October 14, 1983
Revision 1

ATTACHMENT 1

ALLIED-GENERAL NUCLEAR SERVICES
BARNWELL NUCLEAR FUEL PLANT
DECOMMISSIONING PLAN

October 1983

GLOSSARY

AEC	- Atomic Energy Commission
AGNS	- Allied-General Nuclear Services
AWR	- AGNS Work Request
BNFP	- Barnwell Nuclear Fuel Plant
CFR	- Code of Federal Regulations
CNSI	- Chem-Nuclear Systems, Inc.
DOE	- Department of Energy
FAA	- Federal Aeronautics Administration
FRSS	- Fuel Receiving and Storage Station
HCLA	- Hot and Cold Laboratory Area
HP	- Health Physics
HWP	- Hazardous Work Permit
LTRC	- Lower Three Runs Creek
LWR	- Light Water Reactor
MTU	- Metric Tons of Uranium
NRC	- Nuclear Regulatory Commission
OSC	- Operational Safety Committee
RWP	- Radiation Work Permit
R&D	- Research and Development
SCDHEC	- South Carolina Department of Health and Environmental Control
SEC	- Safety and Environmental Control
SRP	- Savannah River Plant
TBP	- Tributyl Phosphate
TRU	- Transuranic
UF_6	- Uranium Hexafluoride
WTEG	- Waste Tank Equipment Gallery

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1.0 INTRODUCTION

1.1 Purpose

This Plan has been prepared to describe fully the decommissioning of the Barnwell Nuclear Fuel Plant (BNFP), including non-radiological considerations and non-licensed facilities, in a single, comprehensive document. Therefore, the procedures and status described herein are not necessarily intended to reflect license requirements. Proposed specific license conditions will be submitted as part of the BNFP license amendment application.

1.2 General Background

The BNFP was designed and constructed, as a privately owned facility, to process light-water reactor fuel equivalent to 1500 metric tons of uranium per year. A Construction Permit was applied for on November 6, 1968 and issued (as CPCSF-4) by the Atomic Energy Commission on December 18, 1970. Construction began in early 1971 and presently existing facilities were essentially completed by mid-1976.

These facilities provide for fuel receiving and storage, separation of the uranium, plutonium and fission products in the spent fuel, conversion of uranyl nitrate solution to uranium hexafluoride (UF_6), storage of plutonium nitrate and liquid wastes and for laboratory analyses and research. As these facilities were completed, cold testing for operability was conducted using natural uranium as surrogate fuel. At no time has spent nuclear reactor fuel been present at the BNFP. During this period applications were made for other requisite Federal licenses and permits.

1.3 Reason for Shutdown

On December 23, 1977, responding to an abrupt reversal of long-standing governmental policy, the Nuclear Regulatory Commission terminated all licensing proceedings related to reprocessing and recycle of recovered products, leaving undisturbed, however, the BNFP Construction Permit. Promptly thereafter, in early 1978, recognizing the BNFP as a national asset, the Congress authorized and provided funding for research and development programs at the BNFP in support of national policy. This R&D work, which continued through July 1983, involved use of all on-site facilities other than the Uranium Hexafluoride Conversion Facility which was deactivated and placed in standby status.

In December 1982, the Congress passed a resolution which specified that "no Federal funding is provided for any activities at the Barnwell Plant beyond July 31, 1983." Proceeding on that basis, activities leading to an orderly shutdown of the BNFP by year-end 1983 were initiated in May.

There is continuing industry/utility interest in the possibility of making a proposal to the Department of Energy for future operation of

the BNFP. If such proposal is made, it may be possible to modify the ongoing shutdown program. However, in the absence of such proposal, activities leading to shutdown in December 1983 continue. These activities include implementation of this Decommissioning Plan.

2.0 BNFP DESCRIPTION AND HISTORY

2.1 Site Location and Description

The BNFP is located about 7 miles west of the City of Barnwell on a site of approximately 1706 acres of land of which approximately 200 acres have been cleared. This site is situated in a predominantly rural area in Barnwell County, South Carolina. The plant base line reference is positioned at the approximate Mercator coordinates of latitude 33°15'0" N and longitude 81°29'20" W (South Carolina State Lambert coordinates Y:516,100 and X:1,850,300).

The BNFP site is bounded on the west and south by the DOE Savannah River Plant (SRP) reservation, on the east by the Chem-Nuclear Systems, Inc. (CNSI) site, and on the north by the Barnwell County Industrial Park.

The location of the BNFP site with respect to South Carolina and Georgia is shown in Figure 2-1. The site perimeter relative to surface streams, abutting properties, industrial plants, and other items of specific interest within a five-mile radius is shown in Figure 2-2.

The BNFP site is largely forest land, with a small number of abandoned farm fields undergoing secondary succession, and several Carolina Bays. Forestation consists of loblolly pine plantings, mixed-pine forests, and mixed pine-hardwood (scrub oak) forests.

There are no natural streams on the BNFP site.

The plant site is wholly-owned private property. A right-of-way for Osborn Road, which is the principal access road to the site, has been granted to the State of South Carolina. An easement for the power transmission lines that supply the BNFP has been granted to South Carolina Electric and Gas Company. The railroad spur serving the Fuel Receiving and Storage Station (FRSS) within the site boundary is wholly AGNS-owned.

A plot plan of the BNFP plant area showing significant features is presented as Figure 2-3. A chain-link exclusion fence has been installed around the plant area.

2.2 Separations Facility

The Separations Facility was designed to process 1,500 metric tons of uranium (MTU) per year at a daily rate of 5 MTU/day. The plant was designed for processing fuel elements that prior to irradiation had a fissile material content of up to 5% U-235 or the equivalent for plutonium fuels.

The process systems in the BNFP for the recovery of special nuclear material are an adaptation of the Purex solvent extraction process, for which the technology and risks are well-defined.

The Separations Facility includes five (5) contact maintenance cells, two (2) remote maintenance cells, two (2) plutonium nitrate storage cells and associated equipment, e.g., pumps, instrumentation, and piping. Only liquid process equipment in the Separations Facility has been exposed to solutions containing uranium (natural only). No plutonium has been used in any process area. Process support equipment, such as the shear and cranes, has not had direct contact with uranium. The plutonium nitrate storage cells and auxiliary systems have not been in contact with uranium. Closed-loop cooling water and steam generating systems are clean; however, their status will be verified. The status of the Plant's ventilation systems will also receive consideration depending on areas it serviced, some of which have been exposed to natural uranium. Generally, residual in-cell natural uranium contamination levels were less than 1000 dpm/100 cm^2 α and 2000 dpm/100 cm^2 $\beta\gamma$ smearable prior to the start of decommissioning. Process piping and vessels that have contained solutions of natural uranium may have higher levels. Such levels in normal access areas, (e.g., operating stations, piping and instrument galleries, stairwells and hallways), in general are less than 50 and 500 dpm/100 cm^2 α and $\beta\gamma$ smearable, respectively.

2.3 Uranium Hexafluoride Facility

The UF_6 facility contains equipment to convert uranyl nitrate to uranium hexafluoride. This equipment is housed in an eight-story metal frame building. Some of the process-related equipment, such as piping, calciners, screw conveyors, bag houses, and vessels, has been in direct contact with uranium, in most cases in the form of uranium oxide powders. Auxiliary systems and areas, such as compressors, refrigeration, fluorine production and UF_6 cylinder loading/unloading, have not been in direct contact with uranium. Residual uranium levels in normal access areas are comparable to those that exist in the Separations Plant.

2.4 Hot and Cold Laboratory Area

The Hot and Cold Laboratory Area contains a temporary lunchroom, a change and locker room, Health Physics support offices, and laboratories.

The Analytical Chemistry Laboratories consist of individual laboratories equipped to provide specific types of analyses or services. The laboratories include all facilities required for analyzing samples for purposes of process control, accountability and safeguards, product and raw material specifications, and process instrumentation calibration.

The Analytical Chemistry Laboratories have been used for DOE-sponsored research and development work, support of plant cold testing, and analytical procedures development. Radioactive materials have been used in all of the laboratories. Plutonium has been used in six laboratories; thus, the hoods and glove boxes in these six laboratories contain residual TRU.

The Engineering and Technical Laboratories consist of an Engineering Laboratory, Alpha Laboratory, Radiochemical Laboratory, and Cold Chemical Laboratory.

The Engineering Laboratory consists of pilot-plant scale equipment, e.g., stainless steel tanks up to 500 gallons capacity (15-20 vessels), pumps, heat exchangers, instruments, three glass pulse columns, pulsers, piping, and valves. Only uranium and thorium have been used in this laboratory.

The Alpha Laboratory contains three very large glove boxes and one standard fumehood. One box (18'L x 10'H x 2.4'D) contains solvent extraction pulse columns and ancillary equipment, such as glass vessels, pumps, stainless steel tubing, and valves. A second box (approximately 25'H x 10'L x 5'D) is used for waste solution handling. This box contains a vacuum pump, stainless steel tank, glass mixing vessel, and several 26-liter polyethylene bottles for storage of waste. The third glove box is used for analytical tests. All three glove boxes will contain residual plutonium.

The Radiochemical and Cold Chemical Laboratories are standard chemical laboratories containing fume hoods, normal bench tops, and sinks, and are equipped with standard chemical labware. These laboratories have been used for work with natural and/or depleted uranium and by-product tracer level radionuclides. No plutonium has been used in the Radiochemical and Cold Chemical Laboratories.

2.5 Other

The Fuel Receiving and Storage Station (FRSS) contains a cask testing and decontamination pit, two (2) cask unloading pools, a fuel storage pool, and associated pool water cooling and treatment equipment and handling cranes. The FRSS has not been exposed to radioactive materials.

The Waste Tank Equipment Gallery (WTEG) houses the pumps, piping, and equipment for maintaining and sampling the three (3) underground liquid waste storage tanks. Some transfer and sampling lines have contained uranium solutions, but the general area is clean. Two of the three underground storage tanks have also contained uranium-bearing solutions.

Support facilities, such as the utility area, administration buildings, shops, and warehouses have never been exposed to radioactive materials.

Prepared by
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Photogrammetric Consultants

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AERIAL PHO
BNFP SITE AND SUR
BARNWELL COUNTY

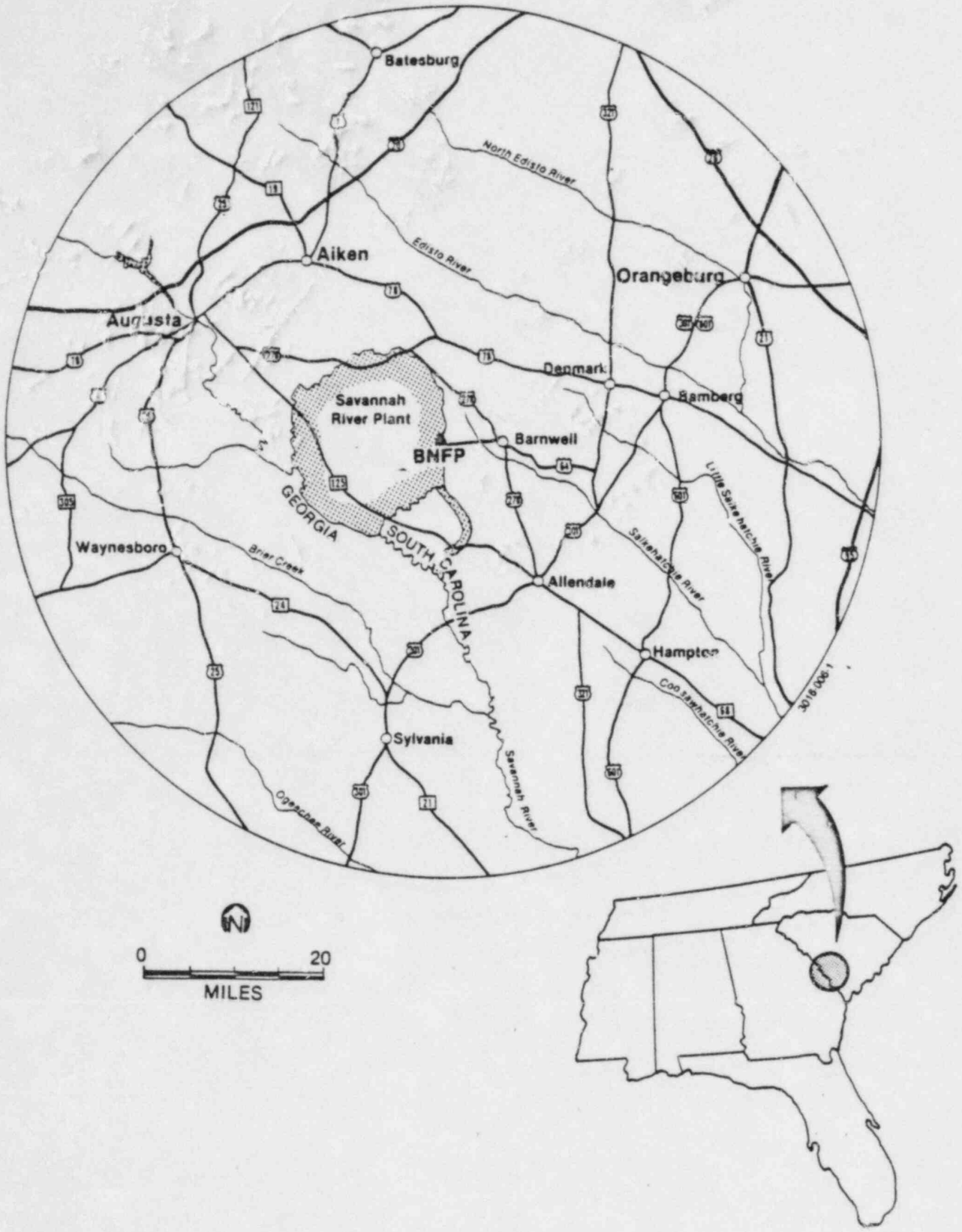
FIGURE 2-2

OTOGRAPH
ROUNDING AREAS
SOUTH CAROLINA

NORTH

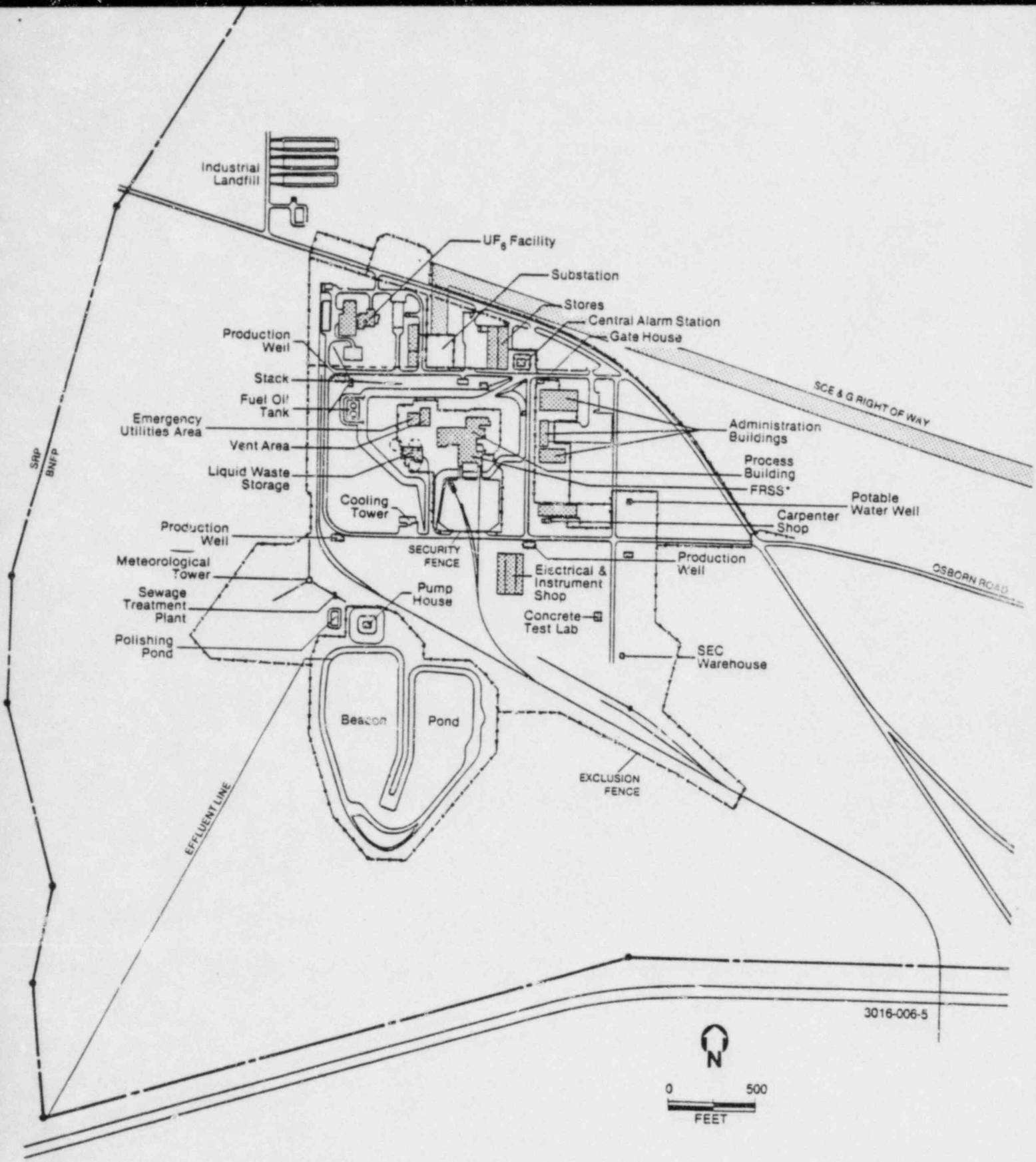
SCALE 1" = 7000'

DATE OF PHOTOGRAPHY : 10/14/1980



BNFP SITE LOCATION

FIGURE 2-1



PLOT PLAN OF THE BARNWELL PLANT

FIGURE 2-3

3.0 DECOMMISSIONING OBJECTIVES

The objective of the BNFP Decommissioning Plan is to place the BNFP facilities and the site in such a condition that a minimal level of radiological controls and security will be required following shutdown. The Plan is consistent with preserving the option of reprocessing at the BNFP in the near term future. However, should a decision be made later that the reprocessing option no longer needs to be preserved, then the plan provides that the future level of effort necessary to place the facilities in an "unrestricted use" status also should be minimal. To accomplish the Plan's objectives, source, special nuclear, and by-product materials will be removed from the site. Low levels of residual natural uranium will remain on the interior surfaces of process piping and vessels. In addition, some residual plutonium contamination will remain on the interior surfaces of glove boxes. The TRU glove boxes will be isolated from ventilation systems and securely sealed. The exterior surfaces of equipment and structures will be cleaned to the "unrestricted use" levels set forth in NRC Regulatory Guide 1.86.

Selected equipment outside of process cells will be salvaged and sold. All waste will be disposed of in accordance with existing regulations. AGNS will submit to the SCDHEC an application to amend its existing state radioactive material license to a "possession only" license. The facilities will be closed and all access points secured. Continued surveillance will be provided as described in Section 10.0 of this plan.

4.0 REGULATORY REQUIREMENTS

Allied-General Nuclear Services (AGNS) has been licensed by the State of South Carolina to possess and use radioactive materials. The State regulations governing the use of radioactive materials are published in "Rules and Regulations for Radiation Control, Regulation No. EC-1." The shutdown and decommissioning of the BNFP will be conducted under these regulations and in conformance with existing AGNS procedures which are incorporated by reference in the State license. Although the State regulations do not specifically address decommissioning, Section RHA 2.19 states that the "Department may terminate a specific license upon request submitted by the licensee to the Department in writing." It is intended that this decommissioning plan and the supporting documentation which will be generated during the course of decommissioning will support an application to amend AGNS' current State license to be a "possession only" licensee.

A second set of applicable regulatory requirements is associated with the AGNS Construction Permit granted under 10 CFR Part 50. 10 CFR 50, paragraph 50.82 states that "a licensee must submit decommissioning plans to the NRC." However as with State Regulations, no specific guidance is provided. The NRC recently revised 10 CFR Parts 30, 40, and 70 for the purpose of establishing procedures for termination of licenses. Although these revisions address the question of acceptable levels of residual radioactive materials, no specific limits were established. Regulatory Guide 1.86, "Termination of Operating License for Nuclear Reactors." dated June 1974, included by reference in numerous NRC-issued licenses as guidelines for release of facilities for unrestricted use, will be so used during the decommissioning activities.

All other applicable State and Federal regulations governing packaging, transportation, and disposal of radioactive and hazardous materials, shutdown of sanitary waste treatment facilities, inert industrial waste landfills, etc., also will be followed.

5.0 MANAGEMENT PLAN

5.1 Management Organization

The AGNS present management organization is depicted in Figure 5-1. Dr. J. A. Buckham, President, has appointed J. H. Ellis, Director, Operations, to be Chairman of the BNFP Shutdown Steering Committee. The Committee has the responsibility for detailed planning, scheduling, and conduct of the plant shutdown and decommissioning program. Other committee members are:

J. L. Aughtman - Manager, Procurement and Material Control
J. H. Mestepey - Manager, Plant Engineering and Maintenance
J. J. Jernigan - Controller
M. Hawkins - Manager, Safety and Environmental Control

The functional decommissioning project organization is shown in Figure 5-2.

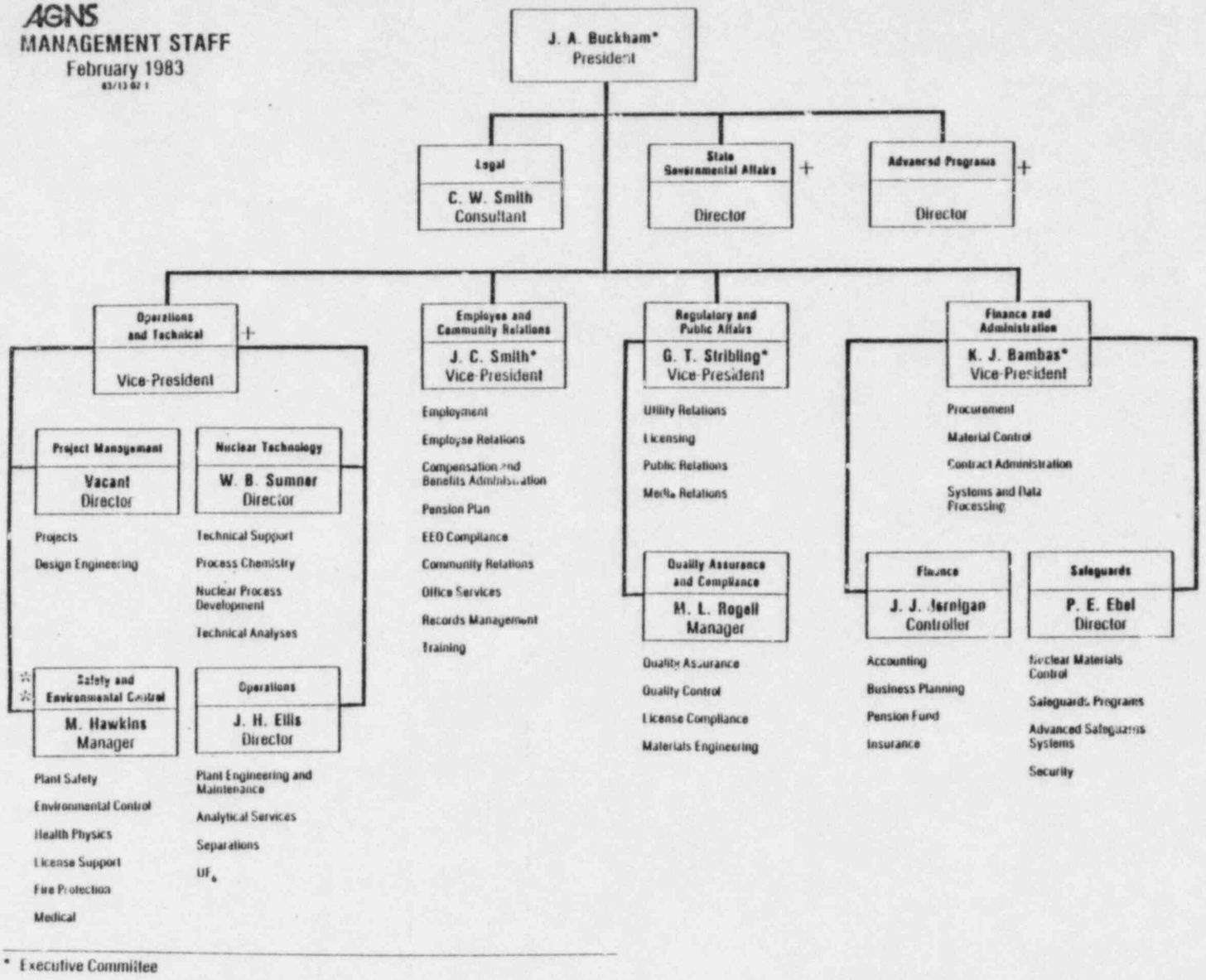
5.2 Quality Assurance and Safety

Quality assurance considerations will be in conformance with the BNFP Quality Assurance Program as set forth in AGNS Policy and Procedure Q-11. The program will be utilized to monitor and provide documented evidence of activities during the period of decommissioning.

The AGNS Operational Safety Committee (OSC) will remain functional during the decommissioning period. The OSC provides a management oversight function to assure that activities conducted at the BNFP are carried out in a manner consistent with the safety policies of AGNS and in conformance with all applicable regulations.

5.3 Consultant

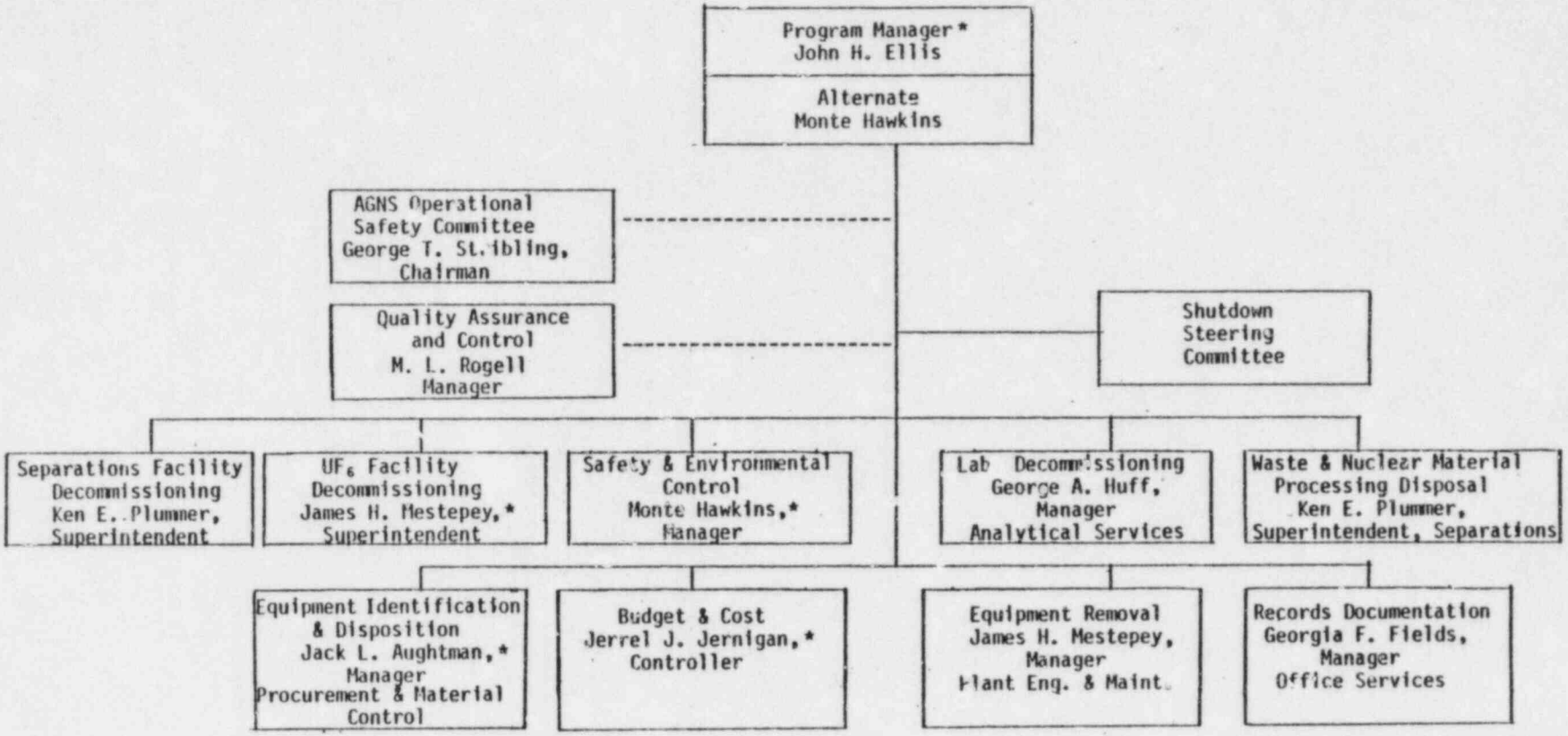
AGNS has contracted with Rockwell International of Canoga Park, California as a consultant to provide an independent review of the BNFP decommissioning program. This action was taken to provide added impartial and objective assurance that the decommissioning program is properly planned, documented and performed. Rockwell has conducted an initial review, resulting in a number of recommendations all of which have been incorporated in this decommissioning plan. Rockwell will also perform an independent radiological survey to verify the final radiological status of the facilities. This consultant is to prepare reports addressing the adequacy of the decommissioning plan and procedures, as well as perform periodic reviews during the course of decommissioning. A final report summarizing the results of the decommissioning program will be prepared. This final report will be available for review by appropriate regulatory agencies as will other supporting documentation.



**Now reports to the Director of Operations.
+As part of the shutdown plan, these employees have been terminated and the positions are now vacant.

AGNS MANAGEMENT STAFF

FIGURE 5-1



*Steering Committee Member

DECOMMISSIONING PROJECT ORGANIZATION

FIGURE 5-2

6.0 DECOMMISSIONING PLAN AND ANTICIPATED RESULTS

Existing AGNS procedures will be followed during decommissioning operations. A Hazardous Work Permit, Radiation Work Permit, AGNS Work Request and/or Work Instruction will be issued by AGNS to cover items of work in order to provide written instructions, to assure compliance with existing procedures and regulations, and to document that the work was done.

Disposal of non-TRU Radwaste, TRU waste, non-rad waste, and non-rad hazardous waste will be governed by existing AGNS procedures

6.1 Separations Facility

6.1.1 Process Systems

Process solutions will be removed from process vessels and piping. Unused TBP and diluent will be removed from their respective feed tanks. Solvent with uranium contamination will be cleaned with sodium carbonate. Process solutions will then be packaged for off-site disposal or sale. Approximately 14.5 MTU of DOE-owned natural uranium, in the form of uranyl nitrate solution, will be shipped* to an off-site vendor for conversion to UF_6 prior to return to DOE.

In order to remove residual quantities of uranium and reduce residual internal levels in the Separations process equipment and piping, nitric acid and water flushes will be performed. Internal smear surveys will be taken from selected vessels and piping sections prior to performing an initial acid flush. Solution samples will be taken before and after "flushing" so that the effectiveness of this flushing can be determined. Additional (repeat) internal smear surveys will also be taken. Where indicated, vessels will also be flushed with sodium carbonate solutions to remove organic residues.

Data collected from this initial flush will be used to determine if an additional acid flush is required on all or part of the process. Waste generated from these acid flushes will be collected in a waste tank. Following these acid flushes, a water flush will be performed and process vessels and piping will be filled to overflow. A final dilute acid flush will then be performed to enhance clean-up and to assure passivation of the internal surfaces of the piping and vessels. All flush solutions will be collected and prepared for off-site disposal.

Records will be maintained to document the history of clean-up of major vessels and process systems (internal residual levels, type and number of flushes, etc.).

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*Shipment was completed on September 26, 1983.

It is expected that the above cleanup and flushing program will result in residual uranium levels on the interior surfaces of process piping and vessels of less than 1000 dpm/100 cm^2 smearable natural uranium alpha. The results of the flush solution samples and smear surveys of the interior surfaces of process systems will be analyzed to verify this expected result.

6.1.2 Process Building Cleanup

All areas of the process building (contact cells, remote cells, galleries, stations, and areas) will be cleaned to levels as low as practicable. Direct radiation levels in the buildings will not exceed background. Final radiological surveys will be performed.

To the extent practicable, all wood, paper, flammable liquids, and other combustibles will be removed from the process building.

Cell ventilation lines will be surveyed by Health Physics (HP), and closed off. Ventilation and off-gas filters will be left in place.

After clean-up is complete, all water will be shut off and all lines drained. All electrical service will be de-energized and the buildings secured.

6.2 Uranium Hexafluoride Facility

6.2.1 General

The same general procedures will be followed for cleanup of the UF_6 process system and building as are described for the Separations Facility.

6.2.2 Carbon Steel Piping and Equipment

Some systems in the UF_6 Facility have been in contact with natural uranium powder. Because they are constructed of carbon steel, these systems cannot be flushed with nitric acid. These systems will be identified, opened, and vacuum cleaned. They will then be physically removed from the facility. Piping will be discarded as non-TRU waste. Where practicable, equipment such as conveyors, blowers, valves, etc., will be transferred to Allied Corporation's Metropolis, Illinois Facility. These items will require HP approval prior to disposal or shipment.

6.3 Hot and Cold Laboratory Area

6.3.1 General

The laboratory area of the BNFP consists of analytical chemistry laboratories, an engineering laboratory and an alpha laboratory. The analytical chemistry laboratories are equipped with hoods, glove boxes,

work tables, and the necessary analytical chemistry equipment to perform sample analyses for process control, accountability and safeguards, product and raw material analyses. The engineering and alpha laboratories contain pilot plant scaled equipment and have been used for process development work.

The general plan for decommissioning the laboratory areas is to remove all radioactive sources, contaminated equipment and any other radioactive materials. Fixed work tables, hoods, and glove boxes will be left in place. Floors, ceiling, counter tops, and if possible, the interior of hoods will be cleaned to AGNS Zone II limits which are 50 dpm α/100 cm^2 and 500 dpm $\beta\gamma$/100 cm^2, smearable. The interior surface of the glove boxes which have not contained Pu will also be cleaned to Zone II limits.

The laboratory area also contains administrative offices for laboratory personnel, a temporary lunchroom, and Health Physics support offices. All of these areas will be cleaned to Zone II limits. It is expected that as a result of this decommissioning effort, the laboratory area, except for the interior surfaces of TRU glove boxes and hoods, will not have residual levels greater than Zone II levels on any accessible surfaces.

6.3.2 Portable Equipment and Supplies

Portable equipment will be cleaned and placed in storage outside of the laboratory area for future sale or disposal. If the equipment cannot be readily cleaned, it will be discarded as waste. Compatible laboratory chemicals will be discarded to the Separations Plant Waste Treatment Systems. Other chemicals will be packaged for disposal at an approved chemical disposal site.

All cabinets and drawers will be emptied and the contents removed from the laboratory for sale or subsequent disposal. The interior surfaces of cabinets and drawers will be cleaned to Zone II limits. All portable equipment will be removed from hoods and glove boxes.

6.3.3 Hoods and Glove Boxes

All accessible exterior surfaces of the hoods will be cleaned to Zone II limits. The interior surfaces of hoods will be cleaned to a level that is considered to be as low as practicable.

All drain lines from hoods, non-TRU glove boxes, and sinks will be flushed with nitric acid and water. The flush solutions will be treated in the Separations Facility Waste Systems. Flush solutions from TRU glove boxes will be collected and treated as TRU waste.

After cleaning, the glove boxes and hoods, which had contained TRU material, will be isolated from the ventilation system and other utilities. The gloves will be left in place in the glove boxes and a gasketed cover plate will be placed over the glove port. Since there

will be residual plutonium remaining in some of the glove boxes, a periodic surveillance program, as described in Section 10, will be performed to assure that the integrity of the boxes is maintained.

There are three large non-standard glove boxes in the alpha laboratory which have been exposed to plutonium. As much equipment as practicable will be removed from these boxes via existing bag-out ports. These boxes will be cleaned to a level that is considered to be as low as practicable, sealed and isolated as described above. As with the analytical laboratories, periodic surveillance will be performed.

6.3.4 Waste System

After clean-up of the laboratories is completed, all drain lines and tanks in the laboratory waste system will be flushed with nitric acid and water. It is expected that the interior surfaces of the pipes and vessels in this system will contain less than 1,000 dpm/100 cm^2 natural uranium alpha. No plutonium-bearing solution has ever contacted the laboratory waste system.

All waste disposal operations required as a result of laboratory decommissioning will be performed in accordance with existing AGNS procedures and applicable state and Federal regulations.

6.4 Other

6.4.1 Waste Tanks

There are two High-Level and one Intermediate-Level stainless steel waste tanks. Each tank has a nominal capacity of 300,000 gallons and is located inside a concrete vault which is lined with stainless steel.

One High-Level tank and the Intermediate-Level Waste Tank were used to collect wastes generated during the DOE-sponsored demonstration runs of the Separations Facility. These solutions have been removed and solidified. However, a waxy film containing a small amount of uranium adhered to some of the cooling coils in the High-Level Waste Tank. The Intermediate-Level Waste Tank has been cleaned, and it will be surveyed by HP. The second High-Level tank has not been used.

The Intermediate-Level Waste Tank will be used to collect the nitric acid flush solutions used in cleaning the Separations Facility. The used High-Level Waste Tank will collect the water flushes which follow the acid flush.

The water flush solution will provide sufficient volume to submerge the coils and sodium hydroxide solution will be added to dissolve the waxy film on them. This solution will then be used to neutralize the acid in the intermediate-level tank and the combined solutions will be concentrated and prepared for disposal at an authorized burial site.

Allied-General Nuclear Services
Post Office Box 847
Barnwell, South Carolina 29812

J. A. Buckham
President

(803) 259-1711

December 9, 1983

PRES/83/166

The Honorable Donald Paul Hodel
Secretary of Energy
1000 Independence Avenue, S.W.
Washington, D.C. 20585

Dear Mr. Secretary:

My letter of April 15, 1983 promised to keep you informed of progress in the orderly shutdown of the Barnwell Nuclear Fuel Plant. Subsequently, in letters dated May 24 and June 17, 1983, I advised that we were proceeding with both the cleanout of equipment and the issuance of notices of termination to employees. This letter is to summarize for you the current status of such shutdown activities, which will be virtually complete by December 31, 1983.

All work under R&D contracts with the Department of Energy has been completed and described in twenty-nine (29) reports which we provided to the Department's Savannah River Operations Office. (As that Office is aware, our costs for the FY 1983 R&D work exceeded the contract funding by approximately $700,000.) During the six-year course of the DOE/AGNS research programs, $5.6 million of government-owned equipment was purchased for use or testing at the BNFP. This equipment is being returned to DOE's possession in conformance with the Department's regulations and instructions.

Following completion of the DOE-sponsored research, we initiated an extensive and thorough cleanout of the plant, transferring to others all usable nuclear materials which had been associated with the R&D programs. Waste materials were sent to approved waste disposal sites. The cost of this decommissioning activity will be approximately $3.3 million.

On April 15, 1983, the BNFP employee census stood at 293. Today, it is 127, and it will be reduced to 14 by December 31, 1983. The census reduction is being accompanied by outplacement and severance programs consistent with practice at AGNS' owner companies. The cost of severance and outplacement is estimated at $2.7 million.

The AGNS pension plan is being terminated with funds which are more than adequate to cover required distributions to plan participants. We have submitted the required documentation to the Internal Revenue Service and to the Pension Benefit Guaranty Corporation.

In a separate program, selected items of plant equipment have been removed and sold. Those items have been restricted to: (1) those which would be expected to deteriorate or become obsolete within a few years, such as laboratory and portable instrumentation, and (2) readily replaceable, high-value equipment and materials such as emergency diesel generators, silver zeolite, and aluminum canisters. For the time being, in-cell process equipment is being left in place and necessary quality control and other vital records are being preserved.

I believe you share our regret that these actions have become necessary. We most certainly share your views, as reported last month at the AIF's annual meeting in San Francisco, that disposal of spent fuel is an "atrocious, unacceptable waste" and that "sometime, somewhere, we've got to come to grips with the reprocessing issue." Reprocessing is clearly a better way to manage the disposal of high-level waste than is the burial of spent fuel. However, our decommissioning activities do not provide for long-term preservation; hence, unless prompt actions are undertaken, the Barnwell Plant will not long be preserved as the most timely and cost-effective place in which the nation can realize the energy conservation and waste disposal benefits of reprocessing.

As I have done in the past, I am providing copies of this letter to members of the South Carolina Congressional delegation and to Governor Riley.

Sincerely,

J. A. Buckham

JAB/jr

cc: Mr. R. L. Morgan, Mgr. SR

The two tanks will then be flushed and final surveys will be taken. The unused High-Level Waste Tank will also be inspected and surveyed. All utilities will then be shut off, and the vaults will be closed.

6.4.2 Support Buildings

There are a number of support buildings such as warehouses, machine, vehicle maintenance, and instrument-electrical shops at the BNFP. All of these support facilities are clean. Portable equipment, flammable liquids, and to the extent practicable, combustible material will be removed for disposal or possible sale. Power will be shut down, and the buildings will be locked.

It is possible that the administration buildings will be used for records storage and will be occupied by records personnel for the immediate future. In addition, portable equipment will probably be stored in the warehouse.

7.0 DISPOSITION OF SURPLUS EQUIPMENT

A system has been established for controlling the distribution of surplus materials. All items of equipment or lots of similar items will be assigned a unique identification number. All pertinent data will be keyed to this number and maintained in a computerized data management system. The data collected will include, among other things, a description of the item, its value, location, to whom it was donated or sold, and Health Physics survey and release data.

7.1 Disposition of Equipment

Portable equipment (i.e., readily disconnected by unplugging or unbolting) is located in the Separations, Laboratory, and UF_6 facilities as well as administrative and support areas. This equipment includes such things as office furniture, laboratory instruments, welding machines, medical and safety equipment, and small tools. This equipment will be cleaned, tagged, surveyed by Health Physics, and moved to a designated holding area. Movement of this equipment will facilitate subsequent cleanup of the building.

Some of this equipment, such as safety and medical equipment, may be donated to area hospitals, schools, fire departments, and rescue squads; limited quantities of office furniture and other selected items will be sold to employees. Other selected equipment also will be sold. All equipment that is released from the site will be cleared by the Safety and Environmental Control Department (SEC) in compliance with existing AGNS procedures.

7.2 Radiological Controls

The SEC Department will determine whether an item can be released from the site on an "unconditional use" basis or whether it must be treated as a "restricted use" item. "Restricted use" items will be released only to organizations or persons authorized to receive radioactive materials, such as other licensees or the Department of Energy.

Table 7-1 describes the criteria to be used to determine the Health Physics Release Code classification for the release of material from the BNFP.

TABLE 7-1

HP RELEASE CODE CLASSIFICATION

Type of Residual Material	HP Release Code Classification	Definition	Limits (b) Alpha (c)	Limits (b) Beta/Gamma
Smearable (a)	A	unconditional use of items	$\leq$100dpm/100cm^2	$\leq$100dpm/100cm^2
	B	restricted use of items	>100dpm/100cm^2	>100dpm/100cm^2
Fixed	1	unconditional use of items	$\leq$100dpm/100cm^2	$\leq$0.1 mR/hr
	2	restricted use of items	$\geq$100dpm/100cm^2	$\geq$0.1 mR/hr

(a) No covering or coating materials shall be applied to items for the purpose of reducing removable residual levels.

(b) Except as noted (see Note No. c), the limits shown shall pertain only to natural uranium.

(c) For items removed from plutonium handling areas in the HCLA, the unconditional use limit for smearable alpha shall be $\leq$10dpm/100cm^2.

A code letter and number designating fixed and smearable classifications shall be assigned to each item.

The restrictions associated with Health Physics Release Codes shall be applied independently and the most restrictive limits shall determine the subject item's disposition. For example, items classified with a "Health Physics Release Code of 'A1'" are defined as unconditional use items. Items classified as "A2," "B1," or "B2" are defined as being restricted use items. Only authorized parties, e.g., radioactive material licensees, shall be eligible to take possession of restricted use items.

8.0 WASTE DISPOSAL

A number of types of waste will result from the shutdown and decommissioning of the BNFP. All waste disposal operations will be in compliance with applicable State and Federal regulations.

8.1 Radioactive Non-Transuranic

The waste which will be generated in this category will include such things as non-salvageable uranium-bearing equipment, including some pipes and vessels from the UF_6 Facility; "job control" waste resulting from decommissioning activities; non-salvageable laboratory glassware which may have been in contact with uranium; and solidified aqueous waste resulting from process equipment clean-up. The principal radioactive material in these wastes is natural uranium. The waste will be packaged for disposal in accordance with existing regulations. It will then be transported to a licensed commercial site for disposal.

8.2 Radioactive-Transuranic

During the performance of research and development programs for the Department of Energy, it was necessary to use limited quantities of plutonium. Because the plutonium was used in support of Department of Energy programs, it has been determined that all transuranic wastes resulting from decommissioning activities can be accepted by the Department of Energy's Savannah River Operations Office for interim storage. In addition, plutonium and other transuranic waste laboratory standards, sources, and stock material will be transferred to the Department of Energy.

8.3 Non-Radioactive

Non-radioactive wastes will include such items as paper, wood, scrap metal, plastics, and general trash resulting from cleanup. AGNS is currently licensed by the state to operate an inert industrial waste landfill on the BNFP site. Materials such as those described will be placed in that landfill. The landfill will be stabilized and shut down in accordance with state regulations. After the landfill is shut down, AGNS will obtain the services of a commercial waste contractor to accommodate the small volume of waste that will remain.

AGNS has on hand a number of chemicals used in support of laboratory operations and as stock for process solutions. These nonradioactive chemicals will be donated, sold, or disposed of as chemical waste at a licensed disposal site. Any other chemicals or hazardous nonradioactive materials will also be disposed of only at an authorized disposal site.

9.0 ENVIRONMENTAL IMPACT OF DECOMMISSIONING

The shutdown and decommissioning of the BNFP will not have a significant environmental impact beyond the socio-economic impact on employees and the community associated with loss of employment.

All flammable liquids, chemicals, radioactive, and other hazardous materials will be removed from the site for sale or for disposal at an authorized facility. Any environmental impact associated with such disposal will have been evaluated and considered during licensing activities for the disposal facilities.

The radiation exposure of personnel during decommissioning will be negligible since the principal radioactive material which must be removed from the site, natural uranium, will be handled in pipes, tanks, and similar essentially closed systems. Where it is necessary to work with plutonium, protective measures will be taken in accordance with existing AGNS procedures which have been proven effective. No exposures to the general public will result from decommissioning.

The outfall from Beacon pond will be closed off and liquid discharge into the pond and thence Lower Three Runs Creek (LTRC) will be terminated. Since the pond's discharge constitutes only a small fraction of the total flow of LTRC, cessation of discharge will have minimal, if any, impact.

An Environmental Consultant retained by AGNS has recently inspected the site to determine if erosion would be a problem should the site be abandoned. His conclusion was that the surface features of the site have stabilized and that erosion will not be a problem.

10.0 FINAL STATUS AND CONTINUED SURVEILLANCE

Upon completion of the decommissioning program, the BNFP site and facilities will be in a condition such that only minimal periodic surveillance will be required.

Except for previously discussed residual amounts, all radioactive material will have been removed from the site. All normal access areas will have been cleaned to Zone II limits and entrance may be made wearing street clothing only. Some natural uranium will be present on the internal surfaces of process pipes and vessels. However, it is anticipated that levels of residual material will be less than the limits set forth in Regulatory Guide 1.86 for "Unrestricted" use. While glove boxes which previously contained plutonium will still have residual quantities of plutonium on their interior surfaces, the external surfaces will be less than Zone II limits. Hoods, laboratory work benches, floors, ceilings, and walls in the laboratory area will also be less than Zone II limits.

The doors to laboratories and cells will be securely locked. Ventilation dampers to cells and laboratories will be closed. Glove boxes which have contained plutonium will be isolated from the ventilation system. All combustibles, flammable liquids, portable equipment, and furniture will be removed from the laboratories and process buildings. Electrical power and other utilities will be shut down. All entrance points to the process buildings will be securely locked.

Support buildings such as utility areas, training center and warehouses will be emptied of their contents. Entrances will then be locked. However, it is possible that some equipment may be stored in existing warehouses on site.

Two of three large waste tanks at the BNFP have been contained with natural uranium. These tanks will be cleaned to a level that is considered to be as low as practicable. It is expected that the residual level in these tanks will be less than the levels specified in Regulatory Guide 1.86, for "Unrestricted" use.

Although the amount of radioactive material remaining on site will be extremely small and will be present only as low-level surface residues, a periodic surveillance program will be implemented. Security inspection of the process areas will be performed quarterly. The security inspector will look for obvious damage to buildings or evidence of attempts to enter the facility. Site boundary fences will be inspected for evidence of entry and the site will be observed for erosion damage. While the meteorological tower remains in place, the FAA warning lights will be checked daily for operation.

Semi-annual radiological surveys and safety and fire protection inspections will be performed. This will consist of walk-through inspections

of the facility to detect fire or safety problems. Smear surveys will be conducted in the Separations Facility, the laboratory areas, and the UF_6 Facility. In the laboratory areas, smears will be taken around glove ports to assure that any residual material remains confined. Glove ports will be visually inspected to insure that the integrity of the box is maintained.

As a part of preparing for operation of the BNFP, an extensive radiological environmental survey was performed by a consulting team now headed by Dr. John M. Palms of Emory University in Atlanta, Georgia. Although AGNS' contractual relationship with these consultants has been terminated, a new contract will be written to provide for a final environmental survey of the BNFP. However, because only minimal levels of radioactive materials will remain at the BNFP, it is not considered necessary to perform periodic environmental surveys such as soil, air, and water sampling.

AGNS will contract with a qualified organization to perform the surveillance functions. An individual within one of the parent companies will be assigned responsibilities for assuring that the surveillance program is properly conducted.

11.0 DOCUMENTATION

All activities associated with the decommissioning of the BNFP will be performed under existing AGNS procedures. These procedures will be supplemented with written work instructions as necessary. Copies of procedures, work instructions, radiological survey data, and property disposition records will be retained as supporting documentation.

BARNWELL NUCLEAR FUEL PLANT
POST - DECOMMISSIONING
SURVEILLANCE PROGRAM

Allied-General Nuclear Services is contracting with Chem-Nuclear Systems, Inc. of Barnwell, South Carolina, to perform the surveillance program described in the BNFP Decommissioning Plan (Attachment 1 to this License Application).

Chem-Nuclear is intimately familiar with the regulatory, radiological and industrial safety, and security aspects of nuclear operations in Barnwell, across the country, and around the world. This experience, the Company's reputation for quality, and the familiarity and proximity to the Allied-General Nuclear Services (AGNS) Barnwell Nuclear Fuel Plant make Chem-Nuclear superbly suited to operate the AGNS Surveillance Program.

The CNSI Surveillance Program of the AGNS Facility will consist of two phases:

A. Radiological surveillance

B. Quarterly security inspection

AGNS will provide to Chem-Nuclear the name and telephone number of a designated AGNS representative who will be notified immediately of any radiological, safety, or security problems detected on the AGNS property.

Descriptions of each phase of the surveillance program follow.

A CNSI procedure will be prepared to implement the AGNS surveillance program. This procedure will be supplied to the AGNS representative and to the SCDHEC.

A. Radiological Surveillance

Chem-Nuclear will perform a semi-annual radiological survey of the Separations and UF_6 Facilities. The first of these surveys will be performed as soon as possible after the AGNS decontamination project is completed, and prior to December 9, 1983, to permit AGNS personnel to escort CNSI personnel through the facility on the initial survey and so that AGNS can assist in establishing a baseline set of survey readings. These surveys will be performed in accordance with existing CNSI radiological survey procedures.

The radiological survey will consist of:

1. A general safety and fire protection inspection of all areas entered

2. Smear surveys of the entrance areas, ground floor, hallways, and stairwells of the Separations and UF_6 Facilities and of the hallways of the HCLA. Sample locations will be demarcated for standardization of samples. The smears will be counted for alpha and beta-gamma activity.

3. Smear surveys and portable alpha and beta-gamma instrument surveys of the HCLA Analytical Chemistry Lab, the Engineering Lab, and the Alpha Lab. Special attention will be given to the smear surveys of the external surfaces of gloveboxes, gloveports, and hoods for evidence of removable contamination.

4. At the UF_6 Facility, additional smear surveys and portable alpha and beta-gamma instrument surveys will be performed at the following equipment/locations: spray dryer, laboratory, base of main stack, decontamination tank, decontamination room, calciner, 8th floor bag house, and oxide vacuum system.

The AGNS representative will be notified of any contamination found in excess of 50 dpm/100 cm^2 alpha or 500 dpm/100 cm^2 beta-gamma or of any significant variation in radiological conditions from those found in the baseline survey.

In addition, semi-annual reports detailing the above surveys will be submitted to AGNS within 30 days of the end of the report period. If requested by AGNS, a copy of the report will also be submitted to the South Carolina Department of Health and Environmental Control.

Chem-Nuclear will designate Mr. James E. Purvis, CNSI Director of Licensing and Safety, as the "Contract Radiological Safety Officer for the BNFP." He will be responsible for working with the South Carolina Department of Health and Environmental Control in matters related to the BNFP Radioactive Material License. Mr. Purvis' resume is attached.

The Radiation Protection Officer's training and experience (items 8 and 9 on the South Carolina Application for Radioactive Material License); Individual Users (item 9); Radiation Detection Instruments (item 10); Methods, Frequency and Standards Used in Calibrating Instruments Listed Above (item 11); Film Badges, Dosimeters, and Bio-Assay Procedures Used (item 12); Facilities and Equipment (item 13); Radiation Protection Program (item 14); and Waste Disposal (item 15) can be found on Chem-Nuclear Systems, Inc., Radioactive Material Licenses Numbers 097, 287-01, 287-02, and 287-03. These licenses are on file with the South Carolina Department of Health and Environmental Control, and all CNSI operations performed for AGNS will follow the procedures listed on these licenses.

B. Security Inspection

In addition, Chem-Nuclear will perform a quarterly security inspection which will consist of:

1. Checking the outside doors and gates of all buildings for signs of attempted entry.

2. Entering the warehouses and administrative buildings and checking for signs of entry or removal of equipment.

3. Inspecting the BNFP boundary for damages. All incidents will be reported to AGNS and damages to fences or gates will be repaired.

4. Checking posted signs for legibility and replacing them as necessary.

5. Checking for possible safety or fire protection problems throughout the inspection.

CNSI will control access to the BNFP via Osborne Road. This will be accomplished using an electronically operated gate that can be controlled from the CNSI security building. Chem-Nuclear will receive one day's prior notice of any persons wishing to enter the AGNS Facility. Upon arrival, all persons will be required to report to the CNSI security station with proper identification. Individuals will also be required to check out at the security station upon leaving the AGNS Facility.

A quarterly summary report detailing the quarterly inspections will be submitted to AGNS. In addition, CNSI will perform a preliminary investigation of any abnormal findings and will recommend corrective action to the AGNS representative.

RESUME

JAMES E. PURVIS
1433 Canterbury Court
Aiken, S. C. 29801

803-648-6449 (Home)
803-259-1781 (Business)

March, 1981 - present

Director, Licensing and Safety
Chem-Nuclear Systems, Inc.
P.O. Box 726
Barnwell, South Carolina 29812

Deputy Director, Regulatory Affairs
Chem-Nuclear Systems, Inc.
P.O. Box 726
Barnwell, South Carolina 29812

Manager, Regulatory Affairs
Chem-Nuclear Systems, Inc.
P.O. Box 726
Barnwell, South Carolina 29812

Provide and maintain a workable regulatory system for site operations. Ensure compliance in regulations. Provide CNSI Radiation Safety Officer functions. Provide ALARA guidance in operations and equipment design. Maintenance of the Site Criteria and planning. Provide licensing functions for new sites and new operations, as necessary. Maintain accurate waste inventory records in volume, location and activity, with periodic reports to regulatory agencies. Provide liaison, as necessary, between the site surveyor, site operations, site construction contractor and site engineering in site construction. Coordinate and perform special projects, requested by regulatory agencies and other CNSI departments, to improve and/or clarify site performance and operations. Investigate all radiological incidents, license and health physics procedure violations and ensure proper reporting. Make notifications to customers and regulatory agencies of any discrepancies in shipments and make recommendations for correction or disposition. Meet and work with regulatory agencies on all matters that affect Company operations. Director of Emergency Safety Review Board functions. Direct the preparation and implementation of the company-wide industrial safety program.

October, 1979 - March, 1981
Supervisor, Health Physics
Chem-Nuclear Systems, Inc.
P.O. Box 725
Barnwell, South Carolina 29812

Provided health physics supervision for operations of CNSI's Low-Level Radioactive Waste Burial Facility. Responsibilities required a thorough knowledge of burial license requirements, NRC and DOT regulations for packaging, transport and Site Criteria. Completely revised the site's Health Physics program and included an effective Health Physics Technician Training Program. Was instrumental in establishing and preparing the company's ALARA and Health Physics policies. Provided license preparation and liaison with regulatory agencies.

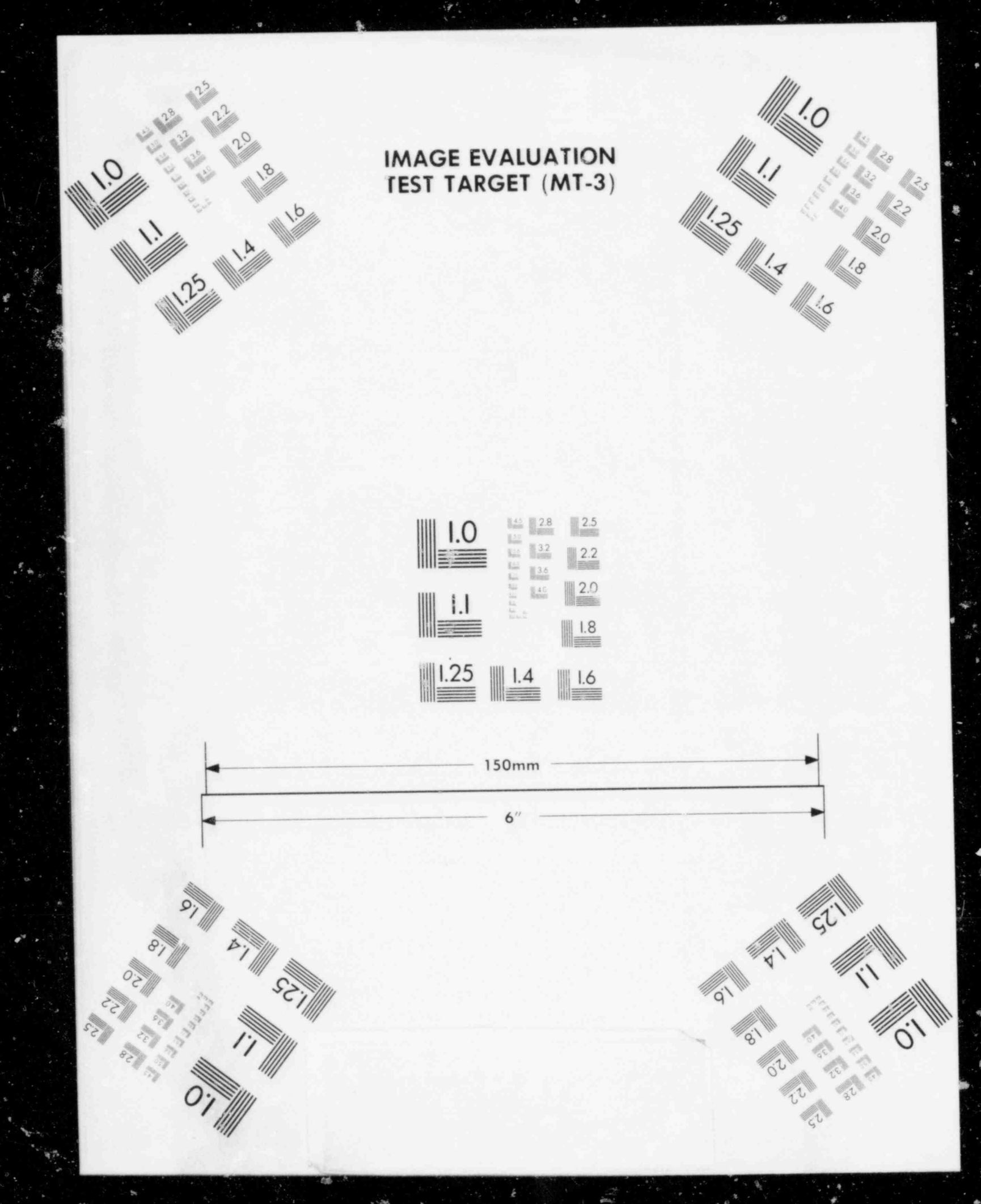
January, 1974 - October, 1979
Supervisor, Operational Safety
Allied General Nuclear Services
Barnwell, South Carolina 29812

Assisted in establishing the complete Health Physics Monitoring Program (Policy and Procedures) for a nuclear fuel reprocessing plant. Supervised the practical application of all health physics and industrial safety functions required for preparation and start-up. Established and implemented an elaborate and complete Health Physics Technician Training Program.

April, 1971 - January, 1974
Broker/Salesman
Real Estate Sales and Investments
Levy Realty Company
Las Vegas, Nevada

September, 1969 - April, 1971
Working Foreman, Radiation Monitoring and Industrial Hygiene
Reynolds Electrical and Engineering Company
Mercury, Nevada Test Site

Underground nuclear weapons testing (tunnels and drill holes). Responsibilities consisted of pre-shot planning, preparation and provisioning of equipment and materials required for re-entry and recovery. Post shot responsibilities included radiation protection for entry and removal of test equipment experiments from highly contaminated and radioactive areas.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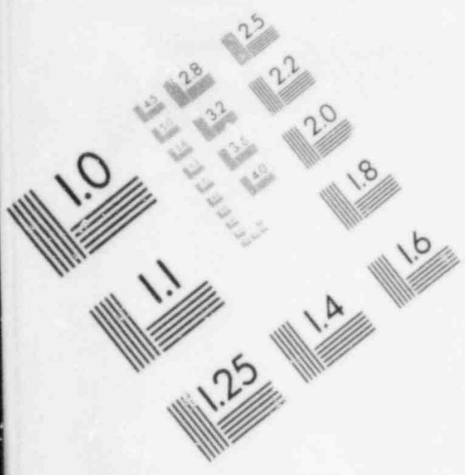
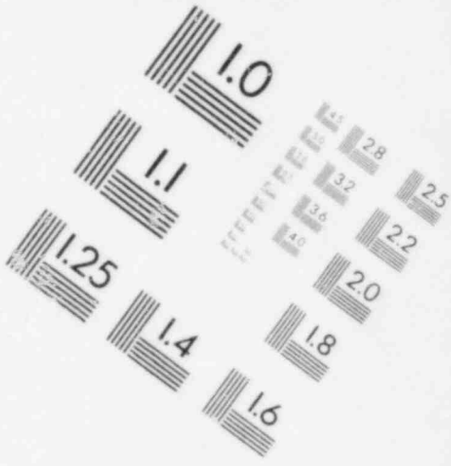
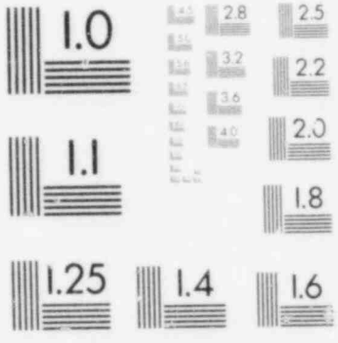
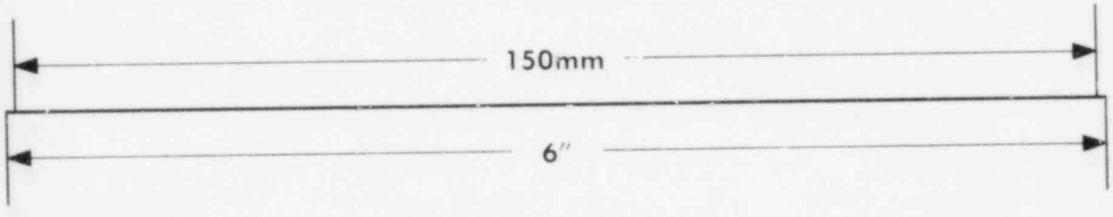
6"

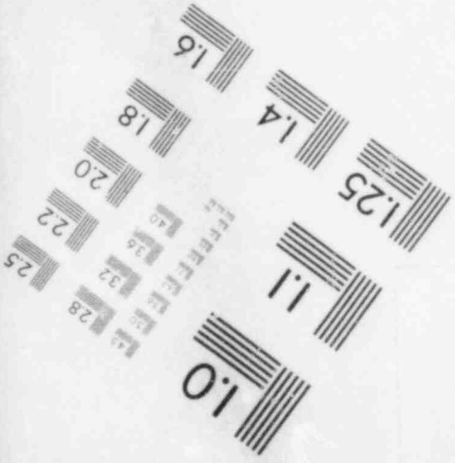
IMAGE EVALUATION TEST TARGET (MT-3)

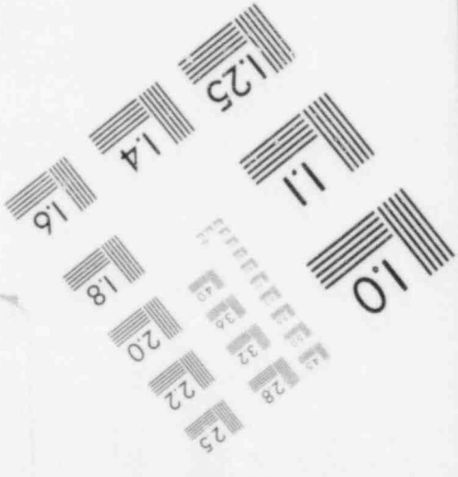












April, 1966 - September, 1969
Supervisor, Decontamination
General Monitoring and Industrial Safety
Pan American World Airways, Incorporated
Nuclear Rocket Development Station
Jackass Flats, Nevada

Supervised the group responsible for all radiation monitoring for Nuclear Reactor Operations for the ROVER Program. These operations included all phases of hot cell and remote handling operations, establishing methods and procedures for decontamination of all areas used for testing and disassembly.

August, 1963 - August, 1965
Senior Engineering Technician
Westinghouse Astronuclear Laboratory
Jackass Flats, Nevada

Worked with group responsible for planning tests to be performed on the nuclear reactor for the NERVA Program, (Nuclear Engine Reactor for Vehicle Application), Project ROVER.

March, 1961 - March, 1963
Licensed Reactor Operator
Carolinas-Virginia Nuclear Power Associates
Pressure Tube Reactor
Parr, South Carolina

Operation of nuclear reactor, preparation of test procedures, start-up and operating instructions and emergency procedures. Pre-operational test, checkout, start-up and operation of all systems and components associated with the reactor.

June, 1960 - March, 1961
Licensed Reactor Operator
General Electric Test Reactor
Vallecitos, California

Operating of a 30-MWT test reactor.

EDUCATION

Graduated from Eastman High School, Eastman, Georgia. Attended Diablo Valley College, Concord, California. Have had continuous intensive training in nuclear reactor technology, plant systems and health physics during the past twenty-three (23) years. This training consisted of both classroom and practical application and was mandatory for obtaining nuclear power reactor operator license and health physics qualifications. Have had specialized training in Mine Rescue, Industrial Hygiene and Industrial Safety. Have participated in several training courses in effective supervision and management.

J. A. Buckham

Dr. James A. Buckham is President of Allied-General Nuclear Services. He obtained his Ph.D. in Chemical Engineering from the University of Washington in 1953, preceded by an M.S. degree in 1948 and a B.S. degree in 1945 from the same institution.

Dr. Buckham has overall responsiblility for activities of AGNS and the Barnwell Nuclear Fuel Plant.

Dr. Buckham has been a leading figure in the development of nuclear reactor technology, the reprocessing of irradiated nuclear fuels, and the management of nuclear wastes. He is probably best known for his R&D work on the application of fluidized bed technology to the solidification of high-level radioactive waste and for the development and operation of several new dissolution processes for irradiated reactor fuel elements.

He is the author or coauthor of over 25 technical publications related to nuclear technology, nuclear fuel reprocessing, and radioactive waste management and is active in the American Institute of Chemical Engineers, the American Nuclear Society, American Chemical Society, and the Atomic Industrial Forum. In 1974, Dr. Buckham was awarded the Robert E. Wilson Award by the AIChE in recognition of his outstanding accomplishments. In 1976, he was elected a Fellow of AIChE, and in 1979 he was elected to a three-year term as Director. He is a member of the honorary societies Tau Beta Pi, Sigma Xi, Phi Lambda Epsilon, and Zeta Mu Tau.

BNFP SOURCE INVENTORY

Source Description	Serial No.	Activity	Assay Date	Final Disposition	Remarks
Plated	0096 QB	1 μCi mixed gamma	2/1/80		
Plated	10-27-78	.8 mCi/Cd^{109}	9/78	CNSI waste	
Plated	7683	.1288 μCi/Pu^{239}	10/12/77	Transferred to Carolina Metals	Pending
Plated	7684	1.2222 μCi/Pu^{239}	10/12/77	Transferred to Carolina Metals	Pending
Plated	7682	.012 μCi/Pu^{239}	10/12/77	Transferred to Carolina Metals	Pending
Plated	S-1620	.022 μCi/Pu^{239}	10/12/77	Transferred to Carolina Metals	Pending
Plated	S-1619	.0211 μCi/Pu^{239}	10/12/77	SRP waste	Pending
Flated	Nen 4/7/77	.183 μCi/Am^{241}	4/7/77	Transferred to DOE	
Plated	F-311	50 mCi/Fe^{55}	2/16/76	CNSI waste	
Plated	D-365	5 mCi/Cd^{109}	2/11/76	CNSI waste	
Plated	A-343	25 mCi/Am^{241}	2/11/76	SRP waste	
Plated	SRM 4907-82	.078 μCi/Gd^{148}	1/13/73	CNSI waste	
Plated	4904-D-103	.22 μCi/Am^{241}	2/2/75	Transferred to DOE	
Plated	18121-1	1.092 μCi/Am^{241}	6/1/78	Transferred to DOE	
Plated	No. 2	.5 μCi/Pu^{239}	9/29/75	Transferred to DOE	
Plated	No. 1	.5 μCi/Pu^{239}	9/29/75	Transferred to DOE	
Plated	No. 1	5 mCi/Sr^{90}	9/17/75	Transferred to Carolina Metals	Pending
Plated	No. 2	5 mCi/Sr^{90}	9/17/75	Transferred to Carolina Metals	Pending
Plated	81-001 NBS(4906-B-64)	Pu^{238} 5 μg	7/1/78	Transferred to DOE	

ATTACHMENT 4

BNFP SOURCE INVENTORY (CONTINUED)

Source Description	Serial No.	Activity	Assay Date	Final Disposition	Remarks
Solid Salt	C-2342 to C-2357	16 sources 166.4 mCi total/Co^{57}	1/17/83	Transferred to DOE	
	C-2342 C-2343	Included Above	1/17/83	Transferred to DOE	
Sealed Source	C-1903	10 mCi/Co^{57}	12/11/80	CNSI waste	
Sealed Source	C-1904	10 mCi/Co^{57}	12/11/80	CNSI waste	
Encapsulated	C-1905	10 mCi/Co^{57}	12/11/80	CNSI waste	
Encapsulated	C-1906	10 mCi/Co^{57}	12/11/80	CNSI waste	
Sealed Source	C-1907	10 mCi/Co^{57}	12/11/80	CNSI waste	
Sealed Source	C-1908	10 mCi/Co^{57}	12/11/80	CNSI waste	
Encapsulated	C-1909	10 mCi/Co^{57}	12/11/80	CNSI waste	
Sealed Encap.	C-1910	10 mCi/Co^{57}	12/11/80	CNSI waste	
Sealed	7-14	1 mCi/Pu^{238}	4/19/77	Transferred to DOE	
Encapsulated	MCR Pu & BE-374	4.1 Ci/Pu^{238} Be	12/29/76	Transferred to DOE	
Sealed	A-4530-5	300 Ci/Co^{60}	9/72	CNSI Waste	Pending
Sealed in a plastic vial Metal Pellet	949-E #153	36 mCi/Pu^{239}	7/15/76	Transferred to DOE	
Sealed Encap.	R-141, R-2966	7.01 µCi/U^{235} (3.26 g total)	10/16/75	Transferred to DOE	
Solid Sealed Source	94-238-2 (total) 94-238-3	40 Ci/Pu^{238}Be	10/2/75	Transferred to DOE	
Solid Sealed	CE-104	1 mCi/Ce^{144}	3/16/76	CNSI waste	
Solid Sealed	1000577	40 µCi/Cs^{137}	10/7/74	CNSI waste	

BNFP SOURCE INVENTORY (CONTINUED)

Source Description	Serial No.	Activity	Assay Date	Final Disposition	Remarks
Sealed Rod Source	909	113 mCi/Cs^{137}	5/21/74	CNSI waste	
Sealed Rod Source	814	10.2 mCi/Cs^{137}	4/14/74	CNSI waste	
Calibrated Source Sealed	2638-1	10 mCi/Cs^{137}	11/12/75	CNSI waste	
Solid Sealed Source	Cat. No. (10 ea.) CHCQ 1126	2 mCi ea. 20 mCi total/Ce^{144}		CNSI waste	
Solid Sealed	Cat. No. RKCQ 1127	150 mCi/Ru^{106}	1/12/76	CNSI waste	
Solid Sealed	Cat. No. CDCQ 1128	4.2 mCi/Cs^{137}	1/12/76	CNSI waste	
Solid Sealed	Cat. No. CDCQ 1129	42 mCi/Cs^{137}	1/12/76	CNSI waste	
Solid Sealed	0905	19.8 Ci/Co^{60}		CNSI waste	
Solid Sealed	CDCQ 1130	420 mCi/Cs^{137}	1/27/76	CNSI waste	
Sealed (79) Encapsulated	3037 3289	2.7 mCi/Pm^{147}	1979	One source to DOE with rifle. One source will be returned to DOE with revolver.	
Liquid	83-17	.037 mCi/U^{235},U^{238}	2/7/83	Solidified to CNSI waste	
Liquid	82-7	1.33 mCi/HNO_3,U^{233} U^{234},U^{235},U^{236},U^{238}	7/23/82	Solidified to CNSI waste	
Liquid	82-6	109 μCi/Zr^{95} Nb^{95}	4/28/82	Solidified to CNSI waste	
Liquid	82-5	1 μCi/Co^{57}	4/30/82	Solidified to CNSI waste	
Liquid	82-4	1 mCi/Ru^{103}	4/13/82	Solidified to CNSI waste	
Liquid - In	82-3	22 g/U^{238},U^{235}		Solidified to CNSI waste	
Liquid	82-2 (SRM 996)	.106 mCi/Pu^{244}	1/4/82	Transferred to DOE	
Liquid	82-1	127 μCi/Zr^{95}, Nb^{95}	12/22/81	Decayed	

BNFP SOURCE INVENTORY (CONTINUED)

Source Description	Serial No.	Activity	Assay Date	Final Disposition	Remarks
Liquid	Sale March 1981 January 1982	1.32 g/U^{235} 45.5 g/U^{238}	3/2/81	Solidified to CNSI waste	
Liquid	SRM-995	.005 g/U^{233}	8/25/80	Solidified to U.S.E.-Washington	
Liquid	8791HJ1	2 mCi/Ce^{144}	8/19/80	Solidified to CNSI waste	
Liquid	10M28-J8	2 mCi/Sr^{85}	8/19/80	Solidified to CNSI waste	
Liquid	6801	2 mCi/Co^{10}	8/19/80	Solidified to CNSI waste	
Liquid	5B, 6B, 7B, 8B	41 g total U1.1 gU^{235}		Solidified to CNSI waste	
Liquid	59/60/34	29 μCi/Ce^{144}	11/26/79	Solidified to CNSI waste	
Liquid	So-30-12 Depleted So-30-13 Depleted So-30-14	59 μCi/Ce^{144}	6/11/80	Solidified to CNSI waste	
Liquid	F-10124-1 F-10124-0	20 mCi/Co^{60}	6/8/80	Solidified to CNSI waste	
Liquid	RO/25/121	5 micro curies/ mixed gamma	2/1/80	Solidified to CNSI waste	
Liquid	4233B	.2 mCi/Cs^{137}	8/29/79	Solidified to CNSI waste	
Liquid	4926-C	.18 μCi/H^3		Solidified to CNSI waste	
Liquid	SRM 4234-8 4234-16	62 μCi/Sr^{90}, Y^{90}		Solidified to CNSI waste	
Liquid	R5/217/5	50 μCi/Rd^{106}	11/20/75	Solidified to CNSI waste	
Liquid	SRM-4232-33	23 μCi/Ag^{110}	6/4/74	Solidified to CNSI waste	
Liquid	SRM-4949	.193 μCi/I^{129}	9/29/73	Solidified to CNSI waste	
Liquid	63010	6 mCi/Ce^{144}	11/13/75	Solidified to CNSI waste	

BNFP SOURCE INVENTORY (CONTINUED)

Source Description	Serial No.	Activity	Assay Date	Final Disposition	Remarks
Liquid	82-2	.106 Millicuries/ Pu^{244}	1/4/82	Transferred to inventory section	
Plated	44026	5 $\mu Ci/Se^{75}$	8/13/77	CNSI waste	
Plated	61008-63	5 mCi/Co^{57}	10/4/78	CNSI waste	
Plated	62034-Sr-1	5 $\mu Ci/Se^{75}$	10/4/78	CNSI waste	
Plated	7779-C2 878073-136	5 mCi/Co^{57}	8/15/77	CNSI waste	
Plated	SRM-4906-74	.36 $\mu Ci/Pu^{238}$	4/25/69	SRP waste	
Liquid	6801 M4(2)	2 mCi/Cs^{137}	8/19/80	Returned to CNSI	
Liquid	Item #Z27975 Code RKZ64 Solution #59/48/12	60 $\mu Ci/Ru^{106}$	10/31/78	Solidified to SRP waste	
Liquid	59/60/12	63 $\mu Ci/Ce^{144}$	11/26/79	Solidified to CNSI waste	
Liquid	50299/61008	5 mCi/Co^{57}	5/19/78	Solidified to CNSI waste	
Liquid	62011	1 mCi/Cs^{134}	9/1/74	Decayed	
Liquid	63027	25 mCi/Sr^{90}	7/23/76	Decayed	
Liquid (NEN)	9891A	2 mCi/Co^{60}	9/25/74	Decayed	
Liquid (NEN)	9891	119 $\mu Ci/Ba^{133}$	9/25/74	Decayed	
Liquid (NEN)	7743	1 mCi/Cs^{137}	9/25/74	Decayed	
Plated	61008-63	5 mCi/Co^{57}	4/8/77	Solidified to CNSI waste	
Plated	62034-SR-1	5 mCi/Se^{75}	4/11/77	Solidified to CNSI waste	
Solid	SRM944 Batch #15	.5 grams/Pu^{239}		Not accepted.	Returned to New Brunswick Lab.

BNFP SOURCE INVENTORY (CONTINUED)

Source Description	Serial No.	Activity	Assay Date	Final Disposition	Remarks
Plated	18121-3	1.039 μCi/Co^{60}	6/1/74	CNSI waste	
Plated	SRM-4215-C	∿5 μCi/mixed gamma	9/1/75	CNSI waste	
Plated	SRM-4215-B	∿5 μCi/mixed gamma	8/1/74	CNSI waste	
Solution	RM-4243E	5 μCi/mixed gamma	12/1/75	CNSI waste	
Liquid	605355-143	100 μCi/I^{131}	1/19/76	Decayed	
Sealed Source Solid	4-A	31 μCi/Pu^{239}	3/17/76	Transferred to Los Alamos	
Plated	SkM-4215E	5 μCi/mixed gamma	8/1/76	CNSI waste	

BNFP SNM AND SOURCE MATERIAL INVENTORY

Material	Transaction	Quantity	Final Disposition	Remarks
Natural U	Receipt	136,610.20	--	
	Receipt	100.01	--	
	Receipt	4.56	--	
	Receipt	2.64	--	
		136,717.41 Kg/U		
	Transfer	109.28	SRP	
	Transfer	116,507.00	DOE-Paducah	as UO_3
	Transfer	0.14	NBS-NBL	
	Transfer	14,222.11	Kerr-McGee	As Un solution
	Transfer	75.70	DOE-Hanford	Waste
	Transfer	4,717.79	CNSI	Waste
	Transfer	171.00	CNSI	Waste - Not shipped yet
	Transfer	574.00	Allied-Metropolis	
		136,377.02 Kg/U		
	Residual in Plant	5.0 Kg/U Est.		
	Inventory Difference(1)	335.39 Kg/U		
	Composite Measurement Error(2)	~±680 Kg/U (~0.5%)		

(1) The inventory difference is the arithmetic difference between the measured receipts and transfers, adjusted for the quantity remaining in plant.

(2) The composite measurement error is an estimate of the uncertainty of the measurements made upon receipt and prior to transfer of SNM or source materials at the BNFP. This estimate is based on the results of calibrations, standards programs, and experience and is expressed as a mass quantity and as a percent of throughput. Inventory differences within the range of uncertainty are not statistically significant.

BNFP SNM AND SOURCE MATERIAL INVENTORY (CONTINUED)

Material	Transaction	Quantity	Final Disposition	Remarks
Plutonium	Receipt	157.70	--	
	Receipt	0.26	--	
	Receipt	31.00	--	
	Receipt	25.30	--	
	Receipt	3.00	--	
		217.26 g/Pu		
	Transfer	44.73	DOE-SRP	
	Transfer	2.00	NBS-NBL	
	Transfer	132.12	DOE-SRP	Waste ±10%
	Transfer	30.82	DOE-HANFORD	Waste ±10%
		209.67 g/Pu		
	Residual in Plant	0.80 g/Pu		
	Inventory Difference	6.79 g/Pu		
	Composite Measurement Error	~±16 g/Pu (based on ±10% uncertainty on waste measurements)		
U-233	Receipt	0.058	--	
	Receipt	1.270	--	
	Receipt	0.025	--	
		1.353 g/U^{233}		
	Transfer	0.860	DOE-SRP	
	Transfer	0.470	DOE-SRP	Waste ±10%
	Transfer	0.060	DOE-HANFORD	Waste ±10%
		1.390 g/U^{233}		
	Residual in Plant	- 0 -		
	Inventory Difference	(0.037) g/U^{233}		
	Composite Measurement Error	±0.06 g/U^{233} (Based on ±10% on waste, 1% on balance)		

BNFP SNM AND SOURCE MATERIAL INVENTORY (CONTINUED)

Material	Transaction	Quantity	Final Disposition	Remarks
Enriched U	Receipt	3.66	--	
	Receipt	0.27	--	
	Receipt	6.00	--	
	Receipt	22.64	--	
	Receipt	3.27	--	
	Receipt	4.20	--	
		40.04 g/U^{235}		
	Transfer	13.38	DOE-SRP	Standards
	Transfer	1.58	DOE-SRP	Waste
	Transfer	3.60	CNSI	Waste
	Transfer	21.78	Internal	Blended with Nat. U. Inventory
		40.34 g/U^{235}		
	Residual in Plant	- 0 -		
	Inventory Difference	0.3 g/U^{235}		
	Composite Measurement Error	$\pm$0.4 g/U^{235} (~1.0%)		
Thorium	Receipt	59.00 Kg/Th		
	Transfer	0.90	DOE-SRP	
	Transfer	31.96	CNSI	Waste
	Transfer	26.14	CNSI	Waste not shipped
		59.00 Kg/Th		
	Residual in Plant	- 0 - Kg/Th		
	Inventory Difference	- 0 - Kg/Th		
	Composite Measurement Error	$\pm$3.0 Kg/Th ($\pm$5%)		

BNFP SNM AND SOURCE MATERIAL INVENTORY (CONTINUED)

Material	Transaction	Quantity	Final Disposition	Remarks
Depleted U	Receipt	394.33 Kg/U	--	
	Transfer	8.07	DOE-SRP	
	Transfer	2.43	Internal	Blended with Enriched U
	Transfer	389.30	CNSI	Waste - to be Shipped
		399.80 Kg/U		
	Residual in Plant	- 0 - Kg/U		
	Inventory Difference	(5.47) Kg/U		
	Composite Measurement Error	±20 Kg/U (5%)		
Neptunium	Receipt	20.00 g/Np		
	Transfer	10.80	DOE-SRP	
	Transfer	6.20	DOE-SRP	Waste
	Transfer	1.00	DOE-HANFORD	Waste
	Transfer	3.00	CNSI	Waste
		21.00 g/Np		
	Residual in Plant	- 0 - g/Np		
	Inventory Difference	(1.00) g/Np		
	Composite Measurement Error	±2.00 g/Np	(based on ±10% on waste measurements)	