety of forms, including shift check sheets, memos-to-file, and computer printouts. Where appropriate, specific ORNL forms have been identified that are used in recording the survey results; otherwise, the listing identifies the type of documentation used and the administrative unit that maintains the permanent file (i.e., WOCC records refers to the files maintained at the ORNL WOCC). Manpower and resource requirements are recorded in mh/y for individual tasks and in dollar costs (FY 1990 dollars) for material needs. Those items that do not require direct programmatic funding have been noted.

8. Routine Maintenance - An itemized listing of routine maintenance activities for each facility, similar in scope and content to item 7.

9. Anticipated Repairs/Improvements - A brief description of identified major repairs or other facility improvements scheduled for the planning period. These discussions outline the need for the repairs, the scope of the task (including an estimate of the resource needs), and the proposed year of expenditure.

10. Cost and Schedule - A summary of the surveillance costs, routine maintenance needs, and major repair requirements. This summary totals the manpower and dollar costs on an annualized basis and provides a schedule of these costs by year of expenditure through the planning period. Cost estimates beyond FY 1992 are in constant FY 1992 dollars.

The M&S summaries are presented in Appendix A according to their program category (SFMP or DFDP) and project grouping, as given in Table 2. Facilities are treated separately unless they are closely associated (several tanks in a single tank farm) or are contained in a single structure (ORR-experimental facilities). Twenty-one summaries are provided, covering the 75 SFMP and DFDP facilities.

4. PROGRAM COSTS AND SCHEDULES

Based on the information provided in previous chapters, overall M&S program costs have been developed. The annual resource requirements are presented in Tables 3 and 4 for the planning period FY 1990 through FY 1999. The costs have been itemized by facility (or groups of associated facilities), within the appropriate defense or civilian program categories.

Table 2. Facility groupings of M&S activity summaries

Appendix section	Program	Project grouping	Facility	Page No.
A.1	SFMP	Isotope Group	Storage Garden 3033	A-5
			Shielded Transfer Tanks	A-9
		Reactor Group	Molten Salt Reactor Experiment	A-13
			ORR Experimental Facilities	
			Reactor Experiments	A-19
			ORR Heat Exchanger	A-25
A.2	DFDP	D&D Projects Group	Fission Product Development Lab	A-29
			Metal Recovery Facility	A-35
		Isotope Group	Storage Garden 3033	A-5
			Waste Evaporator Facility	A-41
			Fission Product Pilot Plant	A-47
			Shielded Transfer Tanks	A-9
		Radwaste Group	Waste Holding Basin	A-51
			Gunite Storage Tanks W-5 to W-10	A-57
			Waste Storage Tanks:	
			Waste Tank WC-1	A-63
			Waste Tanks WC-15 & WC-17	A-67
			Waste Tanks W-1 to W-4	A-71
			Waste Tanks W-13 to W-15	A-71
			Waste Tank W-11	A-77
			Waste Tanks TH-1 to TH-3	A-81
			Waste Tank TH-4	A-83
			Old Hydrofracture Facility	A-87
		Reactor Group	ORNL Graphite Reactor	A-93
			Low-Intensity Test Reactor	A-99
			Homogeneous Reactor Experiment	A-105

Table 3. SFMP M&S program costs

M&S activities	Fiscal year projected costs ($ X 10^3)									
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1. Routine M&S										
A. Isotope Group										
1. Storage Garden 3033	a									
2. Shielded Transfer Tanks	3	a	a							
Isotope Group subtotal	3	0	0	0	0	0	0	0	0	0
B. Reactor Group										
1. Molten Salt Reactor Experiment	121	125	131	131	a	a	a	a	a	a
2. ORR Experimental Facilities	9	9	10	10	10	10	10	10	a	a
Reactor Group subtotal	130	134	141	141	10	10	10	10	0	0
Routine M&S subtotal	133	134	141	141	10	10	10	10	a	a
2. Management Reserve (Special projects)										
A. Expense	10	10	10	10	5	5	5	5		
B. Capital		25								
3. Program Management	34	35	37	37	37	37	37	37		
SFMP Program total - Expense	177	179	188	188	52	52	52	52	a	a
Capital		25								

[a]Decommissioning activities are being planned for these years. Routine M&S will be discontinued when these efforts are initiated.

Table 4. DFDP M&S program costs

M&S activities	Fiscal year projected costs ($ X 10^3)									
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
1. Routine M&S										
A. D&D Projects Group										
1. Fission Product Development Lab[a]	70	73	76	76	76	76	76	76	76	76
2. Metal Recovery Facility	61[a]	22	23	23	23					
D&D Projects Group subtotal	131	95	99	99	99	76	76	76	76	76
B. Isotope Group										
1. Waste Evaporator Facility	4	4	4	b						
2. Fission Product Pilot Plant	4	b	b							
Isotope Group subtotal	8	4	4	0	0	0	0	0	0	0
C. Radwaste Group										
1. Waste Holding Basin	25	26	27	27	b	b	b			
2. Gunite Storage Tanks	102	106	110	110	110	110	110	110	110	110
3. Waste Storage Tanks	28	28	29	29	29	29	29	29	29	29
4. Old Hydrofracture Facility	30	31	32	32	32	32	32	b	b	b
Radwaste Group subtotal	185	191	198	198	171	171	171	139	139	139
D. Reactor Group										
1. ORNL Graphite Reactor	127	133	138	138	138	138	138	138	138	138
2. Low-Intensity Test Reactor	78	81	84	84	84	84	84	84	b	b
3. Homogeneous Reactor Experiment	87	91	b	b	b	b				
Reactor Group subtotal	292	305	222	222	222	222	222	222	138	138
Routine M&S subtotal	485	522	447	443	416	393	393	361	277	277
2. Management Reserve (Special Projects)										
A. Expense	100	70	55	55	55	55	55	40	30	30
B. Capital		25	25				25			
3. Program Management	34	35	37	37	37	37	37	37	37	37
DFDP Program total - Expense	619	627	539	535	508	485	485	438	344	344
Capital		25	25				25			

[a]Projected resource needs have been combined with decommissioning project budgets and are not a part of the DFDP M&S program total.

[b]Decommissioning activities are being planned for these years. Routine M&S will be discontinued when these efforts are initiated.

Program management needs have been listed as a separate item. The estimated dollar amounts are based on year of expenditure through FY 1992, with out-year figures reported in constant FY 1992 dollars.

The M&S program is structured to provide adequate control over all assigned facilities up to the initiation of project disposition activities (project stage). Currently, only two facilities (Fission Product Development Laboratory and Metal Recovery Facility) are in the project stage, with maintenance and surveillance needs provided through project funds. They will still require significant resources for M&S during the first few years of decommissioning - resources that up until FY 1984 were provided through the M&S program. No M&S program funds are now utilized to support these facilities, although the resource requirements and M&S schedules have been included in this report for completeness.

The remaining ORNL facilities were analyzed and prioritized as part of a long-range planning effort. Based on the project priorities and expected funding levels, schedules have been established for initiation of facility disposition activities. As highlighted in Tables 3 and 4, as these facilities enter the project stage, M&S funding is no longer provided.

Special projects funding has been included in each of the planning years in order to provide adequate support for nonroutine facility maintenance or other special needs. Specific tasks have been identified in the project summaries where they are known for the early years, with additional items to be funded each year as necessary. Capital equipment requirements have also been included in this category, primarily for upgrading surveillance instrumentation or containment features.

6. REFERENCES

1. Oak Ridge National Laboratory, "Procedures and Practices for Radiation Protection - Health Physics Manual," prepared by the Environmental and Health Protection Division, Revised 1988.

2. Oak Ridge National Laboratory, "Safety Manual," prepared by the Environmental and Health Protection Division, Revised 1988.

3. Oak Ridge National Laboratory, "Plant and Equipment Division Procedures Manual," prepared by the Plant and Equipment Division, Revised 1987.

4. T. W. Burwinkle, Quality Assurance Plan for the Remedial Action Program Maintenance and Surveillance Phase, QAP-X-88-EHPD/RAP-002, August 1988.

Appendix A

PROJECT M&S ACTIVITY SUMMARIES

Appendix A.1 SURPLUS FACILITIES MANAGEMENT PROGRAM

- Storage Garden 3033
- Shielded Transfer Tanks
- Molten Salt Reactor Experiment
- ORR Experimental Facilities
- ORR Water-to-Air Heat Exchangers

Appendix A.2 DEFENSE FACILITIES DECOMMISSIONING PROGRAM

- Fission Product Development Laboratory
- Metal Recovery Facility
- Waste Evaporator Facility
- Fission Product Pilot Plant
- Waste Holding Basin
- Gunite Storage Tanks W-5 to W-10
- Waste Tank WC-1
- Waste Tanks WC-15, WC-17
- Waste Tanks W-1 to W-4, W-13 to W-15
- Waste Tank W-11
- Waste Tanks TH-1 to TH-3
- Waste Tank TH-4
- Old Hydrofracture Facility
- ORNL Graphite Reactor
- Low-Intensity Test Reactor
- Homogeneous Reactor Experiment

Appendix A.1

SURPLUS FACILITIES MANAGEMENT PROGRAM

SFMP - Isotope Group

1. FACILITY NAME: Storage Garden 3033

2. LOCATION: North of Building 3033 (Bethel Valley)

3. SERVICE DATES: 1956-1975

4. FACILITY STATUS: Inactive; site controlled by Environmental and Health Protection Division (D. F. Hall)

5. FACILITY DESCRIPTION:

(a) Operating History - This storage garden was used to store sealed radioactive sources, miscellaneous contaminated items, and irradiated targets prior to processing.

(b) Physical Description - The 3033 storage garden consists of seven stainless steel cylinders, approximately 1 ft in diameter and 5 ft long, set in concrete with about 3 in. extending above ground-level. Each well is equipped with a shielded cover that extends approximately 1 ft into the well. The garden is located immediately behind Bldg. 3033.

(c) Current Condition - The storage garden is currently empty with shielded covers in place. The wells are believed to be structurally sound, with little visible deterioration. A bar extends through each lid handle with locks at each end to prevent unauthorized access.

(d) Radiological Hazards - Only low levels of residual contamination remain in the storage garden, principally in the form of surface contamination on the steel walls.

(e) Occupancy - The garden is located in the rear of an active radioactive process building (3033) in a little used or accessed area.

6. SECURITY/PROTECTION SYSTEMS:

The storage garden is within the ORNL Bethel Valley secured area.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

No routine maintenance activities are conducted at this facility.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

No major repairs or improvements are anticipated for Storage Garden 3033 through the planning period.

Table 1. Surveillance activities - Storage Garden 3033

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Site inspection	Semiannual	EHP	M&S semiannual check sheet	30 mh/y
2. Radiation survey	Semiannual	EHP	EHP, Radiation Protection sect. data base	20 mh/y

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.03	$2K
Routine maintenance	0.00	0K
Supervisory oversight	0.01	1K
Total	0.04	$3K

Annual materials requirements	Cost
None	

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	a									
Maintenance	a									
Supervision	a									
Materials	a									
Repairs/ improvements	a									
Total	a									

[a]No M&S costs will be incurred during site decommissioning activities.

SFMP - Isotope Group

1. FACILITY NAME: Shielded Transfer Tanks (STT)

2. LOCATION: Solid Waste Storage Area 4 Annex (Melton Valley)

3. SERVICE DATES: 1958-1970

4. FACILITY STATUS: Inactive; tanks controlled by Environmental and Health Protection Division (D. F. Hall)

5. FACILITY DESCRIPTION:

   (a) Operating History - These shielded tanks were used for the shipment of ^{137}Cs-loaded ion exchange resins from Richland, Washington, to ORNL for processing. The resins were removed from the tanks and the ^{137}Cs converted to a usable form at the Fission Product Development Laboratory. The casks were reused several times over their service lifetimes.

   (b) Physical Description - There are five shielded tanks being managed by the SFMP (four STT Model No. II and one STT Model III). The Model II tanks consist of a 500-gal, 3/8-in.-thick stainless steel liner surrounded by a 3 1/2-in. lead shield, all encased in a 3/4-in. mild steel outer shell. The overall tank dimensions are approximately 6 ft in diameter by 7 ft tall, with a loaded weight of about 38,000 lb. The Model III tank (referred to as "gun barrel") consists of a 200-gal stainless steel liner encased in 9 in. of steel (8 ft tall, 4 ft diam). Both types of tanks have provisions for lifting. All of the tanks are located in a materials storage yard on the western end of SWSA 4.

   (c) Current Condition - Three of the four Model II tanks (RD-C-43, -47, and -48) still contain approximately 400 gal of Decalso inorganic ion-exchange media. The other Model II tank (RD-C-44) is empty. The Model III tank is believed to contain 150 gal of AW-500 inorganic ion exchange media. The tanks are stored without protection from the weather and are showing only signs of minor external deterioration. There is no evidence of loss of containment in any of the tanks.

   (d) Radiological Hazards - Each of the tanks still containing resin is estimated to contain approximately 50 to 700 Ci of residual ^{137}Cs. Surface exposure rates on the tanks range from 2 to 400 mR/h, with nominal surface activity levels of less than 1000 dpm/100 cm^2.

   (e) Occupancy - The tanks are located in a remote area of the Laboratory, with little potential for personnel exposure.

6. SECURITY/PROTECTION SYSTEMS:

   The tanks are within the ORNL Melton Valley restricted area.

7. SURVEILLANCE ACTIVITIES:

   See Table 1 for details of surveillance activities.

Table 1. Surveillance activities - Shielded Transfer Tanks

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine inspection	Semiannually	EHP	M&S semiannual check sheet	30 mh/y
2. Radiological Surveillance	Semiannually	EHP	EHP, Radiation Protection sect. data base	20 mh/y
a. Monitoring of surface contamination levels and exposure rates				

8. ROUTINE MAINTENANCE:

No routine maintenance activities are conducted on the tanks.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

No repairs or improvements to the storage transfer tanks are anticipated through the planning period.

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.03	$2K
Routine maintenance	0.00	0K
Supervisory oversight	0.01	1K
Total	0.04	$3K

Annual materials requirements	Cost
None	

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

Task	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	2	a	a							
Maintenance	0	a	a							
Supervision	1	a	a							
Materials	0	a	a							
Repairs/ improvements	0	a	a							
Total	3	a	a							

[a]No M&S costs will be incurred during site decommissioning activities.

SFMP - Reactor Group

1. FACILITY NAME: Molten Salt Reactor Experiment (MSRE)

2. LOCATION: Building 7503 (Melton Valley) 3. SERVICE DATES: 1965-1969

4. FACILITY STATUS: Inactive/occupied; reactor building controlled by Environmental and Health Protection Division (M. K. Ford)

5. FACILITY DESCRIPTION:

   (a) Operating History - The MSRE was a single-region, unclad-graphite-moderated, homogeneous-fueled reactor built to investigate the practicality of the molten salt reactor concept for central power station applications. It was operated from June 1965 to December 1969 at a nominal full-power level of 8 MW. The circulating fuel solution was a mixture of lithium-, beryllium-, and zirconium-fluoride salts, containing uranium fluoride as the fuel. Reactor heat was transferred from the fuel salt to a similar coolant salt and then dissipated to the atmosphere.

   (b) Physical Description - The primary reactor components, the reactor vessel, auxiliary equipment, fuel drain tanks, and fuel storage tanks are located below-grade in reinforced concrete cells. Access to these cells is through removable concrete roof plugs. The reactor and associated equipment are housed in a steel and concrete structure approximately 80 X 157 X 33 ft tall, with special containment features. Containment ventilation is provided by centrifugal fans located at the base of a 100-ft steel discharge stack. Before discharge, the air passes through roughing and HEPA filters. Ancillary facilities include an office building (Bldg. 7509), a diesel generator house, utility building, blower house, cooling-water tower, and vapor condensing system. Heat dissipation was provided by a salt-to-air radiator, exhausting through a discharge stack.

   (c) Current Condition - Following shutdown, the fuel and coolant salts were drained to storage tanks within the containment cells and isolated. Although the stored coolant salt needs little attention, the fuel salt (4650 kg), contained in two criticality-safe tanks, requires annual heating to a temperature well below the molten state to allow recombination of fluorine gas released by radiation effects. The reactor and drain-tank cells are sealed and the top shield blocks secured. These cells, as well as the reactor bay area, are maintained under a slight negative pressure. The building and ancillary facilities are structurally sound, with only isolated areas of deterioration.

   (d) Radiological Hazards - The most significant contaminated areas in the MSRE are in and adjacent to the reactor vessel and fuel storage cells. Exposure rates of up to 2200 R/h have been measured in the reactor vessel, principally due to fission products and neutron-induced radioactivity. The remaining ancillary cells, process piping, and other process-related equipment are internally contaminated. The accessible areas of the building, including the reactor bay, are generally uncontaminated. No significant spread of contamination or personnel exposure has occurred since facility shutdown.

(e) Occupancy - Portions of the building are being utilized by other ORNL Divisions for research, workshop, and storage space. Maintenance funds are allocated from each of the participating divisions. The MSRE is in a remote location of the ORNL site, with minimal nonroutine personnel access.

6. SECURITY/PROTECTION SYSTEMS:

The MSRE is in the ORNL Melton Valley restricted area. The buildings and grounds are posted with respect to access restrictions and radiation/contamination zones. The building is protected by a fire alarm and sprinkler system.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

See Table 2 for details of routine maintenance activities.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

Decommissioning activities are currently scheduled to begin in FY 1994. No major repairs or improvements are foreseen prior to that time.

Table 1. Surveillance activities - Molten Salt Reactor Experiment

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Waste Operations surveillance		EHP	WOCC records and MSRE control room log	102 mh/y
(a) Stack fan status	Daily			
(b) Radiation monitors check	Daily			
(c) Stack activity check	Daily			
(d) Instrument alarm monitoring	Continuous			
2. Routine inspection		EHP	MSRE monthly log	34 mh/y
(a) Stored salt temperatures	Monthly			
(b) Sump levels check	Monthly			
(c) Visual of building and ancillary facilities	Monthly			
3. Annual Surveillance		EHP	MSRE annual log	68 mh/y
(a) Reheat of fuel and flush salt	Annually			
(b) Reactor and drain tank cells leak test	Annually			
(c) Sump pump operability	Annually			
(d) Ventilation system check	Annually			
(e) Verify switches and valves	Annually			
(f) Review routine inspection and maintenance records	Annually			
4. Radiological surveillance		EHP	EHP Radiation Protection sect. data base	170 mh/y
(a) Routine inspections	Monthly			
(b) Surveillance of maintenance activities and material transfers	As required			

Table 1. (Continued)
Page 2

Activity	Frequency	Responsibility	Documentation	Manpower/ Resource Requirement
5. Safety inspection	Semiannually	EHP	EHP memo	5 mh/y[a]
6. Fire safety inspection	Quarterly	LP	Inspection and protection report	4 mh/y[a]
7. Fire sprinkler system test	Annually	LP	Inspection report of sprinkler systems	6 mh/y[a]
8. HEPA filter DOP testing	Annually (or after replacement)	QD	EHP printout	8 mh/y[a]
9. Overhead crane inspection	When operated	QD	QD memo	8 mh/y[a]
10. Routine security patrol	Daily	LP	Daily security report	a

[a]Costs are included in ORNL overhead charges. No direct SFMP funding is required.

Table 2. Routine maintenance activities - Molten Salt Reactor Experiment

Activity	Frequency	Responsibility	Documentation	Manpower/ Resource Requirement
1. General maintenance and repair	As required	EHP/P&E	EHP records	104 mh/y
2. Exhaust filter changes	Every 5 years (or as required)	EHP	QD printout	140 mh/y[a]
3. Health physics instrument maintenance/ repair	Quarterly (or as required)	EHP	Program maintenance records	40 mh/y
4. Maintenance of heating/cooling systems	Quarterly (or as required)	P&E	P&E Report 1216	80 mh/y
5. Maintenance of overhead bridge crane	Semiannually	P&E	P&E Report 1216	40 mh/y
6. Maintenance materials	Annually	EHP	EHP records	$15,000 ($5,000[a])
7. Utilities	Annually	EHP	EHP records	$60,000

[a]Additional resources required for filter changeout on a five year cycle, beginning FY 1993.

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.10	$ 9K
Routine maintenance	0.13	12K
Supervisory oversight	0.25	25K
TOTAL	0.48	$46K

Annual materials requirements	Cost
Filters/miscellaneous supplies	$15,000
Utilities	60,000
Total	$75,000

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

Task	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	9	9	10	10	a	a	a	a	a	a
Maintenance	12	12	13	13	a	a	a	a	a	a
Supervision	25	26	27	27	a	a	a	a	a	a
Materials	75	78	81	81	a	a	a	a	a	a
Repairs/ Improvements	—	—	—	—	—	—	—	—	—	—
Total	121	125	131	131	a	a	a	a	a	a

[a]No M&S costs will be incurred during site decommissioning activities.

SFMP - Reactor Group

1. FACILITY NAME: ORR Experimental Facilities

2. LOCATION: Building 3042 (Bethel Valley) 3. SERVICE DATES: 1959-1973

4. FACILITY STATUS: Experimental facilities are inactive and controlled by the Environmental and Health Protection Division (M. K. Ford); the ORR is inactive and controlled by the Research Reactors Division (G. H. Coleman).

5. FACILITY DESCRIPTION:

(a) Operating History - Since 1959, several different experimental facilities have been installed at the ORR (Bldg. 3042) for use in testing of various materials, analysis of liquid and gaseous coolant systems, and irradiated sample transfers. Six of these facilities have been designated as surplus and have been accepted into the ORNL SFMP. These are (1) GCR A9-B9 experiment (1960 - 1969) for measurement of fission-product gases from ceramic fuels, (2) Molten Salt Loop (1959-1967) for analysis of homogeneous reactor fuels, (3) Maritime Ship Reactor Loop (1959-1962) for materials testing of structural materials and fuel pins for nuclear merchant ship applications, (4) Pneumatic Tube Irradiation Facility (1968-1973) for transfer of irradiated samples from the ORR to a laboratory in Bldg. 3001, (5) GCR Loop I (1960-1967) to test new fuels for gas-cooled reactors, and (6) GCR Loop II (1962-1963) for the irradiation of unclad graphite fuel specimens for study of fission product release.

(b) Physical Description - Each of the experimental facilities at the ORR are separate, identifiable units with a variety of designs, structural materials, and flow patterns. All of the facilities included an in-reactor section, with associated piping, instrumentation, and controls leading to away-from-reactor processing or experimental areas. These areas were located either immediately adjacent to the reactor or at remote locations, primarily in the basement of the ORR. The out-of-reactor portions of the facilities were normally contained in shielded cells, either lead, concrete block, or concrete and steel, with separate instrument and control panels. The complexity of the systems range from a simple lead-shielded stainless-steel pneumatic tube to a large pressurized water loop consisting of pumps, heat exchangers, heaters, surge tanks, water purification systems, sampling stations, emergency electric supply, and continuously manned control room.

(c) Current Conditions - Following completion of the respective experiments, the in-reactor portions of the facilities were removed and the remaining systems placed in standby. Most of the facilities remain as left at that time, with only limited equipment or instrumentation removal conducted to provide room for active experiments or for reactor maintenance activities. The abandoned experiments are in various states of disrepair and deterioration. The ORR building is maintained under constant negative pressure, with HEPA filtration of exhaust air.

(d) Radiological Hazards - All of the experimental facilities involved transfers of irradiated solids, liquids, or gases during normal operations. As a result, the transfer piping became contaminated with long-lived corrosion or fission products to varying degrees depending upon the experiment. In addition, for those experiments where significant chemical processing or irradiated product handling and analysis was conducted, much of the process equipment is contaminated. Preliminary characterization efforts have been conducted to determine the radiation/contamination levels and estimate the residual radionuclide inventory present in these facilities. No significant hazards to operating personnel were identified.

(e) Occupancy - All of the experimental facilities are housed in the main reactor building of the operating ORR. This reactor is staffed by full-time operators, maintenance personnel, health physicists, and support staff. The ORR is located on the northern side of the main ORNL complex, adjacent to several active facilities, with routine personnel access.

6. SECURITY/PROTECTION SYSTEMS:

The ORR is within the ORNL Bethel Valley secured area. The experimental areas are posted with respect to access restrictions and radiation/contamination zones. Doors to experimental areas are normally locked. The building is protected by a fire alarm and sprinkler system.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities that are in addition to those conducted for the other areas of the ORR.

8. ROUTINE MAINTENANCE:

See Table 2 for details of routine maintenance activities that are in addition to those conducted for the other areas of the ORR.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

No major repairs or improvements are anticipated for the ORR experimental facilities through the planning period.

Table 1. Surveillance activities - ORR Experimental Facilities

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine inspection		EHP	ORR shift check sheet	15 mh/y
(a) Visual of experimental areas	Daily			
2. Radiological surveillance		EHP	EHP Radiation Protection sect. data base	7 mh/y
(a) Radiation/contamination survey of Loop II	Weekly			
(b) Surveillance of other facilities	Quarterly			
(c) Surveillance of maintenance activities	As required			

Table 2. Routine maintenance activities - ORR Experimental Facilities

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. General maintenance and repair	As required	EHP/P&E	EHP records	91 mh/y
2. Maintenance materials	Annually	EHP	EHP records	$3000

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.01	$ 1K
Routine maintenance	0.04	4K
Supervisory oversight	0.01	1K
Total	0.06	$ 6K

Annual materials requirements	Cost
Filters/miscellaneous supplies	$ 3K
Total	$ 3K

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

Task	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	1	1	1	1	1	1	1	1	a	a
Maintenance	4	4	5	5	5	5	5	5	a	a
Supervision	1	1	1	1	1	1	1	1	a	a
Materials	3	3	3	3	3	3	3	3	a	a
Repairs/ improvements	—	—	—	—	—	—	—	—	—	—
Total	9	9	10	10	10	10	10	10	a	a

[a]No M&S costs will be incurred during site decommissioning activities.

SFMP - Reactor Group

1. FACILITY NAME: ORR Water-to-Air Heat Exchanger

2. LOCATION: ORNL Site 3087 (Bethel Valley) 3. SERVICE DATES: 1958-1961

4. FACILITY STATUS: Inactive; site controlled by the Environmental and Health Protection Division (M. K. Ford)

5. FACILITY DESCRIPTION:

   (a) Operating History - This heat exchanger was the original heat dissipation system for the ORR. When the reactor power level was increased from 20 MW to 30 MW in 1960, the radiators were replaced by a water-to-water heat exchanger and cooling tower heat dissipation system.

   (b) Physical Description - The heat exchanger consisted of eight aluminum 24 by 22 ft horizontally mounted, finned, water-to-air radiators (2.5 MW capacity each). The units were housed in steel support structures, secured to concrete pads, and connected to the ORR by underground aluminum piping. Cooling airflow was provided by variable speed fans.

   (c) Current Condition - This heat dissipation system was drained and disconnected from the ORR when removed from service. One radiator was later removed for use at an off-site location. The condition of the piping, motors, and other equipment is uncertain, although it is apparent that the exterior metal surfaces are deteriorating due to weather exposure.

   (d) Radiological Hazards - The interior surfaces of the transfer and heat-exchanger piping are slightly contaminated, principally with long-lived fission and corrosion products. No significant hazard was encountered when the single heat exchanger was dismantled for shipment off-site.

   (e) Occupancy - The heat exchanger is located in a semiremote area on the north end of the main ORNL complex, with little routine personnel access.

6. SECURITY/PROTECTION SYSTEMS:

   The site is within the ORNL Bethel Valley secured area.

7. SURVEILLANCE ACTIVITIES:

   No routine surveillance activities are conducted at this facility.

8. ROUTINE MAINTENANCE:

   No routine maintenance activities are conducted at this facility.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

   No major repairs or improvements are anticipated for the ORR Heat Exchanger through the planning period.

Appendix A.2

DEFENSE FACILITIES DECOMMISSIONING PROGRAM

DFDP - D&D Projects Group

1. FACILITY NAME: Fission Product Development Laboratory (FPDL)

2. LOCATION: Building 3517 (Bethel Valley) 3. SERVICE DATES: 1958-1975

4. FACILITY STATUS: Approximately 30% of the facility is inactive and is maintained by the DFDP under Chemical Technology Division control (K. W. Haff). The remainder of the facility is utilized for radioisotope production, radioactive waste handling, and decontamination activities, funded through other ORNL programs.

5. FACILITY DESCRIPTION:

(a) Operating History - The FPDL was originally designed and constructed to separate kilocurie quantities of ^{137}Cs, ^{90}Sr, ^{144}Ce, and ^{147}Pm from Redox- and Purex-type waste streams. The facility was modified in 1963 to allow production of megacurie amounts of ^{137}Cs, ^{90}Sr, and ^{144}Ce, primarily for use in the AEC's SNAP program. At the conclusion of this program (1975), the facility was placed in standby, and initial decontamination efforts were undertaken. Since that time, a significant portion of the facility has been reactivated for chemical separation and purification of fission products.

(b) Physical Description - The FPDL consists of 24 large-volume shielded concrete hot cells with associated manipulator galleries and service areas. The facilities are enclosed in a reinforced-concrete, steel, and brick structure approximately 125 ft long, 62 ft wide, and 44 ft high. The associated tank farm cells are located adjacent to the building, extending about 14 ft below grade. The FPDL contains cell-ventilation and off-gas systems; a process chilled water system; radiation and contamination monitoring systems; general building services (air conditioning, steam, water, argon); and a process waste and LLLW collection system. Decontamination facilities consisting of a vibratory finisher and electropolishing unit were installed for general plant use but are presently inactive.

(c) Current Condition - The facility is structurally sound and, in most areas, fully operable; however, large quantities of surplus process equipment remain in the inactive cells. Due to the presence of operating programs utilizing the facility, the majority of the building is being maintained in working order.

(d) Radiological Hazards - The inactive process cells are highly contaminated with ^{90}Sr and ^{137}Cs. Cell surfaces are known to exhibit beta-gamma radiation levels of 10 to 1000 R/h. Process equipment and piping, although previously flushed and partially decontaminated, are expected to contain levels of up to 100 R/h. The high-bay area immediately over the cells is moderately contaminated and is maintained as a contamination zone, with appropriate access restrictions. The operating areas outside the cells and high-bay are uncontaminated, with constant surveillance and decontamination efforts conducted to maintain transferable levels of <500 dpm/100 cm^2 beta-gamma and <30 dpm/100 cm^2 alpha activity.

(e) Occupancy - The FPDL is currently manned by a staff of approximately ten full-time Chemical Technology Division personnel and a full-time health physics surveyor. The operating programs in the FPDL utilize all of the manipulator cells and about 10% of the remainder of the facility for their purposes. The facility is centrally located in the main ORNL complex, which is near several operating facilities and a main traffic thoroughfare.

6. SECURITY/PROTECTION SYSTEMS:

The FPDL is within the ORNL Bethel Valley secured area, with building exterior doors locked at night. Building and grounds are posted with respect to access restrictions and radiation/contamination zones. The facility is protected by a fire alarm and sprinkler system.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

See Table 2 for details of maintenance activities.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

Beginning in late FY 1983, cell decommissioning operations began at the FPDL. These activities consist primarily of remote and hands-on decontamination of the high-bay and hot cells to levels allowing reuse, and will include removal of all excess equipment. The FPDL decontamination is expected to take several years. During this time, routine M&S must be continued. As cells are decontaminated and returned to active service, a decrease in the DFDP M&S support will occur. At the end of the decommissioning campaign (potentially beyond this planning period), the facility M&S support will be limited to support of decommissioned facilities not transferred to active programs. This support will be discontinued when these areas are returned to service.

Table 1. Surveillance activities - Fission Product Development Laboratory

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine inspection		EHP	FPDL shift check sheet (UCN-12530)	475 mh/y
(a) Visual of building	Daily			
(b) Waste tanks liquid levels	Daily			
(c) Radiation monitors	Daily			
(d) Cell ventilation	Daily			
- HEPA filters				
- Supply pressure				
- Pressure drops				
- Negative pressure				
(e) Chilled water units	Daily			
(f) Argon manifold reading	Daily			
(g) Building containment negative pressure	Daily			
(h) Power usage	Daily			
(i) Off-gas negative pressure	Daily			
(j) Emergency lights/horn	Weekly			
(k) Filter pit sump	Daily			
2. Radiological surveillance		EHP	EHP Radiation Protection Sect. data base	100 mh/y
(a) Smear surveys of operating areas	Daily			
(b) Inspection of radiation monitors	Daily			
(c) Surveillance of maintenance jobs	As required			
(d) Routine whole-body counting of operating personnel	Annually			

Table 1. (Continued)
Page 2

Activity	Frequency	Responsibility	Documentation	Manpower/ Resource Requirement
3. Process Waste System				
(a) Routine monitoring	Daily	EHP	WOCC records	50 mh/y
4. Cell ventilation monitoring	Continuous	EHP	WOCC records	a
5. Safety inspection	Semiannually	EHP	EHP memo	5 mh/y[a]
6. Fire safety inspection	Quarterly	LP	Inspection and protection report	8 mh/y[a]
7. Fire sprinkler system test	Annually	LP	Inspection report of sprinkler systems	6 mh/y[a]
8. HEPA filters DOP testing	Semiannually (or after replacement)	QD	EHP printout	32 mh/y[a]
9. Routine security patrol	Daily	LP	Daily security report	a
10. Overhead crane inspection	Annually	QD	QD memo	28 mh/y[a]

[a]Costs are included in ORNL overhead charges. No direct DFDP funding is required.

Table 2. Routine maintenance activities - Fission Product Development Laboratory

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. General maintenance and repair	As required	EHP/P&E	EHP records	140 mh/y
2. Cell ventilation exhaust filter replacement	Semiannually (or as required)	EHP	QD printout	180 mh/y
3. Health physics instrument maintenance/ calibration	Quarterly (or as required)	EHP	Program maintenance records	90 mh/y
4. Maintenance of heating/cooling systems	As required	P&E	P&E Report 1216	80 mh/y
5. Maintenance of overhead bridge crane	Semiannually	P&E	P&E Report 1216	10 mh/y
6. Maintenance materials	Annually	EHP	EHP records	$10,000
7. Building utilities	Annually	EHP	EHP records	$ 5,000

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.30	$25K
Routine maintenance	0.24	20K
Supervisory oversight	0.12	10K
Total	0.66	$55K

Annual materials requirements	Cost
Filters/miscellaneous supplies	$10K
Utilities	$ 5K
Total	$15K

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)[a]									
	90	91	92	93	94	95	96	97	98	99
Surveillance	25	26	27	27	27	27	27	27	27	27
Maintenance	20	21	22	22	22	22	22	22	22	22
Supervision	10	11	12	12	12	12	12	12	12	12
Materials	15	15	15	15	15	15	15	15	15	15
Repairs/ improvements	0	0	0	0	0	0	0	0	0	0
Total	70	73	76	76	76	76	76	76	76	76

[a]These costs assume no additional decommissioning activities occur during the planning period (FY 1990 - FY 1999).

DFDP - D&D Projects Group

1. FACILITY NAME: Metal Recovery Facility (MRF)

2. LOCATION: Building 3505 (Bethel Valley) 3. SERVICE DATES: 1952-1960

4. FACILITY STATUS: Inactive/Occupied; Building controlled by Chemical Technology Division (K. W. Haff)

5. FACILITY DESCRIPTION:

(a) Operating History - The MRF was a pilot- and small-scale production nuclear fuel reprocessing plant used for the processing of various waste solutions, scrap, and miscellaneous fuel elements for the recovery of uranium, plutonium, neptunium, and americium. The facility was shut down in 1960, after some 25 different processing campaigns, due to the lack of secondary containment.

(b) Physical Description - The MRF is a one-story metal-sided building, approximately 90 ft long by 70 ft wide by 24 ft high. The building consists of seven concrete or concrete-block cells (which are secured and maintained under negative pressure, with ventilation through HEPA filters), makeup area, offices, storage area, control room, and an active shop. A below-grade concrete dissolver pit and fuel-handling canal are located inside and adjacent to the building, respectively, both with controlled access. Two associated underground storage tanks (W-19 and W-20) and associated jet pit are located some 50 ft east of the building.

(c) Current Condition - The building structure is basically sound although gradually deteriorating with time. The major structural deficiencies are associated with the roof, which is of light construction. All equipment has been removed from the process cells. The facility has few special features for contamination control, although it does have an upgraded cell ventilation system. The canal and dissolver pit have been stabilized and placed in a monitored, controlled standby condition. The waste tanks are empty and operable.

(d) Radiological Hazards - The process cells are internally contaminated, primarily along lower walls and inside process equipment. The majority of this activity is due to long-lived (TRU) surface contamination present. Beta-gamma radiation levels are generally much less than 100 mR/hr.

(e) Occupancy - The shop area is maintained by the P&E Division in support of the adjacent High-Radiation-Level Examination Laboratory. The remaining area is being utilized in support of decommissioning operations. The MRF is located in a central area of the main ORNL complex, adjacent to several active facilities.

6. SECURITY/PROTECTION SYSTEMS:

The MRF is within the ORNL Bethel Valley secured area. Building and grounds are posted as restricted access and radiation/contamination zones. The facility is protected by a fire alarm and sprinkler system.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

See Table 2 for details of routine maintenance activities.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

Beginning in FY 1984, decommissioning operations were undertaken at the MRF. These activities consist of process equipment removal, cell, canal, and dissolver pit decontamination, and associated facility modifications leading towards potential reuse of the building. The initial decontamination operations are planned for FY 1984 through FY 1990, with the potential for additional facility dismantlement beyond that time. During this project phase, routine M&S must still be continued. Final decommissioning of the waste tanks, canal, and dissolver pit will be integrated with the decommissioning of the other waste tanks at ORNL and will be deferred until that project is undertaken. Limited funds for routine surveillance will be required after building decontamination until ownership is transferred to an active program.

Table 1. Surveillance activities - Metal Recovery Facility

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine inspection	Daily	EHP	FPDL shift check sheet (UCN-12530)	400 mh/y
(a) Visual of building				
(b) Negative pressure in cells				
(c) HEPA filter pressure drop				
2. Canal surveillance				
(a) Sump water level check	Annually	EHP	EHP records	10 mh/y
3. Radiological surveillance		EHP	EHP Radiation Protection sect. data base	
(a) Routine smear surveys	Weekly			300 mh/y
(b) Surveillance of maintenance Activities	As required			40 mh/y
(c) Surveillance of material transfers	As required			10 mh/y
4. Safety inspection	Semiannually	EHP	EHP memo	5 mh/y[a]
5. Fire safety inspection	Quarterly	LP	Inspection and protection report	4 mh/y[a]
6. Fire sprinkler system test	Annually	LP	Inspection report of sprinkler systems	5 mh/y[a]

[a]Costs are included in ORNL overhead charges. No direct DFDP funding is required.

Table 1. (Continued)
Page 2

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
7. HEPA filters DOP testing	Semiannually (or after replacement)	QD	EHP printout	4 mh/y[a]
8. Routine security patrol	Daily	LP	Daily security report	a
9. Process/ventilation stream monitoring	Continuous	EHP	WOCC records	a

[a]Costs are included in ORNL overhead charges. No direct DFDP funding is required.

Table 2. Routine maintenance activities - Metal Recovery Facility

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. General maintenance and repair	As required	EHP/P&E	SFMP memo	350 mh/y
2. Cell ventilation exhaust filter replacement	Annually	EHP	QD printout	100 mh/y
3. Health physics instrumentation maintenance/calibration	Quarterly	EHP	Program maintenance report	a
4. Maintenance of steam heating system	Annually (or as required)	P&E	P&E Report 1216	a
5. Maintenance materials	Annually	EHP	EHP records	$10,000
6. Building utilities	Annually	EHP	EHP records	$ 2,000

[a]Costs are included in ORNL overhead charges. No direct DFDP funding is required.

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.37	$30K
Routine maintenance	0.22	18K
Supervisory oversight	0.01	1K
Total	0.60	$49K

Annual materials requirements	Cost
Filters/miscellaneous supplies	$10K
Utilities	2K
Total	$12K

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	30	18	19	19	19					
Maintenance	18	2	2	2	2					
Supervision	1	0	0	0	0					
Materials	12	2	2	2	2					
Repairs/ improvements	0	0	0	0	0					
Total	61[a]	22[b]	23	23	23					

[a]Project phase of facility decommissioning occurs during this year. M&S resource needs have been combined with project decontamination budget.

[b]Routine M&S will be continued at this level until a reuse for the facility has been identified and ownership has been transferred.

DFDP - Isotope Group

1. FACILITY NAME: Waste Evaporator Facility

2. LOCATION: Building 3506 (Bethel Valley) 3. SERVICE DATES: 1949-1954

4. FACILITY STATUS: Inactive; controlled by Environmental and Health Protection Division (D. F. Hall)

5. FACILITY DESCRIPTION:

(a) Operating History - The facility received the LLLW waste streams from ORNL laboratories and other processing areas during the 1950s for concentration prior to final disposition by shale fracture techniques. This activity was suspended when the presently active evaporator facility (Bldg. 2531) was brought on-line. Subsequent installations of experimental equipment were used to develop fission-product purification processes and demonstrate contaminated waste incineration.

(b) Physical Description - The facility consists of a stainless-steel-lined, reinforced concrete cell with underground piping, valve pit, and an attached wood-framed operating area. The building dimensions are approximately 22 X 28 X 8 ft high. The evaporator facility is located on the west side of the south tank farm (Site 3507).

(c) Current Condition - The building structure is basically sound, although roof repairs have had to be made due to normal deterioration. The interior of the structure has been decontaminated and is in a safe storage condition. Most of the former process equipment has been removed.

(d) Radiological Hazard - The waste evaporator was decontaminated prior to its use as an incinerator facility. Hence, the building now contains only low levels of contamination, primarily associated with the valve pit, piping, and some surface contamination. The radionuclides of concern are expected to be ^{137}Cs and ^{90}Sr, in less than curie quantities.

(e) Occupancy - The facility is unoccupied, with personnel access on only an occassional basis. The site is located adjacent to several active facilities, along a major pedestrian and vehicle thoroughfare.

6. SECURITY/PROTECTION SYSTEMS:

The waste evaporator is within the ORNL Bethel Valley secured area. The building and grounds are posted with respect to access restrictions and radiation/contamination zones.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

See Table 2 for details of routine maintenance activities.

Table 1. Surveillance activities - Waste Evaporator Facility

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine inspection	Weekly	EHP	M&S weekly check sheet	25 mh/y
2. Radiological surveillance (a) Survey for preventative maintenance	Semiannually	EHP	EHP, Radiation Protection sect. data base	25 mh/y
3. Safety inspection	Semiannually	EHP	EHP memo	5 mh/y[a]
4. Fire safety inspection	Quarterly	LP	Inspection and protection report	4 mh/y[a]
5. Routine security patrol	Daily	LP	Daily security report	a

[a]Costs are included in ORNL overhead charges. No direct DFDP funding is required.

Table 2. Routine maintenance activities - Waste Evaporator Facility

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. General maintenance and repair	As required	EHP/P&E	EHP records	25 mh/y

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

No repairs or improvements are anticipated prior to decommissioning currently scheduled for FY 1993.

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.03	$2K
Routine maintenance	0.01	1K
Supervisory oversight	0.01	1K
Total	0.05	$4K

Annual materials requirements	Cost
None	

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	2	2	2	a						
Maintenance	1	1	1	a						
Supervision	1	1	1	a						
Materials	0	0	0	a						
Repairs/ improvements	0	0	0	a						
Total	4	4	4	a						

[a]No M&S costs will be incurred during site decommissioning activities.

DFDP - Isotope Group

1. FACILITY NAME: Fission Product Pilot Plant (FPPP)

2. LOCATION: Building 3515 (Bethel Valley) 3. SERVICE DATES: 1948-1958

4. FACILITY STATUS: Inactive/entombed; site controlled by Environmental and Health Protection Division (D. F. Hall)

5. FACILITY DESCRIPTION:

   (a) Operating History - The FPPP was used in the fission product recovery development program for the separation of curie quantities of various radionuclides from LLLW waste streams. It was abandoned in 1958 when it was replaced by the Fission Product Development Laboratory (FPDL).

   (b) Physical Description - The facility consisted primarily of an unlined concrete-shielded cell, ~20 X 10 X 8 ft high, with an adjacent operating area. The process cell contained several small (few gal capacity) stainless-steel vessels and columns with associated piping, valving, and controls. The concrete-block and reinforced-concrete building is located on the east side of the South Tank Farm (Site 3507).

   (c) Current Condition - Shortly after the FPPP was abandoned, the building was entombed in a concrete block shell with dimensions of 17 ft x 26 ft x 12 ft tall. In 1988, it was discovered that a large crack in the roof of this shell was allowing rainwater to penetrate the building, become contaminated, and exit through the exterior walls. The crack was repaired, a new stainless-steel roof was installed, and latex sealant was applied to the walls. The entombment structure now appears to be sound.

   (d) Radiological Hazard - Radiation levels within the process cell prior to entombment ranged from 1 R/h to 100 R/h, with the major contaminants being ^{137}Cs and ^{90}Sr. The remaining radionuclide inventory in the facility is believed to be in the range of 10 to 100 Ci. Contamination is present underneath and adjacent to the building due to drain line leaks during past operations. The entombment structure now appears to be providing adequate containment.

   (e) Occupancy - The facility is entombed, with no personnel access. The site is in a central location of the main ORNL complex, adjacent to several operating facilities and a major pedestrian and vehicle thoroughfare.

6. SECURITY/PROTECTION SYSTEMS:

   The FPPP is within the ORNL Bethel Valley secured area. The building and grounds are posted with respect to radiation/contamination zones.

7. SURVEILLANCE ACTIVITIES:

   See Table 1 for details of surveillance activities.

Table 1. Surveillance activities - Fission Product Pilot Plant

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine inspection	Semiannually	EHP	M&S checksheet	35 mh/y
2. Radiological surveillance	Semiannually	EHP	EHP, Radiation Protection sect. data base	40 mh/y
3. Safety inspection	Semiannually	EHP	EHP memo protection report	2 mh/y[a]

[a]Costs are included in ORNL overhead charges. No direct DFDP funding is required.

8. ROUTINE MAINTENANCE:

No routine maintenance is performed at this facility.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

No major repairs or improvements are anticipated at the FPPP through the planning period. Decommissioning activities are currently scheduled to begin in FY 1991.

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.04	$3K
Routine maintenance	0.00	0K
Supervisory oversight	0.01	1K
Total	0.05	$4K

Annual materials requirements	Cost
None	

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	3	a	a							
Maintenance	0	a	a							
Supervision	1	a	a							
Materials	0	a	a							
Repairs/ improvements	0	a	a							
Total	4	a	a							

[a]No M&S costs will be incurred during site decommissioning activities.

DFDP - Radwaste Group

1. FACILITY NAME: Waste Holding Basin

2. LOCATION: Site 3513 (Bethel Valley) 3. SERVICE DATES: 1944-1977

4. FACILITY STATUS: Inactive; pond controlled by the Environmental and Health Protection Division (D. F. Hall)

5. FACILITY DESCRIPTION:

(a) Operating History - The waste holding basin served as a LLLW receiving pond throughout most of its active service life. The pond received the slightly contaminated aqueous solutions arising from laboratory floor drains, steam and cooling water leakage, flush drains, etc., and contained the liquid until transferred to the LLLW processing system or discharged to the environment. In the latter years of use, the pond received only the liquid effluent from the LLLW treatment plant, serving as a settling basin prior to discharge to White Oak Creek.

(b) Physical Description - The basin is an unlined earth-bermed structure approximately 230 ft by 250 ft at the top of the berm, with sloping sides down to the pond bottom (approximately 200 by 200 ft). The depth of water in the basin varies but averages about 6 ft. The pond surface is open to the environment. Pond overflow is routed to the adjacent equalization basin for processing prior to discharge to White Oak Creek.

(c) Current Condition - The pond is believed to be structurally sound. Vegetation has become established along the basin perimeter. There is no evidence of significant pond leakage.

(d) Radiological Hazards - The pond sediment is contaminated with fission products and actinides. Preliminary estimates of the radionuclide inventories of ^{90}Sr, ^{137}Cs, and ^{239}Pu are 20 Ci, 130 Ci, and 3 Ci, respectively. The concentration of ^{239}Pu in the sediment is of the order of 2 nCi/g. The water contained in the pond is only slightly contaminated.

(e) Occupancy - Members of the Environmental Sciences Division at ORNL have used the pond in the past as an experimental plot for the study of radionuclide transport mechanisms. However, no active sampling programs are currently under way. The pond is located in a semiremote area of the Bethel Valley complex, with minimal routine personnel access.

6. SECURITY/PROTECTION SYSTEMS:

The waste holding basin is within the ORNL Bethel Valley secured area. The pond is encircled with a barrier chain and posted with "Radiation Hazard - Keep Out" signs.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

See Table 2 for details of routine maintenance activities.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

Decommissioning of the Waste Holding Basin is currently scheduled to begin in FY 1994. Maintenance and surveillance funding will be discontinued when project funding is in place. No repairs or improvements are planned prior to that time unless a need is indicated by routine surveillance or dictated for regulatory compliance.

Table 1. Surveillance activities - Waste Holding Basin

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. M&S site inspection	Weekly	EHP	M&S weekly check sheet	12 mh/y
2. Safety inspection	Semiannually	EHP	EHP memo	2 mh/y[a]
3. Radiological surveillance	As required	EHP	EHP, Radiation Protection sect. data base	10 mh/y
(a) Surveys for grounds maintenance				
4. Groundwater surveillance	Annually	ESD	ESD memo	
(a) Monitoring wells sampling/ reporting		ESD		90 mh/y
(b) Sample analysis		ACH		$10,000
5. Effluent monitoring	Continuous	EHP	WOCC records	a
6. Routine security patrol	Daily	LP	Daily security report	a

[a]Costs are included in ORNL overhead charges. No direct DFDP funding is required.

Table 2. Routine maintenance activities - Waste Holding Basin

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. General maintenance	As required	EHP/P&E	EHP/P&E records	225 mh/y

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.05	$15K
Routine Maintenance	0.11	9K
Supervisory oversight	0.01	1K
Total	0.17	$25K

Annual materials requirements	Cost
None	

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	15	16	16	16	a	a	a			
Maintenance	9	9	10	10	a	a	a			
Supervision	1	1	1	1	a	a	a			
Materials	0	0	0	0	a	a	a			
Repairs/ improvements	0	0	0	0	a	a	a			
Total	25	26	27	27	a	a	a			

[a]No M&S costs will be incurred during site decommissioning activities.

DFDP - Radwaste Group

1. FACILITY NAME: Gunite Storage Tanks W-5, W-6, W-7, W-8, W-9, W-10

2. LOCATION: South Tank Farm Site 3507 (Bethel Valley)

3. SERVICE DATES: 1943-1978

4. FACILITY STATUS: Tanks were emptied of sludge under the Interim Waste Operations Program but they still retain some unsluiceable heels. Responsibility for the South Tank Farm falls under the Environmental and Health Protection Division (D. F. Hall).

5. FACILITY DESCRIPTION:

(a) Operating History - The gunite tanks have been used for the storage and transfer of LLLW since their construction in 1943. The tanks have accumulated varying amounts and compositions of radioactive sludge that precipitated from solution during the 35 years of tank service.

(b) Physical Description - Each of the six cylindrical, domed waste storage tanks in this ORNL tank farm is 50 ft in diameter with a vertical height of 18 ft at the center and 15 ft at the walls. The storage capacity for each tank is approximately 170,000 gal. The tanks were built of steel-reinforced Gunite (a trade name for a mix of cement, sand, and water sprayed from a cement gun) with no inside liner. The six tanks are buried under 5 to 6 ft of earth cover and are arranged in a 60-ft center-to- center square matrix. Each tank was set on a concrete dish and installed with a sampling dry well.

The past sludge removal project has resulted in little physical change in the tanks. Additional access holes have been drilled into the tanks, and permanent structural supports and sluicing equipment have been constructed within the tank farm area. The equipment used for the sludge removal campaign remains on site and will probably be used in final decommissioning activities.

(c) Current Condition - The tanks are believed to be structurally sound and are in operable condition. However, based on observations during the sludge removal project, the interior walls are known to be deteriorating to the point of exposing the structural reinforcement steel. Preliminary studies indicate that the tank walls can still easily support the overburden, but that the condition should be considered in future decommissioning activities. Level increases have been noted in each of the tanks during periods of heavy rain. Past efforts have had marginal success in correcting this inleakage problem.

(d) Radiological Hazards - The tanks still contain over 3×10^3 Ci of total activity, primarily ^{90}Sr and ^{137}Cs, with some transuranics present. This activity is associated with the waste slurry left in each tank and contamination imbedded in the tank walls. Detailed characterizations of these tanks will have to be conducted prior to final decommissioning.

(e) Occupancy - The site is periodically occupied by tank farm operating personnel. The tank farm is located in a central area of the main ORNL complex, adjacent to several active facilities along a major vehicle and pedestrian thoroughfare.

6. SECURITY/PROTECTION SYSTEMS:

The gunite tank farm is within the ORNL Bethel Valley secured area. The grounds are posted with respect to access restrictions and radiation/contamination zones.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

See Table 2 for details of routine maintenance activities.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

The schedule for decommissioning of the Gunite Tanks is currently undefined. Further tank wall deterioration, groundwater inleadage, or regulatory compliance may dictate future repairs or improvements; however, none are currently envisioned for this planning period.

Table 1. Surveillance activities - Gunite Storage Tanks

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. M&S site inspection	Weekly	EHP	M&S weekly check sheet	25 mh/y
2. Waste tank monitoring				200 mh/y
(a) Liquid levels monitored	Continuous	EHP	WOCC records	
(b) Dry wells monitored	Continuous	EHP	WOCC records	
(c) Dry wells sampled and analyzed	Monthly	ACh, EHP	WOCC records	
3. Off-gas system filters DOP testing	Quarterly (or after replacement)	QD, EHP	QD printout	48 mh/y[a]
4. Off-gas monitoring	Continuous	EHP	WOCC records	a
5. Radiological surveillance	As required	EHP	EHP, Radiation Protection sect. data base	30 mh/y
(a) Surveys for grounds maintenance, filter changes, and preventative maintenance				
6. Routine security patrol	Daily	LP	Daily security report	a

[a]Costs are included in ORNL overhead charges. No direct DFDP funding is required.

Table 2. Routine maintenance activities - Gunite Storage Tanks

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine maintenance	As required	EHP/P&E	EHP records	100 mh/y
2. Off-gas filter replacement	As required	EHP	QD printout	4 mh/y
3. Maintenance materials	Annually	EHP	EHP records	$ 1,000
4. Gaseous radioactive waste treatment	Annually	EHP	EHP records	$75,000

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.12	$10K
Routine maintenance	0.05	4K
Supervisory oversight	0.14	12K
Total	0.31	$26K

Annual materials requirements	Cost
Filters/miscellaneous supplies	$ 1K
Gaseous rad. waste treatment	75K
Total	$76K

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

Task	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	10	11	12	12	12	12	12	12	12	12
Maintenance	4	4	4	4	4	4	4	4	4	4
Supervision	12	12	13	13	13	13	13	13	13	13
Materials	76	79	81	81	81	81	81	81	81	81
Repairs/ improvements	—	—	—	—	—	—	—	—	—	—
Total	102	106	110	110	110	110	110	110	110	110

DFDP - Radwaste Group

1. FACILITY NAME: Waste Storage Tank WC-1

2. LOCATION: Between Building 3037 and 3038 (Bethel Valley)

3. SERVICE DATES: 1950-1968

4. FACILITY STATUS: Inactive; controlled by Environmental and Health Protection Division (D. F. Hall)

5. FACILITY DESCRIPTION:

(a) Operating History - This tank was used to collect and monitor liquid waste from radioisotope production processes and experimental systems in the radioisotope area. The stored waste was then transferred to the LLLW system for treatment. Tank WC-1 was abandoned in 1968 because of a leaking discharge line.

(b) Physical Description - Tank WC-1 is an underground 2000-gal stainless-steel vessel. The waste tank was constructed on a collection pad with an adjacent dry well for sampling. The tank ejector pit, consisting of associated valving, piping, and sampling stations, is located approximately 10 ft to the west of the tank. When abandoned in 1968, the tank was emptied and thepit was isolated, filled in and capped under a 10 by 10-ft concrete slab. Only this slab, dry well cover, and a tank flange are visible above ground.

(c) Current Condition - The tank is believed to be structurally sound, with no apparent leaks. The concrete cap over the ejector pit shows no signs of significant deterioration.

(d) Radiological Hazards - The tank and ejector pit contain curie quantities of ^{60}Co, ^{137}Cs, and ^{90}Sr as residual contamination. No direct personnel exposure pathways are present.

(e) Occupancy - The tank is located in a central area of the main ORNL complex, adjacent to several active facilities, and lies within 25 ft of a major vehicle thoroughfare.

6. SECURITY/PROTECTION SYSTEMS:

Waste tank WC-1 is within the ORNL Bethel Valley secured area. The ejector pit is posted as a radiation/contamination zone.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

No routine maintenance activities are conducted at waste tank WC-1.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

The schedule for decommissioning activities for the waste tanks (including WC-1) is currently undefined. Routine M&S will be discontinued when these efforts are initiated. No repairs are anticipated prior to that time.

Table 1. Surveillance activities - Waste Tank WC-1

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Waste tank monitoring				100 mh/y
(a) Dry well sampling	Monthly	EHP	WOCC records	
(b) Sample analysis	Monthly	ACh	WOCC records	

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.05	$4K
Routine maintenance	0.00	0K
Supervisory oversight	0.01	1K
Total	0.06	$5K

Annual materials requirements	Cost
None	

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	4	4	4	4	4	4	4	4	4	4
Maintenance	0	0	0	0	0	0	0	0	0	0
Supervision	1	1	1	1	1	1	1	1	1	1
Materials	0	0	0	0	0	0	0	0	0	0
Repairs/ improvements	0	0	0	0	0	0	0	0	0	0
Total	5	5	5	5	5	5	5	5	5	5

DFDP - Radwaste Group

1. FACILITY NAME: Waste Storage Tanks WC-15 and WC-17

2. LOCATION: Tank Farm Southeast of Bldg. 3587 (Bethel Valley)

3. SERVICE DATES: 1940s-1960s

4. FACILITY STATUS: Inactive; controlled by Environmental and Health Protection Division (D. F. Hall)

5. FACILITY DESCRIPTION:

(a) Operating History - These tanks were used to collect and monitor liquid wastes from the research laboratories in Bldg. 4500. The stored waste was then transferred to the LLLW system for treatment. The tanks were removed from service due to leakage.

(b) Physical Description - Tanks WC-15 and WC-17 are identical underground 1000-gal stainless-steel vessels, located in an active tank farm consisting of 5 other underground tanks, 2 pump pits, an off-gas filter system, instrument cabinet, and associated piping. The tanks are sitting on a concrete collection pad draining to an operable dry well and pump system. The tanks are surrounded and covered with crushed rock.

(c) Current Condition - The tanks are known to have leaked, although the extent of their structural deterioration has not been determined. At the time the tanks were removed from service, they were emptied and the piping isolated to preclude use. The surface flange on WC-15 was removed and the area covered.

(d) Radiological Hazards - No accurate information on the condition of the tanks and piping is available. However, based on the history of their operation, it is expected that the vessels are internally contaminated with curie quantities of mixed fission and corrosion products (primarily ^{60}Co and ^{137}Cs).

(e) Occupancy - The tank farm is located in a central area of the main ORNL complex, adjacent to several active facilities along pedestrian and vehicle thoroughfares.

6. SECURITY/PROTECTION SYSTEMS:

Waste tanks WC-15 and WC-17 are within the ORNL Bethel Valley secured area. The tank farm is posted with respect to access restrictions and radiation/contamination zones.

7. SURVEILLANCE ACTIVITIES:

The active tanks in the tank farm are under constant surveillance. Tank WC-17 liquid level is monitored continuously at the WOCC. No additional surveillance is provided for the abandoned tanks.

8. ROUTINE MAINTENANCE:

The active tank farm is maintained by the ORNL Waste Operations Department. No additional maintenance is provided for the abandoned tanks.

Table 1. Surveillance activities - Waste Tanks WC-15 and WC-17

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Waste tank monitoring				
(a) Liquid levels monitored	Continuous	EHP	WOCC records	75 mh/y

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

The schedule for decommissioning activities for the waste tanks (including WC-15 and WC-17) is currently undefined. Routine M&S will be discontinued when these efforts are initiated. No repairs are anticipated prior to that time.

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.04	$3K
Routine maintenance	0.00	0K
Supervisory oversight	0.01	1K
Total	0.05	$4K

Annual materials requirements	Cost
None	

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	3	3	3	3	3	3	3	3	3	3
Maintenance	0	0	0	0	0	0	0	0	0	0
Supervision	1	1	1	1	1	1	1	1	1	1
Materials	0	0	0	0	0	0	0	0	0	0
Repairs/ improvements	0	0	0	0	0	0	0	0	0	0
Total	4	4	4	4	4	4	4	4	4	4

DFDP - Radwaste Group

1. FACILITY NAME: Waste Storage Tanks W-1, W-2, W-3, W-4, W-13, W-14, and W-15

2. LOCATION: North Tank Farm, Site 3023 (Bethel Valley)

3. SERVICE DATES: 1940s-1960s

4. FACILITY STATUS: Inactive; controlled by Environmental and Health Protection Division (D. F. Hall)

5. FACILITY DESCRIPTION:

(a) Operating History - The tanks in the North Tank Farm were used for the collection and storage of liquid wastes from various ORNL facilities prior to the transfer of the material to the liquid waste treatment facilities. These tanks were removed from service due to leakage (W-1, W-2) or because they were no longer required for use (W-3, W-4, W-13, W-14, and W-15).

(b) Physical Description - Tanks W-1 and W-2 are both underground gunite-sprayed concrete vessels of approxmiately 5000-gal capacity, located in the west end of the tank farm. Tanks W-3 and W-4 are also of sprayed concrete construction, but have capacities of 41,000 gal each and are located underground in the eastern part of the farm. Both sets of gunite tanks are set on concrete saucers, with an associated dry well. Each tank has an array of inlet and outlet lines leading to valve pits and controls. Waste tanks W-13, W-14, and W-15 are underground stainless-steel tanks of approximately 2000-gal capacity each. These tanks are set inside a concrete cell with drainage to a dry well. This tankage is located in the center of the tank farm and includes a normal array of piping, valving, and controls.

(c) Current Condition - All of these storage tanks were emptied at the time they were removed from service. However, tanks W-3 and W-4 are known to collect surface water and must be routinely monitored. Only tanks W-1 and W-2 are documented as leaking, but the structural integrity of all the tanks is questionable. The conditions of the piping, valve pits, and controls for all the tanks are deteriorating with time.

(d) Radiological Hazards - The radiological condition of these tanks is generally unknown. It is estimated that curie quantities of ^{60}Co, ^{90}Sr, ^{106}Ru, ^{137}Cs, and ^{231}Pa are present in the tanks and piping, primarily in the form of surface contamination. The surface water that collects in tanks W-3 and W-4 becomes slightly contaminated after sitting in the tanks and is treated as LLLW. Soil contamination in the vicinity of tank W-1 has been documented.

(e) Occupancy - The tank farm is centrally located in the main ORNL complex, adjacent to several active facilities along a primary vehicle and pedestrian thoroughfare.

6. SECURITY/PROTECTION SYSTEMS:

The North Tank Farm is within the ORNL Bethel Valley secured area. The tank farm is posted with respect to access restrictions and radiation/ contamination zones.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

See Table 2 for details of routine maintenance activities.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

The schedule for decommissioning activities for these waste tanks is currently undefined. Routine M&S will be discontinued when these efforts are initiated. No repairs are anticipated prior to that time. However, tank deterioration or regulatory compliance may dictate site improvements before that time.

Table 1. Surveillance activities - Waste Storage Tanks W-1, W-2, W-3 W-4, W-13, W-14, and W-15

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. M&S site inspection	Weekly	EHP	M&S weekly check sheet	5 mh/y
2. Waste Tank Monitoring				125 mh/y
(a) Drains monitored	Continuously	EHP	WOCC records	
(b) Dry wells sampled	Monthly	EHP	WOCC records	
(c) Sample analysis	Monthly	ACh	WOCC records	
(d) Liquid levels monitored	Daily	EHP	WOCC records	
3. Radiological surveillance	As required	EHP	EHP, Radiation Protection sect. data base	20 mh/y
(a) Personnel monitoring during maintenance operations				

Table 2. Routine maintenance activities - Waste Storage Tanks W-1, W-2, W-3, W-4, W-13, W-14, and W-15

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine maintenance	As required	EHP/P&E	EHP records	10 mh/y
2. Transfer of surface drainage from W-3 and W-4 to LLLW system	As required	EHP	WOCC records	10 mh/y

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.07	$ 6K
Routine maintenance	0.01	1K
Supervisory oversight	0.04	3K
Total	0.12	$10K

Annual materials requirements	Cost
None	

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	6	6	7	7	7	7	7	7	7	7
Maintenance	1	1	1	1	1	1	1	1	1	1
Supervision	3	3	3	3	3	3	3	3	3	3
Materials	0	0	0	0	0	0	0	0	0	0
Repairs/ improvements	0	0	0	0	0	0	0	0	0	0
Total	10	10	11	11	11	11	11	11	11	11

DFDP - Radwaste Group

1. FACILITY NAME: Waste Storage Tank W-11

2. LOCATION: South of Site 3536 3. SERVICE DATES: 1943-1948

4. FACILITY STATUS: Inactive; controlled by Environmental and Health Protection Division (D. F. Hall)

5. FACILITY DESCRIPTION:

   (a) Operating History - Tank W-11 was used as a liquid waste collection and monitoring tank for various laboratories in Bldg. 3550. The stored waste was ultimately transferred to the ORNL LLLW system for processing. The tank was removed from service because of leaks.

   (b) Physical Description - This tank is a 1700-gal gunite-sprayed concrete vessel, located underground in a small tank farm with one active tank (W-12). In addition to the tanks, the farm contains an ejector pit, a subsurface liquid collection system, and a variety of interconnecting piping, valving, and controls.

   (c) Current Condition - Tank W-11 was emptied at the time it was removed from service. The extent of its structural deterioration is unknown. Due to the presence of the active tank (W-12) in this tank farm, the ejector pit and controls are actively maintained.

   (d) Radiological Hazards - The tank is believed to be highly contaminated internally, primarily with ^{90}Sr, ^{137}Cs, and ^{60}Co in curie quantities.

   (e) Occupancy - The tank is located in an active tank farm requiring periodic access by operating personnel. The farm is located in a central area of the main ORNL complex, although it is not along any major traffic thoroughfares.

6. SECURITY/PROTECTION SYSTEMS:

   Tank W-11 is within the ORNL Bethel Valley secured area. The tank farm is posted with respect to access restrictions and radiation/contamination zones.

7. SURVEILLANCE ACTIVITIES:

   Tank W-11 is equipped with a liquid level staff gauge which is monitored daily. The active tank in the tank farm is under continuous surveillance. No additional surveillance is provided for the abandoned tank.

8. ROUTINE MAINTENANCE:

   The active tank farm is maintained by the ORNL Waste Operations Department. No additional maintenance is provided for the abandoned tank.

Table 1. Surveillance activities - Waste Storage Tank W-11

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Waste tank monitoring				75 mh/y
(a) Liquid level monitored	Daily	EHP	WOCC records	

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

The schedule for decommissioning activities for the waste tanks (including W-11) is currently undefined. Routine M&S will be discontinued when these efforts are initiated. No repairs are anticipated prior to that time.

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.04	$3K
Routine maintenance	0.00	0K
Supervisory oversight	0.01	1K
Total	0.05	$4K

Annual materials requirements	Cost
None	

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	3	3	3	3	3	3	3	3	3	3
Maintenance	0	0	0	0	0	0	0	0	0	0
Supervision	1	1	1	1	1	1	1	1	1	1
Materials	0	0	0	0	0	0	0	0	0	0
Repairs/ improvements	0	0	0	0	0	0	0	0	0	0
Total	4	4	4	4	4	4	4	4	4	4

DFDP - Radwaste Group

1. FACILITY NAME: Waste Storage Tanks TH-1, TH-2, and TH-3

2. LOCATION: South of Building 3503 (Bethel Valley)

3. SERVICE DATES: 1952-1970

4. FACILITY STATUS: Inactive; controlled by Environmental and Health Protection Division (D. F. Hall)

5. FACILITY DESCRIPTION:

(a) Operating History - Tanks TH-1, TH-2, and TH-3 were used as liquid waste collection and transfer tanks for the Thorium Pilot Plant projects in Bldg. 3503. The tanks were removed from service because there were no requirements for their use.

(b) Physical Description - These tanks are all underground stainless steel vessels, with a combined capacity of approximately 8000 gal. The three tanks are located on the north end of an active tank farm containing four other tanks. Associated with this farm is a pump pit, valving stations, and instrumented controls. All but two of the tanks in the farm (TH-1 and WC-9) are constructed on concrete drainage pads with adjacent dry wells.

(c) Current Condition - All three inactive storage tanks were emptied at the time of service termination. Their structural integrity is unknown, although they are believed to be sound. Due to the presence of the active tanks in this farm, the pump pit and controls are actively maintained.

(d) Radiological Hazards - The tanks and associated piping are contaminated internally, primarily with thorium and its daughters. The extent of residual contamination is not well known, but the activity is believed to be in curie amounts.

(e) Occupancy - The tanks are located in an active tank farm requiring periodic access by operating personnel. The farm is located in a semi-remote area of the main ORNL complex, with minimal non-operating personnel access.

6. SECURITY/PROTECTION SYSTEMS:

This tank farm is within the ORNL Bethel Valley secured area. The farm is posted with respect to access restrictions and radiation/contamination zones.

7. SURVEILLANCE ACTIVITIES:

The active tanks in the tank farm are under continuous surveillance. No additional surveillance is provided for the abandoned tanks.

8. ROUTINE MAINTENANCE:

The active tank farm is maintained by the ORNL Waste Operations Department. No additional maintenance is provided for the abandoned tanks.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

The schedule for decommissioning activities for the waste tanks (including TH-1, TH-2, and TH-3) is currently undefined. Routine M&S will be discontinued when these efforts are initiated. No repairs are anticipated prior to that time.

DFDP - Radwaste Group

1. FACILITY NAME: Waste Storage Tank TH-4

2. LOCATION: Southwest of Building 3500 (Bethel Valley)

3. SERVICE DATES: 1952-1970

4. FACILITY STATUS: Inactive; controlled by Environmental and Health Protection Division (D. F. Hall)

5. FACILITY DESCRIPTION:

(a) Operating History - Tank TH-4 was used to collect and transfer radioactive waste solutions from irradiated thorium and uranium pilot plant projects in Bldg. 3503 to the LLLW process system. The tank was removed from service because its use was no longer required.

(b) Physical Description - The tank is an underground, gunite-sprayed concrete vessel of approximately 4000-gal capacity. The transfer lines, valving, and controls are located in the tank farm south of Bldg. 3503. The tank is set on a concrete basin, with an associated drainage dry well.

(c) Current Condition - The tank is filled with an alkaline thorium and uranium sludge resulting from precipitated waste solutions over the years of operation. The tank is believed to be structurally sound, with no known leakage problems. The valving and controls are maintained as a part of the active 3503 tank farm.

(d) Radiological Hazards - The contained sludge in tank TH-4 is a combination of irradiated uranium and thorium and their daughters in curie quantities.

(e) Occupancy - The tank is located in a central area of the main ORNL complex, adjacent to several active facilities. Personnel access across the site is minimal.

6. SECURITY/PROTECTION SYSTEMS:

Tank TH-4 is within the ORNL Bethel Valley secured area. A metal lid has been installed to prevent unauthorized access.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

No routine maintenance activities are conducted at waste tank TH-4.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

The schedule for decommissioning activities for the waste tanks (including TH-4) is currently undefined. Routine M&S will be discontinued when these efforts are initiated. No repairs are anticipated prior to that time.

Table 1. Surveillance activities - Waste Storage Tank TH-4

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine surveillance	Weekly	EHP	M&S weekly check sheet	40 mh/y
2. Waste tank monitoring				60 mh/y
(a) Dry well sampling	Monthly	EHP	WOCC records	
(b) Sample analysis	Monthly	ACh	WOCC records	

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.05	$4K
Routine maintenance	0.00	0K
Supervisory oversight	0.01	1K
Total	0.06	$5K

Annual materials requirements	Cost
None	

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	4	4	4	4	4	4	4	4	4	4
Maintenance	0	0	0	0	0	0	0	0	0	0
Supervision	1	1	1	1	1	1	1	1	1	1
Materials	0	0	0	0	0	0	0	0	0	0
Repairs/ improvements	0	0	0	0	0	0	0	0	0	0
Total	5	5	5	5	5	5	5	5	5	5

DFDP - Radwaste Group

1. FACILITY NAME: Old Hydrofracture Facility

2. LOCATION: Site 7852 (Melton Valley) 3. SERVICE DATES: 1964-1980

4. FACILITY STATUS: Inactive; site controlled by Environmental and Health Protection Division (D. F. Hall)

5. FACILITY DESCRIPTION:

(a) Operating History - The Old Hydrofracture Facility was an experimental and operational plant for the injection of waste grout into a fractured shale formation. The experimental design was tested in 1964-1965 using dilute and concentrated waste solutions. Beginning in 1966, operational injections of concentrated liquid waste from the ORNL LLLW system were routinely made until facility shutdown in 1980. The plant was closed when the New Hydrofracture Facility, located just south of this site, was constructed.

(b) Physical Description - The facility consists primarily of an injection well approximately 1000 ft deep, five waste storage tanks, one waste pond, two emergency waste pits, four bulk storage tanks for cement and other solid constituents of the grout mix, waste and injection pumps, a waste/grout mixer, and assorted piping and other equipment. The wellhead, injection pumps, and mixer are enclosed in concrete cells.

(c) Current Condition - The facility structures are basically sound. In 1987 and 1988, extensive work was done to improve the condition of these structures. Metal covers were installed on all cell windows and hatches, all openings and penetrations were closed, and exterior surfaces, excluding the bulk storage tanks, were repainted. The emergency waste pits continue to collect water at a slow rate. This is believed to be coming from a floor drain in the building, indicating that a possible roof leak still exists. The bulk storage tanks are showing signs of accelerated corrosion but appear to be in a usable condition. The waste pond is believed to be structurally sound.

(d) Radiological Hazards - Although no detailed radiological characterization of the site has been conducted, it is known that portions of the site are significantly contaminated due to process operations. The contaminants are principally mixed fission and activation products (^{137}Cs, ^{90}Sr, ^{60}Co, etc.), with some trace amounts of transuranic isotopes. The primary areas of contamination are the surfaces and equipment in the injection/mixing cells and the waste pits and emergency pond. Isolated areas of contamination are known to exist underneath and immediately adjacent to the building, as well as associated with valve pits, waste pumps, and the transfer piping. The waste tanks are internally contaminated.

(e) Occupancy - The site is currently unoccupied in a remote location of the ORNL site, with minimal routine personnel access.

6. SECURITY/PROTECTION SYSTEMS:

The Old Hydrofracture Facility is in the ORNL Melton Valley restricted area, adjacent to the boundaries of SWSA 5. The building and grounds are posted with respect to access restrictions and radiation/ contamination zones.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

See Table 2 for details of routine maintenance activities.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

Decommissioning activities are currently planned for FY 1997. M&S funding will be discontinued when this project funding is in place. No repairs or improvements are anticipated prior to that time; however, the surface facilities will be closely inspected for further signs of serious degradation.

Table 1. Surveillance activities - Old Hydrofracture Facility

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine inspection		EHP	WOCC Records	150 mh/y
(a) Visual of site	Daily			
(b) Negative pressure in cells	Daily			
2. Waste tanks surveillance				150 mh/y
(a) Tank levels	Daily	EHP	WOCC records	
(b) Dry well sampling	Monthly	EHP	WOCC records	
(c) Sample analysis	Monthly	ACh	WOCC Records	
3. Radiological surveillance	As required	EHP	EHP, Radiation Protection sect. data base	10 mh/y
(a) Surveys for ground maintenance and preventive maintenance				
4. Groundwater surveillance	Annually	ESD	ESD memo	
(a) Monitoring wells sampling/reporting		ESD		90 mh/y
(b) Sample analysis		ACh		$ 6,000
5. Safety inspection	Semiannually	EHP	EHP memo	5 mh/y[a]
6. Fire safety inspection	Quarterly	LP	Inspection and protection report	4 mh/y[a]
7. Routine security patrol	Daily	LP	Daily security report	a
8. HEPA filter DOP testing	Semiannually (or after replacement)	QD	QD printout	6 mh/y[a]

[a]Costs are included in ORNL overhead charges. No direct DFDP funding is required.

Table 2. Routine maintenance activities - Old Hydrofracture Facility

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. General maintenance and repair	As required	EHP/P&E	EHP records	25 mh/y
2. Maintenance materials	Annually	EHP	EHP records	$1,000
3. Utilities	Annually	EHP	EHP records	$1,000

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.19	$22K
Routine maintenance	0.01	1K
Supervisory oversight	0.06	5K
Total	0.26	$28K

Annual materials requirements	Cost
Filters/miscellaneous supplies	$1K
Utilities	1K
Total	$2K

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	22	23	24	24	24	24	24	a	a	a
Maintenance	1	1	1	1	1	1	1	a	a	a
Supervision	5	5	5	5	5	5	5	a	a	a
Materials	2	2	2	2	2	2	2	a	a	a
Repairs/ improvements	0	0	0	0	0	0	0	a	a	a
Total	30	31	32	32	32	32	32	a	a	a

[a]No M&S costs will be incurred during site decommissioning activities.

DFDP - Reactor Group

1. FACILITY NAME: ORNL Graphite Reactor (OGR)

2. LOCATION: Building 3001 (Bethel Valley) 3. SERVICE DATES: 1943-1963

4. FACILITY STATUS: Inactive/occupied; building controlled by Environmental and Health Protection Division (M. K. Ford); facility open to public as a Registered National Historical Landmark

5. FACILITY DESCRIPTION:

(a) Operating History - The OGR was the first reactor constructed at ORNL, being placed in service in 1943, at a 1-MW power level. In 1944, improvements in the cooling system and fuel cladding allowed the power level to be increased to an average level of 3.6 MW. The reactor was successfully operated for 20 years and was shut down in November 1963. In September 1966, the OGR was designated as a National Historical Landmark.

(b) Physical Description - The OGR was an air-cooled, graphite-moderated and reflected, heterogeneous, natural-uranium-fueled reactor. The moderator assembly is a 24-ft cube of graphite blocks, with spaces allowed for experimental access, thermocouples, and fuel slugs. The fuel channels extend through the blocks for fuel loading and unloading operations as well as providing for coolant air flow. The assembly is surrounded by a 7-ft thick reinforced concrete shield. A subsurface water-filled canal was utilized in the handling of spent reactor fuel. This main reactor facility is housed in a 140 X 116 X 70-ft corregated metal structure.

Coolant air was supplied through underground concrete ducts to the inlet mainfold where it was routed through the fuel channels to the exhaust manifold. Exhaust air was then passed through underground concrete ducts to a filter house (Bldg. 3002) for HEPA filtration prior to exhaust through the fan house (Bldg. 3003) to a 200-ft concrete stack (Stack 3018).

(c) Current Condition - Boron-steel rods were inserted into the reactor at shutdown to assure that the reactor could not go critical and all control and safety rods were disabled. The fuel was removed in 1966. The facility is structurally sound, although some level of building deterioration is occurring, particularly in the fuel canal and ventilation duct areas. A negative pressure is maintained within the reactor, and the exhaust is vented through the stack. The fuel canal is being utilized for storage of various radioactive materials.

(d) Radiological Hazards - Although the fuel has been removed from the OGR, the reactor is contaminated with fission products, traces of plutonium, ^{14}C, and ^{55}Fe. Exposure levels at the face of the graphite assembly are in the range of 2-4 R/h. The fuel discharge canal is contaminated with fission products, both in the canal water and absorbed into the concrete walls.

The concrete exhaust air ducts, filter house, and fan house are contaminated, primarily with ^{137}Cs and ^{90}Sr (80-500 mR/h). The remainder of the facility (offices and public areas in Bldg. 3001) is generally uncontaminated, with only a few isolated and restricted areas of elevated activity.

(e) Occupancy - Most of the office and workshop areas in Bldg. 3001 are occupied by personnel from the Environmental and Health Protection Division, Plant and Equipment Division, and a few research groups. In addition, a large portion of the facility has been altered to allow public access to view the reactor face and ORNL visual displays. Maintenance of these occupied portions of the building is provided by other programs. The OGR is located in the northern portion of the main ORNL complex, adjacent to several active facilities.

6. SECURITY/PROTECTION SYSTEMS:

With the exception of the public viewing area, the OGR is within the ORNL Bethel Valley secured area. The building and grounds are posted with respect to access restrictions and radiation/contamination zones. The facility is protected by a fire alarm and sprinkler system.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

See Table 2 for details of routine maintenance activities.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

In order to reduce the spread of contamination into the OGR canal from the radioactive materials stored in it, these materials should be removed and disposed of in the ORNL Solid Waste Storage Area. This activity would consist of remote removal, packaging, and transport of the equipment and debris within the canal, and a general cleanup of the canal area. This work is in progress and will require approximately $70K for FY 1990. Sludge removal from the canal will be incorporated into the ORNL waste tank decommissioning project.

Table 1. Surveillance activities - ORNL Graphite Reactor

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine inspection		EHP	LITR - Bldg. 3001 shift check sheet (UCN 10593)	421 mh/y
(a) Visual of building	Daily			
(b) Waste container inspection	Daily			
(c) Elevator alarms	Weekly			
(d) Steam heater check (when applicable)	Daily			
(e) Containment negative pressure	Daily			
(f) Air blower check	Weekly			
(g) Auxiliary blower	Semiannually			
(h) Exhaust duct visual	Weekly			
(i) Exit duct inspection	Semiannually			
(j) Canal water level	Daily			
(k) Walkway inspection	Daily			
(l) Flow rate - isotope storage box	Weekly			
(m) Demineralizer Solubridge reading	Daily			
(n) Cation column radiation level	Weekly			
(o) Demineralizer pH, resistance and counts	Weekly			
(p) Radiation monitoring system check	Weekly			
2. Radiological surveillance		EHP	EHP, Radiation Protection sect. data base; Air Monitoring data sheet (UCN-3367)	170 mh/y
(a) Canal area surveillance	Weekly			
(b) Inspection of radiation monitors	3 times a week			

Table 1. (Continued)
Page 2

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
3. Instrumentation Inspection	Quarterly	I&C	I&C records	20 mh/y[a]
4. Safety inspection	Biannually	EHP	EHP memo	5 mh/y[a]
5. Fire safety inspection	Quarterly	LP	Inspection and protection report	4 mh/y[a]
6. Fire sprinkler system check	Annually	LP	Inspection report of sprinkler system	6 mh/y[a]
7. HEPA filter DOP testing	Semiannually (or after replacement)	QD	EHP printout (UCN-4556)	6 mh/y[a]
8. Overhead crane inspection	Annually	QD	QD memo	28 mh/y
9. Routine security patrol	Daily	LP	Daily security report	a

[a]Costs are included in ORNL overhead charges. No direct SFMP funding is required.

Table 2. Routine maintenance activities - ORNL Graphite Reactor

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. General maintenance and repair	As required	EHP/P&E	EHP records	120 mh/y
2. Exhaust filter changes	Annually (or as required)	EHP	QD records	60 mh/y
3. Regenerate demineralizer	As required	EHP	EHP records	35 mh/y
4. Health physics instrument/ maintenance repair	As required	EHP	Program maintenance records	85 mh/y
5. Maintenance of heating/cooling systems	Quarterly (or as required)	P&E	P&E Report 1216	80 mh/y
6. Maintenance of building cranes	Annually	P&E	P&E Report 1216	36 mh/y
7. Maintenance materials	Annually	EHP	EHP records	$ 6,000
8. Liquid LLW disposal	Annually	EHP	EHP records	$30,000

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.26	$26K
Routine maintenance	0.18	18K
Supervisory oversight	0.40	40K
Total	0.84	$84K

Annual materials requirements	Cost
Filters/miscellaneous supplies	$13K
LLLW disposal	30K
Total	$43K

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	26	27	28	28	28	28	28	28	28	28
Maintenance	18	19	20	20	20	20	20	20	20	20
Supervision	40	42	43	43	43	43	43	43	43	43
Materials	43	45	47	47	47	47	47	47	47	47
Repairs/ improvements	70	—	—	—	—	—	—	—	—	—
Total	197	133	138	138	138	138	138	138	138	138

DFDP - Reactor Group

1. FACILITY NAME: Low-Intensity Test Reactor (LITR)

2. LOCATION: Building 3005 (Bethel Valley) 3. SERVICE DATES: 1951-1968

4. FACILITY STATUS: Inactive/occupied; building controlled by Environmental and Health Protection Division (M. K. Ford)

5. FACILITY DESCRIPTION:

(a) Operating History - In 1951, the LITR was converted from a hydraulic mockup of the materials testing reactor (later built in (Idaho) to an operating reactor for the purpose of supplying a variety of irradiation facilities for ORNL and other research groups. The LITR was a water-moderated- and cooled-reactor using enriched uranium as fuel and beryllium as a reflector. The reactor was originally designed for 500-kW power level but was converted to a 3-MW testing reactor prior to permanent shutdown in 1968.

(b) Physical Description - The LITR tank is made up of five cylindrical steel and aluminum sections, connected by gasketed flanges, and contains the reactor controls, coolant pipes and the reactor internals. All but the lowest tank section is above ground. The enclosure for the reactor is not an integral building but is a composite of essentially independent rooms built on an as-required basis. The facility is primarily of steel and corregated-metal construction with dimensions of approximately 70 X 62 X 57 ft. As the reactor passed through stages from hydraulic testing reactor to a training and test reactor, shielding was added consisting of a thin layer of borated plastic surrounded by loose-stacked concrete blocks and river sand (10-ft thick total). Heat dissipation for the final design was provided by two 1 MW water-to-air heat exchangers and one 1-MW water-to-water heat exchanger (Site 3077). Two 18,000-gal retention ponds, originally used for holdup of slightly contaminated waste water were located 350 ft east of the reactor building. These ponds were filled in and stabilized in 1970.

(c) Current Condition - The LITR fuel was removed as part of the reactor shutdown. However, the beryllium reflector and other reactor vessel components still remain in the vessel. A slight negative pressure is continuously maintained in the building, with exhaust routed to the Bulk Shielding Reactor (BSR) off-gas system. Those portions of the facility not normally occupied are gradually deteriorating with time.

(d) Radiological Hazards - As mentioned above, all the internal radioactive and contaminated components of the reactor (except the fuel and shim rods) are still in place. Interior surfaces of the reactor tank and primary water piping are contaminated with radioactive corrosion products and traces of long-lived fission products. It is suspected that the concrete-block- and sand-shielding materials are contaminated and contain some quantities of induced radioactivity due to neutron leakage around the borated plastic shield. All areas of the building that are normally occupied are uncontaminated and outside any radiation zones.

(e) Occupancy - The east and west rooms and the old control room are currently being utilized on a full-time basis by the P&E Division and the I&C Division as shops. Maintenance of these occupied areas is provided by other programs. The LITR is located on the north side of the main ORNL complex, adjacent to several active facilities.

6. SECURITY/PROTECTION SYSTEMS:

The LITR is within the ORNL Bethel Valley secured area. The building and grounds are posted with respect to access restrictions and radiation/contamination zones. The facility is protected by a fire sprinkler system.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

See Table 2 for details of routine maintenance activities.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

No repairs or improvements are anticipated at the LITR through the planning period.

Table 1. Surveillance activities - Low-Intensity Test Reactor

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine inspection		EHP	LITR - Building 3001 shift checksheet (UCN 10593)	421 mh/y
(a) Visual of building	Daily			
(b) Steam heater check (when applicable)	Daily			
(c) Absolute filter pressure drop	Daily			
(d) Radiation monitoring system check	Daily			
2. Radiological surveillance		EHP		
(a) Smear surveys of reactor bay and shops	Weekly		EHP, Radiation Protection sect. data base	85 mh/y
(b) Inspection of radiation monitors	Weekly		Air-monitoring data sheet (UCN-3367)	85 mh/y
3. Off-gas monitoring (BSR)	Continuous	EHP	WOCC records	a
4. Safety inspection	Semiannually	EHP	EHP memo	5 mh/y[a]
5. Fire safety inspection	Quarterly	LP	Inspection and protection report	4 mh/y[a]
6. Fire sprinkler system check	Annually	LP	Inspection report of sprinkler system	6 mh/y[a]
7. HEPA filter DOP testing (BSR)	Semiannually (or after replacement)	QD	EHP printout	16 mh/y[a]
8. Overhead crane inspection	Annually	QD	QD memo	32 mh/y[a]
9. Routine security patrol	Daily	LP	Daily security report	a

[a]Costs are included in ORNL overhead charges. No direct SFMP funding is required.

Table 2. Routine maintenance activities - Low-Intensity Test Reactor

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. General maintenance and repair	As required	EHP/P&E	EHP records	172 mh/y
2. Health physics instrument maintenance repair	Quarterly (or as required)	EHP	Program maintenence records	40 mh/y
3. Maintenance of heating/cooling systems	Quarterly (or as required)	P&E	P&E Report 1216	80 mh/y
4. Maintenance of overhead bridge crane	Semiannually	P&E	P&E Report 1216	40 mh/y
5. Maintenance materials	Annually	EHP	EHP records	$13,000
6. Utilities	Annually	EHP	EHP records	$15,000

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.26	$26K
Routine maintenance	0.15	$15K
Supervisory oversight	0.09	$ 9K
Total	0.50	$50K

Annual materials requirements	Cost
Filters/miscellaneous supplies	$13,000
Utilities	$15,000
Total	$28,000

Anticipated major repairs/improvements

None

(b) Projected resource requirements by year of expenditure

Task	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	26	27	28	28	28	28	28	28	a	a
Maintenance	15	16	16	16	16	16	16	16	a	a
Supervision	9	9	10	10	10	10	10	10	a	a
Materials	28	29	30	30	30	30	30	30	a	a
Repairs/ improvement	—	—	—	—	—	—	—	—	—	—
Total	78	81	84	84	84	84	84	84	a	a

[a]No M&S costs will be incurred during site decommissioning activities.

DFDP - Reactor Group

1. FACILITY NAME: Homogeneous Reactor Experiment (HRE)

2. LOCATION: Building 7500 (Melton Valley) 3. SERVICE DATES: 1957-1961

4. FACILITY STATUS: Inactive/occupied; building controlled by Environmental and Health Protection Division (M. K. Ford)

5. FACILITY DESCRIPTION:

(a) Operating History - This facility was originally constructed (1951) to house the HRE-1, the first of two experimental aqueous homogeneous reactors to be developed for nuclear power application analysis. In 1953, a decision was made to replace HRE-1 with a new experiment (HRE-2), and the second reactor was constructed during 1953-1956. The HRE-2 was a two-region reactor containing 93% enriched ^{235}U [U_2SO_4 + $CUSO_4$ + D_2SO_4 in heavy water (D_2O)] as the fuel, surrounded by a blanket region of D_2O. The reactor, which included an on-line chemical processing plant, reached criticality in 1957, operating for most of its active life at a nominal full-power level of 5 MW. Shortly after full-power operation was achieved, a hole developed in the reactor core tank, allowing mixing between the fuel and blanket regions. After extensive repair efforts failed, the reactor continued to operate with fuel in both regions. The reactor was shut down in April 1961 after approximately 16,295 MWh of operation.

(b) Physical Description - The HRE-2 was a complex experimental reactor system principally housed in three below-grade steel-lined concrete cells, within a steel and reinforced-concrete structure (90 X 105 X 42 ft high). The reactor cell contained the fuel and blanket systems, consisting of the reactor vessel, high-and-low pressure circulating loops, heat exchangers, and an off-gas handling system. A portion of the fuel flow was circulated through the chemical processing plant, also located in shielded cells, providing continuous removal of impurities from the fuel solution. Process liquid waste was handled and treated at the HRE through a system of underground stainless steel tanks, a separate concrete waste-evaporator building (Bldg. 7502), and an unlined earthen 300,000-gal storage pond. Gaseous wastes were treated in the main building and vented through a 100-ft steel stack. Primary reactor heat removal was through a steam-to-air heat exchanger located on the building roof. Auxiliary heat dissipation was provided by a wooden water-to-air heat exchanger, located west of the reactor building (Site 7554).

(c) Current Condition - During 1961-1962, the reactor fuel and heavy water were recovered from the system and the facility placed in standby condition. Portions of the reactor core vessel were removed in late 1962 for studies. The reactor, chemical plant, and the auxiliary systems remain as left at that time. A portion of the chemical process cells have been altered to accommodate other research programs during the period from 1963 to the present. The reactor building is structurally sound, with only isolated areas

of deterioration. The liquid-waste storage pond has been filled and covered with asphalt to reduce radionuclide transport. However, the condition of the storage pond, as well as the other ancillary facilities (waste evaporator, cooling tower, and decontamination pad), is deteriorating over time.

(d) Radiological Hazards - The most highly contaminated portions of the reactor system are located in the reactor cell. This cell was routinely flooded during maintenance operations, resulting in widespread contamination of cell walls and equipment surfaces. Exposure levels up to 600 R/h have been measured in the cell area. The contaminants are believed to be primarily ^{90}Sr and ^{137}Cs. The estimated inventory of fission and corrosion products remaining in the process piping is 30-40 kg. Personnel accessible areas outside the reactor and process cells are relatively free of contamination, with only isolated areas of elevated activity remaining. Of the ancillary facilities, the waste evaporator and holding pond are known to contain significant quantities of radionuclides but have not been adequately characterized to date.

(e) Occupancy - Offices in the main building are currently occupied by members of the P&E Division. Maintenance funds for these areas are provided by that division for upkeep and operation of the part of the facility it occupies. The site is in a remote location of the ORNL site, with minimal nonroutine personnel access.

6. SECURITY/PROTECTION SYSTEMS:

The HRE is in the ORNL Melton Valley restricted area. The buildings and grounds are posted with respect to access restrictions and radiation/contamination zones. The building is protected by a fire alarm and sprinkler system.

7. SURVEILLANCE ACTIVITIES:

See Table 1 for details of surveillance activities.

8. ROUTINE MAINTENANCE:

See Table 2 for details of routine maintenance activities.

9. ANTICIPATED REPAIRS/IMPROVEMENTS:

Decommissioning is currently scheduled in the FY 1992-1995 timeframe. M&S funding will be discontinued when this project funding is in place.

Table 1. Surveillance activities - Homogeneous Reactor Experiment

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. Routine inspection		EHP	Surveillance check list for the HRE	286 mh/y
(a) Visual of building	Monthly			
(b) Sump pumps operation	Monthly			
(c) Sumps activity levels	Monthly			
(d) 12,000-gal waste tank activity level	Monthly			
(e) 12,000-gal waste tank liquid level	Monthly			
(f) 1,000-gal waste tank liquid level	Monthly			
(g) Off-gas filter pressure drop	Monthly			
(h) Storage pool radiation level	Monthly			
(i) Storage pool water level	Monthly			
(j) Auxillary containment fan check	Monthly			
(k) Air compressor check	Monthly			
(l) Main containment fan check	Monthly			
2. Radiological surveillance		EHP	EHP, Radiation Protection sect. data base	100 mh/y
(a) Smear surveys of reactor bay and offices	Monthly			
(b) Surveillance of maintenance activities and material transfers	As required			
3. Groundwater surveillance	Annually	ESD	ESD memo	
(a) Monitoring wells sampling/reporting		ESD		90 mh/y
(b) Sample analysis		ACh		$6,000

Table 1. (Continued)
Page 2

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
4. Safety inspection	Semiannually	EHP	EHP memo	5 mh/y[a]
5. Fire safety inspection	Quarterly	LP	Inspection and protection report	8 mh/y[a]
6. Fire sprinkler system test	Annually	LP	Inspection report of sprinkler system	6 mh/y[a]
7. HEPA filter DOP testing	Semiannually (or after replacement)	QD	EHP printout	8 mh/y[a]
8. Overhead crane inspection	Annually	QD	QD memo	28 mh/y[a]
9. Routine security patrol	Daily	LP	Daily security report	a

[a]Costs are included in ORNL overhead charges. No direct SFMP funding is required.

Table 2. Routine maintenance activities - Homogeneous Reactor Experiment

Activity	Frequency	Responsibility	Documentation	Manpower/ resource requirement
1. General maintenance and repair	As required	EHP/P&E	EHP records	300 mh/y
2. Exhaust filter changes	Every 5 years (or as required)	EHP	QD printout	140 mh/y[a]
3. Health physics instrument maintenance/repair	Quarterly (or as required)	EHP	Program maintenance records	100 mh/y
4. Maintenance of heating/cooling systems	Quarterly (or as required)	P&E	P&E Report 1216	40 mh/y
5. Maintenance of overhead bridge crane	Semiannually	P&E	P&E Report 1216	51 mh/y
6. Maintenance materials	Annually	EHP	EHP records	$ 3,000
7. Utilities	Annually	EHP	EHP records	$10,300

[a]Costs are included in ORNL overhead charges. No direct DFDP funding is required.

10. COST AND SCHEDULE:

(a) Annualized costs

Annual manpower requirements	Man-Years	Cost
Surveillance activities	0.21	$21K
Routine maintenance	0.22	22K
Supervisory oversight	0.25	25K
Total	0.68	$68K

Annual materials requirements	Cost
Filters/miscellaneous supplies	$ 9K
Utilities	$10K
Total	$19K

Anticipated major repairs/improvements

None

*This cost includes sample analysis of groundwater for monitoring wells.

(b) Projected resource requirements by year of expenditure

Task	Fiscal year cost ($ X 10^3)									
	90	91	92	93	94	95	96	97	98	99
Surveillance	21	22	a	a	a	a				
Maintenance	22	23	a	a	a	a				
Supervision	25	26	a	a	a	a				
Materials	19	20	a	a	a	a				
Repairs/ improvements	—	—	—	—	—	—	—	—	—	—
Total	87	91	a	a	a	a				

[a]No M&S costs will be incurred during site decommissioning activities.

INTERNAL DISTRIBUTION

1. J. F. Alexander
2. J. W. Autrey
3. L. D. Bates
4. K. S. Belitz
5. W. A. Boegly
6. H. M. Braunstein
7-10. T. W. Burwinkle
11. H. M. Butler, Jr.
12. G. H. Coleman
13. B. L. Corbett
14. K. W. Cook
15. T. L. Dahl, Sr.
16. J. R. DeVore
17. W. A. Duggins
18. M. K. Ford
19. H. R. Gaddis
20. S. B. Garland II
21. D. F. Hall
22. J. L. Hammontree
23. R. L. Hendren
24. L. D. Hyde
25. L. L. Kaiser
26. J. R. Lawson
27. G. J. Mandry
28. L. E. McNeese
29. T. E. Myrick
30. T. J. Newsom
31. C. E. Nix
32 G. W. Oliphant
33-36. P. T. Owen
37. K. H. Poteet
38. L. P. Pugh
39. T. H. Row
40. T. F. Scanlan
41. C. B. Scott
42. B. P. Spalding
43. J. H. Swanks
44. J. R. Trabalka
45. L. D. Voorhees
46. Laboratory Records - RC
47. Laboratory Records
48. ORNL Patent Section
49. Central Research Library
50. ORNL Y-12 Technical Library

EXTERNAL DISTRIBUTION

51. Office of Assistant Manager for Energy Research and Development, U.S. Department of Energy, Oak Ridge Operations, Post Office Box 2001, Oak Ridge, Tennessee 37831-8610

52-53. Office of Scientific and Technical Information, Post Office Box 62, Oak Ridge, Tennessee 37831

54-58. R. D. Freeberg, Program Manager, Defense Facilities Decommissioning Program Office, Richland Operations, U. S. Department of Energy, Post Office Box 550, Richland, Washington 99352

59-60. W. E. Murphie, Office of Remedial Action and Waste Technology, Division of Facility and Site Decommissioning, U.S. Department of Energy, 19901 Germantown Road, Route 270 & 18, Germantown, Maryland 20874

61. R. D. Glenn, Bechtel National, Inc., P.O. Box 350, Oak Ridge, Tennessee 37831-0350