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September 23, 2002
E910-02-046

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, DC 20555

Gentlemen,

Subject: Saxton Nuclear Experimental Corporation (SNEC)
Operating License No., DPR-4
Docket No 50-146
Decommissioning Environmental Report, Revision 2

The purpose of this letter is to submit Revision 2 of the Decommissioning Environmental Report for the SNEC Facility. This report is being submitted in conjunction with Revision 1 of the SNEC Facility License Termination Plan (LTP), GPU Nuclear, Inc letter E910-02-041.

The SNEC Facility Environmental Report was originally submitted in April 1996 to support SNEC Facility decommissioning. Three supplements to the report in the form of responses to NRC requests for additional information was provided on July 18, 1996, March3, 1998, and March 31, 1998. Revision 1 of the Environmental Report (GPU Nuclear letter 1920-00-20025) was submitted February 2, 2000 along with Revision 0 of the SNEC Facility LTP.

The most significant changes in this document are:

1. Updated information for the SNEC site to reflect its current configuration Plant structures such as the septic system, weir pipe and other underground piping have been removed. Description of the SSGS Intake Tunnel and various Penelec buildings has been added to reflect the impact of decommissioning activities

2 Updated the estimated occupational exposure from approximately 37 person-rem to 37.84 person-rem based on changes in work scope for CV concrete removal and experience gained on the SNEC Facility Decommissioning Project. This occupational exposure is still well within the GEIS (NUREG 0586) estimate of 344 person-rem.

3. Updated geology, hydrology, endangered species and groundwater flow studies conducted in 2001. In addition, population and population trends have been updated to reflect current year 2000 census data.

4. Updated current status of plant dismantlement activities, sources of waste generation (radioactive, hazardous and asbestos), and current decommissioning schedule.

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5. Updated accident and exposure analyses for total public dose from radwaste shipping and re-estimated land area occupied by disposal of radwaste.

6. Updated historical and future radwaste volumes. Analyzed these volumes in comparison to NUREG-0586 criteria for a reference test reactor.

7. Included table summarizing SNEC vs NUREG-0586 comparative analyses which includes updated and previously submitted information.

These changes are still within the bounds of the GEIS, and it can be concluded that there are no significant environmental changes at the SNEC Facility associated with License Termination.

If you have any questions on this information, please contact Mr. James Byrne at (717) 948-8461.

Sincerely,

G. A. Kuehn
Program Director, SNEC

cc: NRC Project Manager
NRC Project Scientist, Region 1

Saxton Nuclear Experimental Corporation Facility

Updated Decommissioning Environmental Report

Revision 2

September 2002

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1.0 INTRODUCTION AND SUMMARY

1.1 Introduction

The Saxton Nuclear Experimental Corporation (SNEC) is decommissioning the SNEC Facility. The SNEC Facility now consists of the Containment Vessel (CV), Decommissioning Support Facility (DSF) and adjacent yard areas. Surrounding and impacted by the SNEC facility are the Saxton Steam Generating Station (SSGS) basement, adjoining Intake/Discharge Tunnels, various Penelec buildings and associated underground piping. This decommissioning program will prepare for the release of the SNEC site and surrounding areas for unrestricted use.

The SNEC Facility is a deactivated, pressurized water reactor (PWR), that was originally licensed to operate at 23.5 megawatt thermal (23.5 MWT). The SNEC Facility is maintained under a Title 10 Code of Federal Regulations Part 50 License and associated Technical Specifications. In 1972 the license was amended to possess but not operate the reactor.

The facility was built from 1960 to 1962 and operated from 1962 to 1972 primarily as a research and training reactor. The facility was placed in a condition equivalent to a status later defined by the United States Nuclear Regulatory Commission (NRC) as SAFSTOR after it was shutdown in 1972. Since then, it has been maintained in a monitored condition.

All fuel was removed from the CV in 1972 and shipped to the Atomic Energy Commission (AEC) facility at Savannah River, South Carolina, who remained owner of the fuel. As a result, neither SNEC nor GPU Nuclear Inc. has any responsibility relative to the spent fuel from the SNEC Facility. In addition, the control rod blades and the superheated steam test loop were shipped offsite. Following fuel removal, equipment, tanks, and piping located outside the CV were removed. The buildings and structures that supported reactor operations were partially decontaminated in 1972 through 1974 (Reference 1).

Radiological decontamination of reactor support structures/buildings was performed in 1987, 1988, and 1989, in preparation for demolition of these structures (Reference 2). This included the decontamination of the Control and Auxiliary Building, the Radioactive Waste Disposal Facility, Yard Pipe Tunnel, and the Filled Drum Storage Bunker, and the removal of the Refueling Water Storage Tank. Upon acceptance of the final release survey by the NRC (Reference 3), these buildings were demolished in 1992.

In November 1994, the Soil Remediation Project was completed. This was a comprehensive project of soil monitoring, sampling, excavation, packaging and shipment of radiologically contaminated site soil. This program successfully reduced much of the soil contamination levels to below the NRC radiological release limits required to meet site cleanup criteria for unrestricted use (Reference 4).

From 1996 through 1997, site preparations were made to support full scale decommissioning efforts. Support systems such as temporary power, compressed air, HEPA filtered exhaust ventilation and lighting were installed. The Decommissioning

Support Facility (DSF) was erected south of the Containment Vessel (CV) and was physically connected to the CV.

The NRC approved the start of full scale decommissioning in April 1998 and operations began in May 1998. Up to that time selected loose materials, spare components, asbestos insulation and electrical components had been removed with the NRC's permission. Following approval in April 1998, the main focus of decommissioning efforts was on making all necessary preparations for the removal of the nuclear steam supply system components, namely the reactor pressure vessel, the single steam generator, the pressurizer and the main coolant pump.

The SNEC Large Component Removal Project (LCRP) was completed November 22, 1998. This involved the preparation, removal, packaging, shipment and disposal of the SNEC Facility Pressurizer (PZR) Steam Generator (S/G) and Reactor Pressure Vessel (RPV).

Following removal and shipment of the SNEC Facility large components, decommissioning activities focused on the removal and shipment of the remaining permanent mechanical and electrical equipment, systems and components. This work was completed by May of 1999. All permanent mechanical and electrical systems and components have been removed and shipped off-site for processing/disposal in accordance with all applicable regulations. The only remaining systems are small pipe sections that penetrate walls, floors and ceilings and site storm drains. Site storm drains have been radiologically characterized and will be included in the Final Status Survey.

Since May 1999, the focus has been on Containment Vessel concrete removal and remediation work in the SSGS footprint and associated tunnels.

1.2 Purpose

The purpose of this Updated Environmental Report (ER) is to present an updated evaluation of the actual or potential environmental impacts resulting from the decommissioning of the facility, including decontamination, dismantlement, and site restoration activities. The SNEC Facility Decommissioning Environmental Report issued on April 17, 1996 was evaluated in the NRC's Environmental Assessment and Finding of No Significant Impact dated March 1998. Three supplements were issued against this report to address requests for additional information from the NRC. Revision 1 of SNEC Decommissioning Environmental Report was submitted on February 2, 2000 with the License Termination Plan (LTP). The potential environmental effects of the construction and operation of the SNEC Facility were reported in the "Final Safeguards Report" (Reference 5).

This updated Environmental Report is submitted in accordance with the requirements of 10CFR50.82 (a) (9) and 10CFR51.53 (d) to address the post operating license stage of the facility. As required by these regulations this updated ER addresses new information and environmental changes associated with the proposed termination activities. This report updates the two prior environmental reports and three supplements (See References 32– 36). Appropriate information contained in the three supplements and provided with Revision 1 of the Environmental Report, has also been incorporated into the content of this Revision 2.

The NRC prepared a generic environmental impact statement (GEIS), NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" (Reference 6) to assess the environmental effects associated with decommissioning alternatives for various types of nuclear facilities. This evaluation led to the following conclusions:

1) The technology for decommissioning nuclear facilities is well in hand and while technical improvements in decommissioning techniques are to be expected, decommissioning at the present time can be performed safely and at reasonable cost. Radiation dose to the public due to decommissioning activities should be very small and be primarily due to transportation of decommissioning waste to waste burial facilities. Radiation dose to decommissioning workers should be a small fraction of their exposure experienced over the operating lifetime of the facility and be well within the occupational exposure limits imposed by regulatory requirements. Decommissioning costs are reasonable and are, at least for the larger facilities such as reactors; a small fraction of the present worth commissioning costs (i.e., less than 10%).

2) Decommissioning of nuclear facilities is not an imminent health and safety problem. However, planning for decommissioning as an integral activity prior to commissioning as well as during facility life is a critical item that can have an impact on health and safety as well as cost. Essential to such planning activity is reasonable assurance that funds will be available for performing required decommissioning activities at the cessation of facility operations.

3) Decommissioning of a nuclear facility generally has a positive environmental impact. At the end of the facility life, termination of a nuclear license is the goal. Termination requires decontamination of the facility so that the level of any residual radioactivity remaining in the facility or on the site is low enough to allow unrestricted use of the facility and site. Commitment of resources, compared to operational aspects, is generally small. The major environmental impact of decommissioning is the commitment of small amounts of land for waste burial in exchange for reuse of the facility and site for other purposes. Since in many instances, such as at a reactor facility, the land is a valuable resource, return of this land to the commercial or public sector is highly desirable.

   Where applicable, the SNEC Facility information is compared to the generic assessments of NUREG-0586.

1.3 Regulatory Basis

Decommissioning of nuclear power plants is a regulated process whereby the radioactive materials contained in structures, systems, components, and portions of the site are reduced to residual levels, and the 10CFR50 license is terminated by the NRC. The termination of the Part 50 license requires NRC approval as specified in 10CFR50.82. Pursuant to the version of 10CFR50.82 in effect at that time, GPU Nuclear

Inc. prepared a SNEC Facility Decommissioning Plan (Reference 8). This Environmental Report supported the SNEC Facility Decommissioning Plan submittal. In a subsequent letter (Reference 30), GPU Nuclear reconciled these submittals with the modifications to 10CFR50.82 which was issued in July 1996.

Decommissioning activities will be accomplished in accordance with all applicable regulations. Radiation exposures to both plant personnel and the public will be controlled and monitored in accordance with 10CFR20. The shipment and disposal of all radioactive materials will be accomplished in accordance with 10CFR61, 10CFR71, and the appropriate parts of 49CFR. A quality assurance program will be implemented to assure decommissioning activities are conducted in a safe and controlled manner.

This Updated ER has been prepared in accordance with the requirements outlined, in 10CFR50.82(a)(9) and 10CFR51.53(d). The report is also intended to assist the NRC in meeting the National Environmental Policy Act (NEPA) requirements of Title 10 CFR Part 51.

Additionally, those federal, state, and local regulations that are required for safety and environmental purposes are also identified.

1.4 Decommissioning Alternatives

The decommissioning alternatives described in NUREG-0586, "Final Generic Environmental Impact Statement on Decommissioning of Nuclear Facilities" are: NO ACTION, DECON (immediate dismantlement), and SAFSTOR (long term storage followed by dismantlement).

The SNEC Facility was placed in a condition equivalent to a status later defined by the NRC as SAFSTOR when it was shutdown in 1972. Since then, it has been maintained in a monitored condition and the plant structures, external to the containment vessel, have been dismantled. In recognition of this, SNEC has evaluated several options for decommissioning of the facility in light of current facility conditions and factors external to the facility.

Since the facility has been maintained in a condition equivalent to SAFSTOR for approximately 30 years, radioactivity levels at the facility have decayed naturally, thereby reducing occupational radiation exposure during future decontamination activities.

The two decommissioning alternatives that have been evaluated are: SAFSTOR with dismantlement deferred an additional 30 years; and DECON - Immediate Dismantlement and Site Restoration.

The NO ACTION alternative, as described in NUREG-0586, implies that a licensee would abandon or leave a facility as is. This is not a viable decommissioning alternative and, therefore, is not considered.

As described in Section 4.2, the most appropriate alternative for the facility is Immediate Dismantlement and Site Restoration for the following reasons:

- It can be accomplished at this time with no significant impact to the health and safety of the workers, public, and the environment.

- Radioactive materials are removed from the site which is located in a 100 year flood plain and transported to a facility designed for long term disposal, thereby reducing overall environmental risk.

- Thirty years of radioactive decay have already reduced radiation exposure rates. The majority of personnel exposure savings to be gained from deferring dismantlement have already been achieved.

- A high groundwater condition could lead to loss of containment which could either cause an unmonitored release path or groundwater flooding of the lower elevations of the containment vessel.

- Degradation of containment vessel systems and structural components (e.g., polar crane and related equipment) which are needed to support dismantlement activities could start to occur.

- The people who worked on the SNEC Facility and the TMI2 Post-Defueling Monitored Storage (PDMS) projects have skills and knowledge directly applicable to the remaining work and are currently available.

- A low level radwaste disposal facility is available now. Its future availability and costs are uncertain.

- It eliminates the ongoing maintenance expense.

1.5 Final Release Criteria

The decommissioning objective is to release the site for unrestricted use per 10 CFR 50 and 10 CFR 20.1402 Subpart E. GPU Nuclear Inc. will demonstrate that the total effective dose equivalent (TEDE) from residual radioactivity is less than 25 mrem (0.25 mSv) per year to an average member of the critical group. In addition, a goal has been established to demonstrate that the committed dose equivalent (CDE) for the drinking water pathway will be less than 4 mrem (0.04 mSv) per year.

1.6 Summary And Conclusions

This Environmental Report demonstrates that the decommissioning of the SNEC Facility will not result in any significant impact to the health and safety of the workers and public or to the environment. Removal of radioactive materials from the site and placement in a facility designed for long term disposal along with restoration of the site will result in a positive benefit to the environment.

The following is projected for the decommissioning of the facility:

- Decommissioning activities will be conducted within the bounds evaluated by the GEIS (NUREG-0586).
- Occupational radiation exposures are now lower following the 30 years of radioactive decay and within the bounds evaluated by the GEIS (NUREG-0586).
- Exposure to onsite workers and the offsite public as a result of waste transportation are expected to be maintained well below the levels projected by the GEIS (NUREG-0586).
- The use of Low-Level Radioactive Waste (LLRW) disposal land will be less than projected by the GEIS (NUREG-0586).
- Radiological effluents will be monitored and minimized through engineering controls and treatment, and will be much lower than federal regulatory limits. Doses to the public will also be far below limits established by federal regulations.
- Radiological environmental monitoring will be conducted to confirm that effluents are minimal and that controls and treatment are effective.
- Residual radioactivity will be limited such that upon release of the site for unrestricted use an individual of a critical population group, living on the site, would not receive a dose greater than 25 millirem per year from all combined environmental exposure pathways.
- Accident analyses demonstrate that no adverse public health and safety or environmental impacts are expected from accidents that might occur during decommissioning operations.
- Ecological impacts (wildlife, plants, etc.) will be minimal.
- The proposed SNEC License Termination Plan (LTP) is environmentally sound and will result in the removal of radioactive materials from the site and permit unrestricted access.
- Non-radiological effluents will be permitted and discharged in accordance with the National Pollutant Discharge Elimination System (NPDES).
- The generation of hazardous waste and the potential for hazardous material spills will be minimized.

2.0 SITE AND FACILITY DESCRIPTION

2.1 Location of the Site

The site of the SNEC Facility is located about 100 miles east of Pittsburgh and 90 miles west of Harrisburg, Pennsylvania in the Allegheny Mountains, three fourths of a mile north of the Borough of Saxton in Liberty Township, Bedford County, Pennsylvania. The site is on the north side of Pennsylvania Route 913, 17 miles south of U. S. Route 22, and about 15 miles north of the Breezewood Interchange of the Pennsylvania Turnpike (Figure 2.1-1).

2.2 Description of SNEC Facility Site

The SNEC Facility was built adjacent to the Saxton Steam Electric Generating Station of the Pennsylvania Electric Company, a subsidiary of General Public Utilities. This coal fired station operated from 1923 to 1974 and was demolished between 1975 and 1977 (See site property map, Figure 2.2-1). The SNEC Facility site consists of 1.148 fenced acres of the approximate 150 acres owned by Pennsylvania Electric Company. An additional 9.6 acre area is fenced in around the electrical switchyard and buildings under Pennsylvania Electric Company control. The site as well as a portion of the Pennsylvania Electric Company area and the surrounding uncontrolled lands are in the 100-year floodplain of the Raystown Branch of the Juniata River, which borders the north and west portion of the property. A small stream known as Shoup's Run crosses the central portion of the property and joins the Juniata River. Normal elevation of the River near the facility is about 794 feet mean sea level (MSL), the site and adjacent property lie about 17 feet above river level. Much of the property is comprised of gently sloping open land comprised of grasses that are a result of restoration activities following the demolition of the Saxton Steam Electric Generating Station.

2.3 Facility Description

The only remaining structures of the original facility are the Containment Vessel (CV), the SSGS basement and adjoining Intake/Discharge Tunnels and associated underground discharge piping. In addition, as part of the decommissioning process, a Decommissioning Support Facility was constructed adjacent to the CV.

<u>Containment Vessel</u>
The Containment Vessel (CV) is a circular steel structure approximately 109 feet tall by 50 feet in diameter with approximately 50 percent of the structure below grade. The CV is subdivided into a reactor compartment/storage well, primary compartment, auxiliary compartment, and an operating floor. These areas are separated from each other by concrete walls, floors, and ceilings. Additionally the below grade portion of the CV is lined with concrete.

<u>Decommissioning Support Facility</u>
This pre-engineered facility was constructed to support decommissioning operations at the site. It consists of a steel "Butler" type building approximately 40' x 60', constructed on a slab located against the CV on the south side. The building consists of three sections; the Decommissioning Support Building (DSB), the Material Handling Bay (MHB),

and the Personnel Access Facility (PAF). Various doors are provided and an opening was cut into the CV shell to provide access between the CV and the MHB to facilitate removal of components for packaging and shipment.

Saxton Steam Generating Station Basement and Discharge Tunnel

The Saxton Steam Generating Station (SSGS) basement and Discharge Tunnel were contaminated as a result of radioactive liquid effluent discharges from the SNEC facility. The tunnel was the routine discharge point for liquid radioactive effluents. To date, characterization results of these structures indicate that extensive remediation will not be needed to meet final release criteria.

Intake Tunnel

During operation of the SSGS, water was drawn from the Raystown Branch of the Juniata River. A dam was utilized to impound the river in the area of the intake structure, which included the Intake tunnel. The intake water system only provided intake of river water to the SSGS and no discharges to the river were made via this pathway. During freezing weather, warm water from the SSGS Discharge Tunnel was diverted and allowed to flow into the SSGS Intake Tunnel via a pathway that utilized the Spray Pond supply piping. This configuration was established in order to prevent ice formation on the intake tunnel screen wash and filtration system components. This flow path, by use of discharge tunnel water, would have provided a mechanism for low level radioactivity to enter the SSGS intake tunnel.

Penelec Line Shack, Penelec Garage, Penelec Warehouse, Penelec Switchyard and Building

These buildings are located off the SNEC facility property but are on adjoining Penelec property. These structures were not directly associated with operation of the SNEC facility. However, they have been used by SNEC for storage, staging and other such activities. These buildings (except the small switchyard building) were included in the scope of the comprehensive final release survey. Portions of associated underground piping still exist at the site.

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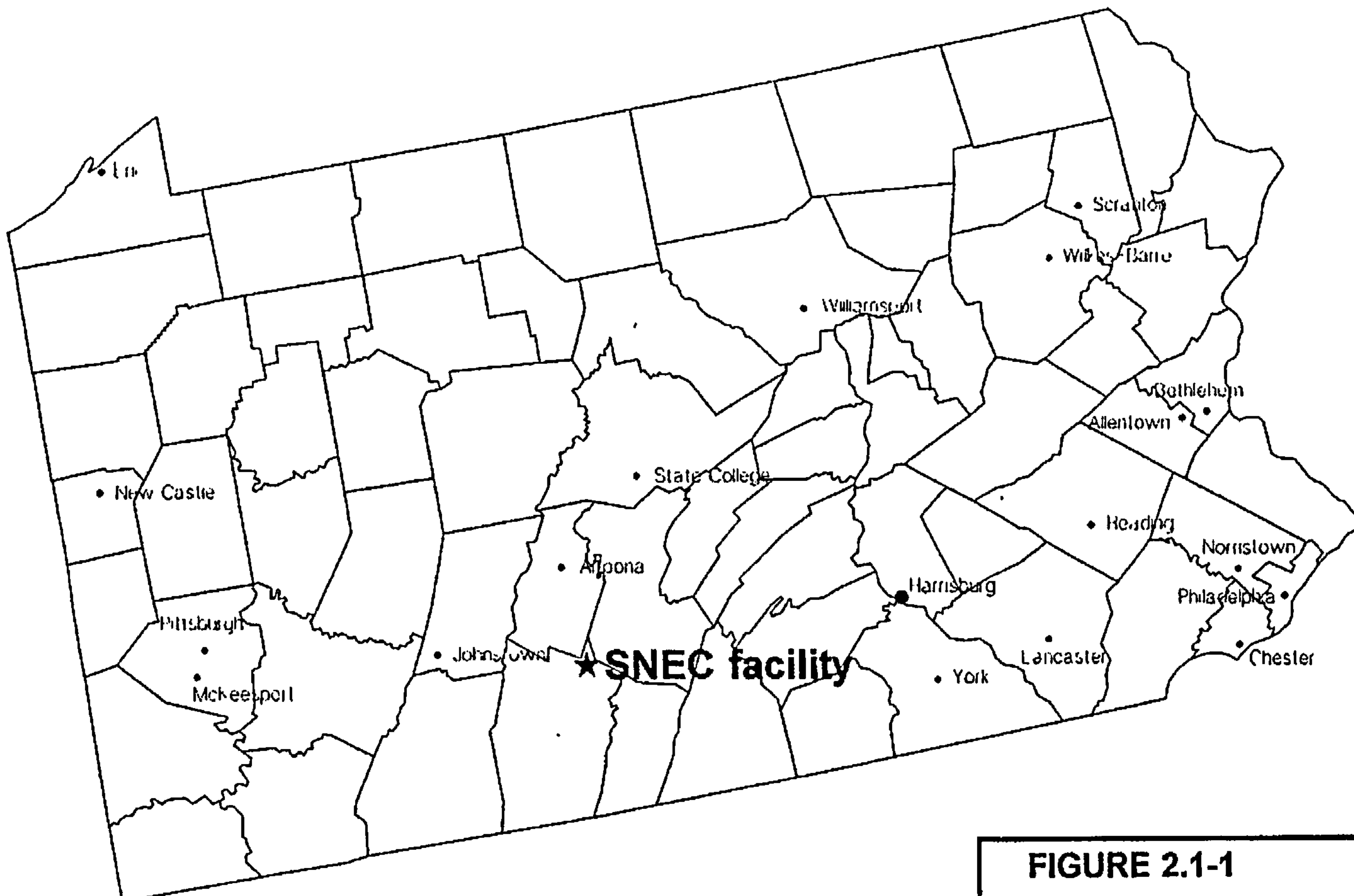
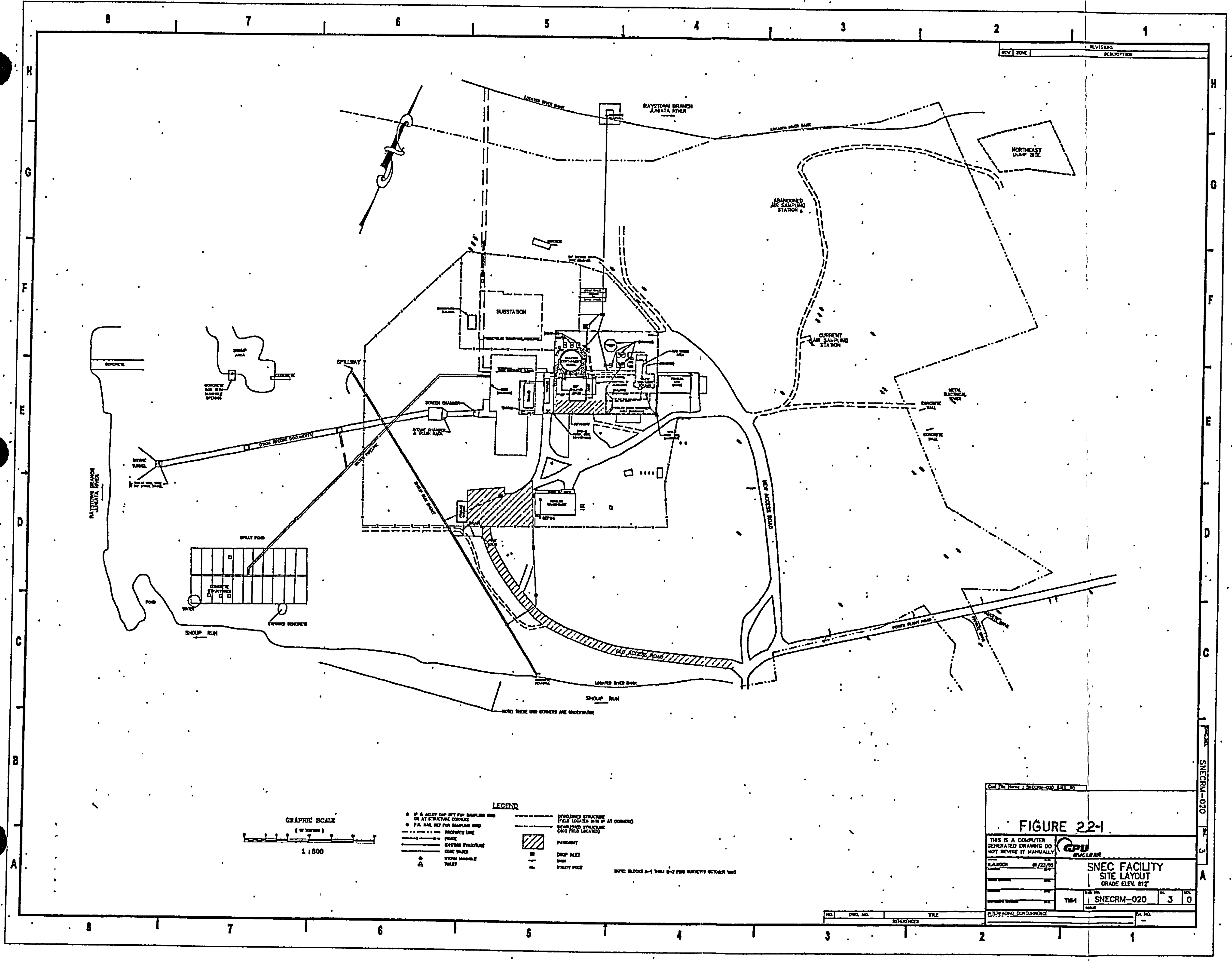


FIGURE 2.1-1

Location of Saxton Nuclear Experimental facility Saxton, Pennsylvania



RAYSTOWN BRANCH
JUNIATA RIVER
NORTHEAST
DUMP SITE
ABANDONED
AIR SAMPLING
STATION
CURRENT
AIR SAMPLING
STATION
SUBSTATION
SPILLWAY
SCREEN CHAMBER
INTAKE CHAMBER & PUMP RACK
INTAKE TUNNEL
RAYSTOWN BRANCH
JUNIATA RIVER
SPRAY POND
POND
SHOUP RUN
EXPOSED CONCRETE
CONCRETE
STRUCTURE
CONCRETE WALL
METAL
ELECTRICAL
TOWER
NEW ACCESS ROAD
OLD ACCESS ROAD
POWER PLANT ROAD
LOCATED RIVER BANK
SHOUP RUN
LEGEND
GRAPHIC SCALE
1 : 600
PROPERTY LINE
FENCE
PAVEMENT
DROP INLET
STORM MANHOLE
TOILET
UTILITY POLE
FIGURE 2.2-1
THIS IS A COMPUTER GENERATED DRAWING DO NOT REVISE IT MANUALLY
GPU NUCLEAR
R.A.KOCH 01/23/02
SNEC FACILITY
SITE LAYOUT
GRADE ELEV. 812'
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REVISIONS
REV ZONE DESCRIPTION
REFERENCES

3.0 PLANT ENVIRONMENTAL INTERFACES

3.1 Demography - Human Activities in the Environs

The area surrounding the site is generally rural, forested and mountainous terrain. The population density of the area is low with small concentrations in the valleys and along main highways. The site lies about three-fourths of a mile north of the Borough of Saxton in Liberty Township, Bedford County, Pennsylvania. The population and population trends for the Borough of Saxton, Bedford County and the adjacent counties of Blair and Huntingdon are shown in Table 3.1-1. The combined population of these three surrounding counties has decreased between 1980 and 2000. At the time the SNEC Facility was constructed, the estimated population of the Borough of Saxton was 975, as recorded during the 1960 census. Forty years later the population as recorded during the 2000 census was 803, a decline of 17.6%.

The nearest population center (as defined by 10CFR100) of 25,000 or more is the city of Altoona which lies about 20 miles north-northwest of the SNEC Facility site. The 2000 population of Altoona was 49,523. The closest incorporated towns other than the Borough of Saxton are Coalmont Borough about 2.5 miles to the east, Dudley Borough about 3.4 miles to the east and Broad Top about 5.3 miles also to the east.

Current uses of adjoining properties include undeveloped wooded and residential areas. A cemetery is present along the eastern property boundary, undeveloped wooded and residential areas along the northern, southern, and western property boundaries.

The Raystown Branch of the Juniata River in the vicinity of the site is widely used for recreation by local residences primarily for boating and fishing. However the vast majority of recreational activities along the river are centered downstream of the site on Raystown Lake.

Approximately 34 miles downstream from the site the Raystown Branch of the Juniata River is dammed, therefore impounding the river to form Raystown Lake. The dam was built by the US Army Corps of Engineers (COE) from 1968 to 1973 for flood control, recreation, and water quality purposes. At normal pool level the lake is 27 miles long and has an area of 8,300 acres. The lake provides one of the better recreational areas in this part of Pennsylvania The lake has been intensively developed by the Federal Government for recreational activities including boating, fishing, camping, hunting, and picnicking. Over 475,000 visitors annually make use of the many recreational activities offered.

3.2 Geology

The site lies in the Appalachian highlands in the Ridge and Valley physiographic province. This province comprises alternate successions of narrow ridges and broad or narrow valleys trending generally northeast. This is a region of alternating hard and soft sedimentary rocks that have been severely folded by lateral compression into a series of anticlines and synclines. The ridge is of Tuscarora quartzite and small amounts of Pleistocene gravel and recent alluvium are found along the river. Most of the area is underlain by strata of Upper Devonian age. This geologic cross section denotes a northwest - southeast orientation and shows the SNEC Facility to be located on the limb of a major syncline that dips generally towards the east (Reference 7). Although coal was mined in the general area of the site, no coal has been reported to lie beneath the site, nor has the site been undermined. The ridges immediately to the northwest of the site rise to 1,300 feet and to the southeast rise to 1,500 feet with site elevation being about 811 feet MSL.

Soil Description

Split-spoon samples collected during an extensive hydrogeological investigation (References 7 & 21) and samples from hand-dug pits indicate the following: the surficial soil is composed of sand, silt and gravel or ash and cinders. These fill materials were placed during station construction. In most areas adjacent to the area modified during the construction of the CV this material has been observed to be 1.5 to 4 feet thick. The fill material is generally unsaturated.

Underlying the fill materials is a boulder layer. This layer is generally four to six feet thick and separates the fill material from the top of the bedrock. A boulder layer apparently was formed as a result of the river's depositional processes. Most of the boulders are rounded and are very hard quartzite (virtually no porosity). The void space between the boulders contain a dense mixture of sand, silt and clay. Based on these characteristics, this material has a low bulk permeability and consequently acts as a hydraulic barrier to flow between the fill and the siltstone bedrock. Although water level information indicates most of this layer is saturated, it does not undergo appreciable groundwater flow. (Reference 21).

Bedrock Geology

The bedrock locally underlying the boulder layer is identified as the marine beds of upper Devonian age in the Paleozoic era (Pennsylvania Geologic Survey, Fourth Series, 1960). These rocks are described as gray to olive brown shales, graywackes and sandstone. The top of the bedrock surface is weathered and fractured (Reference 7). Also, the bedrock surface apparently decreases in elevation from the Facility to the northwest. This surface apparently decreases in elevation to the north and the south. Depth to the bedrock at the site is generally 7 to 18 feet below the overburden material (fill and boulder layers).

Groundwater movement within the bedrock is predominantly controlled by fractures. Groundwater also moves within the spaces (bedding planes) between the individual layers of the siltstone bedrock. There are two major fracture patterns one trending to the northwest (a high angle fracture set oriented between N 50° W and N 75° W) and a second trends to the northeast. Bedding planes also trend to the northeast. (Reference 21)

3.3 Hydrology

Surface Water

The primary water body in the vicinity of the facility is the Raystown Branch of the Juniata River, which meanders along its water course in an overall flow direction to the northeast and generally borders the northern and western edges of the property. Approximately 34 miles downstream from the site the Raystown Branch of the Juniata River is dammed, therefore impounding the river to form Raystown Lake. The dam was built by the COE from 1968 to 1973 for flood control, recreation, and water quality purposes. At normal pool level the lake is 27 miles long and has an area of 8,300 acres. Normal elevation of the river near the site is about 794 feet MSL in comparison to the site which lies at about 811 feet MSL. A small stream known as Shoup's Run flows west and transects the Company property to the south of the SNEC Facility and empties into the Raystown Branch of the Juniata River. The watershed extending upstream from Saxton, Pennsylvania is about 756 square miles.

Because the vicinity of the site contains old field and forest vegetation and very little impervious cover, precipitation falling on the SNEC Facility generally will percolate into the local soils and become incorporated into the groundwater regime as opposed to direct overland flow into the adjacent streams. Significant precipitation will cause minor intermittent ponding in the immediate site area, further demonstrating that surface runoff from the site is minimal. Therefore, an understanding of groundwater hydrology at the SNEC Facility is of primary importance. Extensive groundwater monitoring in the site vicinity has been undertaken to ensure that groundwater degradation is not occurring.

A detailed description of the hydrology of the major surface water bodies in the vicinity of the site is provided in the SNEC Final Safeguards Report (Reference 5).

Ground Water

There is reportedly approximately 7 to 18 feet of overburden material overlying bedrock (a fractured siltstone). The overburden materials generally consist of a fill overlying a natural boulder layer in a dense sandy, silty, clay matrix. Groundwater occurs in both the overburden/bedrock interface and bedrock.

Groundwater flow is toward the northwest from the Facility in both the overburden/bedrock interface and bedrock and is not affected by seasonal water table fluctuations. The groundwater data indicates that the Raystown Branch of the Juniata River is a groundwater discharge feature. A subsurface discharge tunnel of a former coal fired generating station affects groundwater flow at the overburden/bedrock interface, acting as both a barrier and a drain. Groundwater flow in bedrock is controlled by northwest trending fractures.

Hydrogeologic data collected from the site was utilized to calculate a range of travel times, including high and low water level events, and high and low hydraulic conductivity values for the aquifer. In the overburden/bedrock interface, the calculated average travel times from the Facility to the river ranges between 17 and 30 years with an overall travel time between 11 and 46 years. In bedrock, calculated average travel times were between 5 and 6 years with an overall travel time range between less than one and 45 years.

Groundwater flow in overburden (Figure 3.3-1) is affected by the discharge tunnel. The tunnel creates a groundwater flow barrier since concrete was poured directly on the top of bedrock. The backfill adjacent to the tunnel provides a groundwater drain. Thus, shallow groundwater at the overburden/bedrock interface flowing from the facility is intercepted and drained by the backfill adjacent to the eastern side of the discharge tunnel.

Groundwater flowing in bedrock (Figure 3.3-2) is generally controlled by fractures and bedding plains. There are two general fracture orientations at this Site. One trends to the northwest (a high angle fracture set oriented between N 50° W and N 75° W) and a second trends to the northeast (dipping at moderate angle to the northwest). Bedding planes trend to the northeast and dip moderately to the southeast.

Data from the site indicates that the northwest trending high angle fractures control groundwater flow since groundwater flow is consistently toward the northwest throughout the year. There is no indication during high (12 April 2001) or low (6 November 2001) groundwater elevation events, that groundwater flows toward the northeast and OW-4 series wells either along bedding planes or through the northeast trending fractures at any time throughout the year.

In 2000 and 2001, slug tests were conducted on several observation wells. Slug tests (falling head tests) were conducted on seven wells to assess the ability of water to move through the subsurface. Tests were conducted on three overburden (OW-3, OW-5, and OW-6) and four bedrock wells (OW-3R, OW-4R, OW-5R, OW-7R). The test was conducted by adding water to the well and frequently measuring and recording decreasing water levels. The water levels were recorded with a hand held water level probe. The Bouwer-Rice and the Hvorslov methods were used to analyze the slug test data and estimate hydraulic conductivity.

The range of hydraulic conductivity for three wells at the <u>overburden/bedrock</u> interface is 15.59 m/year to 35.62 m/year. The range of hydraulic conductivity for the four <u>bedrock</u> wells is 15.59 m/year to 909.53 m/year (Reference 21).

3.4 Meteorology

Applicable references for this section are contained in references 12, 13, and 14.

Regional Climate

The climate of the south-central Pennsylvania region can best be described as a region of contrast. During the late spring, summer and early fall, the region is dominated by air masses that originate from the southeastern United States. Warm and humid conditions are normal during this time along with air mass thunderstorms and precipitation associated with cold fronts. These frontal boundaries are more active (weather-wise) during the spring and autumn, when the polar jet stream is over the region. The winter season is cold and often times overcast. Air masses are generally cold and dry. Winds associated with these air masses are generally from the west-northwest. They originate from central Canada and move into the region behind active cold fronts and low pressure systems that move north along the Atlantic seaboard. The region will experience a large percentage of cloud cover, in part, due to its close proximity to the Great Lakes. As the cold, polar air passes over the relatively warm lakes, condensation occurs along with lake-effect snows close to the shore of these large bodies of water. Drying will occur as the distance increases from the lakes and a constant cloud cover will dominate in western Pennsylvania. In addition, in this region of steep-sided valleys, mountain winds during the day will lead to an increase in clouds as daytime heating will cause rising air motions and subsequent condensation (clouds).

Precipitation in the region is mainly due to air mass thunderstorms, cold front passages from the west and low pressure storms that move along the Appalachian Mountains through the St. Lawrence Valley region.

These storms will generally produce copious amounts of rain from a northeast direction. Annual amounts can range from 30 - 40 inches. One quarter of the winter precipitation is snowfall. The major fall and winter coastal storms that produce large amounts of precipitation in the eastern half of the state have minimal effect on the site.

Winds in the Saxton region are influenced by topographic features. The facility lies in the main valley formed by the Terrace and Saxton Mountains to the east, and Tussey Mountain to the west. The Allegrippis Ridge is also located to the west. The mountains and valley are generally southwest to northeast. With the large scale wind flow out of the west, "wind channeling" occurs at the lower levels, which give rise to a small-scale southwesterly flow up the valley. On a smaller scale, the varying topographic regime will cause valley-slope circulation patterns. During the daytime, beginning in mid-morning and continuing until near sunset, the wind will cross the valley and blow up the sides of the mountain as daytime heating near the surface creates unstable, rising air and, as previously mentioned, an increase in clouds. Beginning around midnight and continuing until shortly after sunrise, the wind tends to blow down the mountain slope as the land surface along the slopes cools more rapidly than at the base of the valley. This cooler, denser, stable air will sink towards the valley and move down the canyon. Wind speeds are generally light at the SNEC Facility site (below ten miles per hour), primarily due to the wider valley around the site.

Past Meteorological Facility Operations

An onsite meteorological program at the SNEC Facility site was instituted in 1960 and operated for one year. Data from the program were used to establish estimates of dispersion and diffusion characteristics of the site. The network contained three towers located east, west and north of the site. Instrumentation at each location included wind speed, wind direction and ambient temperature. Temperature probes were mounted at different vertical levels to try and obtain a better understanding and determination of the inversion stable layer that develops with valley flow at night. Other readings from the site such as barometric pressure, river water temperature, relative humidity and rainfall were available.

Meteorological Dispersion Assessment

Due to the steep mountain slopes in the Saxton region, direct heating, which leads to unstable meteorological conditions and strong mixing (dispersion), are minimal. In fact, conditions of strong mixing occur only 3 percent of the time. Air dispersion in the region is either neutral or stable. The former condition is synonymous with a cloud cover or moderate wind while the latter condition is characteristic of cold air "pooling" due to mountain winds at night.

Under neutral conditions in which mixing throughout the layer occurs, the ultimate dispersion is in a direction determined by the wind direction in the main valley. As previously mentioned, the two wind directions are southerly, along the mountain-valley range and westerly, blowing up out of the valley through the gap between Terrace and Saxton Mountains to the east. These winds range between 5-10 miles per hour.

Under stable conditions, the stratification of air isolates the valley flow from the large-scale wind flow of the main valley. Cold air "pooling" in the valley will cause a temperature inversion to develop. This inversion will tend to "trap" dispersion within a well-mixed region in the first several hundred feet. Fifty percent of the time, these stable conditions exists. Of this, approximately 25 percent are extreme in that pollutant "trapping" or fumigation in the lower levels will occur. Wind speeds will be 3-5 miles per hour with flow generally down the valley away from the Saxton region. Since daytime heating takes place in the region, prolonged periods of pollutant "trapping" do not exist.

Since the release from the SNEC Facility is considered "ground" in nature, highest radioactive dispersion values will be close to the site boundary and in the direction of the prevailing wind flow. It can be expected that the major portion of the particulate matter originating at the site will be deposited in the valley north-northeast of the site. These areas are sparsely occupied and almost completely covered by forests. It should be noted that an elevated release, by definition, is a release that is 2-2.5 times the height of the nearest adjacent building structure.

Wet deposition of radioactive particulate matter will occur during periods of precipitation. Since most major precipitation events occur from a northeast direction, radioactive material would be deposited towards the south and southwest directions. In addition, with a ground release, this washout will occur close to the source and within the site's property line.

3.5 Other Environmental Features

Historical

The SNEC Facility site and adjoining Pennsylvania Electric Company property has been evaluated by the Pennsylvania Historical and Museum Commission which included the project's potential impact on both historical or archaeological areas. The project site has been previously disturbed by the construction of the SNEC Facility. No cultural resource surveys were necessary or required by the commission (Reference 37).

Endangered Species

In 2002 an endangered species screening was conducted using the Pa. Natural Diversity Inventory (PNDI) search system. For the SNEC Facility site and adjacent Pennsylvania Electric site, there were 3 endangered plant species identified in the screening process. The following plants were identified: Wild Oat (Chasmanthium Latifolium), American Beakgrain (Diarrhena Obovata), and Sida (Sida Hermaphrodita).

A review by the Pa. Dept. of Conservation and Natural Resources (Reference 22) concluded that there is no effect on plants, natural communities or insects anticipated from SNEC decommissioning activities.

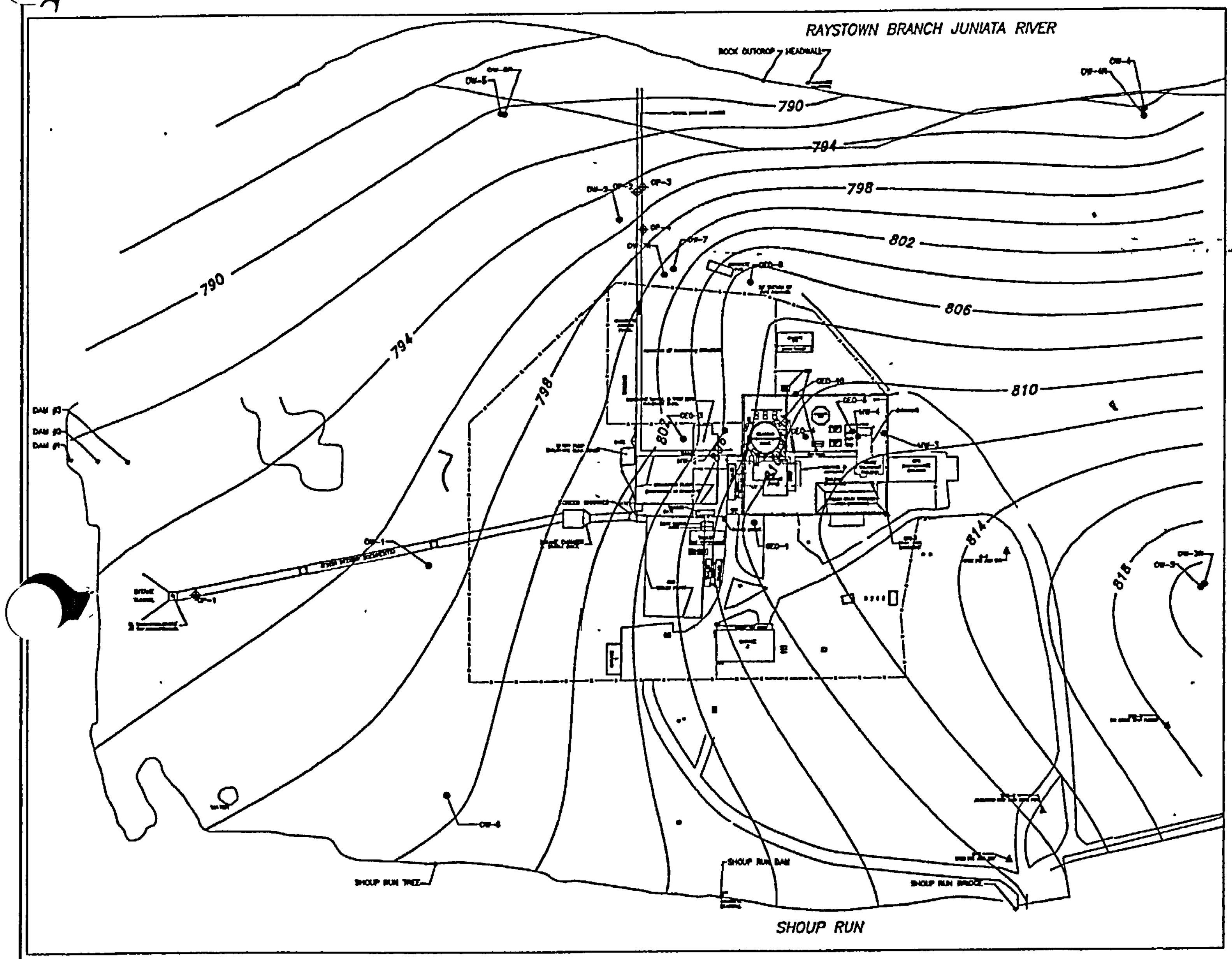
Table 3.1-1

Population and Population Trends
for the Borough of Saxton,
Bedford and Adjacent counties

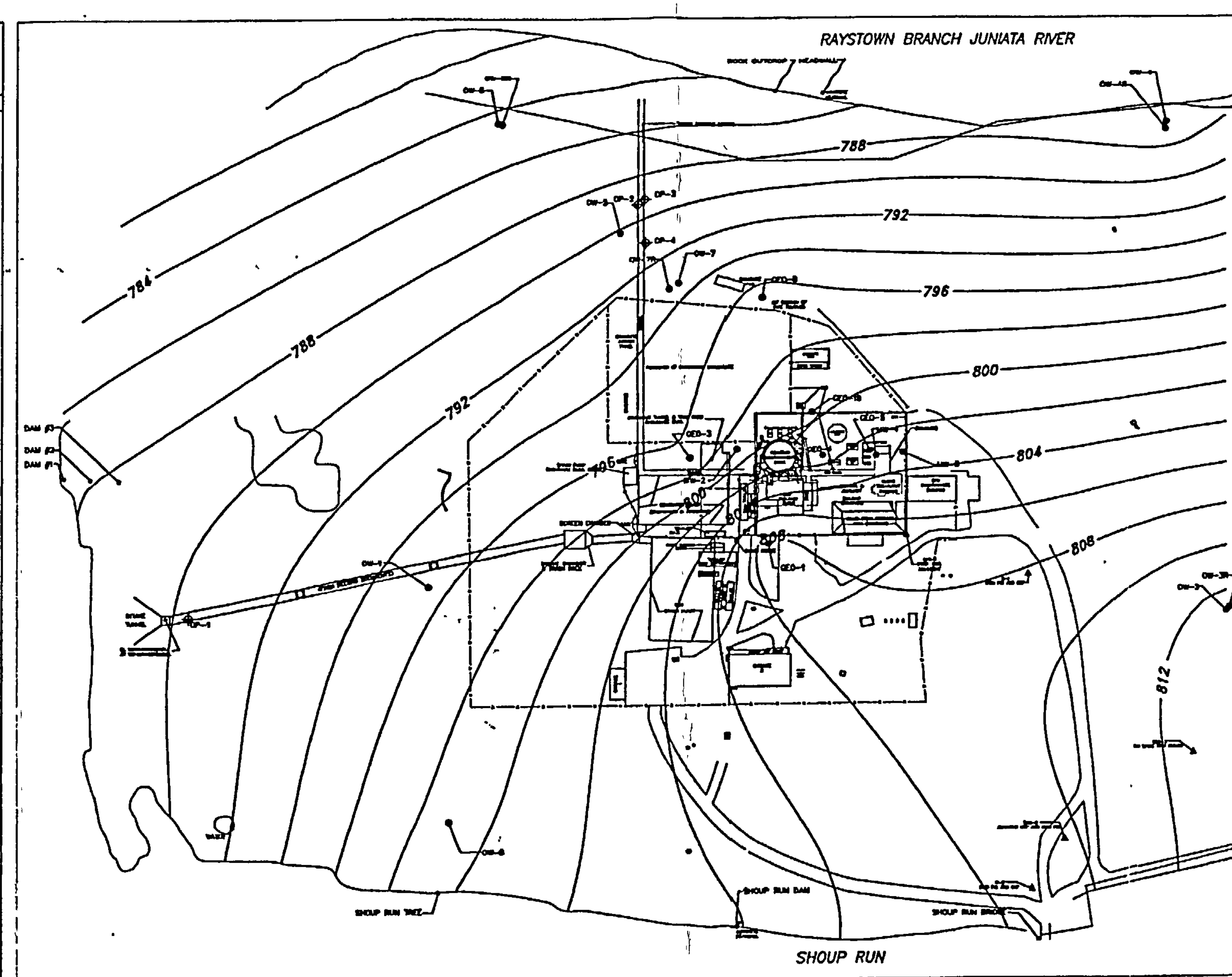
Saxton Borough

Year	Population
1960	975
1980	814
1990	838
2000	803

Year	Bedford County	Blair County	Huntingdon County
1980	46,784	136,621	42,253
1990	47,919	130,542	44,168
2000	49,984	129,144	45,586



GROUNDWATER ELEVATION CONTOURS-
OVERBURDEN/BEDROCK INTERFACE
HIGH WATER LEVEL EVENT
(12 APRIL 2001)



GROUNDWATER ELEVATION CONTOURS-
OVERBURDEN/BEDROCK INTERFACE
LOW WATER LEVEL EVENT
(6 NOVEMBER 2001)

200 0 200 400 600
SCALE IN FEET

NOTES:

1.) BASE PLAN FROM "SAXTON NUCLEAR FACILITY SAMPLING GRID", BY L. ROBERT KIMBALL & ASSOCIATES INC., CONSULTING ENGINEERS, DATED 1999.

2.) GROUNDWATER ELEVATION CONTOURS DEVELOPED UTILIZING A COMPUTERIZED KRIGGING ROUTINE.

LEGEND

- OBSERVATION POINT (OP) LOCATION
- EXISTING GROUNDWATER MONITORING LOCATION AND/OR GROUNDWATER OBSERVATION LOCATION
- SURFACE WATER GAUGING LOCATION
- PROPERTY LINE
- FENCE
- EXISTING STRUCTURE
- EDGE OF SURFACE WATER
- 800 GROUNDWATER ELEVATION CONTOUR (CONTOUR INTERVAL: 2 FT)

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS

150 MINERAL SPRING DRIVE
DOVER, NEW JERSEY 07801
TEL: 973-361-3600
FAX: 973-361-3800

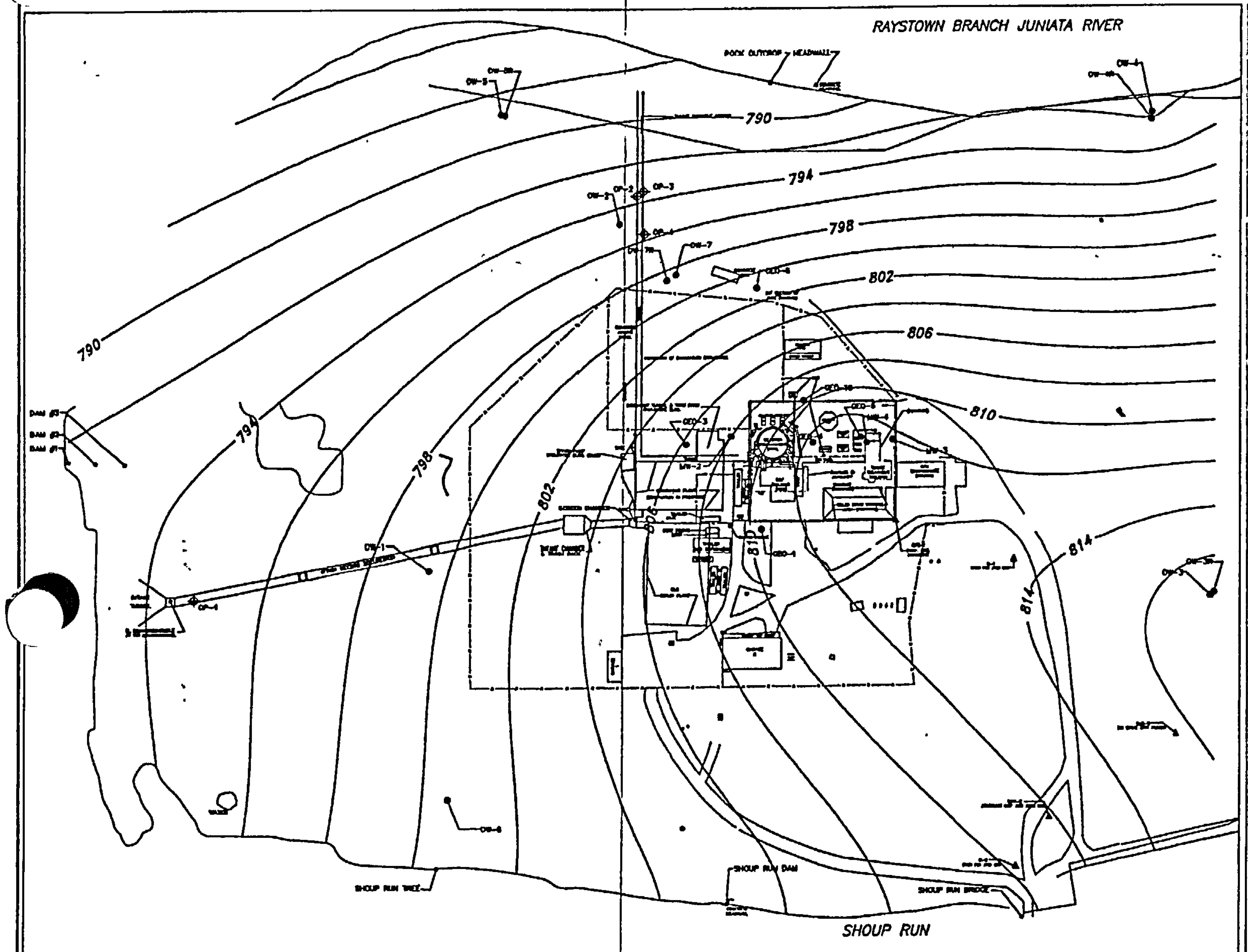
SAXTON NUCLEAR EXPERIMENTAL STATION
SAXTON, PENNSYLVANIA

FIGURE 3.3-1

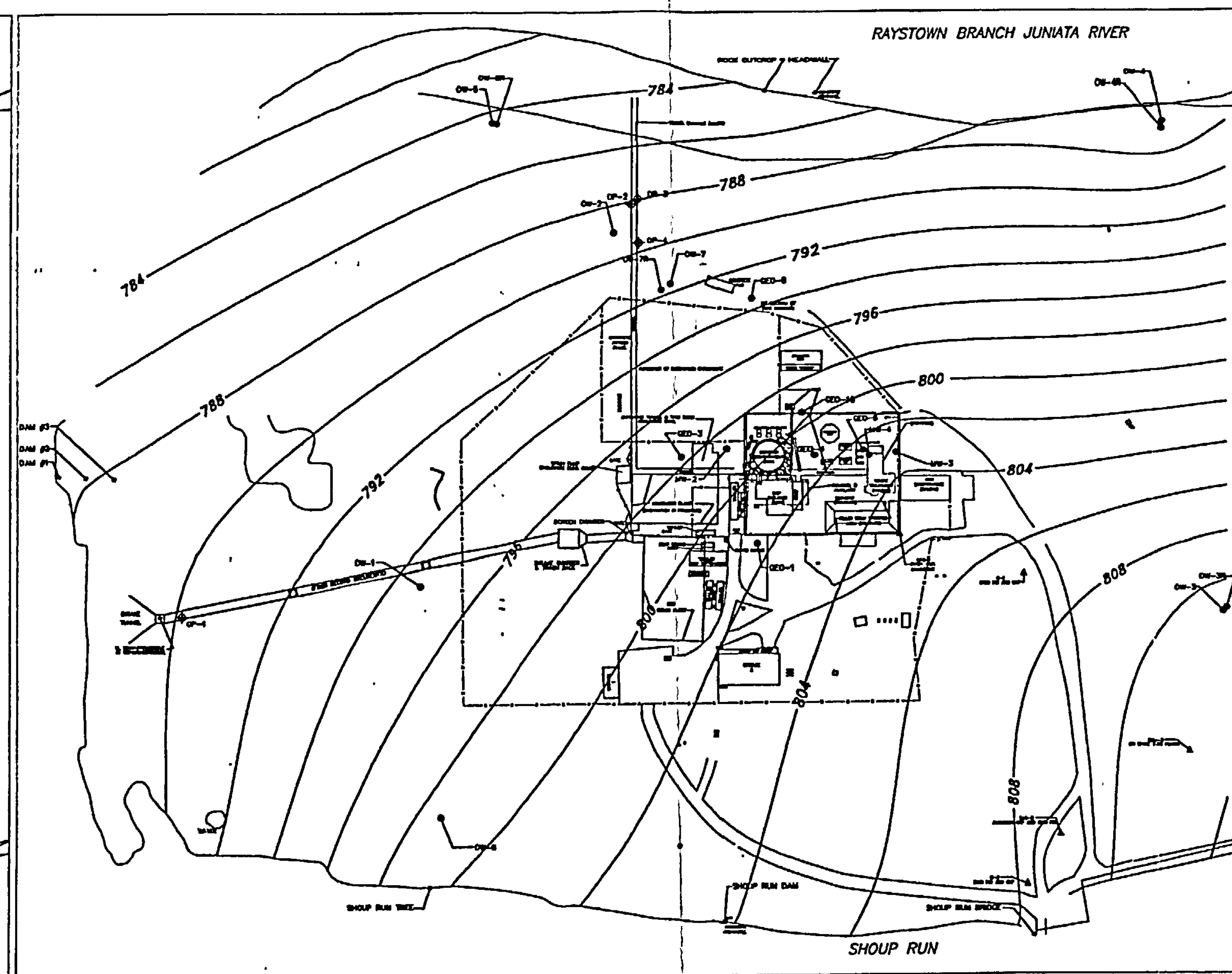
GROUNDWATER ELEVATION CONTOURS- OVERBURDEN/ BEDROCK INTERFACE

SCALE: AS SHOWN

DECEMBER 2001



GROUNDWATER ELEVATION CONTOURS-
BEDROCK
HIGH WATER LEVEL EVENT
(12 APRIL 2001)



GROUNDWATER ELEVATION CONTOURS-
BEDROCK
LOW WATER LEVEL EVENT
(6 NOVEMBER 2001)

200 0 200 400 800
SCALE IN FEET

NOTES:

1.) BASE PLAN FROM "SAXTON NUCLEAR FACILITY SAMPLING GRID", BY L. ROBERT KIMBALL & ASSOCIATES INC., CONSULTING ENGINEERS, DATED 1999.

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- PROPERTY LINE
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- EDGE OF SURFACE WATER
- 800 GROUNDWATER ELEVATION CONTOUR (CONTOUR INTERVAL: 2 FT)

UNDERGROUND ENGINEERING & ENVIRONMENTAL SOLUTIONS	SAXTON NUCLEAR EXPERIMENTAL STATION SAXTON, PENNSYLVANIA FIGURE 3.3-2 GROUNDWATER ELEVATION CONTOURS- BEDROCK
150 MINERAL SPRING DRIVE DOVER, NEW JERSEY 07801 TEL: 973-361-3600 FAX: 973-361-3800	SCALE: AS SHOWN DECEMBER 2001

FILE: 74853-000 017

4.0 DECOMMISSIONING ACTIVITIES AND PLANS

4.1 Introduction

This section describes the selection of the decommissioning alternative that is most appropriate for the SNEC Facility and the decommissioning activities required to implement it.

4.2 Selection of Decommissioning Alternative

GPU Nuclear Inc. has selected DECON with Immediate Dismantlement as the alternative for decommissioning the facility. The following sections provide a detailed description of the selection of this alternative.

4.2.1 No Action

The NO ACTION alternative, as described in NUREG-0586, implies that a licensee would abandon or leave a facility as is. This is not a viable decommissioning alternative and, therefore, is not considered.

4.2.2 Further Deferral of Dismantlement

The SNEC Facility has been shut down since 1972, therefore, dismantlement has already been deferred for greater than 20 years. The option of deferral of dismantlement for an additional 30 years has been evaluated.

Thirty (30) year additional deferral has the advantage of further radioactive decay thus reducing overall radiation exposure during dismantlement. Table 4.2-2 provides a comparison of radiation exposure for the various alternatives.

In spite of this advantage, deferral for 30 years has several overriding disadvantages. The first is the loss of an experience base currently available. GPU, Inc., SNEC's parent company, employed individuals who worked at the SNEC Facility while it operated. Their knowledge of the plant from that era has proven and will continue to be invaluable. In addition, GPU Nuclear Inc. has remediated and demolished the reactor support buildings and structures at the facility and placed Three Mile Island Unit 2 in Post-Defueling Monitored Storage (PDMS). The skills of the people who worked on these projects are directly applicable to the remaining work at the SNEC Facility and those same people will not be available in 30 years.

In addition, a high groundwater condition could lead to loss of containment, which could either cause an unmonitored release path or groundwater flooding of the lower elevations of the containment vessel. Much of the CV is located below ground level and groundwater flooding would create an extremely difficult dismantlement scenario, increase the quantity of resulting radwaste, thus increasing the overall cost. Further, since the inside of the steel liner below grade is covered by concrete on the inside, degradation of the liner could go undetected. Additionally, the high moisture content of the atmosphere inside the facility would hasten degradation of containment vessel systems and structural components (e.g., polar crane and related equipment) which will be needed to support dismantlement activities. This would result in making decommissioning activities less safe for workers as the components continue to deteriorate.

There is also the disadvantage of the continuing maintenance requirements including an escalating effort to manage the deterioration of the facility over the next 30 years. It makes no economic sense to spend money to monitor and maintain a facility that will never be used again.

Finally, the cost of the radioactive waste disposal in 30 years is likely to be much greater than the cost of disposal at the presently available facilities. The cost of the radioactive waste disposal has been rising at a much higher rate than that of inflation and therefore, it would be more expensive to wait until later to decommission the facility. Sites for the disposal of low level radioactive waste generated in Pennsylvania are currently available at the Barnwell, South Carolina Waste Management Facility and/or Envirocare of Utah, therefore the waste can be sent directly to burial. Future waste disposal choices are less certain, introducing the possibility of long term radioactive waste storage at the site. This is clearly undesirable due to the location of the site in a flood plain. The facility was never intended to be a long-term radioactive waste storage site.

For these reasons, the 30 year additional deferral of dismantlement was not selected.

4.2.3 Immediate Dismantlement

The major advantages of immediate dismantlement of the SNEC Facility are that it most quickly removes components from below ground level, stabilizes the radiological conditions at the site and allows the site to be released for unrestricted use. Immediate dismantlement also allows GPU Nuclear Inc. to make use of GPU's remaining SNEC Facility and TMI-2 expertise for planning and implementing dismantlement activities. In addition, sites for the disposal of low level radioactive waste generated in Pennsylvania are currently available at the Barnwell, South Carolina Waste Management Facility and/or Envirocare of Utah under present contracts, therefore the waste can be sent directly to burial, thus further minimizing decommissioning costs.

The major disadvantage to proceeding with immediate dismantlement is that radiation exposure to dismantlement personnel is the highest for this option as compared to additional deferral. Since the SNEC Facility has been shutdown for approximately 30 years, the majority of personnel exposure savings to be gained from deferring dismantlement have already been achieved. The person-rem determination for the immediate dismantlement option is reasonable and in-line with current industry experience. The 13 person-rem difference is small and provides no overall benefit compared with removing the site as a source of radioactive material.

Radiological conditions at the facility now are at a level that allows workers to safely remove components from the facility without threat to the safety of workers or local residents. Additionally, the technology exists to safely and efficiently decommission the site now.

Immediate dismantlement places the SNEC Facility in a stable and secure condition in the shortest amount of time. It has been chosen as the preferred option.

4.3 Decommissioning Schedule

Table 4.2-1
Decommissioning Schedule

Milestone	Begin	Complete
CV Concrete Removal	2nd Qtr 2002	4th Qtr 2002
Final Status Survey (FSS)	1st Qtr 2003	2nd Qtr 2003
Terminate License	----	3rd Qtr 2003
Site Restoration	3rd Qtr 2003	3rd Qtr 2003

4.4 Plant Dismantlement Activities

It is the objective of GPU Nuclear Inc. to complete the decommissioning of the SNEC Facility in a safe and efficient manner that protects the health and safety of the workers, public and environment.

The scope of work includes the following major activities associated with the proposed decommissioning of the facility, some of which have been completed: removal and disposal of the steam generator, pressurizer, and the reactor pressure vessel; dismantlement and disposal of system components; the decontamination/disposal of radiologically contaminated facility structures; waste management; demolition of non-contaminated plant structures; and site restoration.

Based on the results of the site characterization study, conceptual engineering and planning have been performed to determine the most advantageous approach to decommissioning. Both conceptual and detailed engineering and planning have and will incorporate such considerations as: regulatory guidance, maintenance of occupational radiation exposure as low as reasonably achievable (ALARA), management of low level radioactive waste (LLRW), industrial safety, environmental impacts, cost and schedule. Another aspect considered is the use of field-proven and state-of-the-art dismantlement techniques. Decommissioning activities will be performed under a quality assurance program.

<u>Temporary Support Facilities</u>
In order to facilitate decommissioning activities, temporary support facilities: such as trailers and a Decommissioning Support Facility were located on previously disturbed areas of the property. The Decommissioning Support Facility was constructed adjacent and connected to the containment vessel and used for segregating and packaging of waste for transportation to offsite licensed disposal sites.

A temporary building has been constructed that houses the SNEC Water Disposal System. This building contains various tanks, pumps and other components necessary for the site's water management. The purpose of the system is to collect, analyze and disposition various classes of water on the SNEC site. Water is forwarded to one of the system holding batch tanks through one or more 10-micron filters. The tank is then isolated, recirculated and sampled prior to release to an on-site sedimentation field designed specifically for this purpose. While the system and its operating procedures have provisions for releasing slightly radioactive water to the Juniata River in accordance with the SNEC ODCM, no such releases have been made to date. The system has been in continuous operation since October 2000 and as the end of 2001, approximately 1,250,000 gallons of water has been dispositioned.

System and Structure Dismantlement

Those systems or structures that do not meet the release criteria will be dismantled and removed. Pipe and metal dismantlement and removal will be performed using shears, portable band saws, diamond wire saws, abrasive wheel cutting, OD milling machine, or other suitable techniques. Scabblers and C02 blasters are options for removal of fixed radiological contamination from concrete. Evaluations of the best alternatives are continuing as part of the further detailed engineering and planning. The use of water will be minimized due to the cost and schedule impact of disposing of the water.

Radiological surveys, after dismantlement of systems and structures, will be performed to ensure that all radiological contamination levels are at or below the release criteria. If radiological contamination levels are discovered above the release criteria, remedial measures will be evaluated and implemented.

Steam Generator and Pressurizer

The steam generator and pressurizer required that all process piping attachments to the vessels be cut. Openings created by cutting the attached piping were sealed to prevent release of radiological contamination to the surrounding areas during handling. Removal of the steam generator and pressurizer vessels from the containment was through an opening cut in the containment dome. The vessels were prepared for shipment by removing, fixing, or covering any external radiological contamination.

Reactor Vessel

An opening was cut in the steel containment vessel dome above the reactor vessel. Piping and instrumentation lines attached to the reactor vessel were cut using appropriate cutting technologies. Openings created by cutting operations were sealed to preclude the release of surface radioactive contamination. The reactor vessel was removed through the dome opening from the containment vessel and placed into a sheltered laydown area to package the vessel for transportation to a licensed disposal facility. The internals were contained within the vessel and the internal void space was filled with concrete/grout. When not transferring material through the dome opening, it was covered to ensure the weather-tight integrity of the containment vessel dome. Appropriate radiological contamination and airborne control measures were implemented to prevent the spread of such material prior to removal of the reactor vessel. Any external loose radiological contamination was removed or fixed to meet federal shipping regulations.

Demolition of Non-Contaminated Structures and Site Restoration

When all systems, components, radiologically contaminated concrete and other internal building structures, and exposed steel, not required to maintain CV stability, have been removed from the CV, the building demolition and site restoration phase will begin. This phase includes:

- Final Status Survey of any portion of the CV that has been identified to remain after license termination

- Removal and scrapping of the Containment Vessel steel shell to at least three feet below grade

- Backfilling of CV and other facility voids with uncontaminated concrete from facility demolition and additional structural fill

- Removal of all temporary support facilities

- Grading and placement of soil and the revegetation of the site

Structural fill and soil will be used as necessary to fill the CV void, and to grade and revegetate the site.

Control Of Airborne Radioactivity and Effluents

All work performed as part of SNEC Facility decommissioning will be in accordance with current industry standards and practices. These include appropriate radiological controls, radiological monitoring, radiological contamination control envelopes, local ventilation control with High Efficiency Particulate Air (HEPA) filters, etc., as necessary to prevent the spread of radiological contamination and radiation exposure to both workers, members of the public, and the environment.

Releases of radioactive liquid and airborne effluents during decommissioning will be minimized by the use of temporary effluent treatment systems. Decontamination and dismantlement of facility system and structures will result in the generation of radioactive liquid waste. These wastes will be processed as necessary by GPU Nuclear Inc. or by experienced vendors and contractors where appropriate to meet NRC effluent requirements.

4.5 Decommissioning Workforce

The make up of the workforce during decommissioning is expected to be GPU Nuclear Inc. employees and several contractors due to the specialized nature of some work involved with demolition/construction activities. It is expected that the maximum number of workers at any one time will be approximately 100.

TABLE 4.2-2

Occupational Dose Comparison between Decommissioning Alternatives

Task	30 Year Deferral Person-Rem	Immediate Person-Rem
Asbestos Remediation	2.68	2.97
System Dismantlement	9.42	12.83
Reactor Vessel and Steam Generator Removal	3.37	7.38
Structure Decontamination and Dismantlement	0.35	4.17
Waste Management	1.28	2.13
Miscellaneous Support Activities	2.36	2.41
Scaffold and Shielding	4.94	5.32
Other Characterization	0.54	0.63
Total	24.83	37.84

5.0 ENVIRONMENTAL EFFECTS OF DECOMMISSIONING ACTIVITIES

5.1 Effects On Human Activities

The number of workers is expected to be approximately 100. Due to the small number of workers required, there are no significant adverse impacts expected on temporary housing or schools as a result of the decommissioning activities.

Transmission lines in the vicinity of the site will be unaffected by decommissioning activities.

Other than the additional staffing, transportation related issues will include waste shipments and the arrival of heavy operating equipment. However, most of the heavy equipment needed for the decommissioning project have been used already at the Saxton facility, and, no local traffic related issues occurred. Waste shipments will utilize normal freight vehicles.

No adverse impact to local transportation is expected from these shipments. Approximately 130 waste shipments are anticipated over the next year in support of the CV concrete removal work and other decommissioning activities. For comparison, 165 waste shipments were completed within a three-month schedule during the Saxton Soil Remediation Project (reference 4). The soil shipments were completed without incident or complaint. Additionally, radwaste shipments have been made from the Saxton facility since 1962.

Because much of the anticipated transportation activities occurred without incident during prior Saxton projects, no adverse impact is expected to the local traffic conditions. Traffic increases from the increased staffing also should have minimal effect. The proposed staffing will be comparable to staffing levels during operation of the facility.

5.2 Effects On Terrain, Vegetation and Wildlife

As noted in Section 3.5 of this report there are a few endangered or threatened plant species, which occur on or make use of the SNEC Facility site and adjacent Pennsylvania Electric Company property. A review by the Pa. Dept. of Conservation and Natural Resources (Reference 22) concluded that there is no effect on plants, natural communities or insects anticipated from SNEC decommissioning activities.

No endangered or threatened animal species have been identified. The property is essentially composed of open grassland with scrub vegetation and trees along the property boundaries. That portion of the 1.148 acre site not occupied by facility structures is composed primarily of open grassland that does not provide good habitat for wildlife. Areas that have remained undisturbed following the cessation of the coal-fired station's operations and razing are generally open field or wooded and provide better wildlife habitat.

The decommissioning activities will take place on the previously developed areas of the site or adjacent open areas of the Pennsylvania Electric Company property. This includes temporary support facilities such as office trailers, the construction of the Decommissioning Support Building needed for segregating and packaging of waste. Stone aggregate and soil will be used to fill the CV void and other excavations as needed. Those areas of the site that have been left in their natural state will not be disturbed by activities required for decommissioning. Therefore, there will be no effect on the existing terrain or vegetation in the previously undeveloped areas of the site.

During the removal/demolition of the facilities, waterfowl and other wildlife may from time to time make use of adjacent areas and will be disturbed and or displaced by demolition activities. However demolition activity in the area will last a very short period of time and will be limited to as small an area as necessary thus disturbing as little area as possible.

Under the Pennsylvania Code of Regulations relating to erosion control (25 PA Code Chapter 102), requirements for an erosion and sedimentation control plan are listed (Section 102.5). They are as follows:

(a) A person trained and experienced in erosion and sedimentation control methods and techniques shall prepare the erosion and sedimentation control plan.
(b) The erosion and sedimentation control plan shall be designed to prevent accelerated erosion and sedimentation and shall consider all factors which contribute to erosion and sedimentation, including, but not limited to, the following:

    (1) The topographic features of the project area
    (2) The types, depth, slope and areal extent of the soils
    (3) The proposed alteration to the area
    (4) The amount of runoff from the project area and the upstream watershed area
    (5) The staging of earthmoving activities
    (6) Temporary control measures and facilities for use during earthmoving
    (7) Permanent control measures and facilities for long term protection
    (8) A maintenance program for the control facilities including disposal of materials removed from the control facilities or project area

Guidelines for compliance with the above requirements are described in the SNEC Soil and Sedimentation Control Plan (Reference 27).

5.3 Effects on Adjacent Waters and Aquatic Life

The decommissioning activities of the facility are not expected to have any adverse impact on the adjacent surface waters or associated aquatic life. Given that the majority of the decommissioning work will be done in previously developed areas of the site, the adjacent river and the aquatic life therein will not be adversely affected by decommissioning activities.

Although decommissioning activities will involve minor construction activities to remove/demolish facilities, a comprehensive Soil Erosion and Sedimentation Control Plan will be implemented to minimize the area of disturbance and potential siltation of the river. The content and implementation of the Soil Erosion and Sedimentation Control Plan will meet the requirements of Pennsylvania Code 102.4.

5.4 Effects Of Released Radioactive Materials

As part of routine decommissioning operations, limited quantities of radioactivity are released to the environment in liquid and airborne effluents. An effluent control program is implemented to ensure radioactivity released to the environment is minimal and does not exceed release limits. Federal effluent limits are set at low levels to protect the health and safety of the public. GPU Nuclear Inc. conducts operations in a manner that holds radioactive effluents to small percentages of the federal limits.

The Offsite Dose Calculation Manual (ODCM) is a support document of the Technical Specifications and implements SNEC Facility radiological effluent controls. The ODCM contains the controls, bases, and surveillance requirements for liquid and gaseous radiological effluents. This document also describes the methodology used for calculations of the liquid and gaseous effluent monitoring instrumentation alarm and trip set points. The ODCM follows the methodology and models suggested by NUREG-0133 and Regulatory Guide 1.109, Revision 1, for calculation of offsite doses due to plant effluent releases. Simplifying assumptions have been applied in this manual where applicable to provide a more workable document for implementation of the Radiological Effluent Controls requirements.

<u>Airborne Radioactive Effluents</u>
Radiation doses to the public were calculated for the airborne releases from routine decommissioning operations of the Reference PWR in NUREG/CR-0130, "Technology, Safety and Costs of Decommissioning a Reference Pressurized Water Reactor Power Station" (Reference 16). The calculations show that decommissioning results in extremely small airborne radionuclide releases and the radiation dose to the public is expected to be negligible.

Since termination of the SNEC Facility operation in 1972 and prior to dismantlement of all radiological waste systems, radioactive gas had been decayed and released. Therefore, processing of gaseous waste will not be necessary.

However a temporary high-efficiency particulate air-purifying (HEPA) filtration system was installed to contain airborne particulate radionuclides that may be generated during the performance of various decommissioning activities. The Decommissioning Support Building (DSB) is vented through the wall opening between the DSB and the CV to the CV atmosphere. The CV atmosphere is monitored by portable air samplers and, if necessary, by Continuous Air Monitors (CAMs). The CV ventilation exhausts via a HEPA filtered ventilation system. If other activities require control of airborne radiological contamination, portable HEPA filtration units, including those built into vacuum cleaners, will be used. The effluent monitoring instrumentation is used to monitor discharges of airborne effluent as required, and to demonstrate compliance with the SNEC Facility ODCM limits as promulgated by applicable regulations.

<u>Liquid Radioactive Effluents</u>
Radioactive liquid wastes may be generated during the decontamination and dismantlement of the SNEC Facility systems and structures.

Liquid radioactive wastes generated during decommissioning will be processed as necessary using temporary systems supplied by GPU Nuclear Inc. or by experienced vendors and contractors where appropriate. The temporary waste treatment system will be connected to tanks for storage of processed water prior to discharge. Once it has been verified that the stored processed water meets the allowable discharge limits specified in the ODCM, the water will be released. These systems may include temporary ventilation with filtration for airborne radiological contamination control.

The liquid waste stream will be processed using techniques which are cost effective and meet ALARA goals. During earlier demolition activities, installed plant equipment used to process liquid radwaste had been removed. Therefore, temporary filtration units or demineralizers will be used, if necessary, as the primary means of treatment for all planned releases. Any processed liquids may then be discharged after it has been monitored and approved for release. Effluent monitoring techniques will be used to monitor discharges of liquid effluent as required, and to demonstrate compliance with the SNEC Facility ODCM limits as promulgated by applicable regulations.

Additionally, compliance with applicable Pennsylvania Department of Environmental Protection (PaDEP) National Pollutant Discharge Elimination System (NPDES) requirements will be accomplished.

No impact on the existing quality of the nearby water resources is expected.

5.5 Effects on Groundwater

The generation of radiologically contaminated water at the SNEC Facility will be minimized to keep water processing costs as low as possible and to minimize liquid effluent discharges. See section 4.4 for description of SNEC's water management systems. Some radiologically contaminated water, however, may be generated during the decontamination and decommissioning of the SNEC Facility. The majority of this water will likely be generated during decontamination activities. Groundwater that has infiltrated the Saxton Steam Generating Station discharge tunnel may contain low levels of radioactive materials, and may need to be dispositioned. If generated liquid wastes will be processed as necessary using temporary systems supplied by GPU Nuclear Inc. or by experienced vendors and contractors. Processed water may be discharged after it has been monitored and approved for release. All discharges of processed water will be verified to be within the limits of the ODCM prior to approval for release.

The only mechanism for the transport of radionuclides to the groundwater will be a spill of radiologically contaminated water. Temporary systems used for processing of water will be designed to minimize the possibility of spills to the ground. Procedures and work instructions at the facility will be written so as to minimize the potential for spills. These procedures will also be written to mitigate the spillage in a timely fashion should a spill occur.

If a spill of radiologically contaminated water occurs, groundwater at the facility should not be adversely affected. Fission and activation products in the water (primarily cesium-137, cobalt-60 and small quantities of transuranics) will be adsorbed onto the soil as the water percolates through the ground. Numerous studies of the retention by soil for these radionuclides (Reference 24) show that they are typically retained in the first 10 to 30 cm of soil. As a result they are not immediately available for transport to the groundwater. Should such a spill occur at the SNEC Facility, the affected soil would be sampled and analyzed for radionuclide content. Soil containing appreciable quantities of these nuclides would be excavated and disposed of offsite. As a result, these types of radionuclides would not find their way into the groundwater at the site.

The only radionuclide that could reach the groundwater would be tritium, since this nuclide is not retained by the soil. Concentrations of tritium in the water that is currently at the SNEC Facility are relatively low. The highest concentrations were found in the Containment Vessel Sump which has been decontaminated. These concentrations ranged from 3E-4 to 6E-4 uCi/cc. Since there is no source of tritium production at the site, the concentration of tritium will not increase with time. In fact, as decontamination activities create radiologically contaminated water, the concentration of tritium in liquid wastes will decrease through dilution. The low concentrations of tritium in this water, coupled with the finite nature of such a spill, will not appreciably affect tritium concentrations in groundwater at the site.

The Saxton Steam Generating Station Discharge Tunnel was opened for inspection in the fourth quarter of 1999. This structure was primarily used as the river water discharge for the Saxton Steam Generating Station. This tunnel was also used for liquid radwaste discharges from the SNEC Facility. Approximately one foot of groundwater containing significant sedimentation existed during the initial opening. GTS Duratek was contracted to process the water and remove the sediment. Sedimentation was filtered, surveyed and shipped off-site by GTS Duratek. Recent surveys in the Discharge Tunnel indicate that there is still some residual contamination on the seal chamber walls which interface with the tunnel. The tunnel is maintained in a dry/damp condition to support remediation work. There should be no groundwater impact as a result of this work.

In 1986 a similar situation existed in the other below grade structures at the site which have since been demolished. At that time approximately 210,000 gallons of very slightly radioactively contaminated groundwater was removed from these structures and discharged to the Raystown Branch of the Juniata River (Reference 2).

The closeness of Raystown Lake has significantly influenced the ground water level at the SNEC Facility site. As work progresses, there may be efforts to locally de-water around specific structures. Once the water is shown by analysis to be only ground water comparable to water from the site monitoring wells, it will be pumped to the sedimentation field area.

5.6 Effects of Released Chemical and Sanitary Wastes

During decommissioning, water from an existing groundwater well, located on the adjacent Pennsylvania Electric Company property, will be the source for sanitary water. The use of groundwater for sanitary and drinking water is regulated by the Pennsylvania Department of Environmental Protection (PaDEP). If the groundwater well is used as a drinking water source, it may be necessary to provide water treatment to permit it as a drinking water source.

The use of water during decommissioning will be kept to a minimum. No chemical decontamination is planned and the use of hazardous chemicals is not anticipated during the decommissioning process. Liquid discharges from the facility are regulated by the NPDES permitting system administered by the PaDEP. All liquid waste streams will be sampled, tested and processed as necessary prior to discharge to ensure effluents are in compliance with applicable PaDEP - NPDES permit limits. No impact on the existing quality of the nearby water resources is expected.

Holding tanks will be used during decommissioning for the collection of sanitary waste. These tanks shall pumped out by a PaDEP licensed contractor for offsite disposal at a licensed facility.

5.7 Radioactive Waste

Members of the public will be exposed to small amounts of direct radiation associated with the shipment of low-level radioactive waste for burial. The GEIS (NUREG-0586), (Reference 6), estimates this radiation exposure to total 2.2 person-rem. The estimated cumulative radiation exposure to the public is the sum of the small individual radiation exposures that are assumed to occur when members of the public are in the vicinity of a low-level radioactive waste shipment (truck) for brief periods. The packaging and amount of radioactive waste in each shipment is restricted by NRC regulations (10CFR71) and U.S. Department of Transportation (DOT) regulations (49CFR170-189).

NUREG-0586 estimate for radiation exposure to the public was based on the shipment of an estimated volume of 4,930 cubic meters of low-level radioactive waste for burial. The volume of low-level radioactive waste that has been and will be shipped to offsite burial facilities is estimated to be 4532 cubic meters, or approximately 92% of the bounding conditions of NUREG-0586. This volume estimate is derived from Table 5.7-1. Information related to radwaste volumes was obtained from References 2, 4, & 39 and the SNEC Radwaste Shipper.

Table 5.7-1
Radioactive Waste Shipment History

Source of Radioactive Waste	# of Shipments	Volume (m^3)
1. Decontamination, dismantlement & demolition of reactor support buildings (1972-1992)	27 (est.)	243
2. Soil Remediation project (1992)	165	1592
3. Decommissioning activities (1997-2001) 1997 – 167 m^3 (5 shpts.) 1998 – 498 m^3 (13 shpts.) 1999 – 414 m^3 (11 shpts.) 2000 – 256 m^3 (5 shpts.) 2001 – 305 m^3 (12 shpts.)	46	1640
4. Concrete removal & other decommissioning activities (Estimated for 2002)	130	1057
Total	**368**	**4532**

The projected cumulative radiation exposure to the public is well within NRC estimates and regulations. In reference to the above table, the 2002 radwaste volume estimate calls for 130 shipments of low level waste (LLW) by truck from the site to a processing facility (Oak Ridge). A portion of these shipments, which cannot be processed as clean, will be sent to an approved site for burial (e.g. Envirocare). It is estimated the radiation exposure levels of each radioactive waste shipment will be less than 1% of the regulatory limits established by the NRC and DOT. See Section 6.2 for the population dose impact analysis from radioactive waste shipments.

5.8 Non-Radiological Waste

Asbestos

Surveys for asbestos were conducted in the containment vessel during May 1995. Bulk insulation samples were taken of various components, piping systems and vessels throughout the containment building. Both the U.S. Environmental Protection Agency, (EPA) and the Occupational Safety and Health Administration (OSHA) have established regulations that apply to the removal of asbestos-containing material. These regulations contain requirements for asbestos removal notification, record keeping, handling, air emissions limits and disposal. Activities involving asbestos at the facility were conducted in accordance with Federal and State regulations.

During the process of the characterizing the SSGS 'footprint', sampling wells were installed to obtain data from the low points of the footprint. The most significant of these were four wells that were drilled down to approximately the bottom of the four drainage sumps in the former SSGS.

Drilling spoils from the well installation were examined and analyzed. It was determined that the material, which was predominately demolition debris used as backfill in the SSGS footprint contained greater than 2 percent asbestos fibers and that the material was friable. The primary concern at this point was that the presence of asbestos contamination in the fill area could result in an airborne asbestos hazard as characterization work proceeded. The work area was covered with a ground stabilization membrane and a layer of gravel to prevent the generation of an airborne asbestos hazard.

Excavation of the area began in order to remove the asbestos and to further characterize the area. The subsequent excavation of the filled area has been performed under the auspices of individuals licensed by the Commonwealth of Pennsylvania to supervise asbestos remediation activities.

Excavation of the SSGS footprint is now complete. About 1 million lbs. of asbestos containing debris have been removed from the SSGS footprint. This debris contains about 41,500 lbs. of asbestos. The material was packaged and shipped for disposal to an approved disposal facility.

Asbestos removal activities started in 1996 and are now completed. However, there may still be trace amounts of asbestos within the debris piles.

Throughout the SSGS remediation project, GPU Nuclear Inc.has been in communication with the Pennsylvania Department of Environmental Protection Bureau of Air Quality and the Bureau of Water Quality; South Central Regional Office located in Harrisburg, Pennsylvania.

In 2001, additional asbestos material was found while excavating the area surrounding the outside of the CV. Approximately 43,850 lbs. of asbestos was removed, packaged and shipped for disposal to an approved disposal facility.

Hazardous Waste

The generation, storage, transportation and disposal of hazardous waste are regulated by the PaDEP under Pennsylvania's Solid Waste Management Act (35 P.S. 6018.101 et. Seq.). Decommissioning of the facility may be expected to generate very small amounts of hazardous waste. Decontamination and dismantlement activities primarily utilize non-hazardous chemicals or mechanical processes. Potential sources of hazardous waste include lead-based paint that was used to cover much of the painted surfaces of the facility and mercury-containing instruments and switches. Other minor sources of hazardous waste may be encountered during decommissioning; however it is expected that the amount of waste generated will be well less than the limit for a small quantity generator under Pennsylvania hazardous waste regulations.

Excavation of the SSGS uncovered four electrical capacitors that had been buried during demolition of the SSGS. Testing revealed that they contained oil with PCB contamination. Each capacitor was packed in a drum along with the surrounding soil. and shipped to an approved disposal facility. In addition PCB contamination was found in the seal chamber area of the Discharge Tunnel as a result of remediation efforts in Seal Chamber # 3 located in the SSGS Discharge Tunnel. A total of 27 drums of PCB waste has been generated. Of this total 14 drums were PCB waste and 13 drums were PCB and radioactive waste. The 14 drums of PCB waste were shipped for disposal in October of 2001. The remaining 13 drums will be disposed prior to site license termination.

Analyses of water samples from the four sumps in the SSGS footprint identified very low but detectable levels of oil and grease, mercury, and Arochlor-1254 and Arochlor-1260 (classes of PCB's). The detectable contaminants were believed to be the result of residual contamination in the sumps that was not cleaned out at the time of demolition of the SSGS. The approach to dealing with these contaminants was removal of the water and solid debris, down to the base slab of the demolished building, so that the floor area and the sumps could be cleaned. The water/solid debris mixture was analyzed and stored in drums. Analyses determined that these drums contain a mixture of radioactive materials and PCBs (mixed waste). They will eventually be sent to a licensed disposal facility prior to site license termination.

5.9 Socioeconomic Effects

The socioeconomic impacts were mainly from the shutdown of the facility in 1972 which resulted in the loss of certain jobs and income to the community. Decommissioning of the SNEC Facility should provide a short term small increase in income to the community.

5.10 Other Effects

The total estimated occupational radiation exposure associated with the planned decommissioning activities at the facility is 37 person-rem. This is well within the bounds of the estimated total occupational exposure of 344 person-rem contained in the NRC's Generic Environmental Impact Statement. The occupational radiation dose to any individual worker will be limited by federal regulations and SNEC Facility administrative procedures. The as low as reasonably achievable or "ALARA" principle will be used to minimize occupational radiation dose associated with decommissioning activities.

5.11 Summary of Environmental Effects of Decommissioning Activities

The environmental impact due to decommissioning of the facility is generally favorable. In most cases, dismantlement eliminates or further reduces the already small environmental effects that are associated with maintaining the facility in its current condition. In addition, decommissioning by immediate dismantlement avoids potential environmental impacts associated with alternative decommissioning options that defer dismantlement. There are certain short term environmental effects which will be increased due to decommissioning activities. These include the occupational radiation exposure necessary for dismantlement activities, the radiation exposure to the public associated with transportation of low-level radioactive waste and small radiological effluent releases, and the commitment of small amounts of land at the burial site for disposal of this low-level radioactive waste. However, these estimated effects for the proposed SNEC Facility decommissioning are well below those which have been previously evaluated by the NRC on a generic basis (Table 5.11-1). GPU Nuclear Inc. in References 33 and 34 provided a comparison of the SNEC facility decommissioning activities with NUREG-0586 to the NRC. Chapters 5 & 6 of this report have been updated to include revised information that was previously submitted in these references.

Table 5.11-1

FINAL GENERIC ENVIRONMENTAL IMPACT STATEMENT (GEIS)
NUREG-0586
ENVIRONMENTAL CONSEQUENCES

1. Summary of Radiation Safety Analysis for Decommissioning the Reference Test Reactor (Person-Rem)

	DECON	SAFSTOR 10 years	SAFSTOR 30 years	SAFSTOR 100 years
Occupational Exposure	344	212	130	125

2. The Volume of Low-Level Radioactive Waste to be Disposed of for the Reference Test Reactor (cubic meters)

DECON	SAFSTOR 30 years	SAFSTOR 50 years	SAFSTOR 100 years
4930	4930	2960	2940

3. The dose to the public from routine releases during DECON or SAFSTOR activities at the reference test reactor is estimated to be negligible.

4. The dose to the public from truck transport of wastes during DECON activities from the reference test reactor is estimated to be 2.2 person-rem. During SAFSTOR activities, the doses are estimated to be 0.35, 0.14, and 0.11 person-rem for storage periods of 10, 30, and 100 years respectively.

5. The waste volumes requiring burial would represent a use of about one-half acre for the reference test reactor.

6.0 ENVIRONMENTAL EFFECTS OF ACCIDENTS AND DECOMMISSIONING EVENTS

6.1 Protective Action Guidelines

The EPA has established protective action guidelines (Reference 15) that specify the potential offsite dose levels at which actions should be taken to protect the health and safety of the public. The EPA protective action guidelines (PAGs) are limiting values based on the total effective dose equivalent (TEDE) resulting from exposure to external sources and the committed effective dose equivalent (CEDE) incurred from the significant inhalation pathways during the early phase of an event. The EPA PAG limits are:

EPA PAGs (millirem)

Total Whole Body (TEDE)	**1,000**
Thyroid Committed Dose Equivalent	**5,000**
(CEDE) Skin (CDE)*	**50,000**

*Committed dose equivalent

Because there is no irradiated fuel stored at the site, there are no radioactive noble gases or radioiodines available for release from the facility. This preempts the possibility of accidental offsite radiological releases that could approach the PAGs for the skin and thyroid. As a result, the PAG for TEDE is the limiting criteria for decommissioning activities at the facility.

6.2 Accident and Exposure Analyses Related to Decommissioning Events

GPU Nuclear Inc. has analyzed the decommissioning activities described in the SNEC Facility Decommissioning Plan (Reference 8) to ensure that they will not create the potential for accidental releases that could cause doses at the site boundary to be more than a small fraction of the EPA PAGs. Performing decommissioning activities in a manner that keeps offsite doses from even the most unlikely events at a small fraction of the EPA PAGs provides for the protection of the health and safety of the public without the need for protective actions.

Section 3.4 of the SNEC Facility Decommissioning Plan (Reference 8) analyzes a number of potential events, which could be postulated to occur during decommissioning activities and result in the release of radioactive materials. The decommissioning activities evaluated included events with the potential for liquid and/or airborne radioactive releases.

The analyses of these events used very conservative approaches in treating the source terms, as well as in the methods of calculation. To the extent applicable, these analyses are consistent with approaches used in the NRC's examination of postulated accidents during the decommissioning of the Reference PWR (References 6,16, & 38).

Table 6.2-1 is provided to illustrate a side-by-side comparison of the analysis results of applicable scenarios for the SNEC decommissioning work to cases in NUREG-0586 (Reference 6). This table, with supporting analyses, was included in a 1998 Supplement (Reference 34) to SNEC's 1996 Environmental Report which was provided to the NRC through their request for additional information process. Since that time only items 3, 5 & 6 have changed. Items 1, 2 & 4 are still bounding from the previous analyses. Following the table are the bases and assumptions used in determining the updated table results (i.e items 3, 5 & 6).

Table 6.2-1
SNEC vs. GEIS NUREG-0586 Comparative Analyses

Scenario	SNEC	GEIS NUREG 0586
1. Estimated Offsite Population Dose from Routine Decommissioning Activities	14.2 person-mrem	<100 person-mrem (per Section 7.3-1)
2. Estimated Offsite Dose for a Severe Transportation Accident for Decommissioning	6.8 mrem lung (max. exposed individual)	16 mrem lung (max. exposed individual) (per Table 7.4-2)
3. Estimated Total Public Dose from Radwaste Shipments During Decommissioning	**0.502** person-rem	2.2 person-rem (per Section 7.3-1)
4. Estimated Dose to Maximum Exposed Individual as a Result of an Onsite Accident During Decommissioning	0.283 mrem lung 1.5-mrem whole body	16 mrem lung (per Table 7.4-2) (Whole body dose not defined in GEIS)
5. Estimated Land Area Occupied by Disposal of Radwaste	**0.447** acre	~0.5 acre (per section 7.4)
6. Occupational Exposure as a Result of Decommissioning Operations	**37.84** person-rem	344 person-rem (per Table 7.3-4)

Note: Bolded values are revised updates.

<u>Estimated Total Public Dose from Radwaste Shipments during Decommissioning</u>
The public dose from radwaste shipments during SNEC facility decommissioning is estimated to be 0.502 person-rem. This estimate falls well within the bounds of the 2.2 person-rem value specified in Section 7.3.1, of NUREG-0586 (Reference 6) for the reference test reactor. The following assumptions were made:

1. A bounding total of 400 radwaste shipments will be or have been made from the SNEC facility. Most of these shipments (approximately 350) contain concrete, soil and demolition debris containing radioactivity near background. This includes shipments completed to date (Reference Table 5.7-1) and all future shipments in support of decommissioning.

2. Per Section N.5.1 of NUREG/CR-1756 (Reference 38), it is assumed that 50 shipments of waste contain enough material to result in the maximum exposure rates allowed by USDOT regulations. Also, per this section, the cumulative dose to the public is 2.3E-06 person-rem/km/shipment. This is very conservative since it is unlikely that any shipment from the SNEC facility site will emit radiation at the maximum allowable

exposure rates. For the remaining shipments it is assumed that the 350 remaining shipments contain low level waste which result in only 1 % of the maximum exposure rates allowed by USDOT regulations. Therefore, the cumulative dose to the public is 2.3E-08 person-rem/km/shipment. These values are representative of the SNEC facility case.

3. Per Table N.5-2, Reference 38, for DECON of the reference test reactor, the onlooker dose is 6.25E-06 person-rem/km/shipment (i.e. 5E-03 person-rem/800 km/shipment = 6.25E-06 person-rem/km/ shipment). This figure is applicable to 50 shipments from the SNEC facility. In the case of the remaining 350 shipments the onlooker dose is 6.25E-08 person-rem/km/shipment.

4. It is assumed 50 shipments travel 1003 km one way between the SNEC facility and Barnwell. The remaining 350 travel to Oak Ridge, Tn (1120 km) for processing (volume reduction) and 50% (175 shipments) of these are forwarded to Envirocare (2690 km) for burial.

5. Dose Calculation:

The dose to onlookers during shipping is:

(6.25E-06 person-rem/km/shipment)(1003 km)(50 shipments)	= 0.313 person-rem
(6.25E-08 person-rem/km/shipment)(1120 km)(350 shipments)	= 0.025
(6.25E-08 person-rem/km/shipment)(2690 km)(175 shipments)	= 0.029
Sub-total	0.367 person-rem

The dose to the general public during shipping is:

(2.3E-06 person-rem/km/shipment)(1003 km)(50 shipments)	= 0.115 person-rem
(2.3E-08 person-rem/km/shipment)(1120 km)(350 shipments)	= 0.009
(2.3E-08 person-rem/km/shipment)(2690 km)(175 shipments)	= 0.011
Sub-total	0.135 person-rem

Total Public Dose **0.502** person-rem

<u>Estimated Land Area Occupied by Disposal of SNEC Radwaste</u>

The estimated land area, which will be occupied by the SNEC radwaste is approximately 0.48 acres. This is bounded by the value given in the GEIS for the reference test reactor of.... "about one-half acre"....stated in section 7.4 of NUREG-0586 (Reference 6). The volume of radwaste to be disposed of by decommissioning the reference test reactor was assumed to be 4930 m^3, per NUREG/CR-1756 (Reference 38). The waste volume from the decommissioning of the SNEC Facility is estimated to be approximately 4532 m^3

Unlike the other consequences of decommissioning which were analyzed in References 6 and 38, the methodology used to calculate the land area occupied by the disposal of radwaste is not described. Most of the radwaste from the SNEC facility decommissioning will be or has been disposed at the Envirocare facility near Clive, UT and to a lesser degree at the Barnwell facility. Operators of these facilities could not project how waste may be layered and were also unable to provide a conversion from disposal volume to a land area. As a result, GPU Nuclear Inc. has conservatively calculated the land area by estimating the footprint, which would be occupied by a single layer of the radwaste as disposed. At both the Barnwell and Envirocare facilities, waste is in fact layered to the extent possible. The area occupied by the radwaste is broken down as follows:

Table 6.2-2
Area Occupied by Radwaste

Category	Area (ft^2)	Area (acre)
1. Large components (RV, S/G, Pzr.)	811	0.019
2. Asbestos (Post compaction)	138	0.003
3. Concrete to Envirocare	17230	0.395
4. Miscellaneous Radwaste	1316	0.030
Total Land Area	**19495 ft^2**	**0.447**

Assumptions - Each category was calculated as follows:

1. Large components, including the reactor vessel, steam generator and pressurizer were assumed to be buried in a single layer including their shipping skid. This follows the industry experience to date and conforms to the SNEC facility large component disposal plan. The footprint was calculated based on the size of the attached shipping skids, which for each component exceeds the area occupied by the component alone. The reactor vessel skid = 360 ft^2; the steam generator skid = 247 ft^2, the pressurizer skid = 204 ft^2; total = 811 ft^2.

2. The asbestos waste volume (which has already been disposed of) is an actual value. This volume was converted into a land area value by calculating the area occupied by the six B-25 LSA boxes used to dispose of the waste. The footprint of one B-25 box = 23 ft^2, 6 x 23 ft^2 = 138 ft^2.

3. The concrete volume to be disposed of was calculated to be 34,460 ft^3. This value was based on removing all 5.1E+06 lbs. of concrete (density = 148 lbs/ft^3) from the CV and shipping to Oak Ridge, TN for processing. It is estimated that half of this volume will be reduced and processed as clean and the other half (17230 ft^3) shipped to Envirocare for burial. Therefore, approximately 17,230 ft^3 of concrete will be disposed of at Envirocare. The Envirocare license requires that waste be disposed of in layers one foot thick. Without taking credit for the stacking of the layers, which would probably occur, this means the concrete waste will occupy a land area of 17230 ft^2.

4. For the miscellaneous radwaste (DAW, structural steel, pipe, heat exchangers, pumps, tanks, etc.), the volume for these materials was taken from Table 4 - 19 of the SNEC Site Characterization Report and assumed to be packaged for disposal with no credit for any form of volume reduction (VR). This results in a base volume of approximately 3370 ft^3. Since VR is planned where practical, this results in a conservative assumption for the base volume. A conservative packaging growth of 30% was used. Therefore, the as-packaged volume is approximately 4381 ft^3, (3370 ft^3 x 1.30 = 4381 ft^3). Based on experience, it is reasonable to assume this waste will be packaged in B-25 LSA boxes. With an internal volume of 85 ft^3 per box, this would result in the disposal of 52 such boxes (4381 ft^3 miscellaneous waste/ 85 ft^3 per box =

52 boxes). Each box has a footprint of 23 ft^2; therefore, the land area occupied as a result of this is 52 x 23 ft^2 = 1196 ft^2. An additional growth factor of 10% was added to account for the recent requirements for the use of a technology overpack at Barnwell. Thus, the estimated area is 1196 ft^2 x 1.10 = 1316 ft^2.

This estimate of land area occupied by the radwaste disposed from the decommissioning of the SNEC Facility is conservative for the following reasons:

1. The area occupied by the disposal of the reactor vessel, steam generator, and pressurizer is assumed to be that of the transport skids for each component, which are larger than the components themselves.

2. It is assumed that all waste is disposed of in a single layer at each disposal site. In reality, waste at each site is multi-layered and co-mingled with other generators.

3. No credit is taken for volume reduction (VR) of any of the miscellaneous waste. It is expected we will use industry accepted VR techniques where practical.

4. A total packaging growth of 30% was assumed for all miscellaneous waste. References 6 and 38 do not discuss radwaste packaging efficiencies; however, Appendix I section I.1.3.1 of Reference 6 describes the use of custom fabricated disposable containers to minimize volume. No such containers are assumed for the SNEC facility case. Rather, the use of standard B-25 LSA boxes is assumed.

<u>Occupational Exposure as a Result of Decommissioning Operations</u>
New exposure estimates have been made to reflect changes in structure dismantlement work scope and waste management. Table 4.2-2 provides the list of person-rem estimates for each category. These changes were made to include the increased level of effort for the complete removal of concrete from the CV and the subsequent impacts on waste management issues. As a result of these work scope changes the SNEC person-rem estimate has increased 2% (from 36.93 to 37.84). This new estimate is only 11% of the NUREG-0586, Table 7.3-4 estimate of 344 person-rem for decommissioning the reference test reactor.

The accident analyses demonstrate that no adverse public health and safety or environmental impacts are expected from accidents that might occur during decommissioning operations. The highest calculated dose to an individual located at the site boundary is still 1.5 millirem to the whole body based on a postulated materials handling accident. The results of other onsite accidents are below this value. As a result, it is concluded that there are no significant radiological consequences to the general public from postulated credible accidents during the planned decommissioning operations at the SNEC Facility.

Offsite radiological events related to decommissioning activities are limited to those associated with the shipment of radioactive materials. Radioactive shipments will be made in accordance with the applicable regulatory requirements. The facility's Radioactive Waste Management Program will ensure compliance with these requirements. The facility's Quality Assurance Program (QAP) is further implemented to assure decommissioning activities are conducted in a safe and controlled manner. Compliance with these requirements ensures that both the probability of occurrence and the consequences of an offsite event do not significantly affect health and safety of project workers, the public or the environment.

7.0 FACILITY RADIOLOGICAL STATUS AND ENVIRONMENTAL MONITORING

7.1 Introduction

Operation and decommissioning of nuclear power plants results in releases of small amounts of radioactive materials to the environment. Radiological environmental monitoring is conducted to monitor radiation and radioactive materials in the environment. The important objectives of this monitoring are:

- to verify controls for the containment of radioactive materials,
- to assess dose impacts to the public,
- to determine buildup of long-lived radionuclides in the environment and changes in background radiation levels,
- to provide reassurance to the public that the program is capable of adequately assessing impacts and identifying noteworthy changes in the radiological status of the environment.

Once released, radioactive materials move through the environment in a variety of ways and may eventually reach humans via breathing, drinking, eating, and direct exposure. Samples may be collected from the aquatic, atmospheric, and terrestrial environments and may include air, soil, river water, precipitation, sediment, finfish, milk, vegetables, and groundwater. They are analyzed for the various types of radiation such as alpha, beta, and gamma.

A preoperational radiological survey of the environment around the SNEC Facility was initiated in 1960. Data gathered in the preoperational survey was used as a basis for evaluating radiation levels and radioactivity in the vicinity of the plant after the plant became operational. The data documented the natural background radiation levels and naturally occurring and fallout radioactive materials in the environment.

The operational phase began in 1962 at the time the SNEC Facility became operational and concluded in 1972. Releases of radioactive materials to the environment were within the bounds of the hazards analysis in the Final Safeguards Report (Reference 5).

Five unplanned releases of radioactive materials have been identified which occurred during the operation of the SNEC Facility. These releases occurred in August 1963, May 14 and August 26, 1970, and November 29 and December 15, 1971. These releases were reported to the AEC/NRC as required. The maximum amount of exposure to anyone standing at the site boundary from each of the later four releases would have been 0.387 millirem, 0.0018 millirem, 4.28 millirems, and 1 millirem, respectively. An exposure calculation was not performed for the August 1963 release which was at least one order of magnitude less than the next smallest release. To put the radiation exposure due to these releases into perspective, the average individual may receive up to 300 millirems a year from a variety of natural sources in the environment. On average, an individual also receives about 60 millirems a year from radiation use in the medical and dental fields.

The SNEC Facility was placed in a condition equivalent to a status later defined by the NRC, as SAFSTOR after it was shutdown in 1972. All fuel was removed from the containment vessel (CV) in 1972. Following fuel removal, equipment, tanks, and piping located outside the CV were removed. The buildings and structures that supported reactor operations were partially decontaminated in 1972 through 1974. Since that time, the SNEC Facility no longer produced radioactive liquid or gaseous effluents in the conventional manner of operating nuclear plants. The radiological environmental monitoring program confirmed there were no offsite adverse effects on the environment or public health and safety.

7.2 Final Release Survey of the Reactor Support Buildings

Radiological decontamination of the reactor support structures/buildings was performed in 1987, 1988, and 1989, in preparation for demolition of these structures. A final release survey documented that the NRC release criteria guidelines were met. One component of the final release survey was the measurement of offsite background radiation and radioactivity. Exposure rate measurements were made and soil samples were collected at 12 locations around the site at distances ranging from 0.61 to greater than 3.0 kilometers. The results are documented in a report to the NRC (Reference 2). Oak Ridge Associated Universities performed a confirmatory radiological survey of the reactor support buildings for the NRC. They also performed offsite exposure rate measurements and soil sample analyses. Exposure rates and radionuclide concentrations were typical of normal background levels (Reference 28).

7.3 Demolition of the Reactor Support Buildings

Upon acceptance of the final release survey by the NRC, the reactor support buildings were demolished in 1992. Controls were put in place to minimize fugitive emissions and soil erosion. Environmental air particulate sampling stations were operated during this evolution. The particulate filters were analyzed for gross alpha, gross beta, and gamma radioactivity. Three indicating air stations are located around the site and one control station is located 10 miles from the site. Generally, the weekly trends of gross alpha and gross beta activity at all stations were similar. Gamma-emitting radionuclides related to the SNEC Facility were not detected in any of the samples during the demolition process.

Aquatic sediment samples were collected near the SNEC Facility storm water discharge to the river. Low levels of cesium-137 and cobalt-60 were detected in samples following the demolition of the support buildings when site soil was carried to the river from the site storm drain discharge. Upon detection that a small amount of soil erosion was occurring, the storm drain discharge line was plugged.

7.4 Soil Remediation

Operation of the SNEC Facility resulted in low levels of radioactive contamination in the soil surrounding the facility. Some of this soil was transported outside the SNEC Facility fence but within the property limits of GPU due to construction activities, erosion, etc. Various radiological surveys were conducted. If radiologically contaminated soil was found outside the SNEC Facility fence, it was excavated and either disposed of as low level radwaste or stored inside the fenced area.

In late 1987, GPU Nuclear Inc. conducted a radiation survey of the restricted area onsite, which showed a greater-than-normal background activity of cesium-137 (Cs-137), as well as detectable amounts of another radioactive by-product material cobalt-60 (Co-60). The Pennsylvania Bureau of Radiation Protection, Department of Environmental Resources (DER), was concerned that the soil could have been dispersed to offsite areas by natural forces over the years since operations had ceased. The DER contacted the U.S. Department of Energy (DOE) requesting assistance in evaluating the extent, if any, of offsite Cs-137 radiological contamination, possibly through the use of an aerial survey. DOE responded by tasking EG&G Energy Measurements, Inc., (EG&G/EM) to determine the feasibility of an aerial survey.

EG&G/EM aerial operations dispatched a field team to the Saxton area to make *in-situ* measurements to determine the relative Cs-137 concentrations. The measurements were made in June 1988 (Reference 25) using a high purity germanium (HPGe) detector.

The prevailing winds at the site flow from the southwest to the northeast, up the valley. Since the site is so heavily influenced by the surrounding terrain, it is unlikely that any radiologically contaminated material would have escaped the valley under normal weather conditions.

Additionally, an aerial radiological survey was conducted from July 5 through July 22, 1989, over the SNEC Facility and surrounding area (Reference 26). The survey covered an 83-square-kilometer (32-square-mile) area around the plant. The purpose of the survey was to map the gamma environment of the area surrounding the SNEC Facility. Particular attention was to be paid to the possible presence of Cs-137 in the areas surveyed

The survey was conducted at a nominal altitude of 61 meters (200 feet) with line spacing of 91 meters (300 feet).

Pressurized ion chamber measurements and soil samples were collected during the survey at six sites within the survey boundaries.

The isotopic and ion chamber measurements generally agree with the inferred aerial data for each site.

A contour map of the terrestrial gamma exposure rate (extrapolated to 1 meter above ground) was prepared. The Cs-137 activity inferred from aerial data was within the limits of the deposition from world-wide fallout. No other man-made contaminants were detected in the survey area.

In November 1993, comprehensive soil monitoring and sampling work was performed at the site to assess the extent of radioactive contamination levels present on the site. NUREG/CR-5849 (Reference 19) was used as a basis document for the development of methods and guidelines in establishing survey and assessment protocols. After completion of the soil characterization work, radioactively contaminated soil was excavated, packaged, and shipped offsite and disposed at both an NRC licensed low level radwaste (LLRW) and a state licensed low activity radwaste (LARM) facility.

Approximately 105 cubic feet of soil containing 1.2 millicuries of radioactivity was shipped to Barnwell, South Carolina, LLRW facility on May 26, 1994. Between July 25 and October 26, 1994, 56,161 cubic feet of soil containing 9.8 millicuries was shipped to the Envirocare LARM facility located in Clive, Utah. Soil containing radioactivity in concentrations below 560 pCi/g was shipped to Envirocare and soils containing greater concentrations was shipped to Barnwell.

Non-radiological analysis results indicated all chemical constituents for hazardous material classification were below EPA 40CFR261.21-24 limits. Soil density analysis indicated that moisture content ranges were within a suitable range to ensure adequate disposal compatibility.

The results of radiological analyses for transuranics and "hard to detect" radionuclides (strontium-90, nickel-59-63, iron-55, carbon-14, niobium-94, technetium-99, and iodine-129) indicate that these materials were present in quantities at or below background levels or the lower limit of detection (LLD). The results of the remaining radiological analyses of site soil indicated that the predominant radionuclides were Cs-137 and Co-60.

The pre-remediation site average concentrations of predominant radionuclides were 15 pCi/g for Cs-137 and 0.5 pCi/g for Co-60. Approximately 14 percent of the soil samples contained Cs-137 in concentrations greater than 5 pCi/g with 3393 pCi/g being the highest concentration, and 10 percent contained detectable quantities of Co-60 with 23.7 pCi/g being the highest concentration. From a public dose perspective, the pre-remediation postulated dose rates to a theoretical onsite resident would have been 40.2 millirem per year due to Cs-137 and 5.6 millirem per year due to Co-60, for a total of 45.8 millirem per year, (total of all pathways as analyzed using the RESRAD Code [Reference 23]).

The current site average concentration of Cs-137 is below 1.0 pCi/g and Co-60 is below 0.1 pCi/g. However, small pockets of residual radiological contamination of Cs-137 in the range of 5-10 pCi/g remain in the exclusion area adjacent to the CV. These areas will be remediated during subsequent decommissioning activities. The current postulated dose rates to a theoretical onsite resident would be below 3 millirem per year due to Cs-137 and below 1 millirem per year due to Co-60, for a total of less than 4 millirem per year.

7.5 Radiological Environmental Monitoring Program

GPU Nuclear Inc. continues to conduct a comprehensive radiological environmental monitoring program (REMP) at the SNEC Facility to monitor radiation and radioactive materials in the environment. The information obtained from the REMP is used to determine the effects of the SNEC Facility, if any, on the environment and the public. A written report is submitted to the NRC annually. The results of the REMP to date indicate that the operation and maintenance of the facility has not had a significant radiological impact on the environment and the public.

Environmental monitoring at the SNEC Facility currently involves high volume air sampling; sediment, groundwater, potable water, soil, surface water and thermoluminescent dosimeter (TLD) monitoring.

Gamma radiation exposure rates near SNEC are measured using thermoluminescent dosimeters (TLDs). There are 28 TLDs that surround the SNEC Facility. Sixteen Indicator Stations, one per compass sector, are located on the SNEC outer perimeter fence. One station is located in the GPU Energy Line Department Garage. There are nine offsite indicators in various sectors within two miles of the site. There are also two control stations, each about ten miles from the site. Each TLD station consists of two TLD badges (Panasonic Model 814), each of which has three phosphors or elements. Since each TLD phosphor responds to radiation independently, this provides six independent detectors at each station.

The current groundwater monitoring program includes approximately thirteen (13) overburden monitoring wells and seven (7) deeper, bedrock monitoring wells. Site location maps are in the SNEC LTP. Since 1981, subsurface investigations have been conducted through installation of monitor wells.

The first investigation was conducted in 1981 by Groundwater Technology, Inc. The investigation consisted of reviewing information obtained from the Pennsylvania State Geologist and the United States Geological Survey (Water Resource Branch), and conducting geologic reconnaissance of the area to provide the initial geologic interpretation for the Facility. In addition, test borings were drilled near the CV and the RWDF to characterize the soils, bedrock and depth to groundwater. The results of this investigation were summarized in a 1981 report entitled "Preliminary Hydrological Investigation, Saxton Nuclear Station, Saxton, Pennsylvania".

In 1992, GEO Engineering installed monitor wells near the CV and the RWDF. Eight monitoring wells (GEO-1 though GEO-8) were installed in the suspected upgradient and downgradient flow direction for the CV. The wells were screened (and sanded) across the top bedrock and boulder layer contact (overburden/bedrock interface). This zone was previously identified in the 1981 as an area of relatively higher permeability compared to its immediate surroundings The results of this investigation were included in a 1992 report entitled, Phase I Report of Findings-Groundwater Investigation Saxton Nuclear Experimental Station, Saxton, Pennsylvania, by GEO Engineering.

In 1994, GEO Engineering installed three monitor wells at the Site. Two additional monitor wells (MW-1 and MW-2) were installed near the CV. The two additional monitor wells were installed west and northwest of the CV at an angle, approximately 25°, to facilitate the interception of groundwater flowing in fractured bedrock. The wells, completed as gas-actuated monitor wells, 54' in length, were installed to the depth similar to the CV (approximately 50' below ground surface). A third monitor well, a 50-foot monitor well (GEO-9), was installed in bedrock making it possible to obtain water level elevation data from the bedrock unit. As part of this field activity, monitoring wells GEO-1 to GEO-8 were retrofitted with gas actuated samplers. The results of this investigation were reported in GEO Engineering's, Summary of Field Work, 1994.

Periodically, low levels of tritium (200-760 pCi/l) have been detected in environmental groundwater monitoring well GEO-5. Upon review of the GEO-5 results, it appeared that the activity in the GEO-5 area could be attributed to pockets of tritiated water trapped in fractures leading to the overburden groundwater. In order to assess the possibility of other contaminates in this area supplemental monitoring wells were added in this location. In 1998, a total of three additional wells were added to the monitoring array. Two bedrock monitor wells (MW-3 and MW-4) with gas actuated devices were installed adjacent to the RWDF (to the depth of the sump) to investigate the potential presence of tritium in groundwater. In addition, GEO-10 was installed at the overburden/bedrock interface downgradient of GEO-5 to evaluate trace amounts of tritium detected in the groundwater at GEO-5. These new wells showed infrequent tritium activity slightly above minimum detectable levels ranging from 120-180 pCi/l. Details of this investigation are described in a 1998 Summary Report of Field Work by Haley and Aldrich.

In December 2000, additional monitor wells were installed at the Site and slug testing was performed to evaluate hydraulic conductivity of the materials. Seven monitor wells were installed to characterize groundwater flow in the area beyond the Facility. The seven wells consisted of three nests of an overburden/bedrock interface and bedrock well (OW-3/3R, OW-4/4R, and OW-5/5R) and one additional overburden well (OW-6). The monitor wells in the overburden are screened at the overburden/bedrock interface. The bedrock wells extend to 50 feet below ground surface. The well installations occurred between December 11 and 21, 2000. The investigation confirmed the presence of the types of subsurface materials reported in earlier investigations. Slug tests (falling head tests) were conducted on the monitor wells.

In May 2001, one additional monitor well nest and two observation points were installed in the area of the Facility. The monitor well nest, OW-7 and OW-7R, consists of a well installed in the overburden/bedrock interface and a well installed in bedrock. The cluster was installed to the east of the discharge tunnel, between the facility and the river. The two observation points (OP-3 and OP-4) were installed in the backfill on the eastern side of the discharge tunnel The purpose of the wells was to obtain additional groundwater elevation data and provide an additional groundwater monitoring points for the detection of tritium, if present, in groundwater.

The details regarding these investigation are summarized in the December 2001 Summary Report by Haley and Aldrich (Reference 29).

In 2001, the north side of the CV yard was excavated down to bedrock as part of the dewatering plans required prior to CV concrete removal work. As a result, three (3) overburden (GEO-6, 7 & 9) wells and one bedrock (MW-1) well were removed. In addition, GEO-2 was removed in October 2000 to support SSGS remediation.

Tritium has been periodically detected in GEO-5, MW-3 & 4 wells. The maximum concentration was 760 pCi/L. This concentration is well below the United States Environmental Protection Agency Primary Drinking Water Standard of 20,000 pCi/l.

Other than tritium, SNEC produced gamma and alpha emitting radionuclides have never been detected above minimum detectable activity (MDA).

Other environmental monitoring currently employed at the SNEC Facility includes two potable groundwater stations, four sediment stations, and four high volume air samplers for measuring air particulate activity and two surface water stations. Soil sampling is conducted on an as needed basis.

During decommissioning, GPU Nuclear Inc. will continue to monitor the environment in the vicinity of the site for the presence of radioactivity. It is anticipated that the current REMP may change during the course of decommissioning to reflect changes in site conditions

The REMP includes the monitoring, sampling, analysis and reporting of radiation and radionuclides in the environment in accordance with the methodologies and parameters as contained in SNEC Facility Procedures.

7.6 Final Radiation Survey and Release Criteria

Final Status Survey Plan

The SNEC decommissioning objective is to release the site for unrestricted use per 10 CFR 50 and Subpart E of 10 CFR Part 20.1402. After completion of decommissioning activities, GPU Nuclear Inc. will conduct a final status radiation survey of the site. This survey, scheduled for mid 2003, will verify that surface radioactive contamination has been reduced to levels that will allow release of the site for unrestricted use.

The SNEC Facility Final Status Survey Plan (FSSP) will describe the final survey process that will be used to demonstrate that the SNEC Facility and all additional near site impacted areas meet radiological criteria for license termination. The final site survey will encompass structures, land areas, and any remaining facility systems which, because of licensed activities, were originally contaminated or had the potential to be contaminated. Areas that exhibited the highest contamination levels were located within the SNEC Containment Vessel (CV). As of September 2002, except for CV concrete, the majority of all contaminated systems, components, and soils have been removed from the site. Continued remediation in selected areas will ensure these areas satisfy unrestricted release criteria before the Final Status Survey (FSS) process begins.

GPU Nuclear Inc. will design its survey plan using current technical documents published by the NRC (References 20 & 31). These documents are discussed in more detail in the 'Final Release Criteria' and 'Documentation' sections of this report.

Radiation monitoring instruments used during the conduct of the final radiation survey will be selected as appropriate for the physical and environmental conditions and the type of radiation being measured. The radiation surveys will be performed by properly trained individuals using calibrated survey instruments. The survey instrumentation will be controlled by specific procedures that define accuracy requirements and calibration techniques.

Applicable portions of the facility's Quality Assurance Program (QAP) will be implemented during the conduct of the final survey plan and periodic audits will be performed in accordance with the QAP to verify survey activities comply with established procedures and applicable aspects of the QAP.

Final Release Criteria
A rule covering explicit radiological criteria for decommissioning is contained in 10CFR20. GPU Nuclear Inc. intends to meet the criteria of 10 CFR 20 for site release through implementation of a survey plan incorporating guidance contained within current and proposed regulatory documents. The regulation requires the residual radioactive contamination at the site attributed to licensed operations to contribute not greater than 25 millirem per year total effective dose equivalent to an average individual of the critical population group during the period of 1000 years following site release.

This plan will include a description of the technical considerations and methods to be used for design and implementation of the final survey. The methods to be described are derived from regulatory guidance contained within NUREG-1727 (Reference 31). Appropriate instrumentation and modeling methods will be utilized for attainment of release limits for surface activity, exposure rate and pathway analysis requirements as specified by these guidelines. For example, rubble, debris, soil and structures remaining onsite will be analyzed using RESRAD (Reference 23) or, equivalent methodology to calculate the total effective dose equivalent. Residual radiological contamination types not applicable to RESRAD methodology will be analyzed by guidance deemed appropriate at time of use. At present, such guidance is given in NUREG/CR-5512 "Residual Radioactive Contamination from Decommissioning (Reference 17) and NUREG-1549 "Guidance on Using Decision Methods for Dose Assessment to Comply with Radiological Criteria for License Termination," (Reference 18).

As a project goal, radiological contamination and/or migration of radioactive contamination into ground and surface waters with the potential to be used as a source of drinking water will be evaluated against the 4mrem/year dose criteria referenced in the National Primary Drinking Water Standards contained in 40CFR141

Documentation
GPU Nuclear will prepare a final status survey plan and implementing procedures which will follow the guidance contained in NUREG-1575 "Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)" (Reference 20). Radiological survey results will be compiled into a report. This report will provide a complete record of the radiological status of the site and comparison to the established guidelines for termination of the license. The report will also contain sufficient information to enable an independent re-creation and evaluation of the survey and the results derived from the survey. GPU Nuclear Inc. will submit the final report to the NRC.

8.0 ENVIRONMENTAL APPROVALS

8.1 Federal Requirements

NRC approval for performing decommissioning of the SNEC Facility was received on April 20, 1998 via License Amendment No. 15

Decommissioning activities that are subject to Federal regulations, permits, licenses, notification, approvals or acknowledgments include:

- Handling, packaging and shipment of radioactive waste
- Worker radiation protection
- Worker health and safety
- Liquid effluent and stormwater releases
- Hazardous waste generation, storage, transportation and disposal
- Handling, removal and disposal of asbestos
- Handling and removal of lead paint
- Stream encroachment

The majority of radiological activities fall under Title 10 of the Code of Federal Regulations (CFR) and are administered by the Nuclear Regulatory Commission (NRC). Applicable Title 10 regulations include:

- Part 50 - decommissioning activities
- Part 20 - radiation protection
- Part 51 - environmental protection
- Part 61 - disposal of radioactive waste
- Part 71 - packaging and transportation of radioactive waste (regulations in 49CFR171 to 174 also apply)

Worker health and safety protection during decommissioning is subject to Occupational Safety and Health Administration (OSHA) regulations. The regulations applicable to construction are 29CFR1910 and 1926. These regulations include requirements for respiratory protection (non-radiological), hearing protection, illumination, scaffold safety, crane and rigging safety, chemical usage and release response, and clean-up operations.

The Environmental Protection Agency (EPA) regulations outlined in Title 40 of the Code of Federal Regulations apply as follows:

- Part 61 - asbestos handling and removal
- Parts 122 to 125 - National Pollutant Discharge Elimination System (NPDES)
- Part 141 - safe drinking water standards
- Part 190 - radiation protection standards for nuclear power operations
- Parts 260 to 272 - Resource Conservation & Recovery Act (RCRA)

Asbestos and lead paint handling and removal is subject to OSHA regulations 29CFR1910 and 1926, and EPA regulations 40CFR61, Subpart M. Hazardous waste generation, storage, transportation, are subject to the regulations outlined 40CFR260 through 272 of the Resource Conservation & Recovery Act (RCRA).

8.2 State and Local Requirements

Permits and approvals from or notifications to several State and local agencies are required for safety and environmental protection purposes. Many of the State and local requirements apply to activities that are also subject to Federal regulations previously identified. Decommissioning activities and related site operations that fall under State and local jurisdiction include:

- Air emissions
- Hazardous waste generation, storage, transportation and disposal
- Asbestos removal notification and disposal
- Lead paint removal and disposal
- Solid waste generation, storage, shipment and disposal
- Sanitary waste
- Liquid effluents, including storm water
- Liquid waste shipment
- Fuel oil storage
- Building permits
- Domestic water wells
- Soil erosion and sedimentation control

Air emissions and asbestos removal for the facility are regulated under the Pennsylvania Air Pollution Control Act in addition to the Federal Clean Air Act. Notification of asbestos removal was prepared and submitted to the Pennsylvania Department of Environmental Protection (PaDEP), as required. Air emissions were evaluated by the PaDEP and a waiver was issued due to the minor quantities of emissions from the SNEC Facility during decommissioning operations.

Liquid discharges from the facility are regulated by the NPDES Permitting System administered by the PaDEP, Bureau of Water Quality Management. Pennsylvania NPDES regulations are promulgated under the Clean Streams Law (35 P.S. Sections 691.1-691.701).

Generation and disposition of hazardous waste and lead paint removal and disposal are subject to regulations promulgated under Pennsylvania's Solid Waste Management Act (35 P.S. 6018.101 et. Seq.).

Shipment and disposal of solid wastes including asbestos are governed by Pennsylvania's Residual Waste regulations, also promulgated under the Solid Waste Management Act.

At the local level, building permits were not required for temporary waste handling and packaging or other facilities necessary to support decommissioning activities.

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