GE Nuclear Energy

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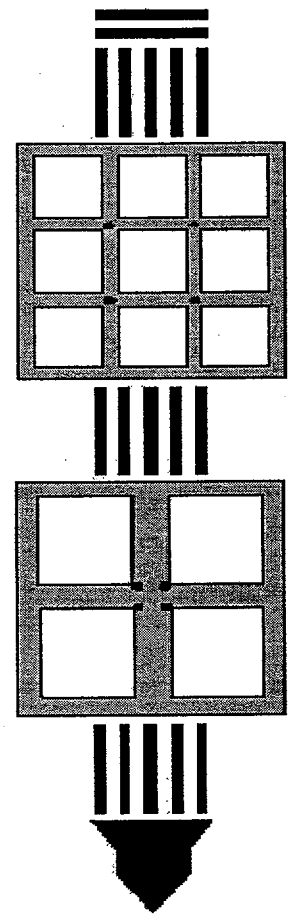
Class I
May, 2000

Applicant's Environmental Report



for
Morris Operation
Morris, Illinois

GE Nuclear Energy

Morris Operation
7555 East Collins Road
Morris, Illinois 60450

NEDO-32966
Class I
May 2000

APPLICANT'S ENVIRONMENTAL REPORT

MORRIS OPERATION
MORRIS, ILLINOIS

Prepared and Issued by
Morris Operation of
GE Nuclear Energy

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I. INTRODUCTION

1.0 PURPOSE OF ENVIRONMENTAL REPORT

General Electric Morris Operation (GE-MO) is a spent nuclear fuel storage facility located in Grundy County, Illinois, owned and operated by General Electric Company, and stores irradiated fuel discharged from commercial nuclear power reactors.

This Environmental Report has been prepared in accordance with requirements of Chapter 10 Code of Federal Regulation, Part 51, Subpart A, and 10 CFR 72, Paragraph 72.34 for submittal to the USNRC and other appropriate regulatory agencies.

This document contains a consolidation of environmental information relating to receipt, storage and transfer of irradiated nuclear fuel in operations conducted by General Electric Company at Morris Operation.

Almost all information in this document has been previously published or otherwise made part of the public record regarding the Midwest Fuel Recovery Plant (MFRP) in NEDO-14504, "Applicant's Environmental Report." The purpose of this document is to present information regarding fuel storage operations, disregarding features of the facility not applicable to fuel storage.

2.0 FUEL STORAGE OBJECTIVES

Irradiated fuel from commercial power reactors has been received and stored at GE-MO since 1972. These activities have affirmed experience elsewhere that such fuel can be handled and stored safely with no impact on the environment. There has been no significant fuel leakage (as determined by measurement of basin water activity), indicating the fuel is a stable, inert material while in the storage basin environment. Effective control of water quality, radioactive material concentration in the water, cask contamination, and airborne radioactive material has been demonstrated.

3.0 PROJECT BASES

In 1964, following years of technical and engineering study, General Electric Company decided to enter the nuclear fuel recovery business and established a program for development, design, construction and operation of facilities capable or reprocessing irradiated fuel from commercial, light-water cooled and moderated power reactors to recover products of value. Potential impact of plant operation on the environment and the effect of site characteristics on design and operating safety were considered during plant design. Thus, the degree of control and confinement of radioactive materials provided for exceeded that of any previously designed nuclear fuel reprocessing plant.

In January 1971, General filed an application with the AEC for an Operating License. As indicated in that application, it was planned to begin receiving and storing irradiated fuel and to begin cold runs and preoperational checkout about August 1971.

Cold runs and preoperation checkout using natural uranium had begun, but due to political changes and technical problems, the process was abandoned. The facility was never fully licensed to operate as a reprocessing plant. In September of 1974, General Electric requested authorization from the AEC to render the Midwest Fuel Recovery Plant (MFRP) inoperable. The AEC approved the request and issued Facility license for possession only No. CSF-2. This license provided for the termination of the provisional construction permit and authorized continuation of Special Nuclear Materials License Nos. SNM-1265 and SNM-1281 to the extent that General Electric could continue to (1) possess and store natural and depleted uranium presently at the facility; (2) receive, possess and store irradiated nuclear fuel elements; and (3) possess and use certain radioactive materials needed for instrument calibration and laboratory standards.

In May of 1982, the USNRC issued a new license (SNM-2500) pursuant to 10 CFR 72 for a twenty year term authorizing conduct of spent fuel storage activities at GE-MO. This is the current authorized operating license.

II. GENERAL INFORMATION

1.0 SITE LOCATION AND DESCRIPTION

1.1 Location

GE Morris Operation (GE-MO) is located on an approximately 892 acre site (Figure II-1-1) located near the midpoint of the eastern side of the Morris 15 quadrangle (USGS designation) Goose Lake Township, Grundy County, Illinois (Figure II-1-2). The GE-MO site is bounded on the north by the Dresden Nuclear Power Station (DNPS) site and on the south by the closed A. P. Green Refractory Company. The GE-MO site is bounded on the east by the Thorson fishing cottages and by the DNPS cooling lake. With the exception of the Thorson property, the cooling lake will prevent any further substantial development between the Kankakee River and Lorenzo Road for about three miles east of the GE-MO site. On the west the GE-MO site is bounded by the 2,500 acre Goose Lake Prairie State Park. Thus, except for the park the GE-MO site is almost entirely surrounded by land that is being utilized for industrial purposes. Figure II-1-3 is an aerial photograph of the area.

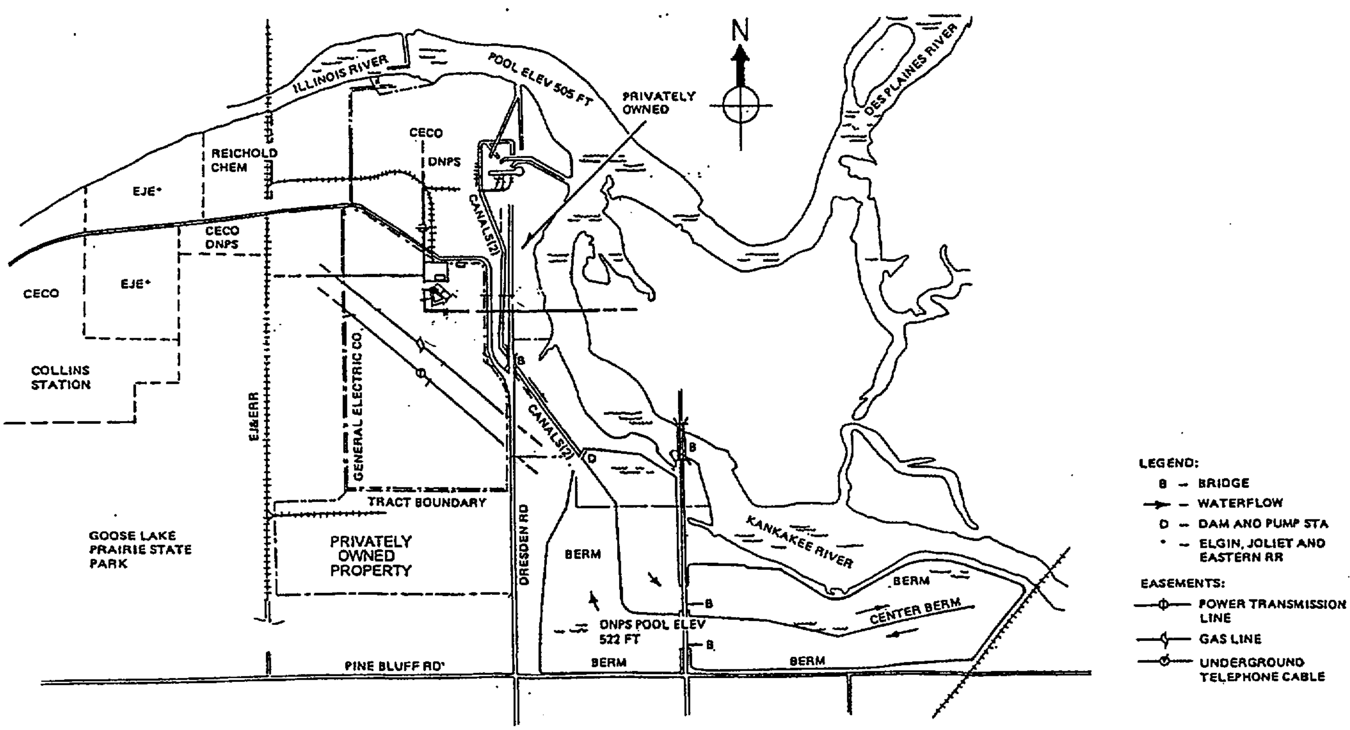


Figure II-1-1. Property Map

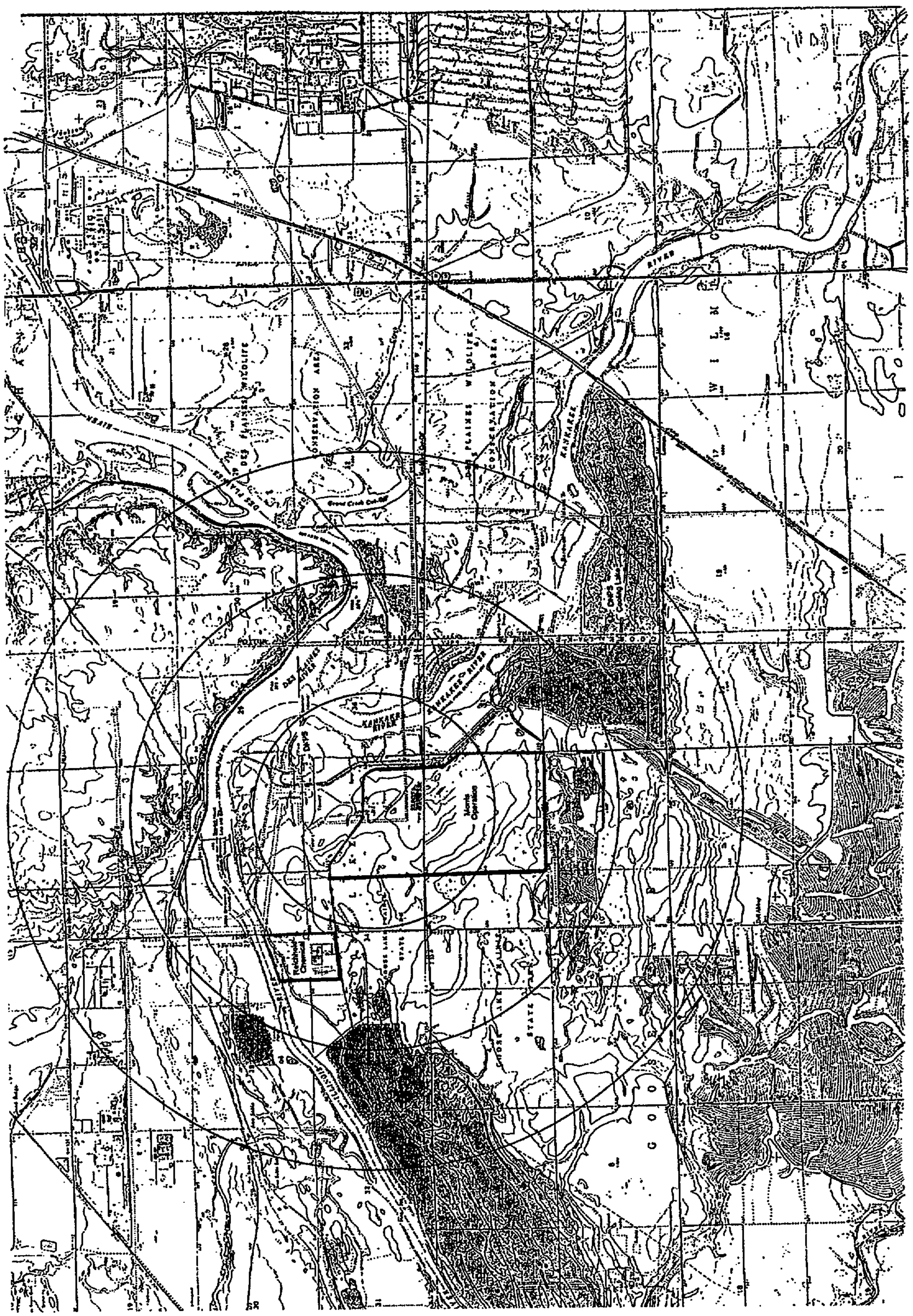


Figure II-1-2. Topographic Map

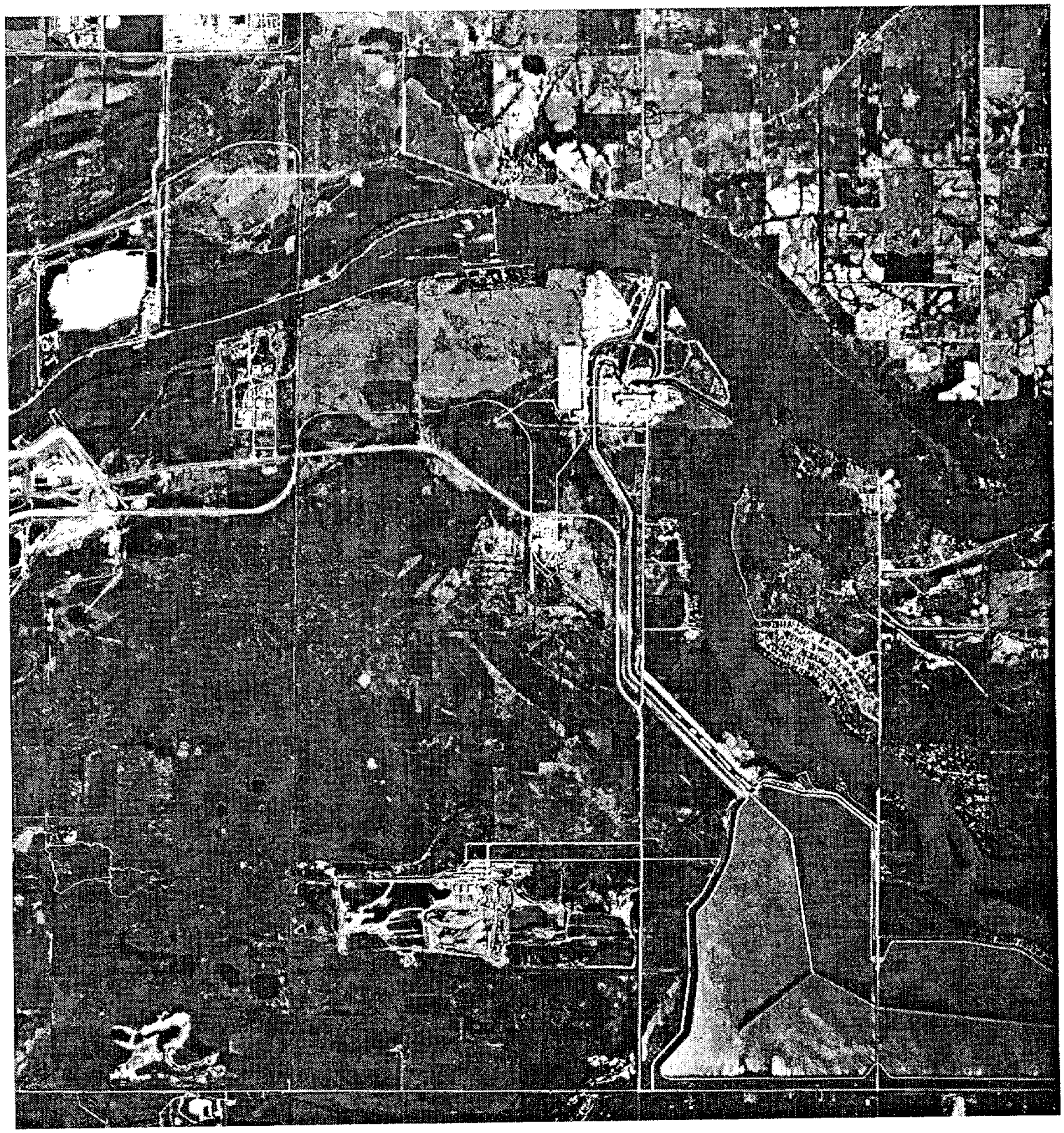


Figure II-1-3. Aerial Photograph of GE-MO and Surrounding Area.

As shown in Figure II-1-4, the GE-MO-DNPS sites are located about 15 air miles southwest of Joliet and about 45 to 50miles southwest of the Chicago, Illinois - Gary, Indiana area. Aurora and Kankakee are located about 25 miles north and southwest respectively of the sites. Morris, the county seat of Grundy County. is located about 7 miles west of the sites. Interstate 55 is about 4 miles east of the sites, and Interstate 80 is about 8 miles north of the site.

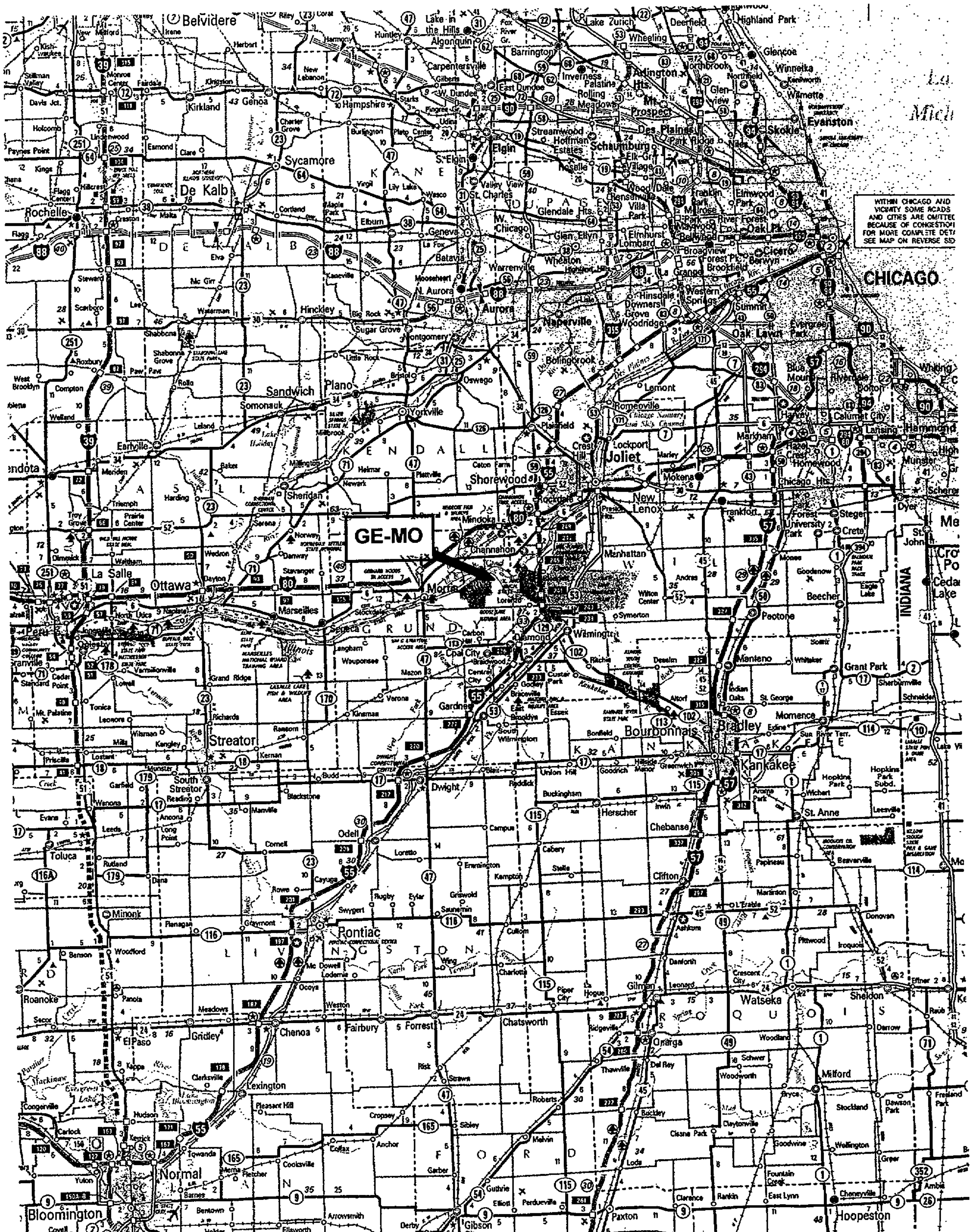


Figure II-1-4. Area Map.

1.2 Description

The GE-MO site consists of approximately 892 acres and is made up of the following parcels:

564 acres of Section 2, Township 33 North, Range 8 East; that is, all of this section except for 50 acres in a 400-foot wide strip along the south edge of the section and a 21 acre portion in the extreme northeast corner of the section for the DNPS Lake intake and discharge canals.

328 acres of Section 35, Township 34 North, Range 8 East; that is, all of this section which lies outside of the DNPS site except for 37 acres in a 525-foot-wide strip along the east edge of the parcel where the DNPS Lake intake and discharge canals are located.

The Main Process Building, Waste Storage Facilities and offices and service buildings are located within a fenced Owner Controlled Area (OCA) near the midpoint of the northern side of the site. The OCA (approximately 15 acres) is fenced with a chain link and barbed wire fence.

1.3 Ownership

The General Electric Company is the sole owner of the entire site of about 892 acres subject to easements which have been granted for power lines, and natural gas lines, as shown in Figure 11-1 -1. The site, as originally purchased by General Electric, totaled about 1,380 acres and included that portion of Section 1, Township 33 North, Range 8 East that was south of the Kankakee River, all of Section 2, Township 33 North, Range 8 East and that portion of Section 35,Township 34 North, Range 8 East that was south of the DNPS site. Since that time approximately 70 acres in the southwest corner of Section 1, Township 33 North, Range 8 East and approximately 50 acres in a 400-foot wide strip along the south edge of Section 2, Township 33 North, Range 8 East were sold to A. P. Green Refractory Co. for use in connection with their clay mining and clay products manufacturing activities in the area. Subsequently, the remainder of Section 1, Township 33 North, Range 8 East and a 525-foot wide strip along the east edge of Section 35, Township 33 North, Range 8 East (37 acres) and extending into Section 2, Township 33 North, Range 8 East for a short distance (21 acres) have been made available to Commonwealth Edison Company for utilization in providing acreage for, and flume access to and from, the DNPS cooling lake. An additional factor affecting site ownership is the contract effective November 3, 1967,between General Electric and the State of Illinois whereby title to that portion of the GE-MO site on which the main process building (and associated waste storage abilities) is located will be transferred to the State of Illinois if required by the United States Atomic Energy Commission as a condition of General Electric's obtaining, retaining or being relieved of an operating license or upon abandonment of the GE-MO site.

1.4 Access Control

Access to the 892 acre GE-MO site is controlled by the General Electric Company. The entire site is enclosed by an agricultural fence with proper posting to keep out unauthorized personnel. The storage basins and related facilities are within the Owner Controlled Area (OCA) which is fenced with 6-foot-high chain link fence topped by multiple strands of barbed wire. Access to the OCA is controlled through gates that are either locked or manned at all times. Further, in conveyance of the parcels, described in Section 1.3 above, provisions have been included for assuring that subsequent utilization and access will continue to be appropriately controlled so that GE-MO safety considerations will not be adversely affected. Commonwealth Edison similarly controls access to the DNPS site and security area. Therefore, both the GE-MO and DNPS sites are considered to be restricted areas.

2.0 PROCESS DESCRIPTION

Process steps utilized in GE-MO are described briefly in the following paragraphs.

2.1 Summary of Plant Data

Design capacity

The principal unit operations making up GE-MO are as follows:

- Fuel receipt and storage: to assure that input material specifications are met and to provide for necessary radioactive decay.
- Radioactive waste treatment: to convert essentially all fission product activity to immobile form for retention in protected storage facilities.
- Process building air treatment: to reduce airborne radioactivity release to the lowest practicable levels and to assure compliance with release limits.

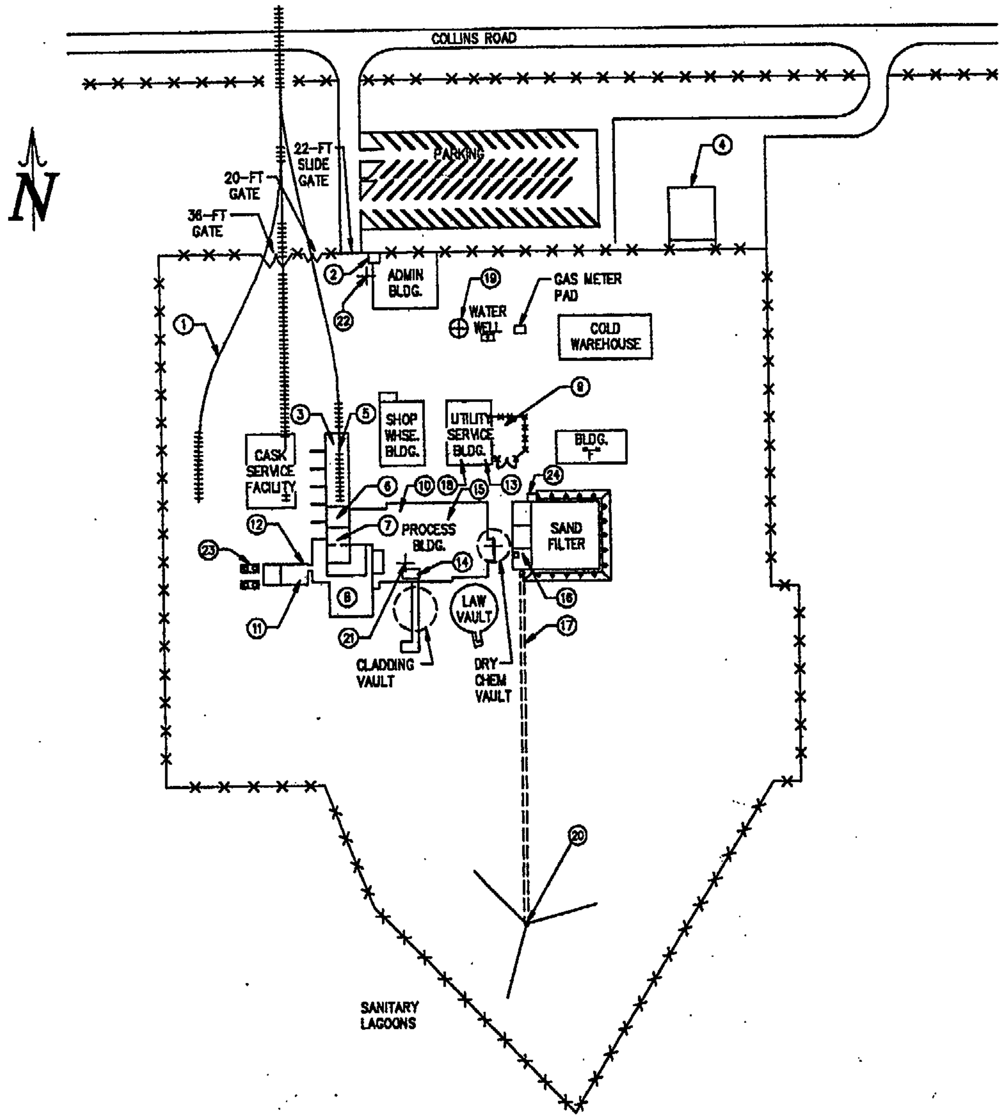
2.2 Fuel Receipt and Storage

Shipping casks containing irradiated fuel were delivered to the main process building by rail or truck where they were inspected, monitored, off-loaded, decontaminated, flushed and lowered into the cask unloading pool by the cask transfer crane. The cask cover was removed and fuel assemblies removed one at a time, placed in specially designed baskets, and transferred to the fuel storage basin by the fuel handling crane. Empty casks were lifted from the unloading pool, decontaminated, and replaced on their vehicles for removal offsite.

3.0 FACILITY DESCRIPTION

3.1 Summary

GE-MO process facilities are enclosed in a 15 acre Owner Controlled Area (OCA) (Figure II-3-1) located near the center of Section 35, Township 34 North, Range 8 East, Grundy County, Illinois. The OCA faces on the county road, known as Collins Road, which bounds the GE-MO site on the north side and separates the GE-MO site from the adjacent DNPS site.



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GENERAL ELECTRIC
MORRIS OPERATION
MORRIS, ILLINOIS

SITE PLAN – PRINCIPAL FACILITIES

Figure II-3-1. Site Plan (Owner Controlled Area)

Facilities are provided for receiving irradiated fuel in shielded shipping casks, transported to the GE-MO site by rail or truck.

After receipt at the plant, all radioactive process material is contained in the main process building. The main process building is located approximately 550 feet south and 300 feet east of the center point of Section 35, Township 34 North, Range 8 East. Site elevation at the main process building location is 532.5 feet above sea level.

In addition to the main process building, facilities within the OCA include a sand filter and emergency equipment building, a general warehouse, a utility and service building, an elevated water tank, a shop and warehouse building, an administration building, and the 300 foot main process stack. Fenced, and adjacent to the OCA are the sanitary lagoons.

3.2 Principal Process Facilities

All equipment and systems for handling radioactive process materials, except for gaseous effluent discharge facilities, are housed in the main process building. This complex structure is 200 feet by 120 feet in plan, and its total vertical dimension is about 140 feet, of which 90 feet extends above grade. Principal elements of this structure that relate to spent fuel storage, are described briefly in the following paragraphs.

3.2 Cask Receiving Area. Inside the security fence, the site rail spur and paved roadways lead to a controlled personnel access area for receipt, inspection, monitoring and transfer of irradiated fuel shipping casks.

It is provided with a 125-ton crane, the travel of which extends into the main process building to service the cask decontamination area and unloading pool. The 50-foot deep unloading pool is designed to accommodate one cask at a time (vertical orientation, top opening), and is provided with an intermediate-level shelf for cask lid storage and for temporary cask placement (to permit use of crane yoke extension). Contamination monitoring and control are the primary important to safety functions and resistance to mechanical damage (earthquake, wind, rail car accident) is the principal structural requirement for these facilities.

3.2.2 Fuel Storage Basins and Transfer Area. Adjacent to the cask receiving area are a 1000 square foot by 30-foot deep and l,500 square foot by 30 foot deep fuel storage basins. Like the unloading pool, they are lined concrete structures below grade and equipped for level control and leak detection. The basin area is provided with a 7½ ton fuel handling crane and a water recirculating system equipped for heat rejection and contamination removal. The baskets into which fuel assemblies are loaded for storage are designed to provide criticality control and mechanical protection. Special provisions are made for contained and vented storage of fuels which are received in a leaking condition or which develop leaks during storage.

Basin capacity is commensurate with the current requirements of Appendix F (Policy Relating to the Siting of Fuel Reprocessing Plants and Related Waste Management Facilities) to 10 CFR

Part 50, but provisions are also made for basin extension or addition of special waste transfer facilities, if required in the future.

3.2.3 Operating Areas. Equipment and systems in the basin area are operated from control points located In the basin, basin pump room, and basin pump room addition. A central control room is provided from which additional functions essential to safe operation and shutdown can be effected. In addition to necessary assurance of radioactive material control and process shutdown capability, designs provide protection against earthquake and tornado conditions for safety-related functions.

3.2.4 Waste Storage Areas. Facilities for onsite retention of low mobility radioactive process wastes, designed to provide multiple confinement barriers and to permit future retrieval for transfer to offsite disposal facilities, are as follows:

Cladding Vault: A 1385 square foot by 72 feet deep cylindrical concrete structure for vented, low temperature storage of low specific activity water of negligible leachability is lined and provided with leak detection and pump-out means. It is located below grade and has been cleaned and emptied. The vault is currently being held available on a contingency basis

3.3 Other Site Facilities

3.3.1 Ventilation Filter and Exhaust System. A large capacity sand filter is housed in a 6400 square foot by 15 foot deep reinforced concrete structure located near the east end of the main process building and connected to it by the below-grade ventilation exhaust tunnel. Air distribution (for upward flow) and filter drainage provisions are located at the bottom of the structure, 6 feet below grade. The remaining volume contains 4.5 feet of sand, in graded layers. Between the sand filter and the main process building (adjacent to the filter structure) is a reinforced concrete enclosed area which houses the ventilation exhaust fan, gas monitoring, emergency generator, switchgear and air compressor systems. Structural requirements for these facilities and enclosures specifically include resistance to earthquake and tornado forces.

3.3.2 Main Process Stack. The 300-foot high main process stack for elevated release of offgases and ventilation air is located approximately 300 feet south of the exhaust fan enclosure and Is connected to it by a horizontal duct at grade level. The stack is an all-welded unit, stainless clad on the inside, supported by external guys. It Is capable of withstanding specified earthquake forces and design wind conditions. It Is not designed to withstand full tornado wind velocities without damage,. but provisions are made for assuring that stack failure under such conditions would not result In undue risk to public health and safety. The stack is located 950 feet south and 410 feet east of the center point of Section 35, Township 34 North, Range 8 East. Further, the main process stack is about 0.8 miles from the DNPS reactors and about 0.5 miles from the nearest unrestricted area.

3.3.3 Water Supply System. A 788 foot deep well with a 100 gpm pump and a 50,000 gallon elevated storage tank are located in the OCA to provide, through necessary treatment and distribution facilities (1) demineralized make-up water for the fuel storage basins and closed-loop basin filter and cooling systems, (2) potable water for the sanitary water system, and (3) water for fire fighting.

3.3.4 Utility and Service Facilities. A 3500 square foot single-story high bay building of conventional steel frame and insulated panel siding construction is located on a grade-level slab foundation near the main process building to house utility and service systems. Facilities are arranged as follow:

- Utilities Area: Contains (1) a process water demineralizer system, (2) primary electric power supply switchgear, (3) operations office, (4) first-aid and training rooms.
- Service Area: Contains (1) rad safety offices, (2) a lunch room, and (3) a change room.
- Outside Area: Adjacent to the building are (1) the terminal structure for incoming transmission lines, in a fenced enclosure, (2) a meter station for the site gas supply, and (3) underground distribution facilities.

3.3.6 Maintenance (F) Building Facility. A 3100-square foot insulated siding and steel frame building on a grade-level slab foundation is provided to house a maintenance machine shop, welding area, wood shop and paint storage room.

3.3.6 Nonradioactive Waste Disposal Facilities. Three separate systems are provided for disposal of nonradioactive liquid wastes as follows:

Sanitary Sewer System: Equipment for disposal of sanitary wastes from site change rooms and lavatories includes (1) underground lines and lift stations for collection and routing through a comminutor to a sewage treatment system located 600 feet south of the main process building, (2) two 20,000-square foot clay-lined lagoons enclosed in fencing and equipped with inlet and outlet controls to permit either series or parallel operation, and (3) facilities for routing lagoon overflow into an overflow lagoon. None of these lagoons have a discharge to the environment.

3.3.7 Warehouse and Shop Facilities. A 3700-square foot insulated siding and steel frame building on a slab foundation is located near the main process building for storage of materials requiring fire protection and to house shop facilities required in support of plant operation. In addition, a 5000-square foot general warehouse building of uninsulated siding and steel frame construction is located within the OCA for storage of operating supplies and materials.

3.3.8 Administration Building. A single-story, 4200-square foot building of steel frame and insulated siding construction is located on a grade-level slab foundation at the entrance to the Owner Controlled Area. In addition to office facilities, a guard station is located in the foyer of the building for control of road, rail and pedestrian access to the OCA.

4.0 EFFLUENT AND WASTE SOURCES AND CONTOL SYSTEMS

4.1 Source Identification

GE-MO Is designed to have a minimum Impact on the immediate environment and to have no adverse impact on any area beyond the 892 acre site, which is owned and controlled by General Electric. From the beginning of initial planning for GE-MO, considerable attention has been focused on assuring containment and confinement of radioactive materials within the building and vault structures and to reducing potential pollutants in the waste streams to the lowest practicable quantities. Thus there are multiple containment barriers between the environment and radioactive materials in storage on the site, and there is no direct burial of radioactive materials on the site. There are no potentially radioactive liquid wastes discharged from GE-MO and only insignificant quantities of potential pollutants are discharged in the gaseous effluents. The principal sources of effluents and wastes are summarized below.

4.1.1 Building and Structure Sources

There are no discharges of wastes directly from processing and storage structures. However, radioactive materials are contained and confined within them and, thus, could represent a potential for leakage of pollutants to the environs. All structures are designed to prevent leakage and, in the unlikely event a leak should occur, are equipped with provisions to detect and remove such leakage. The buildings and structures, described in Section 11.3-0, include:

Fuel Storage Basins - For receipt and storage of irradiated fuel. Both basins are water filled to provide required cooling and radiation shielding.

Cladding Vault: A 1385 square foot by 72 feet deep cylindrical lined concrete structure for storage of low specific activity water. The vault is currently empty and being held available on a contingency basis

4.1.2 Gaseous Effluent Sources

The sources of gaseous effluents which potentially contain radioactive and/or non-radioactive materials include:

Main Process Stack - The building ventilation air exhaust plus process offgases containing Kr-85, tritiated water vapor, and radioactive particulates are discharged from the stack.

Diesel Generator Exhaust - Discharge exhaust gases from the 815 hp diesel engine which drives the stand-by electrical generator. This engine normally Is operated for about one hour per month for reliability testing. The only other occasions of operation would be during an actual termination of off-site power supplies.

4.1.3 Liquid Effluents

There are no liquid effluents discharged from the GE-MO site.

4.I.4 Solid Wastes

Solid wastes, either radioactive or contaminated with radioactive materials, generated at GE-MO include:

Operating wastes such as broken glassware, swipes, absorbent materials, clothing, etc., which will be packaged and shipped to an authorized disposal site.

Failed Equipment, which will be decontaminated, packaged and shipped to an authorized disposal site.

4.2 Confinement and Control Systems

4.2.1 Buildings and Structures

To assure the confinement and containment of radioactive materials, multiple, high-integrity barriers are provided between radioactive materials which are in storage and the environs.

These barriers are provided with means of detecting and removing any materials which may leak from the radioactive systems toward the environs and, conversely, any near surface ground water which might have a tendency to leak from the environs into the facility. Thus, a high degree of assurance is provided that there will be no inadvertent leakage of radioactive materials outside the confinement structures or ultimately into ground water supplies.

Additionally, no radioactive materials will be buried directly on site, for the same reason of preventing radioactive contamination of the GE-MO site outside the confinement structures.

These facilities are all designed to maintain their integrity, even under such adverse natural phenomena as earthquakes and tornadoes. Thus, even in the unlikely event of such an occurrence at GE-MO, there would be no release of radioactive materials to the environs as a result of equipment or facility failures. The specific features of the buildings and structures are described below.

Main Process Building

The primary system which is relied upon to provide confinement of the radioactive materials in process is the process equipment and piping. This equipment is fabricated from stainless steel or other corrosion resistant materials to rigorous quality standards to provide the requisite integrity. The building provides additional confinement barriers, and is a reinforced concrete structure set in bedrock.

Fuel Storage Basins

The primary confinement barrier for the irradiated fuel in the fuel storage basins is the fuel cladding, and even the fuel pellets since they are essentially insoluble in water. However, provisions are made for isolating fuel assemblies, in the event that a fuel assembly is found to be causing an increase In the radioactive material concentration In the basin water.

The second barrier is the basin water which is maintained at a low level of radioactive contamination by use of a circulating cleanup system. Thus, by monitoring the basin water any leakage from the fuel or high-level wastes would be detected at concentrations well below those at which any significant hazard would result, there by permitting early corrective actions to be taken.

The final barriers are the basin stainless steel liner and reinforced concrete structure. As with other liners and structures, the space between is equipped with means of leakage detection and removal, thus assuring isolation of the radioactive materials from the environs.

Cladding Vault

The vault is located below grade and is a stainless steel lined, reinforced concrete structure provided with leak detection and removal equipment necessary to prevent the escape of any radioactive materials from the vault. The vault is empty and is being held in reserve on a contingency basis.

Low-Activity Waste Vault

The vault is empty and piping to it has been cut and capped. No further use of this vault is anticipated.

Dry-Chemical Vault

The vault is empty and cleaned, piping to it has been cut and capped and no further use of this vault is anticipated.

4.2.2 Gaseous Control Systems

Main Process Stack

The principal means of reducing and controlling potential emissions from GE-MO is the building ventilation system. The principal source of potential emissions originates in the fuel basins and from the canyon area which are vented and maintained at a negative pressure to prevent by passing the treatment system. The building ventilation system maintains pressure differentials required to maintain control of radioactive materials movement between areas of the building and provides for final filtration of gases leaving the process building prior to discharge from the main steam stack. This system is further described below.

Building Ventilation System

The building ventilation system, is a once-through system In which air enters the building In occupied zones of no contamination and moves progressively through the building into zones of potentially higher contamination. The air flow through the building is controlled by maintaining pressure differential between zones of differing potential contamination levels, so the zone in the building with potential for the highest degree of contamination is at the lowest pressure, thus assuring that leakage from surrounding areas is always into this area of the building. Thus, generally, air flow through the building Is from occupied areas Into maintenance areas and, finally, into the canyon and cell areas where air is discharged into a common exhaust ventilation air tunnel.

- Air Supply: Facilities are provided for supplying filtered and heated air to the building. The protected inlet point is located so as to minimize potential for recycle.

- Cold Areas: Ducting and controls are provided for routing fresh air from the supply plenum to various personnel occupancy zones (process control room, offices, operating stations, etc.) at above atmospheric pressure. Air conditioning is provided in local areas as required. Control room ventilation is designed to maintain positive pressure in respect to surrounding zones and to provide assurance of safe occupancy under all conditions. Flow paths through the building are designed so the personnel entrance and access control lobby is at atmospheric pressure and that all potentially contaminated areas of the building are at negative pressure with respect to the atmosphere.

- Zones of Low Contamination Potential: Where radioactive materials of limited specific activity and/or low mobility may be present, building structure (usually panel siding on steel frame) is sufficiently sealed for confinement of ventilation air and provisions are made for controlling relative pressure to assure that any leakage is toward zones of higher contamination potential. The fuel storage basin area is equipped for monitoring and exhausting of ventilation air to prevent gases released by damaged fuel from causing excessive exposure conditions and from migrating to cold zones or outside the building; hooded storage and offgas collection facilities are provided for identified leakers.

- Zones of High Contamination Potential: Process vent systems are provided to conduct radioactive gases and vapors from canyon areas into the ventilation air exhaust tunnel.

- Exhaust System: The building ventilation air exhaust tunnel is a protected duct leading directly to the final sandfilter and exhaust fan system through which all process offgases and building air are routed. It is equipped with gas stream monitors near the entrance to the sand filter and near the exhaust fan discharge.

All gaseous effluents from the building are discharged into the ventilation air tunnel and subsequently passed through a deep bed sand filter, Figure 11-4-3, prior to being monitored and discharged from the 300-foot high main process stack. The deep bed sand filter was chosen to provide a high efficiency filtration system with sufficient ruggedness to maintain its operating efficiency over the range of normal and abnormal conditions which possibly could be encountered during the lifetime of GE-MO.

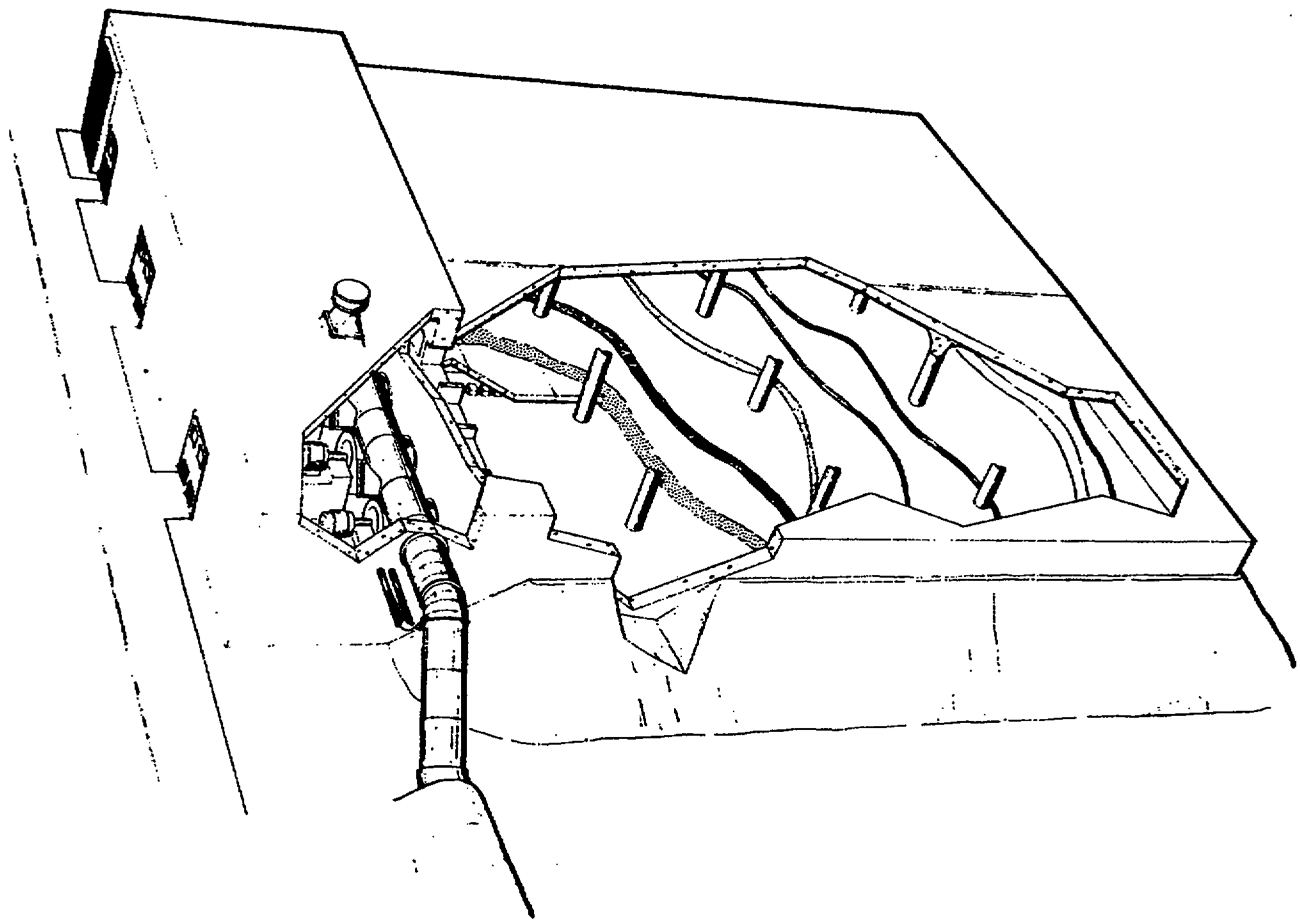


Figure 11-4-3. Sand Filter Cross Section

4.2.3 Liquid Wastes Control Systems

As previously Indicated, there are no liquid wastes from GE-MO which could potentially contain radioactive materials of process origin.

Further, there are no discharges of cooling water to the environs. This is a recirculating system also. The cooling water system use heat pumps and freon to water heat exchangers to dissipate the basin water required heat to the atmosphere. In this system, there are double barriers between hot and cold systems such that a single failure would not result in a breech of containment, with the resultant potential for release of radioactive materials to the environs.

There are no liquid effluents from the GE-MO

4.2.4 Solid Wastes Source Control

The potential environmental impact of wastes stored at GE-MO is minimized by reducing the wastes to solid, immobile forms and storing them in high integrity containers (HIC) that effectively preclude their release to the environs. Thus, beyond the effects of the storage structures, there is essentially no environmental impact from stored wastes. Principal provisions of the waste immobilization process are described below.

Low-Activity Wastes

The low-activity wastes are evaporated to a saturated solution in the main process building before being pumped to the rad waste HIC . The remaining liquid which has not solidified is recycled to the low-activity waste evaporator. The steam is released to the air tunnel, and the evaporator bottoms are collected in approved drums for shipment to approved off-site disposal facility.

5.0 SHIPMENTS

Shipments of radioactive materials to and from GE-MO are made in containers approved and licensed by the NRC and the United States Department of Transportation (DOT). Such shipments will be made by rail, truck and possibly, barge.

All containers utilized in shipping these materials are licensed by the NRC and DOT and, as such, must perform satisfactorily under all normal shipping conditions, including a range of temperatures from -40°F to +130°F and, in addition, must be capable of providing adequate containment of radioactive materials under specified accident conditions. These accident conditions include a 30-foot free fall onto a completely unyielding surface, followed by a 40-inch drop onto a six-inch diameter pin, followed by 30 minutes of 1476°F fire, followed by 24-hour immersion in water. With the safety conditions built into these containers, there is essentially negligible possibility the public would ever be exposed to radioactive materials escaping from these containers even in the event of a serious transportation accident.

5.1 Irradiated Fuel

Incoming shipments were principally irradiated fuel arriving from reactors located throughout the United Stated. Their radiated fuels were shipped in heavily shielded containers (casks) similar to that shown in Figure 11-5-1. The casks were shipped in the horizontal position as shown in Figures 11-5-2.

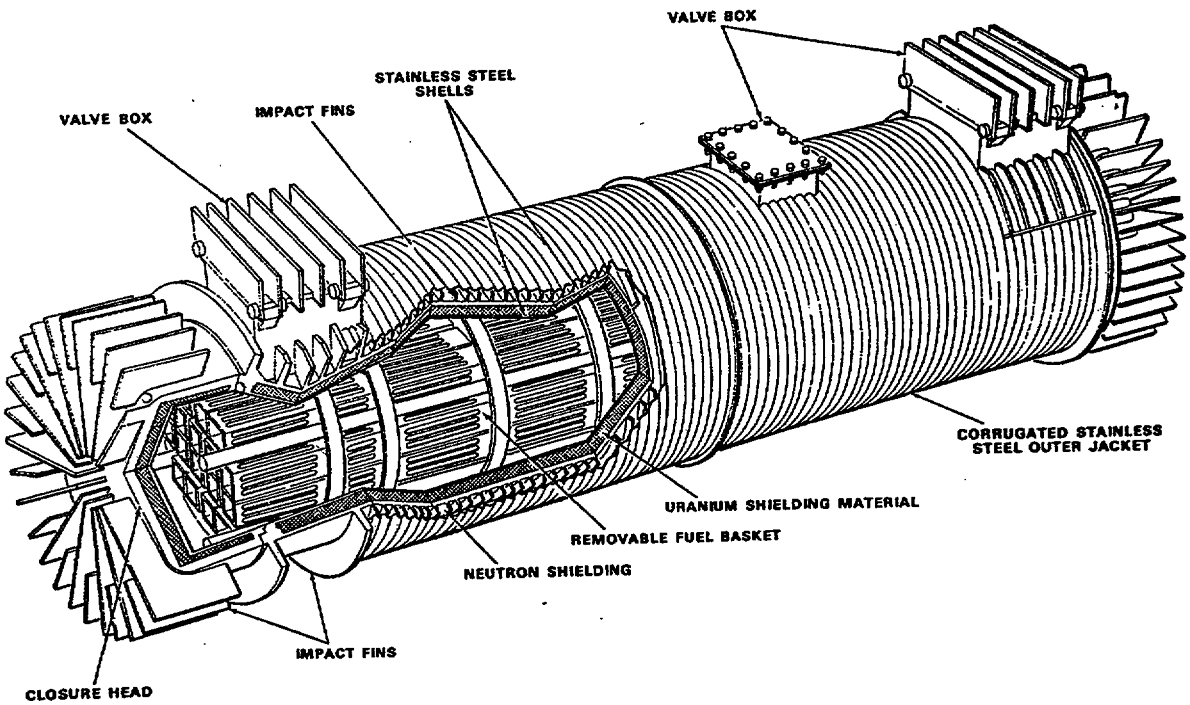


Figure 11-5-1. IF-300 Spent Fuel Shipping Cask

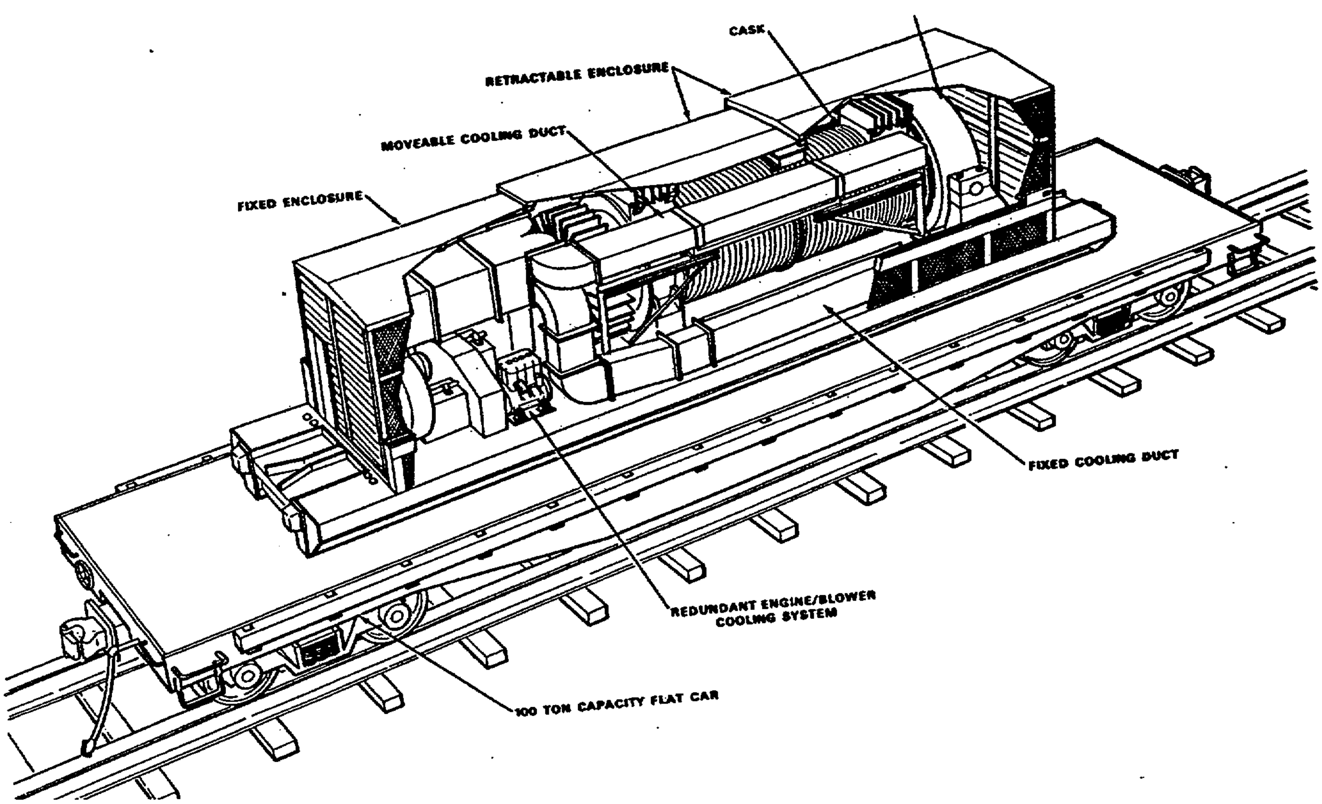


Figure 11-5-2. IF-300 Spent Fuel Shipping Cask Mounted on Transport Railcar.

5.2 Recovered Products and Wastes

The principal shipments from GE-MO are packaged miscellaneous wastes shipped to off-site disposal areas. Additionally, at some future time, the spent fuel likely will have to be shipped to a federal repository for permanent storage.

There are no standard containers for the miscellaneous wastes and due to the low radioactivity concentration, the containers require little or no shielding. When the high-level wastes are shipped to an offsite repository, casks very similar to the irradiated fuel casks will be used.

III ENVIRONMENT IN THE AREA

1.0 POPULATION AND LAND USAGE IN ADJACENT AREAS

As indicated previously, GE-MO is almost completely surrounded by industrial and recreational sites and is in the industrial area that is developing along the Illinois Waterway. There is some residential development, but the uses are predominantly industrial, recreational and agricultural.

1.1 Population Distribution

Population within a 5 mile radius of GE-MO is approximately 14,700. The largest village in this zone is Channahon (population 5,256) located about 4 miles to the northeast of GE-MO.

The total population within a 10-mile radius is about 63,900. The largest town in this area is Morris, the county seat of Grundy County, with a population of about 10,300. A substantial increase in the population within this radius is not likely in the foreseeable future.

The population in the 10-25 mile zone is estimated to be 319,700. There are two population centers within this zone, the closest being Joliet, centered 14 miles northeast of GE-MO, with a population of about 84,000. The city of Aurora (population 101,000), 25 miles to the north (in the southeastern corner of Kane County) comprises the other population center. By 1980 it is estimated, on the 35% growth pattern in the 1960-1970 census interval, that population of the 10-25 mile zone will have increased to approximately 450,000. Present knowledge of projects and planning for this area does not indicate the growth rate will significantly change in the next 5 years. Estimates beyond 5 years for a local area of this size are not considered reliable.

Studies by Commonwealth Edison's Industrial Development Department indicate that since 1946, 82% of the new industries locating on the Commonwealth system located within 25 miles of downtown Chicago. In 1965, 80% of the new industries also located according to this pattern, indicating the growth pattern is continuing. Thus, growth of the area adjacent to GE-MO outside this area should continue at relatively low rates. The Joliet and Aurora areas are the closest that will likely see substantial population increases.

1.2 Residential

Residential occupancy in the immediate vicinity of GE-MO continues to remain low. There is a cluster of about 30 cottages, known as the Thorsen cottages, on the west shore of the Kankakee River, about 0.7 mile from the GE-MO stack. These are located on a tract of about 50 acres adjacent to the GE-MO site, between the Dresden Access Road and the Kankakee River. The owner, whose permanent residence is on this tract, has divided his river front property into cottage sites and has written leases of 10 or more years with approximately 25 individuals who have subsequently improved their lease holds, largely for recreational purposes. In exploring the possibility of acquiring this tract for incorporation into the GE-MO site, it was found that the owner had no interest in selling on the basis that the property is essential to his plan for long range continued income. This Is the only tract of land immediately adjacent to GE-MO that provides access to the river and therefore is particularly desirable for such development. Thus, any immediately adjacent residential development would be limited to that tract which should be nearing saturation.

In addition, there is a similar group of cottages on the east bank of the Kankakee River, almost all of which are located at a distance of greater then I mile from the GE-MO stack. Some of the homes in this area are permanent residences, although most have been developed for part-time recreational purposes. Surveys by Commonwealth Edison indicate that within 2-1/2miles of the DNPS site there are a total of 129 permanent homes and 191 part-time recreational cottages along the Kankakee River. Figuring 3.5 occupants per home, this represents 462 permanent residents and 669 part-time or temporary residents.

Other residences In the area include several residences at the Dresden Dam about 1.2 miles north of the GE-MO site, and a few homes on top of the bluffs on the opposite shore of the rivers about 1.6 miles to the northeast. There appear to be no major residential centers developing south of the Kankakee and Illinois Rivers in the vicinity of GE-MO.

1.3 Industrial

GE-MO is adjacent to several industrial sites and is generally in a developing industrial area along the Illinois Waterway. However, most of the suitable industrial sites are already developed and Goose Lake Prairie State Park occupies most of the remaining land south of the river. Most is north of the Illinois River at a distance of over one mile from GE-MO.

In addition to DNPS immediately to the north and the closed A. P. Green Refractary Company's clay products plant immediately to the south, other industry in the area includes the Reichold Chemical Plant about 1-1/2 miles northwest, the Rexall Chemical Plant and Mobil Refinery along Interstate 55 about 4 miles east.

1.4 Agricultural

There is no land suitable for large scale farming operations within two miles of GE-MO. There is some farming permitted on the GE-MO site. There are no dairy herds within this radius, with the closest ones being about 3 miles to the north. Most farming operations raise corn and grains. There are a few home gardens, but there is no large scale truck farming in this area. There are some truck farms located near Plainfield and Joliet.

1.5 Recreational

Principal recreational activities in the area include Goose Lake Prairie State Park and boating, hunting, and fishing. Most of these activities involve the Kankakee River, Heideke Lake and the finger lakes left from earlier strip mining operations

There is one small finger lake about 2-1/2 miles south of GE-MO but the nearest lakes on which some houses are being built are located about 3-1/2 miles southwest of GE-MO. Many of these houses are solely for recreational purposes and thus are occupied only part-time.

In addition, the Des Plaines Wildlife Conservation Area (~2500 acres) occupies much of the land between the Kankakee and Des Plaines Rivers in the area between GE-MO and I-55. The Goose Lake Prairie State Park adjoins GE-MO on the West and extends for about 2-1/2 miles. The park was established to preserve the virgin prairie plant life that exists in the particular location. There are a few state parks along the river; the nearest ones being at Channahon, about 4-1/2 miles upstream and at Morris, about 7 miles downstream.

1.6 Transportation

One of the principal factors in the selection of the GE-MO site was the ready availability of excellent rail and highway access to all parts of the United States and water transportation that could be developed if required in the future.

Highway access is gained via the paved county road, known as the Dresden Access Road, extending south from the DNPS site alongside the GE-MO site and intersecting several other paved county roads which connect with several state highways as shown in Figure II-1-4. Lorenzo Road which runs in an east-west direction approximately 1 mile south of the GE-MO site boundary provides access to Interstate 55 approximately 4 miles east of the site. Interstate 55 is a limited access highway between Chicago and New Orleans. Another limited access highway, Interstate 80, which traverses the state from east to west, is approximately 5 miles north of the site and is accessible either from Interstate 55 or from a state highway, Illinois 47, at a point approximately 2 miles north of Morris, Illinois, as shown on Figure II-1-4.

Railroad access to the site is provided by a siding from the Elgin, Joliet and Eastern (EJ&E) Railway through the DNPS site. The EJ&E Is a belt line which circles Chicago from near Wisconsin on the north to Indiana on the east and connects with every major railroad serving Chicago. From the connections. there Is direct rail service to all parts of the United States.

Also the Illinois Waterway, one of the major inland waterways, is adjacent to the DNPS site. An agreement with Commonwealth Edison provides for access to the Illinois Waterway through the DNPS site such that facilities for boat docking and access roads to the waterway can be developed at some future time.

There no airports within 8 miles of the site and the closest major airports are Chicago O'Hare International Airport and Chicago Midway Airport situated approximately 50 and 40 miles, respectively, to the north and northeast of the site.

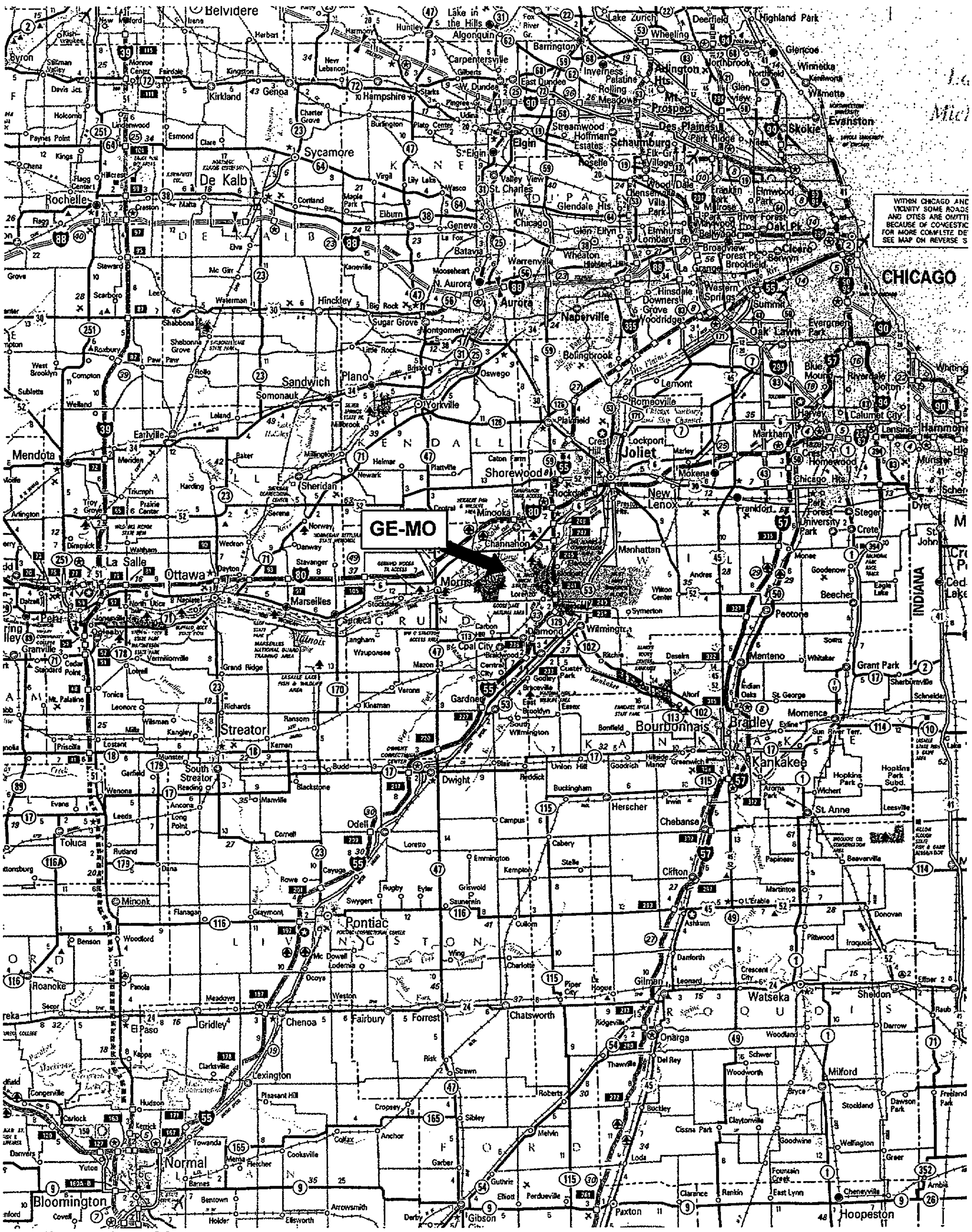


Figure II-1-4. Area Map.

2.0 HISTORY

An evaluation has been made to determine historical sites in the area. The latest National Register of Historic Sites lists five historic sites in Grundy County. The Coleman Hardware Company Building; Mazon Creek Fossil Beds; Morris Wide Water Canal Boat Site; White and Company's Goose Lake Stoneware Manufactory and White and Company's Goose Lake Tile Works. There is only one site listed for Will County which is the towpath and locks on the old Illinois and Michigan Canal In the Channahon State Park.

There are no known local historical sites on the GE-MO Site with the possible exception of an old stone fence, which borders a portion of the road between the GE-MO and Dresden sites. The librarian in Morris indicated that there are some sites in the vicinity of Morris which are considered to be of some local historical interest. The locations identified include the Grundy County Jail, built in 1876; the Gebhard Brewery, built in 1866; Chief Shabonna's grave; the Governor's Mansion built about 1870; the Hough Log Cabin; and the Illinois and Michigan Canal, located on the opposite side of the Illinois Waterway from GE-MO.

3.0 GEOLOGY

Studies of the geology of the GE-MO site were made by Dames and Moore, Consultants in Applied Earth Sciences, Soikl Mechanics, Engineering Geology, Geophysics in support of the construction permit application. Five borings were made and the overburden removed from the bedrock in 17 locations in the vicinity of the GE-MO site. Additional investigations made in the immediate vicinity of the plant structures included 20 test borings to depths ranging from 20 to 103.5 feet below the existing ground surface and 55 additional shallow test borings to depths ranging from 1 to 7 feet to define the upper surface of the bedrock at the sites.

These studies were performed to supplement the previous studies performed by Dames and Moore for DNPS. In support of the DNPS Units 2 and 3 Construction Permit applications, previously available geological and associated data and reports for the Dresden area were reviewed, additional background data were collected, and a field reconnaissance of the area was performed by a geologist. The results of the 69 previous borings on the DNPS site were studied, and two additional test borings to an approximate depth of 100 feet were made in March 1965, in the immediate area of the DNPS Unit 2 principal structures.

Samples of the overburden soils and continuous cores of the underlying rock were obtained. Representative cores of rock were subjected to unconfined compression tests. Previous tests in the area for DNPS included density tests and laboratory dynamic tests to evaluate the compressional wave velocity and the shear modulus of the various rock strata encountered. Using small explosive charges, tests were performed in the DNPS test borings to measure the in-place compressional wave velocities of the various strata present.

The generalized geologic column for the site consists of an upper layer of Pennsylvanian Pottsville sandstone and Ordovician Maquoketa Divine limestone of variable thickness. Next below is a layer of Maquoketa dolomitic shale. The Ordovician system has a total thickness approaching 1000 ft, with the Cambrian system next below. Brecciated rock is found in some cross sections and is indicative of ancient faulting. The geologic evidence indicates that these faults are inactive.

Laboratory tests showed that unconfined ultimate compressive strength on boring samples ranged from 2,000 to15,000 psi on most samples. Laboratory wave velocity propagation tests showed 4,000 to 15,000 ft/sec, and the field tests in the two borings were generally consistent with the laboratory findings.

In summary, it may be said that the favorable geological characteristics of the site, which were previously studied and determined to be suitable for DNPS, have been confirmed by the studies and site excavation. The load bearing capability of the rock formation is significantly in excess of that necessary for the support of the structures. The topographic (elevations) characteristics of the GE-MO site, particularly at the location of the plant, preclude possible movements (slides) either of the plant structures or earth slides from adjacent higher elevations onto GE-MO.

There are no known mineral deposits of value on or under the GE-MO site. There were some clay deposits of value on the original GE-MO site, but they were sold to the A. P. Green Refractory Company for use in their clay products business.

4.0 HYDROLOGY

There will be no discharge of potentially radioactive liquid wastes to the nearby rivers or to the ground, and there will be no storage of liquid high level wastes in underground tanks at the GE-MO site. Therefore there will be no effects on either ground or surface waters in the vicinity as a result of operation of GE-MO. However, sub-surface water conditions have been evaluated to assure that potential seepage Into MFFTP below grade structures will not affect waste storage integrity monitoring and control provisions adversely.

4.1 Surface Water

The sites at the confluence of the Des Plaines and Kankakee Rivers are at the location considered to divide the upper and lower parts of the Illinois River System. The normal pool elevation controlled at the adjacent Dresden Island Lock and Dam is 505 feet, with a maximum historical flood elevation of 506.4 feet. Nominal ground elevation is 530 feet at the location for the principal structures of GE-MO, which renders the probability of site flooding remote. Spillway capacity at the Dresden Island Lock and Dam is well in excess of the estimated maximum instantaneous flow of the Illinois River(100,000 ft^3 /sec based on the assumption that maximum flows for all contributory streams occur simultaneously). The site elevation is well above the vast valley storage area upstream from the dam. The flow of the Illinois River at Marseilles, Illinois is 3,000 cfs or greater 98% of the time. The minimum flow of the Kankakee River at Wilmington, Illinois is about 500 cfs.

The principal usages of the water of the Des Plaines River below Lockport and the Illinois River are for navigation, sewage disposal and dilution, and condenser cooling water for power plants. At and below Peoria, 110 miles downstream, the Illinois river is also used for domestic water supply. The Kankakee River is not navigable above the GE-MO site and is used for domestic water supply.

Commonwealth Edison has built a 1275 acre cooling lake just east of the Dresden Access Road and the intake/discharge flumes for the lake are located on the eastern edge of the GE-MO site. The lake is confined by an earthen fill dam with the top of the dam at an elevation of 527 feet. The elevation of the lake is about 522 feet. The lake has not had any adverse effluents on GE-MO, and none are anticipated.

4.2 Ground Water[1]

Ground water resources in northeastern Illinois are developed from four aquifer systems: (1) sand and gravel deposits in the glacial drift; (2) shallow dolomite formations mainly of the Silurian age; (3) Cambrian-Ordovician aquifers of which the Ironton-Galesville dolomite and the Galena-St. Peter sandstones are the most productive formations; and (4) the Mt. Simon aquifer consisting of sandstone of the Mt. Simon and lower Eau Claire formations of the Cambrian age. In the vicinity of the GE-MO site, the glacial drift thickness ranges from none with outcropping of bedrock to at most a few feet of drift and there is no evidence of the Silurian dolomite. As a result, ground water in the vicinity of GE-MO is drawn from the Cambrian-Ordovician aquifers.

The glacial drift in this area is underlain by the Pennsylvanian-Pottsville sandstone and/or the Ordovician-Divinelimestone. Beneath these formations and directly over the Cambrian-Ordovician aquifers is a layer of Ordovician-Maquoketa shale approximately 65 ft thick. The top of the Cambrian-Ordovician aquifers at the GE-MO site is approximately 100 to150 ft beneath the surface and the peizometric surface of the Cambrian-Ordovician aquifers is also about 100 ft. below the surface. This provides further assurance that operation of GE-MO will not affect ground water supplies in this region.

The major source of near-surface ground water in the area is from rainfall which seeps down through the alluvial overburden and upper strata of weathered and fractured rock to collect over relatively impermeable areas (clay seams, underlying shale) at elevations above the regional aquifer which is well below the deepest M F RP below-grade structure.

[1]Suter, Max, et al., "Ground Water Resources of the Chicago Region, Illinois, "Cooperative Ground Water Report No. I -1 959, State WaterSurvey-State Geological Survey

5.0 TOPOGRAPHY

The GE-MO site is located in typical "rolling prairie" Illinois terrain. The only major topographic Influence in the area, meteorologically speaking, is Lake Michigan, located 45 miles to the northeast and is considered to have an insignificant effect on the site climatology.

The only potentially significant topographical features around GE-MO are the Dresden Heights, located north of the Des Plaines River, about 1-1/2 miles northeast of the GE-MO main process stack. These bluffs rise to an elevation of 630 feet, compared to the elevation at GE-MO of 530 feet. Since the GE-MO main process stack extends 300 feet above grade, perturbation in the flow of the plume over the bluffs located some 1-1/2 miles away would be quite small. At worst, concentrations on the bluff would be those experienced from a 200-foot stack. It is unlikely that such an effect would be experienced since air flow over obstructions is only partially compressed, and tends to follow the profile of the obstruction. For the analysis provided here, an effective stack height of 250 feet was used to calculate the concentrations on the bluff.

These bluffs are the only significant topographical features near GE-MO or, in fact, in most of northern Illinois. The only other topographical disturbances in the area are spoil piles remaining from abandoned strip mines. These are located farther from the site and are not as high as the bluffs. The highest topographical elevation in Illinois is Charles Mound, elevation 1241 feet, located on the Illinois-Wisconsin border. Average state elevation is 600 feet and, according to Encyclopedia Americana, slopes at the almost imperceptible rate of one foot in 2,000 feet.

6.0 CLIMATOLOGY AND METEROLOGY

6.1 Temperature Range

The maximum temperature In the area, based on Argonne National Laboratory data (June 1949 to June 1956) Is 97°F, and the minimum temperature Is -19°F

6.2 Precipitation

Normal annual precipitation in the area is 33.18 inches with a maximum recorded in a 24-hour period of 6.24 inches. The average annual snowfall since 1929-1930 is 37.1 inches with a maximum of 77 inches recorded in the winter of1969-1970.

6.3 Wind Direction and Velocity

Annual wind frequencies show a rather uniform distribution of wind direction. The most frequent wind directions are from the west and south sectors (22 ½ degrees). Average wind speed at the 300-foot level is about 15 mph and at the125-foot level is about 11 mph. These observations are based on 1968 data taken from the site meteorological tower. Maximum wind velocity reported in the area of the site is 109 mph, unofficially reported at Joliet on April 3, 1956 and on April 30, 1962 (official weather bureau closed in 1952), as the fastest gust during heavy thunderstorms and scattered tornadic activity. The fastest wind reported at various locations in the site area is 87 mph at Chicago and 75 mph at Peoria.

Design of all plant structures to withstand the effects of 110 mph wind velocities provides assurance that the GE-MO can maintain safe operation under sustained wind loadings more severe than is expected during the life of the plant.

6.4 Diffusion Characteristics

Hourly wind direction variability at the site shows that an average direction range (angular change in direction) is 120 degrees in a 1-hour period, for all wind speed conditions combined. During 0-3 mph wind speeds, the average range indirection is 100 degrees. Approximately 87% of the time when the wind speed is 0-3 mph (or 98.3% of all wind speeds) the wind direction range is 60 degrees or more, which corresponds to a value of the diffusion parameter of 20 degree-mph or 0.16 radian-meters/second.

It is concluded, from a meteorological standpoint, the site is suitable for the combined operation of GE-MO and DNPS. Environmental surveys of the site and surrounding areas conducted by Commonwealth Edison, Argonne National Laboratory, and the state of Illinois demonstrate that meteorological diffusion characteristics provide a means for dispersion of gaseous emissions during normal operation to a degree that they are almost undetectable in the site environs.

There is nothing in the meteorological or topographical data which indicates that the diffusion characteristics would not be operative during assumed hypothetical accident conditions. The hourly wind direction variability of 60 degrees for more than 98.3% of the time at all wind speeds provides evidence that the concentration of any accidental release of radioactive gaseous products would be rapidly diluted and dispersed.

The meteorological data used in calculating the doses and concentrations from radioactive materials released via the gaseous effluents are a combination of data gathered at the DNPS site and data taken at the Argonne National Laboratories. Wind speed and direction data taken at the DNPS site were used in the calculation. Atmospheric stability measurements taken at the Argonne National Laboratory were correlated hour for hour to determine the joint wind frequency, stability and velocity distribution at the site. Since Argonne is not too distant (27 miles northeast), and is located in similar terrain, it was expected that the two locations were climatologically similar and that joint use of data from the two sites was a valid interpretation.

In late 1967, a 400 ft. fully instrumented meteorological tower was placed in operation at the site. Actual data collected at levels from 35 ft. above ground to 400 ft. above ground have verified the favorable atmospheric diffusion conditions that exist at the site. These data obtained from the tower during the first year's operation were correlated and applied on a preliminary basis, to calculations for the Dresden reactors. These data verified the validity of the earlier approach and indicated that application of site data to the calculation of maximum effects from the releases would result in an Increase of about 5% in the allowable release rate. Since actual data gathered served only to verify the approach which had been taken earlier, the calculation of effects from gaseous effluents were not redone for GE-MO using actual data.

In summary, the Installation of the meteorological tower at the DNPS site has served to verify the previously predicted excellent atmospheric diffusion characteristics which are typical of the northern Illinois site.

6.5 Tornado Conditions

Information from the U.S. Weather Bureau indicates that over a period of approximately 70 years, there was in Illinois an average of 28 tornadoes per year. In the 57 year period, 1931 to 1988, sixteen tornadoes were reported in Grundy County.

Two tornadoes were reported near the DNPS site since 1965. On November 12, 1965 a tornado passed 4 miles west of the site while moving toward the east-northeast at approximately 70 mph. Several electrical transmission lines to the site were interrupted and as a result DNPS Unit I was shut down for about 24 hours. The second tornado, on May 24, 1966, passed near the site, resulting in one transmission line being lost. However, the load was carried by other electrical transmission lines with DNPS Unit I operating normally.

Thom' divides the United States into I degree squares and determines the tornado frequency for any point within each square. Using data from 1953-1962, Thom records 17 tornadoes occurring within a I degree square (about 2.3 million acres) encompassing the site. A mean recurrence interval for a tornado striking a point was calculated to be 760 years using Thom's method.

Since tornado effects are generally erratic and localized to narrow paths or areas, probability of maximum tornadic winds traversing any particular point, or even an area as large as GE-MO, is so remote as to be incalculable. Nevertheless, GE-MO is designed for safe shutdown and control of radioactive material inventories in the event of short-term wind velocities of 300 mph,

7.0 SEISMOLOGY

The site area is In Zone I (zone of minor damage) on the seismic probability map of the 1958 Uniform Building Code. The August 1958 Seismic Regionalization map by Richter gives general predictions of probable maximum intensity, and recognizing that lines between areas of differing intensity are approximations only, shows the region as Modified Mercelli 7 to 8.

Only a few earthquakes of significant intensity in northern Illinois have been reported since 1800, and none has been accompanied by clear-cut surface faulting. A quake on May 26, 1909, caused moderate damage in Aurora, Bloomington, Chicago, and Joliet, and may have been of intensity MM7 in the Dresden area. A quake on January 2, 1912, had a reported intensity of MM6 at Aurora, Yorkville, and Morris and probably was of similar intensity at the GE-MO site. Consideration of an intensity of MM7 for the region appears appropriate. The last significant quake in the area occurred on November 9, 1968 and was felt in 23 states. The quake epicenter was in southern Hamilton County, Illinois (~250 miles from GE-MO). While the intensity was MM7 at the epicenter, it was very much reduced in the vicinity of GE-MO.

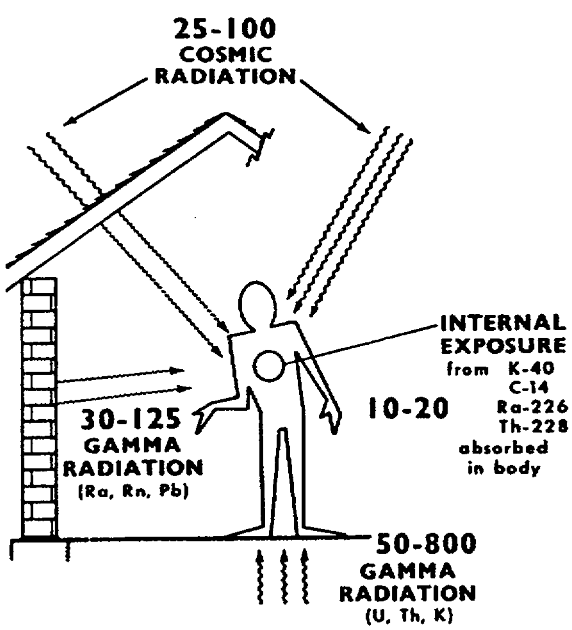
Seismological studies indicate the area of northern Illinois and the actual site are seismically suitable. Nevertheless, it has been considered appropriate to adopt a design approach which will assure the safety of GE-MO so as to preserve the ability to maintain the plant in a safe, shutdown condition in the event of a strong earthquake having a ground acceleration of 0.2g.

8.0 BACKGROUND RADIATION

Radiation occurs naturally in our environment to such an extent that people in the United States receive an average of about 200 mRem per year from background radiation sources, with a dose of about 140 mRem per year being the minimum received by every Individual living in the US. Further, this naturally occurring radiation exposure can be substantially increased by such things as the type of building materials used for structures, the place where a person lives, and other similar choices that are made In everyday life. These background radiation data are furnished to provide a basis for proper evaluation of incremental radiation exposure received from a nuclear facility in relation to the radiation exposure received from our environment.

8.1 Natural Radiation Sources

There are several sources of naturally occurring radiation exposure, as shown in Figure III-8-1. These naturally occurring radiation sources have been essentially constant for the period of recorded history and, thus, man has been continuously exposed to these radiation exposures since the beginning of time.



NATURAL RADIATION

AVERAGE EXPOSURE VALUES

	mRem/Yr
Cosmic(1)	50
Grounds & Structures(1,2)	60
Air(1)	5
Food	25
Total	140

(1) Average total from these sources in the vicinity of GE-MO is about 105 mRem/yr. with a range of 85 to 125 mRem/yr.
(2) Based on wood construction.

Figure III-8-1. Natural Radiation.

One of the principal sources of natural radiation is cosmic radiation. The level of cosmic radiation varies with both latitude and altitude, with the average for a resident of the United States being about 50 mRem/year. Cosmic radiation increases with elevation, and at Denver (elevation 5000 ft.) the exposure from cosmic radiation is about 150 mRem/year, or three times the U.S. average. Air travel also increases an individual's radiation exposure, with a roundtrip cross-country jet flight contributing about 4 mRem.

Radioactive materials in the ground are another major natural radiation source producing an average radiation exposure in the United States of about 45 mRem/year. However, there are wide variations within the United States, there are areas in India where radiation exposure from the ground is about 1300 mRem/year. The type of building materials also has a significant effect on radiation exposure as the natural radioactivity in a wood frame house will produce a exposure of about 50 mRem/year where as a brick house will produce an exposure of about 100 mRem/year. There are some types of stone, such as some granite and marble, that will produce an exposure of 350 to 500 mRem/year. Radioactive gases and particulates in air contribute about 5 mRem/year. Naturally occurring radioactive materials in foods contribute about an additional 25 mRem/year.

8.2 Natural Radiation near GE-MO

The naturally occurring radiation exposure from cosmic radiation, ground and air in the vicinity of the GE-MO site is very near the national average of 115 mRem/year. Measurements in the vicinity of the site indicates that penetrating whole body radiation exposure from naturally occurring radiation sources is about 105 mRem/year, with a range from 85 to125 mRem/year.

In 1968, the radiation exposure levels from radioactive materials in the soil was mapped for the AEC by the Aerial Radiation Measuring Surveys (ARMS) as shown in Figure III-8-2. The dose rates shown would produce annual radiation exposures of from 50 mRem/year (6 MR/hr) to 90 mRem/year (10 mR/hr). As shown, the areas of peak radiation exposure level do not coincide with the location of DNPS Unit I reactor, which had been operating for about eight years at that time. Further, radioactive materials contributing to these exposure levels were "fingerprinted" for identification, and all were identified as being naturally occurring radioactive materials, with no fission products being detected.

The following data are typical of those obtained from the environs monitoring program. The particulate radioactivity in the air is predominately from atmospheric weapons testing, and the program results conform to other area monitoring programs. Concentrations of radioactive materials in water also fluctuate with atmospheric weapons testing. Some of the results of the monitoring program are summarized in Table III-8-1.

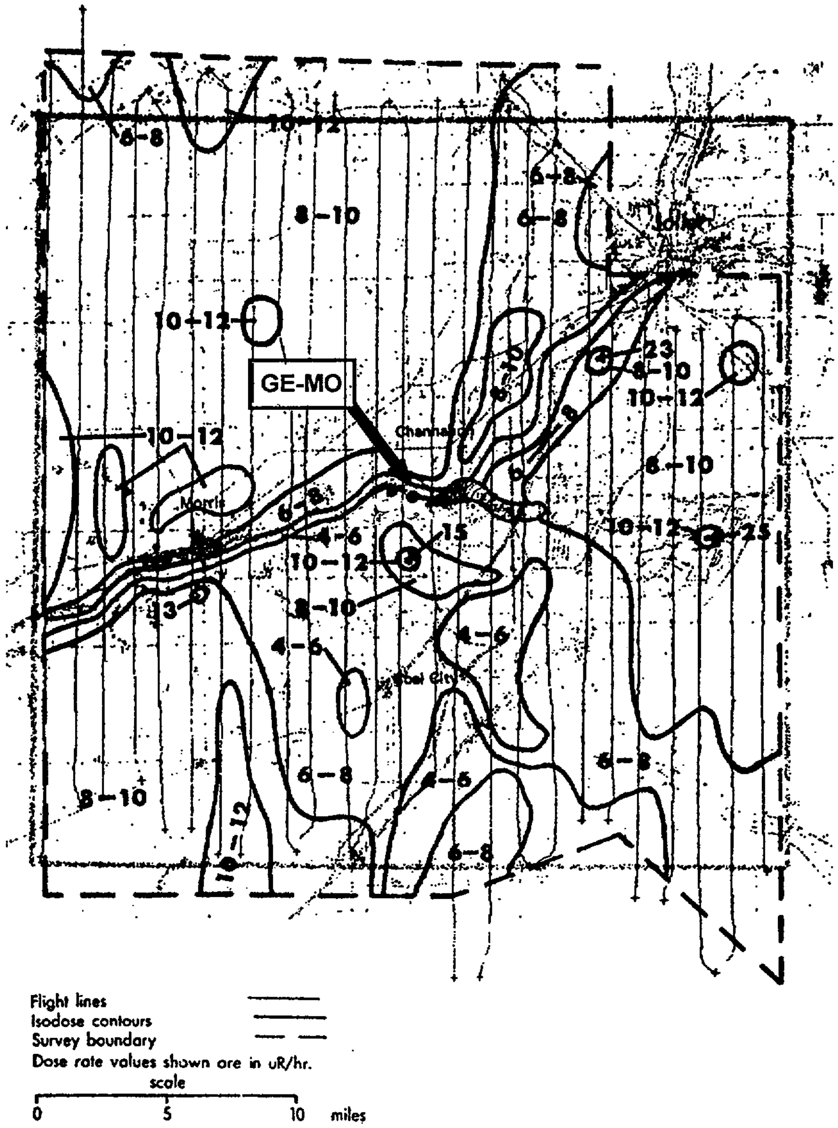


Figure III-8-2. Dresden Survey Area Isodose Contours and Flight Lines.

Table III-8-1
NATURAL BACKGROUND RADIOACTIVITY
GE-MO SITE

Whole Body Radiation Exposure (cosmic, ground, air)	85 to 125 mRem/yr.
Air Particulates (gross beta)	~10^{-13} µCi/cc
River Water	
Gross Beta	1 x 10^{-8} to 5 x 10^{-8} µCi/cc
Alpha	~0.3 x 10^{-8} µCi/cc
Well Water	
Gross Beta	~10^{-8} µCi/cc
Alpha	~10^{-8} µCi/cc

8.3 Variations In Natural Background Radiation

There are substantial variations in natural background radiation levels and a person can affect the radiation exposure he receives from natural sources by 50 to I00 mRem/year. As indicated previously, cosmic radiation increases with altitude, living In Denver will increase the radiation exposure from this source by about 100 mRem/year. Further, there are significant geographical variations In radiation exposure from sources of ground radiation, as shown in Figure III-8-2, within a few miles this may vary by a factor of two or more (approximately 20 to 50 mRem/year).

Building materials utilized in a building where a person lives and in where he works also affects radiation exposure received. For example, natural radioactivity in a brick structure will produce a radiation exposure of about 50 mRem/year more than a wooden structure.

Thus, radiation exposure received from natural radiation sources, by a person living in the vicinity of GE-MO and DNPS can easily be varied by 50 to 100 mRem/year by choices made as a part of everyday living. The fact that people have been living in this environment for thousands of years without discernible effects resulting from such variations in radiation background provides substantial evidence that the effects, if any, produced by such variations are not significant to the general population. This conclusion is further supported by the lack of radiation effects observed in persons living in areas of the world that have natural background radiation levels from two to ten times that of the average United States background.

8.4 Man Made Radiation

There are several sources of man-made radiation not associated with nuclear power used routinely by the general population and contribute to the total radiation exposure received. The most significant of these is the use of medical x-rays, according to the U.S. Public Health Service, contribute an average of about 55 mRem/year whole body radiation exposure for every person in the United States. The total radiation exposure contributed by such sources is about 60 mRem/year. A summary of such sources and the radiation exposure resulting therefrom is shown in Table III-8-2.

Table III-8-2
RADIATION EXPOSURE FROM MAN-MADE RADIATION SOURCES
(NOT ASSOCIATED WITH NUCLEAR POWER)

SOURCE	EXPOSURE
Watch Dials	2 mRem/yr.
Television	1 to 10 mRem/yr.
Medical X-ray (average)	55 mRem/yr.
Typical X-Ray Doses to Parts of the Body	
Teeth	1000 mRem/series
Chest	500-5,000 mRem/exposure
GI Tract	1,000 mRem/exposure
Fluoroscopic	10,000 to 20,000 mRem/min.

IV. ENVIRONMENTAL IMPACT OF GE-MO

1.0 GENERAL CONSIDERATIONS

The identification of the environmental effects of any facility or installation requires a thorough, systematic approach to appropriately identify and investigate potential sources of environmental pollutants and their effects. Such an approach Is used at GE-MO in evaluating the effects of that facility and the nearby Dresden reactors on the environs. The DNPS site was thoroughly investigated as a site for nuclear industry and found to be suitable by the AEC in 1966 when the Construction Permit for Dresden Unit I was issued. Additional studies by qualified experts of independent firms in the areas of meteorology, geology. seismology, and hydrology, and further evaluation of population densities and land usage in the site environs were prepared and submitted in support of the Construction Permit and Operating License authorizations for the MPRP and for DNPS Units 2 and 3.

These studies clearly indicate that GE-MO is compatible with the environment in the area and will have a minimum, essentially immeasurable, impact in the environs.

Potential pollutants and effluent streams have been either eliminated or reduced to the lowest practicable values, and for those materials which are stored and processed on the GE-MO site, multiple containment barriers are provided between these materials and the environs. In all cases predicted releases from GE-MO are a fraction of that permitted by the regulations and result in potential radiation doses that are but a fraction of that received from natural background and other man-made radiation sources not associated with nuclear power.

The key features of the environmental impact evaluation for the GE-MO and DNPS sites are summarized as follows:

1. Identification of potential sources of contamination, such as gaseous effluents, liquid effluents, and material stored or processed on site.

2. Identification of barriers between potential pollutants and the environment and evaluation as to their effectiveness and reliability. This includes barriers both for containing the potential pollutants as well as for reducing to the lowest practicable levels the pollutants released to the environs.

3. Characterization of potential pollutants as to their physical and chemical properties and, in the case of radioactive materials, as to their radiological properties. This is essential in identifying methods which may be available for reducing levels of pollutants released to the environs and in identifying the location and paths of pollutants through the environs and their potential effects in man.

For example, not all potential pollutants are gases. Further, some gases are chemically inert and, even among the inert noble gases there are different radiological properties and half-lives, with the result that some radioactive noble gases deliver a much higher dose in the environs per curie released from a plant than others.

4. Identification of limiting exposure modes and prediction of environmental impact. The calculations include not only the rates at which materials will actually be released from a facility but also the release rates which would correspond to the limits defined in appropriate regulations and other guidelines.

5. Calculation of actual and limiting pollutant release rates. This includes calculation of concentrations in the environs, including studies of those materials susceptible to long-term deposition and buildup, and prediction of direct doses resulting from the various paths of the radionuclides in the environs.

6. Measurement of the quantities of these potential pollutants released from the plant.

7. Measurement of the actual impact in the environs. This Includes direct radiation dose and measurements of the concentrations In air, water, vegetation and foodstuffs to verity actual effects are at or below those predicted In the evaluation. Because of the demonstrated sensitivity of the environs programs to low-level changes in radiation levels, there is a high degree of assurance that radiation effects, if any, in the environs due to the facility operation would be detected at levels which are a very small fraction of that permitted by recognized standards and regulations.

8. Evaluation of environmental monitoring program results.
This includes evaluation of the Environmental Monitoring Program results against the calculated effects, standards and regulations and other area wide monitoring program. This permits verification of the accuracy of calculated effects and improvement in methods if required; indication of the fraction of regulatory or other standards at which the facility is operating; and identification of the effects of a facility in relation to variations in background that may be occurring over a wide area due to other causes.

2.0 BIOLOGICAL IMPACT

As previously indicated, GE-MO is designed to have essentially no measurable biological impact on, or interaction with, the environment. The degree to which this design objective is achieved is monitored through the Environmental Monitoring Program described in Section V.

As to aquatic life, there are no species of commercial value adjacent to the site. Further, GE-MO uses no river water and there are no liquid effluents released from the GE-MO site.

As to other biological species, the measures taken at GE-MO to assure adequate protection of plant personnel and offsite personnel will assure no adverse impact on such species. In most instances, the conditions to which they are subjected will be essentially indistinguishable from natural background. Further, these conditions will be monitored through the program described in Section V to assure that any change in conditions is detected at levels below which any biological effects would be measurable.

3.0 LAND USE

3.1 Past. Present. and Future

As previously described, the GE-MO site is in a developing industrial area and would be most suitable for further industrialization. The soil is not suitable for farming because of the minimum cover of top soil over the bedrock. There are many outcroppings of bedrock with the average cover being less than one foot. As an indication of the desirability of the specific GE-MO site, at the time GE-MO was announced in the area one of the local residents said, "It's a good place for a plant because the area is so rocky that even a mule couldn't lie down on that hill". Thus, it appears the most beneficial future use of the 892 acre GE-MO site is for industrial purposes, and GE-MO will not interfere with such use.

3.2 Onsite Activities

There are no potentially hazardous activities planned for the site other than those described herein. Long range development of the GE-MO site for industrial purposes is anticipated, but an essential requirement is that there can be no potential interaction which would affect safety of GE-MO operations or of the companion activity.

At the present time there is no one resident on the site, and there will be no residences, nor permanent occupancy permitted.

3.3 Adjacent Facilities

The effects of radioactive materials in gaseous effluents from GE-MO and DNPS are in some instances additive and have been evaluated in calculating the radiological effects in the environs. These evaluations consider the separate effects of each facility as well as the combined effects of all facilities. Further the environmental monitoring program measures the total effects of all facilities. Based on the evaluations, the site is compatible for both the GE-MO and DNPS facilities.

Other adjacent uses, both recreational and industrial, are even more compatible as the radiation effects from GE-MO at those locations are but a small fraction of that received from background radiation. Further, because of the very small quantities of nonradioactive chemical effluents from GE-MO, there will be essentially no interaction or interference with such facilities.

3.4 Recreational Uses

GE-MO will not interfere with any present or planned recreational uses in the area. Known recreational uses are the fishing cottages on the Kankakee River about 1/2 mile east of the plant, a wildlife preserve which begins about 2-1/2 miles east of the plant, the Goose Lake Prairie State Park, which adjoins the GE-MO site on the west, and Heideke Lake, a cooling lake for a fossil fuel power plant adjoining the west side of Goose Lake Prairie State Park. Other recreation in the area includes the use of small lakes formed by the abandoned strip mines, beginning about three miles south of the GE-MO. Further, operation of GE-MO will not interfere in any way with possible use of the DNPS cooling lake for recreational purposes. At present, there is no planned recreational development of the GE-MO site.

3.5 Community impact

The impact of the staff required to operate GE-MO on the nearby communities is small compared to that of other industry which Is currently locating in the immediate area. Most of the people working at GE-MO live in either Morris or Joliet, Illinois. The present staff of GE-MO has been previously integrated into these communities, and the community leaders have indicated a favorable response to GE-MO

3.6 Historical Site

As indicated in Section III-2.0, there are no identified historical sites on or adjacent to the GE-MO site. Therefore, there will be no adverse impact on any historical sites.

4.0 WATER USE COMPATIBILITY

4.1 Surface Water

GE-MO has essentially no measurable effect on the surface water adjacent to or near GE-MO. There are no liquid effluents discharged to the rivers. Thus, radiological effects, if any, would arise from washout of radioactive materials, principally tritium, from the offgases discharged from the 300-foot main process stack. Calculations indicate that such an effect would be essentially measurable and that there will be no buildup of tritium in surface waters as the tritium evaporation rate from such waters is greater than the net total water evaporation rate, thus resulting in an actual decrease in tritium concentration because of evaporation.

4.2 Ground Water

There is a single deep well on the GE-MO site which has been completed into the Glenwood St. Peter aquifer, and is equipped with a 100 gpm submersible vertical turbine pump. The principal use of water (~300 gallons per day) from this source is for demineralized water make-up, with some water use (~200 gallons per day) for sanitary water purposes. Well water would also be used for fire fighting in the event that it is needed. The ground water is not used for any once-through cooling systems.

Further, there is no release of liquids from the facility to the potable ground water, since the structures on site do not penetrate any principal aquifers and, in any event, the structures are designed to detect and prevent any leakage which could eventually reach ground water supplies in the area.

5.0 HEAT DISSIPATION

GE-MO will have no thermal effects on surface waters as there are no discharges of heated water to the environs. The cooling required for operation of the plant is provided by utilization of water to freon heat exchangers. The fuel storage basins chiller has a 1,200,000 Btu per hour capacity for each of the two installed units.,

6.0 NONRADIOACTIVE ATMOSPHERIC EFFECTS

6.1 Process Building Stack

There are no EPA regulated emissions released from the 300 foot main process stack.

7.0 SANITARY WASTES

The sanitary wastes from GE-MO are discharged to waste treatment lagoons designed to meet the requirements of the Illinois Environmental Protection Agency. Any discharges from the lagoons are sent to the overflow lagoon. No sanitary waste is released to the environment from any of the lagoons.

8.0 RADIOACTIVE MATERIAL DISCHARGES

8.1 Effect of Radioactive Material Properties

To evaluate properly the effects of radioactive materials discharged from a nuclear facility, it is essential to identify each materials physical, chemical, biological and radioactive properties. Without such classificationit is impossible to evaluate effects in the environs. These properties affect such considerations as how materials are dispersed, where they are likely to appear; the tendency, if any, for materials to concentrate after they enter the environs; the organ or location in the body affected to the greatest extent by the radioisotope of interest; and biological half life of the radioisotope. For example, biological half life, a measure of residence time in the body, is very short for some radioisotopes, such as tritium, compared to their radioactive half life. Additionally the type radiation emitted (alpha, beta, gamma, etc.) by radioactive materials must be evaluated. For example, because of very low penetrating power of alpha and beta radiation, the critical exposure mode for alpha and beta emitting radioisotopes is ingestion via inhalation or food stuffs, as externally they do not penetrate deeper than the outer layers of skin.

8.2 Critical Exposure Paths

Prediction of effects of releases of radioactive materials via gaseous effluents from GE-MO is based on identification of all exposure paths for each type of radioactive material, and on the evaluation of possible exposure paths to select that critical exposure path which results in the maximum radiation dose potential for the specific radioactive material. Thus, regardless of where the radionuclide shows up in the environs, it will not result in excessive exposure of personnel. The limiting release for nuclides is based on critical organs and method of entry to the body. Thus, the contribution of each nuclide emitted to the possible radiation exposure (whole body, skin, critical organ) is considered.

8.3 Properties of Radioactive Effluents

8.3.1 Noble Gases. Both reactors and spent fuel storage facilities discharge radioactive noble gases; however, there are significant differences in their radioactive properties which result in greatly different radiation dose potentials and thus prevent the direct comparison of noble gas release rates from a nuclear power reactor and a spent fuel storage facility.

Noble gases discharged from a reactor are almost entirely short half life kryptons and xenons which have a great abundance of gamma emissions which result almost entirely in penetrating whole body exposure. The radiation dose from Kr-85, primarily a beta emitter, is negligible compared to that from the short half life noble gases. By contrast during the average cooling time of 20 years the fuel has been in storage at GE-MO, the radioactive noble gases have decayed until Kr-85 is essentially the only radioactive noble gas remaining.

Kr-85 has a 10.70 year half life and is a soft beta emitter with a maximum beta energy of 0.67 MeV. A gamma photon is released on only 0.4% of the disintegrations, Thus radiation exposure from Kr-85 requires immersion in the plume because of the short distance beta particles will travel even in air, and the radiation exposure from Kr-85 is primarily to the outer-layers of exposed skin. Any form of shielding, such as clothing, will stop the beta particles. Further, the permissible skin exposure permitted for workers Is six times the permissible whole body exposure thus indicating the lesser biological significance of skin exposure. Calculations indicate that the whole body radiation exposure from Kr-85 is very low as health physics authorities recognize that the whole body dose is 80 to I 00 times less than the skin dose.

Noble gases are chemically inert and relatively insoluble in normal fluids. Being gases they do not deposit in the environs. There are no demonstrated concentration effects and thus radiation effects from noble gases will generally be direct radiation effects from the passing plume.

8.3.2 Tritium

Tritium is not released from the DNPS to the atmosphere in any significant quantities, and thus the effects of atmospheric dispersal are almost entirely caused by that released from GE-MO,

Tritium is a ternary fission product having a fission yield of only 8.7×10^{-5}. It has a half life of 12.26 years and is a pure beta emitter with no gamma emissions. It is a very soft beta emitter, with the maximum beta energy of only 0.02 MeV. Thus, it has a low radiological toxicity with an MPC(A) of 2×10^{-7}mCi/cm^3 and an MPC(w) of 3×10^{-3}, mC/ICM^3 for continuous exposure.

Tritium is an hydrogen isotope and chemically, biologically and physically, essentially identical to hydrogen. This characteristic makes tritium unresponsive to separation and concentration by conventional waste treatment techniques and so it is released as tritiated water. In GE-MO this release is accomplished by vaporizing tritium-bearing water into the ventilation air for release via the 300-foot main process stack.

Once tritium is released to the environment, the same properties that make it unresponsive to physical or chemical separation, cause it to follow hydrogen throughout the biological chain without significant concentration effects. Thus, there does not appear to be a significant reconcentration mechanism for tritium, either in the environment or biologically, radiation effects that result from tritium come from exposure via direct ingestion from either air or water sources.

8.3.3 Radioactive Particulates. Reactors do not have a great potential discharge of radioactive particulates, and thus reactor particulate emission rates are generally included with the limits on iodine release rates. Thus, there is no interaction between GE-MO and DNPS regarding particulate emission rates. Emission of radioactive particulates from normal operation of spent fuel storage facilities using deep-bed sand filters, historically has not been a significant problem. However, both beta-gamma particulates and alpha particulates potentially could be discharged. Potential effects of these particulates have been evaluated considering ingestion via food chain, inhalation, and radiation from ground deposition for beta-gamma particulates and inhalation for alpha particulates. Based on the criteria for radiological protection, the limiting exposure mode for beta-gamma particulates is radiation level from ground deposition and for alpha particulates is concentration in air at ground level. Both beta-gamma and alpha particulates expected release rates are only a small fraction of the calculated permissible release rates.

8.4 Atmospheric Diffusion

8.4.1 General

Calculations are performed separately for noble gases, tritium and particulate fission products released via the main process stack. The whole-body dose calculations were made by use of the computer code COMPLY. COMPLY was developed by the EPA to assess doses by using site-specific information in the determination of dose. COMPLY has 4 screening levels. Level 1 being the simplest and Level 4 the most stringent. GE-MO uses Level 4 to produce a more representative does estimate by providing for more complete treatment of air dispersion by requiring site-specific information. The basis for the compliance measures in COMPLY are contained in "Background Information Document: Procedures Approved for Demonstrating Compliance with 49 CFR Part 61, Subpart I" (EPA 520/1-89-001, October 1989).

8.4.2 Dose Limits for Individual Members of the Public

Per 10 CFR Part 20, Subpart D – "Radiation Dose Limits for Individual Member of the Public", each licensee shall conduct operations so that – "The total effective dose equivalent to individual members of the public from the licensed operation does not exceed 0.1 rem (1 millisievert) in a year, exclusive of the dose contributions from background radiation, from any medical administration the individual has received, from exposure to individuals administered radioactive material and released in accordance with § 35.75, from voluntary participation in medical research programs, and from the licensee's disposal of radioactive material into sanitary sewage in accordance with § 20.2003.

8.4.2 Actual Stack Releases

All previous stack emissions were based on calculations with GE-MO operating as a spent fuel reprocessing facility. This condition never occurred. Below (Table II-8-3) are actual stack emissions for the last 4 years. Calculation of Dose to a member of the public likely to receive the highest dose from air effluents is demonstrated by the use of the COMPLY computer code.

1999 Stack Release			
Nuclide	Amount Released Ci	Stack Concentration uCi/ml	CEDE mRem/year
H-3	3.96E-02	1.97E-10	
Kr-85	1	4.98E-09	
Cs-137	3.18E-06	1.58E-14	
			3.17E-06

1998 Stack Release			
Nuclide	Amount Released Ci	Stack Concentration uCi/ml	CEDE mRem/year
H-3	3.65E-02	1.68E-10	
Kr-85	1	4.61E-09	
Cs-137	2.59E-06	1.20E-14	
			2.55E-06

1997 Stack Release			
Nuclide	Amount Released Ci	Stack Concentration uCi/ml	CEDE mRem/year
H-3	5.50E-02	2.53E-10	
Kr-85	1	4.60E-09	
Cs-137	1.54E-05	7.10E-14	
			1.40E-05

1996 Stack Release			
Nuclide	Amount Released Ci	Stack Concentration uCi/ml	CEDE mRem/year
H-3	7.30E-02	3.10E-10	
Co-60	1.20E-06	5.20E-15	
Ni-63	1.20E-06	5.20E-15	
Kr-85	1	4.30E-09	
Cs-137	2.20E-06	9.50E-15	
			3.40E-06

Table II-8-3. Actual Stack Release Data

As shown, at the annual average operating release rates, the maximum offsite dose rates in all cases are less than one percent of the dose rates on which the NRC limits are based and the maximum whole body radiation dose rate (0.1Rem/year) is less than one percent of natural background. Even at the proposed Technical Specifications annual average release limits, the whole body dose rate (~12 mRem/year) is less than ten percent of natural background and all other doses are well within NRC limits even without considering the factor of 3 reduction of dose resulting from occupancy factors and shielding.

8.5 Population Exposure Within 50 Miles of GE-MO/DNPS

Man-Rem calculations were estimated for annual whole body exposure due to inhalation of released beta emitters and skin dose due to release of Kr-85. Averages of exposures were calculated for concentric circles with radii of multiples of 10 miles. These average values were multiplied by the population within each area which gives an average annual whole body man-Rem. The sum of these values for each area out to a radius of 50 miles gives a total of less than 2 x 10^{-6} man-Rem/yr whole body and less than 0.12 man-Rem skin dose for the period from 1970 to the year 2100.

For comparison, the population exposure from normal background radiation (taken at 100 mRem/yr) in the same area is about 665,000 man-Rem for 1970, to 750,000 man-Rem for the year 2000. Therefore, the radiological impact from the GE-MO fuel storage operations is relatively insignificant.

8.6 Operating Limits

8.6.1 General

The operating limits described in this section are based on detailed analyses described in Section 7.0 of the Morris Operation Consolidated Safety Analysis Report, Docket 70-2. These limits assure that potential exposure to radioactive materials released from GE-MO will not exceed accepted limits for all exposure modes. This assurance is based on efforts to:

- Identify critical exposure modes
- Calculate the radiation effects from such paths

Further assurance that radiation exposure limit objectives will be achieved is provided by equipment installed to maintain actual releases of radioactive materials at the lowest practicable quantity.

Environmental radiation monitoring near the MO site has been performed since 1958. In late 1967, General Electric signed an agreement with CECo to expand the program to accumulate baseline data for later evaluation of effects of General Electric's proposed fuel reprocessing operation. Monitoring program results from 1968 to 1994 confirm the absence of detectable off-site radioactive contamination. In addition, Illinois Department of Public Health measured radiation dose rates in populated areas around the GE-MO/DNPS sites and in 13 central Illinois counties from 1971 to 1976 indicate no significant difference in radiation exposure between the two areas even though the joint site consists of two reactors and a fuel storage facility.

8.6.2 Operating Limits

Effluent air is continuously sampled for particulates at a location between the main stack and the sand filter. Samples are analyzed weekly for gross beta activity. The maximum value shall not exceed a weekly average of 4×10^{-8} µCi/ml to assure that offsite concentrations will be within 10 CFR 20 limits..

9.0 CONSTRUCTION EFFECTS

There were minimum environmental effects caused by construction of GE-MO. The principal effects are confined to the fenced Owner Controlled Area of approximately fifteen acres out of the total 892 acre GE-MO site. In addition, in the area outside the fenced Owner Controlled Area, the only other use of the site made by GE-MO Is for the sanitary waste lagoons. Also, the area chosen for the location of GE-MO is rock with little potential for any other constructive use.

10.0 AESTHETICS

There has been no destruction of any aesthetically pleasing features of the GE-MO site. During construction pine trees on the site have been carefully preserved. The administration and other service buildings all have prefinished steel siding and the Main Process Building has prefinished steel siding and concrete. The parking lot is blacktopped and the area around the buildings is appropriately graded and graveled and is kept weed free. There may be some minimum landscaping around the administration building. GE-MO is not felt to have adversely affected the aesthetics of the area.

11.0 SOLID WASTES

Solid wastes generated on the GE-MO site are either stored in approved containers or packed and shipped offsite to an authorized disposal site as soon as possible. As the wastes are stored, there is little potential for any effect in the environs other than the effect of the structure itself. Further only a small volume of wastes is generated by GE-MO and the storage areas are adequate for several years operation at anticipated throughout rates.

V. ENVIRONS MONITORING

1.0 GENERAL

The GE-MO environmental monitoring program is directed toward measurement of radiation dose and concentrations of radioactive materials in the environs, and detection of any new critical exposure paths for radionuclides that may develop. The program measures direct radiation exposure in the environs as well as concentration of radioactive materials.

The level of background radiation in the environs surrounding GE-MO has been well established. In addition to determining the level of background radiation from natural and man-made sources, the environmental monitoring has established and will follow the concentration of radioactivity in the surrounding environs.

Presently, natural and man-made radioactivity in the site environs is surveyed by several monitoring programs. The long-established and continuing program of the Argonne National Laboratory monitors a radius of about l00 miles, thus encompassing the area, and includes one monitoring point 3-1/2 miles north of GE-MO. An initial series of river samples was analyzed in 1956-57 by the National Aluminate Company under contract to the General Electric Company. The Illinois Department of Health monitoring program includes sampling of air and water near the site starting in November 1959. The continuing Commonwealth Edison Company program started in September 1958, and typically includes some 3000 to 4000 radioactivity analyses and survey instrument readings each year. Thus, there is data on radioactivity in the environs that cover a period of longer than 40 years. Particulate radioactive material in the air is dominated by fallout from weapons testing, reaching a beta emitter peak of 1.3×10^{-11} µCi/cc in June 1963. Current levels are about 10^{-13} µCi/cc.

External gamma radiation of 2 to 3 mR/week is from natural background, cosmic and ground sources, and is not significantly altered by weapons testing.

Well-water beta radioactivity concentrations average less than 1.0×10^{-7} µCi/ml, the same as for surface water. Beta concentrations in well water fluctuate as a function of weapons-testing fallout. The range of fluctuation has been from 1.5×10^{-8} µCi/cc in 1961 to 4×10^{-8} µCi/cc in 1964. Present levels are about 1.5×10^{-8} µCi/ml for beta radioactivity.

2.0 METEOROLOGICAL PROGRAM

A 400-foot high meteorological tower at DNPS went into operation in 967 to measure important atmospheric diffusion parameters. Data regarding wind speed, direction and temperature are recorded at four separate levels up to 400 feet. The data from the first year's operation of the tower is in close agreement with the meteorological model previously used for calculation of the radiation doses and radioactive material concentrations resulting from operation of GE-MO and DNPS. This program was continued until there was adequate data to confirm annual average atmospheric diffusion characteristics at the GE-MO-DNPS sites.

3.0 RADIOACTIVITY MONITORING

Specifications for the current environs monitoring program are shown in Table V-3-1, and the locations of TLD sampling points are shown in Figure V-3-1. Samples are collected at points on the boundaries of GE-MO. Reference samples provide a background making It possible to distinguish significant radioactivity introduced into the environment by GE-MO operation from that introduced by other sources.

Sampling frequencies assure that changes in environmental radioactivity can be detected. The materials which first show changes in radioactivity are sampled most frequently. Those less affected by transient changes but showing long term accumulations are sampled less frequently. However, specific sampling dates are not crucial, and adverse weather conditions or equipment failure may on occasion prevent collection of specific samples.

The program is responsive to radiological recommendations of the Fish and Wildlife Service and the Bureau of Radiological Health of the United States Department of Health, Education and Welfare and meets the requirements of the NRC.

Table V-3-1
GE-MO RADIOLOGICAL MONITORING PROGRAM

Particulates in Air

No routine particulate environmental air samples are collected due to operation of GE-MO. Air samples are collected at the site boundary in the event one of the following conditions occurs:

1. The stack monitoring system and back-up system fails or is out of service for a period of time greater than 24 hours.
2. License specification 4.1.1 "Effluent Air" gross beta activity exceeds 4×10^{-8} µCi/ml.
3. An airborne activity release alert is declared as defined by the GE-MO Emergency Plan.

SAMPLE MEDIUM	COLLECTION SITE	ANALYSIS	FREQUENCY
Exposure by TLD	Duplicate TLDs are placed at the 15 acre site boundary in positions corresponding to eight points of the compass.	Gamma radiation analysis	Quarterly
Water	a. Sanitary Lagoons b. Drainage Ditch	Gross Beta & H-3	Monthly
	c. Eight site monitoring wells		Quarterly

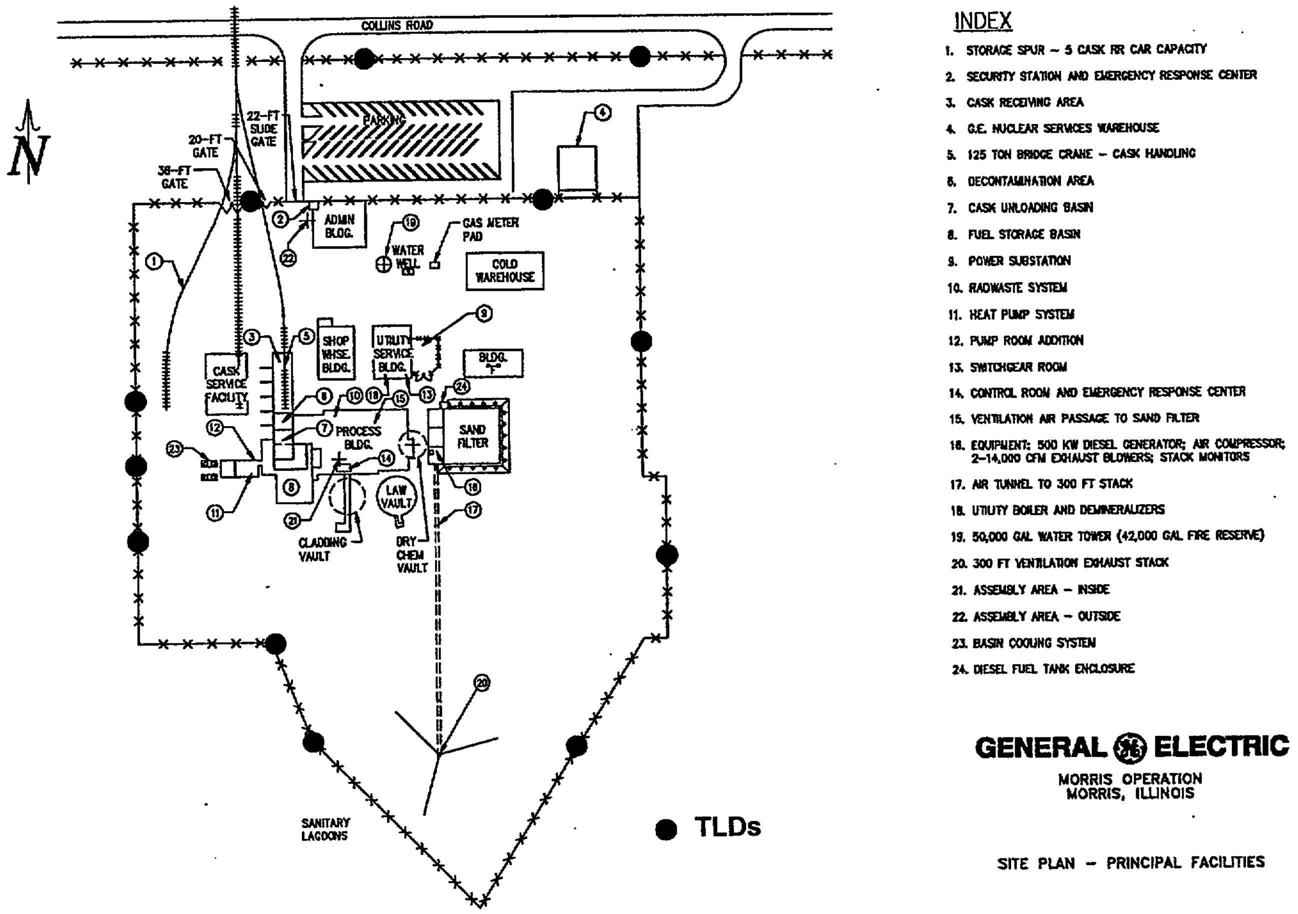


Figure V-3-1. TLD Sampling Locations.

VI. UNAVOIDABLE ENVIRONMENTAL EFFECTS

The operation of GE-MO is in no way adverse to the environmental goals set out in Section 101(b) of the National Environmental Policy Act of 1969 (NEPA). This vital objective has been achieved with only a minimum environmental effect as described in Section IV of this Environmental Report.

As previously indicated, small amounts of radioactive and nonradioactive materials will be released via the gaseous effluents, as described in Section II-4.1.2, and small amounts of nonradioactive materials will be released via liquid effluent, as described in Section II-4.1.3. In all cases the effects of these contaminants in the environs are barely, if at all, distinguishable from natural background, and thus do not represent any adverse impact on the environment.

VII. ALTERNATIVES

1.0 WASTE DISPOSAL SYSTEM

Any requirement for utilization of alternate disposal methods must be measured against the reduction of radiation dose to people in the environs that would be accomplished by installation of proposed systems. For example, with present disposal schemes, the maximum radiation dose from GE-MO to any person in the surrounding environs is only about one percent of that radiation dose received from naturally occurring and non-nuclear power sources of background radiation. This very small incremental addition to natural background is several times less than the variation in natural background from location to location and season to season (~±20 mRem/year) or from an increased dose a person would get living in a brick home as opposed to a wood frame house (~50 mRem/year). Thus, one must keep mind the reduction in total radiation dose to people living in the surrounding areas achieved by installation of alternative waste handling systems.

At present, the only measurable releases of radioactive materials from GE-MO to the environs are Kr-85 and trisected water vapor, both of which are released via the 300-foot main process stack. Elevated release via the 300-foot stack minimizes the environmental impact of these materials.

The Kr-85, being chemically inert, and the tritium being chemically identical to hydrogen, are neither responsive to separation and/or concentration for disposal.

Due to the extremely low levels of these materials being released, alternative methods of disposal are not needed since elimination of these emissions from the stack would not improve the current exposure rates below background

1.1 Low-Activity Waste Disposal Alternatives

Alternatives to the currently utilized GE-MO practice of sending low-activity wastes to licensed disposal facilities do not exist. The alternative is to store these materials on site. GE-MO feels the best practice is to ship these materials to approved disposal sites for processing and burial for isolation from the biosphere.

1.2 High-Activity Waste Disposal Alternatives

The principal alternative for disposal of high-activity radioactive wastes has been storage of the highly radioactive wastes as liquid In large, underground tanks. This waste disposal alternative requires cooling of the tank contents and extensive monitoring to detect any potential leakage of the high-activity wastes from the tanks. Additionally. this disposal means requires availability of a spare storage tank at all times to permit transfer of the wastes in the event that one of the tanks in use develops a leak. This disposal means is, at best, an interim method, because of the continued mobility of the wastes and the limited life associated with the storage tanks.

It is felt that liquid storage is substantially less desirable than the immediate solidification of the wastes and storage of these wastes in small, high integrity containers provided by the GE-MO rad waste system.

1.3 Solid Waste Disposal Alternatives

The principal alternative to disposal of solid wastes such as failed contaminated equipment has been to package these wastes and bury them in trenches on the plant site. Such a disposal scheme requires reliance upon the integrity of the packages and upon the ion exchange capability of the soil to prevent the escape and migration of radioactivity away from the burial area. After careful evaluation, it was determined that there would be no direct burial of radioactive materials on the GE-MO site and that solid wastes stored on site would be stored, as required for the material, to prevent any mixing of the radioactive materials into the surrounding soil.

VIII. SHORT-TERM USE VERSUS LONG-TERM PRODUCTIVITY

The immediate GE-MO site is an area of about 15 acres and Is In a rocky area with minimum overburden and without crapping of the underlying rock. Some of the balance of the GE-MO site is used for farming and grazing and will continue to be used for such purposes during the useful life of GE-MO. Only the immediate GE-MO site of about 15 acres is potentially removed from long-term use because of residual radioactivity in the plant structure. Because of the rocky nature of the area in which GE-MO Is located, its use for purposes other than structures would be limited. Thus, it is felt that the long-term productivity of the productive land in the area is not affected by the location of GE-MO.

IX. IRREVERSIBLE COMMITMENT OF RESOURCES

1.0 LOCAL RESOURCES

As described previously, the only potential irreversible commitment is the immediate GE-MO site. However, even this area is designed to facilitate the removal of the stored wastes if future analysis and requirements indicate that alternate disposal means are more suitable. There is no irreversible commitment of any resources outside the immediate GE-MO site and other uses of land In the area, such as recreational and agricultural, will not be affected by the location of GE-MO in the area.

X. ENVIRONMENTAL APPROVALS AND CONSULTATIONS

1.0 STATE AND LOCAL AGENCIES

1.1 General

During construction of GE-MO, there were contacts with the Office of the Governor of Illinois, Illinois Department of Business and Economic Development and the Illinois Department of Public Health. During the public hearing held in Morris, Illinois, on November 28, 1967, prior to issuance of the AEC Provisional Construction Permit, appearances were made by personnel from the Illinois Department of Business and Economic Development and Illinois Department of Public Health in support of the application. In mid 1970, when GE-MO was about 60 percent complete, the Illinois Legislative Commission on Atomic Energy had a half-day meeting at the GE-MO site. There were briefings of other State of Illinois personnel during the construction.

1.2 Illinois Environmental Protection Act

The Illinois Environmental Protection Act (Ill. Rev. Stats., ch. 111-1/2, §1001 et seq. 1970) became effective on July 1,1970. This Act (inter alia) created the Illinois Environmental Protection Agency and the Illinois Pollution Control Board.

1.2.1 Illinois Environmental Protection Agency

Sanitary Sewage Treatment
The Illinois Environmental Protection Agency issued Water Pollution Control Permit No. 1999-EO-3255, dated June 4, 1999 for Operation of Three Lagoons for Sanitary and Other Wastewaters, to General Electric for operations at GE-MO. A copy is shown as Figure X-1-2.

The stand-by diesel generator exhaust, as described in Section II-4.1.2, does not require a permit under the Illinois Rules and Regulations on Air Pollution since the stand-by diesel generator will be operated only on an infrequent, intermittent basis.

1.2.2 Illinois Pollution Control Board

Title VI-A (Atomic Radiation) of the Illinois Environmental Protection Act purports to require (inter alia) the owner of a nuclear fuel reprocessing plant to file an environmental feasibility report with the Illinois Pollution Control Board. The Board is then required (inter alia) to hold a public hearing on plant operation environmental effects, after which the Board may issue a permit for operation of the plant specifying the maximum allowable level of radioactive discharge, as determined by the Board.

1.3 Illinois Radiation Installation Act

The Illinois Radiation installation Act (Ill. Rev. Stats. ch. 111-1/2, §§194.200) requires the operator of a radiation installation to register the installation with the Director of the Illinois Department of Public Health.

1.4 Illinois Radiation Protection Act

The Illinois Radiation Protection Act (Ill. Rev. Stats. ch. 111-1/2,§§211-229) authorizes the Director of the Illinois Department of Public Health to establish rules for regulation of radiation installations, including the licensing of such installations. However, this Act contemplates a federal-state agreement authorizing such regulation by the State of Illinois, and the licensing provisions of the Act are made expressly conditional upon the execution of such an agreement. Since Illinois has not entered into such an agreement, no action is required of General Electric under the Act at this time with respect to GE-MO.

1.5 Building and Construction Permits

The necessary building and construction permits were obtained from Grundy County, Illinois.

1.6 Zoning Ordinances

At the time construction of GE-MO was authorized in 1967 there was no zoning of the GE-MO site. Subsequently on July 9, 1969, all of Grundy County was zoned with provisions for four (4) industrial zones generally classified as:

M-1 Pleasant and nuisance free with minimum environmental effects compatible with adjacent residential or retail development;

M-2 Industrial operations having moderate environmental effects and which are remote from residential and prime retail developments;

M-3 Industrial operations which are large and self-contained in isolated areas having potentially moderate to high environmental effects; and

M-4 Mining operations.

GE-MO (Figure II-1-1) is zoned M -3 as is most of the land north of Pine Bluff Road,[1] including most of Goose Lake Prairie State Park. The DNPS site is zoned M-2 except for the portion adjacent to the EJ&E Railroad which is zoned M-3. The Thorsen cottages are zoned M-2. There is also a 2000-foot wide strip zoned M-2 along the north side of Pine Bluff Road to the approximate vicinity of the Mazon River. The closed A.P. Green Refractory Co. property is zoned M-4. Operation of GE-MO is compatible with the existing zoning of the GE-MO site.

Pine Bluff Road is the extension of Lorenzo Road in Grundy County.

2.0 FEDERAL AGENCIES

2.1 General

Copies of the GE-MO Construction Permit application and of the Preliminary Safety Analysis Report were circulated to other federal agencies by the Irradiated Fuels Branch of the Division of Materials Licensing of the AEC. Comments were received from the Fish & Wildlife Service of the U.S. Department of Interior, by the U.S. Coast & Geodetic Survey, the U.S. Geological Survey, and the U.S. Weather Bureau. The review by these federal agencies at that stage of licensing indicated that they would expect no adverse effects on the environment from the operation of GE-MO.

2.2 Atomic Energy Act of 1954

The Atomic Energy Act of 1954, as amended, (42 U.S.C.§§201 I et seq.) requires licenses from the AEC in order to construct and operate a nuclear facility. The NRC issued Special Nuclear Materials License SNM-2500 on May 4, 1982 authorizing spent fuel storage activities at GE-Morris Operation. The license was issued in compliance with Title 10, Chapter 1, CFR Part 72, Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste.

2.3 Refuse Act of 1899

The Refuse Act of 1899 (33 U.S.C. §407) requires a permit from the United States Army Corps of Engineers prior to the discharge of any refuse matter into a navigable waterway or a tributary of a navigable waterway.

There are no discharges from GE-MO to navigable waters or their tributaries.

2.4 Federal Water Pollution Control Act

Section 21 (b) of the Federal Water Pollution Control Act, as amended, (33 U.S.C. §l 151 et wq.) requires a certification from the State of Illinois that there is a reasonable assurance that discharges into navigable waters will be conducted in a manner which will not violate applicable water quality standards.

There are no discharges from GE-MO to navigable waters or their tributaries.

ILLINOIS ENVIRONMENTAL PROTECTION AGENCY
WATER POLLUTION CONTROL PERMIT

LOG NUMBERS: 3255-99 **PERMIT NO.:** 1999-EO-3255

FINAL PLANS, SPECIFICATIONS, APPLICATION AND SUPPORTING DOCUMENTS **DATE ISSUED:** June 4, 1999
PREPARED BY: General Electric Company

SUBJECT: GENERAL ELECTRIC COMPANY - MORRIS OPERATION -- Operation of Three Lagoons for Sanitary and Other Wastewaters

PERMITTEE TO CONSTRUCT

General Electric Co.- Morris Operation
7555 E. Collins Road
Morris, Illinois 60450

Permit is hereby granted to the above designated permittee(s) to construct and/or operate water pollution control facilities described as follows:

A one million gallon holding pond and two - 275,000 gallon lagoons for the treatment of approximately 510 gallons per day of sanitary wastewater, potable and utility water system drainage, and groundwater intrusion pumpout. There is no discharge from these lagoons.

This operating permit expires on May 31, 2004.

This Permit renews and replaces Permit Number 1994-EO-0304 which was previously issued for the herein permitted facilities.

This Permit is issued subject to the following Special Condition(s). If such Special Condition(s) require(s) additional or revised facilities, satisfactory engineering plan documents must be submitted to this Agency for review and approval for issuance of a Supplemental Permit.

SPECIAL CONDITION 1: This Permit is issued with the expressed understanding that there shall be no surface discharge from these facilities. If such discharge occurs, additional or alternate facilities shall be provided. The construction of such additional or alternate facilities may not be started until a Permit for the construction is issued by this Agency.

SPECIAL CONDITION 2: The operation of the treatment facilities must be under the direct and active field supervision of a certified industrial treatment plant operator in accordance with the State of Illinois Rules and Regulations, Title 35, Subtitle C, Chapter 1, Part 312.

SPECIAL CONDITION 3: All sludges generated on site shall be disposed of at a site and in a manner acceptable to the Agency.

THE STANDARD CONDITIONS OF ISSUANCE INDICATED ON THE REVERSE SIDE MUST BE COMPLIED WITH IN FULL. READ ALL CONDITIONS CAREFULLY.

TGM:DEL:325599.wpd

cc: EPA - Maywood FOS
Records - Industrial
Binds

DIVISION OF WATER POLLUTION CONTROL

Thomas G. McSwiggin, P.E.
Manager, Permit Section