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Draft A

Removal Action Report for the 105-DR and 105-F Building Interim Safe Storage Projects and Ancillary Buildings

United States
Department of Energy
P.O. Box 550
Richland, Washington 99352

For External Review

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ACRONYMS

ACM	asbestos-containing material
AHA	activity hazards analysis
ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
BARCT	best available radionuclide control technology
BHI	Bechtel Hanford, Inc.
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
CWC	Central Waste Complex
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DQO	Data Quality Objectives
Ecology	Washington State Department of Ecology
EE/CA	engineering evaluation/cost analysis
EPA	U.S. Environmental Protection Agency
ERC	Environmental Restoration Contractor
ERDF	Environmental Restoration Disposal Facility
ETF	Effluent Treatment Facility
FEIS	final environmental impact statement
FSB	fuel storage basin
FSP	field sampling plan
HASP	health and safety plan
HCR	horizontal control rod
ISS	interim safe storage
LSFF	105-DR Large Sodium Fire Facility
MCL	maximum contaminant levels
MITUS	Mobile Integrated Temporary Utility System
MTCA	*Model Toxics Control Act*
NEPA	*National Environmental Policy Act of 1969*
PCB	polychlorinated biphenyl
PHMC	Project Hanford Management Contractor
PMII	project manager's implementing instructions
PPE	personal protective equipment
QAPjP	Quality Assurance Project Plan
RA	readiness assessment
RAR	removal action report
RCRA	*Resource Conservation and Recovery Act of 1976*
RESRAD	Residual Radioactivity Dose Model
RL	U.S. Department of Energy, Richland Operations Office
RWP	radiological work permit
S&M	surveillance and maintenance
SAP	sampling and analysis plan

ACRONYMS (continued)

SSE	safe storage enclosures
SS HASP	site-specific health and safety plan
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
TSCA	*Toxic Substances Control Act of 1976*
TSD	treatment, storage, and disposal
VSR	vertical safety rod
WAC	*Washington Administrative Code*

METRIC CONVERSION CHART

The following conversion chart is provided to aid the reader in conversion.

Into Metric Units

If You Know	*Multiply By*	*To Get*
Length		
inches	25.4	millimeters
inches	2.54	centimeters
feet	0.305	meters
yards	0.914	meters
miles	1.609	kilometers
Area		
sq. inches	6.452	sq. centimeters
sq. feet	0.093	sq. meters
sq. yards	.0836	sq. meters
sq. miles	2.6	sq. kilometers
acres	0.405	hectares
Mass (weight)		
ounces	28.35	grams
pounds	0.454	kilograms
ton	0.907	metric ton
Volume		
teaspoons	5	milliliters
tablespoons	15	milliliters
fluid ounces	30	milliliters
cups	0.24	liters
pints	0.47	liters
quarts	0.95	liters
gallons	3.8	liters
cubic feet	0.028	cubic meters
cubic yards	0.765	cubic meters
Temperature		
Fahrenheit	subtract 32, then multiply by 5/9	Celsius

Out of Metric Units

If You Know	*Multiply By*	*To Get*
Length		
millimeters	0.039	inches
centimeters	0.394	inches
meters	3.281	feet
meters	1.094	yards
kilometers	0.621	miles
Area		
sq. centimeters	0.155	sq. inches
sq. meters	10.76	sq. feet
sq. meters	1.196	sq. yards
sq. kilometers	0.4	sq. miles
hectares	2.47	acres
Mass (weight)		
grams	0.035	ounces
kilograms	2.205	pounds
metric ton	1.102	ton
Volume		
milliliters	0.033	fluid ounces
liters	2.1	pints
liters	1.057	quarts
liters	0.264	gallons
cubic meters	35.315	cubic feet
cubic meters	1.308	cubic yards
Temperature		
Celsius	multiply by 9/5, then add 32	Fahrenheit

1.0 INTRODUCTION

This document is the removal action report (RAR) for the 105-DR and 105-F Reactor Buildings and ancillary facilities[1]. These buildings and facilities are located in the 100-D/DR and 100-F Areas of the Hanford Site in Benton County, Washington, which is owned and operated by the U.S. Department of Energy (DOE). The 100 Areas (including 100-D/DR and 100-F Areas) of the Hanford Site were placed on the U.S. Environmental Protection Agency's (EPA) National Priorities List under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). DOE has determined that hazardous substances in the 105-DR and 105-F Reactor Buildings and four ancillary facilities present a potential threat to human health or the environment. DOE has also determined that a non-time critical removal action is warranted at these facilities.

Alternatives for conducting a non-time critical removal action were evaluated in the *Engineering Evaluation/Cost Analysis (EE/CA) for the 105-DR and 105-F Reactor Facilities and Ancillary Facilities* (DOE-RL 1998a). The evaluation resulted in the recommendation to decontaminate and demolish the contaminated reactor buildings (except for the reactor blocks) and the ancillary facilities and to construct a safe storage enclosure over the reactor blocks. The recommendation was approved in an action memorandum (Ecology et. al 1998) signed by the Washington State Department of Ecology (Ecology) and the EPA. Ecology is the lead regulatory agency for facilities in the 100-D/DR Area, and EPA is the lead regulatory agency for facilities in the 100-F Area. This RAR supports implementation of the non-time critical removal action.

1.1 PURPOSE AND OBJECTIVE OF THE REMOVAL ACTION REPORT

The purpose of this RAR is to establish the methods to perform decontamination and decommissioning (D&D) activities and the supporting functions associated with facility modifications and waste disposal of the 105-DR Reactor Building, the 105-F Reactor Building, and four ancillary buildings. This RAR is prepared in accordance with Section 7.2.4 of the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1990) and also satisfies the requirement in the action memorandum (Ecology et. al 1998) for DOE to submit a RAR that outlines compliance with applicable regulations and enforceable schedule for closing the 105-DR Large Sodium Fire Facility (LSFF), which is a treatment, storage, and disposal (TSD) unit addressed by this removal action.

This RAR describes tasks required and the implementation processes used to accomplish these activities. This RAR additionally identifies applicable or relevant and appropriate regulations (ARARs) and other materials to be considered such as regulatory guidelines, applicable DOE orders, and procedures that will be used to direct and control the work activities. This document will serve as the decommissioning plan and project management plan for the 105-DR and 105-F Interim Safe Storage (ISS) Projects.

[1] The term "facilities" is used generically to encompass all the structures, buildings, tunnels, piping, etc., associated with the buildings. However, with regard to the reactor buildings (i.e., 105-F and 105-DR), the reactor blocks are not included with the removal action.

The intent of this document is to identify the basis and provide guidance for preparation of work packages for the project tasks. Using the most recent information concerning facility conditions, field-level work packages will be developed to direct work activities and instruct workers in the most applicable work methods. Existing procedures (as well as specifically developed instructions) will be used to perform and control the facility removal and disposal actions.

The 105-DR and 105-F ISS and ancillary building project schedule, which encompasses the work scope to project completion, presents the logical progression of events and estimated durations for each activity. The project schedule, included as Appendix A, is presented by fiscal year and the resources with associated costs will be presented by activity.

1.2 SCOPE AND OBJECTIVES OF THE REMOVAL ACTION

The primary goal of CERCLA removal actions is to minimize or eliminate threats to public health or the environment caused by the presence of hazardous substances. The EE/CA for the 105-DR and 105-F Reactor Buildings and ancillary facilities (DOE-RL 1998a) presents three alternative approaches for future facility management and the resulting levels of protection of public health and the environment that may be anticipated. Based on the evaluation, the ISS of the reactors and D&D of ancillary facilities were recommended as the most responsive approach to ensure protection of human health and the environment. The selection and approval of this approach is documented in the action memorandum (Ecology et al. 1998) for the 105-F and 105-DR Reactor Buildings and ancillary facilities.

The scope of the approved removal action includes the 105-F and 105-DR Reactor Buildings (except for the reactor blocks) and the four ancillary facilities, all of which are described in Section 1.2. The 116-DR Exhaust Air Stack, 117-DR Exhaust Filter Building, 119-DR Exhaust Air Sample Building and associated ducting/tunnels, and 116-D Exhaust Air Stack are included in this removal action. Of the four ancillary buildings and facilities, two (116-DR Exhaust Air Stack and 117-DR Exhaust Filter Building) are included within the boundaries of the LSFF TSD unit, which must be closed under authority of the *Resource Conservation and Recovery Act of 1976* (RCRA). Although each of the four ancillary facilities is addressed in this document, each facility has a separate budget from the 105-DR ISS Project. The D&D of the 105-DR ancillary buildings/structures and TSD unit closure will occur before completion of the 105-DR ISS project.

Stabilization, partial demolition, and disposal will reduce the potential hazards to public health or the environment that are currently posed by the 105-DR and 105-F Reactor Buildings and ancillary facilities. Waste products generated by the D&D and safe storage activities will be separated into a variety of waste streams, each of which will be disposed at appropriate disposal facilities.

Future cleanup will be conducted when other remedial action sites are addressed in the 100-FR-1, 100-DR-1, and 100-DR-2 operable units. The respective footprints of the reactor buildings, ancillary facilities, and the affected surrounding terrain will be backfilled after completion of the removal action if the cleanup standards (see Sections 4.1 and 5.7) are met. Site restoration will be coordinated with remedial actions and 100-F, 100-D, and 100-DR Area restoration actions. Characterization information for these areas will be generated to document the status of conditions at the conclusion of this project.

Based upon the selected alternative, the removal action objectives are as follows:

- To the extent practicable, reduce potential future releases of hazardous substances contained within facilities to acceptable protection levels established in ARARs.
- Protect workers from the hazards posed by these facilities.
- Prevent adverse impact to cultural resources and threatened or endangered species.
- Safely manage (treat or dispose) waste streams generated by the removal action.
- Reduce or eliminate the need for future surveillance and maintenance (S&M) activities.
- Coordinate clean closure of the TSD unit (at the 105-DR Reactor Building) and place the 105-DR Reactor Building into ISS.
- Place the 105-F Reactor Building into ISS.
- Coordinate with the Bechtel Hanford, Inc., Remedial Action/Waste Disposal group to address waste sites that may interfere with the disposition of the 105-DR and 105-F Reactor Buildings or ancillary facilities.

Section 1.3 provides a facility history and a description of each of the buildings and facilities covered by the removal action.

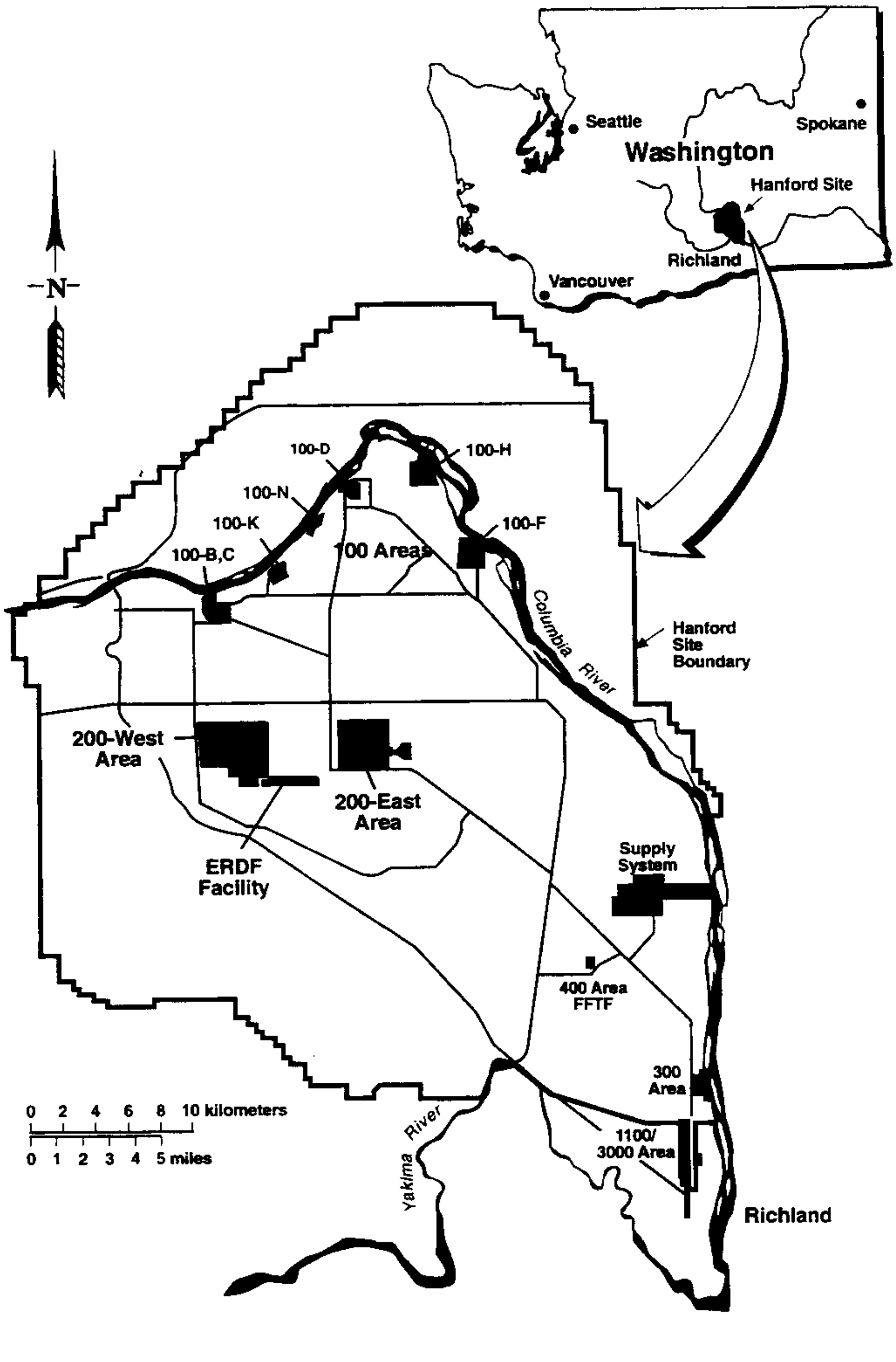
1.3 FACILITY HISTORY AND DESCRIPTION

1.3.1 Facility History

The reactor buildings, designated as the 105-F or F Reactor, and the 105-DR or DR Reactor, were two of the nine water-cooled, graphite-moderated reactors constructed in the Hanford Site's 100 Areas (Figure 1-1) by the U.S. Government to support the plutonium production effort initiated in 1942. The reactors were located along the southern bank of the Columbia River in southeastern Washington State. Construction of the 105-F Reactor began December 1943; operations began in February 1945, and the reactor was shut down in June 1965. Construction of the 105-DR Reactor began December 1947; operations began in October 1950, and the reactor was shut down in December 1964. The 105-F and 105-DR Reactors were placed in final shutdown mode and declared surplus by DOE, and D&D will be performed on each of the reactors.

On May 16, 1985, DOE published in the *Federal Register* (50 FR 20489) a "Notice of Intent to Prepare an Environmental Impact Statement on Decommissioning the Eight Shutdown Production Reactors Located at the Hanford Site Near Richland, Washington."

Figure 1-1. Hanford Site Map.



In December 1992, a final environmental impact statement (FEIS) (DOE 1992a) was issued, which analyzed five decommissioning alternatives for the eight shutdown reactors. The FEIS recommended safe storage of the reactors, followed by deferred one-piece removal of the reactor blocks. In September 1993, a Record of Decision (58 FR 48509) documented the selection of the safe storage/deferred removal alternative for all the 100 Areas' surplus production reactors, except for the 105-N Reactor. The 105-N Reactor was placed in permanent closure in 1991 (DOE-RL 1995b) and, therefore, was not included in the FEIS (DOE 1992a).

1.3.2 Facility Descriptions

1.3.2.1 105-F and 105-DR Reactor Buildings. The 105-F and 105-DR Reactor Buildings are reinforced-concrete and concrete block structures with steel framing. The lower levels of the buildings and central portions surrounding the reactor blocks are constructed of reinforced-concrete walls, 0.9- to 1.5-m thick. Each reactor building includes the following components:

- Reactor block
- Fuel storage basin (FSB)
- Inner and outer horizontal control rod (HCR) rooms
- Vertical safety rod (VSR) winch level
- Front face work area
- Fans and ducts for air ventilation and recirculating inert gas systems, including water cooling systems
- Supporting offices, shops, and laboratories.

Figures 1-2 and 1-3 show the layout of the buildings at ground level, including some of the areas described above. The outside dimensions of the 105-F Reactor Building are approximately 82.7 by 95.8 by 28.4 m high. The outside dimensions of the 105-DR Reactor Building are approximately 82.7 by 95.8 by 32.0 m high. The existing roof panels were removed from the process area, D elevator, and front face work area in 1994-1995 and were replaced with steel-roof decking secured to existing roof framing and concrete walls. The new steel-roof decking was covered with foam and two applications of silicone rubber. The 105-F FSB and adjoining transfer bay roofs were replaced with a similar roof in 1993.

The internal layouts of retired 100 Areas' reactors are typically defined in terms of areas. The areas are identified as follows:

- Module 1 - the general ancillary area of the 105-F and 105-DR Reactor Buildings that is outside of the shield walls

- Module 2 - the area within the shield walls, including the reactor blocks

- The FSB areas

- Ancillary buildings.

Figure 1-2. Floor Plan Layout at Ground Level of the 105-DR Facility Reactor Building.

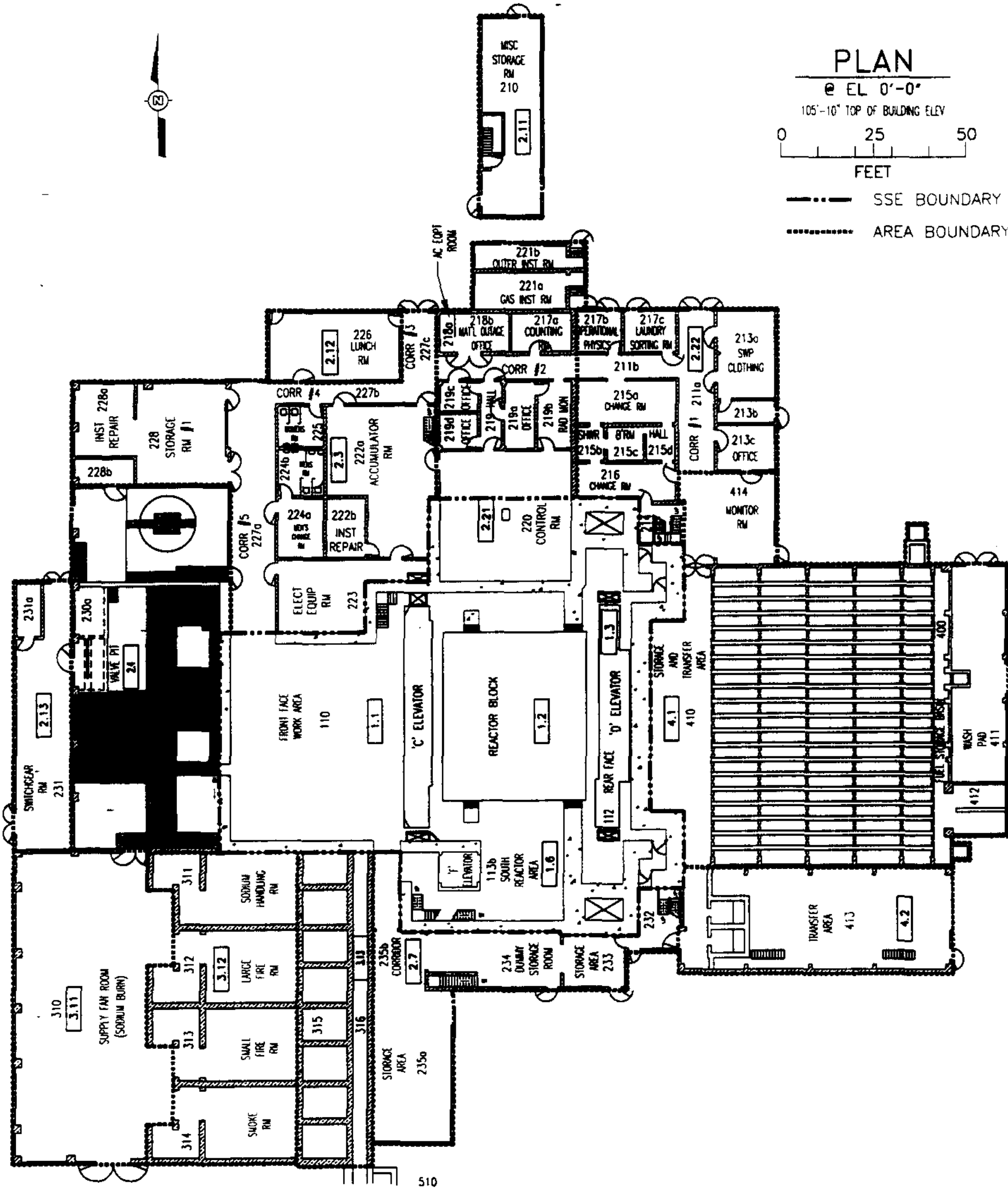
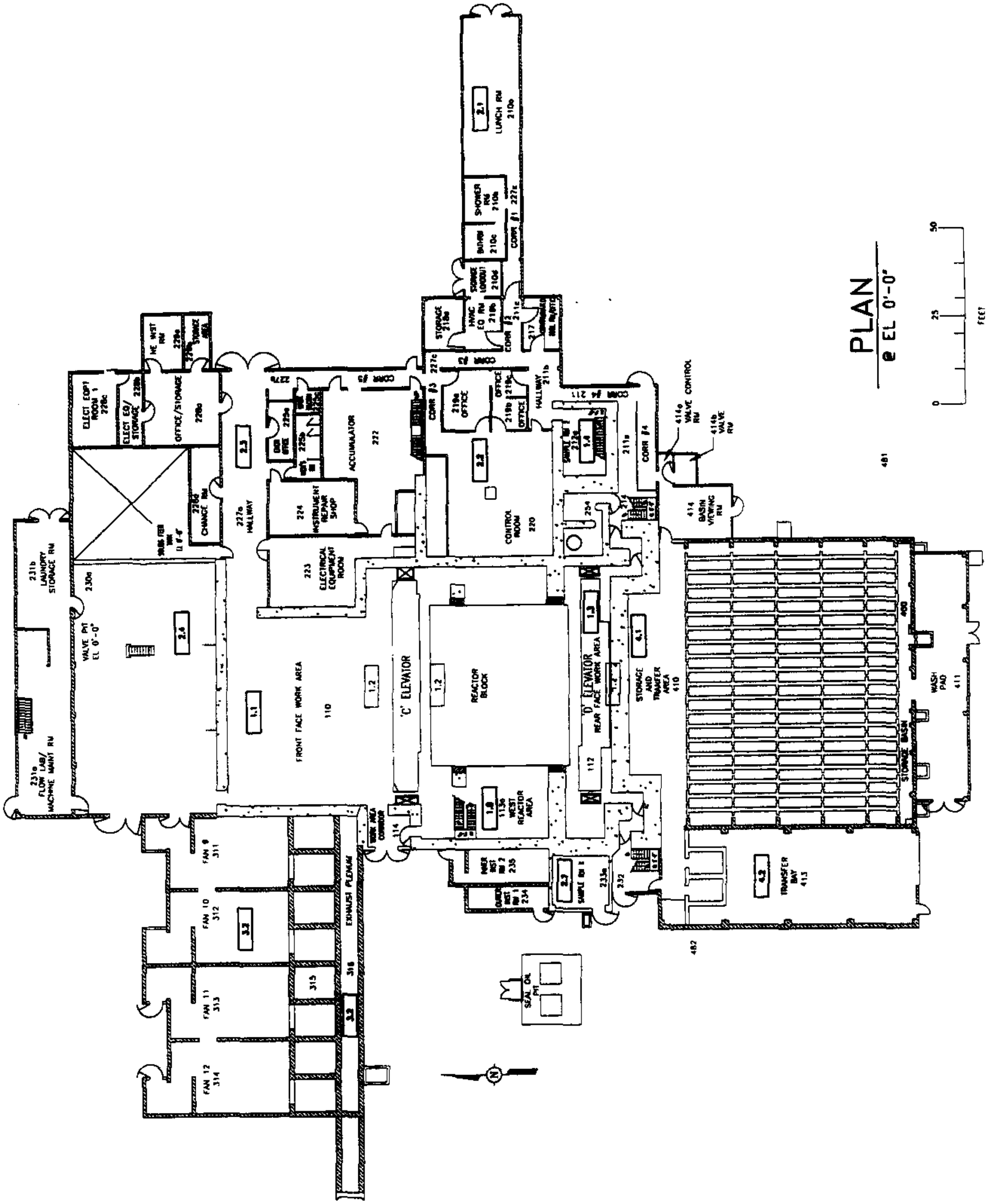


Figure 1-3. Floor Plan Layout at Ground Level of the 105-F Facility Reactor Building.



Figures 1-4 and 1-5 provide a plan view depicting the relationships of these four areas. A more detailed description follows.

1.3.2.1.1 Module 1. Module 1 provided ancillary support areas during former reactor operations. These support areas included office areas, the reactor control room, tool storage rooms, restrooms, cooling water influent areas, change rooms, ventilation equipment areas, electrical systems areas, and other infrastructure support.

1.3.2.1.2 Module 2. Module 2 is the area located inside the shield walls, including the reactor blocks. Figures 1-6 and 1-7 provide a plan view of Module 2 and what will subsequently be the safe storage enclosures (SSEs). In addition to the reactor blocks, areas and rooms within Module 2 include the inner rod rooms, front face work areas, 3X ball systems, VSR winch assembly mechanism areas, laboratories, and other support areas.

Reactor Blocks. The reactor blocks are located near the center of the buildings within Module 2. Each reactor block consists of a 10.2 by 12.5 by 12.5 m graphite moderator stack encased in a 20.3- to 25.4-cm-thick overlapping cast-iron thermal shielding; 132-cm-thick welded biological shields consisting of alternating layers of masonite and steel on the four sides (excluding the bottom of the stacks); and unwelded, stair-step labyrinth seal shields on top. The blocks rest on concrete foundations. The main components of each block are as follows:

- Reactor moderator stack (an assembly of graphite blocks cored to provide channels for the process tubes, control rods, and other equipment)
- Aluminum process tubes that held the uranium metal fuel elements and provided channels for cooling water
- Control rods, gun barrels, monitoring equipment, experimental test holes, etc.
- Thermal and biological shields.

Welded steel-plate box that enclosed the biological shield and served to confine the inert gas atmosphere within the reactor.

Figures 1-6 and 1-7 provide a plan view of the reactor blocks within Module 2. Figure 1-8 provides a three-dimensional illustration of the reactor blocks.

The HCRs entered the reactors from the left side (when facing the reactor front face), and the VSRs and 3X ball system penetrations entered the reactors from the top. The 3X ball system was an emergency shutdown system consisting of neutron-absorbing balls that could be released into the core from hoppers above the reactors. The experimental test facility used penetrations in the right side of the reactor blocks for irradiation and detection studies. The HCRs had inner and outer rod rooms. The inner rod rooms are located within the massive shield walls of the buildings; the walls provided protection to workers when the rods were removed from the reactors during operation. Fuel discharge and storage areas are located directly behind the rear of the reactors.

Figure 1-4. Layout of the 105-DR Facility (Module 1, Module 2, Fuel Storage Basin, and Ancillary Buildings).

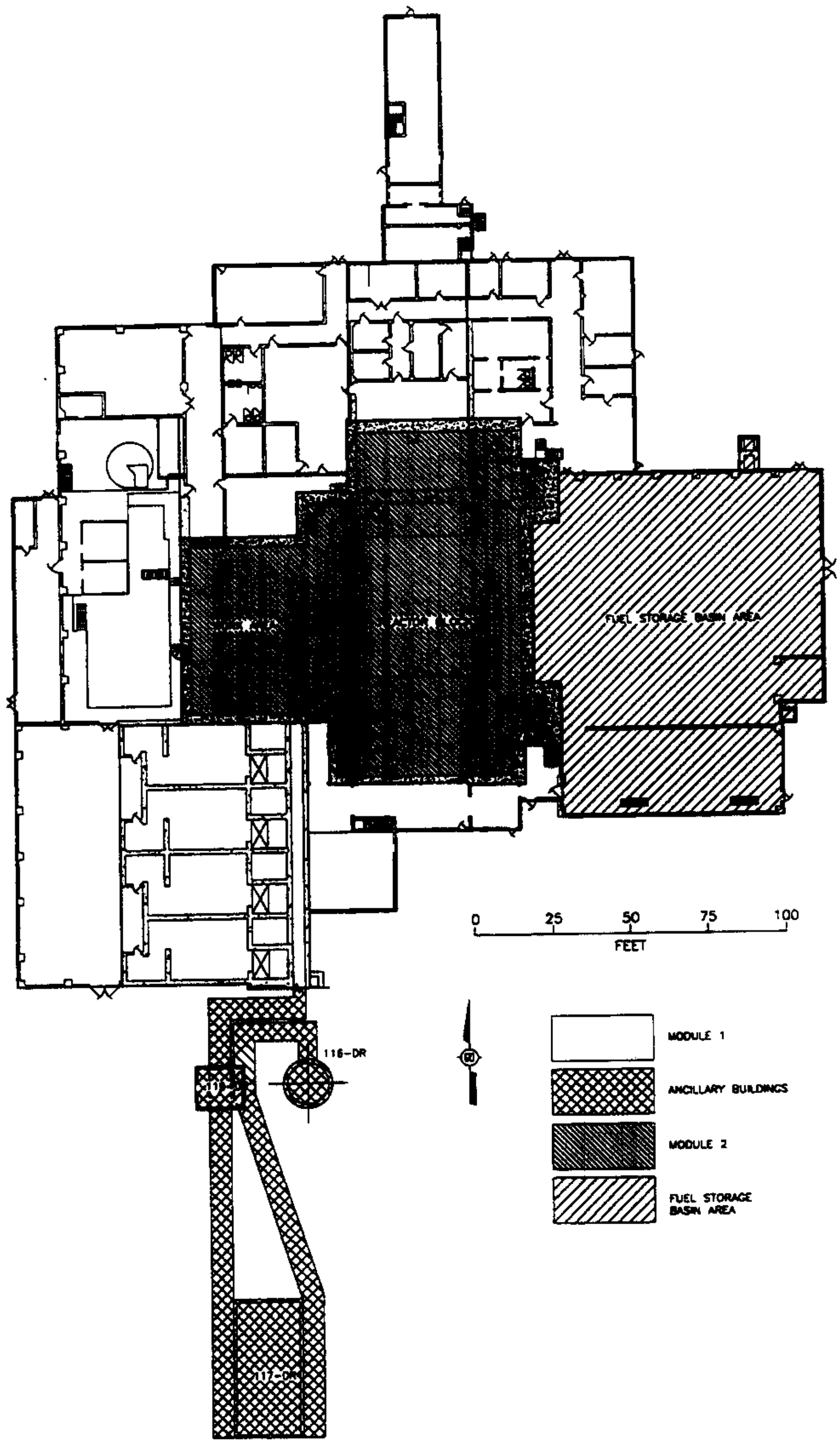


Figure 1-5. Layout of the 105-F Reactor Building (Module 1, Module 2, and Fuel Storage Basin).

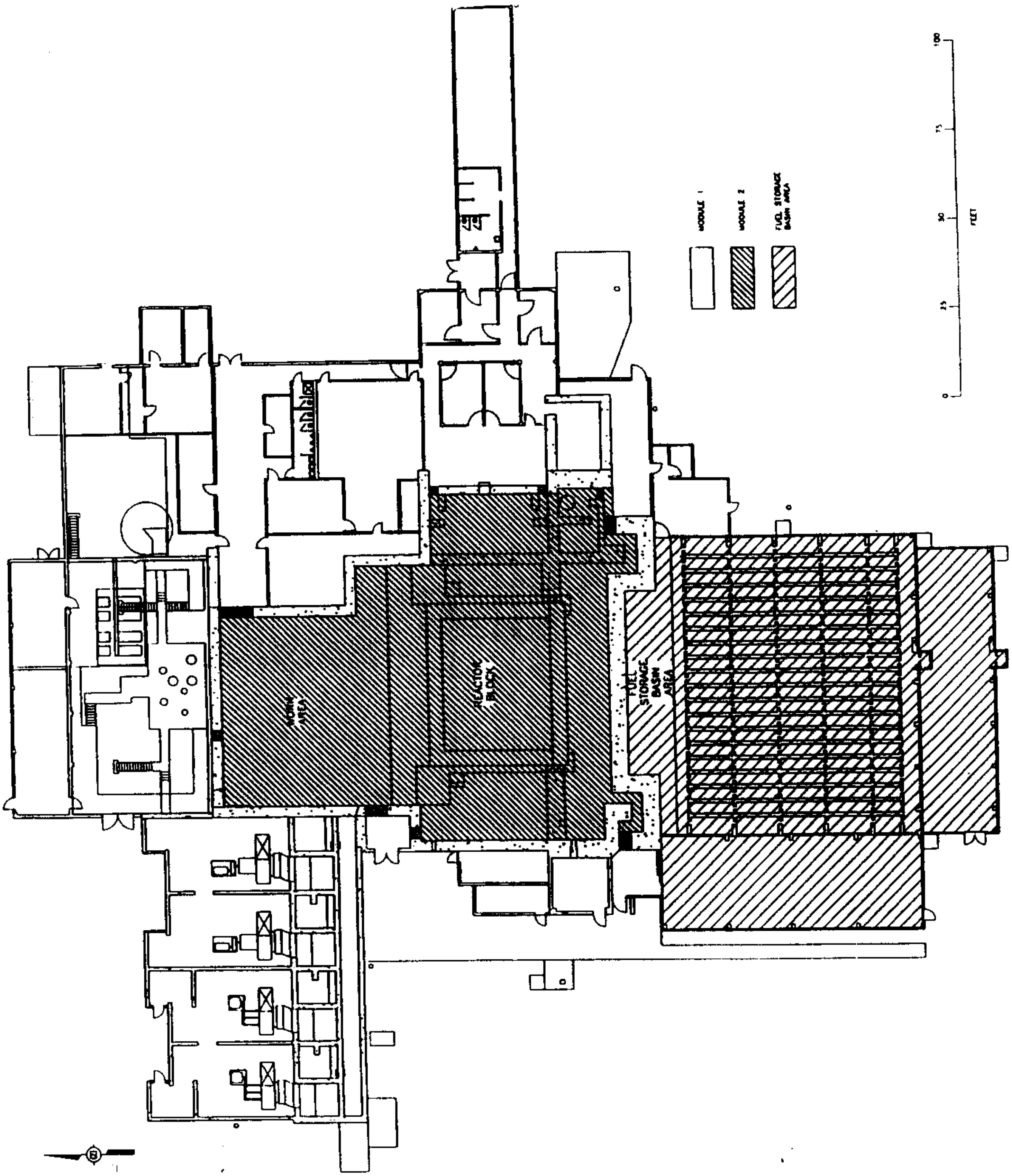


Figure 1-6. General Plan of the 105-DR Safe Storage Enclosure at Ground Level

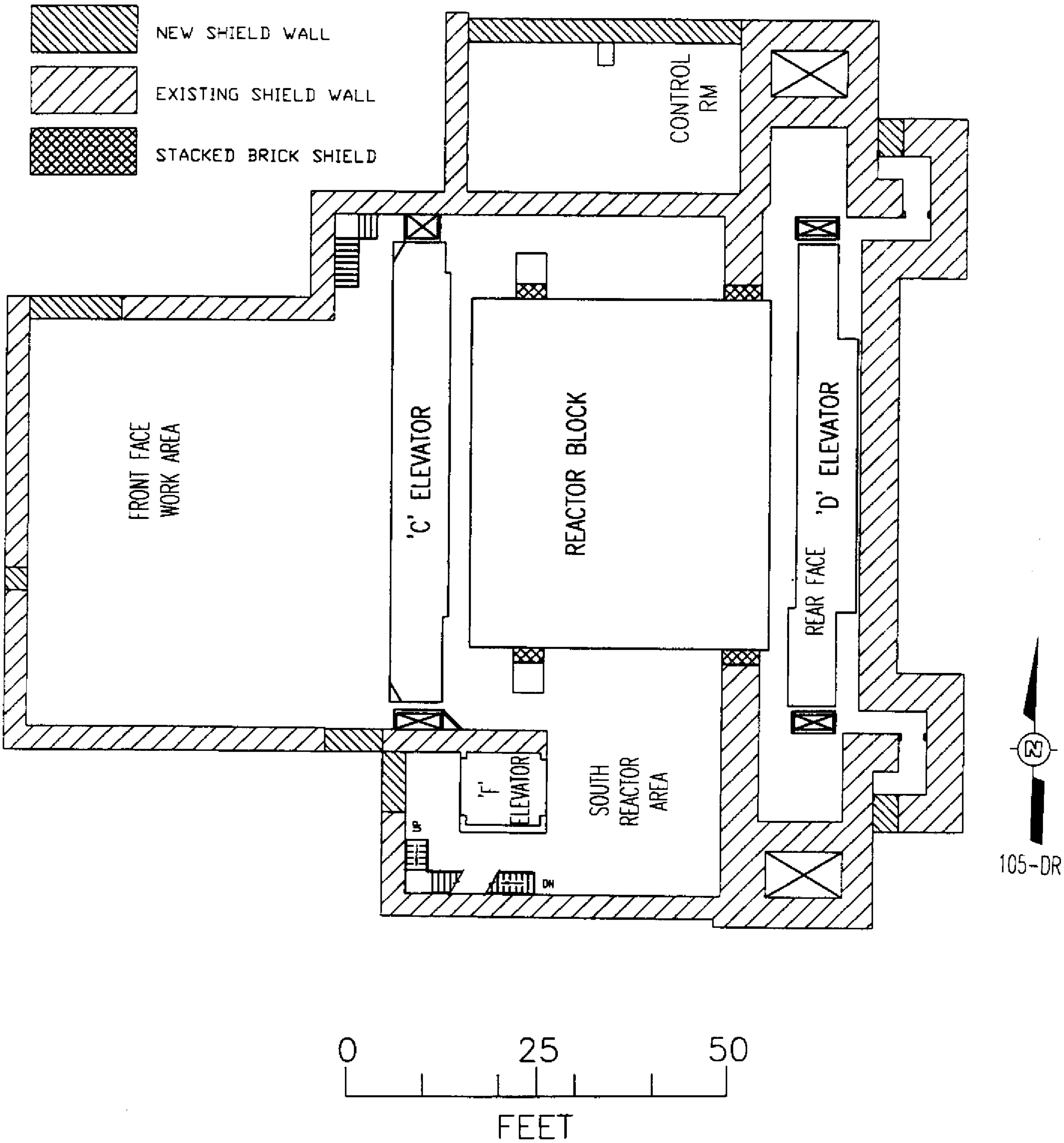


Figure 1-7. General Plan of 105-F Safe Storage Enclosure at Ground Level.

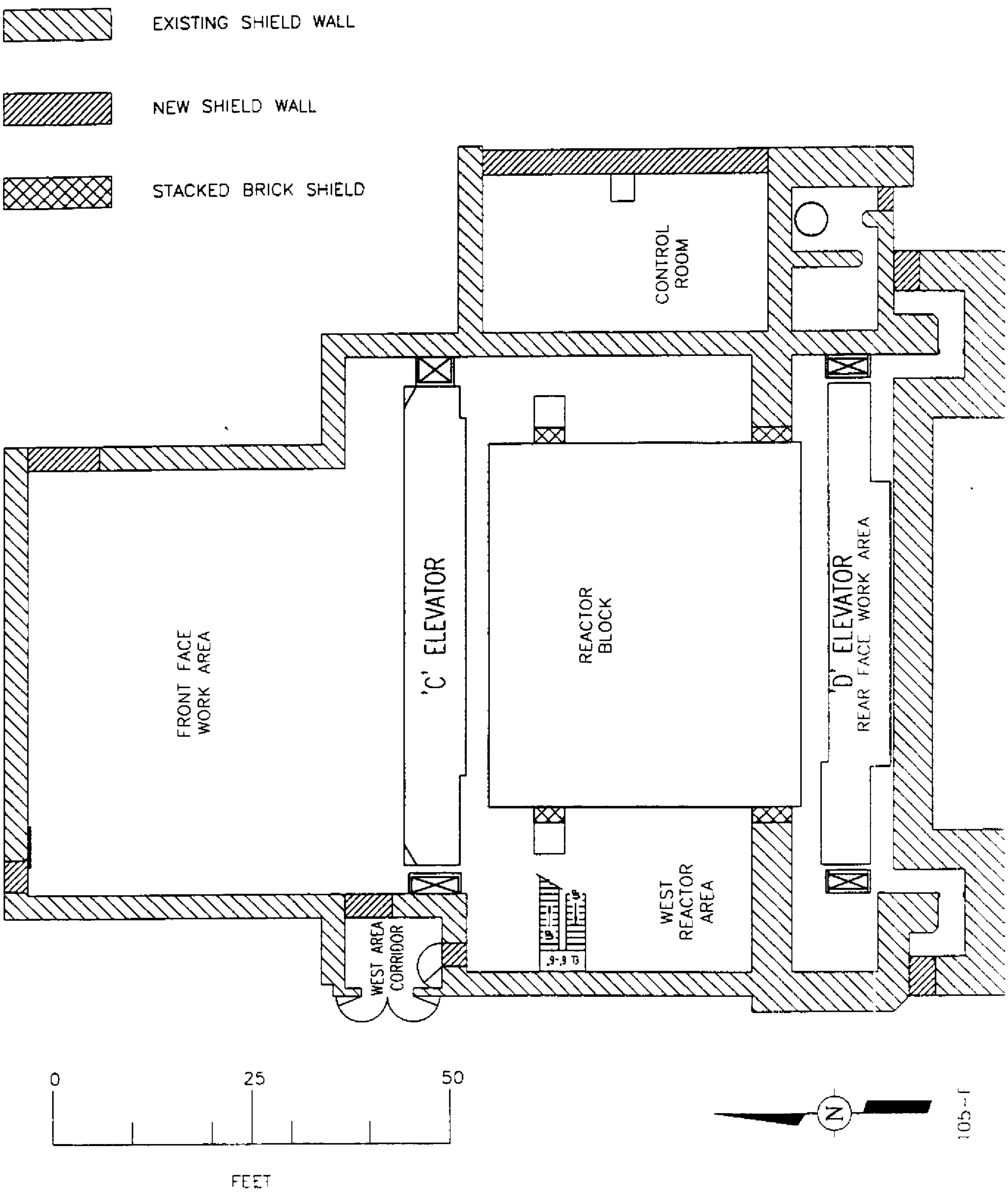
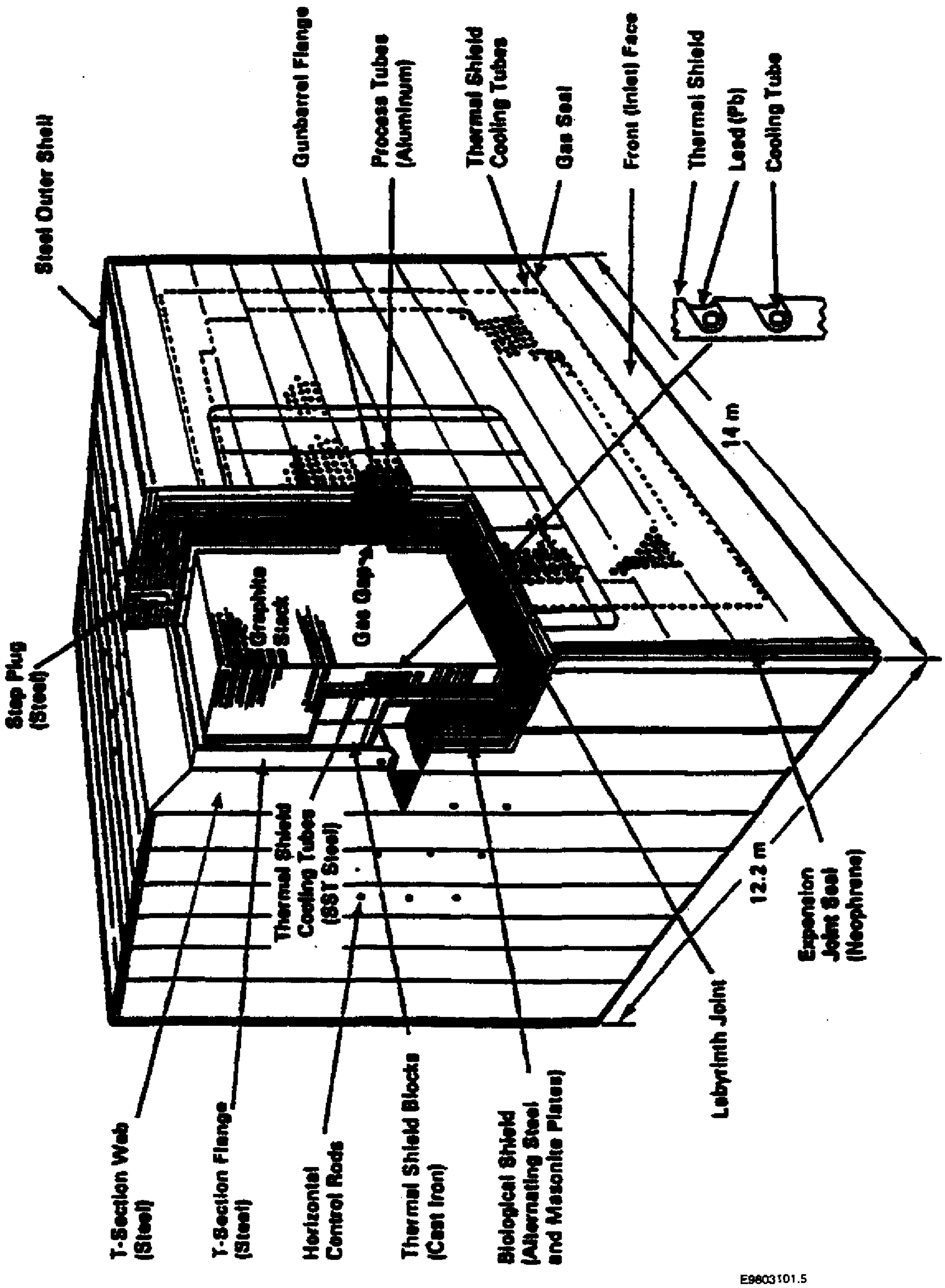


Figure 1-8. Reactor Block Construction.



All penetrations through the outer shielding of the blocks (e.g., the process tubes, HCR/VSR/3X ball channels, and instrumentation/experimental channels) are provided with a cover-gas seal designed tubes/sleeves/thimbles to maintain cover-gas containment. The channel tubes, if left sealed and intact, eliminate outside paths to the inner graphite stack areas.

Reactor Block Shutdown. During final shutdown of the reactors, a number of deactivation procedures were performed to contain contamination within the reactor blocks. After confirmation that all the tubes had been discharged, process caps were installed at the front and rear (GE 1965). The crossheader valves were tagged closed. After all the cover-gas lines were drained, the drain valves were closed. All gas sample lines were closed at the first valve of the primary system and at the inlet and outlet sample chambers. All water lines were drained and all HCRs and VSRs were left in the "full in" position. The balls were vacuumed from the hoppers, and the majority were stored in metal containers with desiccant added. Position and temperature indicators were isolated and pressure-sensing lines were drained and blown dry. The line valves were closed, capped, or plugged.

Special samples were discharged from the numerous test holes in the reactor blocks. Test holes with water were drained and purged with air until the water was removed. Shielding was reinstalled in any experimental channels (the 105-DR reactor block has seven experimental channels).

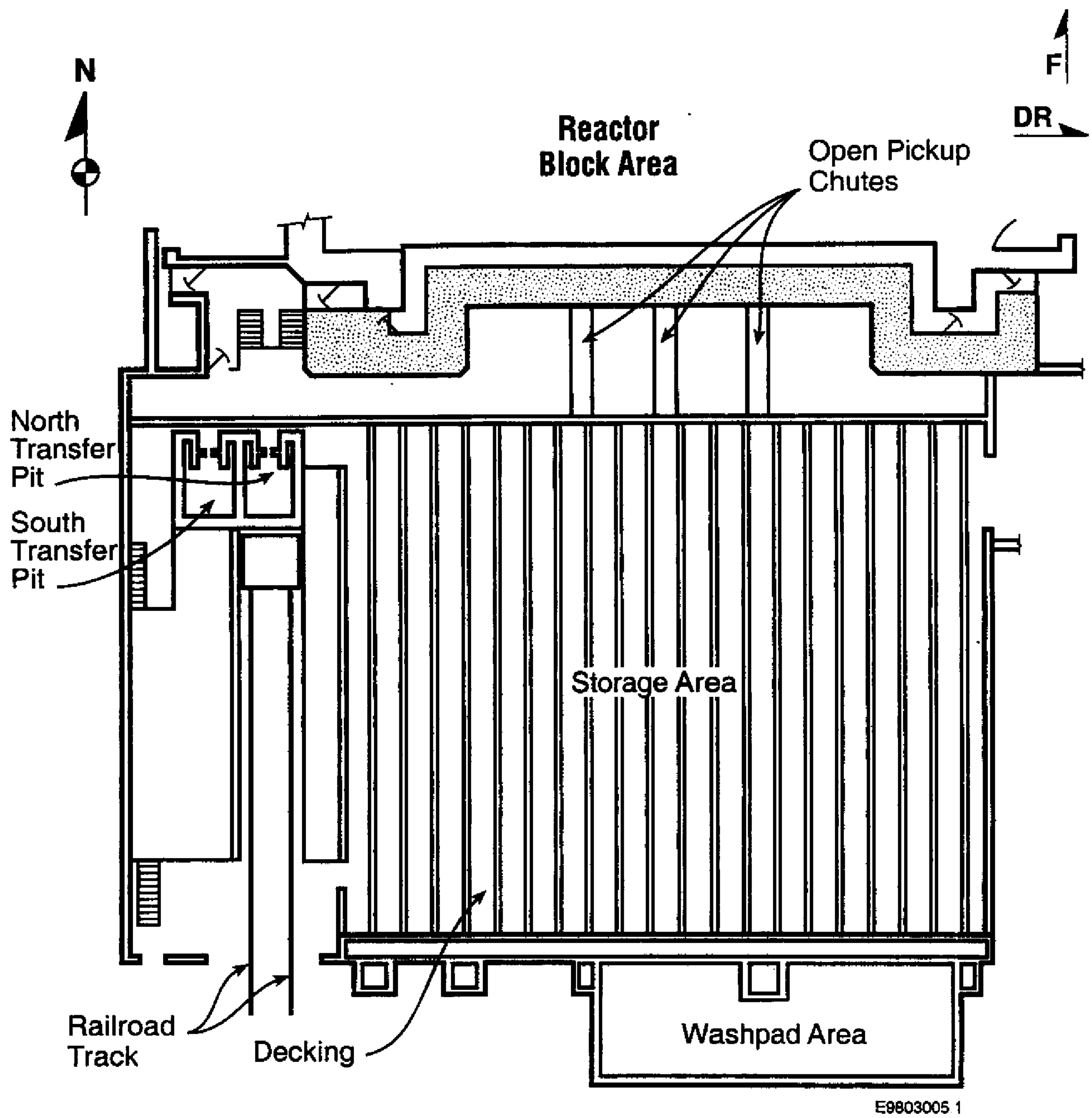
Several areas of the reactor block require additional protective measures to assure 75 years of safe storage. These areas were identified as the VSR gaskets and the HCR openings. These areas will be stabilized using appropriate and approved design methods similar to those used on the 105-C Reactor ISS project.

1.3.2.1.3 Fuel storage basin areas.

105-F Fuel Storage Basin. The 105-F FSB area, located on the south side of the 105-F Reactor Building, served as an underwater collection, storage, and transfer facility for the irradiated fuel elements discharged from the reactor. The FSB area consists of the fuel element discharge pickup area, which is located adjacent to the reactor rear face; the fuel storage area, which is the basin proper; the fuel transfer area, which includes the fuel transfer pits; and the wash pad area used to decontaminate fuel-handling equipment. The storage basin is approximately 22.0 by 25.0 by 6.1 m deep. The FSB area is approximately 822.7 m^2. The transfer bay is located west of the FSB and served as a railcar cask loading area for transferring fuel from the FSB. The transfer bay also has a 3X ball washer located in the southwest corner. Figure 1-9 shows the FSB layout.

The deactivation of the FSB at the 105-F Reactor Building occurred in 1970. Liquid was pumped from the basin until 2 ft of water remained. Within this bottom 0.6 m of water, sediment/sludge and miscellaneous items were left behind. Items known to have been left behind in the basin include fuel buckets, fuel spacers, process tubes, tongs, wooden floor decking, and monorail pieces. After the basin was partially drained, fine stream bed sand backfill was placed into the remaining 18 ft of the basin. The specific characteristics of the backfill placed in the 105-F FSB are unknown; therefore, a backfill characterization sampling

Figure 1-9. Typical Fuel Storage Basin Area Layout.



and analysis for hazardous chemicals and radiological material using EPA protocol was performed from August through September 1991. The backfill characterization report (UNI 1981), issued in October 1993, concluded the following:

- The top 3.1 m of backfill has minimal contamination.
- The next 2.1 m is suspected to be radiologically contaminated in some locations.
- The bottom 0.9 m is contaminated with material, equipment, sediment layer, and possibly fuel elements, mainly residing close to the basin floor.

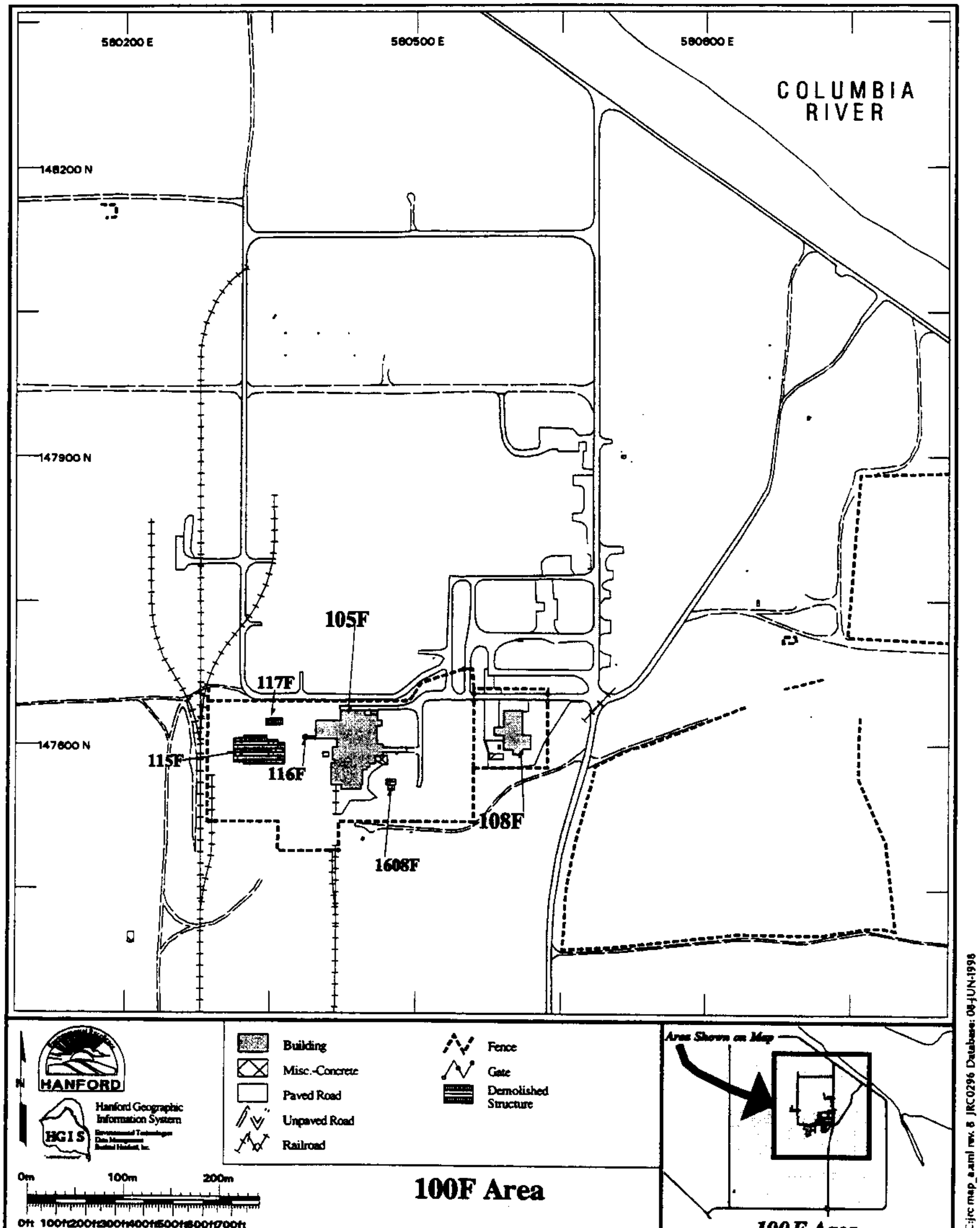
The 105-F FSB inventory is described in greater detail in BHI 1998c.

105-DR Fuel Storage Basin. The 105-DR FSB area, located on the east side of the 105-DR Reactor Building, served as an underwater collection, storage, and transfer facility for the irradiated fuel elements discharged from the reactor. The FSB area consists of the fuel element discharge pickup area, located adjacent to the reactor rear face; the fuel storage area, the basin proper; the fuel transfer area including the fuel transfer pits; and the wash pad area used to decontaminate fuel handling equipment. The storage area dimensions are approximately 22 by 24.7 by 6.1 m deep. The FSB area is approximately 822.7 m^2. The FSB and the fuel transfer pits have been drained and cleared of debris and sediment, and fixative has been applied to the lower portions of the contaminated surfaces (UNI 1986). An asphalt emulsion fixative was applied on the bottom 2.44 m of the FSB walls and the FSB floor. The FSB is covered with fire-resistant coated wood planking (UNI 1986). Figure 1-9 shows the basic FSB area layout.

1.3.2.1.4 Buildings ancillary to the 105-F and 105-DR Reactor Buildings. The 116-F exhaust stack and stack foundation was decontaminated and demolished (using explosives) in September 1983 (UNI 1985). A trench was excavated west of the stack between the 115-F Gas Recirculation Building and 117-F Filter Building burial sites (UNI 1985). Demolition charges caused the stack to fall into the excavated trench. The rubble from the stack foundation was pushed into the trench with heavy equipment, and the trench was covered with clean fill to a depth of at least 1 m (UNI 1985). Allowable residual contamination level (ARCL) calculations on the stack and foundation indicated that doses from the rubble were below radiological control release limits, so the rubble was left in place (UNI 1985). UNI-3492 (UNI 1985) describes the levels of contamination and estimated dose scenarios in greater detail. The previously existing 100-F ancillary buildings are shown in Figure 1-10.

The D&D on the 1608-F and 1608-DR lift stations was performed in fiscal year 1986-1987 (RHO 1987a and 1987b). The lift stations were built as separate buildings, 1608-F and 1608-DR, outside of the footprint of the 105-F and 105-DR Reactor Buildings. The 1608-F and 1608-DR Lift Stations were effluent water pumping stations that served as sumps to collect radioactively contaminated liquid wastes from the buildings. The liquid wastes were collected in the sumps for final disposal by pumping into the effluent system. All pipes entering the buildings were isolated and plugged using the dry pack grout method to prevent water from draining into the ancillary buildings after demolition of the 1608-F and 1608-DR Buildings (RHO 1987a and 1987b).

Figure 1-10. 100-F Area.



1.3.2.2 Ancillary buildings covered by the removal action. In addition to the 105-F and 105-DR Reactor Buildings, there are four ancillary buildings and associated facilities (e.g. underground tunnels, ducting, etc.) covered by the removal action: 116-DR Exhaust Air Stack, the 117-DR Exhaust Filter Building, the 119-DR Exhaust Air Sample Building and associated ducting/tunnels, and the 116-D Exhaust Air Stack. The 116-DR Exhaust Air Stack and the 117-DR Exhaust Filter Building are encompassed within the boundaries of the RCRA TSD unit. A brief history of the TSD unit and specific facility descriptions follow.

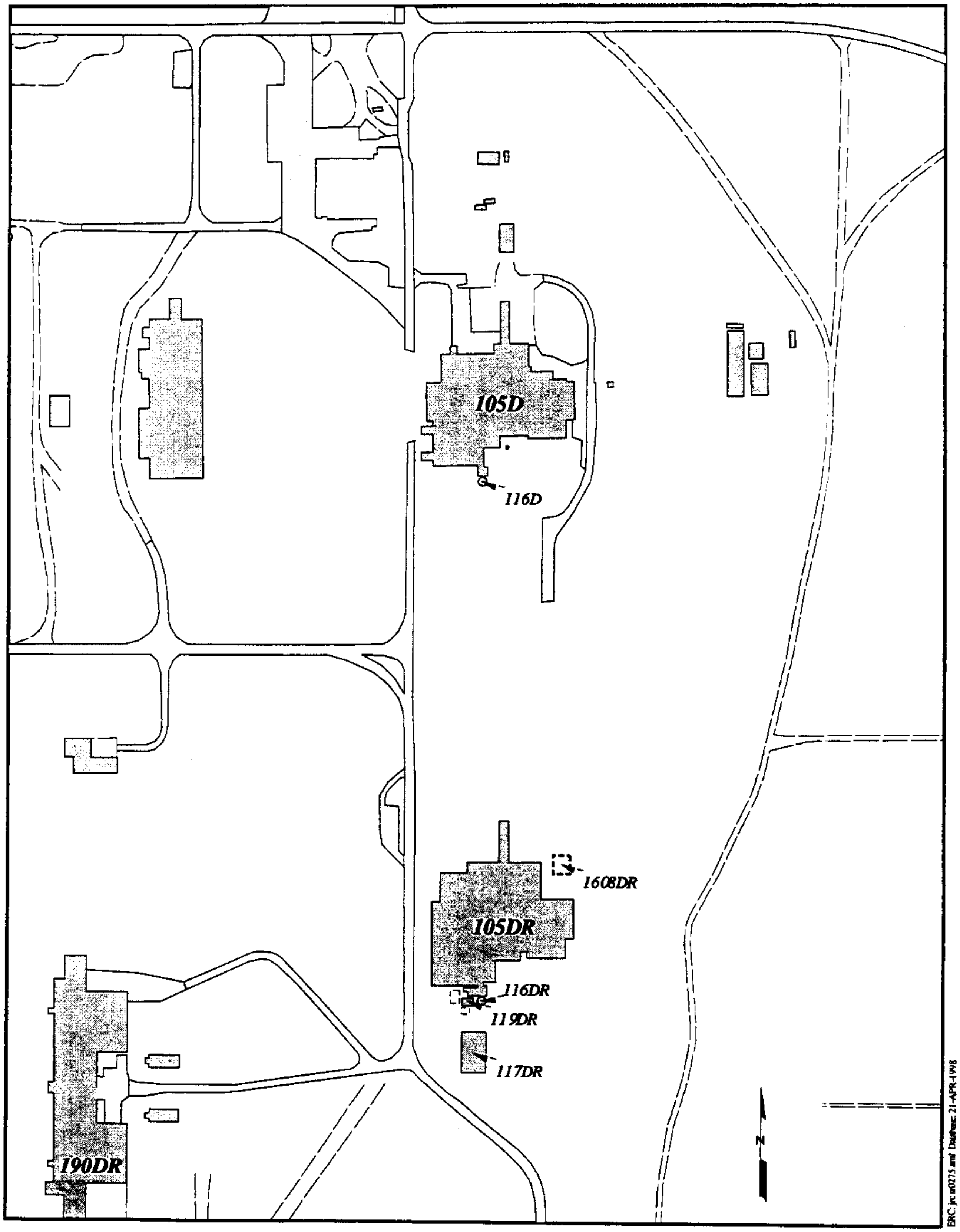
Between 1972 and 1986, the southwest portion of the 105-DR Reactor Building was used as a research laboratory known as the 105-DR LSFF. The LSFF occupied the former ventilation supply fan room and was established to provide a means of investigating fire and safety aspects associated with large sodium or other metal alkali fires. This unit had also been used for the storage and treatment of alkali metal dangerous waste. Additionally, the Fusion Safety Support Studies programs sponsored intermediate-size safety reaction tests in the LSFF with lithium and lithium-lead compounds. The LSFF, a RCRA TSD unit, was partially clean-closed in 1995, as documented in DOE-RL 1995. Clean closure means that dangerous wastes (or dangerous waste constituents or residues) have been removed or decontaminated to ensure that levels do not exceed the numeric cleanup levels calculated using residential exposure assumptions according to the "Model Toxics Control Act-Cleanup" regulations (*Washington Administrative Code* [WAC] 173-340) or closure performance standards (WAC 173-303-610[2][a][ii]). The closure also must be in a manner that minimizes or eliminates post-closure escape of dangerous waste constituents. The portions of the 105-DR LSFF that have been clean closed include the 105-DR supply fan room, 1720-DR LSFF sodium storage building (demolished), and a majority of the surrounding soils. The 116-DR Exhaust Air Stack and 117-DR Exhaust Filter Building and associated ducting/tunnels have not yet been closed. The locations of these facilities are shown in Figure 1-11.

1.3.2.2.1 116-DR Exhaust Air Stack. The 116-DR Exhaust Air Stack, located on the south side of the 105-DR Reactor Building, is a reinforced-concrete, monolithic, 61.0-m-high structure that discharged ventilation exhaust air to the atmosphere. The stack rests on a double octagon-shaped base that extends 5.3 m below grade. The stack is 4.9 m in diameter at its base and was fed by below-grade air exhaust ducts from the 117-DR Exhaust Filter Building, which filtered exhaust air generated in the 105-DR Reactor Building and the experimental sodium burn facility located in the fan room. The stack is in generally good condition and has no noted structural defects.

1.3.2.2.2 117-DR Exhaust Filter Building. The 117-DR Exhaust Filter Building is a reinforced-concrete structure, 18.0 m long, 11.9 m wide, 10.7 m high, and 2.4 m above grade. The building filtered ventilation air from the 105-DR Reactor Building, including the experimental sodium burn facility, before discharging the air to the atmosphere through the 116-DR Exhaust Air Stack.

1.3.2.2.3 119-DR Exhaust Air Sample Building. The 119-DR Exhaust Air Sample Building is a small-prefabricated metal building 109.7 m^2 that housed most of the instrumentation for the exhaust air system. A sample stream of the exhaust air was routed through a continuous air monitoring system in the building to test for radioactivity.

Figure 1-11. 100-D/DR Area.



1.3.2.2.4 Associated exhaust ducting/tunnels. Ducting and tunnels connect the 105-DR Exhaust Fan Room to the 119-DR Exhaust Air Sample Building, 117-DR Exhaust Filter Building, and 116-DR Exhaust Air Stack. Most portions of the tunnels/ducting reside below grade but some portions can be seen above grade.

1.3.2.2.5 116-D Exhaust Air Stack. The 116-D Exhaust Air Stack, located on the south side of the 105-D Reactor, is a reinforced-concrete, monolithic, 61.0-m-high structure that discharged ventilation exhaust air to the atmosphere. The stack rests on a double octagon-shaped base that extends 5.3 m below grade. The stack is 4.9 m in diameter at its base and was fed by below-grade air exhaust ducts from the 117-D Exhaust Filter Building (D&D was performed in 1996), which filtered exhaust air generated in the 105-D Reactor. The intake plenum in the stack has been sealed. The stack is in generally good condition and has no noted structural defects.

2.0 REMOVAL ACTION

The objective of the 105-DR and 105-F ISS projects is to place the 105-DR and 105-F Reactor Buildings into ISS for a period of up to 75 years and to demolish the ancillary buildings. This will reduce the potential for release/exposure of hazardous and radioactive materials to workers, the public, and the environment. The ISS projects will also reduce periodic S&M costs incurred from maintenance of the degrading buildings.

2.1 REMOVAL ACTION WORK ACTIVITIES

The following sections provide a general description of how work activities will be performed on the 105-DR and 105-F ISS projects.

The general scope of work involved to implement this removal action includes the following activities:

- Removing radioactive material
- Removing hazardous substances
- Removing facility equipment and miscellaneous piping
- Dismantling various facility structures
- Disposing of waste products
- Constructing the SSE
- Final closeout report.

This scope will be accomplished by completing the activities described in the following subsections.

2.1.1 Site Mobilization and Preparation Work

Upon initiation of the 105-DR and 105-F ISS projects, personnel will be mobilized and consumables and required equipment will be procured. The first activities to be performed will include mobilizing manual personnel and trailers to support the project activities. Filed Support personnel will also terminate and/or verify termination of all 105-F and 105-DR Reactor Building services and utilities. Utilities currently servicing the facilities are electrical power and sanitary sewer. Electrical systems that will be used throughout the 105-DR and 105-F ISS projects are discussed in further detail in Section 2.3.1.

Concurrent with these activities, waste segregation and staging areas will be set up (within the area of contamination or at an on site location) to facilitate transportation of the material for recycling or disposal. Supervisor trailers, lunch trailers, change trailers, office trailers, mobile shower trailers, and restroom facilities will also be mobilized at the site to prepare for D&D activities. Electricity will be connected from an outside line or generator and temporary lighting will be installed. Occupational Safety and Health Administration concerns, (e.g., fall protection, guarding, and electrical) will be managed as they are identified.

2.1.2 Characterization

Characterization, via sampling and analysis of materials and radiological surveys, will be conducted throughout the 105-DR and 105-F ISS projects and D&D of the ancillary buildings. Sampling and analysis will be used to identify radiological and hazardous conditions that will be encountered in facility operations and to specify health and safety requirements and the waste streams that will be generated. These technical services will also be used to characterize waste for treatment and disposal and to verify facility and area conditions at various phases of project completion. Section 4.3 describes characterization in further detail.

2.1.3 Decontamination and Demolition

Work activities, in general, will start in the radiological controlled areas and will work progressively inward toward the contamination areas surrounding the reactor blocks. One of the first types of work activities inside the building will include conducting radiological surveys. Radiological surveys will be performed using hand-held and large area detection equipment and will be augmented with the Laser-Assisted Ranging and Data System (LARADS) for recordkeeping during surveys. After an area has been surveyed and the radiological conditions have been established, biological cleanup and general housekeeping will commence, which involves removing loose biological feces and rubble, sweeping and vacuuming floors, etc. At this time, asbestos-containing materials (ACMs) and presumed ACMs will be removed. ACM typically consists of insulation for piping, floor tiles, cement asbestos board, etc. Insulation on piping will be removed as Class I asbestos work, and nearly all other ACM in the facilities will be removed as Class II (e.g., floor tiles and cement asbestos board). Asbestos work, air monitoring, and worker safety requirements will conform to existing BHI procedures for ACM removal and will be described in detail in the asbestos abatement work plan.

Lead bricks and sheeting, polychlorinated biphenyls (PCBs) in oil from motors and light ballasts, sodium dichromate from water system treatment, mercury found in lighting components and switches, and other hazardous materials will be removed and disposed of as hazardous or mixed waste, or recycled consistent with guidelines found in Section 4.2.

Most of the loose, accessable radiological contamination will be either removed or fixed in place, depending upon the levels, accessability, complex shapes (e.g., grating) and type of contamination found. Some equipment/piping will be removed, and loose contamination will be wiped or vacuumed. If loose contamination remains after the initial decontamination effort or if the building configuration or conditions make removal of loose contamination impractical, then the contamination may be fixed in place, as required. Activities that have a potential to emit radiological emissions are discussed in Appendix B. The abovegrade structure outside the existing shield walls, including the siding and structural framing above the shield walls, will be demolished using standard demolition techniques. Steel will be segregated for salvage if economically feasible, unless it is determined to be contaminated. Included in the removal operation is the building exhaust fan room, supply fan room, maintenance shops, offices, control room, outer rod room, fuel storage areas, inlet water tunnels, change rooms, corridors, machinery rooms, valve pit, and other miscellaneous spaces currently outside the shield wall, as shown in Figures 1-2 and 1-3. (Note: The supply fan room in the 105-F Reactor Building was demolished as part of an earlier project). Below grade areas of the buildings that meet the cleanup criteria, defined in Sections 4.1, 4.4, and 5.7, will be backfilled with clean debris or soil.

If cleanup of soils surrounding the buildings is too extensive to be managed in a cost-effective manner, the sites will then be stabilized in a manner that does not hinder future remediation. Future cleanup, if necessary, will occur at the same time that waste sites are addressed in the 100-FR-1, 100-DR-1 and 100-DR-2 operable units.

2.1.4 105-F Fuel Storage Basin

Some of the alternatives that are being considered for removing material placed in the 105-F FSB are listed below. All of the alternatives require engineering controls to ensure the safety of workers, maintaining radiological doses as low as reasonably achievable (ALARA), and minimizing potential releases of radiological emissions to the environment. A readiness assessment (RA) will be conducted to assess work activity project readiness prior to initiating FSB cleanout work. The following list of basin cleanout methods are options that may be utilized:

- Using a vacuum to remove basin material, using supporting equipment to remove larger items.
- Using a track hoe to excavate basin material and then loading material into a bucket elevator, which would lift material out of the basin onto a conveyor belt at grade level. Supporting equipment will be used to remove large items.
- Using track hoes to excavate basin material and load a crane clamshell, bucket, or skip to transport all sizes of material to the disposal containers staged next to the basin.
- Using "Bobcat" track hoes and vacuums. The track hoes would load excavated material into clamshell buckets suspended from one of a series of monorails and hoists. The hoist would carry material to a hopper where the larger debris would be screened out, and the soil and small debris would be passed onto a conveyor belt.

The method of basin cleanout described below combines safety and cost effectiveness using standard techniques and available equipment. If this method is chosen, a major portion of material/structure removal will use equipment (e.g., backhoes and excavators) that is typically used for D&D below-grade material removal, structure demolition, and large-scale crib remediation work.

To cleanup and decommission the 105-F FSB, the abovegrade structure (including roof/support columns) would be removed. The washpad end of the basin wall would be removed for equipment access as basin backfill is excavated. The method of backfill excavation and contamination control would be achieved using existing standard equipment and procedures similar to the 105-C ISS demolition and large-scale crib remediation work. Experience gained in past basin cleanout projects (i.e., 105-B, -C, -D, and -DR) would be used in optimizing the working conditions. The frequency of surveys would increase as the lifts removing backfill approach the bottom of the basin. The layer of soil would act as a shield and confinement for the sediment and other radiological material located on the basin floor. From the top of the 76.2-cm-high basin aisle divider walls down to the floor, excavation will be performed broken into several small areas. This excavation will use backhoe-type equipment with small buckets and lifting attachments that will provide shielding and distance for operators, allowing for prudent excavation of high-dose-rate items. Backfill material will be screened from this level and any fuel elements or suspect elements will be remotely placed into a U.S. Department of Transportation (DOT)-approved shipping container.

Loader track hoe, backhoe bucket, and attachments will hook, grip, shear, lift or remove buckets, monorail beams, wood planking material, etc., and place them into Environmental Restoration Disposal Facility (ERDF) containers. Concrete liners or other shielding will be used in high-dose-rate material containers to meet disposal and transportation requirements. Residual radioactivity dose model (RESRAD) methodology may be used to determine radiological release levels for the basin wall, concrete floor, and the remaining structures, similar to that being used at the 105-C FSB.

2.1.5 Safe Storage Enclosure Construction

Following decontamination and partial demolition of the reactor buildings, the existing shield walls will be used to create a SSE, including a new or enhanced metal roof. The shield walls will support the roof, and the enclosure will be completely sealed with only one entrance (i.e., a door will be welded shut). A utility room located outside of the safe storage enclosure will be used for ventilation controls, monitoring equipment, and electrical power. Figure 2-1 shows a graphical representation of what the SSE will look like when completed.

After demolition activities have been completed, a new roof will be constructed over the remaining structure (or the existing roof will be upgraded), and all penetrations and openings will be sealed.

Key elements of the SSE design are as follows:

1. Use existing shield walls as the basis for establishing the SSE footprint and as prime components of the structure.

2. Remove floors and decking to within the minimal acceptable distance of the wall for integrity of the remaining structure.

3. Close all wall penetrations securely so penetration closures will not be dislodged in a seismic event or from wind loads.

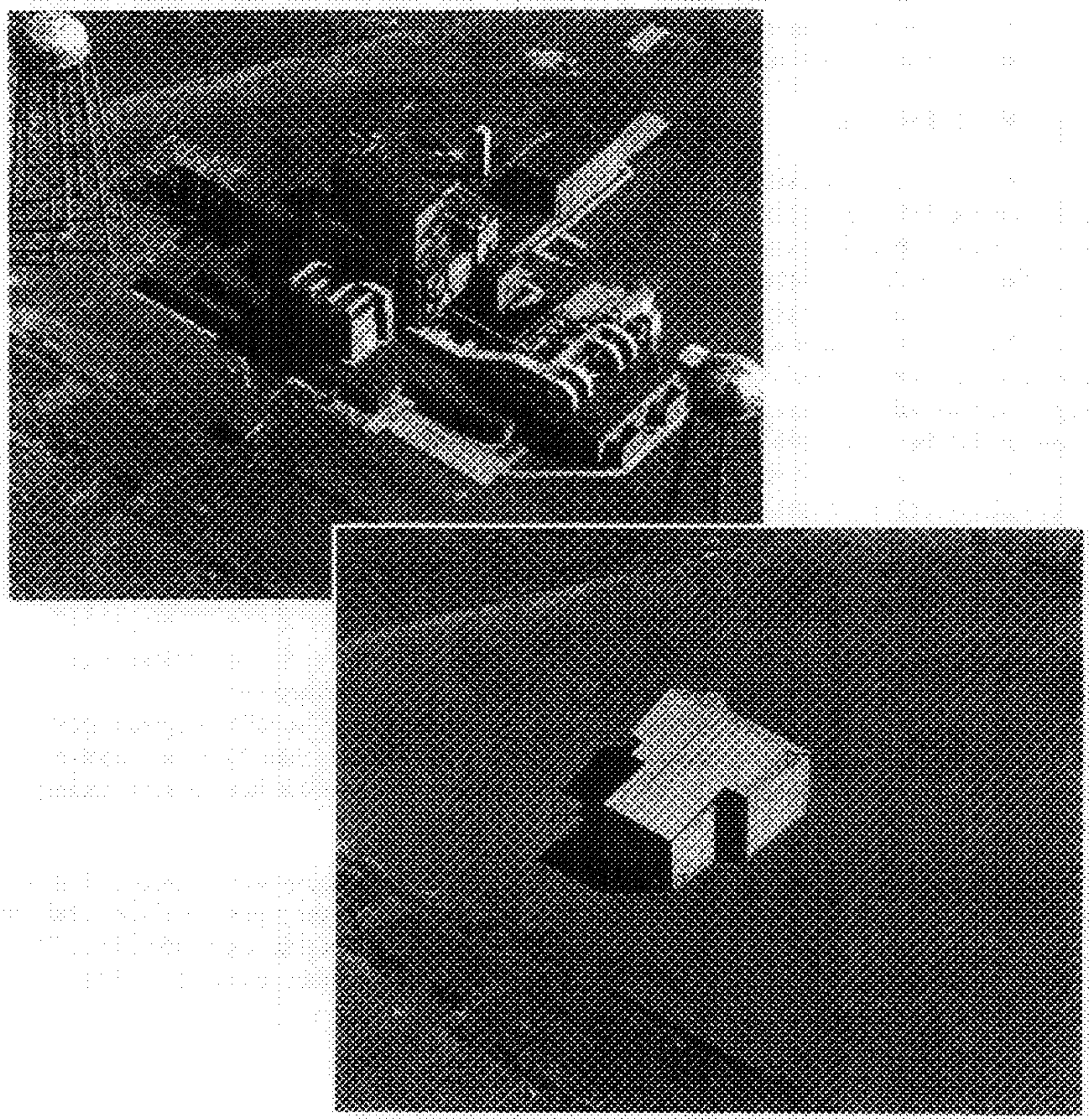
4. Provide an access door for S&M activities.

5. Provide for ventilation of the facility, if required, during surveillance inspections and maintenance activities.

6. Address closure of all subsurface tunnels and pipes that will be left in place to prevent water or pest intrusion.

7. Allow for decontamination of equipment and structural components to the extent reasonable for radioactive and hazardous material volume reduction, ALARA practices, and, if practical, the release of material for unrestricted use.

Figure 2-1. Safe Storage Enclosure.



8. Provide a lighting system and convenience receptacles designed to provide adequate illumination for access/egress and power requirement for S&M activities. The 105-F SSE will have onsite monitoring for flooding within the facility. The 105-DR SSE will have a remote monitoring system, with a readout at 271-U, for flooding within the facility and temperature monitoring.

2.1.6 Waste Disposal

All waste management activities will be performed in accordance with waste management ARARs identified in the action memorandum (Ecology et al. 1998) for the 105-F and 105-DR Reactor Buildings and ancillary facilities (Ecology et. al 1998). Disposal of waste from this action will either be sent to ERDF or an EPA-approved offsite disposal facility. Treatment of waste may be necessary prior to disposal at the ERDF, and waste may be stored up to one year at ERDF if the waste is awaiting treatment. Should transuranic waste be encountered, storage is allowed at the Hanford Site's Central Waste Complex (CWC) on a case by case basis, and requires EPA/Ecology approval. Certain material is eligible for salvage and recycling, which is encouraged if the appropriate regulatory requirements are met and it is economically feasible for the project to do so. Liquid waste will either be sent to the Hanford Site's Effluent Treatment Facility (ETF) or treated to meet the acceptance criteria of the receiving facility. Section 4.2 discusses waste management in further detail.

2.1.7 Site Restoration

Upon completion of demolition activities and if verification surveys of the site indicate that cleanup levels have been met, below-grade void spaces will be backfilled with nonhazardous/nonrecyclable material (e.g., clean concrete rubble and/or soil). Approximately the top 0.6 m to 1 m will be backfilled with soil containing no greater than 20 percent cobble to facilitate future revegetation of the site. The final grade of the site will match the surrounding terrain.

If contamination is found in the soil during verification surveys, cleanup will proceed until it is determined to no longer be cost effective to continue. If this is the case, the site will be stabilized in a manner that does not hinder future remediation. The ISS project final report (Section 5.7) will provide information to identify the location (i.e., longitude, latitude and depth) and the composition/concentration of contamination left behind.

2.1.8 Demobilization

After verification surveys have been completed and the site has been graded consistent with surrounding terrain, trailers, equipment, and personnel will be demobilized from the facility. Project closeout requirements are discussed in Sections 4.1 and 5.7.

2.2 FACILITY HAZARDS

The following section is a summary of information on facility hazards provided in BHI 1998c and BHI 1998d. As stated in Section 4.3, characterization of the ancillary facilities will be conducted to identify the potential existence of hazardous and radiological contamination.

2.2.1 Hazardous Material Inventory

The 105-F and 105-DR Reactor Buildings have been deactivated and all bulk chemical inventories have been removed from the facilities for recycling or disposal. However, several types of hazardous materials remain in the facilities, including asbestos (in the form of cement asbestos board and insulation), mercury, lead, PCBs contained in light fixtures, sodium dichromate, and equipment oil. Of these hazardous chemical constituents, asbestos and lead are found in the greatest quantities and are located throughout the facilities.

The potential for release of asbestos and lead is minimal because all asbestos and lead will be removed in accordance with approved procedures that ensure control over hazardous substances. Environmental Restoration Contractor (ERC) standards and procedures for asbestos and lead are intended to ensure that personnel control, handling, and disposal are performed in a manner that achieves the following objectives:

- Protects the safety of employees and the general public
- Minimizes spills and releases to the environment
- Meets applicable DOE, Federal, state, and local regulatory requirements.

Solvents, grease, oils (i.e., hydraulic oil and fuel), and aerosol containers have also been found throughout the facilities. Although the majority of these items were disposed of during deactivation, the potential exists for personnel to find containers with residual chemical constituents. If such containers are found, the containers will be managed according to applicable work plans.

2.2.2 Radiological Material Inventory

Radionuclide inventories may be found in all areas of the facilities. However, the only significant inventories are found in the reactor blocks and FSBs (BHI 1998c and 1998d). Criticality screenings and evaluations have been performed for the ISS activities for both facilities, which concluded that there is no potential for criticality (BHI 1998e and 1998f). These evaluations will be revised following completion of the ISS activities to reflect the fissile material inventory remaining within the SSE.

2.2.3 Facility Hazard Classification

A facility hazard classification, required for DOE facilities per DOE Order 5480.23, is based on an assessment of the potential release of hazardous and radiological inventories and their impacts on workers and the public. The results of the assessment of potential impacts are based on a bounding, unmitigated release of hazardous and radiological substances and a comparison to defined threshold values. The assessment of potential impacts considers the material quantity, form, location, dispersability, and interaction with available energy sources to determine unmitigated release potential. BHI-DE-01, Engineering Department Project Instruction, EDPI-4-28.01, "Hazard Classification," establishes the basis for classifying a facility and the appropriate actions to be taken if a change in inventory is significant enough to change the facility classification or authorization basis.

The bounding scenario for the 105-F Reactor Building is an unmitigated release from the FSB during a postulated unmitigated high wind event (BHI 1998d). This release would result in a dose of 3.46 rem at 30 m to an individual (BHI 1998d), which is less than the derived threshold for Nuclear Category 3 of 10 rem, at 30 m, in a 24-hour period (Bauer 1996). A total dose from all evaluated events (seismic event, high wind scenario, and direct dose from spent fuel elements) was determined to be 5.55 rem (BHI 1998d). Therefore, the 105-F ISS project is classified as *radiological* (per Bauer 1996).

The bounding scenario for the 105-DR Reactor Building is an unmitigated release from a postulated seismic event (BHI 1998c). This release would produce a dose of 1.34 rem at 30 m to an individual, which is also less than the derived threshold for Nuclear Category 3 (BHI 1998c). A total dose from all evaluated events (seismic and fire scenario) was determined to be 1.53 rem (BHI 1998c). Therefore, the 105-DR Reactor Building is also classified as *radiological* (per Bauer 1996).

The auditable safety analyses for the 105-F and 105-DR Reactor Buildings will be revised when the ISS projects are completed, consistent with the hazard and mission requirements for long-term S&M (up to 75 years).

2.3 STRUCTURES, SYSTEMS, AND COMPONENTS THAT PROTECT FACILITY WORKERS

Controls that will be employed during the 105-DR and 105-F ISS projects include temporary confinement enclosures, glovebag containments, and personal protective equipment (PPE), as directed by the 105-DR or 105-F Reactor Building health and safety plan (HASP), radiological work permits (RWPs), or asbestos abatement work plan for asbestos removal. Personnel monitoring and area monitoring will be used as required to determine and document worker exposures and work conditions.

Temporary confinement enclosures will be constructed, as required, to provide proper air-flow conditions and will be fabricated of noncombustible and fire-retardant materials. One standard type of temporary confinement is glovebag enclosures. Glovebag enclosures will be essentially one-use protective measures used to prevent contamination release during specific operations (e.g., pipe cutting and sample collection). Glovebags are available in a variety of sizes and designs and will be ordered to tailored specifications in accordance with their intended uses.

2.3.1 Electrical System

2.3.1.1 105-DR Reactor Building. The electrical power to the 105-DR Reactor Building will be deployed in three stages. The 105-DR electrical system was upgraded several years ago to provide a new power supply that meets current code requirements, and this constitutes the first stage. All of the existing plant power supply circuits were de-energized and deactivated prior to upgrading the power system. The upgraded power supply was provided using a pole-mounted transformer to provide 120/240 volts, which is fed through a 600-amp/250-volt circuit breaker in Storage Room 1. This 120/240-volt power supply is fed through a new electrical system within the 105-DR Reactor Building and provides power for lighting and outlet receptacles (this 120/240-volt system will provide power for early ISS project activities). However, power is insufficient for the full ISS project scope of work. Because this upgraded power system is internal to the 105-DR Reactor Building, it will require deactivation later in the ISS project schedule. The next electrical stage will provide power needed during the course of placing the building into ISS.

The second electrical stage will provide full power for all ISS activities by the installation of the Mobile Integrated Temporary Utility System (MITUS), which first served at the 105-C ISS Project and will be deployed on the 105-DR ISS project. The MITUS system provides an external power source to the 105-DR Reactor Building, which allows internal power within the 105-DR Reactor Building to be totally deactivated. The MITUS system consists of the following: a portable trailer-mounted substation containing transformer and power distribution switchgear; loadcenters; and flexible temporary power cords connecting the substation and loadcenters. The loadcenters provide 120/240-volt ground-fault circuit interrupter outlet power and the loadcenters can be located in proximity to ISS project activities. The MITUS power supply will be independent of all internal 105-DR power that will allow de-energization of the upgraded power supply stated above. This temporary MITUS will enhance safety during the ISS project because all permanent wired power systems within the 105-DR Reactor Building may be de-energized as directed by management. At the completion of the ISS project, the MITUS will be de-energized and made available for reassignment.

The last electrical stage will be installed during the SSE construction phase of the 105-DR ISS project. The MITUS will then be replaced by a reduced-capacity permanent power system that will provide power for the ISS period of up to 75 years. The S&M activities have lower power demands than ISS project activities and, thus, require a reduced power supply system. The S&M power system will consist of a transformer providing 120/240 volts to lighting panels and outlets for remote monitoring instruments, lighting, and power for S&M activities. Any components existing from the initial two stages mentioned above that can be utilized for the final stage of power will be considered for use.

2.3.1.2 105-F Reactor Building. The 105-F Reactor Building's electrical system was upgraded several years ago to provide a new power supply that met current code requirements. All existing plant power supply circuits were de-energized and deactivated prior to upgrading the power system. The upgraded power supply was provided by a pole-mounted transformer (120/240 volts). This 120/240-volt power is fed through a new electrical system within 105-F and provides power to lighting panels and outlets. The electrical power to the 105-F Reactor Building will be deployed in three stages. The first phase will utilize the existing system, which will provide power for early ISS project activities; however, this power is insufficient for the full ISS project scope of work. Because the electrical system is internal to the 105-F Reactor Building, it will require deactivation later during the ISS project schedule. The next electrical stage will provide power needed during the course of placing the building into ISS.

The second electrical stage will provide full power for all ISS activities by installing a mobile temporary power system. The 105-DR Reactor Building power system will have less capacity than MITUS and will not contain the paging/communication/alarm system or emergency lights of the MITUS. This temporary power system will consist of a substation with a transformer and power distribution switchgear, loadcenters, and flexible temporary power cords connecting the substation and loadcenters. The loadcenters are portable and can be located in proximity to ISS project activities. The temporary power system will be powered independently of all internal

105-F Reactor Building power, which will allow de-energization of the upgraded power supply. This temporary power system will enhance safety during the ISS project because all permanent-wired power systems within the 105-F Reactor Building may be de-energized as directed by management. At the completion of ISS, the mobile temporary power system will be de-energized and made available for reassignment.

The third electrical stage will be installed during the SSE construction phase of the 105-F ISS project. The mobile temporary power system will then be replaced by a reduced-capacity permanent power system that will provide power for the ISS period up to 75 years. The S&M activities have lower power demands than ISS project activities and require a reduced power supply system. The S&M power system will consist of a transformer providing 120/240 volts to lighting panels and outlets for remote monitoring instruments, lighting, and power for S&M activities. Any components existing from the initial two stages that can be utilized for the final stage of power will be considered for use.

3.0 SAFETY AND HEALTH MANAGEMENT AND CONTROLS

3.1 EMERGENCY MANAGEMENT

The ERC Emergency Management Program (including preparedness, planning, and response) is described in detail in BHI-SH-03, Volume 1, *Emergency Management Program*, and contains the administrative responsibilities for compliance with the Hanford Emergency Response Plan (DOE/RL-94-02) (DOE-RL 1998b). BHI-SH-03, Volume 2, contains emergency action plans for BHI-managed "hazardous" facilities. The 100-DR (including the 116-D Exhaust Air Stack) and 100-F areas each have an emergency action plan within BHI-SH-03, Volume 2, which identify the capabilities necessary to respond to an emergency condition, provide guidance and instruction for initiating emergency response actions, and serve as a basis for training personnel in emergency actions for each facility. The emergency response actions within each emergency action plan are provided for recognizing incidents and/or abnormal conditions, initiating initial protective actions, and making the proper notifications. The emergency action plans are consistent with Hanford Site emergency procedures and meet requirements of DOE/RL-94-02 (DOE-RL 1998b), applicable DOE orders, and state and Federal regulations (i.e., *Code of Federal Regulations* [CFR] 29 CFR 1910.38 and WAC 173-303-340, 350, and 360).

All emergency planning and preparedness activities for these projects will be consistent with planning and preparedness actions undertaken by other Hanford Site contractors and similar projects. Activities will be in a manner that ensures the health and safety of workers and the public and the protection of the environment in the event of an abnormal incident at either the 105-DR or 105-F Reactor Buildings, or the ancillary facilities (i.e., 116-D, 116-DR, 117-DR, and 119-DR).

Project response to any emergencies will be to evacuate personnel to a safe location and the required responsibilities of the Building Emergency Director and other project personnel who support the Incident Command System.

BHI-SH-03 (all volumes) comply with and implement the requirements of Hanford Emergency Response Plan (DOE-RL 1998b) and applicable DOE orders. The Emergency Management Program establishes a coordinated emergency response organization capable of planning for, responding to, and recovering from industrial, security, or hazardous material incidents.

3.2 HEALTH AND SAFETY PROGRAM

3.2.1 Worker Safety Program

The ERC Hazardous Waste Operations Safety and Health Program was developed for employees involved in hazardous waste site activities. The program was developed to comply with the requirements of 29 CFR 1910.120 and 10 CFR 835 and to ensure the safety and health of workers during hazardous waste operations. The program includes the following elements:

- An organizational structure that specifies the official chain of command and the overall responsibilities of supervisors and employees

- A comprehensive work plan developed before work begins at a site to identify operations and objectives and to address the logistics and resources required to accomplish project goals

- A site-specific health and safety plan (SS HASP) where workers may be exposed to hazardous substances

- Worker training commensurate with individual job duties and work assignments

- A medical surveillance program administered to comply with the Occupational Safety and Health Administration (29 CFR 1910.120) requirements

- BHI-SH-02, *Safety and Health Procedures*, Volumes 1 through 4, and project/task-specific implementing plans and procedures

- Volunteer Protection Plan.

3.2.2 Site-Specific Health and Safety Plan and Activity Hazards Analysis

A SS HASP will be prepared that defines chemical, radiological, and physical hazards and specifies the controls and requirements for work activities. Building access and work activities are controlled by approved work packages, as required by established BHI/ERC procedures. A SS HASP addresses the health and safety hazards of each phase of site operation and includes the requirements of a SS HASP for hazardous waste operations and/or construction activities, as specified in 29 CFR 1910.120, and DOE Order 5480.9A (DOE 1994a). An SS HASP will be written for each ISS project and may include the ancillary buildings. However, a separate SS HASP may be developed for the ancillary buildings. As part of work package development, an activity hazards analysis (AHA) will be written to identify the hazards associated with specific tasks not already covered under an SS HASP. The SS HASP elements include the following:

- Results of a risk and hazard analysis of each task and operation in the work plan
- List of employee training assignments
- List of PPE to be used by employees at the work site
- Medical surveillance requirements
- Worksite control measures
- Emergency response
- Confined-space entry procedures
- Spill containment program.

In addition to the SS HASP, a RWP will be prepared for work in areas with potential radiological hazards. The RWP extends the Radiological Protection Program (discussed in Section 3.2.3) to the specific work site or operation. All personnel assigned to the project and all work site visitors must strictly adhere to the SS HASP and RWP provisions.

Before work and each activity begin, a pre-job briefing is held with the involved workers. This briefing includes reviews of the hazards that may be encountered and the associated requirements. Throughout an activity, daily briefings may also be held, as well as special briefings prior to major evolutions.

3.2.3 Radiological Controls and Protection

The Radiological Controls and Protection Program is defined in DOE-approved programs and BHI-approved procedures (BHI-SH-02, *Safety and Health Procedures*; BHI-SH-04, *Radiological Control Work Instructions*; and the BHI-SH-01, *Hanford ERC Environmental, Safety, and Health Program*). This program implements the ERC policy to reduce safety or health risks to levels that are ALARA and to ensure adequate protection of workers. The ERC Radiological Protection Program meets the requirements of 10 CFR 835. Radiological material handling will be managed by the DOE Radiological Control Manual (DOE 1994b). Appropriate dosimetry, RWPs, PPE, ALARA planning, periodic surveys, and radiological control technical support will be provided.

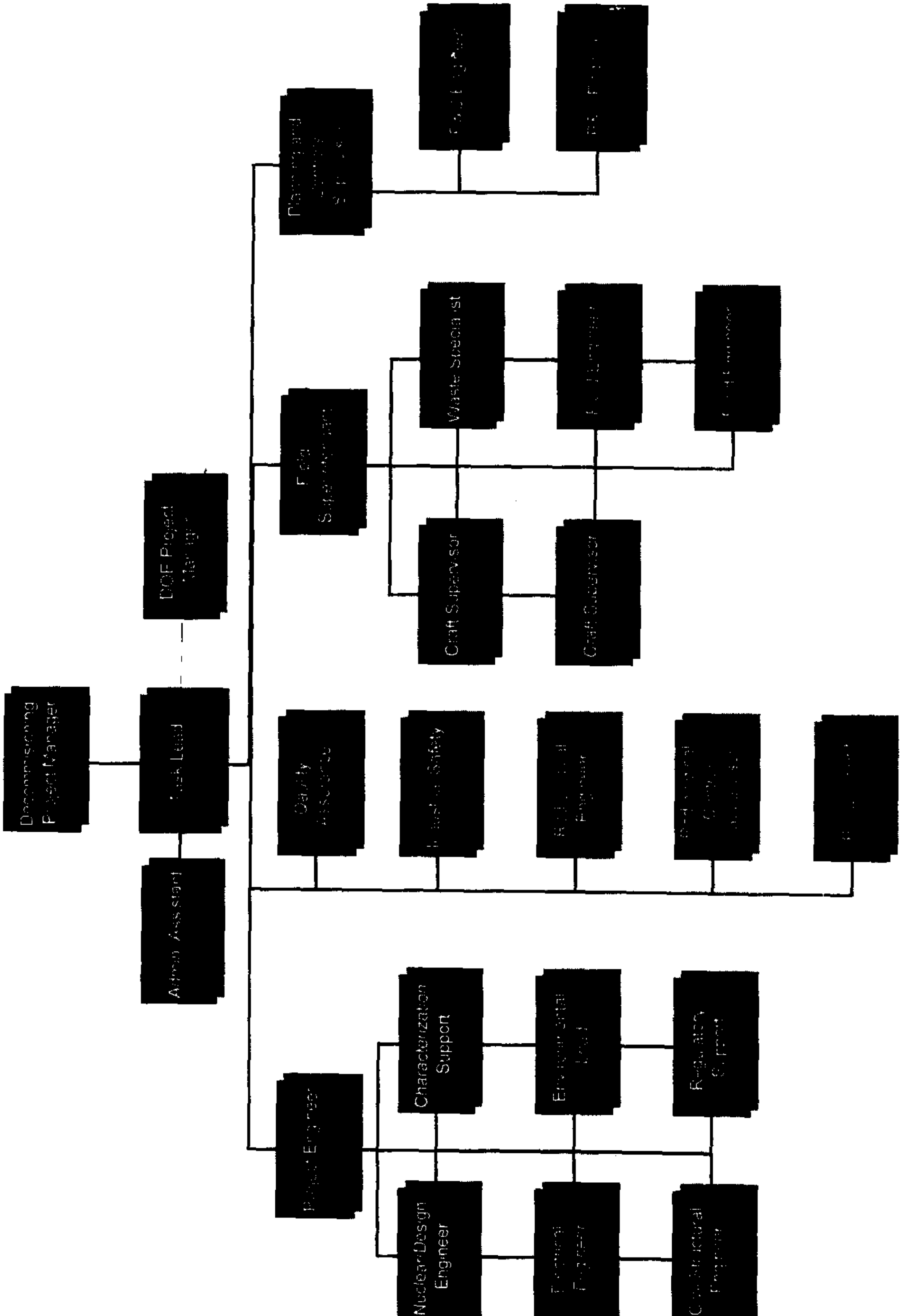
Standard ERC controls for work in radiological areas are assessed as adequate to control project activities. These controls provide for radiological controls planning that identify the specific conditions and govern the specific requirements for an activity, periodic radiation and contamination surveys of the work area, and periodic or continuous observation of the work by radiological control. The ALARA planning process will identify shielding requirements, contamination control requirements (including local ventilation controls), radiation monitoring requirements, and other radiation control requirements for the individual tasks conducted during the course of the projects.

Measures are also taken to minimize the possibility of releases to the environment. Appendix B will quantitatively address the radionuclide inventory and activities that could cause potential release of this inventory, but not to the exclusion of the DOE Radiological Control Manual (DOE 1994b) or 10 CFR 835 requirements. Potential radiological air emissions are discussed in Appendix B.

3.3 MAINTENANCE MANAGEMENT

The BHI organizations responsible for the S&M and D&D programs have reached an agreement regarding the transition and responsibility of the facilities covered by this removal action scope (except for 116-D). There are no systems to be maintained during decommissioning. Inspections, checks, and maintenance, which are activities normally conducted under S&M, will not be conducted during the D&D process. Access control to the respective facility during D&D activities will be under the control of the responsible field superintendent for the 105-DR or 105-F ISS project (Figure 3-1).

Figure 3-1. Organization Chart for the 105-DR and 105-F ISS Projects.



4.0 ENVIRONMENTAL MANAGEMENT AND CONTROLS

4.1 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

This section describes how each of the ARARs identified in the action memorandum (Ecology et. al 1998) will be met during the removal action.

- The *Model Toxics Control Act* (MTCA) (Method B), WAC 173-340, is applicable and specifies that cleanup actions must be protective of human health and the environment, comply with applicable state and Federal regulations, and provide for compliance monitoring. The cleanup standards apply to soil, structures, and debris encountered during the removal action. Groundwater protection standards also apply, should contaminated soil or structures remain in place below 4.6 m.

  The MTCA cleanup standards for hazardous constituents in soil will be met for structures and/or demolition debris remaining after completion of the removal action. Remediation may be required for soil waste sites that fall within the layback area of the SSE. The MTCA cleanup levels will be met for soil waste sites remediated during the removal action.

  Achievement of these cleanup standards will be verified through application of RESRAD dose models, as described in Section 4.4. Contaminated soil not addressed by the removal action in the vicinity of the facilities will be addressed in the final remedial action for the 100-DR-02, 100-DR-1, and 100-FR-01 operable units.

- State of Washington "Dangerous Waste Regulations" (WAC 173-303) are applicable for dangerous wastes encountered during the removal action. Additionally, this regulation applies for land disposal restricted waste, generator requirements, and transportation of hazardous wastes during the removal action.

  Disposition of hazardous substances from the facilities will be conducted in accordance with the waste generator requirements of RCRA, Subtitle C (40 CFR 262) as implemented by the State of Washington's "Dangerous Waste Regulations" (WAC 173-303), including waste designation, waste storage prior to disposal, and disposal restrictions. Waste disposal will also be governed by the requirements of the RCRA land disposal restriction (40 CFR 268); radiological waste land disposal requirements of 10 CFR 61, Subpart C; and the ERDF waste acceptance criteria (BHI 1996) for onsite disposal.

- The *Toxic Substances Control Act of 1976* (TSCA) (40 CFR 761) regulates the management and disposal of PCBs and PCB waste. All waste suspected to contain PCBs will be evaluated to determine if it meets ERDF waste acceptance criteria (BHI 1996). Any PCB waste that does not meet ERDF waste acceptance criteria will be disposed of offsite at an EPA-approved facility capable of accepting TSCA waste.

- *Clean Air Act of 1955* (40 CFR 61, Subpart M) provides the standards to ensure that emissions from asbestos are minimized during collection, processing, packaging, and transportation. These standards are applicable to asbestos and ACM encountered during the removal action.

Removal and disposal of asbestos and ACM is regulated under the *Clean Air Act of 1955* (40 CFR 61, Subpart M) and the Occupational Safety and Health Administration (29 CFR 1910.1101 and WAC 296-62). These regulations provide special precautions to prevent exposure of workers to airborne emissions of asbestos fibers. Compliance with these regulations during the removal action will satisfy the requirements of this ARAR.

- *Clean Air Act* [redacted] (40 CFR 61, Subpart H) provides the standards to ensure emissions from radionuclides are minimized during collection, processing, packaging, and transportation. These standards are applicable to radionuclides that may be encountered during the removal action to prevent exceeding 10 mrem/year effective dose equivalent to any member of the public.

- "U.S. Department of Transportation Requirements for the Transportation of Hazardous Materials" (49 CFR 100-179) are applicable for any wastes transported from the Hanford Site.

- The *Hazardous Materials Transportation Act of 1976* is applicable for transportation of potentially hazardous materials, including samples and waste. All offsite shipments for disposal will comply with the applicable packaging, marking, labeling, and shipping requirements. Any shipment of potentially hazardous materials, either onsite or offsite, will also comply with *the Hazardous Materials Transportation Act.*

- The *Clean Air Act* [redacted] is applicable to releases of airborne contaminants that may occur during the removal action, as well as the air monitoring requirements for these contaminants.

- "Radiation Protection—Air Emissions" (WAC 246-247) is applicable to the release of airborne radionuclides that may occur during the removal action, as well as the air monitoring requirements and best available radionuclide control technology (BARCT).

  The Washington State Department of Health regulates release of airborne radionuclides (WAC 246-247). Quantifying radioactive emissions, implementing BARCT, and performing air monitoring for emission verification have been identified as substantive requirements. Appendix B provides detailed information demonstrating how these requirements will be met. The calculated unabated offsite dose, 6.22×10^{-6} mrem/yr for the 105-DR Reactor Building and 1.20×10^{-5} mrem/yr for the 105-F Reactor Building are not greater than 0.1 mrem/yr; therefore, this activity is not subject to the substantive requirements of 40 CFR, Subpart H (i.e., National Emission Standards for Hazardous Air Pollutants compliant monitoring). However, periodic confirmatory measurements, as described in Appendix B, will be conducted.

- "General Regulation for Air Pollution Sources" (WAC 173-400) and "Controls for New Sources of Toxic Air Pollutants" (WAC 173-460) are applicable to the release of toxic air pollutants that may occur during the removal action, as well as the air monitoring requirements and best available control technology for toxics.

- The *Safe Drinking Water Act of 1974* and "National Primary Drinking Water Regulations" (40 CFR 141, Subpart B) for public drinking water supplies establish cleanup goals that are protective of groundwater. Although the removal action does not directly address groundwater cleanup in the 100-D/DR and 100-F areas, belowgrade structures, soil, and demolition debris to be left in place will be remediated to meet standards that are protective of groundwater. Protectiveness will be verified by ensuring that soil cleanup levels for materials left in place allow compliance with maximum contaminant levels (MCLs) for hazardous constituents and 4 mrem/yr for radiological constituents in groundwater. The RESRAD dose models will be used to verify protectiveness with regard to radiological constituents, as described in Section 4.4. Soil not addressed by this removal action in the vicinity of the facilities that may be contaminated will be addressed in the final remedial action for the 100-DR-2, 100-DR-1, and 100-FR-1 operable units.

- RCRA, Subtitle C, is relevant and appropriate regarding the generation, transportation, storage, treatment, and disposal of hazardous waste. Hazardous waste management regulations promulgated pursuant to RCRA are codified in 40 CFR 260-268. Regulations established under RCRA are applicable to any hazardous waste generated during the removal action.

- The *Clean Water Act of 1977*, as implemented by WAC 173-200-216, establishes cleanup goals that address protection of the Columbia River. Erosion and stormwater controls will be used as necessary during and following the removal action to prevent waste water/stormwater discharges directly to the Columbia River. Building material, soil, and demolition debris to be left in place will meet standards that are protective of the Columbia River. Verification of protection of the Columbia River will be achieved by ensuring soil cleanup levels for materials left in place allow compliance with MCLs for hazardous constituents and 4 mrem/yr for radiological constituents in groundwater.

  If soils within these sites require removal to facilitate D&D activities, soils with contamination levels above the human health risk range of 10^{-4} to 10^{-6} (or above MTCA soil cleanup standards) will be removed and disposed at the ERDF. Protectiveness for carcinogens under CERCLA is generally determined with reference to a cancer risk range of 10^{-4} to 10^{-6}, which is deemed acceptable by EPA. Consistent with this risk range, EPA has considered cancer risk from radiation in a number of different contexts and has consistently concluded that levels of 15 mrem/yr effective dose equivalent (which equates to approximately a 3×10^{-4} cancer risk) or less are protective and achievable (EPA 1997a). EPA takes into consideration the site-specific, naturally occurring background radiation levels. Consistent with the EPA conclusion that 15 mrem/yr or less effective dose equivalent is protective, and the background levels, cleanup levels at the Hanford Site are established at 15 mrem/yr above Hanford Site background. "Risk level," as referred to in this document, means 15 mrem/yr effective dose equivalent above Hanford Site background.

- The *National Historic Preservation Act of 1966* (implemented through 36 CFR 800) requires Federal agencies to evaluate and mitigate adverse effects of Federal activities on any site eligible for inclusion on the National Register of Historic Places. The programmatic agreement for the maintenance, deactivation, alteration, and demolition of the built environment allows DOE to prepare a treatment plan that provides for the mitigation of historic structures. The programmatic agreement requires that all mitigation activities identified in the treatment plan be completed before any demolition, alteration, or removal of artifacts. Although the 105-DR and 105-F Reactor Buildings were determined eligible for listing on the National Register of Historic Places, the facilities were not recommended for mitigation (Neitzel 1997) and no further action is required to meet this ARAR.

- The *Archeological Resources Protection Act of 1979* (43 CFR 37) would govern the protection of any significant artifacts that may be found during the removal action. Because of the extensive disturbance resulting from construction of the facilities, it is unlikely that archaeological remains will be found in the footprint of the facilities (Neitzel 1997). However, if archeological remains are discovered, a mitigation plan will be developed in consultation with the appropriate authorities. Section 4.5, "Natural and Cultural Resources Protection," discusses this subject in more detail.

- The *Endangered Species Act of 1973* (implementing regulations of 50 CFR 402) and WAC 232-012-297 prohibit activities that threaten the continued existence of listed species or that destroy critical habitat. Threatened and endangered species are known to be present in the 100 Areas, but no adverse impacts on protected species or critical habitat is anticipated from activities associated with the removal action. An ecological review will be conducted prior to demolition to identify any potential impacts. If potential impacts are discovered, an appropriate mitigation plan will be developed and implemented.

- The *Native American Graves Protection and Repatriation Act* (implemented via 40 CFR 10) requires agencies to consult and notify culturally affiliated tribes when Native American remains are inadvertently discovered during project activities. It is unlikely that the removal action would inadvertently uncover human remains. If human remains are encountered, the pre-established procedures, documented in the *Hanford Cultural Resource Management Plan* (PNL 1989), will be followed.

4.1.1 Other Criteria, Advisories, or Guidance to Be Considered for this Removal Action

In addition to the ARARs identified in the action memorandum (Ecology et. al 1998) and discussed in Section 4.1 the following criteria, advisories, and guidance will be complied with in accordance to the action memorandum (Ecology et al. 1998) during implementation of the removal action. These materials, while not promulgated as regulations, are important to protect human health and the environment, and to protect workers during the implementation phase.

- *Establishment of Cleanup Levels for CERCLA Sites with Radioactive Contamination* (EPA 1997a) is an EPA policy statement that provides clarifying guidance for establishing cleanup levels for radioactive contamination at CERCLA sites. The statement provides guidance regarding protection of human health and does not address levels necessary to protect ecological receptors. It should be noted, however, that for most radionuclides, remediation goals that are protective of human health are also considered protective of ecological receptors. The guidance indicates that cleanup levels should consider exposure from all pathways and through all media (e.g., soil, groundwater, surface water, sediment, air, structures, and biota). The policy statement establishes a 15 mrem/yr effective dose equivalent as the maximum dose limit for humans. It further states that background should be determined on a site-specific basis. Although not an ARAR, the cleanup standard in the EPA policy statement must be addressed to satisfy the threshold criterion for protectiveness. Protectiveness will be verified through the application of the RESRAD dose assessment models.

Since there is known radiological contamination in the facilities, cleanup standards will meet the protectiveness factor specified in the EPA policy statement (EPA 1997a) from grade to 4.6 m below grade for direct exposure from contaminated building structure and soils. The EPA has concluded that levels of 15 mrem/yr effective dose equivalent or less are protective and achievable.

- The ERDF waste acceptance criteria (BHI 1996) and *Supplemental Waste Acceptance Criteria for Bulk Shipments to the Environmental Restoration Disposal Facility* (BHI 1997c) delineate primary requirements including regulatory requirements, specific isotopic constituents and contamination levels, the dangerous/hazardous constituents and concentrations, and the physical/chemical waste characteristics that are acceptable for disposal of wastes at ERDF. Prior to disposal, waste will be evaluated to ensure that the waste meets ERDF waste acceptance criteria.

- *Revised Procedures for Planning and Implementing Off-Site Response Actions* (EPA 1987) provides procedures for offsite disposal of CERCLA wastes. Although it is anticipated that waste generated by the removal action will be disposed on site, these procedures will be implemented for any offsite disposal that would be required. The EPA Remedial Project Manager will be responsible for decisions regarding the offsite disposal of regulated waste generated during the removal action.

- *Hanford Site Solid Waste Acceptance Criteria* (WHC 1996) identifies criteria for acceptance of waste at the Central Waste Complex and Effluent Treatment Facility.

- "Radiation Protection Guidance for Exposure to the General Public" (59 FR 66414) provides EPA protection guidance recommending that (non-medical) radiation doses to the public from all sources and pathways not exceed 100 mrem/yr above background. It also recommends that lower dose limits be applied to individual sources and pathways. One such individual source is residual environmental radiation contamination after the cleanup of a site. The removal action will meet a 15 mrem/yr effective dose equivalent goal, excluding nearby waste sites to be addressed by the remedial action program.

- "Occupational Radiation Protection" (10 CFR 835) establishes radiation protection standards, limits, and program requirements for protecting workers from ionizing radiation resulting from the conduct of DOE activities. It also requires that measures are taken to maintain radiation exposures ALARA. A combination of PPE, personnel training, physical design features (e.g., confinement, remote handling, and shielded containers), and administrative controls (e.g., limiting time in radiation zones) would be used to ensure that the requirements for worker and visitor protection are met. In addition, the requirements to maintain exposure ALARA will be achieved by decontaminating surfaces to the extent practicable prior to demolition and by providing PPE, training, and administrative controls. For surfaces that could not be adequately decontaminated, fixatives would be applied to contaminants to ensure exposure ALARA. Individual monitoring would be performed as necessary to verify compliance with the requirements.

- Exposure limits, personnel protection requirements, and decontamination methods for hazardous chemicals are established by 29 CFR 1910. Additionally, the regulation requires identification and mitigation of physical hazards to workers posed by a facility including, but not limited to, confined spaces, falling hazards, fire, and electrical shock. The regulation provides requirements for worker safety during construction activities.

- *Radioactive Waste Management* (DOE 1998) provides the requirements for managing low-level radioactive waste and transuranic waste. These requirements are applicable to managing low-level radioactive and transuranic waste encountered during this removal action.

- *National Environmental Policy Act* (NEPA) (DOE 1997b) requires that CERCLA address values of NEPA. The EE/CA (DOE-RL 1998a), a CERCLA document, incorporated NEPA values to the extent practicable.

- The *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1990) contains provisions governing RCRA and CERCLA cleanup activities at the Hanford Site and provides guidance on integrating RCRA and CERCLA requirements to the greatest extent practicable. These provisions are applicable during this removal action, and the requirements have been identified and addressed through the ARARs.

4.2 WASTE MANAGEMENT

CERCLA Section 104(d)(4) states that where two or more noncontiguous facilities are reasonably related on the basis of geography, or on the basis of the threat or potential threat to the public health or welfare or the environment, the President may, at his discretion, treat these facilities as one for the purposes of this section. The preamble to the National Contingency Plan clarifies the stated EPA interpretation that when noncontiguous facilities are reasonably close to one another and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. Therefore, the facilities in the 100 Areas addressed by this RAR and the various disposal/storage facilities such as the ERDF, CWC, and ETF, which are in the 200 Area, are considered as a single site for response purposes under this RAR.

Waste management activities will be performed in accordance with waste management ARARs identified in the action memorandum (Ecology et al. 1998) for the 105-DR and 105-F Reactor Buildings and ancillary facilities (Ecology et. al 1998) and discussed above in Section 4.1. The requirements specified by the ARARs and other applicable guidance will be addressed in a site-specific waste management instruction prepared in accordance with BHI-FS-03, Procedure W-006, "Site Specific Waste Management Instructions." The site-specific waste management instruction will address waste storage, transportation, packaging, handling, and labeling as they specifically apply to waste streams.

In conducting the removal action, various waste steams will be generated. Each waste stream will require specific processing and disposal. These waste streams will include the following:

- Solid waste
- Low-level radioactive waste
- Mixed waste (waste that is both low-level radioactive waste and hazardous waste)
- Used oil
- Hazardous, dangerous, and PCB wastes.
- Transuranic waste

4.2.1 Waste Characterization and Designation

Waste generated will be characterized and designated in accordance with BHI-EE-10, *Waste Management Plan,* and BHI-FS-03, *Field Support Waste Management Requirements*, and the requirements of the receiving facility. Waste will be segregated by radioactive content, physical form, and chemical form. The generation of mixed waste will be minimized to the maximum extent practical. Wastes destined for the ERDF will be considered as follows:

- Characterized in accordance with the appropriate project sampling and analysis plan (SAP)

- Designated in accordance with the following:

  - BHI-EE-10, Attachment 1, "Characterization and Designation"
  - BHI-FS-03, Procedure W002, "Waste Certification"
  - ERDF waste acceptance criteria (BHI 1996).

Waste destined for one of the Project Hanford Management Contractor (PHMC)-controlled facilities will be designated and characterized in accordance with BHI-EE-10 and *Hanford Site Solid Waste Acceptance Criteria* (FDH 1998).

4.2.2 Waste Handling , Storage, and Packaging

Waste will be staged either (1) within the area of contamination, or (2) at on-site location in accordance with all substantive requirements.[2] Waste-handling procedures, including containerizing and inspecting, will meet the requirements of WAC 173-303 and 40 CFR 761. Packaging and labeling of waste will meet the requirements of BHI-FS-03, DOT regulations (49 CFR 171-179) and the waste acceptance criteria of the onsite disposal facility, as appropriate.

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[2] The area of contamination consists of the area of continuous contamination of various amounts and types. 'On-site' locations include the areal extent of contamination as well as all suitable areas in very close proximity to the contamination necessary for implementation of the removal action.

4.2.3 Waste Treatment

Treatment of waste streams may be necessary to provide for safe transport or effective disposal. The type of treatment and the location where treatment will be accomplished, will be determined by the Tri-Parties on a case-by-case basis, in accordance with the substantive requirements of WAC 173-303. Upon regulatory agency approval, solidification, encapsulation, neutralization, and size reduction/compaction may be employed to treat various wastes.

4.2.4 Waste Transportation and Shipping

When transportation subcontractor services are used for waste generated during the 105-DR and 105-F Reactor Buildings removal action, the subcontractor will be responsible for using and maintaining appropriate transport motor vehicles and providing qualified commercial drivers. All shipments will be made in accordance with DOT regulations, 49 CFR 171-179. and BHI-FS-03.

4.2.5 Disposal

Contaminated soil encountered during demolition of the facilities and soil in the FSBs will be disposed of in an appropriate disposal facility. The remaining contaminated soil waste sites will be addressed by DOE's remedial action program, as specified in other CERCLA decision documents.

Disposal of waste from this action will either be sent to ERDF or an EPA-approved offsite disposal facility. Treatment of waste may be necessary prior to disposal at ERDF and may be stored up to one year at ERDF if the waste is awaiting treatment. Should transuranic waste be encountered, storage will be allowed at Hanford's CWC and requires EPA/Ecology approval. Certain material is eligible for salvage and recycling, which is encouraged, provided that the appropriate regulatory requirements are met and that it is economically feasible for the project to do so. In addition, materials shipped offsite for salvage or recycle must be certified free of radioactive contamination in accordance with the ERCs material release program, as discussed in Section 4.4. Liquid waste will either be sent to Hanford's ETF or treated to meet the acceptance criteria of the receiving facility. Ecology approval is required prior to shipping contaminated water to ETF for treatment. *Hanford Site Solid Waste Acceptance Criteria* (WHC 1996) identifies criteria for acceptance of waste at the CWC and ETF. BHI 1996 and BHI 1997c provide waste acceptance criteria for the ERDF.

4.2.6 Waste Management Strategy

Basic waste management strategies are discussed below; however, if other more cost-effective methods become available, they may be used. Throughout the project, material will be recycled whenever possible, assuming that it is economically feasible for the project.

- **Solid waste:** Solid waste will be managed in accordance with WAC 173-304 with an emphasis on recycling or reuse to the maximum extent possible. Solid waste will primarily be sent to inert demolition waste landfills and for offsite disposal at a municipal/industrial landfill (e.g., the City of Richland landfill). All materials released offsite for disposal, recycle, or salvage must be certified free of radioactive contamination in accordance with the ERCs materials release program, as discussed in Section 4.4.

- **Low-level radioactive waste:** Low-level radioactive waste that meets ERDF waste acceptance criteria (BHI 1996) will be disposed of at the ERDF.

- **Mixed waste:** Mixed waste will be managed in compliance with the requirements for both hazardous/dangerous wastes (WAC 173-303) and radioactive waste (10 CFR 61). Due to the expected small size of mixed waste streams to be generated that do not meet LDR volume requirements, waste will be shipped to the CWC for long-term storage, given Ecology/EPA approval. If mixed waste streams are found in quantities large enough to make treatment a viable option, mixed wastes may be treated to meet applicable land disposal restrictions and disposed of at the ERDF.

- **Used oil**: All used oil identified at this time is nonradioactively contaminated. The preferred strategy is to manage the oil (except for PCB oils) as a recyclable material in accordance with the Hanford Site-wide used oil program. Used oil will be evaluated with the material release program, as discussed in Section 4.4.

- **Hazardous/dangerous wastes**: Hazardous/dangerous wastes in the facilities consist primarily of mercury, lead, sodium dichromate, and PCBs. Some forms of mercury can be treated as a recyclable material if not radioactive. If any of these wastes are found to be radioactive, they will be treated as mixed waste. Waste that does not meet the ERDF waste acceptance criteria may be shipped to an offsite disposal facility, contingent upon the waste meeting the offsite disposal facility's waste acceptance criteria and obtaining an offsite determination of acceptability by the EPA. In addition, waste shipped offsite for disposal will be certified free of radioactive contamination in accordance with the ERCs material release program, as discussed in Section 4.4.

- **Transuranic Wastes**: Without regard to source or form, waste that is contaminated with alpha-emitting transuranic radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay is classified as transuranic (TRU) waste (DOE 1988). TRU waste will be managed in accordance with BHI-EE-10, "Waste Management Plan". The CWC, operated by the PHMC, will be used for interim storage of any TRU waste encountered. Storage at CWC requires Ecology/EPA approval.

- **Accountable Nuclear Materials:** If accountable nuclear materials (i.e., fuel elements or pieces) are discovered in the sediment, this material will be transferred to the PHMC for disposal in accordance with an existing Memorandum of Understanding.

4.3 CHARACTERIZATION

Characterization (through sampling and analysis and radiological surveys) will be conducted throughout the 105-DR and 105-F ISS projects to identify radiological and hazardous conditions that will be encountered during facility operations. These technical services will also be used to identify and characterize waste streams for treatment and/or disposal and to verify facility and area conditions at various phases of project completion. Analytical data generated in these efforts will be used to develop the following information:

- Contaminant identification
- Contaminant concentrations
- Waste type categories
- Worker health and safety conditions
- Decontamination requirements
- Operational precautions
- Waste treatment requirements
- Waste packaging and disposal requirements.

The characterization efforts will address both the 105-DR and 105-F Reactor Buildings. Sampling and analytical activities have been separated into an initial scoping survey and four phases of sampling and analysis and radiological surveys. The project will generate four SAPs, one for each phase of the ISS project following the initial scoping survey. Each SAP will be sent to EPA for review and approval prior to use in the field.

Initial Scoping Survey: Initial characterization begins with a review of historical information, including the review of old procedures, technical manuals, drawings, photographs, past radiological surveys, and interviews with experienced reactor operation personnel associated with the historical operation of the reactor. Environmental radiological scoping surveys and technical smears will be collected to identify the radiological conditions and isotopic distribution throughout the facility. A selected team of personnel will conduct facility inspections to examine the physical conditions of the facilities and determine suspect chemical/hazardous and radiological material locations. This information will be used to summarize the waste streams during project planning. The initial scoping survey does not require a SAP.

Phase I: This phase includes sampling and analysis efforts to support demolition activities scheduled for fiscal year 1998. The characterization activities will specifically address the 105-DR lunchroom, miscellaneous storage room, switch gear room, and the 105-F lunchroom, shower room, storage/loadout area and exhaust fan room. The characterization activities start with the development of a Phase I SAP. After the SAP is approved, characterization continues with sample collection and laboratory analysis to support engineering design for the removal and disposal of the components and structures to grade level.

Phase II: This phase includes all abovegrade structures outside the SSE at 105-DR and 105-F Reactor Buildings. The sampling and analysis activities will support decontamination and removal and disposal of all components and structures outside the SSE to grade level. Because characterization is used to provide insight on unknown, uncertain, and/or suspect conditions, characterization will be performed in conjunction with planned operations. Throughout the duration of this phase, facility conditions will change and additional information may become available that could alter the initial characterization plans. The Phase II SAP will address identified waste streams throughout the abovegrade components and structures, as well as anomalies that may be found as the building layers are removed.

Phase III: This phase, Final Status Characterization, includes all grade-level concrete foundations, below grade areas, and underlying soils excluding the 105-F FSB area. Specific objectives of this characterization activity include sampling and analysis of grade-level concrete foundations, belowgrade concrete structures and underlying soils to determine which materials are suitable for closure without decontamination. Characterization of the 105-DR fan room (part of the LSFF TSD unit) will be included in this phase. The characterization will also identify those areas that require removal and/or remediation prior to final closure. This phase will include the development of a Phase III SAP, as well as a final verification report, that will document the status of the facility upon completion of the ISS projects.

Phase IV: This phase, 105-F Fuel Storage Basin Material Removal, includes sampling and analysis activities to support in-process characterization of material removal from the 105-F FSB. It also includes final closure characterization activities in the 105-F FSB and surrounding area after the materials have been removed. Specific objectives of this characterization activity will include sample collection and laboratory analysis to support waste disposition of the soils and other material removed from the FSB. Characterization of the concrete structure and underlying soils will also be required to determine the extent of contamination and support the engineering design for decontamination, removal, and/or remediation of the concrete basin structure and soils. This phase will be implemented in accordance with an approved Phase IV SAP.

In addition to the four phases of characterization for the ISS projects, the 116-D, 116-DR, 117-DR, and 119-DR ancillary buildings/structures and associated ducting piping with the DR ancillary buildings will also be characterized. The characterization activities will follow the same general approach to include the sample documents, as defined below. The characterization of these facilities will also require approval from the EPA but will be funded under separate cost accounts. The 116-DR and 117-DR, including associated piping, ducting, and tunnels, are currently part of a RCRA TSD unit and will be characterized following the appropriate RCRA protocols. Section 5.7 discusses closure of the TSD site in more detail.

4.3.1 Sampling Documents

4.3.1.1 Data quality objectives. The data quality objectives (DQO) procedure (BHI-EE-01, *Environmental Investigations Procedures,* Procedure 1.2, "Data Quality Objectives") will be used to define the quantity and quality of data to be collected to meet the project objectives. The results of the DQO process, including agreements, will be documented in a standardized DQO workbook, which will be performed before the development of the SAP.

4.3.1.2 Sampling and analysis plan. Four separate SAPs will be prepared in accordance with BHI-EE-01, Procedure 1.15, "Sampling Documents." The SAPs will be written for each of the four phases identified above. The SAPs will be prepared in support of the Tri-Party Agreement (Ecology et. al 1990) and site characterization, waste characterization, and/or environmental restoration and remediation activities. Each SAP will be comprised of a summary of the DQO, project-specific quality assurance project plan (QAPjP), and field sampling plan (FSP).

4.3.1.3 Quality assurance project plan. When the DQO workbook has been completed and approved by the appropriate decision makers and technical team, the QAPjP will be written consistent with guidance provided in *Draft Final EPA Requirements for Quality Assurance Project Plans for Environmental Data Operations* (EPA 1997b). The QAPjP will address the following major elements:

- Project management
- Measurements and data acquisition
- Assessment and oversight
- Data validation and data usability.

4.3.1.4 Field sampling plan. The FSP will be written following the completion of the QAPjP. This section of the SAP will describe the field sampling approach to be implemented in the field.

4.4 RESIDUAL RADIATION RELEASE CRITERIA

The 105-DR and 105-F ISS Projects and other buildings covered under this removal action will have the option to determine whether to release the below-grade portions of the buildings undergoing D&D from radiological controls for unrestricted use. The process to be used will be compliant with applicable federal, state, and DOE-mandated requirements, such as those imposed by the CERCLA, Tri-Party Agreement (Ecology et al. 1990), and DOE Order 5400.5, "Radiation Protection of the Public and the Environment." ~~The recently published document~~, *Guidance for Radiological Release of DOE Real Property at Hanford,* (~~DOE/RL-[illegible]~~7), will be used, where appropriate, to develop the appropriate scenarios for derivation of radiological release limits based on D&D alternatives.

The Action Memorandum (Ecology et al. 1998) established a dose limit of 15 mrem/yr from all pathways and 4 mrem/yr from the groundwater pathway.

The determination of whether to release the below-grade portions of the buildings will be based on the unrestricted residential use of the below-grade portions of the buildings. Dose to the receptors will be based on three risk scenarios: post drilling residential, sleeping resident and building renovation as outlined in DOE/RL 1997. Radiological dose to the receptor is modeled via RESRAD-BUILD and RESRAD (soil) computer code supplied by Argonne National Laboratory. RESRAD (soil) is primarily used for estimating doses to a receptor from contaminated soil or other sources of contamination that may move into the soil and ultimately to groundwater. The contamination is modeled as a horizontal layer moving through soil. RESRAD-BUILD is used to derive the dose that an individual may receive while living, working, or visiting the released facility. RESRAD-BUILD may be used to create a three-dimensional model of a source term and facility (e.g., contaminated walls in a building). Both models consider multiple exposure pathways to the receptor (inhalation, ingestion, and external exposure).

RESRAD (soil) has been widely used throughout the United States in modeling both radiological and chemical risk. RESRAD-BUILD has been used by several DOE sites in modeling radiological dose to workers and risk scenarios supporting release of real property. Both the scenarios and software have been generally accepted by Washington State regulatory agencies (Washington Department of Ecology, Washington Department of Health, and U.S. Environmental Protection Agency). Parameters used in the model are outlined in DOE/RL 1997 and have been reviewed by the regulatory agencies mentioned above. The scenarios were deemed acceptable for evaluation of release criteria for the 105-C ISS Project.

In order to proceed with close out, concentration based limits must be developed that are based on the previously discussed scenarios and the 15 mrem/yr and 4 mrem/yr limits. The lookup values or target derived concentration guideline levels (DCGLs) are based on land use, risk scenarios, and modeling. Verification measurements will be made after remediation and the results will be used in the models to estimate the receptor dose from final radionuclide levels. Radiological measurement procedures are based on an approved SAP and technical guidance provided regulatory requirements for the release of real and non-real property, as identified in (BHI-01189, Draft). If the final runs of the dose model with the final measured radionuclide levels indicate that the dose limits are met, the data will be fully assessed and validated to assure that the final verification data meets requirements.

All property that is released for off site disposal and/or reuse and recycle is non real property. The release of non-real property will follow the guidance in DOE 5400.5 as amplified by recent guidance (DOE 1995, DOE 1997b, DOE/EM 1997 and draft BHI guidance BHI-1997a, 1997d). For non-real property that is surface contaminated only (not contaminated in volume) the project may use the processes described in the above referenced documents and authorized limits that are provided in Table 1 of the Pelletier Memo (DOE 1995). If the property meets the surface contamination limits and the person or entity receiving the property is aware of the measured radioactivity on the property, it may be dispositioned without regard to residual radioactivity.

If the property is volumetrically contaminated (e.g., soil, concrete exposed to water, activated concrete, activated metal, etc.) the property must be evaluated through a pathway dose assessment to determine the potential dose to a receptor and residual contamination allowable. Depending on the estimated dose to a member of the public, DOE guidance (DOE 1995) requires DOE/RL and/or DOE HQ approval, as well as the concurrence of the property recipient (e.g. State, disposal site operator) for any non-real property disposed as waste. An ALARA evaluation must be performed prior to final use of any surface (including Table 1) or volumetric authorized limits. DOE has provided guidance for ALARA evaluations applied to environmental releases in a recent document (ALARA 1997).

4.5 NATURAL AND CULTURAL RESOURCES PROTECTION

Most of the areas surrounding the 105-F and 105-DR Reactor Buildings are covered with graveled and asphalt surfaces. No native vegetation exists within the reactor exclusion areas and, therefore, no avoidance mitigation will be required to protect native plants. An ecological review of the 105-F Reactor Building was conducted on February 26 and April 15, 1998, to identify ecological resources (Brandt 1998b). The findings of the review indicated that bats use the building during the summer months, as evidenced by the presence of bat feces and several dead Pallid bats (a Washington State monitor-2 species). No accumulations of bat feces or any other evidence was observed that indicated use of the reactor by roosting concentrations of bats. The review concluded that no adverse impacts would occur to bats if demolition activities began outside their active season (which is approximately April through October) and continued to be uninterrupted. If demolition is scheduled to begin during their active season or is interrupted for a period of time sufficient that bats could commence using the building for roosting (i.e., from several weeks to several months), a new ecological review would be required.

An ecological review of the 105-DR Reactor Building was conducted over four separate visits, between February and April 1998. The results of this review were documented in a letter from C. A. Brandt to D. S. Smith, dated April 16, 1998 (Brandt 1998a). The findings of this review revealed the presence of bats using the facility for roosting. Two live specimens of small-footed Myotis bats were found within the reactor building, and numerous small deposits of scattered feces were found throughout. No evidence of a communal roost or large aggregation of bats was found within the reactor building. However, a communal roost was found within the process water tunnel that enters the reactor from the 190-D (now demolished) water plant. This communal roost had been previously documented (Becker 1993) and appeared to still be active.

The small-footed Myotis is a former Federal candidate species for threatened and endangered status and is currently listed by the State of Washington (1996) as a priority species where it occurs in natural breeding areas and other communal roosts.

The review concluded that no adverse impacts would occur to bats using the reactor building if demolition activities began outside their active season (which is approximately April through October) and continued to be uninterrupted. If demolition is scheduled to begin during their active season or is interrupted for a period of time sufficient that bats could commence using the building for roosting (i.e., from several weeks to several months), a new ecological review would be required.

The review also concluded that the bats using the 190-D process water tunnel for a roost site would be impacted and the roost lost because the project would isolate the tunnel from the reactor, thereby closing off access to the tunnel. Therefore, a mitigation plan was proposed that would preserve the tunnel for habitat by creating an alternate opening at one of the existing surface hatches and installing a "bat gate" that would allow access to the bats and exclude access to people and other animals. This and other mitigation strategies will be evaluated and implemented, as appropriate, throughout the life of the project.

No other species of concern were identified that would be impacted by the projects at 105-F and 105-DR Reactor Buildings. However, because of the possibility of migratory birds using the buildings and surrounding areas for nesting, annual surveys (and seasonal surveys, as needed) would be required throughout the duration of this project. If nesting migratory birds are found within the project area, mitigation actions will be developed to avoid nest destruction or abandonment.

The areas surrounding the 105-F and 105-DR Reactor Buildings will be maintained clear of vegetation until all associated waste sites have been remediated and final disposition of the reactors occurs. Therefore, revegetation of these sites is not planned to immediately follow the ISS Projects. However, provisions will be made during final site grading to ensure that suitable soils are in place to facilitate revegetation at a later time.

Cultural resource reviews (BHI 1998f and 1998g) were conducted on January 14, 1998 at the 105-F Facility and February 7, 1998 at the 105-DR Reactor Building that considered cultural and historic significance. Also, a cultural resources field reconnaissance was conducted on February 26, 1998. These reviews concluded that the 105-DR and 105-F Reactors are situated in areas of low cultural resource potential and that no archeological resources have been recorded within or adjacent to the areas of potential effect. Due to the extensive disturbance to the areas, no intact subsurface materials are anticipated. However, due to potential interest from Native American Tribal representatives to monitor ground-disturbing activities associated with demolition, notification will be provided one week prior to ground-disturbing activities.

The reviews of historic significance found that both the 105-DR and 105-F Reactors were determined by the DOE, Richland Operations Office (RL), and the Washington State Historic Preservation Office to be contributing properties within the Hanford Site Manhattan Project and Cold War Era Historic District. However, neither was selected for individual documentation, and no additional mitigation measures were required prior to demolition. Pursuant to Stipulation V (C) of the Historic Buildings Programmatic Agreement (DOE-RL 1996), a walkthrough of the 105-DR and 105-F Reactor Buildings was conducted on April 29, 1998 to determine which, if any, artifacts and objects remaining within these buildings had educational or interpretive potential. Fifteen items were identified and tagged. These items will be relocated to a secure area for storage prior to the initiation of project activity.

Natural and cultural resource reviews for the ancillary facilities have not been conducted. Therefore, these will need to be completed prior to initiating D&D activities at these locations.

4.6 ADDITIONAL RELEVANT CONTROLS OR ACTIONS

To ensure that the conditions assumed in the 105-DR auditable safety analysis (BHI 1998a) are maintained, no intrusive activities will be performed on the reactor block.

The following special controls are defined to ensure the validity of assumptions in the 105-F auditable safety analysis (BHI 1998b) hazard analysis:

- No activities will be conducted that require penetrating the gas cover shell of the reactor block. Water and gas piping may be cut and capped if an AHA is performed, a hot work permit is in place, and radiological control requirements are met. The potential flammability of the masonite in the biological shield will be considered while preparing the required permitting, and pathways for heat and burning to the material will be addressed.

- Bottles of pressurized flammable material will not be stored in the basin until after all potential fuel elements have been excavated and secured within DOT-approved shipping casks. The wooden planking and other flammable materials that are uncovered during remediation of the FSB will be removed and staged away from the basin.

- Excavation of the soil from the FSB will be carried out until approximately the last 1 m of soil remains in the FSB to provide basin workers with the shielding properties of the soil (which is the height that the top of the concrete spacers on the floor of the FSB reach). The last 1 m is where items would have been collected. Surveys of the surface of the soil will be made to identify areas with elevated dose readings. These locations will be identified as possible areas where high-dose-rate items (including pieces or whole fuel elements) may be located.

- Following identification of areas with elevated surface dose rates, DOT-approved shipping casks will be placed within the basin to store high-dose-rate items as they are excavated. Remote-operated devices and/or long-handled tools will be used to remove the covering soil and debris over the high-dose-rate items, the items will be extracted from the excavation site, and the items will be deposited into the shipping cask (cutting where appropriate and/or required). This operation will be performed for each location containing potential high-dose-rate items.

- Excavation and removal of high-dose-rate items from one location in the basin will be completed before another site is to be excavated. This is to control direct doses from multiple sources. Appropriate measures to control doses to workers will be used, typically by controlling the duration of worker exposure to external doses, using various types of shielding and controlling the distance of the operator to the high-dose-rate items.

- The concrete spacers on the FSB floor will not be removed until all potential high-dose-rate items have been excavated and secured within DOT-approved shipping casks.

5.0 PROJECT MANAGEMENT AND ORGANIZATION

5.1 PROJECT SCHEDULE AND COST ESTIMATE

The 105-DR and 105-F ISS projects have been scheduled and estimated using the ERC hierarchy of schedules, which include activity logic and restraints. Activities will be resource loaded for both non-manual and manual personnel. Equipment needs are identified and other materials are estimated and included in the budgeted cost of work scheduled.

Estimates of project costs have been prepared at the activity level by the project team and subsequently have been reviewed and approved by the ERC, RL, EPA, and Ecology.

The removal action will be initiated in August 1998. The schedule, which encompasses the work scope of the 105-F and 105-DR ISS project and ancillary buildings beginning in fiscal year 1999 through project completion is included in Appendix A. A more detailed schedule, including assumptions, resources, and activity breakdown will be developed and submitted along with the detailed work plan for fiscal years 1999 through 2001. The major activities for which a roll-up of cost and schedule performance has been prepared include the following:

- Auditable safety analysis/FHC document preparation
- DQO/SAP
- EE/CA/action memorandum
- Air monitoring plan and BARCT documentation
- Pre-construction, mobilization, and support
- Radiation scope identification surveys
- Decontamination
- Asbestos abatement
- Hazardous material removal
- Removal of pipe and equipment
- Structure demolition
- Radiation monitoring/sampling/analysis
- Equipment/material/consumables
- SSE subcontract/construction
- Demobilization/project closeout.

Schedule status is reviewed weekly in 105-DR and 105-F ISS project review meetings. On a monthly basis, cost and schedule performance are reviewed by the ERC organization. Members of DOE, EPA, and Ecology are invited to participate in these review meetings.

5.1.1 Project Cost and Schedule Tracking

Performance measurement and analysis is performed by the D&D Project Planning and Controls organization. Project cost and schedule are controlled and updated using the ERC Management Control System, as described in ER-PC-01, *Baseline and Funds Management System.*

An earned value system tracks cost, schedule, and performance for all D&D projects as they progress towards completion. Cost/schedule performance reports provide budgeted cost of work scheduled comparisons and budgeted costs of work performed against the actual cost of work performed. These reports provide variances to the baseline schedule and cost as budgeted in the project's detailed work plan. Variances above threshold values are documented, as well as the rationale for the variance(s) and any recovery plan required.

Trends and baseline change proposals are readily identified through the ERC formal trend and change control program (ER-PC-01, PCP 1.11 and PCP 1.12). All changes that affect the baseline are documented. The ERC trend register, which is reviewed monthly by ERC senior management, categorizes trends from conception to final resolution. Trends are identified as either performance trends or scope trends and are further defined as resolved or unresolved.

Fiscal year project staffing, as budgeted, is reconciled monthly during the project reviews to the actual number of full time equivalent personnel utilized during the month. Likewise, the corresponding number of hours actually worked are presented and compared to the budgeted current work plan. Actual overtime is monitored monthly (by department) and reconciled to the current budgeted overtime.

Cost and schedule variances to the current budget are tracked both on a monthly and to-date basis and are reconciled back to the cause of the variance. Project impacts due to the cost and/or schedule variance are described and corrective actions are identified and tracked to the point of final resolution.

5.2 CONDUCT OF OPERATIONS

Conduct of operations is imposed to ensure that work is performed in a controlled and organized manner, that all facets of work activities have been considered, and that necessary documentation is maintained.

The performance of field activities and D&D projects is governed by *Decontamination and Decommissioning Project Manager's Implementing Instructions* (PMII) (BHI 1998b) and applicable field support instructions and specific work instructions. The PMIIs are based on a graded approach to the conduct of operations authorized by DOE Order 5480.19 and the ERC D&D conduct of operations applicability matrix. The PMII are applicable to all ERC personnel, assigned or matrixed, who perform activities under the responsibility and direction of the D&D Project Manager. The applicability matrix is issued and maintained by the D&D Project Manager and identifies elements of the DOE order that apply to project activities, the implementing documents, and any deviations or exceptions to the DOE order guidelines.

Conduct of operations strongly emphasizes technical competency, workplace discipline, and personal accountability to ensure the achievement of a high level of performance during all activities. Project personnel are responsible for fully complying with the PMII; if conflict arises with other instructions or directions, work will be safely stopped until resolution is achieved. Safety is the first priority, and all planning will include appropriate safety analyses to identify potential safety and health risks and the means to appropriately mitigate them. Workers will not start work until approved safety procedures, instructions, and directions are provided for nonroutine operations.

Conduct of operations requires workers to be alert and aware of conditions affecting the job site. Operators and workers conducting field activities should be notified of changes in the building and/or work area status, abnormalities, and difficulties encountered in performing project operations. Similarly, operators and workers will notify the chain of command of any unexpected situations. In accordance with the severity of a finding (i.e., emergency condition), notification requirements will be expanded to include upper-tier management and regulatory agencies.

5.3 CHANGE MANAGEMENT / CONFIGURATION CONTROL

If a change arises that results in a fundamental change to the selected response action that is not within the scope of the action memorandum (Ecology et al. 1998) and the implementing documents, then an engineering evaluation/cost analysis or proposed plan and supporting documentation will be prepared to allow DOE, EPA, and Ecology to select a revised response action.

Established configuration/change control processes ensure that proposed changes are reviewed in relation to the specified commitments. In the event that discovery indicates a breach of these commitments, work ceases so stabilization and/or recovery actions may be identified and implemented as appropriate. BHI off-normal event procedures describe the reporting process and protocol applicable to such a discovery. BHI-DE-01, *Design Engineering Procedures Manual*, EDPI 4.40-01 defines the management of change process for facilities that have a final hazard classification of less than nuclear. The management of change process is used as follows:

1. Evaluate the impact of proposed changes that could affect authorization basis documents.

2. Determine whether proposed changes require prior DOE approval.

3. Evaluate the impact of discovered conditions.

4. Evaluate the effect of deviations from activities or commitments described in authorization basis documents.

5.4 PERSONNEL TRAINING AND QUALIFICATIONS

During the performance of project activities, the experience and capabilities of the operating staff are extremely important in maintaining worker and environmental safety. Day-to-day knowledge of ongoing operations, month-to-month understanding of conditions encountered, and lessons learned will be vital to continued safe operations.

Training requirements will ensure that personnel have been instructed in the technologies to work safely in and around radiological areas, and to maintain their individual radiation exposure and the radiation exposures of others ALARA. Standardized core courses and training material will be presented, and site-specific information and technologies will be added to adequately train workers.

Health physics workers are required to have completed and be current in radiological control technician qualification training. These training courses require the successful completion of examinations to demonstrate understanding of theoretical and classroom material.

Specialized training will be provided as needed to instruct workers in the use of nonstandard equipment, in the performance of abnormal operations, and in the hazards of specific activities. Specialized training may be provided by on-the-job training activities, by classroom instruction and testing, or by pre-job briefings. The depth of training in any discipline will be commensurate with the degree of hazard involved and the knowledge required for task performance.

Some activities will require the acquisition of expert services as opposed to project staff training. The assaying of waste packages and dismantling the facility by specialized methods (e.g., diamond wire sawing) are examples of activities requiring expert assistance.

The ERC Training Program provides workers with the knowledge and skills necessary to safely execute assigned duties. A graded approach is used to ensure that workers receive a level of training commensurate with their responsibility that complies with applicable requirements. Specialized employee training includes pre-job safety briefings, plan-of-the-day meetings, and facility/work site orientations. The following training and qualifications may be applicable as required by job assignment for work activities:

- Training in accordance with 29 CFR 1910.120
  - 40-Hour Hazardous Waste Worker/8-Hour Refresher
  - 24-Hour Experience Component
  - 8-Hour Supervisor Training (for selected individuals)
  - SS HASP and RWP
  - Respirator Training
  - First aid (two qualified persons per shift/crew)
  - Certified Asbestos Worker and/or Asbestos Awareness
  - Lead Worker
  - Radiation Worker II.
- Medical surveillance requirements
  - Hazardous waste worker physical
  - Mask fit
  - Lead worker baseline
  - Asbestos worker.
- Dosimetry and bioassay requirements
  - Thermoluminescent dosimeter (as directed in the RWP)
  - Plutonium bio-assay (as determined by the Radiological Control organization)
  - Whole body count.

The SS HASP, RWP, and AHA will include specific requirements for project activities being conducted, which include PPE and required training for project personnel. This is discussed in detail in Section 3.2.

5.5 PLAN FOR READINESS

An RA will be conducted, in accordance with BHI-MA-02, *ERC Project Procedures*, Section 8.2, "Readiness Assessments," to detail the level of readiness that will be required to initiate certain project activities. The project manager is responsible for defining activities requiring a RA and the type required in accordance with the RA procedure. The decision to conduct an RA for certain workscopes will be based on the risk involved, and the complexity of the work or work outside the boundaries of the authorization basis. An RA will also be required if the project activities are shut down for reasons other than routine, as described in the RA procedure.

5.6 QUALITY ASSURANCE REQUIREMENTS

The overall quality assurance for the RAR will be planned and implemented in accordance with DOE Order 5700.6C, RLIP 4700.1A (DOE-RL 1991), and other applicable standards. Full implementation will be required when the conceptual design for the SSE is approved and detailed design is initiated. The quality assurance activities will be graded based on the potential impact on the environment, safety, health, reliability, and continuity of operations. Specific activities include quality assurance implementation, responsibilities and authority, document control, quality assurance records, and audits. These areas are discussed in the following subsections:

5.6.1 Quality Assurance Implementation

All project-related activities will establish and implement appropriate quality assurance requirements. Conditions adverse to quality will be identified in nonconformance reports, audit reports, surveillance reports, and corrective action requests. Investigation and corrective actions in response to these adverse conditions will be completed in a timely manner.

5.6.2 Responsibilities and Authority

BHI must perform quality engineering, design reviews, surveillance, and audits (as necessary) to achieve quality assurance objectives. BHI must also ensure that the various contractors and design agencies establish design and D&D quality assurance programs to control design and D&D in accordance with applicable requirements. The D&D contractor(s) must establish, implement, and document an inspection plan in accordance with approved specifications and drawings.

5.6.3 Document Control

The D&D documents, such as specifications and drawings, will be controlled in accordance with approved configuration management procedures. The responsible design agency will maintain control of the design D&D documents through acceptance. A project records checklist will be initiated to identify those records required for the final project file.

5.6.4 Quality Assurance Records

Each organization that maintains quality assurance records will be required to control the records in accordance with applicable BHI quality assurance requirements.

5.6.5 Audits

Internal and external audits are to be performed by the Compliance and Quality Programs organization to ensure project compliance with the quality assurance program requirements.

5.6.6 Self-Assessments

Self-assessments will be conducted by line management to determine compliance as discussed in the D&D PMII (BHI 1998b).

5.7 PROJECT CLOSEOUT

Removal of the facilities (up to reactor shield walls) and their systems will be completed to a minimum depth of 0.91 m belowgrade. At this excavation level, additional characterization will be conducted to verify the status of the remaining belowgrade structure. If the remaining belowgrade structure is found to exceed cleanup standards, then excavation will continue to a maximum depth of 4.6 m below grade. If groundwater protection standards are not met at the 4.6-m depth, then any additional remediation will be coordinated with and conducted under the final remedial action for the 100-DR-02, 100-DR-1 and 100-FR-01 operable units. Soil excavated as a result of the removal of belowgrade structures will be designated and disposed of, as appropriate.

Waste sites within the footprint of the facilities will be remediated. If large volumes of contaminated soil are encountered or if removal of the contaminated material inhibits reactor safe storage activities and/or are not cost effective, then remediation of these sites will be coordinated with and conducted under the final remedial action for the 100-DR-2, 100-DR-1, and 100-FR-1 operable units. These impacted waste sites will be covered with a cap of clean borrow soil and routine S&M activities will be initiated. The S&M efforts and remediation planning will be consistent with that established for the 100 Areas until final remedial action in the 100-DR-02, 100-DR-1, and 100-FR-01 operable units. Waste sites that are remediated and achieve the established cleanup standards during the removal action will be documented and removed from the Waste Information Data System in accordance with Tri-Party Agreement Procedure TPA-MP-14 (Ecology et al. 1990).

Upon completion of D&D activities, a minimum of 0.91 m clean fill/soil cover will be placed over any remaining below-grade structure and inert/demolition material, and will be graded to match the surrounding terrain.

The ARARs for project activities identified in the action memorandum (Ecology et. al 1998) establish the cleanup criteria for the 105-DR and 105-F sites. Cleanup levels specified for soils, belowgrade structures, and fill materials will meet the MTCA Method B standard for nonradiological contaminants in soils and for radionuclides the EPA protectiveness factor of 15 mrem/yr effective dose equivalent to 4.6 m below grade. In addition, these cleanup levels will ensure that MCLs and the EPA 4 mrem/yr protectiveness factor for groundwater will not be exceeded. Rubble created from the demolition of the structure will be evaluated against dangerous waste criteria, ERDF waste acceptance criteria (BHI 1996), and radiological standards. Materials that exceed dangerous waste criteria radiological standards will be appropriately segregated and disposed in accordance with Section 4.2. Subsurface structures and debris that meet the MTCA and radiological standards may be left in place.

Closure requirements for the 105-DR LSFF RCRA TSD unit will be met by the implementation of this removal action. Clean closure of the TSD unit will be documented by verification sampling.

After completion of all demolition activities, a final project closeout report will be prepared. The report will include the location and quantities of waste dispositioned, project costs, lessons learned, summarization of characterization and monitoring data, and a reconciliation to the conceptual model for D&D baseline estimating. The report will be forwarded to the records retention center where it will be included with the administrative record for the 100-DR-2, 100-DR-1, and 100-FR-1 operable units. The report will also be included in the TSD unit-specific operating record for the 105-DR LSFF through transmission to BHI Document and Information Services in accordance with procedures established in BHI-00217, Section 6.2 (BHI 1997b).

In accordance with 40 CFR 300.165, "National Contingency Plan," the on-scene coordinator will submit a complete report on the removal operation and actions taken to the Regional Response Team. This report must be submitted within one year after completion of removal activities. A copy of the report must also be directed to the Secretary of the National Response Team. The report will record the purpose for the removal action, the actions taken, the resources committed, and any problems encountered. The report must follow the format and contain information required in 40 CFR 300.165.

6.0 REFERENCES

10 CFR 61, "Licensing Requirements for Land Disposal of Radioactive Waste," *Code of Federal Regulations*, as amended.

10 CFR 835, "Occupational Radiation Protection," *Code of Federal Regulations*, as amended.

29 CFR 1910, "Occupational Safety and Health Standards," *Code of Federal Regulations*, as amended.

36 CFR 800, "Protection of Historic and Cultural Properties," *Code of Federal Regulations*, as amended.

40 CFR 10, "Native American Graves Protection and Repatriation Act," *Code of Federal Regulations*, as amended.

40 CFR 61, "National Emissions Standards for Hazardous Air Pollutants," *Code of Federal Regulations*, as amended.

40 CFR 141, "National Primary Drinking Water Regulations," *Code of Federal Regulations*, as amended.

40 CFR 262. "Standards Applicable to Generators of Hazardous Waste," *Code of Federal Regulations*, as amended.

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*, as amended.

40 CFR 300.165, "National Contingency Plan," *Code of Federal Regulations*, as amended.

40 CFR 761, "Polychlorinated Biphenyls (PCBs)," *Code of Federal Regulations*, as amended.

43 CFR 37, "Archeological Resources Protection Act of 1979," *Code of Federal Regulations*, as amended.

49 CFR 100-179, "U.S. Department of Transportation Requirements for the Transportation of Hazardous Materials," *Code of Federal Regulations*, as amended.

50 CFR 402, "Interagency Cooperation – Endangered Species Act of 1973," *Code of Federal Regulations*, as amended.

50 FR 20489, 1985, "Notice of Intent to Prepare an Environmental Impact Statement on Decommissioning the Eight Shutdown Production Reactors Located at the Hanford Site Near Richland, Washington," *Federal Register*, Vol. 50, pp. 20489 (May 16).

58 FR 48509, 1993, "Department of Energy, Record of Decision, Decommissioning of Eight Surplus Reactors at the Hanford Site, Richland, Washington," *Federal Register*, Vol. 58, pp. 48509 (September 16).

59 FR 66414, 1994, "Radiation Protection Guidance for Exposure to the General Public," Final Rule, *Federal Register*, Vol. 59, pp. 66414 (December 23).

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BHI, 1996, *Environmental Restoration Disposal Facility Waste Acceptance Criteria*, BHI-00139, Rev. 2, Bechtel Hanford, Inc., Richland, Washington.

BHI 1997a, *A Process to Develop Authorized Release Limits*, BHI-01189, Draft A, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1997b, *RCRA Permit Implementation Plan*, BHI-00217, Rev. 2, Bechtel Hanford, Inc., Richland, Washington.

BHI, 1997c, *Supplemental Waste Acceptance Criteria for Bulk Shipments to the Environmental Restoration Disposal Facility*, 0000XDC-W0001, Rev. 1, Bechtel Hanford, Inc., Richland, Washington.

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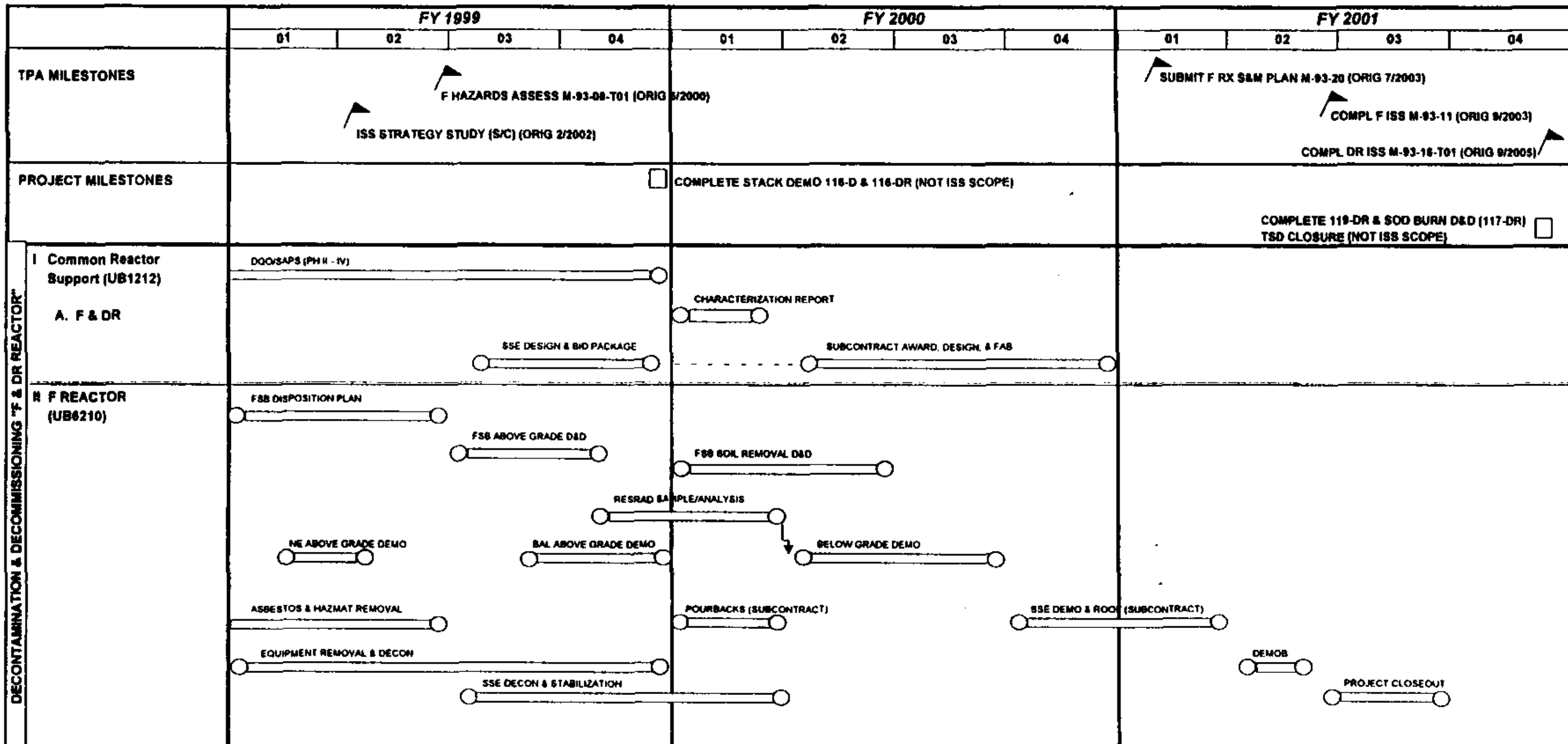
APPENDIX A

105-DR AND 105-F INTERIM SAFE STORAGE (ISS) PROJECT SCHEDULE



LEGEND

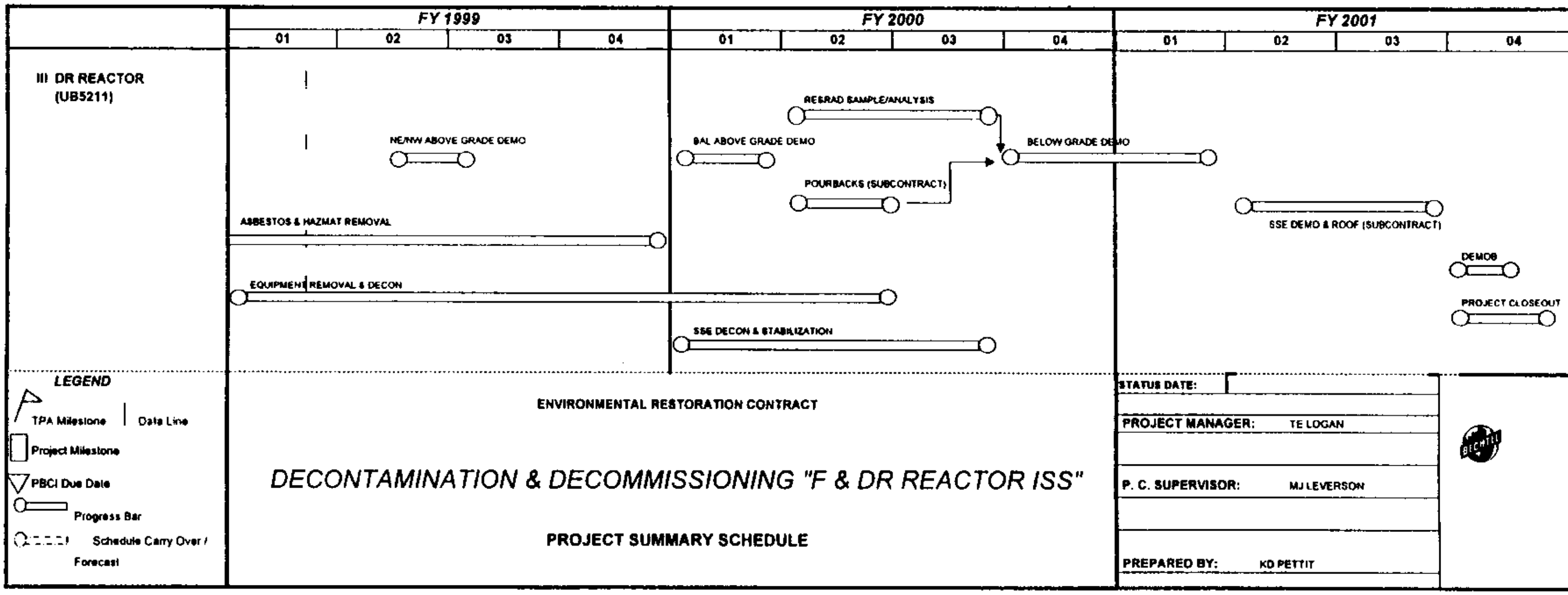
- TPA Milestone
- Data Line
- Project Milestone
- PBCI Due Date
- Progress Bar
- Schedule Carry Over / Forecast

ENVIRONMENTAL RESTORATION CONTRACT

DECONTAMINATION & DECOMMISSIONING "F & DR REACTOR ISS"

PROJECT SUMMARY SCHEDULE

STATUS DATE:	
PROJECT MANAGER:	TE LOGAN
P. C. SUPERVISOR:	MJ LEVERSON
PREPARED BY:	KD PETTIT


FY 1999
FY 2000
FY 2001
01
02
03
04
III DR REACTOR
(UB5211)
RESRAD SAMPLE/ANALYSIS
NE/NW ABOVE GRADE DEMO
BAL ABOVE GRADE DEMO
BELOW GRADE DEMO
POURBACKS (SUBCONTRACT)
SSE DEMO & ROOF (SUBCONTRACT)
ASBESTOS & HAZMAT REMOVAL
DEMOB
EQUIPMENT REMOVAL & DECON
PROJECT CLOSEOUT
SSE DECON & STABILIZATION
LEGEND
TPA Milestone
Data Line
Project Milestone
PBCI Due Date
Progress Bar
Schedule Carry Over / Forecast
ENVIRONMENTAL RESTORATION CONTRACT
DECONTAMINATION & DECOMMISSIONING "F & DR REACTOR ISS"
PROJECT SUMMARY SCHEDULE
STATUS DATE:
PROJECT MANAGER: TE LOGAN
P. C. SUPERVISOR: MJ LEVERSON
PREPARED BY: KD PETTIT

APPENDIX B

RADIOLOGICAL AIR MONITORING PLAN

AIR MONITORING PLAN FOR THE 105-DR/F REACTOR BUILDINGS ISS PROJECT ACTIVITIES

B.1.0 INTRODUCTION

The decontamination and demolition (D&D) activities of the 105-DR/ F Reactor Buildings are one of the initial steps in placing the 105-DR/F Reactor Buildings in interim safe storage (ISS), followed by the construction of the safe storage enclosure (SSE) for the 105-DR/F Reactor Buildings. The ISS Projects have been identified as a *Comprehensive Environmental Response, Compensation, and Liability Act* (CERCLA) program activity (DOE/RL 1998). Quantification of radioactive emissions, implementing best available radionuclide control technology (BARCT), and air monitoring has been identified as substantive requirements (i.e., a relevant and appropriate ARAR). A BARCT compliance demonstration is determined by the regulatory agency on a case by case basis. These substantive requirements are according to WAC 246-247-040. This appendix presents compliance with those requirements.

B.1.1 PLANNED ACTIVITIES

D&D activities on the 105-DR/F Reactor Buildings have the potential to generate particulate radioactive air emissions. The construction of the SSE will not have a potential-to-emit radioactive air emissions, because most of the contamination (to a reasonable extent) will be fixed or removed during D&D. Both reactor building D&D activities will be performed during the same time period in parallel. For each facility, the four areas of concern for air emission releases are 1) The Radiological Buffer Areas, 2) Exhaust Plenum 3) Valve Pit, Process Area, and Solids Feeds Area, and 4) the Inner and Outer Rod Rooms (see Section 1.2 of this document for a description of these areas).

The removal of contamination ranges from non-aggressive to aggressive decontamination. Non-aggressive decontamination includes such methods as wiping or applying fixatives to stabilize contamination. Aggressive decontamination techniques are methods such as scabbling, abrasive blasting and vacuuming. In the event that such techniques do not remove all the contamination or it is not cost effective to do so, the contamination will be fixed with a fixative paint or the contaminated material will be removed and disposed of as appropriate.

Demolition methods will be selected based on the structural elements to be demolished, remaining radionuclide contamination, location, and integrity of the SSE. Such methods could include use of an excavator with a hoe-ram, a hydraulic shear with steel shear jaws, concrete pulverizer jaws or breaker jaws, or crane with wrecking ball. Any fixed contamination will be segmented using techniques such as cutters or mechanical/power saws and handled separately.

B.2.0 AIRBORNE SOURCE INFORMATION

There is a potential of particulate radioactive airborne emissions resulting from the D&D activities described above. Emission estimates were based on the radiological surveys and 105-C characterization information. The surface area and the contamination levels for each area of the facilities were based on the radiological characterization surveys performed to date at the 105-DR and 105-F Reactor Buildings (RSRs 105F-98-0001 through 105F-98-0182, and 105DR-98-0007 through 105DR-98-0051). Since these radiological surveys did not provide a distribution of radionuclides, the radionuclide distribution was derived based on the 105-C Notice of Construction (NOC) (DOE/RL-96-45) with the addition of a few isotopes. The primary radiological composition consists of americium, cobalt, cesium, europium, strontium, and plutonium. As stated in the 105-C NOC, the radionuclides that were considered insignificant dose contributors (i.e. less than 1% of the total) were not listed. The radiological concentrations for americium, cobalt, cesium, europium, and strontium were taken from sample data from the 105-C Fuel Storage Basin (FSB), which is considered one of the most volumetrically contaminated area within the 105-C Reactor Building. The plutonium values were estimated based on information found in PNL-6866 entitled "The Technical Basis for Internal Dosimitry at Hanford (BHI 1998). The isotopes selected bound the possibility of what can be found, thus, creating a conservative estimate.

The 105-F FSB, the 117-DR Exhaust Filter Building, 116-DR Air Exhaust Stack, 119-DR Exhaust Air Sample Building and associated ducting/tunnels are not included in this monitoring plan. When additional information becomes available, this plan will be updated as appropriate.

B.2.1 FACILITY INVENTORY

The radionuclide annual possession quantities and subsequent potential emission calculations are presented in Table B-1 for the D&D of the 105-DR and 105-F Reactor Buildings. It is assumed that the airborne contamination released (the potential-to-emit value) from each facility will be the same. However, their unabated dose rates will be different because they are located at different areas on the Hanford Site. Additionally, it was assumed that 95% of the total annual possession quantity will represent the emissions from non-aggressive methods and the release fraction of 1E-03 will be applied in accordance with WAC 246-247-030 (21) (a). Five percent of the total annual possession quantity will represent the emissions from aggressive methods and the release fraction of 1 will be applied per direction provided by WDOH (letter dated August 1, 1994, from A. W. Conklin to S. H. Wisness). Details of the calculations are documented in BHI Calculation 0100X-CA-V0020, *105 DR & F Demolition Activities* (BHI 1998a).

The CAP-88 model was used to determine the annual unabated offsite dose. The potential-to-emit (Ci/yr) was the input for the computer model, and the model generated the annual unabated dose. The distance to the maximally exposed individual (MEI) used in the model was 15,738 meters to the east for 105-DR Reactor Building and 9,561 meters to the east for 105-F Reactor Building. The CAP-88 model summary and synopsis are presented in Bechtel Hanford, Inc. (BHI) Calculation 0100X-CA-V0020, *105 DR & F Demolition Activities* (BHI 1998a).

The total unabated offsite dose from the D&D activities at 105-DR Reactor Building is 6.22E-06 mrem/yr and for 105-F Reactor Building is 1.20E-05 mrem/yr.

After the characterization activities, described in Section 4.3 of this document, are complete, the results will be evaluated to determine that the D&D activities are still within the assumptions made for the potential-to-emit calculations. If changes have occurred, this monitoring plan will be modified as necessary.

B.2.2 EMISSION CONTROLS

As stated in Section B.1.1, D&D will consist of non-aggressive methods such as wiping a surface or applying foam polymers, or aggressive methods such as scabbling abrasive blasting and vacuuming. For the aggressive methods, the equipment used will contain high-efficiency particulate air (HEPA) filtered units. By connecting a HEPA-filtered unit to the tools, the dust and debris can be collected into containers as it is generated.

The SSE will be a deactivated facility that is uninhabited and locked except during surveillance and maintenance activities, which are expected to occur on a 5-year basis. Many of the reactors' components will be removed as part of the stabilization effort for placing the facility into ISS. The reactor block's penetrations will be sealed during the ISS Project. Many accessible areas of the SSE will have loose contamination removed and a fixative applied to limit the spread of contamination.

As such, no forced ventilation of the building is necessary either during the ISS Period or during periodic surveillance. Passive ventilation through two HEPA filtered covered openings at about the 15 ft. level of the SSE will be installed to allow the structure to breathe.

A provision will be made to provide forced ventilation to the facility, if required, for maintenance. If forced ventilation is required, a portable skid mounted exhauster will be used. This portable exhauster will either meet the conditions of the Portable Temporary Radionuclide Air Emission Unit (PTRAEU) NOC, or a separate approval may be obtained prior to conducting the maintenance depending on current site conditions. The skid-mounted exhauster would be configured with HEPA filters.

B.2.3 BEST AVAILABLE RADIONUCLIDE CONTROL TECHNOLOGY

D&D activities have the potential to release radioactive emissions to the atmosphere. Implementing the best available radionuclide control technology (BARCT) for these radioactive emissions has been identified as an ARAR.

For non-aggressive decontamination, the use of wiping or applying foam polymers is an ALARA control that has been accepted as BARCT for fugitive particulate radionuclide air emissions, particularly when the potential off-site dose is low. Because structure demolition may be a source of radioactive fugitive emissions, dust suppressants (e.g. water and fixatives) will be used and are considered BARCT for demolition. Additionally, for the aggressive techniques, the use of HEPA filters has been generally accepted as BARCT.

B2.4 MONITORING

The potential dose from D&D activities (Section B.2.1) is not greater than 0.1 mrem/yr, therefore, this air emission source is not subject to the radionuclide National Emission Standards for Hazardous Air Pollutants for continuous monitoring systems. However, periodic confirmatory measurements will take place throughout the duration of the project.

Periodic confirmatory measurements are defined as operating one continuous low-volume monitor on each of the downwind and upwind sides of the radiological work activities at each project site. Placement of the monitors will be based on the predominant wind direction. The operation of these monitors will generally follow the protocol established for near-field monitors. The monitors will be operated continuously during D&D activities and the filters will be changed out every two weeks (or for the duration of the radiological work if less than two weeks). The used filters will be field surveyed for gross radioactivity, held for at least seven days (to allow for decay of natural occurring radionuclides), and sent to the designated laboratory for analysis. Analysis includes total alpha and beta activity. The filters will be composited every 3 months and will be analyzed for specific radiological constituents. The data results will be entered into the ABCASH database for record keeping and reporting.

The HEPA-filtered units will have a minimum efficiency of 99.95% for the removal of airborne particulates. The basis for this is *The Nuclear Air Cleaning Handbook, Section 8.2 (U.S. Energy Research and Development Agency* [ERDA] 1976).

Table B.1. 105-DR and 105-F Potential-to-Emit Values.

SUMMARY

Table 1. 105-DR and 105-F Potential-to-Emit Values

Radionuclide	Annual Possession Quantity (Total)[1] [Ci/yr]	Potential to Emit (1E-3 RF)[2] Ci/yr.	Potential to Emit (1RF)[3] Ci/yr.	Potential to Emit (Total) Ci/yr.	Unabated Dose Rate (105-DR)[4] mrem/yr	Unabated Dose Rate (105-F)[4] mrem/yr
Am-241	1.24E-06	1.18E-09	6.20E-08	6.32E-08	8.26E-07	1.60E-06
Co-60	1.73E-06	1.64E-09	8.65E-08	8.81E-08	1.31E-08	2.51E-08
Cs-137	2.79E-04	2.65E-07	1.40E-05	1.42E-05	2.18E-06	4.19E-06
Eu-152	3.15E-06	2.99E-09	1.58E-07	1.60E-07	2.28E-08	4.36E-08
Eu-154	7.87E-07	7.48E-10	3.94E-08	4.01E-08	4.60E-09	8.81E-09
Sr-90	1.84E-04	1.75E-07	9.20E-06	9.37E-06	9.38E-07	1.80E-06
Pu-239/240	4.98E-06	4.73E-09	2.49E-07	2.54E-07	2.14E-06	4.14E-06
Pu-241	1.24E-05	1.18E-08	6.20E-07	6.32E-07	8.43E-08	1.63E-07

Notes:

1. Radionuclide annual possession quantities are as presented in BHI Calculation 0100X-CA-V0020, *105-DR & F Demolition Activities*, Rev 0, June 1998 (BHI 1998n).
2. This represents 95% of the total annual possession quantity, and uses a release fraction of 1E-3.
3. This represents 5% of the total annual possession quantity, and uses a release fraction of 1.
4. The annual unabated dose was determined using the CAP-88 model. The potential-to-emit (Ci/yr) was the input from the model, and the model generated the annual unabated dose. The distance to MEI is 15,738 meters to the east for the 105-DR facility and 9561 meters to the east for the 105-F facility. The CAP-88 model summary and synopsis is presented in BHI Calculation 0100X-CA-V0020, *105-DR and F Demolition Activities*, Rev.0, June 1998.