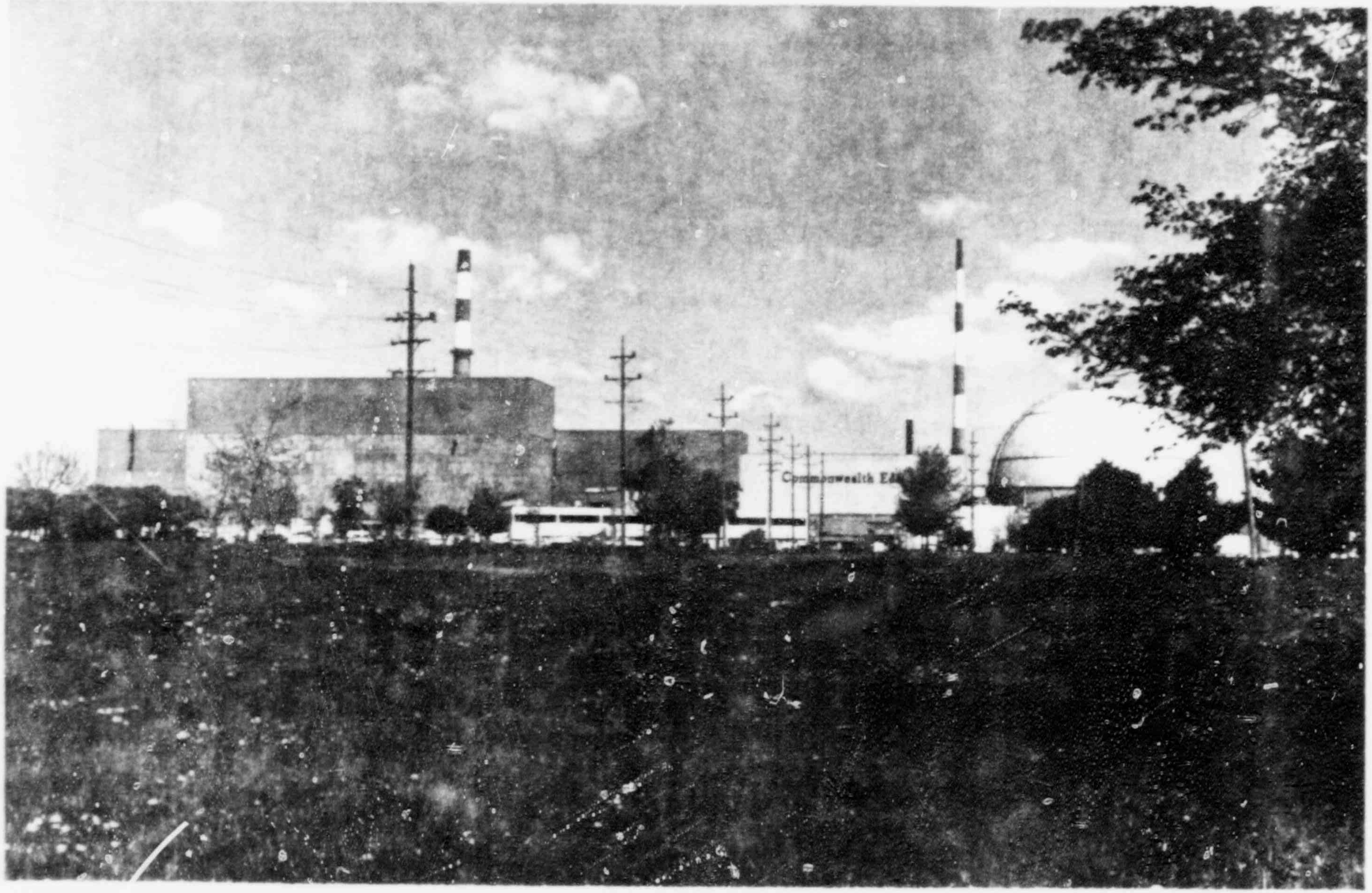
DECOMMISSIONING PROGRAM PLAN

for the

DRESDEN NUCLEAR POWER STATION UNIT 1

COMMONWEALTH EDISON COMPANY

December, 1987



DRESDEN NUCLEAR POWER STATION
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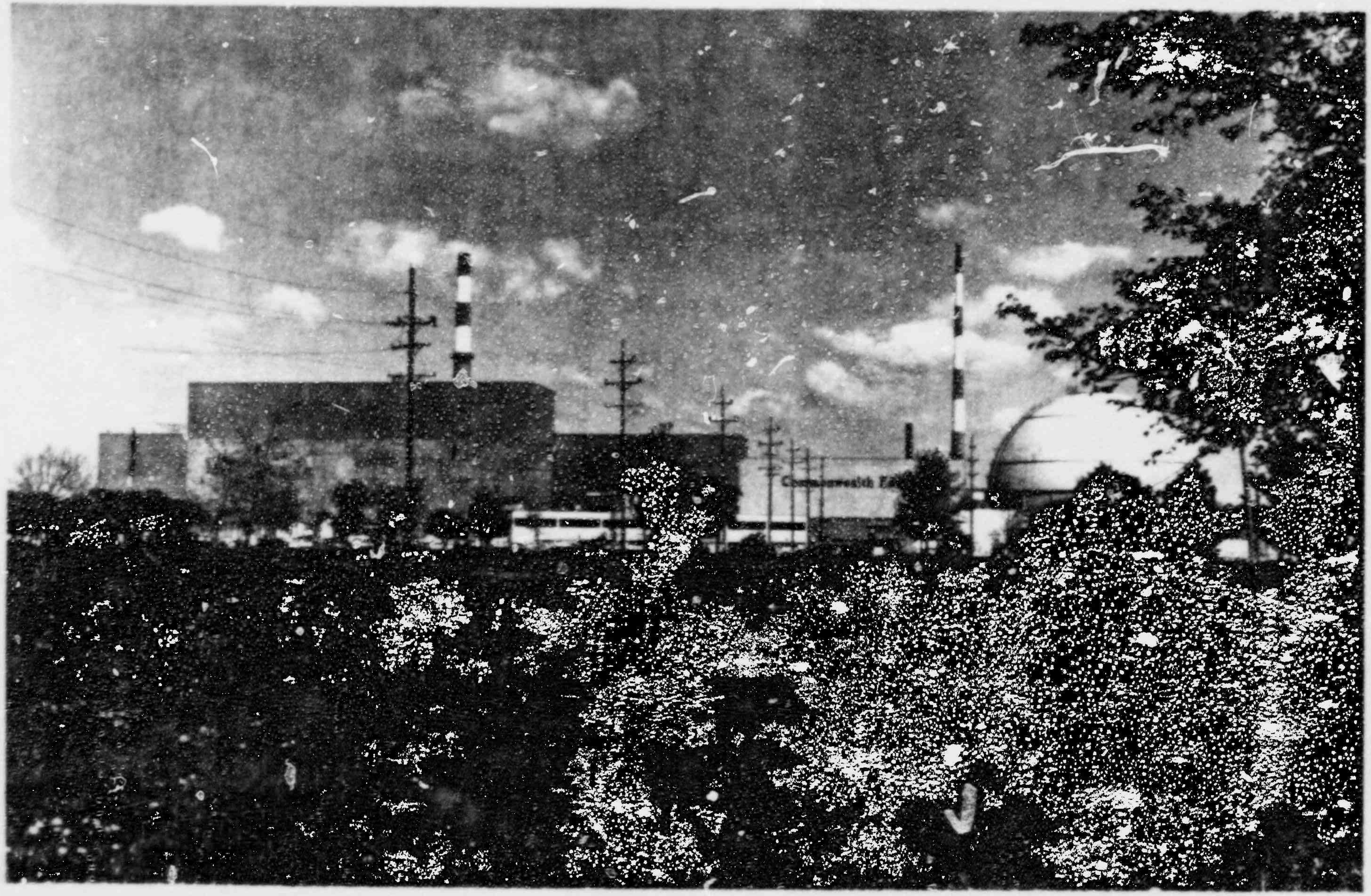

DRESDEN NUCLEAR POWER STATION
COMMONWEALTH EDISON

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INTRODUCTION

Commonwealth Edison Company plans to decommission the Dresden Nuclear Power Station Unit 1 by mothballing the facility in a safe storage condition until Dresden Units 2 & 3 are ready for decommissioning. If an extended life program for Units 2 & 3 is not initiated, all three Dresden units will be decommissioned by removal of radioactivity and dismantling beginning in the year 2017. This year is based on an assumed 30-year interval (30 years being the time duration that would provide the optimal benefit of reduced occupational dose versus storage time, e.g. Cobalt 60 will have decayed to less than 2% of its initial value), but will actually depend on the dates for shutdown for Dresden Units 2 and 3.

This Decommissioning Plan describes generic and site-specific detailed information relative to project planning. The objectives of the program are identified and the elements implemented to achieve those objectives are described.

Decommissioning is defined in the U.S. NRC's Proposed Rules as follows (Ref. 1):

> "Decommission means to remove (as a facility) safely from service and reduce residual radioactivity to a level that permits release of the property for unrestricted use and termination of license."

This definition permits a two-phased approach: mothballing upon permanent shutdown of the facility and delayed dismantling at a later, pre-planned time. This approach was selected by Commonwealth Edison because Dresden Unit 1 can be safely and inexpensively maintained in dormancy on the shared site with Dresden Units 2 & 3.

1. FACILITY OPERATION

1.1 LICENSING AND CONSTRUCTION HISTORY

Dresden Unit 1 was the first nuclear plant built by private industry. It was a cooperative effort by Commonwealth Edison and a "Nuclear Power Group" (NPG) that included six other electric utilities. General Electric Company designed the plant and offered it at a fixed contract price of $45 million, $15 million of which was contributed by NPG. Commonwealth Edison provided the remaining funding, the site, the electrical switchyard and other accessories. Bechtel Corporation was the engineer-constructor. Table 1.1 provides a chronology of Dresden Unit 1 licensing and construction history.

1.1.1 Operating History

Dresden Unit 1 produced power commercially from July, 1960 to October 31, 1978, generating approximately 15,800,000 MWehr of electricity. The unit was taken off-line on October, 1978 to backfit it with equipment to meet new federal regulations and to perform a chemical decontamination of major piping systems.

While it was out of service for retrofitting, additional regulations were issued following the March, 1979 incident at Three Mile Island. The estimated cost to bring Dresden Unit 1 into compliance with these new regulations was more than $300 million. Commonwealth Edison concluded that the age of the unit and its relatively small size did not warrant the investment.

The chemical decontamination of the primary system was performed and 753 curies of Cobalt-60 and 12.4 curies of Cesium-137 were removed. Decontamination was completed in September 1984 and preparations began shortly thereafter to mothball the facility for decommissioning.

1.1.2 Abnormal Events

Dresden Unit 1 had significant problems associated with control rods and undertook a control rod blade replacement program from November 1960 through March 1961. In April of 1961, criticality testing was conducted with new control blades. On June 2 of 1961, turbine generator operation was resumed. The license power of the unit was increased from 630 MWt to 700 MWt in September of 1962.

TABLE 1.1

DRESDEN UNIT 1 LICENSING AND CONSTRUCTION CHRONOLOGY

Date	Activity
March 31, 1955	Preliminary Safety Report submitted to Atomic Energy Commission *
May 4, 1956	Construction Permit issued
November 28, 1956	Site preparation work begun
June, 1957	Major construction work begun
June 12, 1957	Final Safety Report submitted to Atomic Energy Commission *
March, 1959	Reactor pressure vessel shipped
September 23, 1959	Construction completed
October 13, 1959	Fuel loading begun
October 15, 1959	First nuclear chain reaction initiated
November 16, 1959	Operating License issued
April 15, 1960	First electricity generated
June 29, 1960	Full power operation begun - 180,000 kilowatts (net)
August 1, 1960	Commercial operation begun
October 12, 1960	Official dedication
December 31, 1962	Achieved 73% annual capacity factor, exceeding Edison's best coal plant
June 1, 1976	World's first test of chemical cleaning on portion of reactor piping (Task K corrosion Test Loop)
October 31, 1978	Unit shutdown for modification to meet new regulations
September, 1984	Completion of world's first full-scale chemical cleaning of entire primary system
October, 1984	Decision made to decommission unit

* Nuclear Regulatory Commission

The unit had a history of minor steam leaks and erosion in steam piping in the early and mid-1960s - perhaps related to the use of saturated steam. There were also fuel failures during the time of September through December of 1964 and other periods which, although not leading to off-gas releases above limits, did cause redistribution of radionuclides from the fuel to other parts of the primary system. This higher rate of fuel failures at Dresden Unit 1 was not typical for the earlier BWR units.

During other outages in the late 1960s, ultrasonic inspections were made on extensive sections of primary piping and welds because of concerns regarding intergranular cracking failures in some of the smaller 304 stainless steel piping.

Several systems in the plant used admiralty brass (Cu-Ni) heat exchange surfaces, including the main condenser. Most of these were taken out of service and replaced with stainless steel tubing. In the sixth partial refueling, the condenser was retubed from admiralty brass to 304L stainless steel. The use of Cu-Ni surfaces did lead to translocation and deposition of corrosion production throughout the operating systems at levels above more modern units.

The use of carbon steel in the secondary feedwater system may have also contributed to the elevated corrosion radionuclide levels. These foregoing events led to the need to perform a chemical decontamination of the primary system.

1.2 SITE CHARACTERIZATION

Dresden Nuclear Power Station Unit 1 (Dresden 1) is located on a 953-acre site near the confluence of the Des Plaines, Kankakee and Illinois Rivers. The plant shares the site with Units 2 and 3.

1.2.1 Topography

The topography of the site is essentially rolling prairie, with gentle slopes at maximum elevation differences of approximately 25 feet.

1.2.2 Soils and Geology

The Dresden site lies in the Morris Quadrangle, where there is less than 200 feet between the highest and lowest points. The bedrock in this area is almost at the surface, with a shallow covering of sandy loam soil. This bedrock is in the Maquoketa formation of the Upper Ordovician series; the formation is of an upper limestone phase with a lower shale phase.

Underlying the Maquoketa formation is the Galena-Platteville formation of the Middle Ordovician series. It is comprised of a dolomite upper layer and a limestone lower layer; this formation has a slight tilt to the east.

1.2.3 Hydrology

1. Suface Hydrology

The surface drainage is collected by a channel that runs through the center of the site and empties into the Illinois River. There are several marshy areas at the upper ends of the channel, indicating little surface percolation.

The closest river is the Illinois, circling around the north side of the site before proceeding in a southerly direction. The Illinois originates within one half mile of the site's eastern boundary, at the confluence of the Des Plaines and Kankakee.

2. Groundwater Hydrology

There are many shallow wells surrounding the site. The Maquoketa formation yields negligible amounts of water and tapped by many domestic wells. The lower aquifiers, fed from absorption areas in southern/central Wisconsin, exist under artesian conditions and have a general southerly slope. However, the artesian pressure map indicates that the hydraulic gradient actually slopes in a general north-easterly direction due to heavy pumping in the Joliet and Chicago area.

1.2.4 Seismology

The best seismology data available (Loyola University) shows that over the last 100 years less than a dozen earthquakes occurred within a radius of 150 miles from Chicago. There is nothing in the geological structure of the area surrounding the site to suggest that this zone would be susceptible to major earthquakes.

1.2.5 Climatology and Meteorolgy

The average annual wind velocity, derived from three local weather stations, varies from eight to eleven miles per hour from a south/southwest direction. The average annual temperature ranges from 38 to 41 degrees minimum and 59 to 61 degrees maximum. The average annual percipitation was 33 to 36 inches with an average snowfall varying from 21 to 34 inches.

1.3 FACILITY CHARACTERIZATION

The Dresden site consists of three boiling water reactors (BWRs). Dresden 1 had a gross output of 210 MWe, while the output of Units 2 and 3 totals approximately 1660 MWe. The description of the general plant, plant structures and systems is included herein.

1.3.1 General Plant Description

Dresden 1 consists of a General Electric (GE) dual-cycle BWR and a GE dual-admission turbine unit with the necessary support and auxiliary systems. The reactor vessel, with its hemispherical ends, totals 41 feet in height and 12 feet, 2 inches in diameter.

The reactor containment is a sphere, constructed of steel plates of required curvature and butt welded together. Other main process buildings include the Turbine Building for housing the power extraction system, the Fuel Building for storing and handling new/used fuel, and the Radioactive Waste Facility.

1.3.2 Plant Structures

The layout of the plant structures is shown in Figure 1.1. A brief description of the main plant structures is contained herein.

1. The Turbine Building for Unit 1 is situated west of the reactor building; at its west end is the common Unit 2/3 turbine building (see figure 1.1).

2. The Fuel Handling Building is south of the reactor building, with the new fuel storage building to the east. To the west is the shop and warehouse.

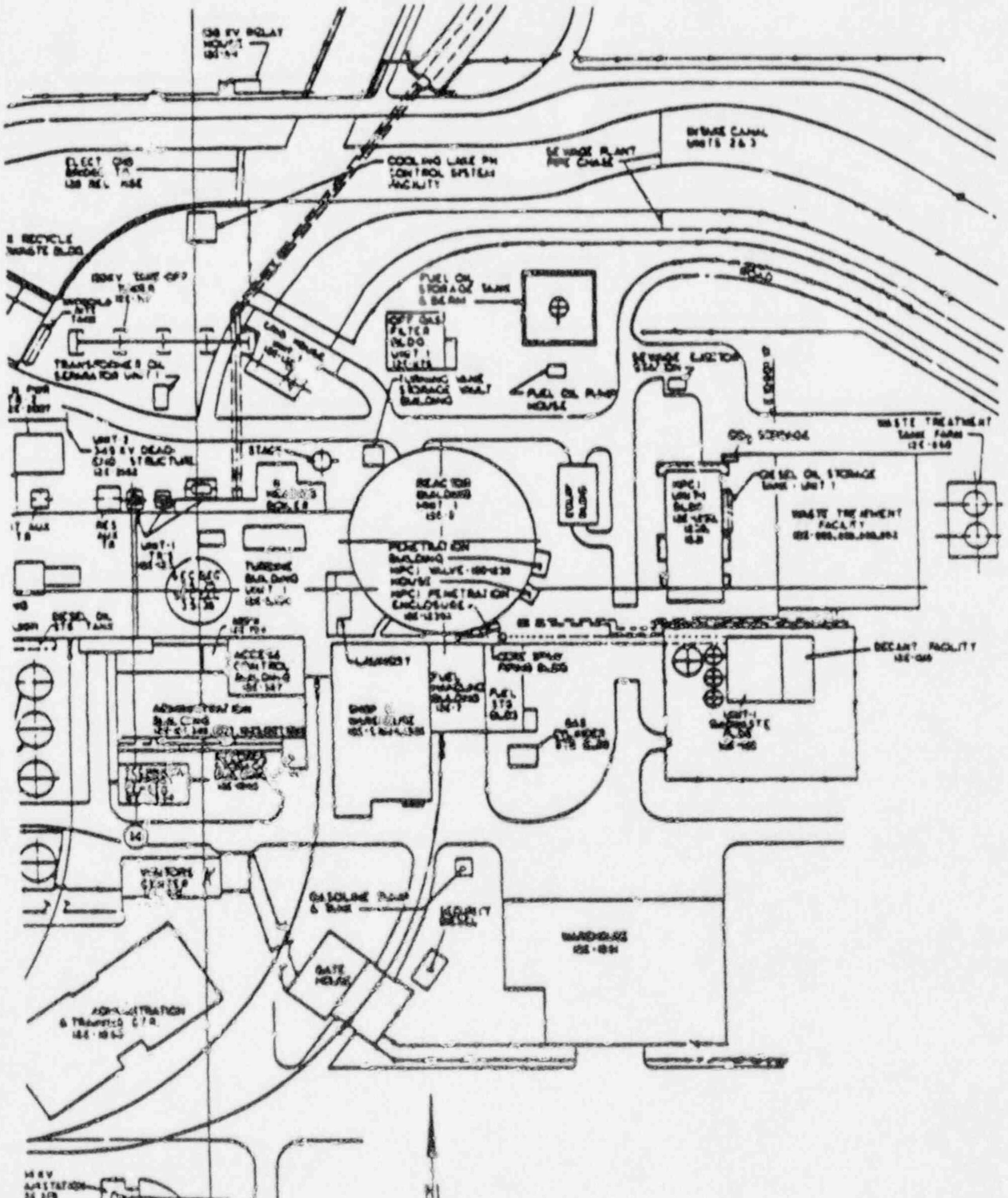
3. The Control Room (shared facility for Units 1, 2 and 3) is located at the juncture of the Unit 1 turbine building and the Units 2/3 turbine building. The Access Control Building is located at the south end of the Unit 1 turbine building. Dresden modification M12-2/3-87-05 is being proposed to separate the Unit 1 Control Room from the Units 2 and 3 Control Room. Necessary Unit 1 controls will be re-located in the Unit 2 and 3 Control Room area.

4. The Radwaste Building is located 150 feet due east of the Fuel Handling Building. Its controlled area is 160 feet wide by 200 feet deep. The types of waste processed include spent demineralizer resins and filter media.

5. The HPCI Building is due east of the Reactor Building and north of the Radwaste Building.

FIGURE 1.1

PLANT STRUCTURES



6. The Crib House is northwest of the reactor building and north of the heating boiler house which adjoins the north side of the Unit 1 turbine building.

7. The Off-Gas Building is between the crib house to the west and the fuel oil storage tanks to the east. It is directly north of the Reactor Building.

8. Entrance to the plant is via the Gatehouse, which is south of the Reactor Building.

9. To the west of the Gate House is the new Administration and Training Center. The Visitor's Center lies southwest of the Reactor Building and northwest of the Gatehouse.

1.3.3 Plant Systems

1. Reactor and Accessories

The Reactor Vessel is made of low-alloy steel, clad inside with stainless steel. The shell thickness opposite the nuclear fuel is 5-5/8" (including the 3/8" cladding). A drawing of the reactor vessel is presented in Figure 1.3.

The Nuclear Core of the reactor has space for 488 fuel assemblies (never loaded in excess of 464). Each assembly consists of a zircoloy channel with an arrangement of 35 or 36 fuel rods in a 6X6 matrix (sintered UO_2 pellets with an average of 2.24 wt percent per bundle average enrichment) encased in zircoloy cladding.

The Control Rod Drive System is comprised of 80 control rod drive mechanisms, each fitted with cruciform control rods made of stainless steel and boron carbide; each rod contains 44 tubes of boron compacted to 70% of theoretical density.

The Liquid Poison System is manually operated and is shown in Figure 1.4. It basically consists of a reservoir containing Sodium Pentaborate, a pressure equalizer and a feedline running from the reservoir to the sparger system.

The Fuel Handling System involves loading and unloading the reactor core through approximately 40 feet of water using a fuel grapple crane for lifting. Fuel is transfered from the Reactor refueling canal located in the Sphere to the bottom of the transfer pool in the Fuel Building through a vertical transfer tube. The transfer baskets hold up to 16 fuel bundles each. Fuel moves horizontally in a transfer basket through a canal in a level below grade outside the enclosure (see Figure 1.5). Due to the possibility of fuel rupture, provisions were made to remove the ruptured fuel from the sphere in a sealed container.

2. Steam Supply System

The Steam Supply System is comprised of a steam separating drum, 4 secondary steam generators, 4 recirculating pumps, an emergency condenser and unloading heat exchangers (see Figure 1.6 for a schematic drawing).

There are four separate recirculation loops, each consisting of a secondary steam generator, recirculating pump and secondary valves. Each loop can be independently isolated. The steam generator and associated pump units are installed in separate shielded compartments and may be isolated from the remainder of the system.

3. Power Extraction System

As indicated in Figure 1.2, the saturated primary and secondary steam enter the dual-admission turbine from the main steam lines which connect the reactor plant to the turbine. The primary steam enters the first stage of the high pressure turbine, while the significantly lower pressure secondary steam (approximately 500 psig) enters the ninth stage of the high pressure turbine. The tandem compound turbine consists of high pressure, intermediate pressure, and double-flow low pressure sections. The three sections are on one shaft, connected to the generator.

The generator is rated at 245,000 kVA, at a power factor of 0.85, and 30 psig hydrogen cooled with field excitation by either of two exciter sets with automatic voltage regulation.

4. Reactor Recirculation Water Cleanup System

The water cleanup system consists of two identical loops. Each loop contains a booster pump, a regenerative and non-regenerative heat exchanger, and a demineralizer. The regenerative heat exchanger uses the recirculating water from the demineralizer for cooling.

5. Condensate System

The condensate system includes the condensate pumps, steam jet air ejector condensers, gland steam exhauster condensers, condensate demineralizers, chemical feeders, condensate storage tank, and condensate drip tank systems.

6. Electrical System

This system is a "Unit System" in which the generator, main power Transformer 1, and station service Transformer 11 are all solidly connected together. Station service Transformer 12 is connected to the 138 kV bus and supplies half the auxiliary power with Transformer 11 providing the other half. Reserve station service Transformer 13 supplies a limited amount of auxiliary power in the absence of normal power.

7. Control and Instrument System

The devices used for control and instrumentation are extensive and include combinations of hydraulic, pneumatic, mechanical and electrical components interconnected in a single device.

8. Fire Protection System

Fire protection services are provided by a pressurized water system serving most areas throughout the buildings and grounds, and portable extinguishers at strategic locations. This system is connected to Units 2 & 3 via Unit 2. The Unit 1 Diesel Fire Pump is located in the Unit 1 Crib House.

9. Air Systems

Instrument air is connected to Units 2 & 3 and is provided by an air compressor situated in Unit 1, with two additional compressors for backup and maintenance operations. The instrument air is free of moisture, oil and grit. Compressed air for general service is supplied at 100 psig for distribution throughout the plant and yard facilities from the service air system.

10 HVAC System

The heating steam supply system feeds steam to provide heat and various other services. Each major building has its own ventilation system.

FIGURE 1.2

TURBINE SYSTEM

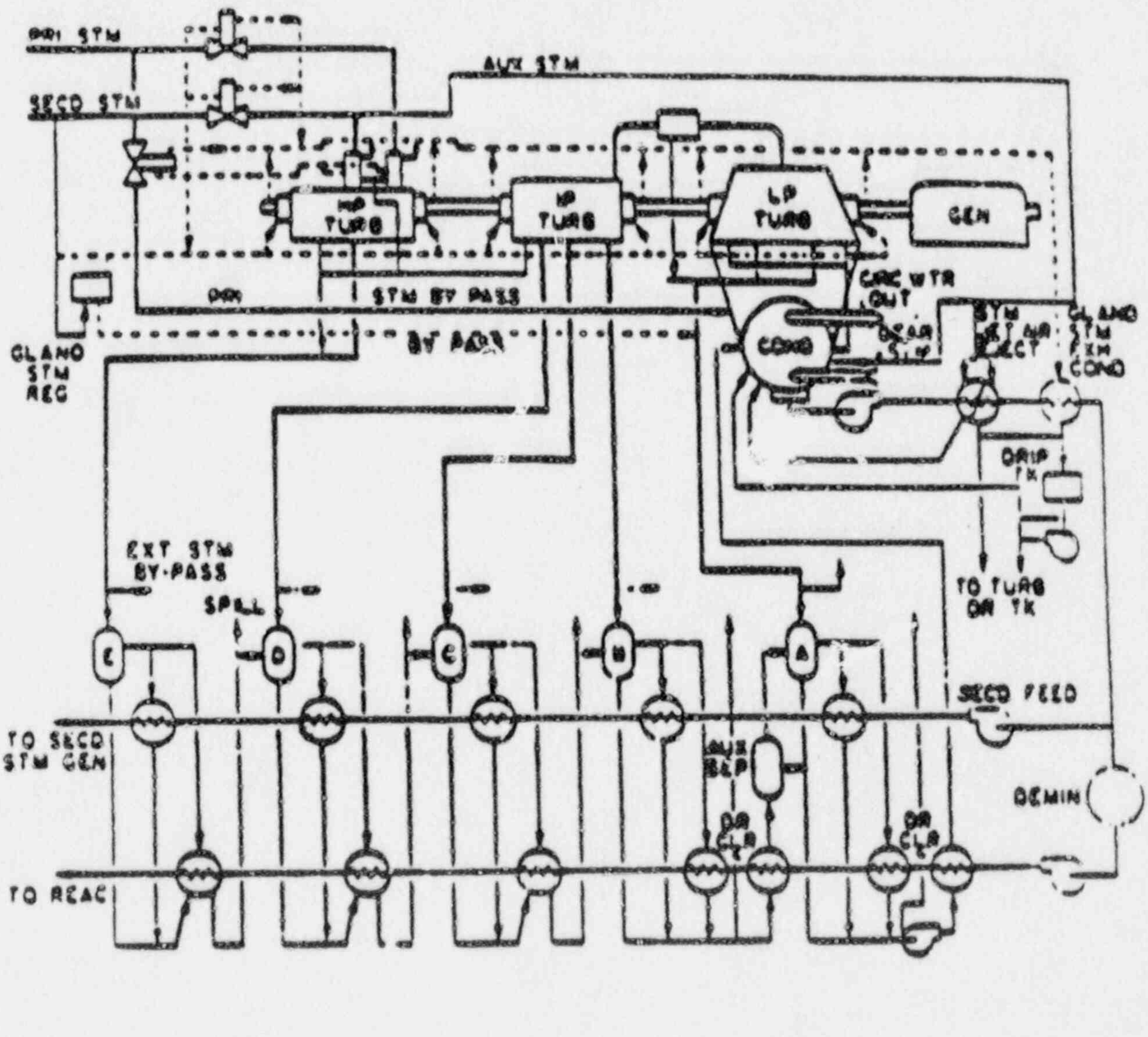


FIGURE 1.3

REACTOR VESSEL

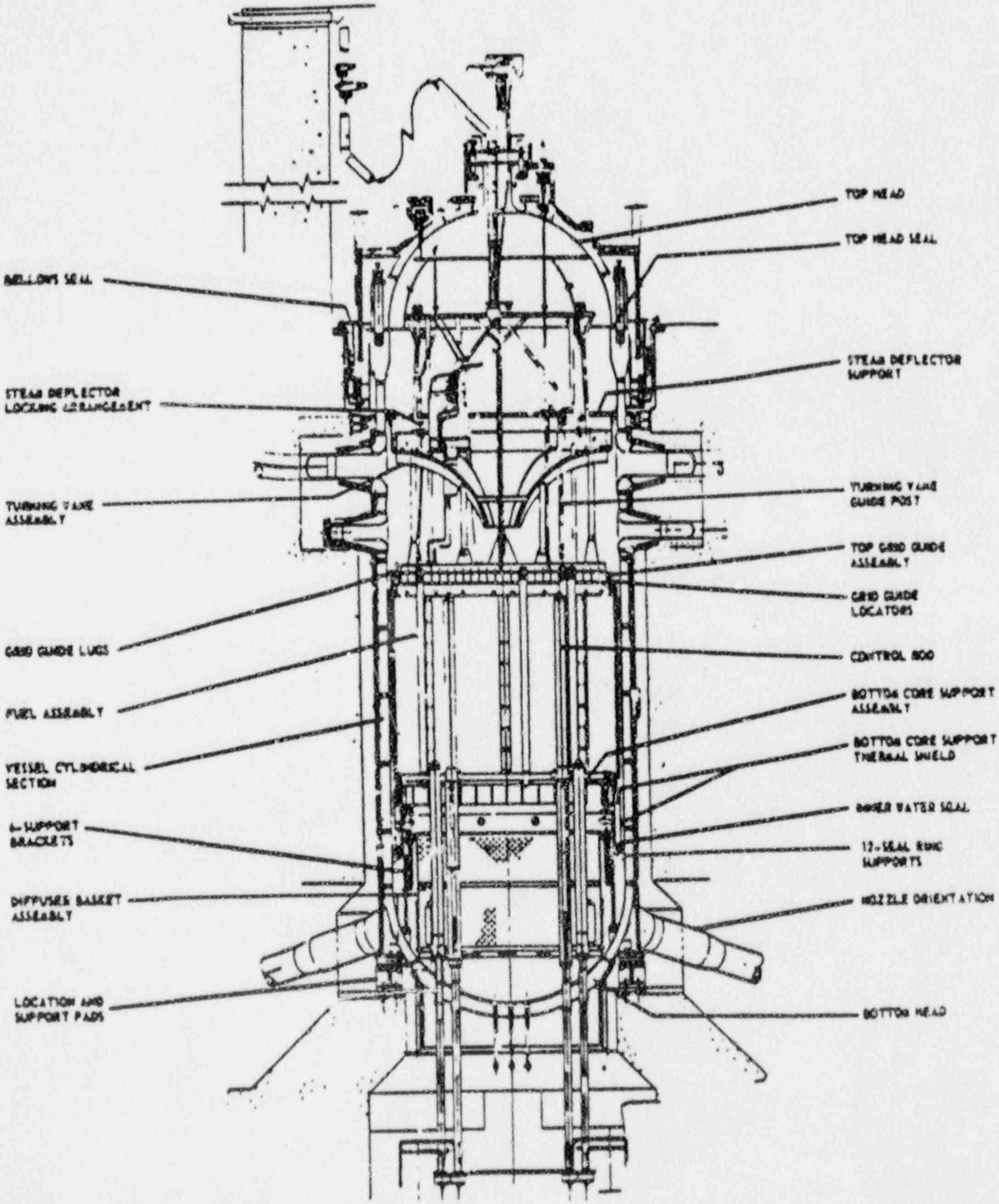


FIGURE 1.4

LIQUID POISON SYSTEM

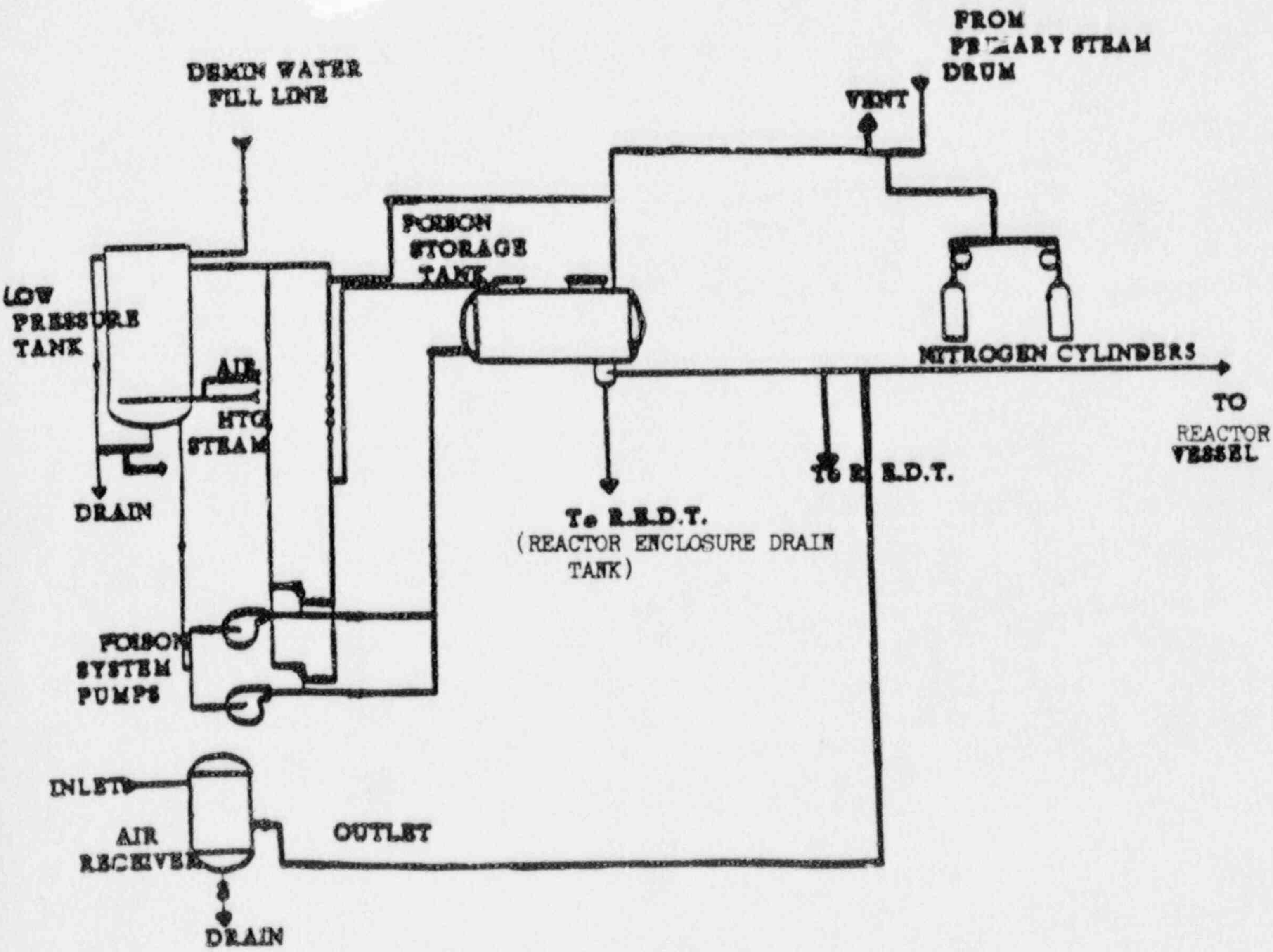


FIGURE 1.5

FUEL HANDLING SYSTEM

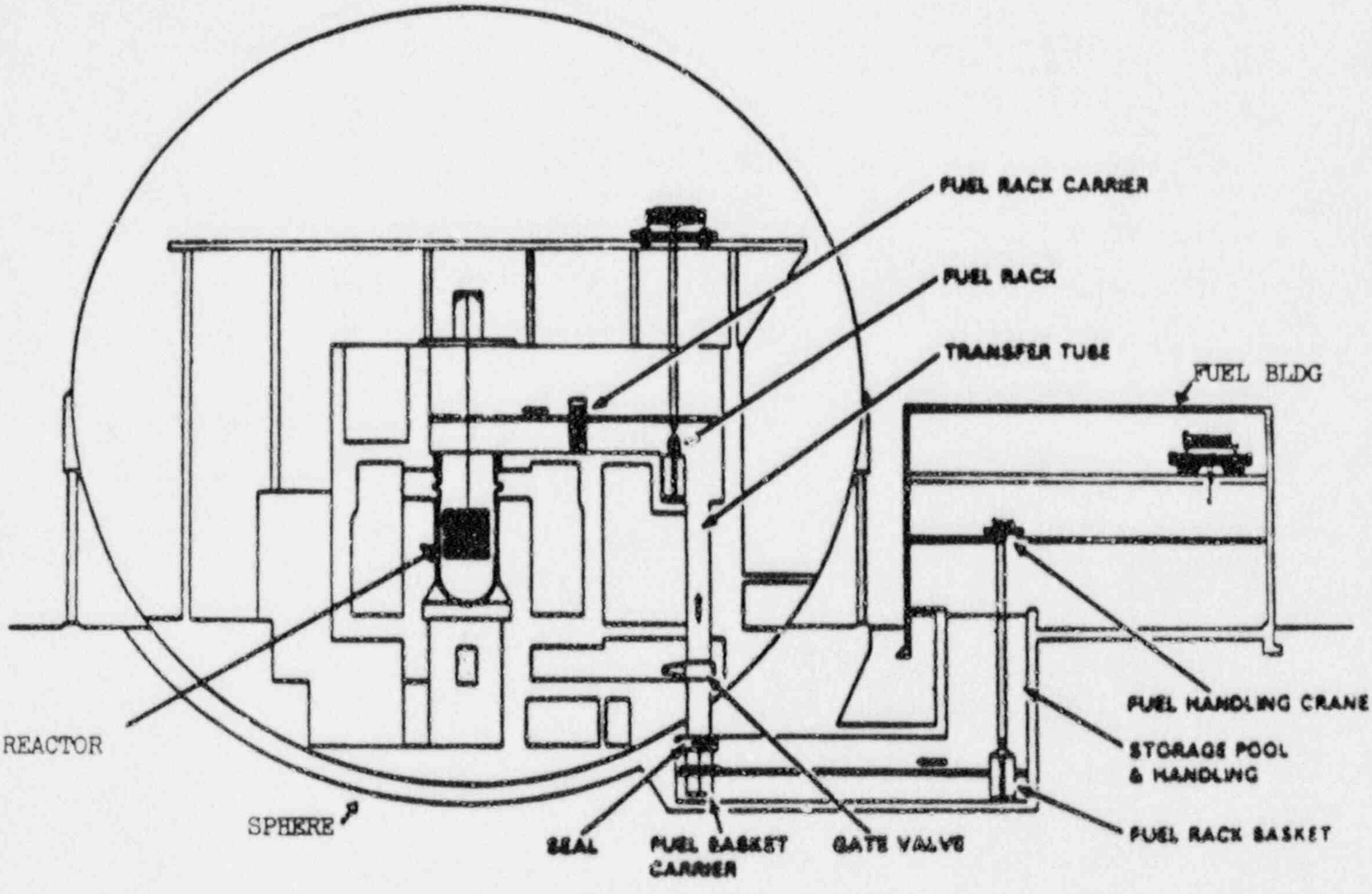
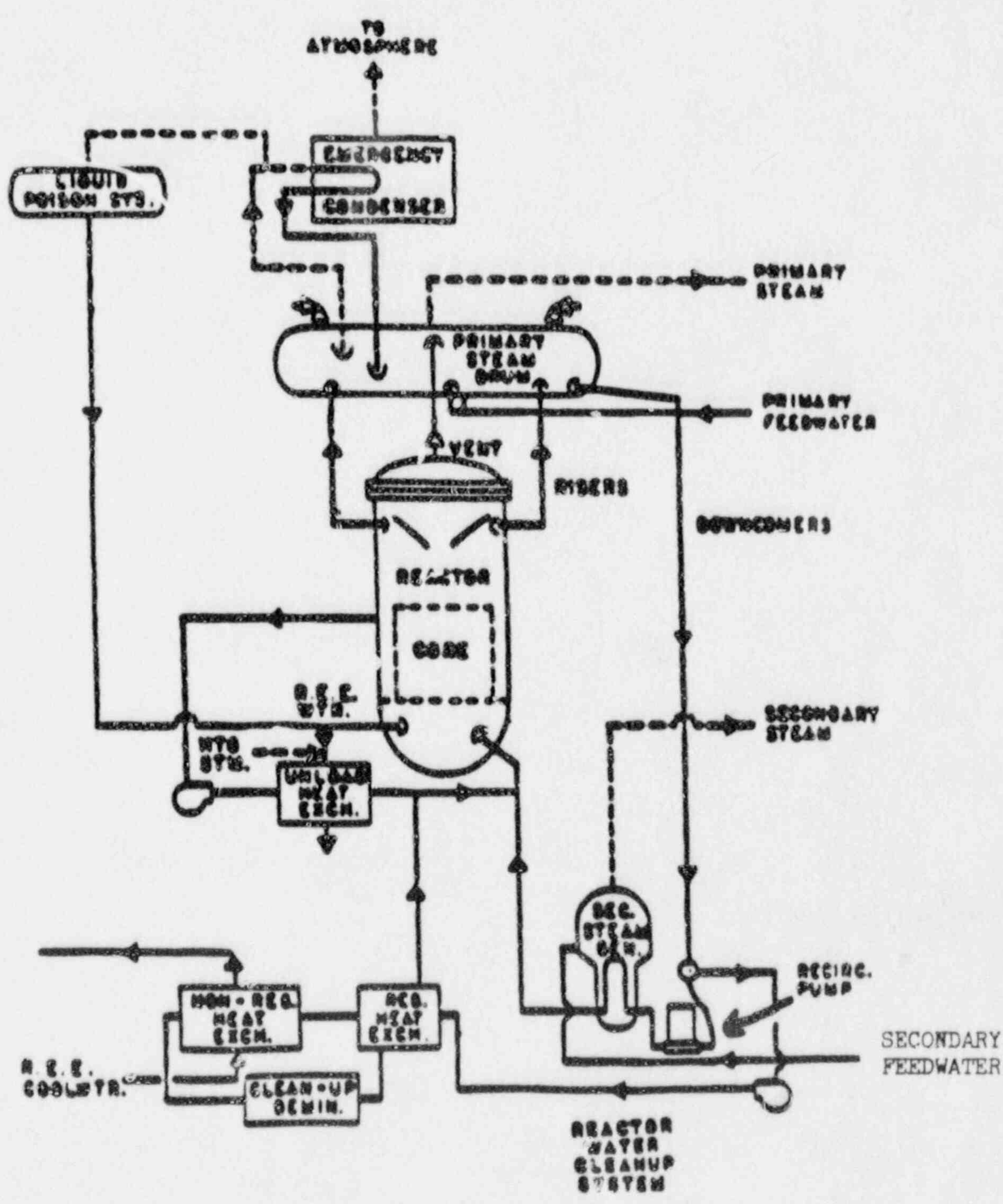


FIGURE 1.6

SCHEMATIC DRAWING OF STEAM SUPPLY SYSTEM



2. PROGRAM OBJECTIVES

Dresden Unit 1 will be prepared for decommissioning by maintaining it in the Safe Storage (SAFSTOR) mode for up to 30 years, or until Units 2 & 3 are decommissioned and dismantled. At the end of the safe storage period, Unit 1 will be decommissioned by dismantling (DECON). The objectives of the decommissioning program are:

1. To maintain Dresden 1 systems and structures needed to support operation of Units 2 and 3.

2. To secure <u>all</u> nonessential Unit 1 systems and structures to prevent deterioration and ensure there will be no potential for release of contained radioactivity.

3. To dispose of radioactive and hazardous wastes remaining on-site in preparation for the SAFSTOR dormancy period.

4. To store spent fuel temporarily on-site until a federal repository is available for permanent disposal.

5. To decontaminate plant floors and areas enroute to or adjacent to operating equipment or repetitive survey/monitoring locations.

6. To prepare a radiological baseline characterization of the plant, and a monitoring and surveillance program for the SAFSTOR dormancy period.

7. To devitalize all areas no longer containing vital equipment and amend the Security Plan accordingly.

2.1 DECOMMISSIONING ALTERNATIVE DESCRIPTION

The SAFSTOR decommissioning alternative represents the minimal effort required to prepare the facility for protective storage and to provide safety to the public from residual radioactivity remaining at the site. The facility is left essentially intact and all structures are maintained in a sound condition. Systems not required to be operational for maintenance/surveillance during the SAFSTOR dormancy period will be drained, de-energized and secured. Minimal cleaning or removal of loose contamination and/or fixation and sealing of remaining contamination will be performed. All access to contaminated areas will be sealed or sufficiently secured to provide controlled access for inspection and maintenance.

The overall decommissioning process of SAFSTOR followed by delayed dimantling is organized into five separate periods, including:

Period 1: SAFSTOR Operations
Period 2: Dormancy
Period 3: Delayed Dismantling Engineering and Preparations
Period 4: Decommissioning Operations and License Termination
Period 5: Site Restoration

2.1.1 Period 1: SAFSTOR Operations

In general, Period 1 activities include the engineering and planning effort to revise the Dresden Unit 1 Technical Specifications for the safe storage period and obtain a possession-only license (POL) amendment to the operating license. The POL will be issued by the U.S. NRC in accordance with Title 10 of the Code of Federal Regulations Parts 30, 50, 51 and 70. The POL will require that the plant be maintained in safe storage in accordance with the revised Technical Specifications. In the interim, the NRC acted upon a request from Commonwealth Edison Company to amend the Operating License (No. DPR-2) to a possess-but-not-operate status (Amendment No. 36, July, 1986). The preparations for SAFSTOR include the activities described herein:

- Drain, de-energize and secure all noncontaminated, non-essential systems.
- Remove filter elements and demineralizer resin beds for shipment and burial.
- Drain reactor vessel; reactor vessel internals will remain in place.
- Drain, de-energize and secure all contaminated systems; decontaminate as required.
- Prepare the spent fuel storage pool for long term storage of fuel. Provide for maintenance of fuel pool water chemistry.
- Lighting, fire protection, HVAC and alarm systems will be maintained, as required, for continued use during SAFSTOR dormancy.
- Clean loose surface contamination from building access pathways.
- Access to radioactive or contaminated areas will be controlled in accordance with normal Station Procedures.

2.1.2 Period 2: Dormancy

Activities required during the dormancy period for the SAFSTOR alternative include a 24-hour guard force, preventive/corrective maintenance on area lighting, general building maintenance, heating and ventilation of buildings, routine radiological inspections of contaminated buildings, maintenance of structural integrity, and an environmental and radiation monitoring program. Maintenance and equipment inspection activities are provided by the full time utility maintenance staff. Their duties are to maintain the facility in a safe condition, to provide adequate lighting, ventilation, and heating, and to perform periodic preventive maintenance on essential equipment.

An environmental surveillance program will be carried out during the dormancy period to prevent releases of radioactivity to the environment; any such releases will be identified and quantified. The environmental surveillance program is a modified/abbreviated version of that carried on during normal plant operations.

Primary physical security is provided by the Dresden Units 2 & 3 security force on a 24-hour basis for the duration of the dormancy period. Security during this period is primarily conducted to prevent unauthorized entry. Security detection and notification systems will be used during SAFSTOR in accordance with the station Security Plan. Liaison with local law enforcement agencies will be maintained and their assistance requested as necessary.

2.1.3 Period 3: Delayed Dismantling Engineering and Preparations

This work will presumably be performed concurrently or sequentially with the decommissioning of Dresden Units 2 & 3. In general, all reactor dismantling engineering, planning and site preparations occur during this period. Utility and Decommissioning Operations Contractor (DOC) management staffs will be selected and mobilized on-site. Decommissioning activity specifications and detailed procedures will be prepared for removal of systems, components and structures. The overall decommissioning sequence will be developed. Preparations will include selection of specialty contractors, long-lead tooling and equipment, arrangements for radioactive waste disposal and construction of site temporary facilities for the workforce.

2.1.4 Period 4:
<u>Decommissioning Operations and License Termination</u>

The decommissioning operations during this period will be directed at removing all radioactivity from systems, components and structures. Minimal chemical decontamination will be required since most short-lived radionuclides will have decayed to levels low enough to permit removal with low occupational exposure. The reactor vessel and internals will be segmented, packaged, shipped and buried. Similarly, the steam drum, steam generators and all associated pumps and piping will be removed for controlled burial. All components and structures with radioactivity levels above US NRC Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors", Table 1 (Ref. 2) limits will be removed. The facility will be surveyed to certify the removal of radioactivity, and the license may be terminated.

2.1.5 Period 5:
<u>Site Restoration</u>

Following completion of the decommissioning operations, site restoration activities may begin. These involve demolition and removal of remaining structures although it is expected that the switchyard will remain. All building foundations will be backfilled. Site areas affected by the dismantling activities will be cleaned up and the plant site will be graded and restored. A final dismantling program report will be prepared and submitted to the U.S. NRC.

2.2 CLEANUP CRITERIA

The criteria to be applied for determining the disposition of radioactive materials removed from the site for unrestricted use are either 5mR/hr above background at one meter from the surface or 10 mRem/year above background, considering reasonable proximity and occupancy. Permissible surface contamination levels will be in accordance with U.S. NRC Regulatory Guide 1.86, Table 1 therein. The same criteria will be applied for termination of the license during delayed dismantling.

For the safe storage period, all accessible areas within the facility having radiation levels in excess of 5 mRem/hr will be marked, shielded or protected by physical barriers. Criteria for disposition and disposal of hazardous and toxic wastes including asbestos will be in accordance with U.S. EPA Title 40, Part 61 (Ref. 3).

2.3 LICENSING SUMMARY

The licensing objective of the Dresden Unit 1 decommissioning program is to first obtain a POL amendment to the operating license. This POL will require that the facility be maintained in safe storage in accordance with the provisions of the Revised Technical Specifications. In the interim, the NRC acted upon a request from Commonwealth Edison Company to amend the Operating License (No. DPR-2) to a possess-but-not-operate status (Amendment No. 36, July, 1986). These specifications identify the necessary criteria, tests, limiting conditions of operation, and surveillance requirements; they have been revised to reflect the shutdown status of the facility.

The POL will remain in effect until completion of Period 4, "Decommissioning Operations," when all radioactive material will have been removed from the site. Upon inspection and certification by the NRC that radioactivity above Regulatory Guide 1.86 Table 1 limits has been removed, the NRC will terminate the facility license.

3. PROGRAM MANAGEMENT AND ADMINISTRATION

Commonwealth Edison has identified a decommissioning project team to manage the program to prepare Dresden Unit 1 for SAFSTOR. The team consists of a Decommissioning Project Manager responsible for the on-site project staff and general office project staff. The Project Manager will also be responsible for all subcontractors.

3.1 PROJECT ORGANIZATION AND RESPONSIBILITIES

The Project Manager will report directly to the Vice President-BWR Operations. This will ensure that high level management attention will be available to commit personnel and resources to properly and safely prepare the plant for decommissioning. The overall organization is shown in Figure 3.1.

3.1.1 Vice President - BWR Operations

The Vice President - BWR Operations is responsible for the authorization and approval of the decommissioning project. He has the authority to commit personnel and resources to prepare the plant for SAFSTOR safely, on schedule and within budget. The Vice President - BWR Operations is also the chairman of the General Office Project Team. He is responsible for reviewing the Decommissioning Plan, proposed possession-only license (POL) amendments, and the Revised Technical Specifications.

3.1.2 Project Manager

The Project Manager has the responsibility to develop the Decommissioning Plan and POL amendment application with Revised Technical Specifications. These responsibilities include:

- identifying and coordinating the project team participants
- developing a decommissioning plan schedule and budget
- developing a decommissioning program cost estimate and schedule
- preparing for and obtaining Commonwealth Edison approval of the Decommissioning Plan
- meeting with the NRC and other regulatory agencies to ensure compliance with regulatory requirements
- resolving NRC comments on the Decommissioning Plan, POL amendment
- participating on the General Office Project Team to review the Decommissioning Plan

3.1.3 On-Site Project Team

The On-Site Project Team has the responsibility to review and prepare the Revised Technical Specifications for the SAFSTOR POL amendment. They will participate in the General Office Project Team review of the Decommissioning Plan. This team will also be responsible for implementing the plant preparations for SAFSTOR. Most of this work can be performed by on-site personnel. Some of the work may be contracted.

3.1.4 General Office Project Team

The General Office Project Team has the responsibility to prepare the POL amendment with Revised Technical Specifications for submittal to the NRC. They are also responsible for the development of the Decommissioning Plan, cost estimate and schedule, funding plan and Environmental Report. The resources available from this General Office Project Team constitute all the technical support needed to prepare or review the submittal documents.

3.1.5 Consultants and Contractors

Specialty consultants and contractors will be used to assist Commonwealth Edison in preparing documentation and performing site preparations for SAFSTOR. The development of a detailed site-specific cost estimate and schedule for decommissioning was prepared using industry accepted guidelines. Consulting assistance to Commonwealth Edison was provided in the development of the Decommissioning Plan.

Specialty contractors may be used to perform spot decontamination, waste packaging and disposal services. Additional services may be required to provide additional or modified security monitoring equipment, and environmental surveillance data acquisition equipment. The consultants will report to the Project Manager directly. Specialty contractors will report to the Station Manager.

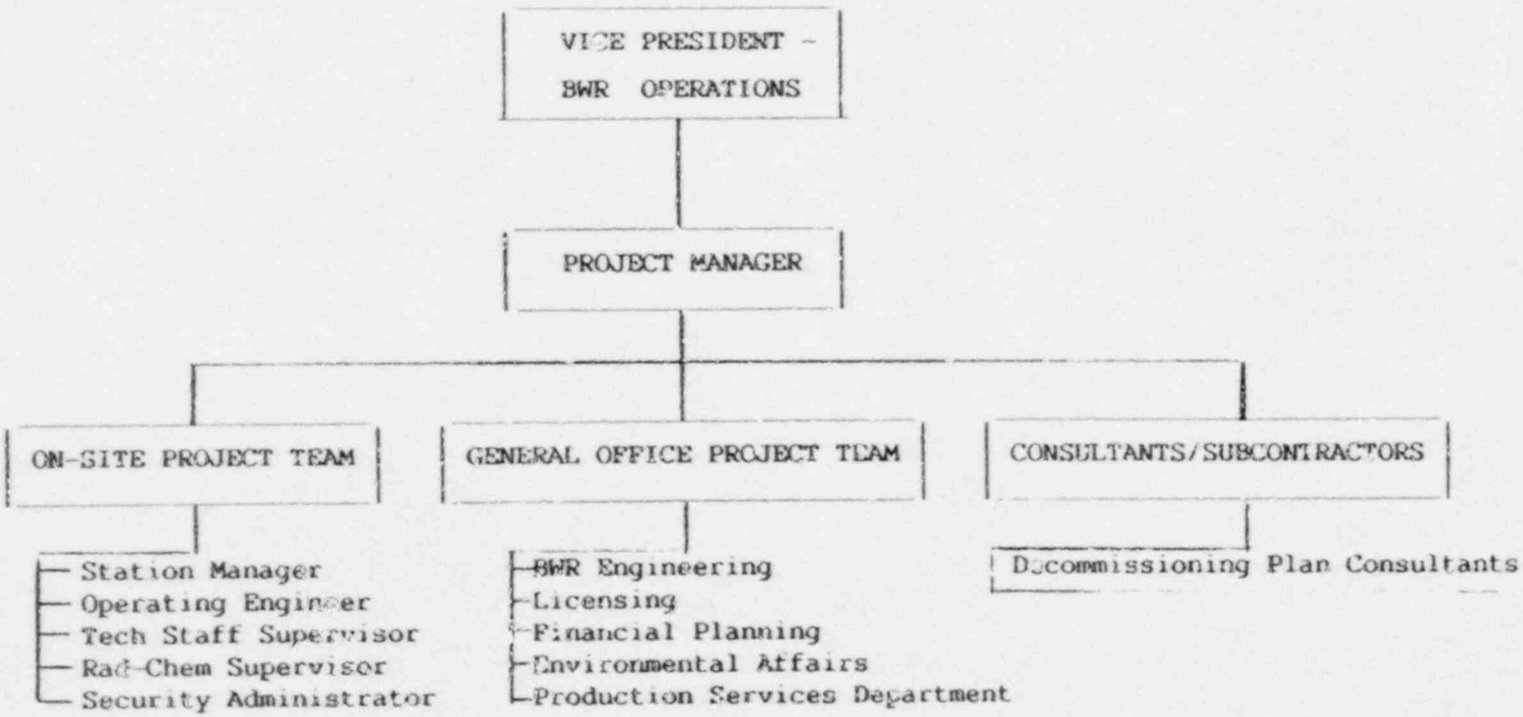
3.2 ORGANIZATION AND RESPONSIBILITIES DURING SAFSTOR DORMANCY

The Station Manager will have responsibility for ensuring maintenance and surveillance during SAFSTOR dormancy, and for preparing semi-annual surveys of radiation levels. Annual status reports must be submitted to the NRC.

Work activities for maintenance and surveillance will be performed primarily by Commonwealth Edison personnel on site or from other Stations. If necessary, contractor assistance will be used to perform services beyond the capabilities or availability of Commonwealth Edison personnel.

FIGURE 3.1

DECOMMISSIONING PROJECT ORGANIZATION



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4. PROGRAM SCHEDULE AND COST

The overall program and schedule for decommissioning Dresden Unit 1 consists of five periods starting with SAFSTOR-Mothballing and ending with Site Restoration, as described in Section 6 herein. The decommissioning program costs were estimated in a site-specific cost estimate (Ref. 4) for each period of the program. A summary of the estimated costs is included in this section. A financial plan has been developed to assure decommissioning funds will be available to safely decommission and dismantle the facility. A brief description of the plan is described in this section.

4.1 PROGRAM SCHEDULE

An overview of the program schedule showing major milestones for Prompt Removal/Dismantling and Mothballing is shown in Figure 4.1. Delayed dismantling will reflect an abbreviated prompt dismantling sequence. The program consists of SAFSTOR-Mothballing, Dormancy, Decommissioning Preparations, Decommissioning Operations and Site Restoration. The Dormancy period is shown on an assumed 30-year interval, but will actually depend on the dates of shutdown for Dresden Units 2 & 3. Table 4.1 shows the durations in years for each period of the program.

4.2 PROGRAM COSTS

A summary of the decommissioning costs for each period of the program is shown in Table 4.2. The costs are in 1985 dollars and include 25% contingency for all periods except Dormancy (the work activities for Dormancy are considered expense items and shall be funded from appropriate Station budgets. These activities are well defined and there is little cause for variability). These estimates do not include any allowance for inflation, interest or federal tax effects; these factors are accounted for in the Financial Plan described in Section 4.3 herein.

The estimate is based on the assumption that all work activities will be performed by a Decommissioning Operations Contractor (DOC) reporting to the Commonwealth Edison's decommissioning Project Manager and team. The costs include all management, engineering and planning, decontamination equipment and structure removal, packaging, shipping and burial of removed materials. Collateral costs such as equipment rental, health physics supplies, nuclear liability insurance, plant energy, site property taxes and staff relocation have been accounted for and distributed to their respective periods of expenditure.

4.3 FINANCIAL ASSURANCE

Commonwealth Edison Company ("Edison") currently uses an internal funding method commonly referred to as the negative net salvage method for accumulating decommissioning costs. The Illinois Commerce Commission ("Commission") in a 1980 order directed Edison to prepare special accounting procedures for the amounts provided for end-of-life decommissioning costs of its nuclear plants. In that same year the Chief Accountant of the Commission approved Edison's accounting procedures.

Edison's negative net salvage method treats decommissioning costs the same way that Edison treats all other plant removal costs; that is, estimated decommissioning costs are recovered through depreciation charges over the life of the plant. The funds collected through depreciation charges are used by Edison to satisfy its financial and other daily obligations, including investment in bondable property. This use of the funds benefits Edison's ratepayers through reductions in the rate base which result from increases in the accumulated provisions for depreciation. Thus, this method permits the ratepayers to earn effectively the same rate of return as Edison earns on its rate base. At the time of decommissioning, Edison will use conventional financing methods to pay the costs incurred.

The assurance provided by the negative net salvage method is based on Edison's ability to obtain external financing at the time decommissioning funds are required. Several factors provide the necessary confidence in that fund raising ability. Historically, Edison has been able to raise the funds needed to meet its obligations. Currently, Edison's senior securities are rated A3 by Moody's Investors Service and BBB+ by Standard & Poor's -- ratings that allow Edison to raise new money in capital markets at reasonable rates. In the future, one of Edison's primary goals is to improve these ratings to the AA level, thus ensuring financial stability and even stronger capabilities for raising additional funds. Although Edison's future financial position cannot be predicted precisely for 20 to 30 years from now, Edison is currently completing a large construction program which will provide adequate generation capacity for several years. Thus, a relatively small construction budget is forecasted for the next several years. During that period, it is estimated, given adequate rate relief, that all the Company's cash requirements will be internally generated. For these reasons, the negative net salvage method, by permitting reinvestment of decommissioning funds into bondable investment should provide adequate assurance that decommissioning funds will be available when needed.

Edison believes that all the alternatives proposed by the NRC for funding decommissioning costs provide reasonable assurance that funds will be available as decommissioning costs are incurred. The main difference between these alternatives is the degree of surety which each method provides. Therefore, in choosing from among the alternatives, the question is what additional cost level to be borne by Edison's ratepayers is justified for that additional degree of assurance. Ratepayer cost is a very sensitive issue today. Great strides are underway by regulators and utilities alike to ensure reliable service at the least cost. Therefore, the total cost of each of the alternatives has to be a significant factor in selecting a funding method.

Arguably, the method which provides the highest degree of reasonable assurance is the prepayment external funding method. In terms of present valued revenue requirements, however, this method is much more expensive than the internal sinking fund method. The total present valued revenue requirements of the external sinking fund method, although significantly less expensive than that of the prepayment external funding method, are still significantly more expensive than Edison's current internal funding method. Edison believes that the small additional degrees of assurance provided at significant increases to the cost to ratepayers are not warranted.

Therefore, absent any showing that Edison will not be able to carry out conventional financing to meet the decommissioning costs of the plants, Edison believes that the internal methods, and particularly the negative net salvage method, not only provide reasonable assurance that funds will be available at time of decommissioning, but also result in a lower cost to Edison's ratepayers.

Edison is a large, fully integrated electric utility. For such a utility, the funds necessary for decommissioning any one unit are small relative to the utility's overall size, financial condition and cash flow. The estimated costs of decommissioning one unit are approximately $150 million (stated in 1987 dollars) as detailed in Table 4.3. A utility that can afford to build a 1,100 megawatt nuclear generating unit and spend approximately $60-75 million dollars a year for fuel consumed and to operate and maintain it can be relied upon to bear the $150 million cost of decommissioning. Thus, there is no need to establish a separate, external fund to guarantee the availability of decommissioning funds when needed. Indeed, for the reasons discussed above, an external fund would penalize Edison's customers by requiring them to pay decommissioning costs significantly higher than is warranted. For these reasons, Edison believes that its current method of funding decommissioning costs internally provides an equitable and adequate accumulation method for decommissioning costs.

FIGURE 4.1
MOTHBALLING SCHEDULE

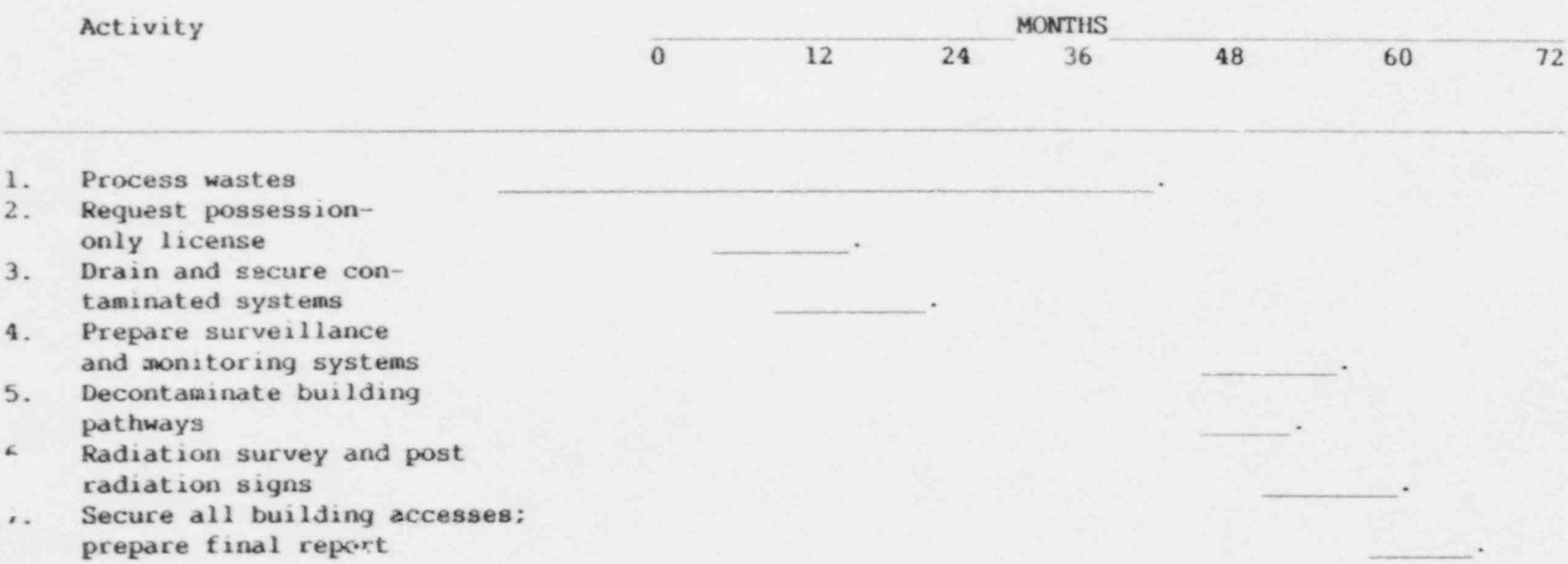
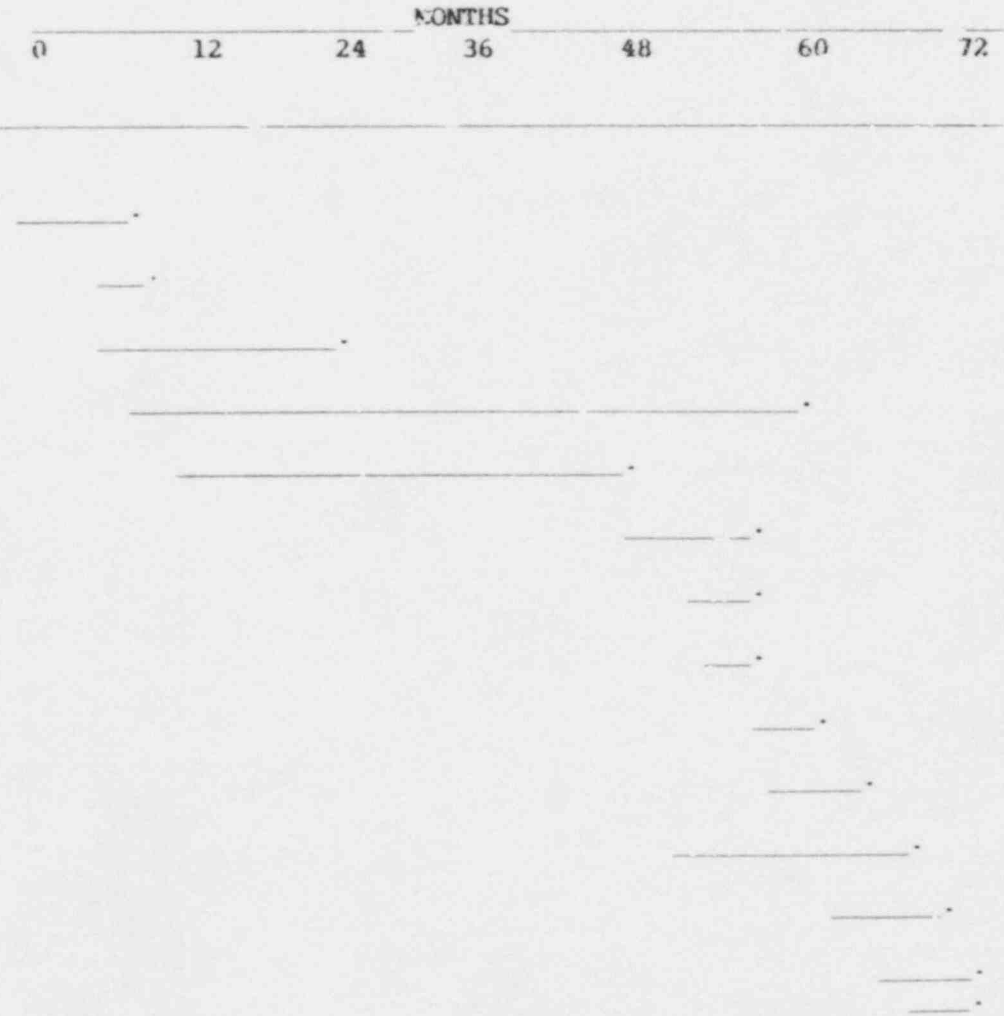


FIGURE 4.1 (Continued)

PROMPT REMOVAL/DISMANTLING SCHEDULE

Activity



1. Remove fuel from site and process wastes
2. Prepare dismantling plan for NRC
3. Prepare activity specifications and procedures
4. Remove and dispose of plant systems
5. Segment and dispose of vessel and internals
6. Remove and dispose of turbine generator/condensers
7. Demolish and dispose of primary containment interior
8. Radiation survey for residual contamination
9. Break secondary containment; remove crane
10. Demolish remaining reactor building
11. Demolish remaining buildings and structures
12. Backfill, grade and landscape site
13. Final radiation survey; report to NRC
14. Terminate license

TABLE 4.1
SCHEDULE ESTIMATE SUMMARY

Activity	Duration (years)	Expected Date of Completion
Period 1: SAFSTOR Mothballing	1	**
Period 2: Dormancy	30 *	December, 2017
Period 3: Delayed Dismantling Preparations	0.5	June, 2018
Period 4: Decommissiong Operations	4.5	December, 2022
Period 5: Site Restoration	1.5	June, 2024

* Actual duration will depend on the decommissioning schedule of Dresden Units 2 & 3.

** Approximately one (1) year from date of NRC approval of Decommissioning Plan.

TABLE 4.2
SUMMARY OF DECOMMISSIONING COSTS

Activity	Estimated Cost *
Period 1: SAFSTOR Mothballing	$ 6,860,300
Period 2: Dormancy (30 years)	11,700,000
Period 3: Delayed Dismantling Preparations	9,651,000
Period 4: Decommissiong Operations	61,334,000
Period 5: Site Restoration	1[illegible]570,000
Total	$108,115,300

* All costs are in 1985 dollars and include 25% contingency (Dormancy has no contingency)

TABLE 4.3

Commonwealth Edison Company

Estimated Decommissioning Costs
For Operating Nuclear Generating Units

Decommissioning costs are comprised of several components including labor, materials, equipment, specialty contractors and license fees. Decommissioning cost estimates for each of the Company's currently operating units are as follows:

	($ millions)	
	Per Unit	Total
Dresden 1	$110	$ 110
Dresden 2 & 3	170	340
Quad Cities 1 & 2 (C.E. Portion - 75%)	125	250
LaSalle County 1 & 2	190	380
Zion 1 & 2	150	300
Byron 1 & 2	150	300
		$ 1,680*

These estimates were made in November 1986 and are stated in 1987 dollars. These figures were determined using information developed in site specific studies of units of comparable size and type to Edison's Units. The costs for Dresden Unit 1, a substantially smaller unit than Edison's other units, are based on a study performed in November 1985 by TLG Engineering (a consulting firm specializing in analysis of commercial reactor decommissioning).

* Depending upon the time of filing of this analysis, Braidwood Unit 1 may have to be added at $150 million.

5. LICENSING ISSUES

The decommissioning of Dresden 1 will require conformance to current federal and state regulations. The preparations require modifications to the existing license, and assurance that the process will protect public health and safety.

5.1 COMPLIANCE WITH CURRENT REGULATION

The decommissioning of Dresden 1 will be performed in accordance with current regulatory requirements, guidance and standards as prescribed by the USNRC, USDOT, US EPA and the State of Illinois. A list of applicable regulations is included herein:

NRC Reg.	Guidance
10 CFR 19	Notices, instructions and reports to workers; inspections
10 CFR 20	Standards for protection against radiation
10 CFR 30	Rules of general applicability to domestic licensing of source material
10 CFR 40	Domestic licensing of source material
10 CFR 50	Domestic licensing of production and utilization facilities
10 CFR 51	Licensing and regulatory policy and procedures for environmental protection
10 CFR 70	Domestic licensing of special nuclear material
10 CFR 61	Licensing requirements for land disposal of radioactive waste .
10 CFR 71	Packaging and transportation of radioactive material.
10 CFR 73	Physical protection of plants and materials
10 CFR 140	Financial protection requirements
10 CFR 150	Exemptions and continued regulatory authority in agreement states under Section 274
10 CFR 170	Fees and facilities and material licenses and other regulatory services under the Atomic Energy Act of 1954, as amended

5.1 COMPLIANCE WITH CURRENT REGULATION (Continued)

Regulatory Guide 1.86	Termination of operating licenses for nuclear power plants
Proposed Rule	Decommissioning criteria (2/11/85) for nuclear facilities
U.S. DOT Regulations 49 CFR 170-190	Hazardous material regulations - DOT
U.S. Regulations 40 CFR 190	Environmental radiation protection standards for nuclear power operations

5.2 LICENSE MODIFICATION

As part of the decommissioning of Dresden Unit 1 the operating license needs to be amended to a "Possession-Only License" (POL). In the interim, the NRC acted upon a request from Commonwealth Edison Company to amend the Operating License (NO. DPR-2) to a possess-but-not-operate status (Amendment No. 36, July, 1986).

5.2.1 Criticality Prevention Description

To prevent criticality, fuel has been removed from the reactor core and placed in the spent fuel pool. As stated in the suggested Revised Technical Specifications, the fuel pool water level shall be recorded daily; minimum water level has been established at 18 feet. The suggested revised Technical Specifications also prohibit fuel from being loaded into the reactor core.

5.2.2 Safety Analysis

Since the spent fuel is in racks of the correct geometry (to prevent criticalities) and under water at all times (to provide shielding), criticality should not occur.

5.3 REVISED TECHNICAL SPECIFICATIONS

Changes will be made to the Dresden Unit 1 Technical Specifications to convert from an operating license to a POL for eventual decommissioning.

5.3.1 Justification

The changes described in Section 5.3.2 should not involve significant hazards as defined in 10 CFR 50.92 since all fuel has been taken out of the core and placed into storage for eventual disposal. The changes will be reviewed to ensure that the health and safety of workers and the general public are not adversely affected.

5.3.2 Overview

The change to a POL status entails several ch nges within the Technical Specifications of Dresden Unit 1. The following is a brief overview of those sections of the specifications that will be changed.

- Rewording of Facility Operating License No. DPR-2 to possess and maintain but not to operate the facility

- Deletion of those systems and components that will no longer be used

- Changes to operating descriptions may be made for those systems remaining in service to protect the health and safety of the public

- Surveillance frequencies and parameters will be changed for systems/components remaining in service

5.4 RESIDUAL RADIOACTIVITY

In August, 1982 Pacific Northwest Laboratory (PNL) conducted a survey at Dresden Unit 1 to estimate the residual radioactivity. This estimate did not include: neutron-activated parts of the pressure vessel and the biological shield, or radioactivity in residues and resins in tanks and pumps, or the spent fuel stored on site. However, an estimate of the radioactivity for those items not included in the PNL survey has been made using NUREG/CR-0672 (Ref. 5) allowing for 18.9 operating years and a 6 year decay time.

The results of the PNL survey are shown on Table 5.1, Residual Radionuclide Concentration in Corrosion Films, Table 5.2, Residual Radionuclide Inventories in Various Operating Systems Table 5.3, Total Residual Radionuclide Inventory, Table 5.4, Inventory of Neutron Activated Parts.

5.4.1 Final Radiation Survey

A radiation survey was conducted by Commonwealth Edison's health physics personnel in July and October of 1985. The surveys show dose rates in mR/hr, smears counted for removable alpha and beta-gamma, surface contamination and air sample results. Results are shown in Attachment A.

Concrete core samples and sediment/soil samples were taken as part of the PNL survey conducted in August 1982. The concentrations in the first segment (0-1 cm) of all concrete core samples were above Regulatory Guide 1.86, Table 1 limits. The second segment (1-2 cm) in all cores except the Make-up Demineralizer Room were also above the recommended limit. Core sample results are shown on Table 5.5.

Several soil samples obtained from the exclusion area around Dresden Unit 1 either approach or exceed the limit of the Draft Environmental Impact Statement on decommissioning of nuclear facilities. The results are shown as Table 5.6.

5.4.2 Radiation Protection Program

During the SAFSTOR and decommissioning periods, a radiation protection program will be maintained to provide for the health and safety of workers and the general public. The program will provide the necessary monitoring and control of radiological conditions.

5.4.3 Industrial Safety and Hygiene Program

Commonwealth Edison Company has an industrial safety program that will be used during the SAFSTOR and decommissioning period. The program includes accident prevention, hazardous material control, and hazardous waste management.

TABLE 5.1

RESIDUAL RADIONUCLIDE CONCENTRATIONS IN CORROSION FILMS
(August, 1982)

SAMPLE DESCRIPTION	SAMPLE #	CONCENTRATIONS pCi/cm^3															
		^{54}Mn	^{60}Co	^{65}Zn	^{94}Nb	^{106}Ru	^{108m}Ag	^{110m}Ag	^{125}Sb	^{113}Sn	^{134}Cs	^{137}Cs	^{144}Ce	^{152}Eu	^{154}Eu	^{155}Eu	^{166m}Ho
FUEL POOL LADDER	D SC 12	1,700	200,000	2,800	<40	<600	<400	<800	<500	<30	6,000	50,100	<200	<100	<100	<80	<50
FUEL TRANSFER CHUTE	D SC 16	3.7	790	11	<0.3	<4	<3	<6	<1	<0.2	3.3	24	4	<0.8	<1	<0.6	<0.4
REACTOR STEAM VENT LINE	D SC 18	12,000	7.9×10^6	113,000	<500	<8,000	<5,000	<9,000	<2,000	<400	<800	5,500	12,000	<2,000	<2,000	<1,000	<700
LOW PRESSURE INLET TO TURBINE	D SC 20	<2	2,270	37	<0.5	<8	<5	<8	<4	<0.4	<0.7	3.1	<3	6	<2	<1	<0.7

SAMPLE DESCRIPTION	SAMPLE #	^{55}Fe	^{59}Ni	^{63}Ni	^{90}Sr	^{99}Tc	^{129}I	^{238}Pu	$^{239,240}Pu$	^{241}Am	^{242}Cm	^{244}Cm
FUEL POOL LADDER	D SC 12	164,000	560	8,600	80	45	<0.4	81	24	33	7.2	66
FUEL TRANSFER CHUTE	D SC 16	440	8.9	3,700	0.062	0.009	<0.02	0.16	0.067	0.11	0.020	0.20
REACTOR STEAM VENT LINE	D SC 18	2.9×10^6	26,000	1.3×10^6	890	4.6	<1	720	360	550	100	840
LOW PRESSURE INLET TO TURBINE	D SC 20	2,200	10	1,000	2.9	0.05	<0.01	0.42	0.68	0.98	0.015	0.19

TABLE 5.2

RESIDUAL RADIONUCLIDE INVENTORIES IN VARIOUS OPERATING SYSTEMS
(August, 1982)

INVENTORY IN CURIES

	AREA (cm^2)	^{54}Mn	^{60}Co	^{65}Zn	^{94}Nb	^{106}Ru	^{108m}Ag	^{110m}Ag	^{125}Sb	^{126}Sn	^{134}Cs	^{137}Cs	^{144}Ce	^{152}Eu	^{154}Eu	^{155}Eu	^{166m}Ho
(18) CONDENSATE	1.34×10^{7}	1.8×10^{1}	110	1.5	$<7 \times 10^{3}$	$<1 \times 10^{1}$	$<7 \times 10^{2}$	$<1 \times 10^{1}$	$<3 \times 10^{2}$	$<5 \times 10^{3}$	$<1 \times 10^{2}$	7.4×10^{2}	1.6×10^{1}	$<3 \times 10^{2}$	$<3 \times 10^{2}$	$<1 \times 10^{2}$	$<9 \times 10^{3}$
(18) FEED WATER	$5.[illegible] \times 10^{7}$	8.0×10^{1}	400	5.7	$<3 \times 10^{2}$	$<4 \times 10^{1}$	$<3 \times 10^{1}$	$<5 \times 10^{1}$	$<1 \times 10^{1}$	$<2 \times 10^{2}$	$<4 \times 10^{2}$	2.8×10^{1}	6.0×10^{1}	$<1 \times 10^{1}$	$<1 \times 10^{1}$	$<5 \times 10^{2}$	$<4 \times 10^{2}$
(20) STEAM	7.38×10^{7}	$<1 \times 10^{4}$	1.7×10^{1}	2.7×10^{2}	$<4 \times 10^{5}$	$<4 \times 10^{4}$	$<4 \times 10^{4}$	$<8 \times 10^{4}$	$<3 \times 10^{4}$	$<3 \times 10^{5}$	$<5 \times 10^{-5}$	3.0×10^{4}	$<2 \times 10^{-4}$	3.7×10^{4}	$<1 \times 10^{4}$	$<7 \times 10^{5}$	$<5 \times 10^{5}$
(18) UNLOADING HT EXCH	1.11×10^{8}	1.3×10^{2}	8.6	3×10^{1}	$<6 \times 10^{4}$	$<8 \times 10^{3}$	$<6 \times 10^{3}$	$<1 \times 10^{2}$	$<2 \times 10^{3}$	$<4 \times 10^{4}$	$<9 \times 10^{-4}$	8.1×10^{3}	$[illegible]2 \times 10^{2}$	$<2 \times 10^{4}$	$<2 \times 10^{4}$	$<1 \times 10^{4}$	$<8 \times 10^{5}$
(18) REACTOR CLEANUP	3.25×10^{8}	3.9×10^{2}	26	3.7×10^{1}	$<2 \times 10^{3}$	$<3 \times 10^{2}$	$<2 \times 10^{2}$	$<3 \times 10^{2}$	$<7 \times 10^{3}$	$<1 \times 10^{3}$	$<3 \times 10^{-3}$	$1.[illegible] \times 10^{2}$	3.3×10^{1}	$<7 \times 10^{3}$	$<3 \times 10^{3}$	$<3 \times 10^{3}$	$<2 \times 10^{3}$
(18) RAD WASTE	1.42×10^{7}	1.7×10^{1}	110	1.6	$<7 \times 10^{3}$	$<[illegible] \times 10^{1}$	$<7 \times 10^{2}$	$<1 \times 10^{1}$	$<3 \times 10^{2}$	$<5 \times 10^{5}$	$<1 \times 10^{-2}$	7.8×10^{-2}	1.7×10^{1}	$<3 \times 10^{2}$	$<3 \times 10^{2}$	$<1 \times 10^{3}$	$<1 \times 10^{3}$
(12) FUEL STORAGE	1.00×10^{7}	1.7×10^{2}	2.0	2.8×10^{7}	$<4 \times 10^{4}$	$<6 \times 10^{3}$	$<4 \times 10^{3}$	$<8 \times 10^{3}$	5.0×10^{-3}	$<3 \times 10^{4}$	8.0×10^{-2}	5.0×10^{1}	2×10^{3}	$<1 \times 10^{3}$	$<1 \times 10^{3}$	$<8 \times 10^{4}$	$<5 \times 10^{4}$
(16) FUEL TRANSFER	7.55×10^{6}	2.8×10^{5}	6.0×10^{3}	8.3×10^{5}	2.2×10^{6}	$<3 \times 10^{6}$	$<2 \times 10^{5}$	$<4 \times 10^{5}$	$<8 \times 10^{6}$	$<2 \times 10^{6}$	2.5×10^{6}	1.8×10^{4}	3.0×10^{5}	$<6 \times 10^{6}$	$<8 \times 10^{6}$	$<4 \times 10^{6}$	$<3 \times 10^{6}$
TOTAL		1.0	600	9.3					5.0×10^{3}		0.06	0.96	0.58	3.7×10^{4}			

	^{55}Fe	^{59}Ni	^{63}Ni	^{90}Sr	^{99}Tc	^{129}I	^{238}Pu	$^{239,240}Pu$	^{241}Am	^{242}Cm	^{244}Cm
(18) CONDENSATE	40	3.6×10^{1}	17	8.9×10^{-3}	6.0×10^{5}	$<1 \times 10^{5}$	9.8×10^{3}	4.8×10^{3}	7.4×10^{3}	1.4×10^{3}	1.1×10^{2}
(18) FEED WATER	150	13	65	3.6×10^{-2}	2.3×10^{4}	$<5 \times 10^{5}$	3.8×10^{2}	1.8×10^{2}	2.8×10^{2}	5.1×10^{3}	4.2×10^{2}
(20) STEAM	1.8×10^{1}	7.4×10^{6}	7.4×10^{-2}	2.1×10^{-4}	3.7×10^{6}	$<7 \times 10^{7}$	3.1×10^{5}	5.0×10^{7}	$7.[illegible] \times 10^{5}$	$1.1 \times 10^{[illegible]}$	1.4×10^{5}
(18) UNLOADING HT EXCH	3.3	2.9×10^{2}	3.4	7.4×10^{-4}	5.0×10^{6}	$<1 \times 10^{6}$	8.0×10^{4}	4.0×10^{4}	6.1×10^{4}	1.1×10^{4}	9.3×10^{4}
(18) REACTOR CLEANUP	9.7	8.6×10^{2}	4.7	2.2×10^{-3}	1.5×10^{5}	$<3 \times 10^{6}$	2.3×10^{3}	1.2×10^{3}	$[illegible].8 \times 10^{3}$	3.3×10^{4}	2.7×10^{3}
(18) RAD WASTE	42	3.7×10^{1}	18	9.9×10^{-3}	6.4×10^{5}	$<1 \times 10^{5}$	1.0×10^{2}	5.1×10^{3}	7.0×10^{3}	1.6×10^{3}	1.2×10^{2}
(12) FUEL STORAGE	1.8	5.6×10^{3}	6.6×10^{2}	8.0×10^{-4}	4.5×10^{6}	$<4 \times 10^{8}$	6.1×10^{4}	2.4×10^{4}	$3.[illegible] \times 10^{4}$	7.1×10^{5}	5.8×10^{4}
(16) FUEL TRANSFER	3.3×10^{3}	6.7×10^{5}	2.8×10^{-3}	4.7×10^{-7}	6.8×10^{9}	$<2 \times 10^{7}$	$1.2 \times 10^{[illegible]}$	5.1×10^{7}	8.3×10^{7}	$[illegible]4 \times 10^{7}$	1.6×10^{6}
TOTAL	250	2.1	110	0.078	8.3×10^{4}		5.9×10^{2}	3.0×10^{2}	$4.[illegible] \times 10^{2}$	8.5×10^{3}	$6.92 \times 10^{[illegible]}$

TABLE 5.3

TOTAL RESIDUAL RADIONUCLIDE INVENTORY

Radionuclide (b)	Half-Life (years)	Inventory (curies)	
		August, 1982 (a)	Oct. 31, 1978 (Shutdown)
^{60}Co	5.27	660	1,080
^{55}Fe	2.7	250	650
^{63}Ni	100	110	110
^{65}Zn	0.668	5.3	450
^{59}Ni	75,000	2.1	2.1
^{54}Mn	0.855	1.0	20
^{144}Ce	0.779	0.98	30
^{137}Cs	30.2	0.96	1.0
^{244}Cm	18	0.069	0.08
^{134}Cs	2.06	0.060	0.21
^{238}Pu	87.7	0.059	0.061
^{241}Am	432	0.046	0.046
$^{239-240}Pu$	24,100	0.030	0.030
^{242}Cm	0.446	0.0085	2.9
	Total	1,030	2,350

(a) Excluding neutron-activated pressure vessel and internals, biological shield, concrete surfaces, residues, sludges and resins in tanks and sumps, and spent fuel.

(b) Other long-lived radionuclides specifically listed in 10 CFR 61,[9] e.g., ^{94}Nb, ^{99}Tc, and ^{129}I, were not included in the inventory because of their insignificant concentrations in the residual radioactive corrosion films in the plant piping and equipment.

TABLE 5.4

INVENTORY OF NEUTRON ACTIVATED PARTS

COMPONENT	OD IN	ID IN	HT IN	THICKNESS IN	LENGTH	NUMBER	KNOWN WT EACH, LBS	TOTAL WT, LBS	REFERENCE BWR WT, LBS	WEIGHT USED LBS	SP ACTIV CI/LB	ACTIVITY CI
*** REACTOR VESSEL ***			400.00			1.00	598000.00	598000.00	1417160.00	598000.00		
UPPER HEAD			95.125				not used			0.00	0.00	
UPPER FLANGE & STUDS/NUTS	151.09	139.70	28.099				not used			0.90	0.00	
TOTAL UPPER HEAD						1.00	100000.00	100000.00	231518.00	100000.00	5.94E-07	0.06
HI ACTIV. ZONE VESS.	157.13	145.00	106.50			1.00	80853.96	80853.96	341474.86	80853.96	5.94E-04	48.06
HI ACTIV. ZONE CLAD	145.00	145.50	106.50	0.375		1.00	5176.62	5176.62	6043.27	5176.62	4.91E-03	25.42
TOTAL HI ACTIV. ZONE								86030.58	347518.13	86030.58		73.41
UPPER NOZZLE ZONE							243670.00	243670.00	721107.60	243670.00	5.94E-06	1.45
LOWER NOZZLE ZONE							85000.00	85000.00	130992.86	85000.00	5.94E-06	0.50
CRD SUPPORT STRUCTURE						1.00	0.00	0.00	25826.00	8676.67	2.97E-06	0.03
VESSEL SUPPORT STANDS						24.00	816.67	19600.00	22647.07	19600.00	2.97E-06	0.06
LOWER HEAD CLOSURE PLATE	150.00			2.00		1.00	17111.35	17111.35	53829.32	17111.35	0.00	0.00
LOWER HEAD	196.00	185.00				calculated	63699.34	63699.34	194894.26	63699.34	2.97E-06	0.19
LOWER HEAD PACKAGE								100410.77	271370.65	100410.77		0.25
VESSEL TOTALS								615111.35	1720333.24	623980.02		75.70
*** INTERNALS ***												
STEAM DEFLECTOR SUPPORT						1.00	15000.00	15000.00	67000.00	15000.00	4.78E-04	7.17
TURNING VANE ASSEMBLY						1.00	4500.00	4500.00	18000.00	4500.00	2.52E-03	11.36
TURNING VANE GUIDE POST						1.00	800.00	800.00	46200.00	800.00	2.52E-03	2.02
TOP GRID GUIDE ASSEMBLY						1.00	5650.00	5650.00	25020.00	5650.00	4.44E-01	2511.13
THERMAL SHIELD						1.00	35750.00	35750.00	90900.00	35750.00	7.71E+00	275655.90
IN-CORE GUIDE TUBES						16.00	20.00	320.00	2100.00	320.00	7.71E+00	2467.41
CORE PLATE						1.00	6352.70	6352.70	12100.00	6352.70	3.05E-03	19.37
BOTTOM CORE SUPPORT GRID						1.00	4504.00	4504.00	12100.00	6504.00	3.05E-03	19.83
BOTTOM CORE SUPPORT STRUCTURE						1.00	19250.00	19250.00	21600.00	19250.00	1.18E-03	22.75
CONTROL ROD GUIDE TUBES						80.00	95.19	7615.20	55500.00	7615.20	1.38E-04	1.05
INTERNAL WATER SEAL						1.00	6650.00	6650.00	83250.00	6650.00	1.38E-04	0.92
DIFFUSER GASKET						1.00	8400.00	8400.00	83250.00	8400.00	1.38E-04	1.16
CRD HOUSING SUPPORT TUBES						80.00	260.00	20800.00	83250.00	20800.00	4.73E-06	0.10
TOTAL INTERNALS								137592.70	680278.00	137592.70		280720.18

TABLE 5.5

RADIONUCLIDE CONCENTRATIONS* (pCi/cm2) IN CONCRETE CORE SEGMENTS

Location	Depth Interval (cm)	^{54}Mn	^{60}Co	^{65}Zn	^{94}Nb	^{106}Ru	^{108m}Ag	^{110m}Ag	^{125}Sb	^{126}Sn
1 Dow Chemical Spill 529' Elevation	0-1	<50	208,800 ± 100	<200	<20	<300	<300	<300	<80	<20
	1-2	<20	73,300 ± 400	<60	18 ± 7	<100	240 ± 70	<80	<20	<20
2 Secondary Steam Generator Room "B" 529' Elevation	0-1	40 ± 20	33,910 ± 50	<70	<8	<200	<200	<90	<60	<20
	1-2	0.5 ± 0.2	320 ± 1	<0.8	<0.09	4 ± 2	<2	<1	<0.7	<0.2
3 Hallway In Front of Accumulator Room488' 488' Elevation	0-1	27.8 ± 0.9	7,010 ± 10	<4	<0.4	34 ± 6	<4	<5	1.5 ± 1.2	<0.9
	1-2	<0.03	7.57 ± 0.09	<0.04	<0.02	<0.3	<0.3	<0.2	<0.2	<0.02
4 Sub-pile Room 488' Elevation	0-1	960 ± 70	276,900 ± 100	<900	<30	<500	<400	<500	<100	<40
	1-2	2.5 ± 0.2	1,000 ± 1	<2	<0.2	3 ± 1	<2	<0.7	<0.6	<0.2
5 Make-up Demineralizer	0-1	<0.2	27.3 ± 0.3	<0.4	<0.05	<1	<2	<0.5	<0.5	<0.1
1-2		<0.02	1.98 ± 0.05	<0.04	<0.01	<0.1	<0.1	<0.04	<0.04	<0.01
6 Condensate Pump Room Pit	0-1	54 ± 6	19,050 ± 20	<20	<3	<60	<70	<30	<20	<7
1-2		<0.06	27.1 ± 0.2	<0.2	<0.03	<0.5	<3.4	<0.3	<0.1	<0.04
7 Unloading Heat Exchanger Room 1-2	0-1	310 ± 20	108,200 ± 500	<80	<8	<130	180 ± 90	350 ± 100	<30	<8
	1.1 ± 0.2	240.7 ± 0.5	<0.7	<0.08	<1	<0.7	<0.9	0.4 ± 0.2	<0.06	
8 Rad Waste Basement 1-2	0-1	29 ± 8	7,560 ± 20	<30	<3	<70	<90	<40	<30	<8
	<0.05	9.2 ± 0.1	<0.2	<0.02	<1	<2	<0.2	0.5	<0.1	
9 Rad Waste Basement Drainage Trough	0-1	63 ± 8	20,750 ± 20	<80	<4	<80	<90	<40	<30	<8
	1-2	0.10 ± 0.04	11.1 ± 0.1	<0.2	<0.02	2 ± 1	<1	<0.2	0.6 ± 0.4	<0.3

* To convert to pCi/g, multiply by 0.45.

TABLE 5.5 (Continued)

RADIONUCLIDE CONCENTRATIONS* (pCi/cm^2) IN DRESDEN UNIT NO. 1 CONCRETE CORE SEGMENTS

	Location	Interval (cm)	^{134}Cs	^{137}Cs	^{144}Ce	^{152}Eu	^{154}Eu	^{155}Eu	^{166}Ho	^{228}Ac
1	Dow Chemical Spill 529' Elevation	0-1	<30	130 ± 30	<260	<50	<40	<70	<30	<300
		1-2	<80	40 ± 10	<80	<7	<10	50 ± 20	<10	<80
2	Secondary Steam Generator Room "B"	0-1	9,870 ± 30	202,200 ± 600	<300	<14	<13	<50	<11	<90
	529' Elevation	1-2	102 ± 0.3	1,644 ± 4	4 ± 2	<0.4	<0.2	<0.4	<0.2	<1
3	Hallway in Front of Accumulator Room	0-1	75.4 ± 0.8	948 ± 1	35 ± 3	<1.2	6.8 ± 0.9	2.4 ± 0.8	<0.6	<5
	488' Elevation	1-2	0.72 ± 0.04	18.2 ± 0.1	<0.2	<0.06	<0.04	<0.05	<0.02	1.4 ± 0.2
4	Sub-pile Room 488' Elevation	0-1	39,970 ± 900	397,600 ± 400	800 ± 40	<80	<60	300 ± 100	<40	<400
		1-2	27.6 ± 0.2	1,203 ± 1	1.3 ± 0.7	13.1 ± 0.4	1.7 ± 0.3	<0.4	<0.2	<2
5	Make-up Demineralizer	0-1	8.9 ± 0.1	431.1 ± 0.8	<1	<0.1	<0.1	<0.3	<0.06	<0.9
		1-2	0.11 ± 0.02	1.13 ± 0.03	<0.07	<0.06	<0.04	<0.04	<0.02	0.8 ± 0.1
6	Condensate Pump Room Pit	0-1	15,100 ± 200	111,800 ± 400	180 ± 70	<40	<4	<20	<4	<30
		1-2	4.00 ± 0.09	44.6 ± 0.2	<0.4	0.11 ± 0.07	<0.06	<0.1	<0.05	<0.3
7	Unloading Heat Exchanger Room	0-1	640 ± 10	18,120 ± 20	160 ± 100	48 ± 12	49 ± 13	40 ± 30	<10	<100
		1-2	0.7 ± 0.1	11.2 ± 0.1	<0.6	<0.2	<0.1	<0.2	<0.2	<1
8	Rad Waste Basement	0-1	1,580 ± 10	40,780 ± 40	110 ± 80	<4	<5	<20	<5	<10
		1-2	18.9 ± 0.1	910 ± 1	<1	0.25 ± 0.08	<0.05	<0.3	<0.03	0.6 ± 0.2
9	Rad Waste Basement Drainage Trough	0-1	6,870 ± 10	90,500 ± 300	360 ± 80	<5	12 ± 6	<20	<6	<40
		1-2	18.2 ± 0.1	862 ± 3	<0.9	<0.06	<0.04	<0.2	<0.03	<0.2

* To convert to pCi/g, multiply by 0.45.

TABLE 5.6

RADIONUCLIDE CONCENTRATIONS* (pCi/g) in SELECTED ON-SITE SOILS and SEDIMENTS (August, 1982)

Location	^{40}K	^{54}Mn	^{60}Co	^{65}Zn	^{106}Ru	^{125}Sb	^{134}Cs	^{137}Cs	^{144}Ce	^{152}Eu	^{154}Eu	^{155}Eu
Equipment Hatch Area North Side of Sphere	8.3 ± 0.2	0.02 ± 0.01	1.32 ± 0.02	<0.03	<0.07	<0.03	<0.01	0.49 ± 0.01	<0.04	<0.05	<0.04	<0.04
Equipment Storage Doorway East of Sphere	6.9 ± 0.2	0.05 ± 0.02	6.2 ± 0.1	<0.06	<0.1	<0.06	0.04 ± 0.01	1.93 ± 0.02	<0.07	<0.1	<0.08	<0.1
Refuel Building South of Sphere	7.7 ± 0.2	0.23 ± 0.02	13.8 ± 0.1	<0.06	0.2 ± 0.1	<0.06	0.27 ± 0.01	3.36 ± 0.02	0.17 ± 0.07	<0.09	<0.09	<0.03
Rad Waste Area 0-6" In Front of Door	7.4 ± 0.5	0.2 ± 0.1	55.9 ± 0.3	<0.3	<0.8	<0.3	1.71 ± 0.07	96.2 ± 0.3	<0.4	<0.6	<0.4	<0.2
6-12"	8.4 ± 0.5	<0.1	161 ± 1	<0.6	<1	<1	6.3 ± 0.1	260 ± 1	1.5 ± 0.6	<0.9	<0.7	<0.2
Sediments												
Inlet Canal 0-8"	14.4 ± 0.3	2.5 ± 0.9	3.1 ± 0.1	<9	9 ± 4	<0.2	<0.07	1.19 ± 0.02	<7	<0.1	<0.1	<0.1
Outlet Canal 0-8"	10.5 ± 0.3	<0.02	2.79 ± 0.03	<0.05	<1	<0.06	0.02 ± 0.01	2.46 ± 0.02	<0.07	<0.09	<0.07	<0.03

6. DECOMMISSIONING ACTIVITIES

6.1 SAFE STORAGE

During decommissioning, systems no longer required will be secured and isolated. The objectives of system lay-up are as follows:

- Drain all systems.

- In September 1984, the primary system was chemically cleaned and 753 curies of Cobalt-60 and 12.4 curies of Cesium-137 were removed. Other source terms in routinely accessible areas will either be removed or shielded.

- Connections will be sealed to prevent leakage from operational systems to inoperable systems.

- De-energize instrument and control equipment to inoperable systems.

Generic Activities
Systems and equipment not required for use in the shutdown mode will be secured in preparation for decommissioning. Activities will include (1) draining and securing systems, (2) de-energizing instruments and controls, (3) isolating non-operational from operational systems, and, (4) de-vitalizing appropriate security areas.

6.2 SYSTEMS STATUS FOR SAFSTOR PERIOD

The following describes the systems that will be placed in lay-up condition as part of the Dresden Unit 1 safe storage.

1. Reactor Enclosure Drain Tanks and Fuel Handling Water Treatment System (Drawing M1000)
   The following components and piping will be layed up as described above: Fuel handling canal and associated piping from the reactor water filter (M-1001 D-4) and to the waste neutralizer tank (M1002 C-4). Also, piping from the secondary steam sample drain to secondary steam generator waste collection tanks, from the reactor cleanup demineralizer system to the permanent resin storage tank T-113. Small bore piping from the slurry mix tank to the reducing flange upstream of valve V-32.

2. Radwaste Collector Tank, Filters, and Waste Demineralizer Tank (Drawing M1001)
   The waste demineralizer tank C-9, waste filter tank C-25C and reactor waste filter C25A will be taken out of service. This system will remain intact with the exception of the following:

- Blowdown tank C-21 and associated piping leading to and from the tank
- Condenser demineralizer regenerative solution drain and the spare line going into waste tank T-117
- Waste neutralizing filters and piping to M-77
- Radwaste acid tank T-130 and piping to M-88
- Radwaste caustic tank
- 2" drain line to trench
- Line to waste demineralizer tank
- Line to waste concentrator
- River discharge line from M-78
- Piping from M-96 to waste concentrator
- Piping from M-104 to filters

3. Turbine Building Floor Drain, Tank, and Laundry Waste Treatment System (Drawing M-1003)
   All systems will remain in use with the exception of:

   - Laundry tanks T-119B and T-119A and overflow piping
   - Drain cooler area drains, tank and line to turbine sump

4. Liquid Waste Storage and Holdup Tanks (Drawing M-1004)
   Appropriate lines in this system will be taken out of service.

5. Sludge Handling, Resin Storage and Waste Concentrator (Drawing M-1005)
   All demineralizer piping, including the spare line leading into the permanent resin storage tank T-113, will be taken out of service.

6. Service Water System (Drawing M-1009)
   The waste neutralizer cooler and secondary steam generator waste tank coolers, including the 3" piping leading to and from the coolers, will be taken out of service. The waste vapor condenser will be taken out of service and its 2" piping. The complete system for hydrogen, turbine lube oil and isolated-phase bus air cooler also will be taken out of service.

7. Cooling Water System (Drawing M-1010)
   This system will remain in service to cool the following systems:

   - Service air compressor
   - Heating boiler feed pumps
   - Turbine building cooling water heat exchangers
   - Instrument air compressor jackets
   - HVAC systems

8. Well Water System (Drawing M-1011)
   Well water will not be used to supply water to the Unit 1 makeup demineralizer feed pumps, degasifier and ion exchange tanks, etc. Other lines taken out of service will be the condenser vacuum pump and feed lines to T-116 (A&B), T-23 (A&B), resin flush water, T-120, E-5 emergency condenser, fuel handling canal, T-122 (A&B), G-54 (A,B,C&D) and the reactor enclosure sump.

9. Fire Systems (Drawing M-1012)
   The fire system will remain in service.

10. Service Air System (Drawing M-1013)
    Service air to the reactor enclosure will be taken out of service unless reactivated for routine maintenance.

11. Instrument Air (Drawing M-1013)
    Instrument air to the reactor enclosure will be taken out of service unless reactivated for routine maintenance.

12. Plant Heating System (Drawing M-1014)
    The heat steam coils to the demineralizer water storage tank T-105 and the well water storage tank T-108 will be taken out of service.

13. Fuel and Lube Oil System (Drawing M-1015)
    The turbine lube oil system, feed pump lube oil system, and lines feeding the emergency diesel generator will be taken out of service.

14. Cleanup and Condensate Demineralizer Systems (Drawing M-1017)
    All systems will be taken out of service.

15. Reactor Enclosure Air Conditioning Water System (Drawing M-1018)
The room heating and cooling units, specificaly K-174, K-175 (A to D), K-176 (A to F), and K-177 (A&B) will be taken out of service.

16. Control Rod Hydraulic System (Drawing M-1019)
This system will be taken out of service.

17. Turbine (Drawing M-1020)
The turbine will be taken out of service.

18. Main Steam and Condensate (Drawing M-1021)
The gas sampler lines connected to the stack will remain in service, along with the main condenser E-1. All other piping and associated equipment will be taken out of service.

19. Nuclear Steam Supply System (Drawing M-1022)
The entire NSSS will be taken out of service.

6.3 DORMANCY PERIOD

During the safe storage dormancy period, administrative procedures, structures, components and equipment will be maintained for the continued safety of workers and the general public.

Generic List of Activities

- Radiation Survey
  A baseline radiological survey was taken prior to the Safe Storage period. Routine quarterly surveys will be established to compare with the baseline survey.

- Operation of Plant Systems
  Systems will be operated as required by the Revised Technical Specifications. The operation will be in accordance with approved procedures.

- Maintenance of Structures, Systems and Components
  The maintenance program will be a modified continuation of the existing program and will include both preventive and corrective maintenance. The preventive maintenance aspect will provide for regular surveillance of structures, systems and components. The frequency will be dependent upon previous plant experience, on going conditions and the Revised Technical Specifications. The corrective maintenance aspect will provide for appropriate action to be taken in the event of degraded systems, components or structures.

Structures Summary
All structures will be maintained in accordance with the generic activities listed above. Maintenance may include the following items:

- Painting the exterior of the reactor building sphere, turbine building and other facilities
- Repair of fencing and/or barriers
- Repair of roofing systems to prevent leaks
- Maintenance of the security systems
- Periodic testing of the fire protection system
- Radwaste system
- Heating and ventilation where necessary

6.4 SYSTEMS STATUS FOR DORMANCY PERIOD

The systems listed herein will remain operational during the safe storage period; they are required to protect health and safety of the workers and general public. Operating procedures will be revised to reflect safe storage status.

1. Fuel Handling Water Treatment System
   All systems will remain in service as necessary to provide cooling for the fuel taken from the reactor.

2. Radwaste Collector Tank, Filters and Waste Demineralizer Tank
   The radwaste collector tank T-109 will remain in service to collect wastes from the following areas. The associated pump, valves and control for these areas will be maintained in an operable condition.

   - Turbine building floor drain
   - Condenser demineralizer
   - Waste condensate
   - Sluice water from permanent resin storage tank T-113
   - Off-standard water return
   - Liquid waste storage tank
   - Secondary steam generator waste collection tanks
   - Associated piping running to waste neutralizer tank
   - Surge tank T-124

3. Waste Neutralizer Tank and Secondary Steam Generator Collector Tanks
   The waste neutralizer tanks will remain in service to collect waste from the radwaste building and the secondary steam generator collection tank. This includes associated pumps, valves and controls. They will be maintained in an operable condition.

4. Turbine Building Floor Drain and Laundry Waste Treatment System
   The turbine building floor drainage system will remain intact to facilitate future decommissioning needs.

5. Liquid Waste Storage and Hold-up Tanks
   The waste hold-up tanks T-129 A, B and C remain in service along with their associated pumps, valves and controls.

6. River Water Systems
   This system will remain in service to provide water for the service water system.

7. Service Water System
   Service water to the air conditioning units for the reactor enclosure, the auxiliary buildings and the fuel handling building will remain in service.

8. Cooling Water System
   The service air compressors, heating boilers, feed pumps, the turbine building cooling water heat exchangers and the instrument air compressor jackets will remain in service.

9. Well Water System
   Both wells will remain in service to provide water for the domestic water system and will be maintained as appropriate.

10. Fire Protection System
    This system will remain in service to protect the health and safety of workers and the general public.

11. Air Systems
    Service air and Instrument air will remain in service up to the reactor enclosure.

12. Plant Heating System
    The Unit 1C Heating Boiler will remain in service.

14. Reactor Enclosure Air Conditioning Water System
    Heating and cooling units K173-A through K173-K will remain in service, as necessary.

15. Main Steam and Condensate
    Only two systems will remain in service: the gas sampling lines connected to the stack and the main condenser (E-1).

6.5 DELAYED DISMANTLEMENT

The ultimate removal of radioactivity and decommissioning of Dresden Unit 1 will not occur until Units 2 and 3 are retired from service and readied for decommissioning. For the purpose of this decommissioning plan it will be assumed that Dresden Unit 1 will be decommissioned independent of Units 2&3. The following section describes the activities to remove the remaining radioactivity and terminate the license.

Generic List of Activities

<u>Period 1: Preparation</u>
In preparation for the final dismantlement of Dresden Unit 1 the following activities will be accomplished:

- Review plant drawings and specifications
- Perform a detailed radiation survey
- Define the major work sequence
- Perform a safety analysis
- Calculate the residual byproduct material inventory
- Prepare specific removal procedures for plant systems components and equipment, etc.

<u>Period 2: Decommissioning Operations</u>

Dismantling may begin upon receipt of the dismantling order from the NRC. The decommissioning operations involve the following:

- Construct temporary facilities to support dismantling activities
- Decontaminate and dispose of piping/components
- Remove and dispose of the spent fuel racks
- Decontaminate and dispose of the NSSS
- Remove major equipment (turbine, condenser, CRD's, etc.)
- Decontaminate site buildings
- Ship all remaining radioactive materials and fuel
- Conduct final radiation survey to assure that all radioactive materials have been removed
- Remove and dispose of plant systems/associated components in accordance with the sequence established. These systems include:
    * Radwaste
    * River, well and service water
    * Fire
    * Instrument and service air

* Heating and air conditioning
* Control rod hydraulics
* Turbine
* AC auxiliary power
* Instrument and control
* Miscellaneous RCS

Period 3: Site Restoration and License Termination
Following completion of the decommissiong operations, site restoration activities may begin. This involves demolition and removal of the remaining site buildings i.e., reactor enclosure, turbine building, fuel handling building, fuel storage building, circulating water intake, the stack and other miscellaneous site structures. The building foundations will be backfilled with non-contaminated material. The plant site will be graded and landscaped as required.

A final dismantling program report will be prepared and submitted to the NRC, along with a request for termination of the possession only license. Following NRC approval, the license will be terminated and the site may be released for unrestricted use.

6.6 SITE RELEASE CRITERIA

Prior to the release of Dresden Unit 1 for unrestricted use, and to comply with Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors," a radiological site release survey will be made. This survey will show the following items:

- Identification of areas surveyed

- Show that reasonable effort has been made to reduce residual contamination to levels as low as are reasonably achievable

- Description of the scope of the survey and general procedures followed

- The survey results will be recorded in units that comply with the latest revision of Regulatory Guide 1.86, Table 1

6.6.1 Survey Designs

Indoor Survey
In accordance with NUREG/CR-2082, "Monitoring for Compliance with Decommissioning Termination Survey Criteria" (Ref. 6.), each indoor survey is divided into two sub-units:

(1) Lower surfaces, comprised of floor surfaces, wall surfaces, up to a height of 2m, and any other surfaces easily accessible to a surveyor standing on the floor, and

(2) overhead surfaces, comprised of ceiling surfaces, wall surfaces higher than 2m and all other surfaces not described in (1) above (i.e., on top of piping or beams).

The areas to be surveyed will be divided into a rectangular grid system. The survey block will be no less than 1m nor more than 3m on a side. There should be at least 30 survey blocks in the population.

The radiological conditions to be characterized include direct alpha contamination levels, beta-gamma dose rates at 1cm above the surface, external gamma radiation levels at 1m above the floor, and removable alpha and beta contamination levels.

The surveyor will record all measurements and the average of five measurements of each type in each block is to be reported as an "unbiased" measurement for that block, and the measurements at the "beta-gamma maximum point" are reported as "biased" measurements. Smear or dust samples will be taken at some of the beta-gamma maximum points for correlation of data.

Records of the survey should contain, as a minimum, the following:

(1) Survey block numbers, identifiable to a scale drawing and
   * The building name or number
   * The building floor number
   * The surfaces surveyed
   * The type of measurement and unit

(2) Name of surveyor, date of survey

(3) Type, model number, calibration date and sensitivity of instruments used

Outdoor Survey
In general outdoor surveys are the same as indoor surveys with the following exceptions:

(1) No survey block should be less than 5m nor more than 15m on a side

(2) Soil samples will be collected to determine radionuclide concentrations

(3) Water and air samples will be collected in addition to biota sampling to define radionuclides present or movement on-or off-site

(4) Core drilling will be taken if there is any reason to suspect subsurface contamination. The number of cores will be dependent upon the extent of contamination

7. WASTE MANAGEMENT

Wastes from decommissioning operations consist of four types:

Radioactive materials
Radioactive hazardous materials
Hazardous materials
Nonradioactive materials

These estimated types and quantities of these wastes will be identified for each period of the decommissioning operations.

7.1 RADIOACTIVE MATERIALS

The total quantity of radioactive materials for each period is shown in Table 7.1 and is based on the decommissioning study for Dresden Unit 1 (Ref. 4). The volume of wastes include the burial container volume at an average void fraction of 40% to 60%. These wastes consist of solidified decontamination solvents used during decommissioning, piping, valves, pumps, heat exchangers, concrete and structural steel from buildings.

Most of the materials for controlled burial are categorized as Low Specific Activity (LSA) material containing less than Type A quantities, as defined in 49 CFR 173-189 (Ref. 7). The reactor vessel and materials are mostly Type B shipments and must be shipped in reusable shielded casks with disposable liners. Some portions of the vessel remotely located from the core center (e.g., vessel head) can qualify as LSA material and would be shipped as an LSA shipment.

TABLE 7.1

RADIOACTIVE WASTE VOLUME

Activity		Volume, cu yds
Period 1	SAFSTOR Mothballing	257
Period 2	Dormancy	(Note 1)
Period 3	Delayed Dismantling Preparations	10
Period 4	Decommissioning Preparations	9,056
Period 5	Site Restorations	(Note 2)

Note 1 Minimal radioactive waste is expected to be generated during Dormancy. Most of it can be disposed of at Dresden 2 or 3.

Note 2 No radioactive material should be expected during this phase of the decommissioning project.

7.2 RADIOACTIVE HAZARDOUS MATERIALS

The primary source of radioactive hazardous materials would be from asbestos insulation on contaminated piping and components. The estimated volume of this waste is approximately 535 cubic yards, assuming all insulation contains asbestos. It is assumed the controlling hazard is radioactivity and therefore the waste must be buried in a commercial low-level waste, shallow land burial facility. The Dresden Unit 1 Decommissioning Study cost estimate was based on this waste being packaged in the same burial containers as the associated piping and components.

7.3 HAZARDOUS MATERIALS

The source of hazardous materials would be from asbestos insulation on noncontaminated piping and components, and from transformers contaminated with polychlorinated byphenyls (PCBs). The amount of noncontaminated asbestos insulation is approximately 129 cubic yards, assuming all insulation contains asbestos. The main and substation transformers are assumed to be contaminated with PCBs. The amount of oil in each is shown in Table 7.2.

TABLE 7.2

TRANSFORMER OIL VOLUMES

Transformer Number	Volume (gals)
1	10,400
11	2,850
12	4,875
13	911
14	340
15	340
16	340
17	340
	20,396

These materials are classified as hazardous under the Resource Conservation and Recovery Act (RCRA) (Ref.8). They are being disposed of at approved hazardous waste disposal facilities as part of CECO's continuing program to dispose of PCBs.

7.4 NONRADIOACTIVE MATERIALS

Nonradioactive (and nonhazardous) waste materials will be generated during the ultimate dismantling of Dresden Unit 1. The wastes will consist of clean piping, components, structural steel, concrete rubble and miscellaneous trash. The estimated volume of this material is approximately 6,890 tons of scrap and 31,000 cubic yards of concrete rubble and trash.

There are no federal regulations governing disposal of this material in local landfills. Local ordinances may require a dumping permit and a disposal fee.

8. REFERENCES

1. U.S. NRC Proposed Rules, "Decommissioning Criteria for Nuclear Facilities," Federal Register, Vol. 50, No. 28 (February 11, 1985)

2. U.S. NRC Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors"

3. U.S. Code of Federal Regulations, EPA Title 40, "Protection of the Environment," Part 61

4. "Decommissioning Study for the Dresden Nuclear Power Station Unit 1," prepared for Commonwealth Edison Company by TLG Engineering, Inc. (November, 1985)

5. U.S. NRC, "Technology, Safety and Costs of Decommissioning a Reference Boiling Water Reactor," NUREG/CR-0672, prepared by Battelle Pacific Northwest Laboratory (June, 1980)

6. U.S. NRC, "Monitoring for Compliance with Decommissioning Termination Survey Criteria", NUREG/CR-2082, Oak Ridge National Laboratory (June, 1981)

7. U.S. Code of Federal Regulations, Transportation Title 49, Parts 173-178

8. The Solid Waste Disposal Act, as amended by the Resource Conservation and Recovery Act of 1976, RCRA Public Law 94-5800

ATTACHMENT A

RESULTS OF 1985 JULY AND OCTOBER SURVEYS

OF DRESDEN UNIT 1

RADIATION SURVEY RESULTS: GENERAL, GROUND LEVEL

[illegible] 257941
DATE: 10-17-85 TIME: 1300
KAE 0 NAME
INST.MODEL - SERIAL #

CP	403
GM	1330

ALL DOSE RATES IN Mr/Hr AT
CHEST HEIGHT UNLESS OTHERWISE NOTED
BETA DETECTED - YES___ NO___
AIR SAMPLES: LOCATION △A

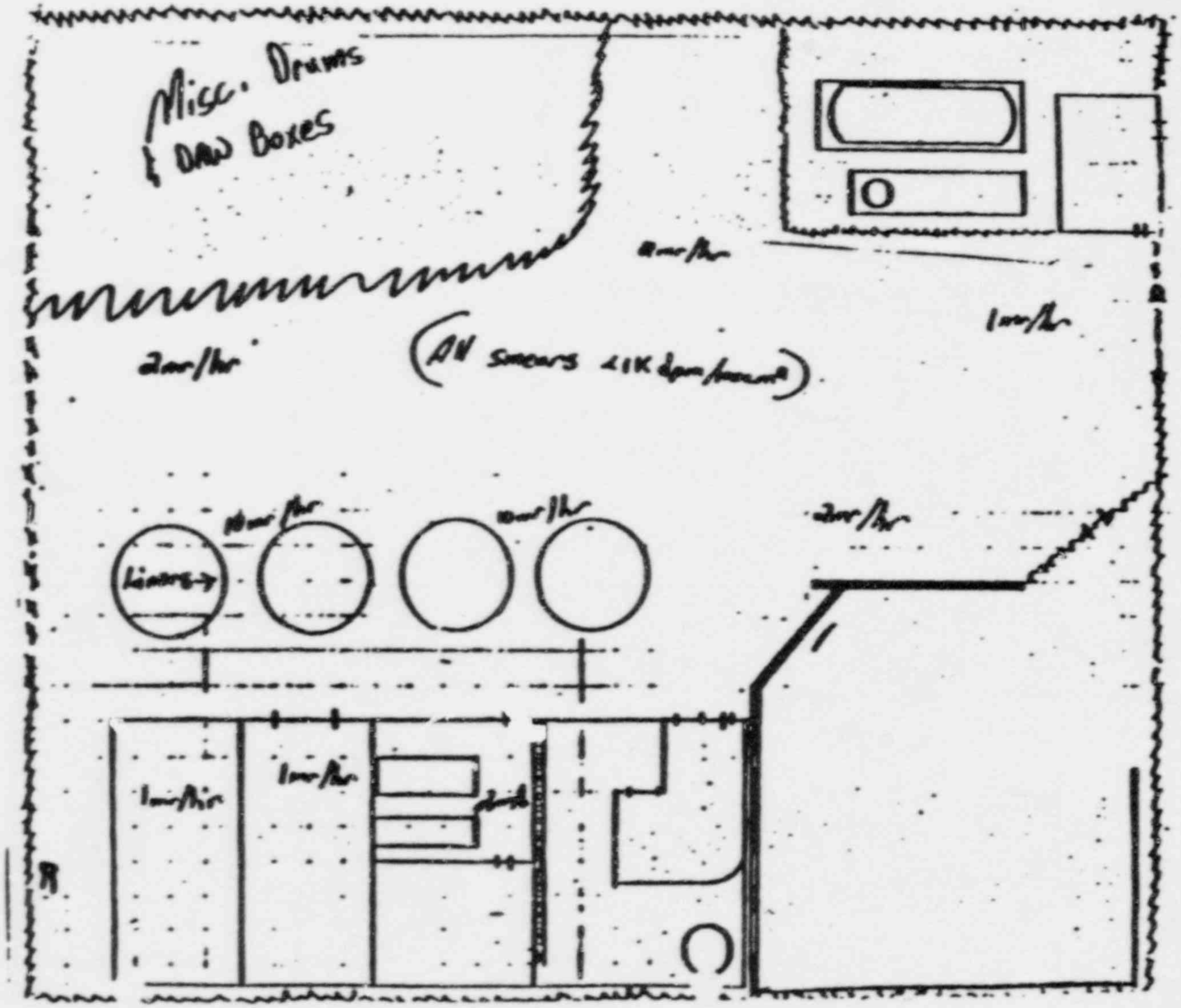
△T	BETA/GAMMA	ALPHA
6 + 0	9.5E-12	6.4E-13

UNIT 1 BLDG RW ELEV Ground
LOCATION General

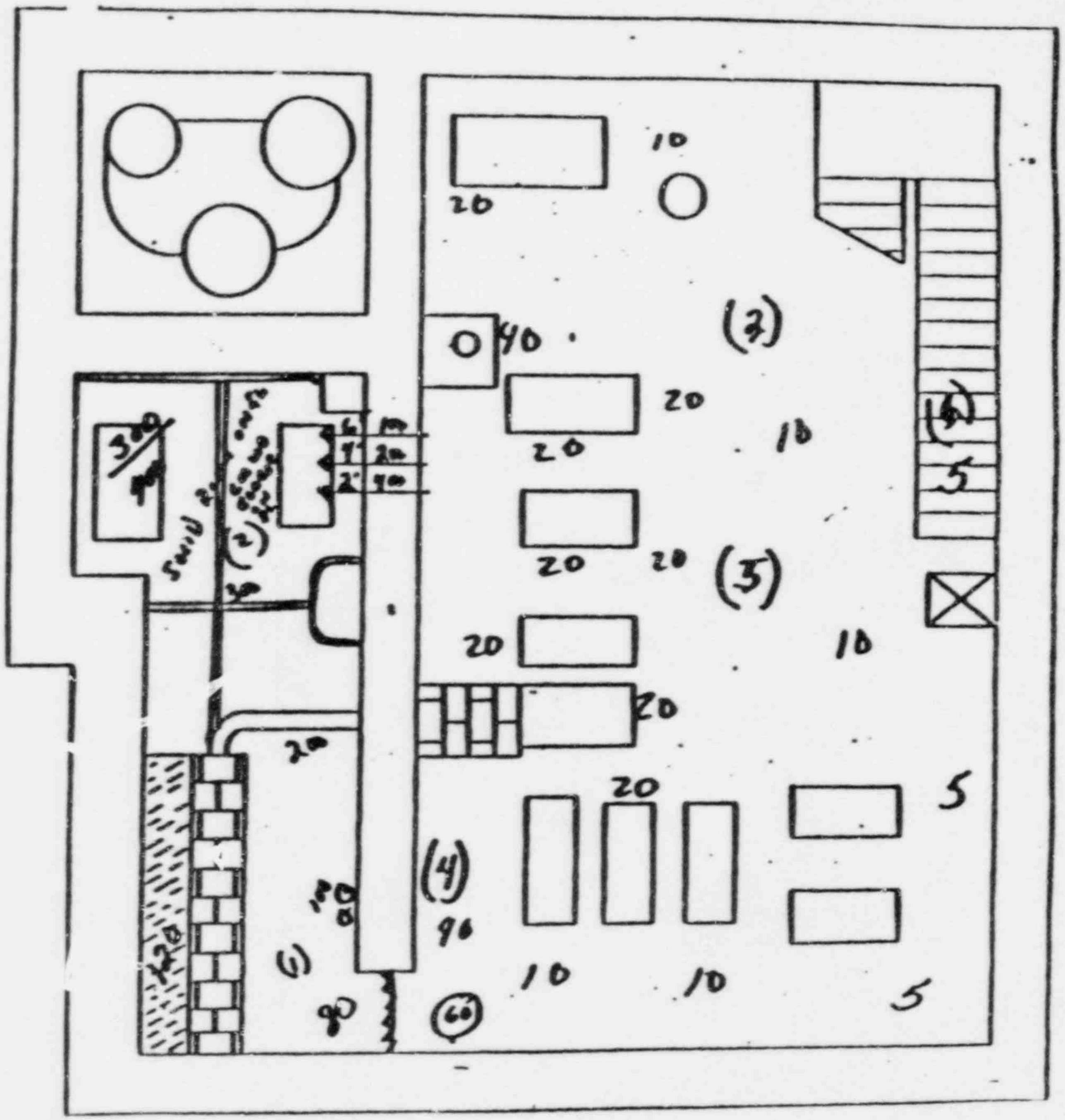
ALL SMEARS <1000 DPM/100 CM βγ
<100 DPM/100 CM α UNLESS NOTED. SMEAR (#)

#	LEVEL βγ	#	LEVEL βγ	#	LEVEL βγ	#	LEVEL α

PURPOSE OF SURVEY (CHECK ONE)
__ROUTINE
X RWP# 52624A
__INVESTIGATIONAL
__RELEASE
__OTHER (SPECIFY)
COMMENTS



RADIATION SURVEY RESULTS: GENERAL, ELEVATION 498'



RWP: 258059
DATE: 10-22-85 TIME: 1600
RWE 0 NAME DeCarlo
INST. MODEL - SERIAL #

R03	741
RADeCo	1210

ALL DOSE RATES IN Mr/Hr AT
CHEST HEIGHT UNLESS OTHERWISE NOTED
BETA DETECTED - YES___ NO___
AIR SAMPLES: LOCATION △

ΔT	BETA/GAMMA	ALPHA

UNIT 1 BLDG RW ELEV 490
LOCATION BSMT

ALL SMEARS <1000 DPM/100 CM βγ
<100 DPM/100 CM α UNLESS NOTED. SMEAR ⓘ

#	LEVEL βγ	#	LEVEL βγ	#	LEVEL βγ	#	LEVEL α
1	450K						
2	700K						
3	19K						
4	40K						
5	20K						
6	10K						

PURPOSE OF SURVEY (CHECK ONE)
x ROUTINE
__ RWP# ____
__ INVESTIGATIONAL
__ RELEASE
__ OTHER (SPECIFY)
COMMENTS ____

RADIATION SURVEY RESULTS: EXHAUST FANS

R..: 258305
DATE: 10-31-85 TIME: 2240
R..: 0 NAME Tim Phillips
R.I. MODEL - SERIAL #

CP	174		
GM	32136	AS	34
SBC	4		

ALL DOSE RATES IN Mr/Hr AT
CHEST HEIGHT UNLESS OTHERWISE NOTED
BETA DETECTED - YES___ NO___
AIR SAMPLES: LOCATION (A)

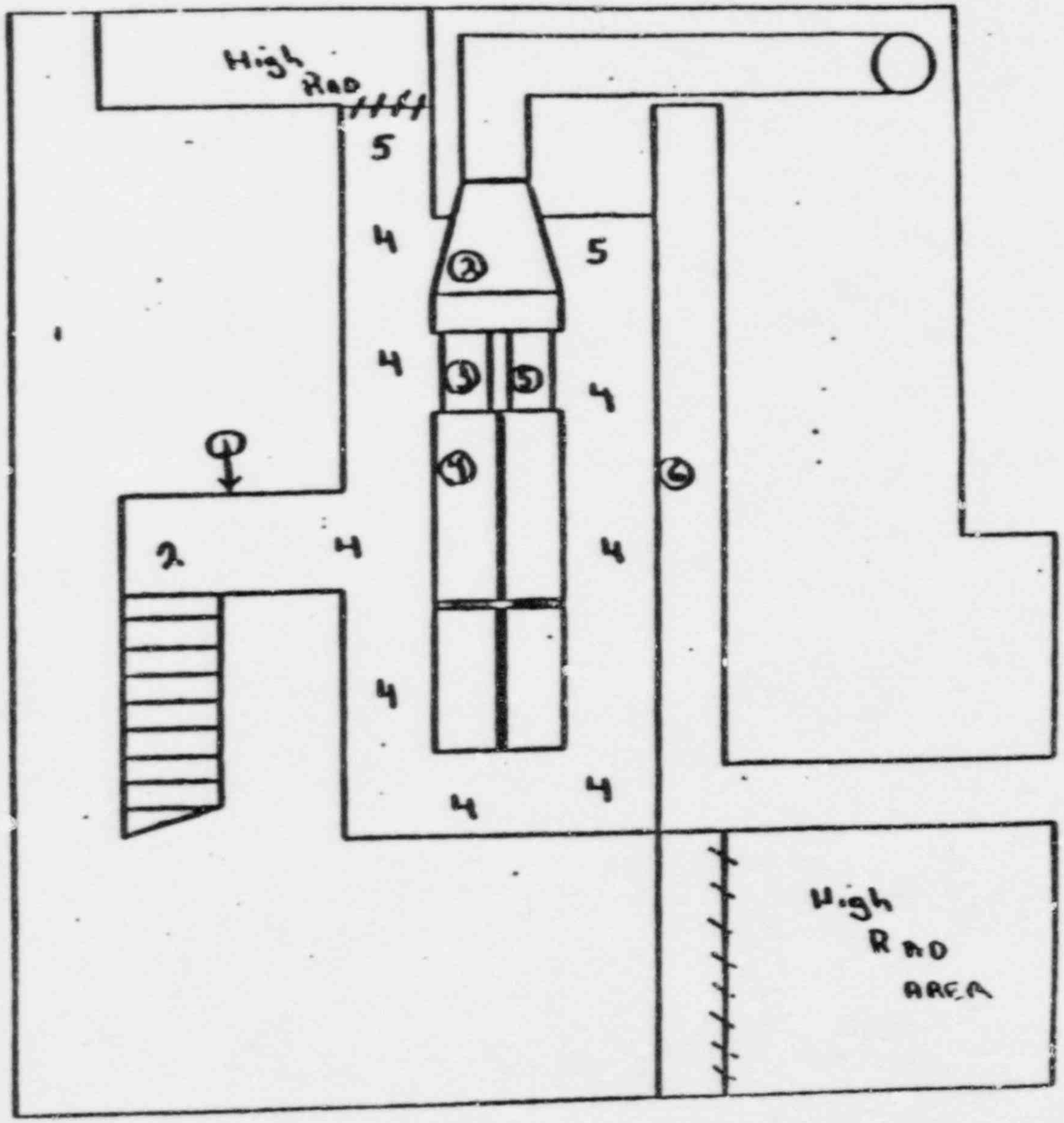
△T	BETA/GAMMA	ALPHA
0629	5.8E-10	3.1E-10

UNIT 1 BLDG RW ELEV______
LOCATION RW Fans

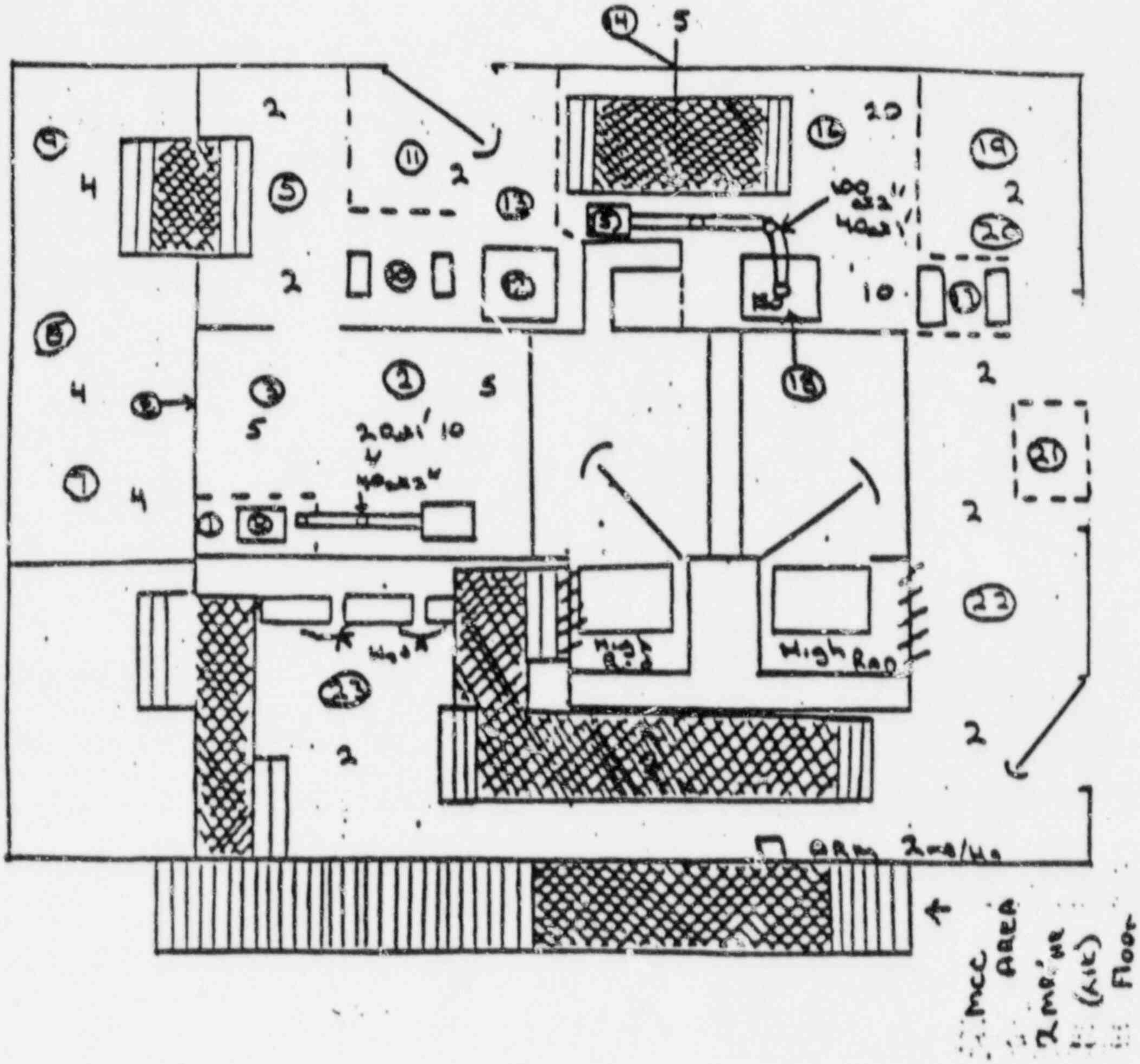
ALL SMEARS <1000 DPM/100 CM βγ
<100 DPM/100 CM α UNLESS NOTED. SMEAR (#)
No Alpha Detected

#	LEVEL βγ	#	LEVEL βγ	#	LEVEL βγ	#	LEVEL α
1	8K						
2	8K						
3	8K						
4	12K						
5	6K						
6	3K						

PURPOSE OF SURVEY (CHECK ONE)
__ROUTINE
x RWP#
__INVESTIGATIONAL
__RELEASE
__OTHER (SPECIFY)
COMMENTS



RADIATION SURVEY RESULTS: DECONTAMINATION BUILDING



Date: ___ Time: ___
Date: O
R.E. Tim Phillips

INST. MODEL - SERIAL #

CP	365
GM	32136
SBC	4

ALL DOSE RATES IN Mr/Hr AT CHEST HEIGHT UNLESS OTHERWISE NOTED

BETA DETECTED - YES ___ NO ___

AIR SAMPLES: LOCATION △ AT

BETA/GAMMA	ALPHA
N/A	

UNIT 1 BLDG RW ELEV 517

LOCATION Decont Bldg.

ALL SMEARS (IN DPM/100 CM βγ) UNLESS NOTED. SMEAR #
(<100 DPM/100

No Alpha Detected

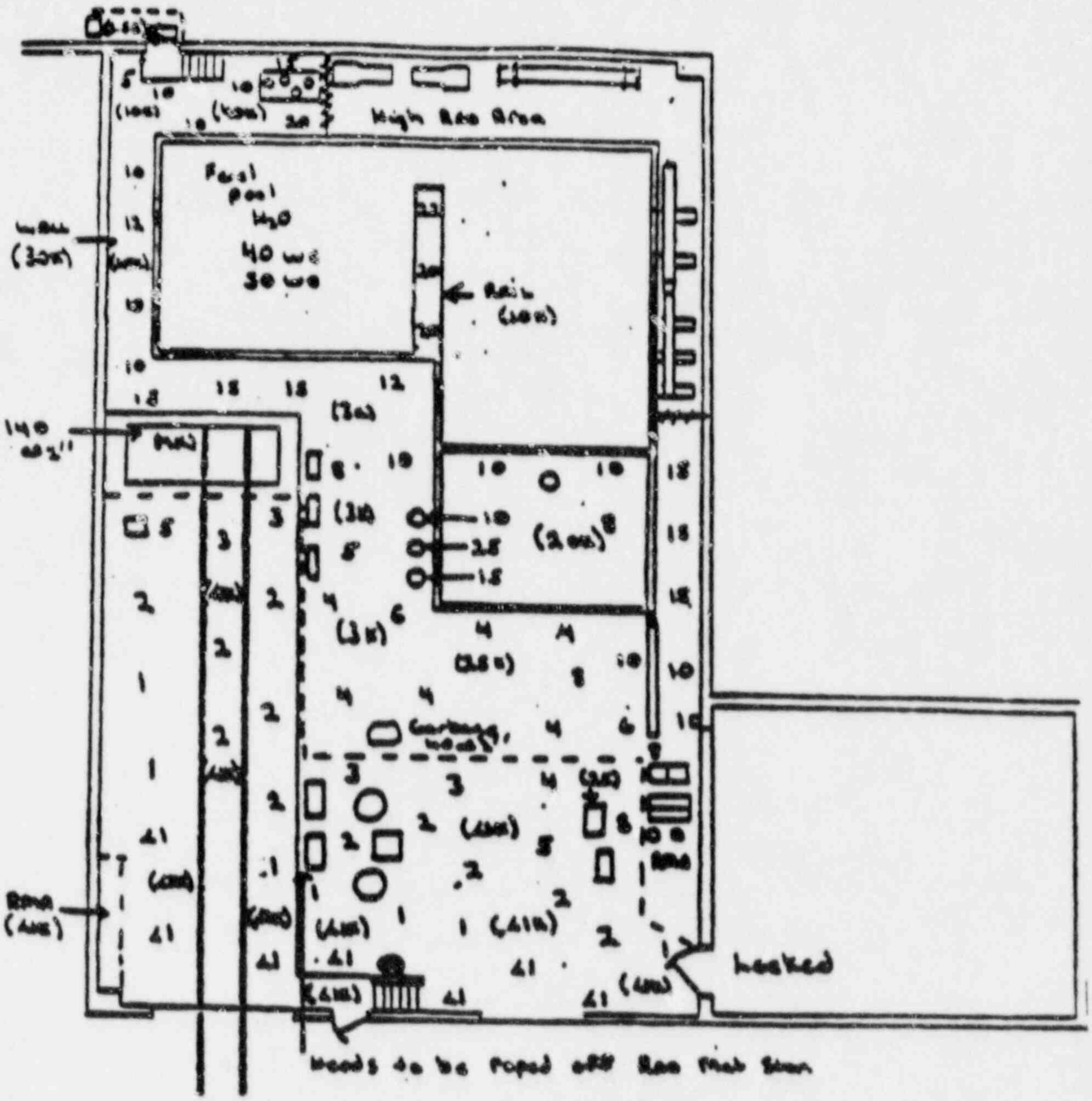
#	LEVEL βγ	#	LEVEL βγ	#	LEVEL βγ	#	LEVEL α
1	70K	14	14K				
2	15K	15	14K				
3	100K	16	140K				
4	6K	17	2K				
5	4K	18	40K				
6	4K	19	<1K				
7	6K	20	<1K				
8	<1K	21	3K				
9	2K	22	<1K				
10	1K	23	<1K				
11	<1K						
12	6K						
13	<1K						

PURPOSE OF SURVEY (CHECK ONE)

_ ROUTINE
x RWP# ______
_ INVESTIGATIONAL
_ RELEASE
_ OTHER (SPECIFY)

COMMENTS ______

RADIATION SURVEY RESULTS: FUEL BUILDING



LEGEND

RSR # 255236
Time 2100
Date 02 July 85
HWT 0
No. = mr/hr
( ) = D/M/100cm²

● Air Sample Data
ΔT 0001
$\beta\gamma$ 3.3E-10
α 2.4E-10
ΔT
$\beta\gamma$
α

ALPHA < 1000 DPM/100cm²

Tim Phillips
(SIGNATURE OF RCT)

SERIAL # OF INSTRUMENTS USED

CP# 174 SAC-4

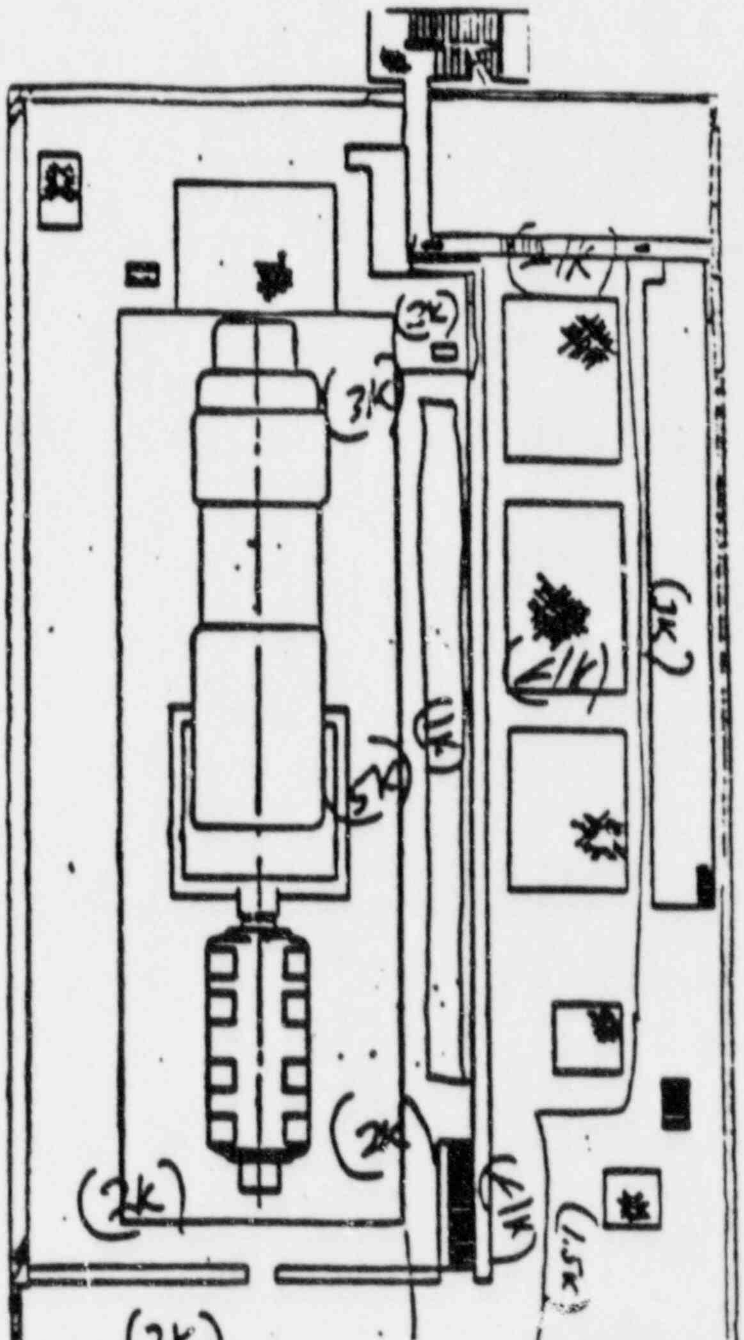
GM# 28364 AS# 31

RADIATION SURVEY RESULTS: TURBINE BLDG, TURBINE LEVEL

RSR # 255308
Date 5 July 85
Time 1540
MMR ——
No.s = MR/HR
( ) = C/M/FT^2

Air Sample Data
ΔT Initial
Δr 2.0 E-10
α 1.5 E-10
ΔT
Δr
α

All Dose Rates <1 mr/hr
Except as noted



(SIGNATURE OF RCT)

SERIAL # OF INSTRUMENTS USED

CP #127 AS#3
28364

RADIATION SURVEY RESULTS: TURBINE BLDG (Elev. 517'6")

[illegible]: 267220
DATE: 10-10-85 TIME: 2230
MRE 0 NAME
INST. MODEL - SERIAL #

CP	127
GM	3315

ALL DOSE RATES IN Mr/Hr AT CHEST HEIGHT UNLESS OTHERWISE NOTED
BETA DETECTED - YES___ NO___
AIR SAMPLES: LOCATION △

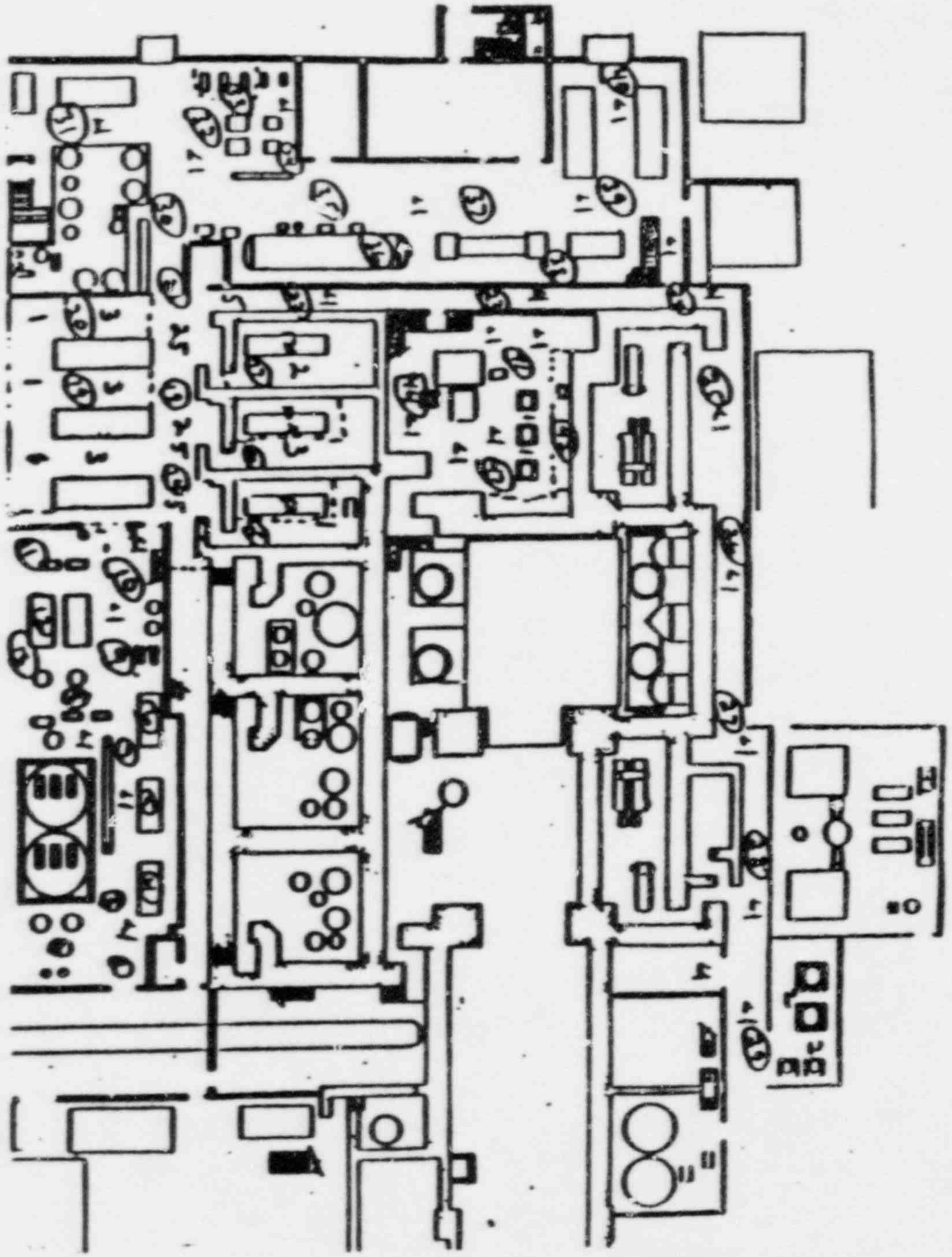
△T	BETA/GAMMA	ALPHA
	1.9E-10	1.2E-10

UNIT 1 BLDG TB ELEV 517
LOCATION General

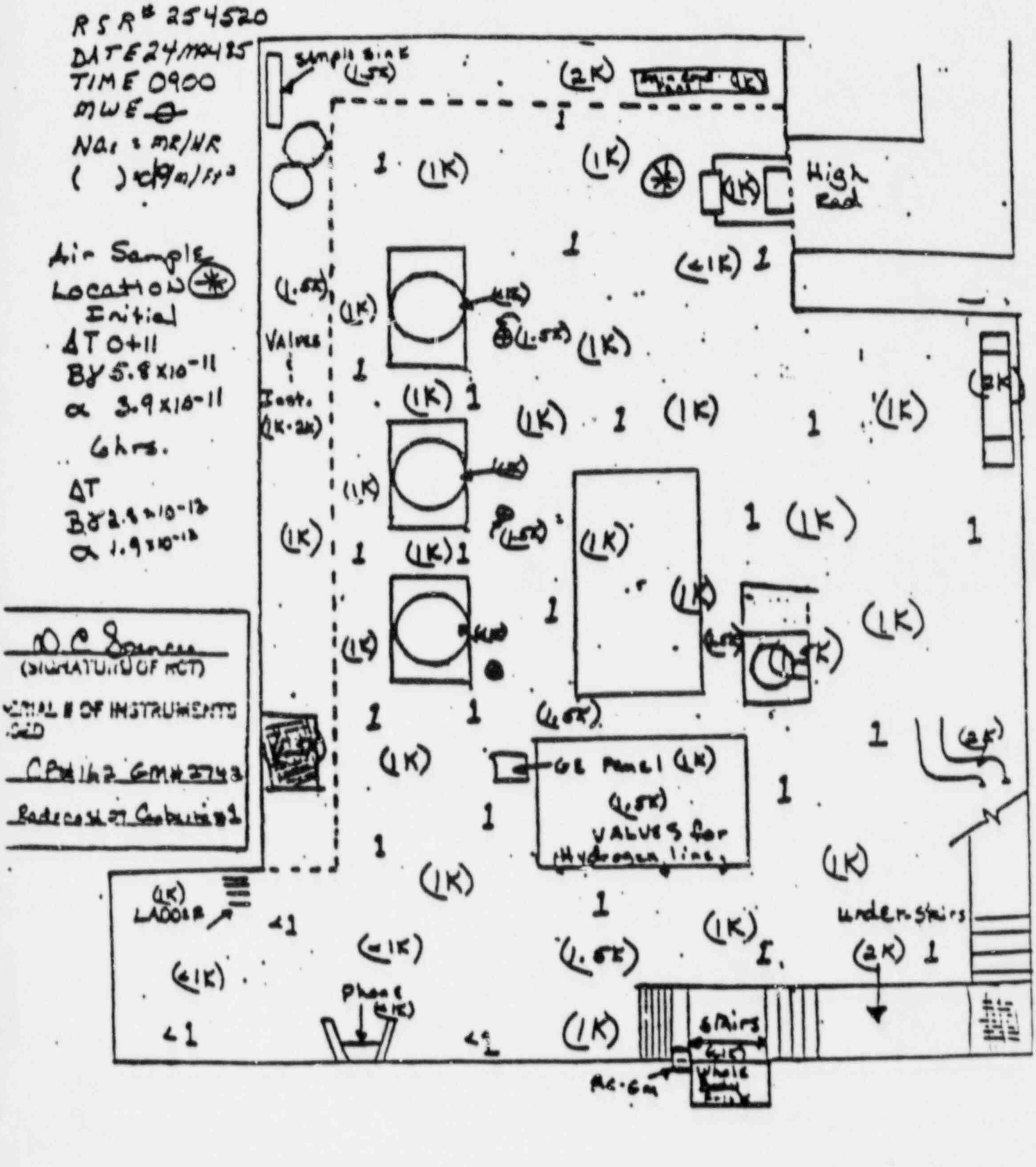
ALL SMEARS (1000 DPM/100 CM βγ
(100 DPM/100 CM α UNLESS NOTED. SMEAR ⓪

#	LEVEL βγ	#	LEVEL βγ	#	LEVEL βγ	#	LEVEL α
15	2K						
16	2K						
17	4K						
19	2K						
20	2K						
42	2K						

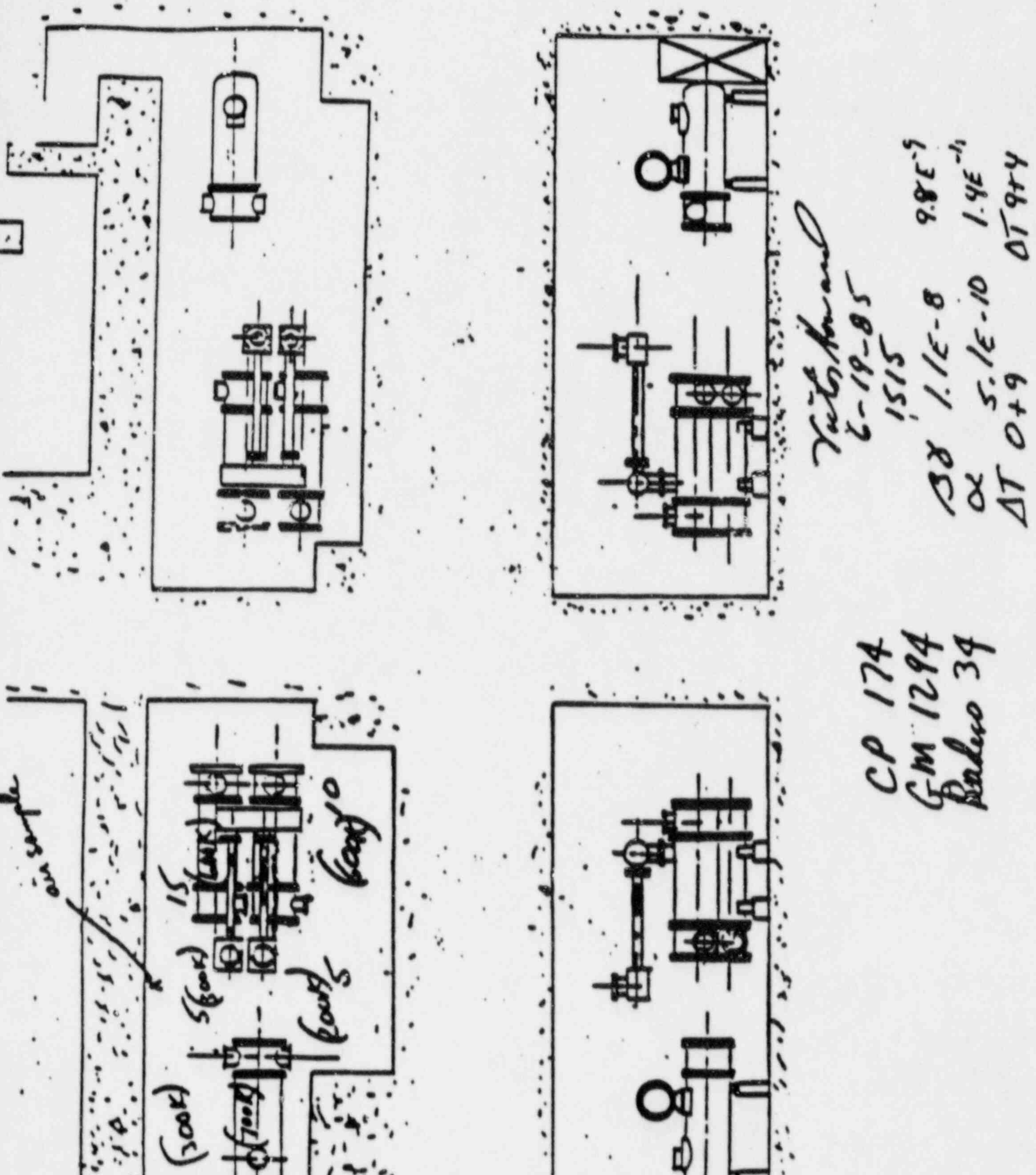
PURPOSE OF SURVEY (CHECK ONE)
X ROUTINE
__ RWP#
__ INVESTIGATIONAL
__ RELEASE
__ OTHER (SPECIFY)
COMMENTS



RADIATION SURVEY RESULTS: TURBINE BLDG, CONDENSATE PUMP ROOM



RADIATION SURVEY RESULTS: TURBINE BLDG, AIR EJECTOR COMPARTMENTS



RADIATION SURVEY RESULTS: BOILER HOUSZ

RWP# 250958
DATE: 9-30-85 TIME: 1450
R.E 0 NAME

INST. MODEL - SERIAL #

CP	364
AS	9
GM	3370

ALL DOSE RATES IN Mr/Hr AT
CHEST HEIGHT UNLESS OTHERWISE NOTED
BETA DETECTED - YES___ NO___
AIR SAMPLES: LOCATION A

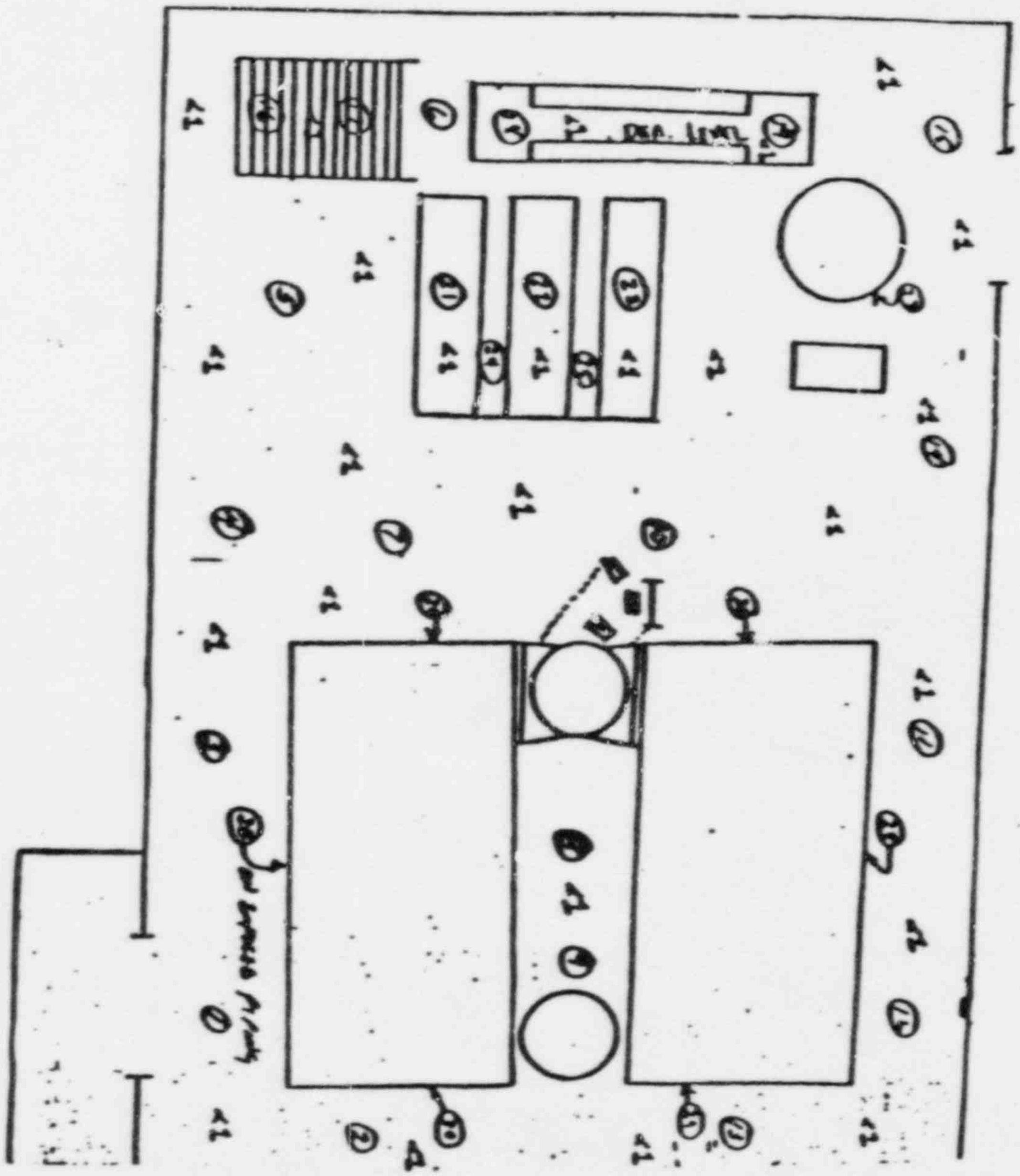
ΔT	BETA/GAMMA	ALPHA
0+13	3.5E-11	2.5E-11

UNIT 1 BLDG BH ELEV
LOCATION General

ALL SMEARS <1000 DPM/100 CM $\beta\gamma$
<100 DPM/100 CM α UNLESS NOTED. SMEAR #

#	LEVEL $\beta\gamma$	#	LEVEL $\beta\gamma$	#	LEVEL $\beta\gamma$	#	LEVEL α
1	1K	14	1K	27	1K		
2		15		28			
3		16		29			
4		17		30			
5		18					
6		19					
7		20					
8		21					
9		22					
10		23					
11		24					
12		25					
13		26					

PURPOSE OF SURVEY (CHECK ONE)
X ROUTINE
__ RWP#
__ INVESTIGATIONAL
__ RELEASE
__ OTHER (SPECIFY)
COMMENTS



RADIATION SURVEY RESULTS: REACTOR ENCLOSURE (Elev. 502'6")

[illegible] 256955

DATE: 9-30-85 TIME: 1030

[illegible] NAME

INST. MODEL - SERIAL #

CP	174
GM	32170

ALL DOSE RATES IN Mr/Hr AT CHEST HEIGHT UNLESS OTHERWISE NOTED

BETA DETECTED - YES___ NO___

AIR SAMPLES: LOCATION △

ΔT	BETA/GAMMA	ALPHA

UNIT 1 BLDG RE ELEV 502

LOCATION

ALL SMEARS <1000 DPM/100 CM βγ <100 DPM/100 CM α UNLESS NOTED. SMEAR (#)

No Alpha Detected

#	LEVEL βγ	#	LEVEL βγ	#	LEVEL βγ	#	LEVEL α

PURPOSE OF SURVEY (CHECK ONE)

x ROUTINE

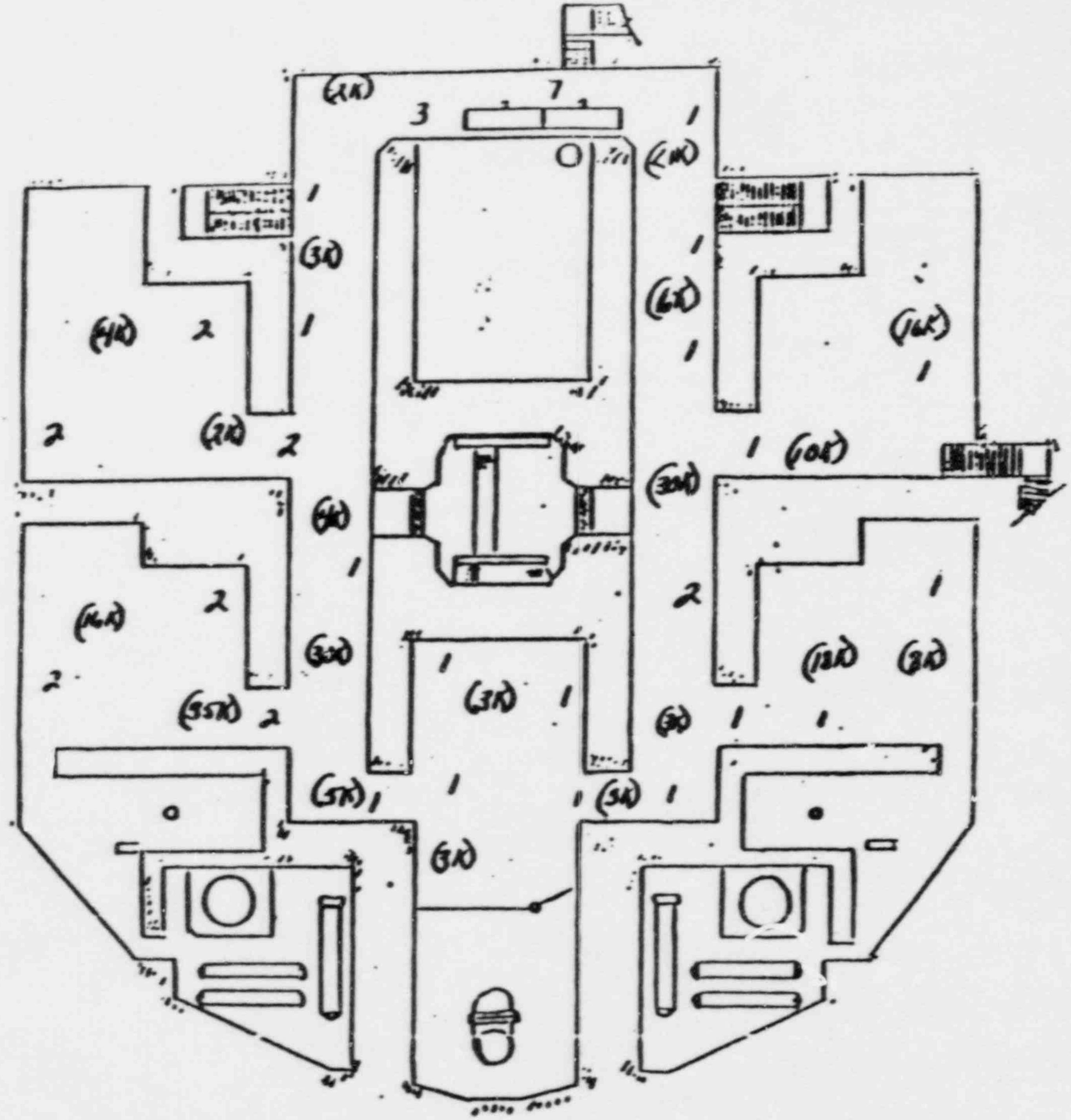
__ RWP#

__ INVESTIGATIONAL

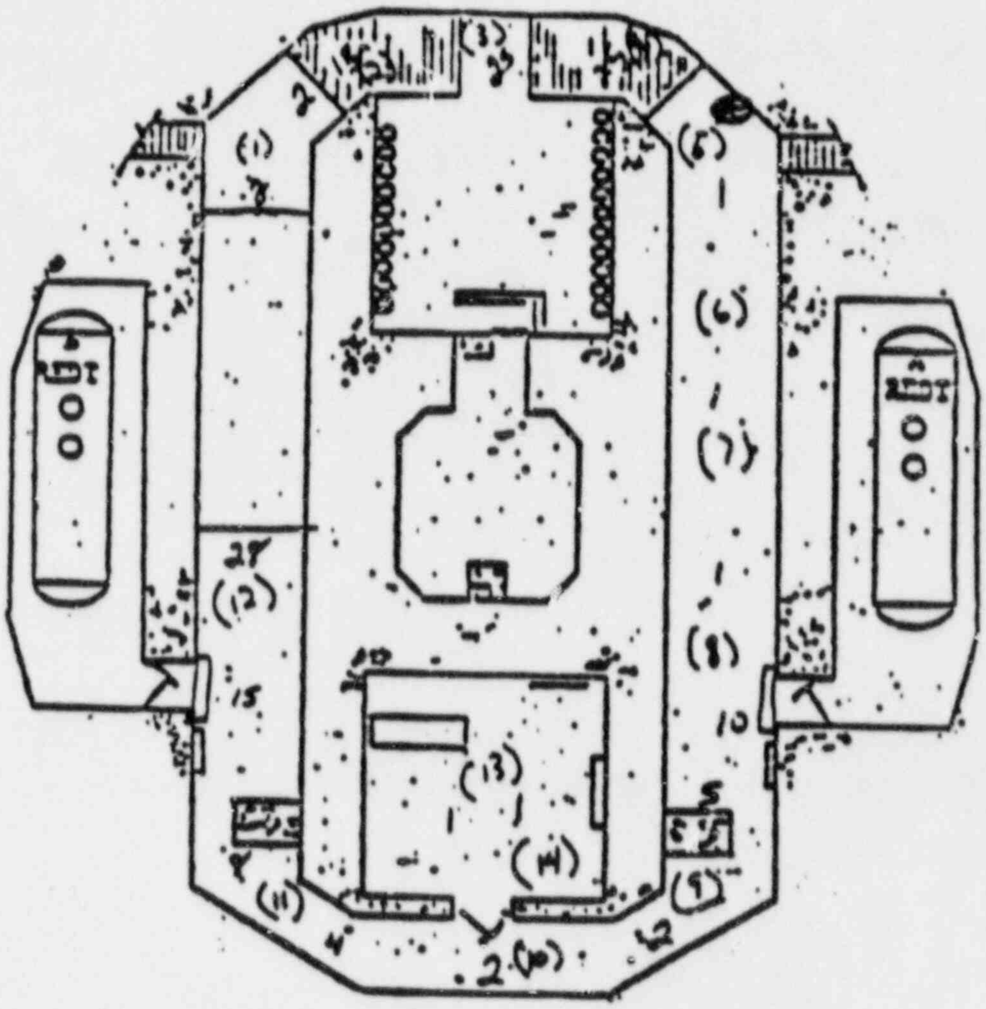
__ RELEASE

__ OTHER (SPECIFY)

COMMENTS



RADIATION SURVEY RESULTS: SPHERE (Elev. 488')



RWP# 258006
DATE: 10-30-85 TIME: 1400
R.E. NAME
INST. MODEL - SERIAL

GM	3801
CP	403
Staplex	7

ALL DOSE RATES IN Mr/Hr AT
CHEST HEIGHT UNLESS OTHERWISE NOTED
BETA DETECTED - YES ___ NO ___
AIR SAMPLES: LOCATION △A

ΔT	BETA/GAMMA	ALPHA
0+46	6.4E-10	4.3E-10

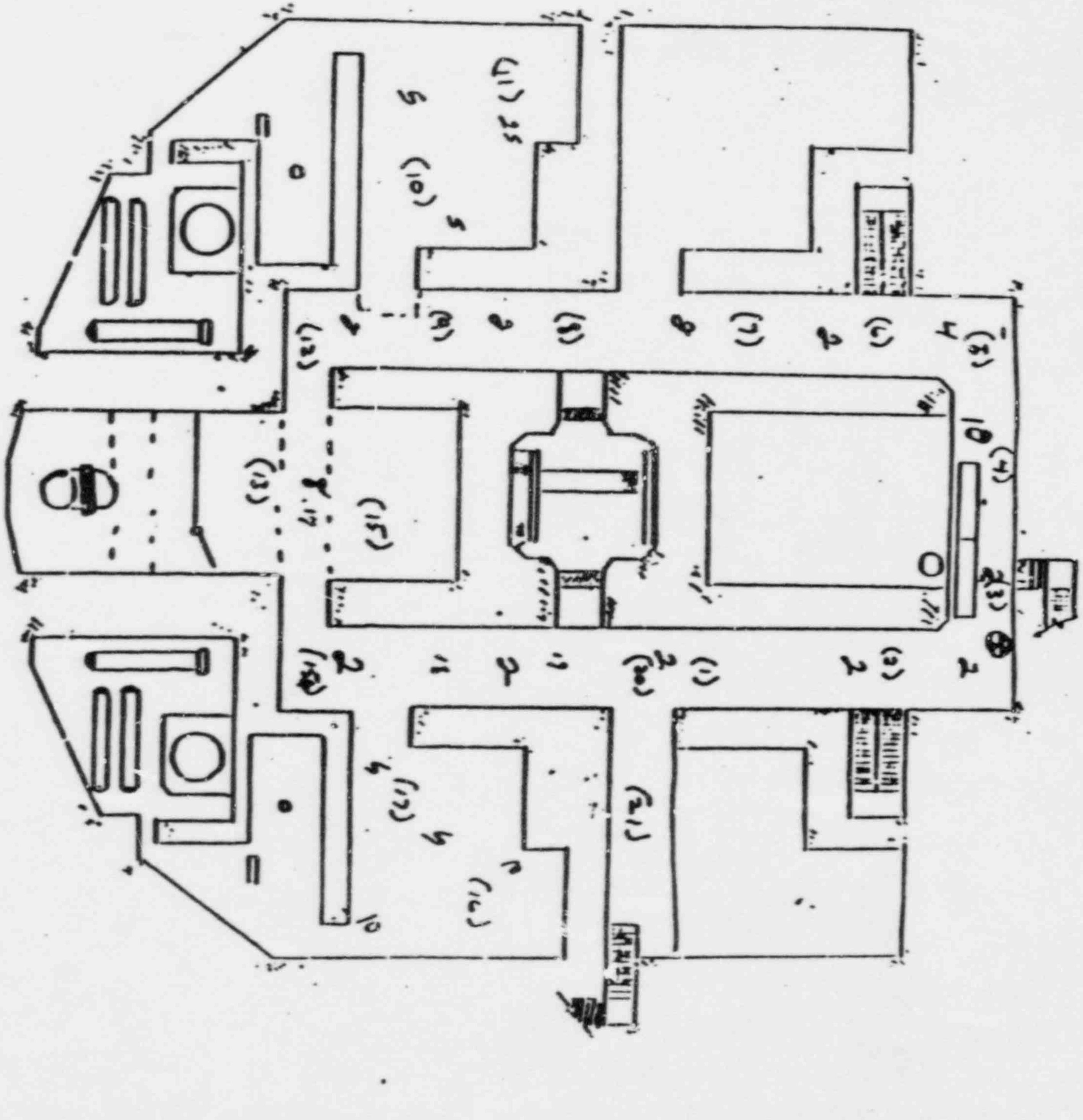
UNIT 1 BLDG SPH ELEV 488
LOCATION Sphere

ALL SMEARS (1000 DPM/100 CM βγ
(100 DPM/100 CM α UNLESS NOTED. SMEAR #

#	LEVEL βγ	#	LEVEL βγ	#	LEVEL βγ	#	LEVEL α
1	10K	14	30K				
2	15K						
3	13K						
4	14K						
5	6K						
6	8K						
7	8K						
8	12K						
9	10K						
10	6K						
11	6K						
12	25K						
13	30K						

PURPOSE OF SURVEY (CHECK ONE)
x ROUTINE
_ RWP# ___
_ INVESTIGATIONAL
_ RELEASE
_ OTHER (SPECIFY)
COMMENTS ___

RADIATION SURVEY RESULTS: SPHERE (Elev. 502')



[illegible]: 258007
DATE: 10-20-85 TIME: 1400
HPE ______ NAME ______
INST.MODEL - SERIAL #

GM	3E01
CP	403
Staplex	9

ALL DOSE RATES IN Mr/Hr AT CHEST HEIGHT UNLESS OTHERWISE NOTED
BETA DETECTED - YES___ NO___
AIR SAMPLES: LOCATION △A

ΔT	BETA/GAMMA	ALPHA
0+4.5	7.1E-10	4.7E-10

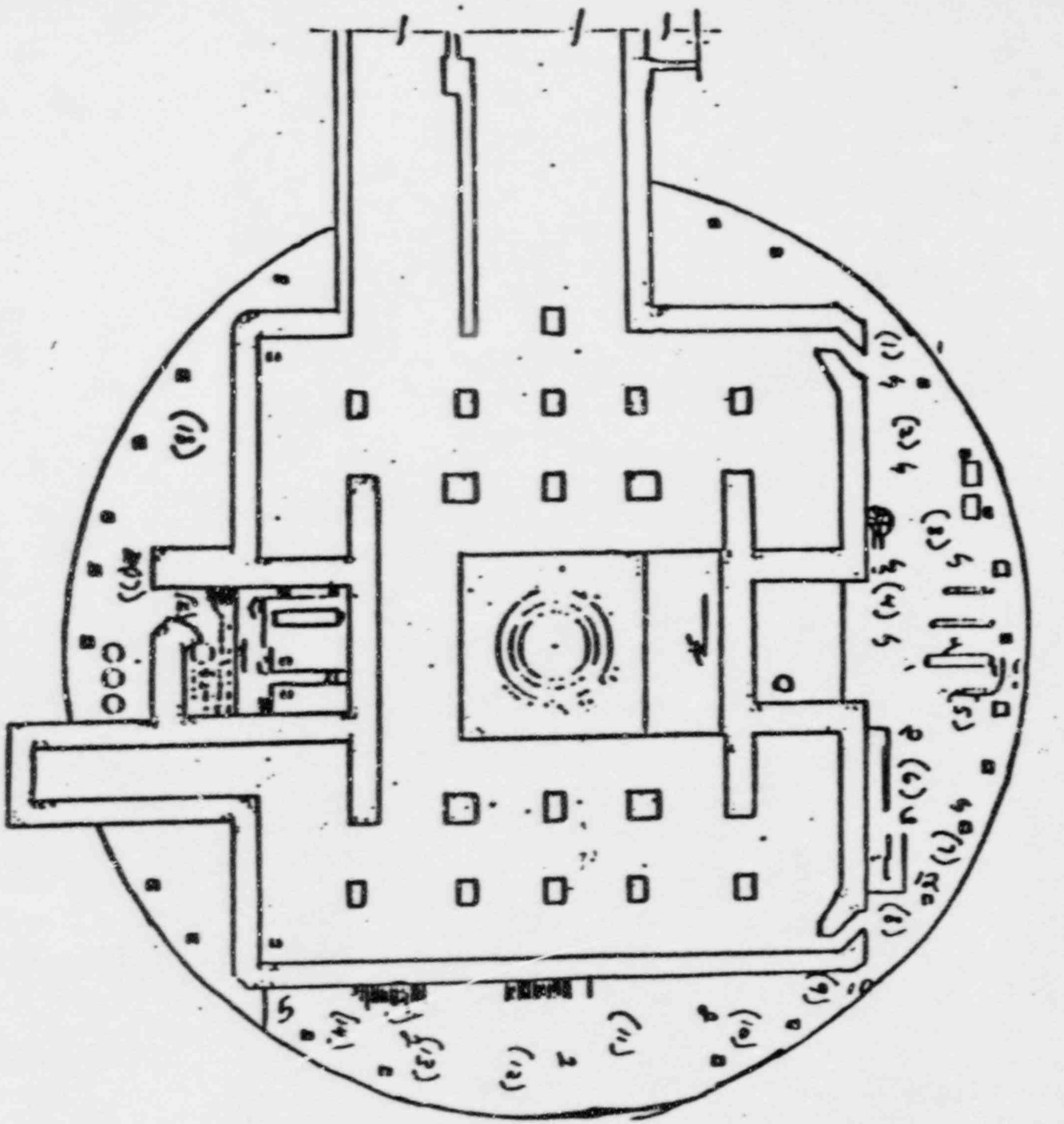
UNIT 1 BLDG SPH ELEV 502
LOCATION Sphere

ALL SMEARS <1000 DPM/100 CM βγ
<100 DPM/100 CM α UNLESS NOTED. SMEAR ⓪
α < [illegible]

#	LEVEL βγ	#	LEVEL βγ	#	LEVEL βγ	#	LEVEL α
1	20K	14	120K				
2	20K	15	140K				
3	14K	16	30K				
4	50K	17	40K				
5	16K	18	20K				
6	20K	19	20K				
7	12K	20	15K				
8	10K	21	20K				
9	15K	22	15K				
10	30K						
11	40K						
12	30K						
13	90K						

PURPOSE OF SURVEY (CHECK ONE)
X ROUTINE
__ RWP# ______
__ INVESTIGATIONAL
__ RELEASE
__ OTHER (SPECIFY)
COMMENTS ______

RADIATION SURVEY RESULTS: SPHERE (Elev. 517')



RSR: 258008
DATE: 10-20-85 TIME: 1400
MRE 0 NAME
INST. MODEL - SERIAL #

GM	3891
CP	403
Staplex	9

ALL DOSE RATES IN Mr/Hr AT CHEST HEIGHT UNLESS OTHERWISE NOTED

BETA DETECTED - YES___ NO___

AIR SAMPLES: LOCATION (A)

ΔT	BETA/GAMMA	ALPHA
0+42	6.1E-10	4.6E-10

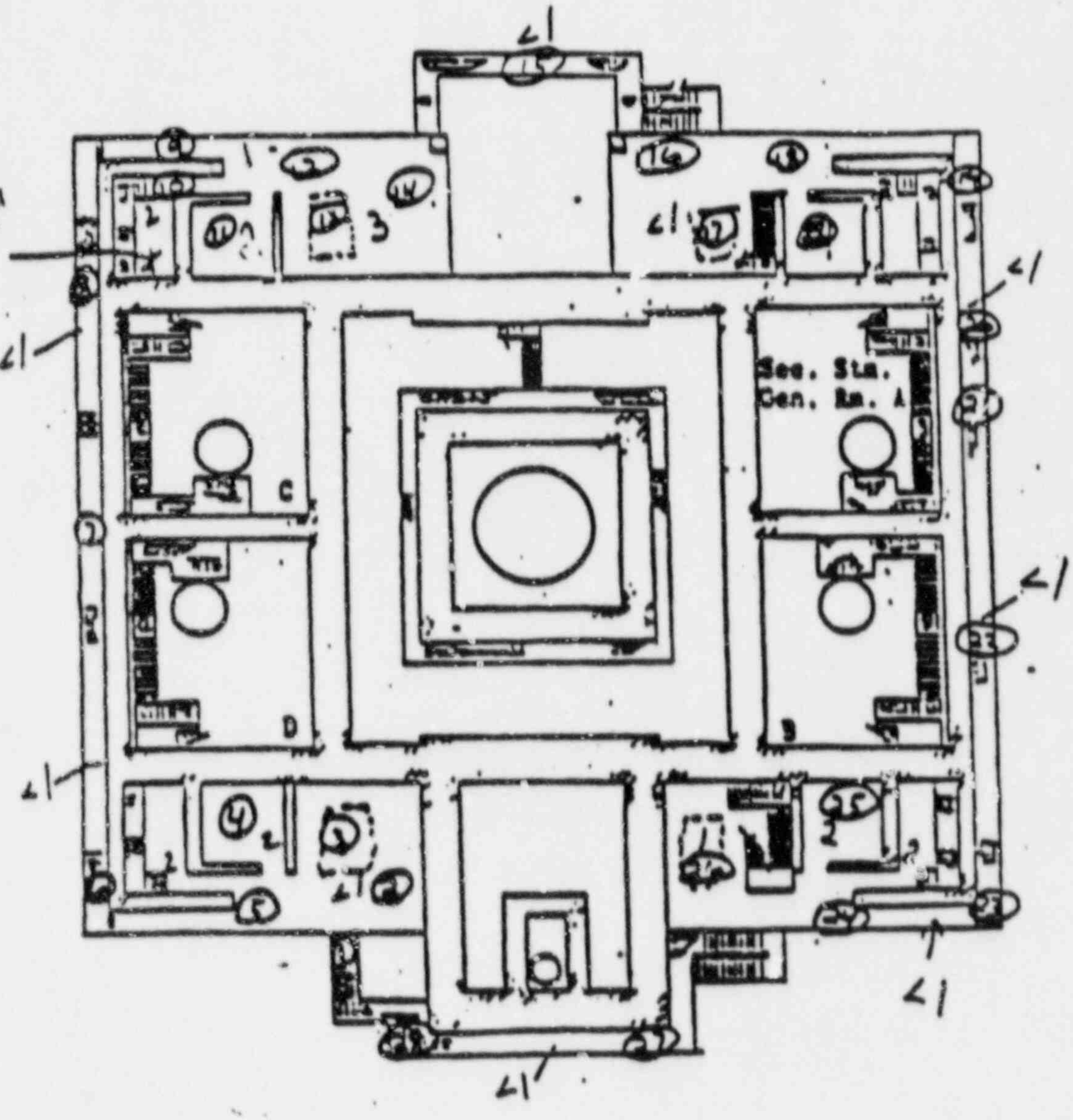
UNIT 1 BLDG SPH ELEV 517
LOCATION Sphere

ALL SMEARS <1000 DPM/100 CM $\beta\gamma$
<100 DPM/100 CM α UNLESS NOTED. SMEAR (#)

#	LEVEL $\beta\gamma$	#	LEVEL $\beta\gamma$	#	LEVEL $\beta\gamma$	#	LEVEL α
1	30K	14	20K				
2	30K	15	20K				
3	40K	16	30K				
4	40K	17	100K				
5	20K	18	20K				
6	40K						
7	40K						
8	18K						
9	16K						
10	16K						
11	20K						
12	20K						
13	16K						

PURPOSE OF SURVEY (CHECK ONE)
X ROUTINE
__ RWP#
__ INVESTIGATIONAL
__ RELEASE
__ OTHER (SPECIFY)
COMMENTS

RADIATION SURVEY RESULTS: SPHERE (Elev. 548')



RSR# 297245
DATE 10-11-85 TIME: 1930
RAE 0 NAME
INST. MODEL - SERIAL #

CP	365
GM	2836

ALL DOSE RATES IN Mr/Hr AT
CHEST HEIGHT UNLESS OTHERWISE NOTED
BETA DETECTED - YES___ NO___
AIR SAMPLES: LOCATION △A

ΔT	BETA/GAMMA	ALPHA
0+39	1.5E-10	1.0E-9

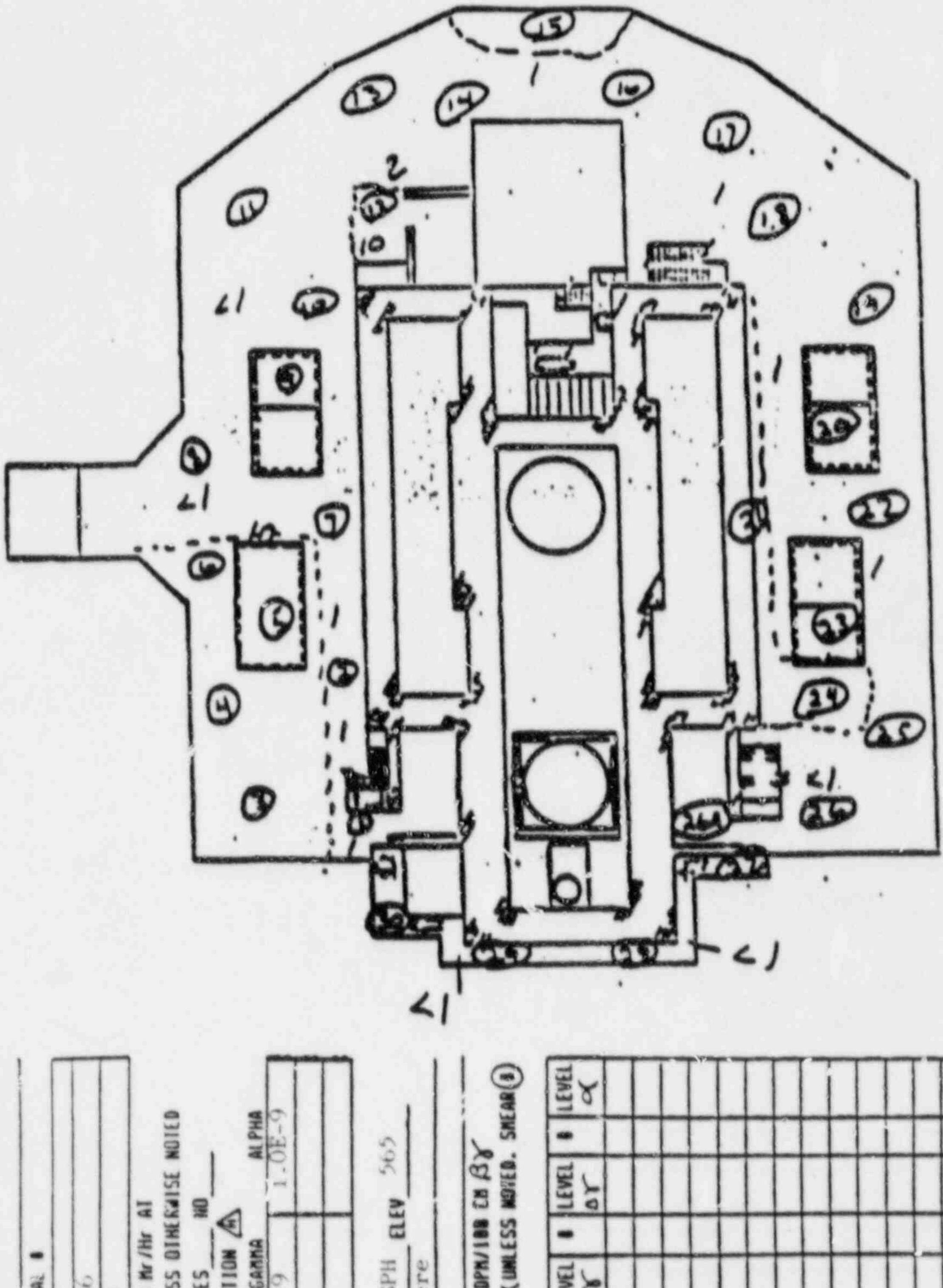
UNIT 1 BLDG SPH ELEV 548
LOCATION Sphere

ALL SMEARS <1000 DPM/100 CM βγ
<100 DPM/100 CM α UNLESS NOTED. SMEAR ⓪

#	LEVEL βγ	#	LEVEL	#	LEVEL βγ	#	LEVEL α
3	2K						
10	15K		▷47				
11	2mill		▷68				
13	2K						
17	2K						
16	3K						

PURPOSE OF SURVEY (CHECK ONE)
__ROUTINE
__RWP#
__INVESTIGATIONAL
__RELEASE
__OTHER (SPECIFY)
COMMENTS #11 Highly smearable

RADIATION SURVEY RESULTS: SPHERE (Elev. 565')



257246
DATE: 10-11-85 TIME: 2200
0 EGME
EL - SERIAL #

GM	2836
CP	365

ALL DOSE RATES IN Mr/Hr AT CHEST HEIGHT UNLESS OTHERWISE NOTED

BETA DETECTED - YES ___ NO ___

AIR SAMPLES: LOCATION △

△T	BETA/GAMMA	ALPHA
0 23	1.3E-9	1.0E-9

UNIT 1 BLDG SPH ELEV 565

LOCATION Sphere

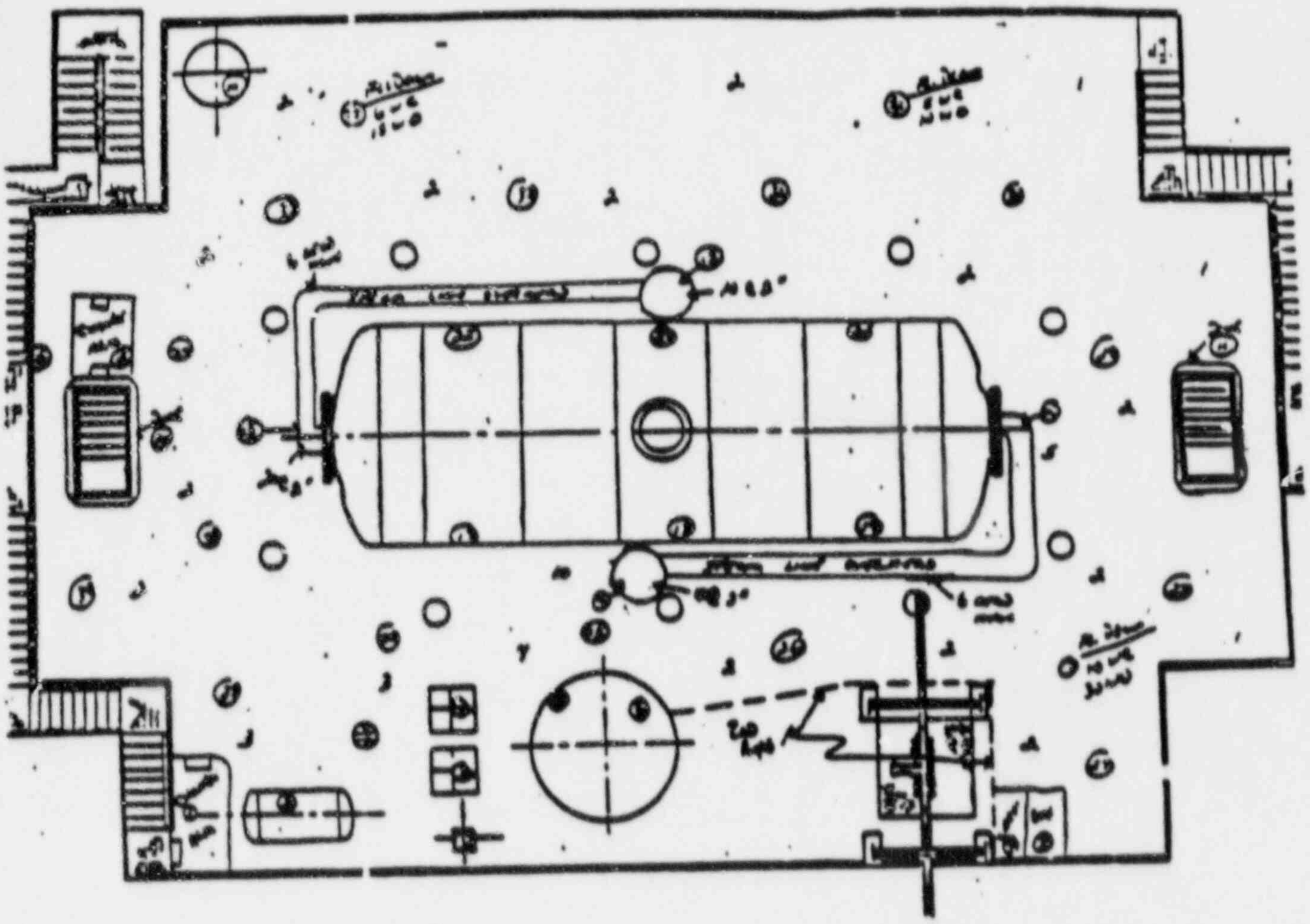
ALL SMEARS (1000 DPM/100 CM βγ
(100 DPM/100 CM α UNLESS NOTED. SMEAR ⑧

#	LEVEL βγ	#	LEVEL βγ	#	LEVEL βγ	#	LEVEL α
3	3K						
4	4K						
5	3K						
6	5K						
12	6K						
13	10K						
21	4K						
24	10K						

PURPOSE OF SURVEY (CHECK ONE)

x ROUTINE
RWP# ___
___ INVESTIGATIONAL
___ RELEASE
___ OTHER (SPECIFY) ___
COMMENTS ___

RADIATION SURVEY RESULTS: EMERGENCY CONDENSER (Elev. 658')



[illegible] 257943
DATE: 10-17-85 TIME: 1850
RWP 0 NAME ____
INST. MODEL - SERIAL #

Staplex	24
CM	1263
CP	403

ALL DOSE RATES IN Mr/Hr AT
CHEST HEIGHT UNLESS OTHERWISE NOTED
BETA DETECTED - YES ____ NO ____
AIR SAMPLES: LOCATION △A

ΔT	BETA/GAMMA	ALPHA
0.26	9.1E-10	6.5E-10

UNIT 1 BLDG SPH ELEV 650
LOCATION Floor

ALL SMEARS (1000 DPM/100 CM $\beta\gamma$
(100 DPM/100 CM α UNLESS NOTED. SMEAR (#)
#13751 DPM/400C Alpha

#	LEVEL $\beta\gamma$	#	LEVEL $\beta\gamma$	#	LEVEL $\beta\gamma$	#	LEVEL α
1	2K	14	12K	27	5		
2	15	15	7	28	2		
3	6	16	12	29	2		
4	10	17	3	30	4		
5	2	18	4	31	3		
6	2	19	3	32	3		
7	10	20	3	33	4		
8	2	21	4	34	2		
9	3	22	4	35	4		
10	1	23	3	36	4		
11	6	24	3				
12	7	25	2				
13	700	26	3				

PURPOSE OF SURVEY (CHECK ONE)
x ROUTINE
__ RWP# ____
__ INVESTIGATIONAL
__ RELEASE
__ OTHER (SPECIFY) ____
COMMENTS ____