GENERAL ELECTRIC COMPANY

WILMINGTON MANUFACTURING DEPARTMENT

WILMINGTON , NORTH CAROLINA

CLOSURE AND DECOMMISSIONING PLAN

12 JUNE 1981

19413

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

1.0 INTRODUCTION

This plan is prepared and submitted as evidence of the General Electric Company Wimington Manufacturing Department (WMD) compliance with Chapter 7 of Special Nuclear Material License No. SNM-1097. It is written in conformance to the Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or termination of Licenses for By Product, Source, or Special Material (NUREG 0435; Rev. 1, 1976) for decommissioning nuclear facilities and to demonstrate financial capability to support closure activities. The plan also addresses site closure requirements as specified in the 1980 Resources Conservation and Recovery Act (RCRA) 40 CFR Part 265, Subpart G.

Decommissioning and closure activities will result in the cleaning and removing radioactive and hazardous waste contamination which may be present on materials, equipment and structures. Cleaning will be followed by verification of effectiveness.

The plan provides information concerning the plant, the types of items to be decontaminated, the disposition of facilities used for hazardous materials, the assumptions upon which the cost of decommissioning/closure is derived, and a schedule of time it will take for decommissioning and closing the facility. Financial considerations are also included.

It is the intent of WMD to decommission the facility so as to reduce the level of radioactivity remaining in the facility to residual levels acceptable for release of the facility for unrestricted useage and for NRC license termination. Facilities which have been used to generate, store, treat or dispose of hazardous waste materials will be placed in safe condition.

It is important to recognize that WMD has been in operation since 1969. The Department has procedures, people, instrumentation and equipment to assure nuclear and industrial safety. The plant is experienced in techniques for decontaminating discrete items and areas, and in verifying the degree to which cleaning has been accomplished. The technology is available to decontaminate the facility; people know-how is present; management has developed safe practices through years of experience. WMD is capable and competent to decommission the plant in accordance with the plan.

2.0 FACILITY DESCRIPTION

2.1 The Site

2.1.1 Location and Layout

General Electric's plant at Wilmington, North Carolina, is situated on a 1664-acre site in New Hanover County, approximately 6 miles north of the city of Wilmington. (Refer to maps, Figures 2-1 through 2-3.) New Hanover County is located in the southeastern corner of the state, in the coastal plains region. The County is bounded by the Atlantic Ocean and by Pender and Brunswick Counties. The region around the site is sparsely settled, and the land is characterized by heavily timbered tracts occasionally penetrated by short roads. Farms, single-family dwellings, and light commercial activities are located chiefly along highways.

The major portion of the site is bordered on the east by U.S. Highway 117 and on the west by the Northeast Cape Fear River. Fourteen acres lie to the east of U.S. 117 and are undeveloped except for water wells and an employee park. The northern and southern boundaries, marked by fences, are surveyed lines through undeveloped forest and marsh lands.

Of the total 1664 acres, only 150 acres have been developed. The developed portion is used as shown in Table 2.1.

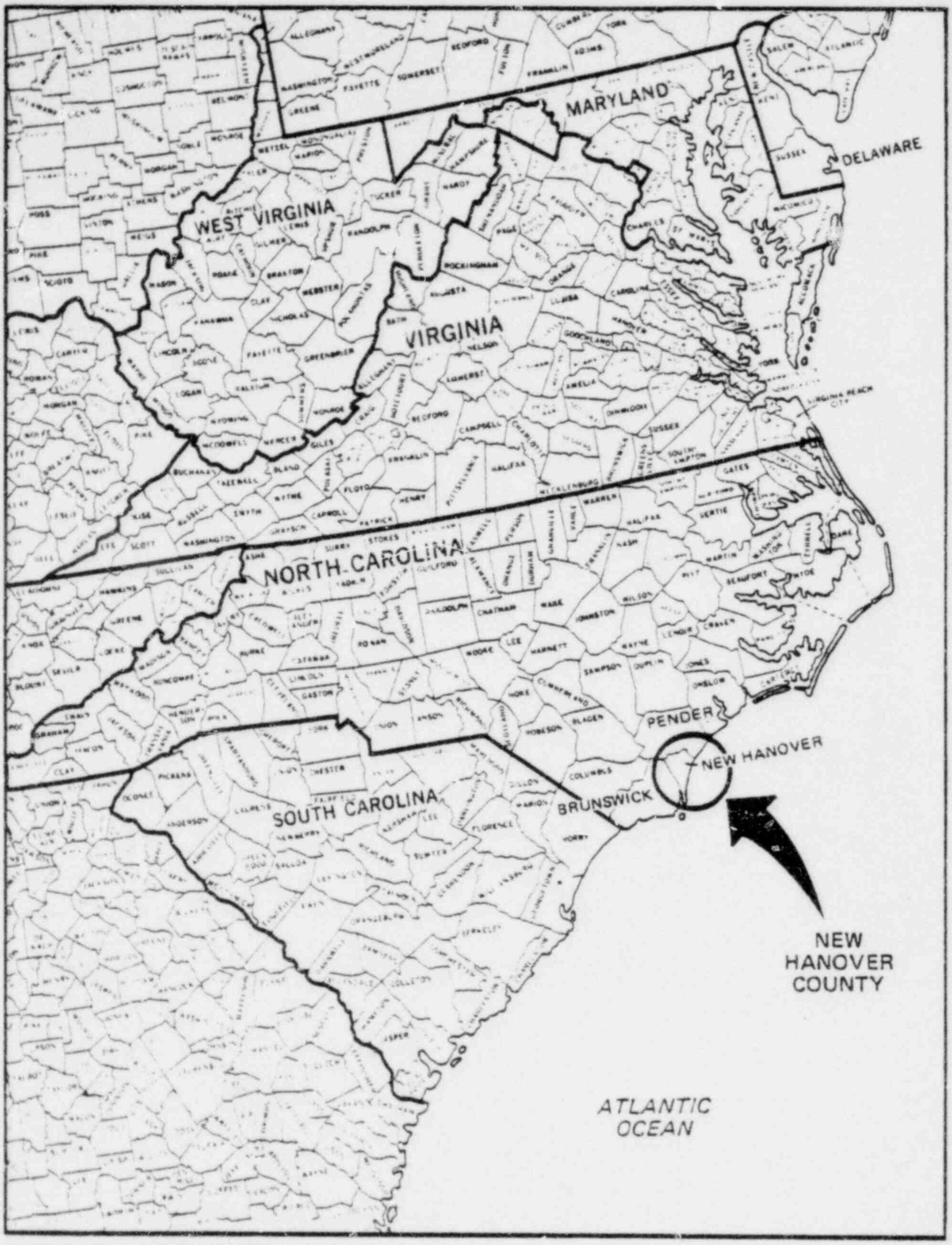


FIGURE 2-1. PLANT SITE – STATE AND COUNTY LOCATIONS

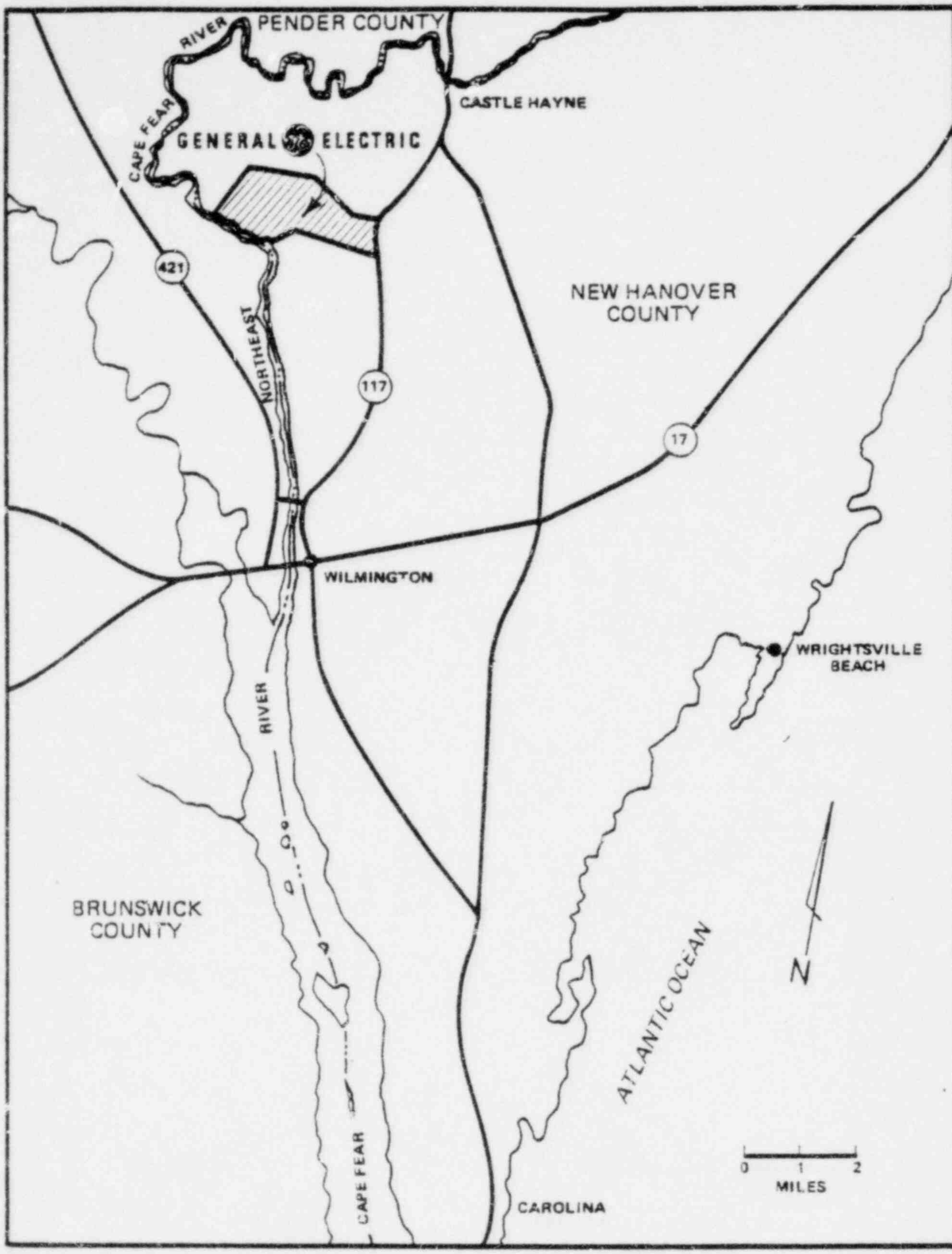


FIGURE 2-2. NEW HANOVER COUNTY AND ADJACENT COUNTIES

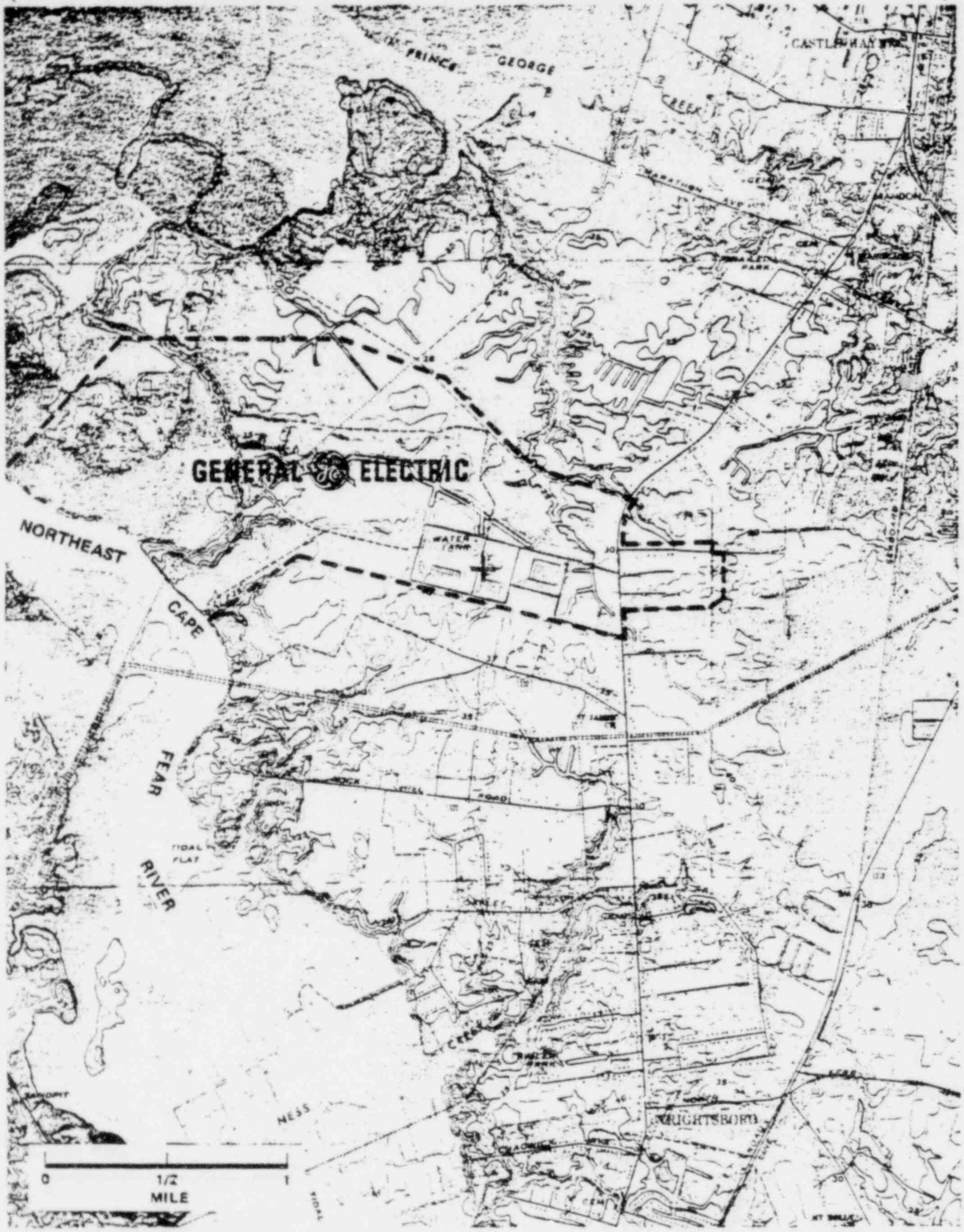


FIGURE 2-3. PLANT SITE (HEAVY OUTLINE) AND ENVIRONS

TABLE 2.1

USES OF DEVELOPED AREAS OF THE PLANT SITE

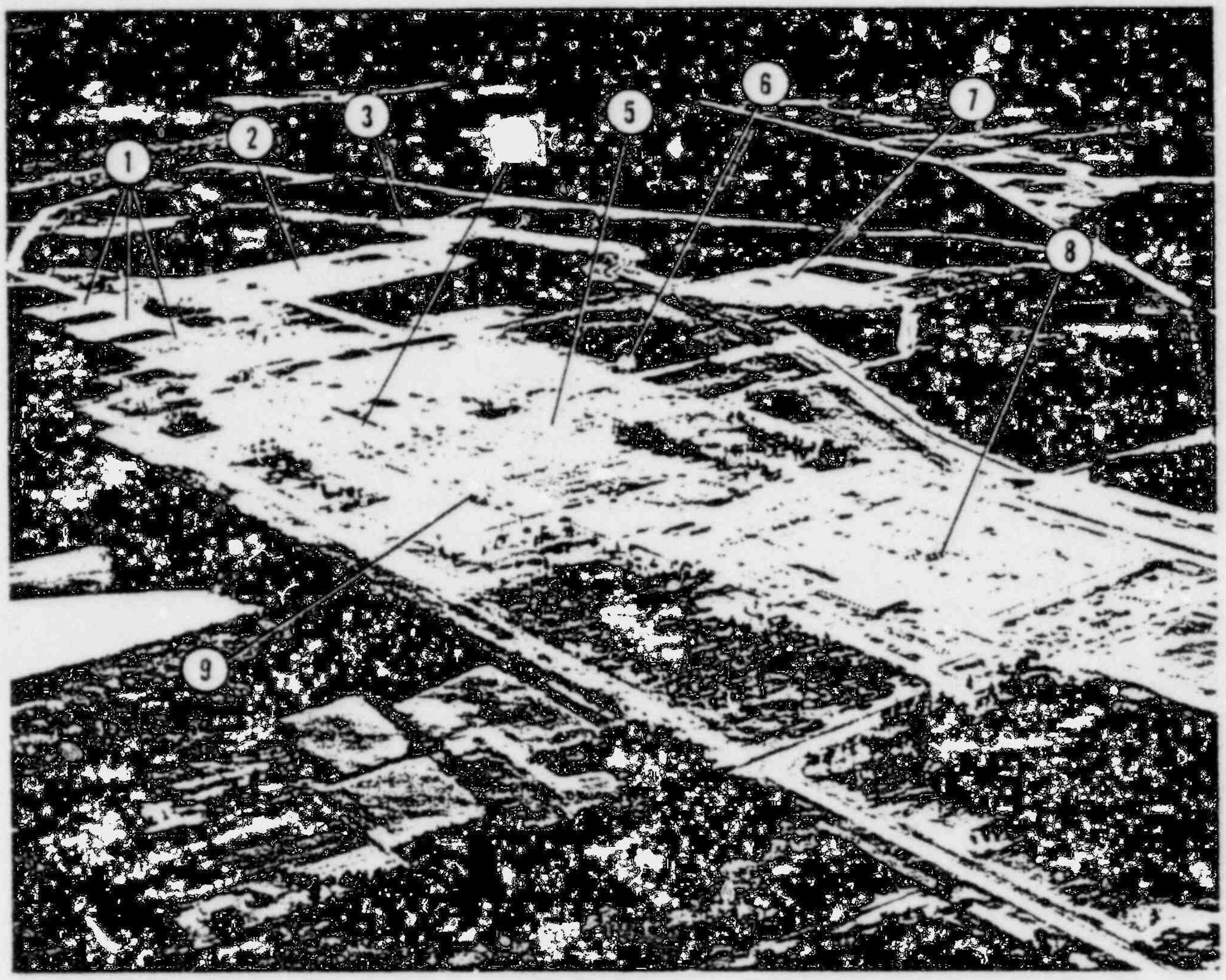
DEVELOPED AREA	Area Size (Acres)
Manufacturing Buildings	16.9
Other Buildings	7.8
Waste Treatment Facilities	26.3
Power Supply Line*	31.7
Paved Roadways, Outside Storage and Parking	30.7
Unpaved Roadways and Parking	12.5
Landscaped Areas	24.1

*Easement to Carolina Power & Light

2.2 Plant and Operations

2.2.1 External Appearance

Figure 2-4 is an aerial photograph showing principal buildings and facilities of the developed plant area. There are seven principal building structures: the equipment building, the tube building, the fuel building, the waste treatment building, the maintenance building, the office building and the site warehouse. During site development, particular attention was given to building orientation and arrangement and to landscaping. Large trees have been left standing and supplemented with more than 9000 new tree plantings, understructure plantings, and ground cover. Parking lots and roadways are designed to minimize adverse effects and to complement the aesthetic value of the area. Entrances to the plant have been cleared of foliage only as necessary to provide safe entrance to and from the highway (Figure 2-5); much of the natural and woods ground cover were retained.



(1) RECYCLE STORAGE

(2) WASTE TREATMENT LAGOONS

(3) DAM

(4) FUEL BUILDING

(5) OFFICE BUILDING

(6) WATER TANK

(7) DISCHARGE LAGOONS

(8) EQUIPMENT BUILDING

(9) TUBE BUILDING

FIGURE 2-4 PRINCIPAL BUILDINGS AND FACILITIES - DEVELOPED

FIGURE 2-5 PLANT ENTRANCE

2.2.2 Plant Operation

The fuel manufacturing process produces fuel for nuclear reactors. The process begins with the receipt of slightly enriched uranium up to 4 percent U-235 in the form of uranium hexafluoride (UF_6), or not more than 6 percent U-235 in the form of uranium dioxide (UO_2) powder. Conversion of UF_6 to UO_2 utilizes the ammonium diuranate (ADU) process or a dry di[illegible] conversion process. The UO_2 is formed into [illegible]s which are sintered, ground to size and loaded into tubes. Loaded tubes are fitted with end cap closures, welded and assembled into bundles. The fuel fabrication process is outlined in the process flow sheet (Figure 2-6).

2.2.3 Non-Nuclear Operations

In addition to the fuel manufacturing operations described above, other activities conducted by General Electric at the Wilmington site include the manufacture of auxiliary equipment for nuclear reactors, the fabrication of Zirconium components for fuel assemblies and the machining of aircraft engine rotating parts. These activities are typical of conventional metalworking plants and are carried out in facilities physically separate from the fuel building.

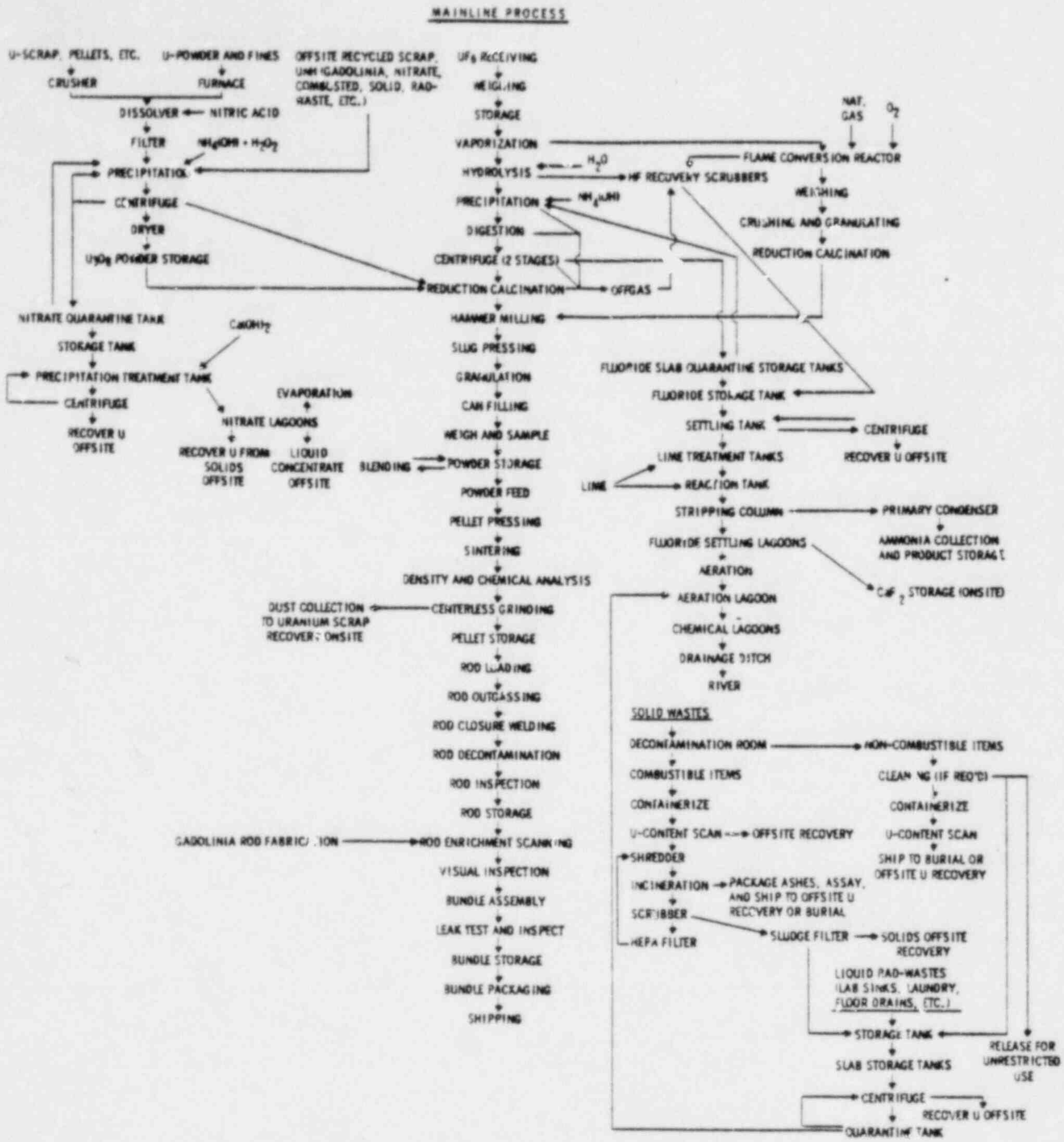


FIGURE 2-6 PROCESS FLOW

2.2.4 Effluent and Waste-Handling Systems

2.2.4.1 Storm Waters

A surface drainage system controls storm water runoff. This storm system drains runoff from the site via a natural channel called Brickyard Creek, which empties into the Northeast Cape Fear River. Brickyard Creek lies entirely within the General Electric property.

2.2.4.2 Sanitary Wastes

Wastes originating in washrooms and sanitary facilities are routed to a sanitary waste treatment system. The treated effluent from the system is discharged into the Northeast Cape Fear River.

In addition to the main sanitary treatment system, two small septic tank systems handle sanitary wastes at facilities which are remote from the main buildings.

2.2.4.3 Process Liquids

Process liquid wastes originiating from the site operations are collected and then either treated in the waste treatment systems prior to release so that the resultant combined discharge to the river meets government regulatory requirements or sent to a licensed disposal site. See Figure 2-7.

The waste collection systems are designed to collect chemically compatible wastes for the subsequent treatment processes and to prevent entry of incompatible wastes into these systems.

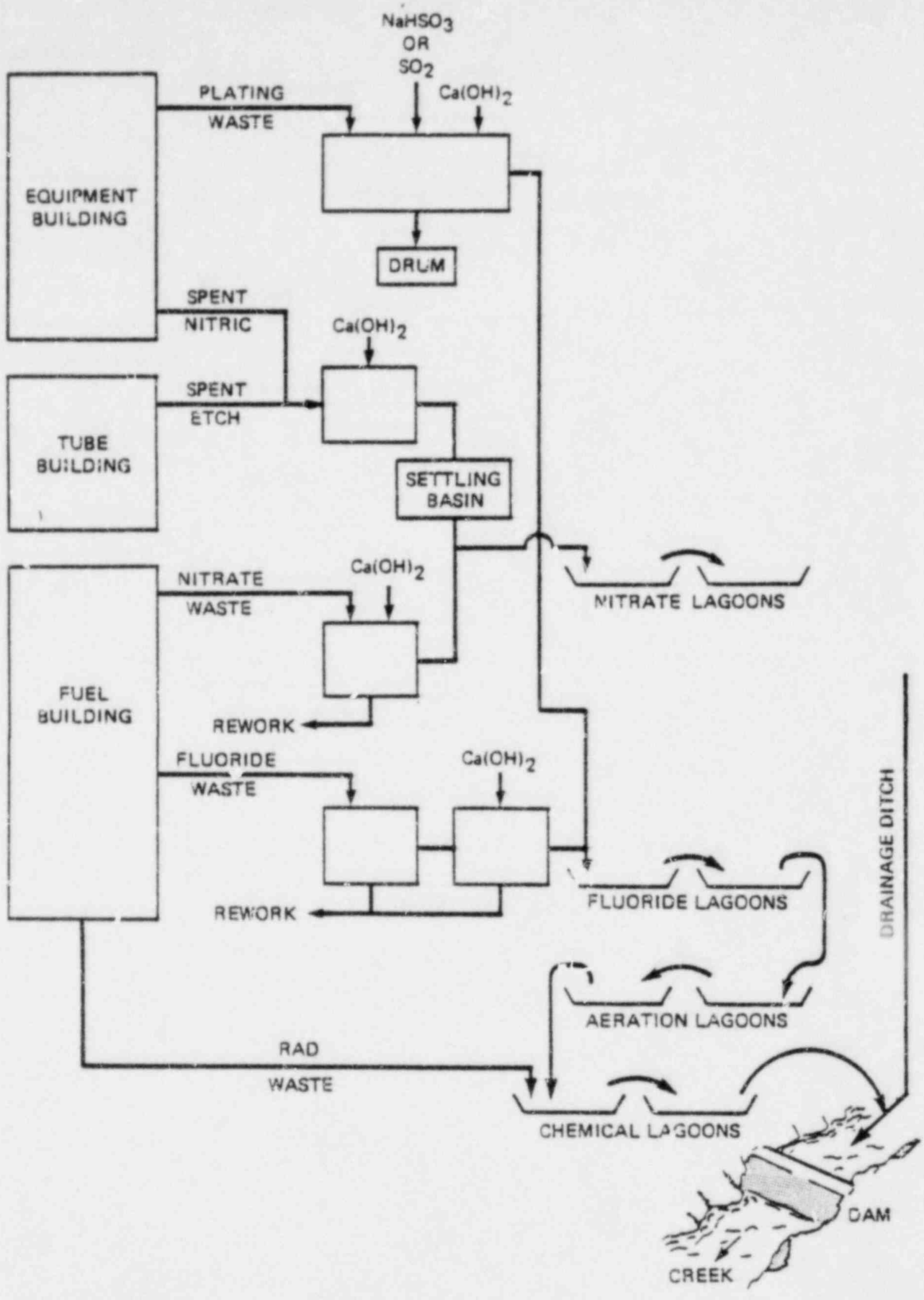


FIGURE 2-7 PROCESS LIQUID WASTE TREATMENT

2.2.5 Solid Waste

Waste materials include packaging, worn out shop clothing, tools, scrap material, and used equipment. Waste material is collected (and stored pending disposal) in two primary classifications based on whether it is uranium contaminated and whether it is combustible.

Contaminated noncombustible wastes (includes filters from the air cleaning system, pumps, motors, valves, segments of process piping, various filter and centrifuge sludges, and the like) are either reprocessed chemically or collected in boxes for ultimate burial at a low level radiological waste disposal facility.

Contaminated combustible items such as paper, cloth, and plastic are reduced to ash in a specially designed incinerator. The incinerator offgas is treated by water scrubbing and filtration. The ash is sampled and analyzed for uranium and either reprocessed or buried in a low level radiological waste disposal facility.

Noncontaminated waste materials that are not hazardous are hauled by a local waste disposal contractor to an approved landfill. Noncontaminated waste materials that are hazardous (RCRA) are disposed of by burying in a landfill permitted for handling these wastes.

2.3 OPERATIONAL FEATURES RELEVANT TO DECOMMISSIONING

2.3.1 Procedures

Inasmuch as the Wilmington Manufacturing Department has produced nuclear fuel since its startup in 1969, it has established effective operational controls for safety in normal and abnormal situations, many of which are typical of decommissioning activities. Controlled document systems are in place to integrate operational organizations with those responsible for nuclear safety and radiation protection. Department and Section-level Procedures, and Operating Instructions constitute a communication hierarchy which assures that management directives are communicated to individuals at all levels. Procedures provide for personnel, environmental, and nuclear material monitoring for routine and nonroutine operations.

In addition, numerous major facility modifications which have occurred since plant startup have resulted in the establishment of procedures and controls for proper conduct of contractor personnel in nuclear environments.

Abnormal operations, not covered by routine procedures, require Radiation Work Permits which specify the safety requirements for the specific unique work to be done.

2.3.2 Organization

Nuclear safety responsibilities are assigned to an organization whose charter includes the engineering and evaluation of criticality and radiological controls for all aspects of the Wilmington Manufacturing Department business. Ongoing radiation protection activities are carried out by an organization, independent of production, which continuously monitors and reports radiological conditions for all operations in the facility. A traffic/transportation organization routinely arranges for the safe transportation of fissionable material to customers and disposal sites. Each of the above functions has established operating routines to govern the conduct of work at the plant site to assure safe and compliant operations in routine and nonroutine situations.

2.3.3 Equipment

In-house air sampling systems and criticality/radiation alarm systems are available to provide information concerning airborne uranium concentration and radiation levels. These systems provide data for radiation exposure evaluations of personnel working inside radiation control areas and continuously monitor the site for criticality.

The Fuel Manufacturing building air filtration system which consists of HEPA filters and scrubbers has provided a high degree of environmental safety and control during plant operations. Stack sampling systems provide continuous assurance that no contamination above regulatory limits is released to the environment. These will be maintained oprational during decommissioning.

The laundry will be maintained to provide cleaning facilities for protective clothing and respirators used during decommissioning activities. Equipment in the laundry also provide the capability for checking leaks in the respirator filters and face masks.

Equipment in the Radiation Protection Laboratory, currently used to measure and evaluate radiological samples, will be available during decommissioning.

The WMD fire protection system will be available throughout the decontamination operations. This consists of fire alarm boxes, sprinkler systems, hoses, extinguishers, and a water supply provided through the site water tower or an emergency fire water pond. Fire protection equipment such as self-contained breathing apparatus (SCBA) equipment, rain gear, pumps, and hoses will be maintained and available. Additionally, fire response capability by outside agencies is available if needed.

The in-plant communication systems consisting of public address, telephone, and radio will be maintained during decommissioning.

3.0 GENERAL DECOMMISSIONING & CLOSURE GUIDELINES

Table 3.1 specifies the design basis surface contamination levels which will be used as stand 's in the decontamination and survey of surfaces or premises and equipment prior to disposal or release for unrestricted use. General guidelines for the decommissioning effort will be:

3.1 A reasonable effort will be made to eliminate residual contamination.

3.2 Radioactivity on equipment or surfaces shall not be covered by paint, plating, or other covering material unless contamination levels are below the limits specified in Table 3.1 prior to applying the covering.

3.3 The radioactivity on the interior surfaces of pipes, drain lines, and ductwork shall be determined by making measurements at all traps, and other appropriate access points, provided that contamination at these locations is likely to be representative of contamination on the interior of the pipes, drain lines, or ductwork. Surfaces of premises, equipment, or scrap which are likely to be contaminated but are of such size, construction, or location as to make the surface inaccessible for purposes of measurement shall be presumed to be contaminated in excess of the limits.

TABLE 3.1

ACCEPTABLE SURFACE CONTAMINATION LEVELS

NUCLIDE[a]	AVERAGE[b c]	MAXIMUM[b d]	REMOVABLE[b e]
U-nat, U-235, U-238, and associated decay products	5,000 dpm α/100 cm^2	15,000 dpm α/100 cm^2	1,000 dpm α/100 cm^2
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	100 dpm/100 cm^2	300 dpm/100 cm^2	20 dpm/100 cm^2
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	1000 dpm/100 cm^2	3000 dpm/100 cm^2	200 dpm/100 cm^2
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above.	5000 dpm β-γ/100 cm^2	15,000 dpm β-γ/100 cm^2	1000 dpm β-γ/100 cm^2

[a]Where surface contamination by both alpha- and beta-gamma-emitting nuclides exists, the limits established for alpha- and beta-gamma-emitting nuclides should apply independently.

[b]As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[c]Measurements of average contaminant should not be averaged over more than 1 square meter. For objects of less surface area, the average should be derived for each such object.

[d]The maximum contamination level applies to an area of not more than 100 cm^2.

[e]The amount of removable radioactive material per 100 cm^2 of surface area should be determined by wiping that area with dry filter or soft absorbent paper, applying moderate pressure, and assessing the amount of radioactive material on the wipe with an appropriate instrument of known efficiency. When removable contamination on objects of less surface area is determined, the pertinent levels should be reduced proportionally and the entire surface should be wiped.

Ref: NUREG-0436 Rev. 1 - Attachment A
"Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for Byproduct, Source, or Special Nuclear Material"

3.4 Special requests may be made to the NRC to authorize the release of premises, equipment, or scrap having surfaces contaminated with materials in excess of the limits specified. This may include, but may not be limited to, special circumstances such as razing of buildings, or transfering of premises or equipment to another organization continuing work with radioactive materials.

3.5 Radiation exposure limits shall be consistent with allowable limits specified in 10CFR20, "Standards for Protection Against Radiation".

3.6 Shipments of radioactive materials associated with decommissioning shall conform with the requirements of 49CFR170-189, Hazardous Materials Regulations.

3.7 Prior to release for unrestricted use, a comprehensive radiation survey will establish that contamination is within the limits specified in Table 3.1. A copy of the survey report shall be filed with the Division of Fuel Cycle and Material Safety, NRC, Washington, D.C. 20555, and the Director of the Regional Office of the Office of Inspection and Enforcement, NRC, having jurisdiction.

3.8 The site will be closed in a manner that minimizes need for further maintenance and controls to the extent necessary to protect human health and the environment.

3.9 Independent reviews of the premises will be made to verify that all hazardous waste and contamination have been removed and that the premises meet regulatory release limits.

4.0 PLANT-SPECIFIC DECOMMISSIONING AND CLOSURE ASSUMPTIONS

Currently underway at GE WMD are several projects which will have a substantial impact on the total effort required for decommissioning the facility. Among these is the incinerator project scheduled for completion in late 1981. The decontamination facility and the waste uranium recovery operation planned for operation in 1985 will significantly decrease the amount of material required for burial at decommissioning. The availability of these facilities and other assumptions which bear on the decommissioning plan are as follows:

4.1 Plant will have had normal operations in the interim prior to decommissioning i.e., no unplanned events have occurred to perturbate the condition of the facility at the time of decommissioning.

4.2 All in-process uranium will have been removed from the site prior to the initiation of decommissioning activities.

4.3 By the time decommissioning of the plant will take place, the NRC will have established by regulation de minimis levels of special nuclear material (low-enriched uranium, specifically) authorized for transfer to recipients not specifically licensed by the Commission.

4.4 An off-site facility will be available to accept uranium during decommissioning.

4.5 Off-site low level radioactive waste burial facilities will be available.

4.6 Decommissioning activities will be performed by personnel familiar with plant operations and radiation protection procedures.

4.7 Safety control practices in place for plant operations will be utilized for decommissioning activities.

4.8 Non-contaminated equipment and facilities will be disposed of by standard corporate practices prior to initiation of decommissioning.

4.9 Dismantling will be programmed and time phased so as to maintain incineration, decontamination and uranium recovery capabilities for as long as possible.

4.10 All hazardous waste will be removed to eliminate the need for long term monitoring.

4.11 Decommissioning and closure activities will result in NRC and EPA approval to use the site for non-nuclear purposes.

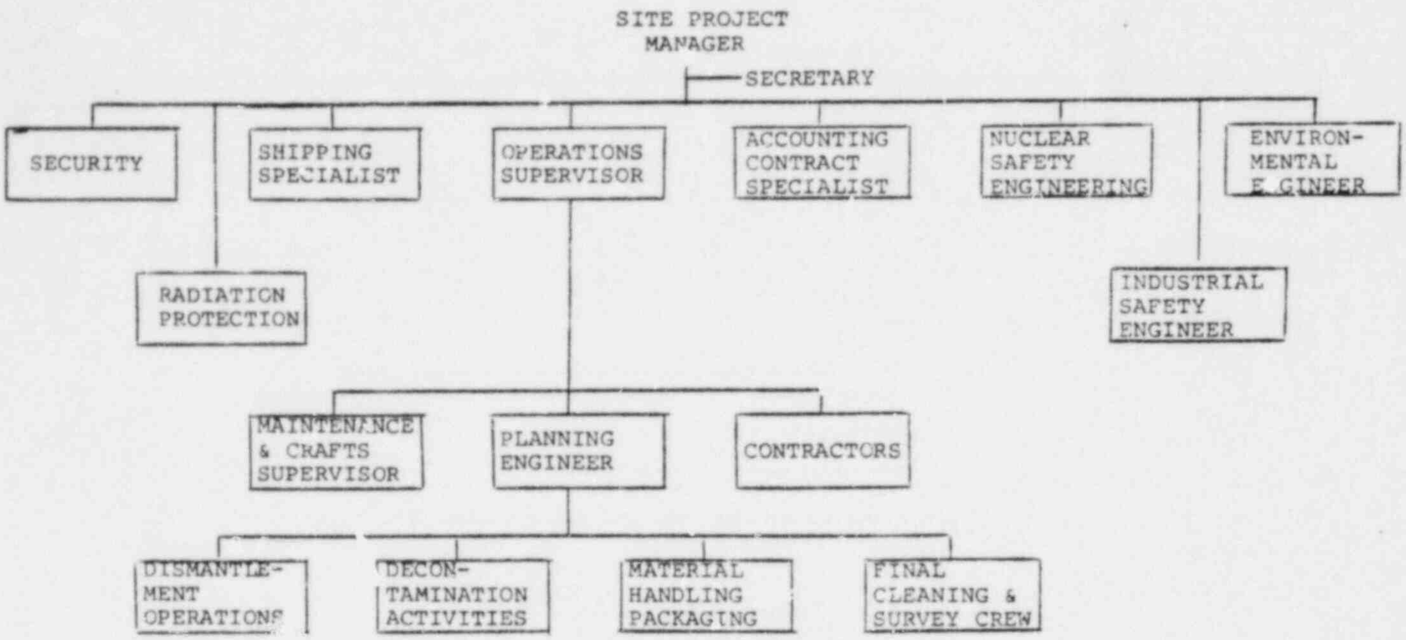
5.0 DECOMMISSIONING ORGANIZATIONAL STRUCTURE

Although the current plant personnel will perform the decommissioning task the organization structure during decommissioning will differ from the current production-oriented structure. The work will be accomplished under a Project Manager who will have at his disposal key experienced professional engineering support in safety related areas, safeguards, shipping, environmental protection, security, planning and operations. An organizational structure identifying the functions planned for decommissioning is provided in Figure 5-1.

Several important functions will be available throughout the decommissioning operations. These are described below.

5.1 Nuclear Safety Engineering, whose function it will be to oversee the criticality safety of the uranium removal process and activities where uranium will be collected, stored or recovered.

5.2 Radiological Safety Engineering, whose responsibility it will be to oversee exposure control and radiological safety parameters for the work being performed. A wholebody counting facility and operator will provide internal monitoring capabilities for total dose assessment.



SITE ORGANIZATION FOR
DECOMMISSIONING AND CLOSURE

FIGURE 5-1

5.3 Radiation Protection will have the responsibility for performing working-area measurements to assure the radiation safety of employees by determining the cleanliness (lack of radioactive contamination) of materials, by conducting contamination measurements of shipments, and by nuclear release of materials to sell or use elsewhere.

5.4 Environmental Engineering will be responsible for evaluating sample analyses to assure the protection of the health and safety of the public. It will assure that samples are taken, analyzed and nondestructive measurements made as required to verify that release criteria limits have been met for hazardous and other non-radioactive materials.

5.5 Industrial Safety Engineering will be responsible for overseeing the industrial safety of operations which include equipment usage and operations, air quality, protective equipment, and for coordinating efforts of outside support agencies (fire, police, hospital) in the event of an emergency.

5.6 The Operations Supervisor will be responsible for all operational activities which involve contactors, maintenance and craft employees. He will report directly to the Project Manager and will be responsible for assuring that decommissioning is carried out as planned.

5.7 A Shipping Specialist will schedule trucks, coordinate loading, provide documentation, and arrange for shipments of materials to the various sites and burial facilities.

5.8 Finance Operations will handle time cards, purchases, contracts, and the overall financial status of the operation.

5.9 A minimal security force will need to provide security to equipment and to control access to the site while decommissioning is underway.

5.10 The Project Manager will have overall responsibility for all facets of the operation. He will be responsible to see that the various facets of decomtamination, material handling, dismantlement, shipping, final clean-up are done orderly, safely, and completely.

5.11 A Nuclear Materials Management Clerk will be responsible for bookkeeping activities for any uranium inventory generated during decommissioning activities.

6.0 DECONTAMINATION, DISMANTLEMENT AND CLEAN-UP METHODOLOGY

6.1 Wet Uranium Process Area

There are a number of areas where uranium has been processed in liquid solutions such as the ADU conversion process (from UF_6 vaporization through hydrolysis, centrifuging and calcination), the uranium purification system, (a nitric acid disolution process), the rad waste system, the centrifuge room at the waste treatment facility, the decon facility, the waste uranium recovery system, uranium liquid transfer systems, sludge recovery systems, and the incinerator building.

Elements of the wet uranium processing areas will include but may not be limited to the following types of equipment, materials and items:

containments & hoods	process equipment
curbing	pipes
drains	pumps
filters	resins
floor grating	scrubber systems
hoses	sludges
pipes	tanks

All items such as carts, work tables, buckets not needed for the decontamination process will be removed and placed in containers for burial or transferred to the decon room for decontamination. The sequence is shown in Figure 6-1.

The plan for decontamination of the wet uranium processing area will be to first remove equipment. Particular attention will be given to process lines where material could be held up. Recovered material will be processed in the waste management system until dismantlement of that system is required. All curbing will be kept intact until the potential for spillage is removed. Spillage will be controlled by quickly drying spills so as to prevent spreading of contamination. Then work will progress from areas with the greatest potential for contamination to areas with the least potential for contamination.

Piping will then be removed and, based upon the economics of decontamination versus burial, will either be shipped to the decon room for uranium recovery or placed in containers for burial.

Tanks, columns, resin containers containing uranium will be cleaned inside to the extent possible so as to recover material, reduce the volume of uranium, and to prepare the item for disposal. In some cases it will be necessary to reduce the volume of containers by sectioning them with torches. Attention will be paid to potential airborne;evacuation with portable trunks, blowers, and respiratory equipment will be used as appropriate. Equipment such as the centrifuges, dump stations, containments will be dismantled, transferred to the decon room for cleaning where, after treatment, a determination will be made whether to fully decontaminate it for reuse or to bury it.

Conveyors, cable racks, elevators, and other like materials will be dismantled, decontaminated as appropriate, and either prepared for burial or cleaned sufficiently to meet release limits. After stripping the inside of the area, work will commence on building utilities and shell. Overhead piping, conduit, lights, etc. will be decontaminated or removed. Ventilation ductwork will be removed when appropriate, maintaining negative pressure until decontamination efforts in the area are complete. The ceilings, walls, and floor will be washed, chipped, scrapped and/or removed until acceptable release limits are achieved.

WORK TABLES, CONSOLES, FURNITURE

↓

PROCESS LINES

↓

TANKS, EQUIPMENT

↓

PUMPS

↓

CURBING

↓

CONVEYORS

↓

CABLE CARRIERS

↓

FILTERS/VENTILATION/DUCTWORK

↓

CEILING RAFTERS

↓

WALLS

↓

FLOORS, DRAINS

DECONTAMINATION AND REMOVAL SEQUENCE
FOR WET PROCESS AREAS

FIGURE 6-1

6.2 DRY URANIUM PROCESSING AREAS

These are the areas where powder is blended, pressed, ground, and/or loaded into open-ended fuel rods. Also scrap is collected and processed into forms suitable for direct recycle or fed to the recovery process. Elements of dry uranium processing areas will include, but not be limited to, the following types of equipment, materials and items:

Blenders	Grinders
Can Storage	Loading Stations
Carts	Pellet Presses
Containments	Pellet Storage
Conveyors	Process Equipment
Desk/Work Tables	Storage Cabinets
Dump Stations	Tile Floor
False Ceilings	Ventilation Ductwork
Filters	Welders
Furnaces	Work Tables

The plan for decontamination of the dry uranium process areas is to work to remove and decontaminate the most contaminated items first, working from the most to least contamination, maintaining all safety related items such as ventilation, air monitoring, radiation monitoring until the last phase of decontamination. The sequence is shown in Figure 6-2.

BOATS, CANS

↓

DESK, FILES, WORK TABLES

↓

PROCESS EQUIPMENT

↓

CONTAINMENTS

↓

STORAGE CABINETS

↓

CONVEYORS

↓

CEILING/RAFTERS

↓

FILTERS/VENTILATION DUCTWORK

↓

WALLS

↓

FLOORS/SUMPS

DECONTAMINATION AND REMOVAL SEQUENCE OF ACTIVITIES
FOR DRY PROCESS AREAS

FIGURE 6-2

External surfaces of all process equipment will be cleaned by processes such as vacuuming, wiping, and/or washing to remove gross removable external contamination. Equipment destined to be shipped to other NRC licensees will be decontaminated to acceptable shipping levels, packaged, and shipped to the customer. Large equipment to be scrapped will be dismantled and/or sectioned to facilitate decontamination or burial. Whenever practical, material will be taken to the decontamination facility where attempts will be made to complete the decontamination. Surveys will be performed by the radiation protection group to verify the effectiveness of the decontamination efforts.

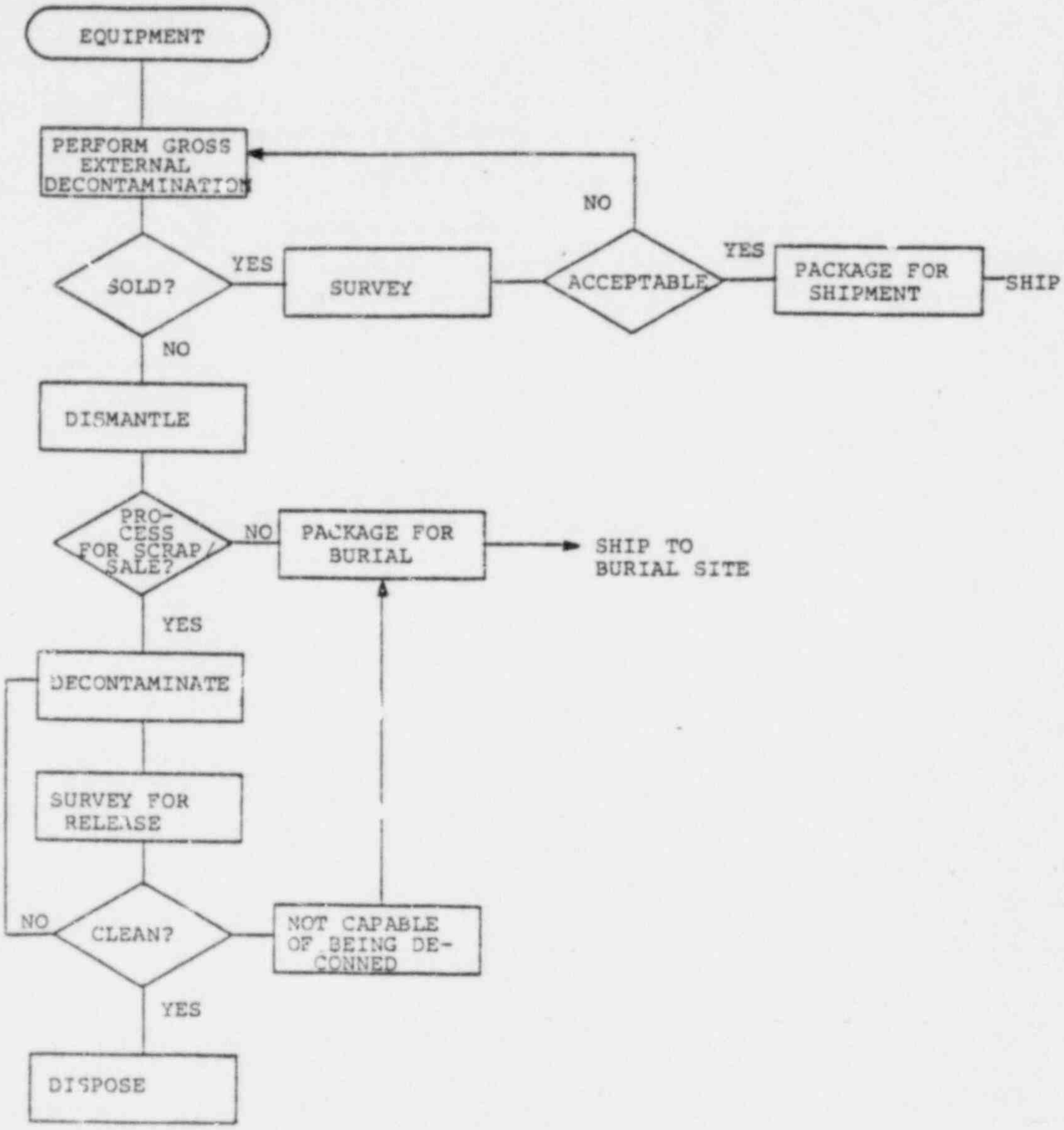
When it is determined that items cannot be decontaminated because of circumstances such as porosity, complexity, or inability to measure the residual contamination levels, they will be packaged, placed in containers, and sent for burial. Items successfully decontaminated will be available for uncontrolled disposal.

Gross contamination will be removed from such items as containment holds, cabinets, work tables, desks, files, conveyors, boots, cans, and the like. Then these items will be evaluated as to the cost relationship of burial or further processing aimed at uncontrolled release. In all cases, where 100% verification that items are clean cannot be achieved, such items will be treated as contaminated and handled accordingly.

See Figure 6-3 for decontamination and disposal sequence.

All ceiling structures (e.g. beams, support members, conduit, light fixtures, and sprinkler lines) will be systematically evaluated for contamination. Gross contamination will be removed and extensive decontamination efforts will be performed to remove traces of contami ation. It is anticipated that extensive surveys will be required to evaluate the effectiveness of decontamination activities. Materials or structures found that cannot be cleaned to acceptable release limits will be removed and buried as contaminated.

All tile and the residue glue will be removed for burial. Decontamination efforts on concrete floors will be directed towards anchor holes, crevices and cracks in the floor and towards hot spots. As necessary to achieve acceptable release limits concrete flooring will be removed. Walls will be cleaned and/or removed as necessary to achieve acceptable release limits.



DRY URANIUM PROCESSING AREA

DECONTAMINATION DISPOSAL SEQUENCE

FIGURE 6-3

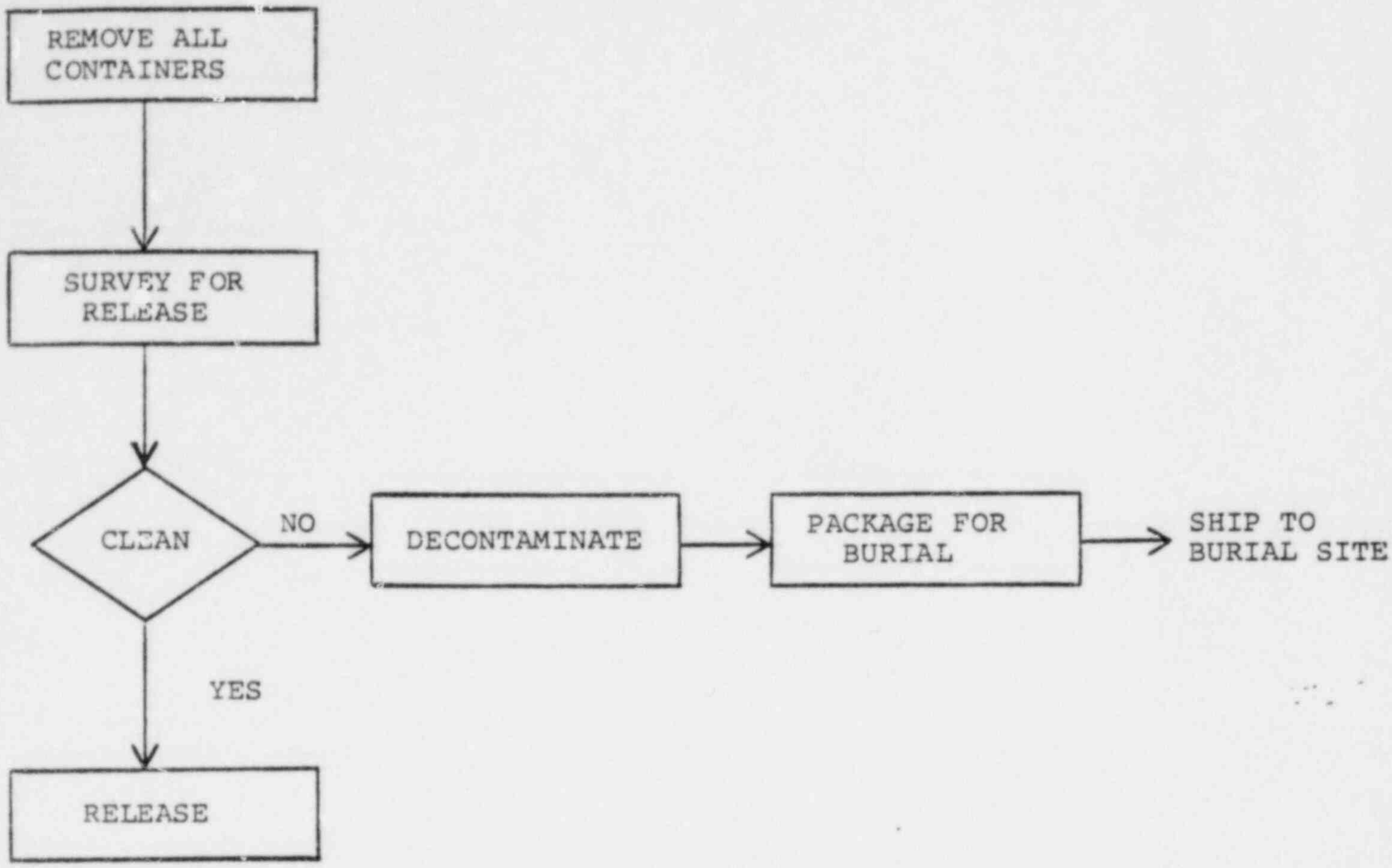
6.3 INDOOR CONTAINED-URANIUM PROCESS/STORAGE AREAS

There are areas inside the buildings where radioactive material is stored and/or handled in sealed containers. Typically these areas are bundle assembly, bundle packing, site shipping andsite receiving. In the bundle area fuel rods and fuel bundle assemblies are processed or stored prior to shipment. In the powder packing area, sealed cans of powder are stored awaiting shipment. Shipping and receiving areas include inspection, loading, and unloading facilities. The integrity of the fuel product handled in these areas is such that the probability of contamination is negligible and not expected. None of these areas are generally contaminated as proven by routine survey programs which monitor for contamination on containers, vehicles, and work areas.

Elements of an indoor contained-uranium process storage area may include the following equipment, materials and items:

- Barrels
- Fixtures and Tools
- Fork Lifts
- Inner Containers
- Insulating Material
- Lift Straps
- Locking Rings
- Outer Containers
- Overhead Cranes
- Pallets
- Process Equipment
- Scales

The areas will have been cleared of packed powder, fuel rods, bundles, and other radioactive materials prior to the beginning of decommissioning activities. Radiation and contamination surveys will be made to verify the absence of contamination or that it is below release limits. See Figure 6-4 for disposal and decontamination sequence.



DISPOSAL AND DECONTAMINATION SEQUENCE FOR
INDOOR CONTAINED URANIUM PROCESS/STORAGE AREAS

FIGURE 6-4

6.4 OUTDOOR CONTAINED-URANIUM STORAGE AREAS

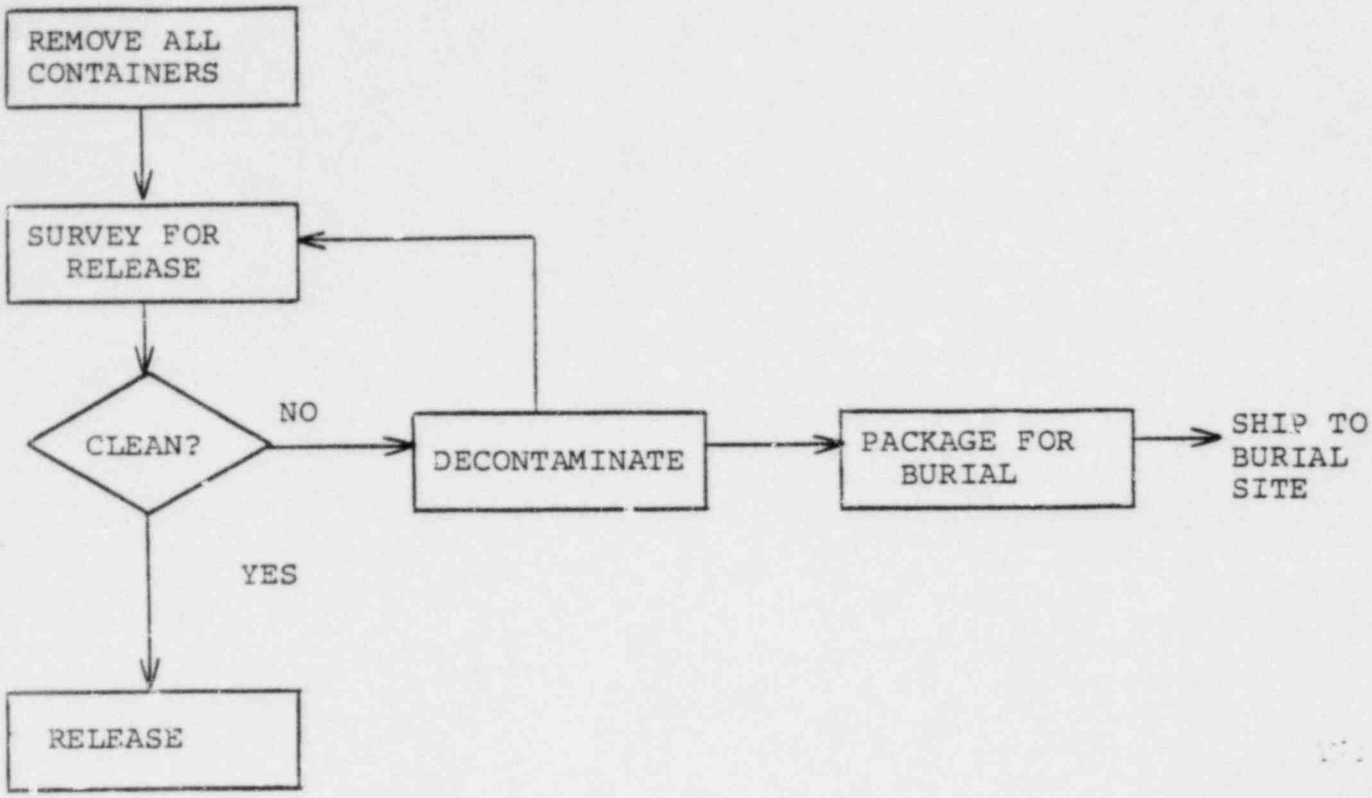
There are areas outside the buildings where containers with uranium are stored. Normally these areas consist of asphalt or marl pads containing (1) boxes of material to be sent to burial sites, being held for incineration, or being stored for later use, (2) 55 gallon drums of uranyl nitrate solution (UNH), waste, oil, etc., awaiting disposal, (3) shipping containers of fuel and powder, (4) 5-gallon cans of scrap powder, and (5) UF6 cylinders.

Elements of an outdoor contained-uranium area may include, but may not be limited to, the following types of equipment, materials and items:

5-gallon containers	Marl surface
55-gallon containers	Metal Shipping Containers
BU type drums	Sea Vans
Chocks	Tie Downs
Cylinders	Wooden Pallets
Hard Surface (Asphalt)	Wooden Shipping Containers

All containers of material stored on outdoor pads are designed to prevent or minimize the potential for leakage. Liquids are stored in lined cans or in lined metal BU containers, UF6 is stored in shipping cylinders; dry contaminated materials are stored in plastic bags within wooden or metal containers. The pad areas are routinely surveyed to monitor for contamination and, if contamination is found it is immediately cleaned up. Protective clothing is not worn when moving materials on the pads.

The areas will be cleared of all containers as indicated in Figure 6-5. Surveys will be performed with instrumentation capable of detecting surface contamination above release limits. In addition, core samples will be taken at intervals across the pads and around its edge into the soil to monitor for any contamination. Prior to release of the pads, all contamination will be recovered, reduced to releasable levels or recovered and shipped to burial.



DISPOSAL SEQUENCE FOR
OUTDOOR-CONTAINED URANIUM STORAGE AREA

FIGURE 6-5

6.5 URANIUM-BEARING PROCESS/STORAGE TANK AREAS

These areas contain large storage tanks and are located near the manufacturing building and at the waste treatment facility. In these areas uranium-bearing liquid material is treated, stored or processed.

Elements of a uranium-bearing process/storage tank area may include the following equipment, materials or items:

Curbing	Sumps
Dry Wells	Steel Storage tanks (up to 100,000 gal)
Manholes	Tanks
Piping	Valves
Pumps	

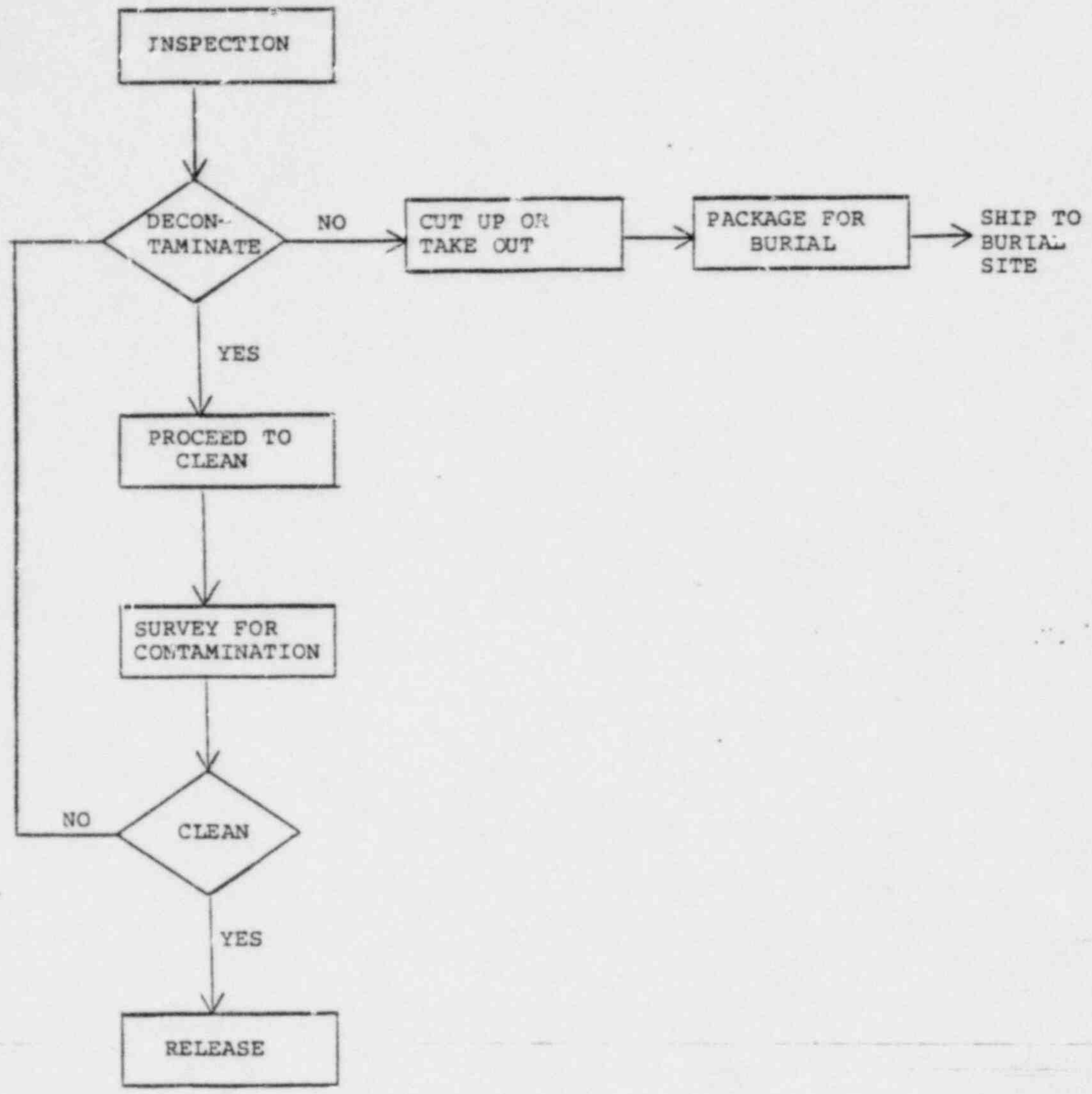
Normally the tanks are filled with liquids containing small concentrations of uranium. These tanks will have been emptied prior to the start of decommissioning activities.

When work begins on these tanks the inspection ports will be opened and an evaluation will be made whether the tanks can be decontaminated or whether dismantlement is necessary. The clean-up sequence will be from the process tanks to the pumps and piping and will end with the tanks at the waste treatment facility. This will preserve the capability to treat cleaning solutions used in decommissioning.

See Figure 6-6 for disposal sequence.

If possible decontamination efforts will permit the tanks to be kept intact. Sensitive radiation instruments will be used and swipe surveys will be made to assess the effectiveness of decontamination efforts, to provide information to estimate the relative value of continued decontamination efforts or to establish that the tanks can be released.

It is probable that piping will be sectioned, cleaned and then packaged for burial. Cutting, cleaning, packaging will be performed under the surveillance of a radiation protection team to provide continued evaluation to assure the radiological safety of the workers, to prevent any spread of contamination, to evaluate the effectiveness of the cleaning operations, and ultimately to release the area.



DISPOSAL SEQUENCES FOR
PROCESS AND STORAGE TANK MODULE

FIGURE 6-6

6.6 URANIUM-BEARING LAGOON AREAS

There are lagoons on the plant site which contained uranium-bearing liquids and sludges. The liquids generally have very low concentrations level uranium contamination, having been treated in the waste treatment facility prior to release to the lagoons.

Elements of a uranium-bearing lagoon area may include the following equipment, materials, and items:

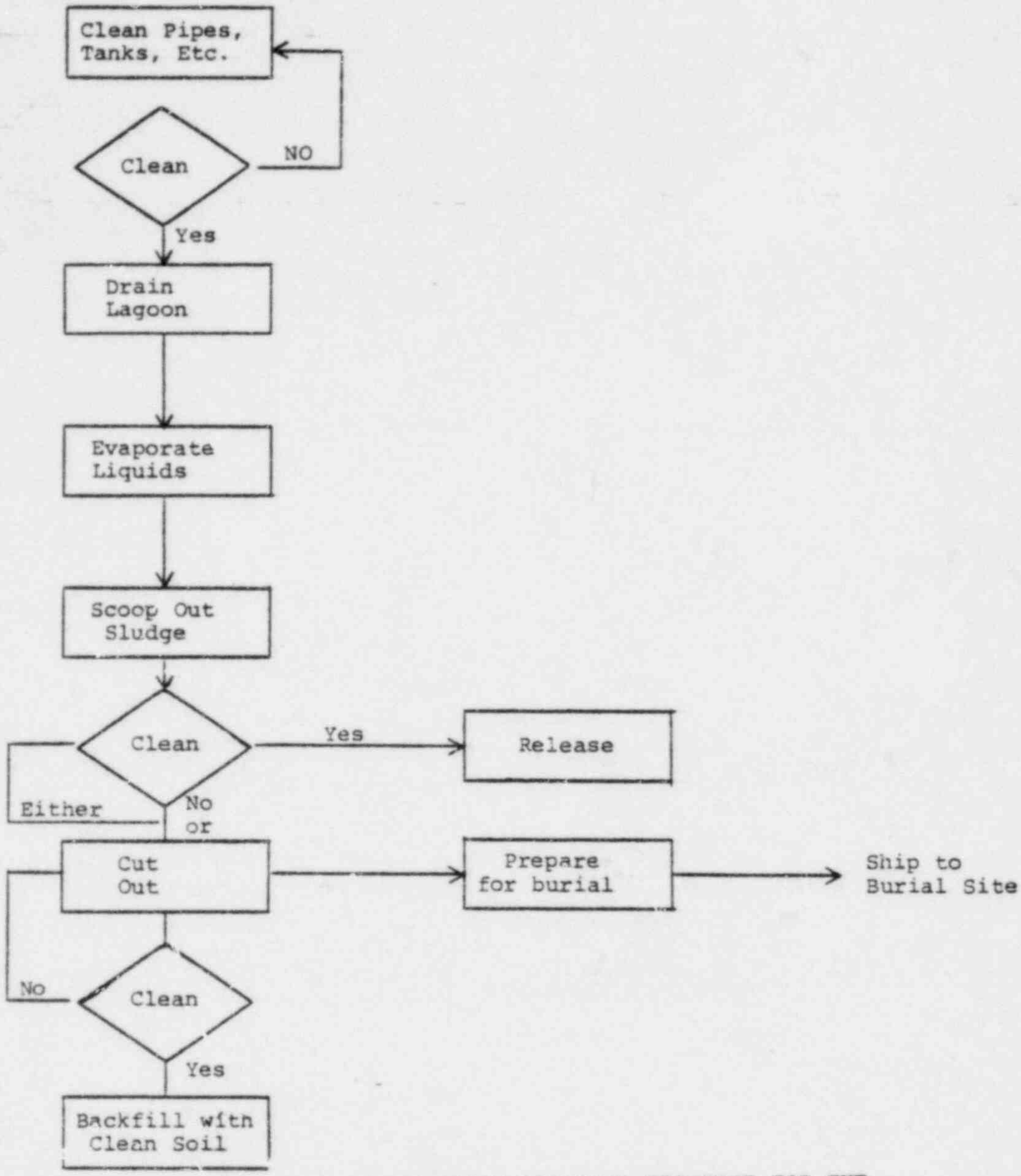
Asphalt liners
Buried Pipes
Fencing/covers
Floats
Liners
Pumps, Valves and Controls
Safety Lines
Safety Rings
Uranium Bearing Sludge and Liquid

The pipelines, pumps, etc. associated with the lagoons will be thoroughly flushed chemically and rinsed with water. The entire system will be blown out. Pipes, pumps, and valves will be disposed of where contamination cannot be accomplished and or the item verified to be "clean". Other items such as the safety lines, floats, rings, fence covers, etc. will be appropriately disposed of after removal.

The lagoons will be emptied and flushed with cleaning fluids. After addition of cleaning liquids to the lagoons have been terminated, the liquids will be allowed to evaporate. The cleaning sludge remaining in the lagoons will be stripped, stored for onsite uranium recovery and/or neutralized and shipped to burial. The Hypalon liners will be cleaned with high pressure water, detergent and rinses. Sections that cannot be decontaminted to release levels will be removed and prepared for burial. Soil under the lagoons will be tested for uranium contamination and removed for burial if necessary.

Soil may be brought in to backfill the excavations, or contoured, and the areas released for unrestricted use. Lagoons involving radioactive materials or hazardous waste will be treated in like manner.

See Figure 6-7 for decontamination sequence of uranium-bearing lagoons and equipment.



DECONTAMINATION DISPOSAL SEQUENCE FOR THE URANIUM-BEARING LAGOONS AND EQUIPMENT

FIGURE 6-7

6.7 HAZARDOUS WASTE MATERIAL AREAS

Hazardous waste materials, as defined by RCRA are liquids, solids or sludges which pose a potential threat to the public health and safety if released in an uncontrolled manner. Undesirable characteristics of hazardous waste are: corrosiveness, pH, toxicity, ignitability, and reactivity.

The WMD RCRA program has identified hazardous waste areas and has established control procedures to monitor on-going storage treatment and shipment activities.

Elements of a hazardous waste material area include the following equipment, materials and items:

- Storage Tanks
- Portable Transfer Tankers
- Pumps, Valves, Controls
- Small Storage Drums or Reservoirs at Generation Point
- Process Area Where Chemicals Are Used
- Protective Wet Gear
- Fencing
- Isolation Fiberglass Covers

Prior to the decision to close and decontaminate the WMD site, all hazardous wastes will be shipped offsite for disposal. Storage tanks will be cleaned or dismantled for shipment to a burial site. All equipment at generation stations will be cleaned up and released for uncontrolled uses.

7.0 RADIOLOGICAL AND INDUSTRIAL SAFETY

During decontamination and closure activities, employee exposures and potential release pathways will be very closely monitored. There will be no relaxation of criticality safety, radiological safety or environmental safety programs. All safety and regulatory requirements involving safety will be closely adhered to.

The criticality monitoring system which provides live time monitoring wherever bulk quantities of uranium is handled or stored on the plant site will be operationally maintained to assure that the system will provide an alarm in the unlikely event a criticality occurs. The system currently provides remote readout capability at the Emergency Control Center which will remain active as long as the monitoring system is needed. An interim emergency response plan will be prepared prior to the start of decommissioning.

A live time air sampling system is used to monitor airborne uraniun concentrations in the fuels manufacturing controlled areas. This system will be modified as appropriate and used to monitor all activities including the abnormal activities where the potential for high airborne levels will increase. Removal of this system will be delayed until only the shell of the building remains and the potential for airborne uranium approaches zero.

Another safety system which will be essential during decontamination is the fire alarm system with fire alarm boxes strategically placed throughout the site. Once triggered, the system sends out a coded alarm which identifies the area of the fire. Activities during decommissioning such as cutting, dismantling and nonroutine trash accumulation will make this safety system essential.

Necessary environmental monitoring programs established during the operations of the plant will continue during the decontamination/closure activities to assure that contaminants are being contained. Samples currently are taken at the stack release points, from soil around the site, at the dam or discharge point, and from wells around the site. These samples will be analyzed for specific contaminants. A history of data has been generated to provide a reference point for the evaluation of the effectiveness of the environmental monitoring program during decommissioning.

Radiation exposure to employees will be monitored through existing programs, such as dosimeter badging, air sampling of airborne contamination, and wholebody counting. This represents no change in current practices which meet the regulatory requirements specified in 10 CFR 20, Radiation Protection. All personnel and equipment will be monitored with instrumentation capable of detecting the presence of radioactive contamination.

Employees trained in Radiation Protection practices and contamination control techniques will perform decontamination activities. Protective clothing utilized in the facility will be available in sufficient quantities to allow for personnel contamination control. Various types of respirators will be available to provide the degree of protection necessary for the decontamination job being performed ranging from half mask respirators to fresh air suits.

For jobs requiring dismantlement of heavily contaminated items, isolation tents with portable blowers and absolute filters will be utilized. This tenting technique will also be available for decontamination activities where significant dusting potential exists.

8.0 GENERAL DECONTAMINATION AND CLEANING METHODS

Removal of radioactive material from contaminated surfaces will be accomplished in three ways: (1) by physical cleaning of the surface, (2) by using of chemicals to dissolve surface films containing radioactive materials or (3) by removing the surface of the structure itself.

Physical cleaning methods include sweeping and vacuuming, handwiping, sandblasting, and washing with various cleansing agents. Chemical decontamination uses acid basic or chelating solutions to dissolve residual contamination from surfaces; this technique is usually applied to wet processing systems, such as pumps, piping, storage tanks, etc. If physical cleaning and chemical decontamination techniques do not reduce contamination levels on equipment and/or building surfaces to acceptable radioactivity release levels, it will be necessary to use more extensive methods such as sandblasting or scarfing that physically removes surface layers or to remove the item for burial.

Removal of contamination from sealed pourous surfaces such as painted walls and floors, asphalt, tank exteriors, etc. can be accomplished using a variety of techniques. For loose contamination, vacuuming or simple sweeping compounds are often effective. For more difficult contaminations, various cleansing compounds combined with handwiping, handscrubbing, and/or power scrubbing techniques are available.

Freon, acetone, alcohol and other solvents are effective degreasing agents that can be used in removing contamination films from surfaces. Organic solvents have an advantage of not being corrosive to equipment and electrical connections.

Variable pressure, high or low-velocity liquid jets can be effective for some types of contamination work. The device can be operated by one man, at pressures up to 300 atm (4400 psig), using a hand-held jet lance. For those contaminants for which the liquid jet is effective, the jet is a very rapid decontamination method. Table 8.1 lists typical tools and equipment used for dismantlement.

Some typical chemical solutions which might be used for chemical decontamination of the plant are a solution of 0.025 - 0.1 $AlNO_3$ (which can be used to remove uranium deposits), a solution of 20% HNO_3 - 6% AlF_3 to remove sludge deposits, a solution of 10 HNO_3 - 0.1 wt % CaF to remove uranium contamination from stainless steel), and a tri-sodium phosphate solution for general cleaning.

TYPICAL TOOLS & EQUIPMENT

FOR DISMANTLEMENT

Tools

Oxyacetylene Torch

Guillotine Pipe Saw

Tube Cutter

Ratcheting Pipe Cutter

Reciprocating Saw

Nibbler

Assorted tools such as impact wrenches, bolt cutters, etc.

High-velocity Liquid Jet

Low-velocity Liquid Jet

Hydraulic Concrete Surface Spalling Device

Concrete Drills

Electric/Pneumatic Hammers

Portable A Frames

Portable Wash Tanks

Portable Greenhouse Erection Kit

Portable Spray Cleaning Booth

Portable Power Brushes

Portable Abrasive Blasting Unit

TABLE 8.1

Chemical solutions selected will be compatible with the available waste treatment processes and with materials used in the system.

Concrete surfaces in the plant which are contaminated to a depth of a few centimeters and that cannot be cleaned to an acceptable release level by surface wiping or washing techniques will be physically removed and packaged for disposal. Several criteria must be considered in selecting a concrete removal method. The method should facilitate control of airborne contamination and minimize the potential for personnel exposure to radioactivity. The size and weight of removed materials will be controlled to facilitate packaging and shipping for disposal.

9.0 WASTE MANAGEMENT

Large quantities of contaminated material will have to be removed during the decommissioning or closure of the plant. If these materials cannot be treated or decontaminated to releasable levels, they will be properly packaged and shipped to an authorized disposal site.

Contaminated waste materials that will be generated during decommissioning or closure include:

Contaminated process equipment, tanks, and hoods
Contaminated piping, ducts, and fixtures
HEPA and roughing filters
Concrete rubble
Contaminated lagoon liners
Contaminated soil
Misc. non-combustible materials (pumps, motors, etc.)

All shipments of radioactive material will be made in compliance with federal, state, and local regulations. Federal transportation regulations of DOT and NRC establish container requirements, dose rate limits and handling procedures to ensure the safety of the public and transportation workers during shipment of radioactive materials. Current federal regulations applicable to the transport of radioactive materials are:

Total 49 Code of Federal Regulations Part 170-179 (40 CFR 170-179) - Department of Transportation reguations governing the transport of hazardous materials.

10 CFR 71 - NRC regulations governing the packaging and shipment of radioactive materials

In addition, for highway transport, state agencies regulate vehicle sizes and weights and, in some cases, transportation routes and times of travel.

All hazardous waste will be packaged in safe containers commensurate to the hazard involved to meet regulatory packaging, shipping, and burial requirements. Materials that cannot be given uncontrolled release will be shipped to sites authorized to handle and bury the specific material. Hazardous waste liquids will be sent to companies authorized by license to receive, treat, and dispose of them. Materials handling will be done according to procedures for transfer, storage, preparation and shipping.

10.0 FINAL RELEASE

As areas/buildings are being decontaminated, contamination surveys will be made to determine the degree to which decontamination is being achieved. Upon completion of all decommissioning activities, a detailed health and safety analysis will be performed. This survey will determine the level of residual material. It is intended to demonstrate that there is no risk to the health and safety of the public, that limits are within those specified by regulatory agencies, and that the premises can be released to use by any industry.

A detailed survey report will be prepared which identifies the premises, shows that sufficient efforts have been made to eliminate residual contamination, describes the scope of the survey, and reports the findings of the survey in specified units.

A copy of this survey will be submitted to the NRC and the State of North Carolina for review.

The NRC will be invited to the site to confirm the survey results in anticipation of their final release to uncontrolled occupancy.

When decommissioning or closure of the facility is completed (i.e., removal of hazardous waste and sludge, equipment cleaned or removed, and storage areas or tanks free from any hazardous waste contaminants) WMD will submit to the RCRA Regional Administrator certification by the Project Manager and an independent registered professional engineer that the facility has been closed in accordance with the specifications of the appproved closure plan.

11.0 DECONTAMINATION SCHEDULE

Figure 11-1 shows the relative sequence and schedule for decontamination activities.

Upon completion of final process cleanout and removal of the uranium inventory, the decon activities will commence. These activities are briefly outlined below:

1. The areas close to the shipping docks (the powder storage warehouse and UF_6 cylinder storage areas) will be cleared first to provide staging areas for the storage, packaging, and shipment of decontaminated equipment and materials from the plant.

2. Plant areas will then be decontaminated, generally in the order of decreasing amount of contamination, i.e. from the most contaminated to the least contaminated.

3. The outdoor lagoon areas system will be dismantled and decontaminated upon completion of liquid processing.

4. The hot maintenance, rad-waste, incinerator facility, and the ventillation filter rooms will be decontaminated near the end of the campaign so they can support the decommissioning operations.

5. The laundry room and change rooms will be the final areas to be decontaminated.

6. The hazardous waste areas will be cleaned concurrent with decontamination activities. Cleaning will progress from the equipment manufacturing building, to the fuels component operations, to fuels areas and then to outside areas

7. The final activity will be to conduct a thorough radiation survey of all areas in and around the plant.

DECONTAMINATION SCHEDULE

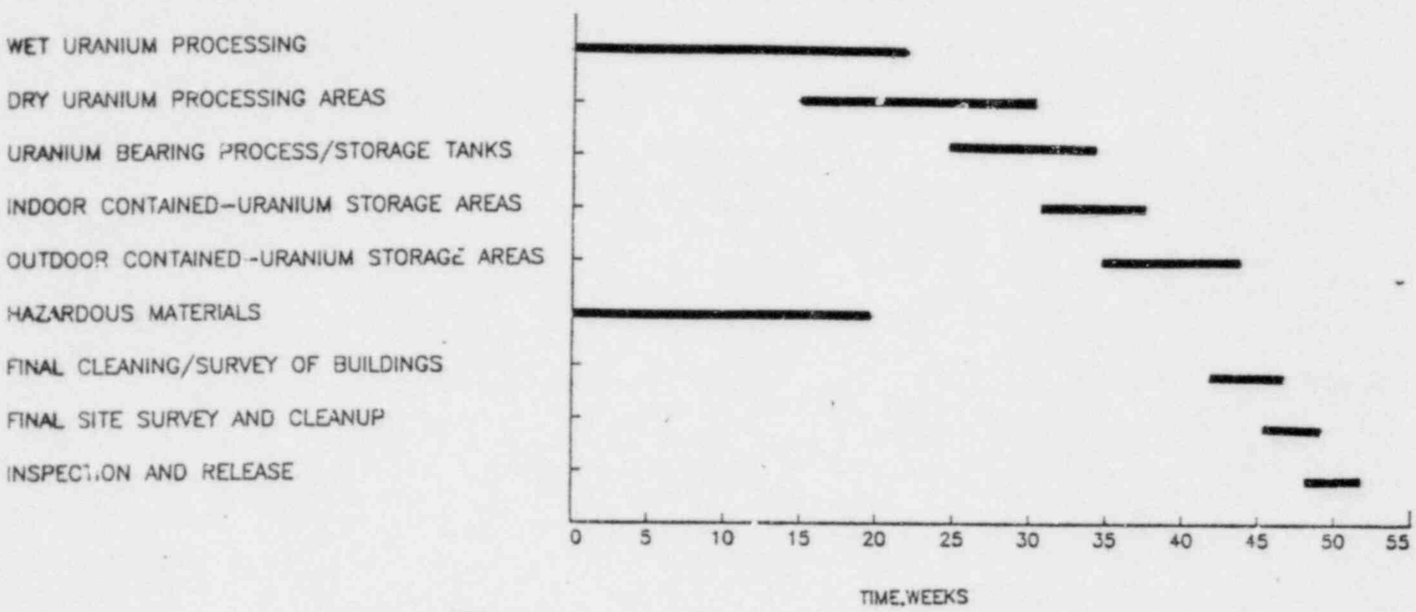


FIGURE 11-1 SCHEDULE FOR DECONTAMINATION ACTIVITIES

12.0 DECOMMISSIONING COST

12.1 The estimated cost for decommissioning the Wilmington nuclear facility and closing the Wilmington manufacturing site is 12.3 million dollars. See Table 12.1 for cost breakdown. This estimate includes the cost of special-purpose equipment, materials, labor, site support services, waste packaging, transportation, burial, and other miscellaneous owner expenses. The cost estimates assume an efficient decommissioning activity but a 25% contingency is added to allow for unforseen problems which might arise during decommissioning. It is important to note that the cost estimate is based on the assumptions stated in Section 4 of this Plan. The costs were developed using estimates provided by responsible and knowledgeable personnel in the various functions.

12.2 Burial cost estimates are based upon the current cost for burial; i.e., $8.50 per cu ft plus $1.00 per cu ft escrow perpetuity account charge (Chem Nuclear Corporation). It is most likely that this cost area will escalate at a higher rate than other factors because of continuing national problems with low level waste disposal.

12.3 Transportation costs assume burial at Beatty, Nevada, a site selected to provide some conservatism and flexibility since the quantity for burial is large and burial sites have been limiting the quantity allowed for burial.

12.4 The cost for a license to decommission the site is estimated to be $100,000 based upon the current routines established by the NRC.

12.5 Nuclear liability insurance for a facility being decommissioned has not been determined. An allowance of $250,000 is included for the annual insurance premium for both nuclear and conventional insurance.

12.6 RCRA regulations specify that an outside consultant who is a registered engineer must perform an independent survey to determine that cleanup activities have been performed per procedure, that measurements are representative of the actual situation, and that the total site is free of hazardous materials. A written report must then be submitted to the state certifying the plant is "clean." It is estimated that this fee will be $20,000.

TABLE 12.1

ESTIMATED DECOMMISSIONING AND CLOSURE COSTS

	$000(1981)
Decontamination and Dismantlement	
Materials and Contract Labor	$1500
GE Labor	2400
Project Salaried Personnel	1100
Burial	1700
Transportation	300
Site Services:	
Telephone	300
Utilities	1900
Taxes	200
Insurance	250
Consultant Inspection	40
Licensing/Inspection NRC	100
Planning/Preparation Costs	50
Subtotal	$9840
25% Contingency	$2460
	$12,300

13.0 FINANCIAL STATEMENT

The decommissioning and closure cost f r the Wilmington manufacturing plant including the full fabrication facility is estimated to be 12.3 million dollars. This cost is considered to be small compared to the total assets of the General Electric Company. Therefore, there appears to be no credible likelihood that General Electric would be unable to meet the financial commitment generally associated with closing and decommissioning activities as outlined and estimated above. Figure 13-1 documents the Corporate commitment to provide them resources to decommission the plant when and if necessary.

GENERAL ELECTRIC
GENERAL ELECTRIC COMPANY
175 CURTNER AVENUE
SAN JOSE, CALIFORNIA 95125

RECEIVED BY
... 1 7 1979
A. L. KAPLAN

ROY H. BEATON
VICE PRESIDENT AND GROUP EXECUTIVE
NUCLEAR ENERGY GROUP

May 14, 1979

Mr. W. T. Crow
Fuel Processing & Fabrication Branch
Division of Fuel Cycle & Material Safety
Office of Nuclear Material Safety & Safeguards
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Reference: NRC License SNM-1097, Docket #70-1113

Dear Mr. Crow:

This letter is to inform you that General Electric Company will have available, at the time of decommissioning, the resources deemed necessary to satisfy its obligation to decommission its nuclear fuel manufacturing plant in Wilmington, North Carolina.

Sincerely,

R H Beaton

R. H. Beaton

FIGURE 13-1 CORPORATE COMMITMENT LETTER

19413