CHEM-NUCLEAR SYSTEMS, LLC

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187807

July 22, 2003

HAND DELIVERED

Mr. Gary E. Walsh
Executive Director
South Carolina Public Service Commission
P O Drawer 11649
Columbia, SC 29211

Dear Mr. Walsh:

In accordance with the requirements of the 1976 SC Code Ann. §48-46-40(B)(6), (the Atlantic Interstate Low-Level Radioactive Waste Compact Implementation Act), please find enclosed ten (10) copies of the 2003/2004 Least Cost Operating Plan of Chem-Nuclear Systems, LLC. Please file these copies of the Plan as your administrative procedures provide.

If you have any questions with respect to this matter, please do not hesitate to contact me (758-1825).

Sincerely,

Deborah G. Ogilvie

Deborah G. Ogilvie
Public Information Director

Enclosures:

BEDL-03-022
PL-CNS-03-004

FY 2003/2004
LEAST COST OPERATING PLAN
BARNWELL DISPOSAL FACILITY
CHEM-NUCLEAR SYSTEMS

CHEM-NUCLEAR SYSTEMS
ENVIRONMENTAL AND DOSIMETRY LABORATORY
BARNWELL, SOUTH CAROLINA

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1.0 INTRODUCTION

Chem-Nuclear Systems, LLC (CNS) operates a low-level radioactive waste (LLRW) disposal facility located approximately five miles west of the City of Barnwell, in Barnwell County, South Carolina. The disposal site comprises approximately 235 acres of property owned by the State and leased by CNS from the South Carolina Budget and Control Board (SC B&CB).

All LLRW arrives at the disposal site by truck or heavy-haul transporter. Waste packages may arrive in shielded "casks" (containers of various sizes constructed of steel and lead), in shielded or unshielded vans, or on flatbed trailers. Each shipment is inspected at the site and released for disposal. Disposal generally involves removing the waste package from its transportation vehicle and placing the package in a vault in an engineered trench. The filled vaults are covered with soils and the completed trench covered with a multi-layer engineered earthen cap.

1.1 Purpose

CNS submits this Least Cost Operating Plan (LCOP) to the South Carolina Public Service Commission (Commission) as required by the S.C. Code Ann. 1976 Section 48-46-40 (B)(6)(supp. 2002). This LCOP is the third annual update.

1.2 Scope

The LCOP describes the facility and its operations, significant events in the history of South Carolina's LLRW disposal site and regulatory/statutory requirements that affect disposal site operations. The LCOP provides information concerning anticipated operations over the next ten years including evaluations of future staffing and operation of the site to ensure least cost operations as well as information related to possible interim suspension of operations.

This plan update includes information from the Operations and Efficiency Plan (O&E Plan) submitted to the Commission June 26, 2002, and the Report of the Collaborative Review of the O&E Plan submitted to the Commission June 16, 2003 (collaborative review). The O&E Plan was prepared by Project Time and Cost (PT&C), Inc., in accordance with Commission Order No. 2001-499. The collaborative review was conducted in response to Commission Order No. 2003-188.

2.0 HISTORICAL BACKGROUND

This section provides a brief history of regulatory and legislative actions, and associated changes to the licensed disposal area, trench construction and maintenance, waste characterization and packaging. The elements of this section provide the perspectives under which the LCOP has been developed.

2.1 Regulatory Documents

Three major documents govern the Barnwell site, its operation and disposition. These documents are the Lease Agreement and its amendments, South Carolina Radioactive Material License 097 (License 097), and the Decommissioning Trust Agreement of 1981.

Lease Agreement and Amendments: CNS entered into a 99-year lease agreement with the SC B&CB on April 21, 1971, to lease 17.2 acres of land, previously deeded to the State by CNS, for the purpose of burial of radioactive waste. Under this agreement, CNS agreed to operate in accordance with its license application, the conditions of its License 097 and the requirements of the U.S. Atomic Energy Commission. The agreement also established a requirement for payments to a fund for the long-term care of the site. CNS agreed to pay eight cents into the fund for every cubic foot of waste received for burial.

The Lease Agreement was amended on April 6, 1976, replacing the previous agreement and expanding the lease area to its present 235 acres. At the same time, the Extended Care Maintenance Fund payment was increased to sixteen cents per cubic foot. The agreement included a formula for increasing the fund based on the Consumer Price Index. Since 1976, the payment to the Extended Care Maintenance Fund has increased to $2.80 per cubic foot of waste. Other conditions of the lease have remained essentially the same.

As of June 30, 2003, there is approximately $24,341,349 in the Extended Care Maintenance Fund. The Extended Care Maintenance Fund provides funding for closure activities, post closure maintenance and monitoring, and long-term care after the decommissioning trust fund is exhausted.

South Carolina Radioactive Material License 097: The most important document affecting operations and closure of the site, License 097, was issued by South Carolina Department of Health and Environmental Control (DHEC) in 1969 authorizing receipt and storage of LLRW. Following extensive geohydrological investigations the license was amended in 1971 to authorize disposal of LLRW by shallow land burial. State and federal agency involvement and DHEC approval preceded authorization for burial.

License 097 specifies requirements by which CNS operates the disposal site. The license describes trench construction specifications, backfilling and capping requirements, and required trench markings. Requirements for acceptable wastes are covered as well as specific documentation that must accompany each shipment from the generator. Waste shipments and vehicles must comply with United States Department of Transportation (DOT) regulations for transport and receipt at the site and even more stringent license conditions for acceptance, burial and vehicle release.

License 097 has been amended forty-eight times since it was issued in 1969. Amendments cover a range of changes, from modifying a single license condition to a complete rewrite consolidating several previous amendments into a single document. The amendments have resulted in positive changes and improvements to the burial site and its long-term integrity. An application to renew the license was submitted to DHEC April 28, 2000 and remains under timely review.

Decommissioning Trust Agreement of 1981: On March 24, 1981, CNS entered into a Trust Agreement with the State of South Carolina to provide monies for establishment of a decommissioning fund. This fund contains sufficient monies to decommission and stabilize the site in accordance with the requirements of the Closure Plan. In 1981, at the time CNS entered into the Trust Agreement, CNS contributed a lump sum of approximately $1.7 million to the decommissioning fund. No additional contributions were made until April 1, 1993, when a rate of $4.11 per cubic foot of waste received for disposal at the Barnwell site was contributed to the fund. This contribution rate lasted for three months. DHEC has directed subsequent contribution rates based on volumes of waste received for disposal and evaluations provided by CNS in its periodic Closure Plan updates. Contributions were again reinstated effective January 1, 1994, at $12.60 per cubic foot to cover costs of enhanced capping at the Barnwell site. On July 1, 1995, the contribution rate was reduced to the current $4.20 per cubic foot.

The current fund balance is approximately $20.6 million (as of June 30, 2003). At current contribution rates and projected volumes, the fund balance will provide sufficient monies to cover the costs of closure. The Extended Care Maintenance Fund can be used for any remaining closure activities when the decommissioning trust fund is exhausted [SC Code Ann. 1976 Section 13-7-10(11) (Supp. 2002)].

2.2 Regulatory/Political History

During the early 1970's, the Barnwell site was one of six commercially operated disposal sites. By 1979, three of the commercial sites (in Illinois, Kentucky and New York) had closed, and the Barnwell site was receiving more than three-fourths of the nation's waste.

The increased rate of waste receipt led to South Carolina establishing limits on the annual volume of waste allowed to be received at the site. The volume restriction program gradually reduced allowable volume by one-half over a two-year period (1979-1981) to 1.2 million cubic feet per year. This restriction remained in effect until statutes were amended in 2000, which established the current limits on volume.

During 1979, South Carolina developed and promulgated Regulation Number 61-83, "Transportation of Radioactive Materials Into and Through the State of South Carolina." This regulation established a permit system for waste generators shipping LLRW in the State, and a prior notification

system to provide DHEC and CNS advance notification of shipments passing through the State and arriving at the site. The system requires that shippers certify shipments have been inspected and meet the requirements of appropriate regulations and license conditions.

In 1980, the U.S. Congress passed the Low-Level Radioactive Waste Policy Act. The Act established three major policies. First, each state is responsible for the low-level waste generated within its boundaries. Second, states may form compacts (or groups of states) to facilitate managing low-level waste generated within the boundaries of the compact states, including the right to deny disposal of out-of-compact wastes at compact disposal facilities. The Act also established the policy that these compacts could not refuse waste from other states until the U.S. Congress had ratified the compact. The Southeast Compact, consisting of eight southeastern states (Alabama, Florida, Georgia, Mississippi, North Carolina, South Carolina, Tennessee and Virginia) was formed, with the Barnwell site designated the regional facility.

In December 1982, NRC promulgated 10 CFR Part 61, "Licensing Requirements for Land Disposal of Radioactive Wastes," which became effective in December 1983. This regulation specifies technical requirements applicable to the different phases of a disposal facility: licensing, operations, closure, post-closure surveillance and institutional control. As a matter of Agreement State compatibility, DHEC adopted 10 CFR Part 61 – equivalent regulations.

On January 1, 1986, the Low-Level Radioactive Waste Policy Amendments Act was signed into law, making a generator's continued access to the three operating disposal sites contingent on its compact meeting specified milestones for new site development. The amended Act clarified Congress' intent to require compacts (or individual states not within a compact) to provide disposal capacity for LLRW generated within their boundaries by January 1, 1993. The legislation also defined the LLRW for which states are responsible. It mandated Federal responsibility for all waste for which states are not responsible above NRC 10 CFR Part 61 Class C limits. The amended Act also established conditions for access to operating disposal sites during the interim period, allowed the partial rebate of surcharges to states and compacts which meet statutory milestones, and established penalties for states that fail to meet the mandated site development goals. A US Supreme Court decision in 1992 struck down the penalty portion of the amended Act.

The South Carolina General Assembly (SCGA), in its 1992 session, enacted legislation to allow the Barnwell site to continue as the regional facility until December 31, 1995 subject to several conditions. One condition required states outside the Southeast Compact demonstrate progress in developing their own regional disposal sites in order to retain access to the Barnwell facility during an 18-month period (January 1993 through June 1994). After June 30, 1994, the Barnwell facility would accept only waste from Southeast Compact generators. By 1995,

continued delays in building a new regional disposal site led South Carolina's governor to propose legislation to withdraw the state from the Southeast Compact.

In June of 1995, the SCGA enacted the legislation, South Carolina withdrew from the Southeast Compact, and the Barnwell facility began accepting waste from generators in all states except North Carolina and the Northwest Compact. North Carolina was restricted from site use due to its failure to develop the next disposal facility. The Northwest Compact states disposed of their LLRW at a facility in Washington. South Carolina also imposed a $235 per cubic foot tax on all waste received for disposal at the Barnwell facility. Proceeds from this tax went to the Children's Education Endowment Fund and have been used for educational scholarships and school construction.

Effective July 1, 2000, the SCGA passed legislation enabling South Carolina to join the Atlantic Compact (formerly the Northeast Compact). Provisions in the legislation limit waste volumes on a yearly basis, repeals the tax, and after June 30, 2008, restricts acceptance of waste to three states: South Carolina, Connecticut, and New Jersey.

2.3 Licensed Disposal Area

The initial licensed area consisted of approximately 17.2 acres purchased by CNS. In April 1971, this tract was deeded to the State of South Carolina, which leased this acreage back to CNS for disposal operations. This tract of land was part of a larger property evaluated and found suitable for use as a disposal site during the site's licensing phase (1969 to 1971). The Lease Agreement was amended in 1976, enlarging the licensed disposal area to the current 235 acres.

2.4 Trench Construction

Amendment 3 to License 097 issued April 1971 was the original document permitting burial at the Barnwell site. Trench design and construction methods have evolved as technologies have improved and regulations changed.

2.4.1 1971 to 1983

As specified in Amendment 3, the first trenches were shallow earthen excavations. The waste was placed into these excavations, surrounded and covered with backfill material, then capped with clay. The clay cap was covered with a sheet of 10-mil plastic, over which additional protective soil was placed. Trench excavations were required to be located above the water table.

Amendment 5 (April 1973) established several new trench design requirements, including standardized trench dimensions. This amendment also required that a gravel-filled drainage field (French

drain) be placed in the bottom center of the trench, running the length of the trench. Monitoring pipes located at specific intervals were placed in the French drain. Trench floor sand, surrounding and covering the French drain, was also incorporated into the trench design. The trench cover was reduced in thickness by one foot and no longer included 10-mil plastic.

Amendment 12 (December 1975) established design criteria for the slit trench. The new slit trench design was like other trenches except length and width were greatly reduced. This trench was designed to provide a disposal method for higher activity waste such as irradiated reactor hardware. Amendment No. 12 also required placing the French drain and monitoring standpipes along the sidewall of trenches to reduce the possibility of pipe damage during waste placement.

Amendment 15 (July, 1977) allowed larger trenches to be constructed. The larger trench size allowed CNS to arrange waste more efficiently to make better use of trench space and to reduce personnel exposure by using low-activity waste as shielding. This amendment also changed cover design, requiring a minimum thickness of clay and general earth cover.

2.4.2 1983 to 1996

At the end of 1982, NRC regulation 10 CFR 61 was promulgated. License 097, Amendment 36 facilitated the implementation of 10 CFR 61 at the Barnwell site by requiring segregation of wastes according to waste class. Amendment 36 describes the use of three separate trench designs to segregate wastes. The new trench designations were Class A, slit trench (C-type), and B/C waste trench.

Amendment 36 also established the practice of installing intrusion barriers on trenches with Class C waste. In response to this change, CNS installed intrusion barriers on all previous slit trenches. The slit trench design was also changed to incorporate a keyway. This keyway arrangement reduced offload crew exposure because waste offloading could now occur below the site's general surface grades.

In 1988, CNS improved the design of the trench floor French drain system based on an evaluation of the existing system and trench drainage properties. CNS changed trench standpipes and screens from polyvinyl chloride (PVC) to stainless steel and the French drain gravel materials to a coarse sand. The steel pipe provides greater resistance to collapse and bending during trench disposal and backfilling operations, and the sand minimizes the infiltration of fines into the French drain.

Amendment 45 (January 1990) required that CNS place polyethylene high integrity containers (HICs) containing Class B or C wastes in concrete vaults. This change was made to resolve concerns regarding the long-term stability of the polyethylene HICs.

In 1991, CNS changed cap design to reduce the likelihood and size of subsidence features on CNS trench caps.

During 1993, CNS began placing slit trench wastes in concrete vaults, eliminating the need for concrete intrusion barriers on subsequent slit trenches.

2.4.3 1996 to Present

Amendment 46 (August 1995) required several substantial changes to trench design and construction. These changes included placing all waste in concrete vaults (unless otherwise approved by DHEC), incorporating an infiltrate detection and monitoring system (IDMS) in the Class A trench, covering all future trenches with enhanced multi-layer earthen caps and allowing phased trench construction.

Waste placement in vaults was implemented to improve long-term trench stability. The IDMS was designed and incorporated into Class A trench designs to provide a means for evaluating enhanced cap performance and collecting trench water. Enhanced trench caps, which had been installed on several trench areas prior to this amendment, were now required on all Barnwell site trenches. This amendment also allowed phased construction of larger Class A trenches, if appropriate, to minimize surface water management and trench exposure to weather. This change allowed more efficient use of available area at the disposal site.

CNS continues to construct and use the B/C trench and slit trench designs for disposal of appropriate wastes.

In the future, CNS may modify trench designs to incorporate results of the optimal vault and trench configuration analysis provided in the O & E plan and to address DHEC comments to the 2000 License 097 renewal. The O & E plan determined that current trench and vault configurations are least cost strategies. However, factors such as site conditions, the impact of reduced waste volumes and other operational considerations (especially during in-region operations) may require different designs and operating practices to best comply with conditions of the burial site's License 097.

2.5 Waste Form/Packaging Requirements History

Since the start of waste disposal at the site in the early 1970's, many changes have occurred affecting the acceptability of wastes, waste

packaging and methods for disposal. This section describes the history of waste types received and disposal methods.

Waste types disposed in the first years of operations included utility wastes consisting of dewatered resins, absorbed liquids and Dry Active Waste (DAW). CNS also received institutional and industrial wastes in the form of biological materials, absorbed liquids, liquid scintillation vials surrounded with absorbent material (e.g., vermiculite), general laboratory trash, DAW, source and special nuclear materials (SNM; LLRW contaminated with small amounts of plutonium and certain isotopes of uranium). These wastes were generally packaged in metal drums, wooden or metal boxes and steel liners. A considerable amount of biological waste containing mostly tritium and carbon-14 radioisotopes was packaged in paper or cardboard containers.

In April 1974, DHEC prohibited the receipt of utility-generated liquids processed in absorbent materials. These liquids had to be processed by cement solidification. The license was amended in July 1977 to broaden the list of acceptable solidification media. In May 1979, scintillation liquids were prohibited from site disposal. Also, institutional liquids had to be solidified.

A change to the license in July 1981 required all ion-exchange resin and filter media bearing isotopes with half-lives greater than five years and combined activity of one microcurie per cubic centimeter, to be solidified or placed in a DHEC-approved HIC. Biological wastes were required to be double-packaged in metal containers with absorbent material and lime added to the waste and the interstitial space between containers filled with absorbent materials. These requirements continue to the present.

The operational requirements of 10 CFR Part 61 were implemented at the site during 1982. These requirements directed certain waste, based on specific radionuclides and concentrations, to be processed/packaged in a more stable form. Since most of these wastes were already packaged in HICs, the biggest effect was the requirement to segregate waste into separate trenches based on waste classification.

In 1989, NRC concluded that the current design of polyethylene HICs did not meet long-term stability requirements. A concrete vault was approved by DHEC to allow continued disposal of Class B and C waste in the polyethylene HICs.

Since 1996, CNS has buried all waste in DHEC-approved vaults. These vaults are designed to improve long-term trench stability and also provide structural stability to waste packages. With DHEC's prior approval, large components such as steam generators, pressure vessels, or reactor coolant pumps are qualified for disposal using methods such as filling the shipping container with cement grout or defining the component exterior shell as comparable to a vault.

In 2003, DHEC authorized placement of different waste classifications in a single trench provided "stable" and "unstable" wastes remain segregated by vault.

2.5.1 Radionuclide Reporting History

Wastes received for disposal are documented on shipment/disposal manifests. The manifest has evolved during the site's history to meet regulatory requirements and site reporting needs. During the early years of disposal, the manifest did not require specific radionuclide information. Often, only the single most abundant radionuclide or a small percentage of the nuclides were listed. During the late 1970's and early 1980's, radionuclide reporting improved as a result of regulatory reporting changes. Isotopes such as carbon-14, tritium, etc., (usually shipped by private industries and universities) were specifically listed on the manifests enabling their existence and quantities to be traced back to their origin. However, in the case of power plant generated wastes, nuclide reporting was still limited mainly to the more abundant nuclides such as easily identified gamma emitters.

In 1983, radionuclide reporting vastly improved to meet 10 CFR Part 61 waste stabilization and classification requirements. Specific waste stream samples from power plants were analyzed by independent labs for hard-to-identify radionuclides. Scaling factors were also developed to better estimate radionuclides in waste streams.

2.5.2 Waste Volume History

Table 2.5.2-1 lists the total waste volume received each year. After 2000, burial volumes are totaled over the fiscal year, which extends from July 1 to June 30.

Table 2.5.2-1
Barnwell Waste Volumes

Year	Volume (cubic feet)
1971	50,219.34
1972	159,933.47
1973	599,886.28
1974	624,759.55
1975	643,564.44
1976	1,393,587.55
1977	1,636,425.12
1978	2,220,519.72
1979	2,238,322.13
1980	2,444,810.72
1981	1,543,278.67
1982	1,228,200.83
1983	1,240,668.21
1984	1,231,715.28

Table 2.5.2-1 Barnwell Waste Volumes	
Year	Volume (cubic feet)
1985	1,214,422.99
1986	1,053,791.68
1987	958,275.82
1988	931,974.01
1989	1,103,299.56
1990	788,031.90
1991	789,681.85
1992	828,727.84
1993	605,443.07
1994	733,896.31
1995	484,890.82
1996	325,815.32
1997	222,269.48
1998	195,684.08
1999	166,435.11
2000 (Jan-June)	69,197.42
FY 2000/2001	125,988.99
FY 2001/2002	57,763.15
FY 2002/2003	65,660.02
Total	27,977,140.73

3.0 REGULATORY REQUIREMENTS

CNS operates the Barnwell site in accordance with the following regulatory requirements.

3.1 Disposal Facility Radioactive Material License Number 097

CNS is authorized to receive, store and dispose of radioactive material as low-level radioactive waste in accordance with all conditions found in License 097. The license conditions are subdivided into the categories described below.

3.1.1 General Conditions

The General Conditions specify the location of the disposal facility, regulatory requirements, personnel training requirements, authorized users, record retention, site operation inspections and operating parameters.

3.1.2 Receipt, Acceptance and Inspection Conditions

The Receipt, Acceptance and Inspection Conditions specify shipment and disposal documentation required for receipt and disposal of low-level radioactive waste, reporting criteria, shipment inspection criteria and unusual hazard notifications.

3.1.3 Waste Characteristics and Waste Form Conditions

The Waste Characteristics and Waste Form Conditions specify waste classification requirements, acceptable waste forms, documentation for particular waste forms, packaging criteria for particular waste forms, package activity limits for particular waste forms and prohibited waste.

3.1.4 Contamination Limit Conditions

The Contamination Limit Conditions specify contamination limits for incoming shipments of radioactive waste and incoming vehicles. These conditions also specify the release criteria for vehicles.

3.1.5 General Packaging Conditions

The General Packaging Conditions specify the minimum requirements for disposal packages and lifting attachments.

3.1.6 Site Design, Construction and Maintenance Conditions

The Site Design, Construction and Maintenance Conditions specify the disposal trench design, construction, approvals and maintenance. These conditions also specify the backfilling of trenches, erosion control, trench inspection procedures, trench closure, unauthorized entry and trench marker requirements.

3.1.7 Burial Operation Conditions

The Burial Operation Conditions specify methods for waste emplacement, vault design and construction, radiation and contamination controls, and waste storage limits.

3.1.8 Environmental Surveillance Conditions

The Environmental Surveillance Conditions specify the on-site and environmental monitoring programs, surveillance reporting criteria, license transfer requirements, and site closure and stabilization plan criteria.

3.2 Regulatory Requirements

CNS operates the disposal site in accordance with all applicable state and federal regulations. The following sections identify and briefly describe each applicable regulation.

3.2.1 South Carolina Regulation 61-63, Radioactive Materials, Title A

Regulation 61-63 specifies the requirements for the possession, use and disposal of radioactive material. The requirements discuss

general provisions, licensing, radiation protection, notices and reports, and land disposal of low-level radioactive waste.

3.2.2 South Carolina Regulation 61-83, Transportation of Radioactive Waste Into or Within South Carolina

Regulation 61-83 specifies the requirements for the Barnwell site operator to report any shipper violations of this regulation, ensure all generators and shippers have a valid transportation permit as required by this regulation, and notify shippers of any special requirements for delivery to the Barnwell site.

3.2.3 US Nuclear Regulatory Commission, 10 CFR 71.12(b)

10 CFR 71.12(b) requires the operator of any NRC approved package (transport cask) to have an approved QA program in accordance with 10 CFR 71 Subpart H and to be registered with the NRC for each package they will operate. CNS possesses USNRC QA Program Approval No. 0231 and is a registered user of all NRC approved packages received at the disposal site.

3.2.4 South Carolina Storm Water NPDES Permitting Regulation 61-9

Regulation 61-9 specifies that activities or facilities associated with industrial activity, such as a landfill, must posses a National Pollution Discharge Elimination System (NPDES) permit for the storm water discharge.

3.2.5 Other Regulatory Requirements

CNS disposal operations must also comply, as applicable, with the following regulatory requirements:

- South Carolina State Primary Drinking Water Regulation 61-58
- South Carolina Hazardous Waste Management Regulation 61-79
- Code of Federal Regulations, Title 29, Chapter XVII – Occupational Safety and Health Administration
- South Carolina Air Pollution Control Regulations and Standards, Regulation 61-62

4.0 FACILITY DESCRIPTION

4.1 Licensed Disposal Area

The 235 acre licensed disposal area is divided into different use categories including: completed trenches, planned trench areas, and ancillary facility, water management and buffer zone areas (see Table 4.1-1).

Table 4.1-1 Barnwell Site Land Designations	
Designation	**Acreage**
Licensed Disposal Area	235
Area Used for Disposal Since 1971	104
Remaining Trench Area	11
Remaining Leased Property (including buffer zone, water basins, ancillary operations, and other areas unsuitable for disposal)	120

As of July 1, 2003, CNS estimates remaining disposal site capacity at approximately 2.69 million cubic feet. To estimate current remaining capacity, CNS reduced its official 1999 estimate by the waste volume disposed since that time. Future capacity estimates will depend on trench and vault configurations and suitability of site areas.

4.2 Disposal Trenches

Current Barnwell site trench design and construction practices are governed by an approved CNS trench construction procedure and trench construction details drawings for each trench type. In accordance with License 097, changes to these documents are approved by DHEC prior to implementation.

CNS currently uses three engineered trench designs primarily to segregate waste by dose rates external to the waste packages. The three types of trenches are Class A, Class B/C, and slit-type trench. The last significant changes to trench design came into effect January 1996 to comply with changes incorporated in Amendment 46 of License 097. Changes included (1) requiring all waste be placed in concrete disposal vaults, (2) placing enhanced caps on all trenches, and (3) improving infiltrate water collection in the large Class A trenches. Trench types are described below.

The Class A trench is the largest of the three trench types at Barnwell. The trench floor is sloped to trench corner locations, and a trench drainage system is installed to facilitate monitoring of water infiltration entering the trench.

Waste is generally disposed of in the Class A trench in rectangular and cylindrical reinforced concrete vaults, which are stacked up to three-high on the trench floor. Voids between vaults are filled with free-flowing soils (backfill) materials. As disposal proceeds, filled vaults are covered with a variable amount of general cover soils and an initial clay cap.

A multi-layer enhanced cap is installed following completion of disposal in a trench or a group of adjacent trenches. The enhanced cap consists of the initial clay cap overlain by polyethylene and bentonite mat materials, a sand drain layer, and general soil materials (for vegetation growth).

The Class B/C trench is used for disposal of stable wastes, primarily Class B and Class C wastes (not including irradiated hardware and large sealed sources). A French drain and sump system on the floor of the B/C trench allows monitoring of any water that accumulates in the trench.

Voids around disposal vaults are filled with free-flowing materials. Vaults are covered like Class A disposal vaults with an initial clay cap and then a multi-layer enhanced cap. The enhanced cap is normally installed over several adjacent filled trenches at the same time. The disposal vault lids serve as an intrusion barrier for Class C waste buried within.

The slit trench is used for disposal of irradiated hardware and large-quantity sealed sources. Trenches are narrow to facilitate remote offload, shielding, and rapid covering of waste. The size allows a two-high stack of slit trench concrete disposal vaults.

The entire trench floor is filled with coarse drain sand and sloped to one end. Standpipes to monitor water accumulation are installed periodically along the length of trench.

Disposal vaults in the slit trench are backfilled and covered with clay-rich materials. An enhanced cap identical to that used for Class A and B/C trenches is installed above backfill materials. The concrete disposal vault lids serve as intrusion barriers, required for Class C waste.

For all trench types, CNS has developed and documented, through its procedures, backfilling methods to maximize filling of voids around vaults and to enhance long-term stability of the entire trench system.

As part of the enhanced cap construction, trenches are covered with topsoil and seeded with grass. Trench standpipe, wellhead protective pads and trench corner and identification markers are installed last.

4.3 Site Support Facilities

CNS maintains several facilities on and adjacent to the Barnwell site, some directly supporting site operations and others related to parent company business lines. Table 4.3-1 lists those existing facilities supporting the disposal operation, their current use, and location. Disposal operations facilities are described below.

Receiving Warehouse No. 2 is the point of receipt and inspection for shipments of materials and supplies for the disposal site and other facilities in the Barnwell complex. Goods are inventoried and stored here until needed and certain routine supplies are kept and dispositioned from this location.

Warehouse No. 3 is primarily used for storage of materials and supplies associated with Nuclear Plant Services activities, such as ion-exchange

media and waste processing equipment. However, CNS also uses the facility as a geological core storage area, in support of disposal site characterization.

The Administration Building houses most of the disposal site administrative staff including Site Management, Security, Personnel, Finance, and Regulatory Affairs. The main access gate is adjacent to the building and controlled by Security whose office overlooks the gate. The Administration Building is on CNS property, but the roadway and access gate are on leased state property.

The Barnwell Environmental and Dosimetry Laboratory (BEDL) contains facilities and equipment for radiological analysis of air, water, and soil samples collected as part of the Barnwell site environmental monitoring program. The laboratory also provides company-wide radiological personnel monitoring services, such as whole body counting, bioassay, and dosimetry services. The laboratory's professional technical staff performs disposal site engineering design, environmental characterization, and site performance studies. Radioactive Material License 287-03 authorizes possession and use of radioactive material in the analytical laboratory.

Table 4.3-1
CNS Barnwell Ancillary Facilities

Number[1]	Name	Location[2]	Use[3]
2	Receiving Warehouse No. 2	SP	DA/CS
3	Warehouse No. 3	SP	DA/CS
4	Administration Building	CN	DA/CS
6	Environmental & Dosimetry Laboratory	CN	DA/CS
8	Site Building	SP	DA
10	Health Physics Building	SP	DA
11	Site Operations Maintenance Building	RA	DA
13	Cask Preservation Building	RA	DA/CS
14	Cask Maintenance Building	RA	DA
16	Grounds Maintenance Shop	RA	DA
19	Drilling Equipment Storage Trailer	RA	DA
20	Instrument Calibration Shop	SP	DA/CS

(1) Building numbers correspond to CNS Drawing B-500-D-300, Appendix B.
(2) The location codes indicate facility is on CNS property (CN), disposal site restricted area (RA), or other State property (SP).
(3) The use codes indicate if facility supports disposal activities (DA), or is shared with other company business lines (DA/CS).

The Site Building is the personnel access and egress point for the disposal site controlled area. Security staff controls vehicle and personnel access to the controlled area at this location. Monitoring equipment is provided for routine self-monitoring to detect personnel contamination. The Site Building also includes site employee lockers, a break room, and an office for the DHEC on-site inspector.

The Health Physics Building provides office space for health physics technicians to perform radiological surveys of waste transport vehicles and to evaluate waste manifests and other shipment documentation. The building also houses contamination smear counting equipment and meters used during vehicle surveys.

The Site Operations Maintenance Building provides facilities for preventive maintenance and repair of equipment used in the daily operations of the disposal site, including a carpenter's shop.

The Cask Preservation Building contains temporary covered parking facilities for trailers and casks and for sand blasting equipment. A separate bay is provided for blasting surfaces with abrasives to reduce contamination (such as cask interiors) or to prepare surfaces for painting (such as cask exteriors). This bay is sealed and maintained under negative pressure during operations, with exhausts passing through High Efficiency Particulate Air (HEPA) filters before release.

The Cask Maintenance Building (CMB) is used to prepare casks for offloading (removing rain covers, loosening lid bolts, etc.), decreasing radiation exposure and improving efficiency and safety during offloading. Casks are also prepared here for release from the site.

The Grounds Maintenance Shop, which is attached to the Cask Maintenance Building, provides storage space for disposal site grounds maintenance equipment and supplies.

The Drilling Equipment Storage Trailer contains parts and supplies in support of drilling operations and environmental sampling at the disposal site.

The Instrument Calibration Shop provides space for calibration of health physics equipment. It also houses instrument calibration sources. Radioactive Material License 287-01 authorizes possession and use of radioactive material in the calibration source area.

4.4 Environmental Monitoring Facilities

CNS maintains significant facilities, instrumentation and equipment for environmental monitoring. The program infrastructure is based in the BEDL, where CNS performs radiological analyses of environmental media. Non-radiological and certain radiological analyses are performed

by vendor labs. CNS regularly collects water, air, soil and vegetation samples from monitoring well, trench monitor pipe, air sampling and boundary station locations. The BEDL also maintains comprehensive monitoring of direct radiation along the facility's fenceline and other appropriate locations using thermoluminescent dosimeters (TLDs).

CNS maintains a network of approximately 240 groundwater monitoring wells and 140 trench standpipes designed and located to monitor for the migration of radioactive and hazardous materials. Wells are categorized by type as on-site, boundary or off-site. Wells located near trenches and within the restricted area are designated as on-site wells. Wells positioned within the restricted area and around the boundary of the disposal site are referred to as boundary wells. Wells located off restricted property are off-site wells. Monitor wells are positioned to collect groundwater upgradient as well as downgradient of the site burial area. Trench standpipes, which number one or more within most trenches, allow monitoring of any water accumulation in a trench.

A large part of BEDL disposal site support involves site characterization, groundwater and contaminant transport modeling and site performance evaluation. A full complement of equipment is maintained and routinely used to gather data for site performance evaluation as well as for routine geotechnical investigation related to qualifications for new trenches. This equipment includes a drill rig for geologic/geotechnical sample collection and monitoring well installation, a drilling equipment storage trailer (also used for environmental monitoring equipment storage) and assorted drilling support equipment such as pumps, air compressors and cement mixing apparatus.

4.5 Site Equipment

In addition to equipment associated with specific site facilities described above, CNS operates and maintains a variety of equipment and vehicles associated with disposal operations at the site. Equipment includes mobile cranes, earth moving and grading equipment, farm tractors and mowers, electrical generators, and forklifts. Vehicles include yard tractors, stake bed trucks, light trucks, and trailers.

5.0 DISPOSAL FACILITY OPERATIONS

This section presents the scope of disposal operations, describing in detail the elements required to successfully and safely operate a disposal site. In addition to basic disposal operations functions such as waste receipt and burial, site maintenance, and trench construction, this section describes critical compliance functions embodied in CNS' comprehensive environmental monitoring, health and safety and radiation protection programs. These programs have enabled the disposal site to set the industry standard in safety and environmental compliance. The activities described in this section form the basis for the allowable costs identified and described in Section 6.0. The work described in Section 5.0 represents functions and tasks developed over the years through lengthy

consultation, review and concurrence from CNS regulatory oversight and CNS internal evaluations. Development of these functions and tasks has also included consideration of comments and recommendations made during audits and inspections of the disposal site operations by various organizations including regulatory entities and customers of the disposal site.

5.1 Disposal Trench Design and Construction

5.1.1 Disposal Trench Qualification

Trench areas are qualified for use prior to trench construction. A geotechnical and hydrological trench qualification investigation is performed in the proposed trench area to demonstrate satisfactory soil characteristics and water table conditions, and suitable proposed trench design.

Site conditions (surface drainage, access) and information from existing boreholes are evaluated as the initial phase of field investigation. Additional exploratory boreholes are drilled if available information is insufficient to characterize the geology of the proposed trench area.

Monitoring data from nearby water table wells are used to determine maximum historic water levels in the area. These data are used to establish the maximum trench depth.

CNS combines trench data and evaluations along with the proposed trench design drawing into a trench qualification report, which is submitted to DHEC for review and approval. Construction begins after DHEC approval. CNS and DHEC verify conformance to design by inspections at designated hold-points in accordance with the approved trench construction procedure.

5.1.2 Trench Construction

Disposal trenches are constructed in accordance with a DHEC-approved procedure, the appropriate trench construction detail drawing and the specific proposed trench design drawing. The drawings are approved by DHEC prior to use. The construction process is controlled through a series of documented hold points and inspections. CNS typically uses earthmoving contractors to construct Class A and Class B/C trenches and CNS personnel and equipment to construct slit trenches.

Prior to excavation, a Registered Land Surveyor (RLS) lays out the trench boundaries in accordance with the approved proposed trench drawing. The larger Class A and Class B/C trenches are constructed using a combination of hydraulic excavators, dump trucks, motor graders and tractor scrapers. During construction, temporary trench ramps are used to provide access to the

excavation area. Slit trenches, due to their narrow and steep-walled design are excavated entirely from the top. CNS allows no personnel entry into the slit trench excavation during construction or trench operations. CNS excavates slit trenches using a hydraulic excavator and dump trucks. CNS extends the trench, as needed, based on waste receipt projections, thereby minimizing trench exposure to rainfall, runoff, and other forms of weathering.

As excavation proceeds in all trench types, the RLS monitors elevations and sloping and establishes trench bottom elevations. Disposal trenches include systems for collection and removal of water entering the closed trench.

CNS conducts formal and informal inspections throughout the construction process and DHEC performs three formal inspections. Formal DHEC inspections occur after (1) trench excavation, (2) drain construction and (3) final floor sand installation. After final trench approval, CNS prepares an as-built trench drawing and documentation package. Pertinent documents are maintained as permanent trench construction records.

5.1.3 Completed Trench Activities

CNS' license and procedures require several activities after completion of burial operations in a trench. These activities include (1) final grading of initial cap and installation of temporary trench identification markers, (2) health physics surveys, (3) enhanced cap construction, and (4) installation of standpipe protection pads and permanent markers.

5.1.3.1 Initial Clay Cap

During waste disposal operations, CNS backfills with free-flowing soil around disposal vaults and places initial clay cap above the topmost vaults in a trench. The initial cap is compacted in lifts and graded to drain surface water away from the trench. After burial operations in a trench are complete, the RLS confirms initial cap grade is consistent with the proposed trench drawings, and CNS performs final grading, as required.

CNS installs temporary trench identification and corner markers. The temporary markers are removed and replaced with permanent features during enhanced cap construction.

5.1.3.2 Health Physics Surveys

The CNS Health Physics department performs a completed trench survey, measuring direct gamma above

the initial clay cap. These measurements are to ensure the initial cap provides adequate shielding for waste.

5.1.3.3 Enhanced Cap Construction

CNS constructs multi-layer enhanced caps in accordance with a DHEC-approved design report and work plan as soon as practicable following completion of waste disposal and backfilling of a trench. Often final capping is delayed until CNS completes a reasonable area of adjacent trenches. CNS manages several contractors and consultants to perform the specialized construction work required for installation of engineered caps.

5.1.3.4 Standpipe and Permanent Marker Installation

Following completion of enhanced capping, CNS installs protective pads around standpipes and permanent identification and corner markers.

5.2 Waste Disposal Operations

5.2.1 Receipt and Inspection of Waste

Certain prerequisites must be satisfied prior to the acceptance of any waste for disposal. Those prerequisites include:

- prior notification of waste shipments by shippers,
- review of shipment documentation upon arrival of the shipment at the Disposal Facility,
- inspection of the shipment for compliance with U.S. Department of Transportation regulations,
- radiological survey of the vehicle and accessible packages, and
- verification of waste class and waste form.

If a discrepancy is noted during the receipt inspection of the waste shipment or its paperwork, the CNS Licensing Department is notified. The CNS Licensing Department notifies the shipper and the DHEC on-site inspector of the discrepancy. A Condition Report is generated and the shipment may not be accepted for disposal until appropriate corrective actions are taken and approval is granted.

5.2.1.1 Prior Notification Process

At least 72 hours prior to releasing a shipment for delivery to the disposal site, the shipper must notify the CNS Prior Notification Plan (PNP) Department with information concerning the shipment. This information

includes name of shipper, anticipated arrival date, and detailed information on the waste.

CNS reviews the information and verifies that the shipper has a valid permit to transport waste into or within the state of South Carolina. The detailed waste information is entered into an electronic database (the Waste Manifest Data Management System). The shipper is issued a shipment identification number once the information is entered into the Waste Manifest Data Management System.

5.2.1.2 Review of Shipping Documentation

When waste shipments arrive at the disposal site, the Licensing Department reviews the paperwork to verify compliance with U.S. DOT regulations, Barnwell Site Criteria, and the 097 License. This paperwork includes:

- The Barnwell Waste Management Facility Uniform Low-Level Waste Manifest,
- S.C. DHEC Radioactive Waste Shipment Prior Notification and Manifest Form (DHEC 802 Form),
- S.C. DHEC Radioactive Waste Shipment Certification Form (DHEC 803 Form),
- Complete isotopic analysis printout or equivalent for aqueous filter media, filters and resins,
- Documentation of waste classification methods and approval required for Class "C" waste shipment,
- Written statement of any unusual hazards and/or precautions that must be taken,
- High Integrity Container Certification, and
- A DOE/NRC Form 741 for Special Nuclear Material (SNM) when required.

Data from the appropriate documents are entered into the Waste Manifest Data Management System. The resultant calculated package volumes, activities, and weights are verified with the reported values from the manifest for consistency. The waste generator is responsible for properly classifying the waste and documenting it on the manifest. Using the information provided in the shipping documentation, CNS calculates the waste classification. When the documentation is found to be acceptable, a “traveler” form is generated that accompanies the shipment through the remaining inspections and offload.

5.2.1.3 Health Physics Receipt Inspection

Once the paperwork has been accepted, the Health Physics Department performs a visual and radiological inspection of the shipment. The visual inspection includes checking that the packages are:

- properly braced and blocked,
- properly labeled and marked,
- not damaged, and
- properly palletized, if appropriate.

The transport vehicle is also inspected to verify that it is properly placarded.

Direct radiation and surface contamination surveys of the vehicle and packages are performed to verify compliance with the U.S. DOT radiological limits.

When all incoming inspections are satisfactorily completed, CNS provides the shipment paperwork to the on-site DHEC inspector for review. When the DHEC inspection is complete, CNS proceeds with the offload of the shipment.

5.2.2 Waste Handling and Storage

Depending on the type of shipment and waste type, the transport vehicle will be directed to either the Cask Maintenance Building (CMB) or to the appropriate trench for disposal.

5.2.2.1 Cask Unloading

Casks are directed to the CMB where the casks are prepared for offloading. Quality Control (QC) inspections are performed on the cask at the CMB. QC inspections include checking the integrity of cask chains and cables, hold-down assembly, rain cover, cask bolts and ratchets, etc. Health Physics personnel perform additional radiological surveys on the cask to assist in preparing for offloading. Offload preparations include removal of the rain cover or impact limiter, loosening ratchet binder assemblies and removal of lid hold-down bolts.

Once all inspections and offload preparations are complete, the cask is then directed to the appropriate trench for offloading. Cask shipments are directed to the appropriate trench depending on waste classification and/or container dose rates. At the appropriate trench, containers are unloaded into concrete disposal vaults.

5.2.2.2 Van Unloading

Vans are directed to the appropriate trench. Containers are unloaded using the appropriate equipment into either the rectangular or cylindrical disposal vaults.

5.2.2.3 Container Inspections

CNS continues inspecting containers as they are unloaded and placed in the disposal vaults. The CNS Licensing Department is notified if any container is damaged, or is improperly marked or labeled.

Containers are selected according to CNS procedure or at DHEC request for verification of the freestanding water criteria. Liners may be placed in a test stand and punctured using hydraulic rams and special punches. Low dose drums and boxes may be placed in an appropriately controlled area and punctured using hand tools. Liquids found are collected and measured. If the amount of measured liquid exceeds the criteria, the on-site DHEC inspector and the generator are notified and proper disposition of the container is determined.

5.2.2.4 Large Component Handling

Large components such as steam generators and pressurizers are disposed of intact. Evaluations qualifying the large components as disposal vaults eliminating the need for concrete vaults are submitted to DHEC for review and approval. Because of their size and weight, large components are brought onto the trench floor with specially designed transport equipment and hardware.

5.2.3 Waste Disposal

Disposal containers are unloaded from vans and casks and placed inside disposal vaults. Three types of reinforced concrete vaults are used: slit trench, rectangular and cylindrical vaults. The position of each vault is recorded in the Waste Manifest Data Management System. Since large components are qualified as disposal vaults, they are placed directly in the trench. For each large component, CNS develops a trench placement plan that is reviewed and approved by DHEC prior to acceptance of any large component for disposal. Monthly disposal volume reports are prepared and submitted to DHEC.

5.2.4 Disposal Trench Stabilization and Closure

When the vaults are filled and closed, CNS places backfill material in the void space between the vaults. Filling void space minimizes the potential for subsidence of the enhanced cap.

Following backfill, vaults are covered with additional soil material and clay cap. CNS installs the initial clay cap to minimize the infiltration of surface water into the trench. Grass may be planted on the initial cap to control erosion. CNS installs the final multi-layer enhanced cap after completion of waste disposal in a trench.

5.3 Site Maintenance

As required by License 097, CNS implements a comprehensive site inspection and maintenance program to ensure trench cap integrity and to maintain proper surface water drainage. All completed trenches are inspected monthly and after substantial rainfall. General disposal site inspections occur weekly. The inspections identify concerns such as erosion, settlement, and water ponding on or around trench areas and ensure timely repair.

CNS maintains records of inspections and maintenance actions. These records document disposal area performance and provide data for estimating future trench maintenance requirements.

CNS manages surface water in accordance with the requirements of License 097 and State NPDES regulations. The primary requirements of License 097 are to eliminate run-in of surface water into open trenches, efficiently drain rainwater off of closed trench caps to minimize potential infiltration, and contour trench covers to minimize erosion. These considerations are addressed in the facility's trench construction procedure and in the design of multi-layer caps, all of which are approved by DHEC before implementation. NPDES requirements are implemented through a Storm Water Pollution Prevention Plan (SWPPP). The purpose of the SWPPP is to establish measures to minimize the release of pollutants (including sediment) from the disposal site in storm water.

5.4 Radiation Protection Program

An integral part of the overall Health and Safety Program is the radiation protection program. This program is designed to ensure site workers, other CNS employees, visitors and members of the general public are not exposed to ionizing radiation in excess of the limits established by DHEC. CNS manages this program with the philosophy that exposures to ionizing radiation should be maintained As Low As Reasonably Achievable (ALARA). CNS maintains an ALARA subcommittee to help achieve this philosophy and draw on expertise throughout the company to provide expert reviews and advice for the radiation protection of workers. Routine and special meetings are held to discuss dose goals and engineering

controls to further reduce employee exposure.

The radiation protection program controls external exposures to ionizing radiation in accordance with DHEC requirements. Exposures are measured using personnel monitoring and other appropriate dosimetry. Radiation work permits are generated as a controlling device for certain work activities with potential radiation exposure. The permits detail the personnel protective equipment required for the activity and any other special considerations needed to safely perform and control the work.

CNS controls exposure to internal sources of radiation to limits substantially below DHEC requirements. CNS uses bioassay samples and whole body radiation scans to monitor internal radiation exposures. If it is determined that an internal exposure has occurred, an internal dose assessment will be performed as part of the total effective dose equivalent record. Controlling internal exposure is done through the respiratory protection program and in accordance with criteria specified in specific radiation work permits.

A key element in the management of radiation program controls is the establishment of areas of different degrees of hazard. Clean areas, which are considered free of radioactive material hazard, are routinely monitored to ensure these areas remain clean. Whereas restricted areas, which may pose a greater potential hazard, require additional monitoring or a higher level of control. Special control areas (such as radiation, airborne radioactivity, controlled surface contamination, and radioactive material storage areas) are designated in accordance with regulations to manage radiation risk. Additional training requirements have been established for personnel entering these areas.

The radiation protection program establishes radiological controls to manage external exposure to alpha, beta and gamma radiation. These controls also are used to minimize the inhalation and ingestion of radiological materials. Through radiological dose rate and contamination surveys, the proper controls can be determined. Adequate personnel contamination monitoring is provided through these surveys and radiological airborne contamination monitoring.

To properly administer the program, radiological controls personnel must undergo rigorous training in areas such as regulatory requirements, radiation protection implementation, health physics principles and practices, proper documentation through surveys, radiation work permits, sample logs, and airborne monitoring.

To ensure proper radiation monitoring, CNS personnel maintain, repair and calibrate instrumentation. The equipment is traceable to the National Institute of Standards and Technology. The program also controls the calibration and check source inventory.

5.5 Environmental Monitoring

As required by License 097, CNS maintains both radiological and non-radiological comprehensive environmental monitoring programs for the disposal site. These programs are designed to assure that any releases of waste materials can be readily detected during operation of the site or following closure. The radiological monitoring program objectives incorporate International Commission on Radiological Protection (ICRP) guidelines.

5.5.1 Radiological Environmental Monitoring Program

The radiological environmental monitoring program for the disposal site is multifaceted, involving a wide range of techniques and sample points. CNS monitors the atmosphere, soil, vegetation, surface water, sediment, and groundwater. In addition, instruments are carefully located to check direct radiation from the site. The sample collection schedules for the on- and off-site areas including number of each sample type, frequency of sampling, and analyses performed are shown in Table 5.5.1-1. The monitoring results are submitted to DHEC on a quarterly basis in the form of two reports, the CNS Site Operational Monitoring Report and the CNS Environmental Monitoring Report. Components of the monitoring program are discussed briefly in the sections that follow.

Atmospheric Monitoring

CNS implements atmospheric monitoring around the perimeter of the disposal facility as well as around active disposal areas. Atmospheric monitoring is concentrated close to active disposal areas in order to increase the likelihood of detecting any potential release soon after it occurs. A particulate filter sample is taken at the side of active trenches near the edge of the wall where the waste is being buried. This air particulate monitor is positioned downwind and moved whenever there is a shift in wind direction. Additional air sampling is performed on an as-needed basis.

Continuous air samples are taken at permanently located stations around the perimeter of the site. The disposal site's boundary stations are located uniformly around the site following ICRP guidance. Uniform spacing enables CNS to distinguish between radioactive materials potentially released by adjacent facilities and the Barnwell disposal site. This approach ensures that all sectors are adequately monitored and all precautions are taken to measure releases from other facilities. Particulates are collected by drawing air through a glass-fiber filter. The filters which contain the sampled particulates, are exchanged bi-weekly.

Soil and Vegetation

Surface soil samples are taken to detect deposition and early infiltration of radioactive material into the soil. Characteristically, tritium and other soluble species have the potential to move through the top layer of the soil rapidly. Surface soil samples provide detection of early or on-going deposition of such radionuclides. Insoluble species, which move much more slowly and are not readily distributed in soil, tend to remain near-surface. In this case, samples help demonstrate if airborne radioactive material has been deposited as a result of routine site operation. Likewise, samples of vegetation may also indicate whether radioactive materials are being deposited.

Surface Water and Sediments

Surface water and sediments are collected at the disposal site. Particular attention is given to surface waters outside the site boundary that could be used as drinking water by the public or animals. Downgradient of the disposal site, CNS has located and monitors the location where shallow groundwater flowing under the site first emerges to join surface streams. At the disposal site, shallow groundwater discharges at the headwaters of Mary's Branch. Water and sediments are monitored at this location, as well as at other nearby stream locations.

Groundwater

The most important facet of any environmental monitoring program for a low-level radioactive waste site is groundwater. CNS routinely monitors an extensive network of both on- and off-site wells for radioactive materials. On-site wells monitor groundwater near trench locations and at the site boundary. Off-site wells are located both up-and down-gradient from the site to as much as three miles away. Wells are strategically positioned in all directions to permit analysis of groundwater upgradient as well as downgradient of the site.

Thermoluminescent Dosimeters

Each environmental station is equipped with a set of thermoluminescent dosimeters (TLDs) to measure external exposure from penetrating gamma radiation. TLDs are also located at intervals along the perimeter fence of the site. CNS makes extensive use of TLDs because such monitoring is relatively inexpensive and yet highly reliable for demonstrating compliance with radiological standards.

Table 5.5.1-1

Barnwell Site Monitoring Program Sample Collection Schedule

Sample Description	# of Loc[(1)]	Type	Media	Frequency	Analysis
On-Site Locations:					
Monitor Wells[2]	108	Grab	Water	Quarterly	Gross Alpha/Beta, Gamma Isotopic, Tritium, C-14, pH, Conductivity, Temperature
Observation Sumps[2]	143	Grab	Water	Quarterly	Gamma Isotopic & Tritium
External Gamma	32	Continuous	TLD	Quarterly	Exposure
Site Boundary Locations[1]:					
Wells[2]	28	Grab	Water	Quarterly	Gross Alpha/Beta, Gamma Isotopic, Tritium, pH, Conductivity, Temperature
Soil	11	Grab	Soil	Annually	Gamma Isotopic, Tritium
Vegetation	11	Grab	Vegetation	Annually	Gamma Isotopic, Tritium
Atmospheric	11	Continuous	Particulate Filter	Bi-Weekly	Gross Alpha/Beta, Gamma Isotopic
External Gamma	64	Continuous	TLD	Quarterly	Exposure
Off-Site Locations:					
Potable Wells[6]	9	Grab	Water	Annually	Gross Alpha/Beta, Gamma Isotopic, Tritium, pH, Conductivity, Temperature
Monitor Wells[2,3]	98	Grab	Water	Quarterly	Gross Alpha/Beta, Gamma Isotopic, Tritium, pH, Conductivity, Temperature
Surface Water[4]	7	Grab	Water	Quarterly	Gross Alpha/Beta, Gamma Isotopic, Tritium, pH, Conductivity, Temperature
Soil[4, 5]	5	Grab	Soil	Annually	Gamma Isotopic, Tritium
Vegetation[4, 5]	5	Grab	Vegetation	Annually	Gamma Isotopic, Tritium
Sediment[4]	4	Grab	Sediment	Annually	Gamma Isotopic, Tritium
Atmospheric[5]	1	Continuous	Particulate Filter	Bi-Weekly	Gross Alpha/Beta, Gamma Isotopic
External Gamma	10	Continuous	TLD	Quarterly	Exposure

[1] As of June 2003

[2] Water levels measured quarterly

[3] Selected wells sampled quarterly

[4] Off-Site Springs and Creeks:

1. *Duncannon – surface water sampled annually*
2. *Mary's Creek, Origin - surface water sampled quarterly at four locations*
3. *Mary's Creek, Grist Mill – surface water sampled quarterly*
4. *Mary's Creek, West - surface water sampled annually*

[5] Barnwell County Airport

[6] WP-0014, WP-0015, and WP-0016 are sampled quarterly

5.5.2 Non-Radiological Monitoring Program

CNS initiated a non-radiological groundwater monitoring program in the third quarter of 1986. The program is designed to characterize and monitor non-radiological constituents in the groundwater at the disposal site. Since 1986, the monitoring program has been enhanced by changing the selection of monitoring wells and non-radiological parameters.

The non-radiological groundwater monitoring program consists of fifteen on-site wells, three boundary wells, ten off-site wells, and two creek sample points. On a quarterly basis, twenty-one of these thirty sample locations are sampled and analyzed for pH, conductivity, total organic carbon, and volatile organics. The remaining twelve wells are sampled and analyzed for pH, conductivity, total organic carbon, and chloroform. Additionally, on an annual basis, twenty-one downgradient sample points are sampled for a complete list of EPA Priority Pollutants. These priority analytes include metals, acids, base/neutrals, pesticides/PCB's, total phenols and total cyanide.

Each quarter, three blind duplicates (ten percent of the total samples) are collected and analyzed for the complete parameter list. These duplicates are selected each quarter and vary from quarter to quarter. The duplicates are used to provide a measure of laboratory quality. Trip and field blanks are also collected for each day of sampling. These blanks are analyzed for volatile organics, and a volatile organic library search is also performed. Blanks provide a measure of quality assurance for both sample collection methods and laboratory analyses.

Samples are collected by CNS and provided to an independent laboratory for analysis. Upon receipt of the laboratory results, CNS performs a review of the data and forwards the results to DHEC. A summary of the sample schedule is provided in Table 5.5.2-1.

Table 5.5.2-1
Barnwell Site Non-Radiological Groundwater Sample Schedule

Sample Description	# of Locations	Type	Media	Collection Frequency	Analysis
Wells and Creek	18	Grab	Water	Quarterly	pH, Conductivity, Total Organic Carbon, Volatile Organics, Library Search
Wells	12	Grab	Water	Quarterly	pH, Conductivity, Total Organic Carbon, Chloroform
Wells and Creek	18	Grab	Water	Annually	pH, Conductivity, Total Organic Carbon, Volatile Organics, Library Search, Acids, Base/Neutrals, Pesticides/PCB's, Cyanide, Phenols
Wells	12	Grab	Water	Annually	pH, Conductivity, Total Organic Carbon, Volatile Organics, Library Search

5.6 Quality Assurance Program

The Chem-Nuclear Systems (CNS) Quality Assurance Program is comprised of planned and systematic actions that are necessary to assure that CNS disposal and disposal-related activities are conducted in a satisfactory and compliant manner. The controls of the QA Program address disposal and disposal-related activities that are considered "Important to Safety". "Important to Safety" items and activities are those necessary to assure that radioactive waste is received, handled,

packaged, stored, processed or disposed without undue risk to the health and safety of the public or the environment. The CNS Quality Assurance Program is based on the nuclear industry standards and regulations required by our customers, the U.S. Nuclear Regulatory Commission and DHEC.

The QA Program is implemented through a series of procedures, instructions and drawings that are prepared, reviewed and approved by appropriately qualified personnel. Adherence to the QA Program and implementing procedures, instructions and drawings is mandatory for all CNS employees and subcontractors. Key elements of the QA Program include, but are not limited to:

- Training and qualification of personnel
- Controls for purchased materials, items and services
- Document control
- Inspections
- Audits
- Record keeping

The QA Program requires CNS personnel that perform "Important to Safety" activities to receive training on the purpose, scope and implementation of procedures and instructions. The personnel also receive training in the principles and techniques of the activity being performed. The QA Program requires that this training be documented.

An important element of the QA Program is the Safety Review Board. The Safety Review Board (SRB) is responsible for review and oversight of the conduct of CNS business where matters of safety are involved and to assure compliance with applicable regulatory requirements, procedures, policy, licenses, permits, and certificates. SRB members are selected based on their experience and level of responsibility within the company. The SRB normally meets once a month and conducts specifically called SRB meetings for review and approval of new procedures. The SRB is supported by four subcommittees that report to the SRB on matters related to ALARA, Brokering, Emergency Response, and Environmental Health and Safety.

The documents that are used to implement the QA Program are controlled by the Company's Document Control Center. These documents are controlled and distributed using a controlled distribution list. Procedures require that personnel remove any obsolete documents from the workplace. The Document Control system ensures that personnel have available the appropriate procedure, instruction or drawing and that it is the most current revision.

Material, items and services purchased for the disposal site are controlled through a number of QA Program procedures. First, vendors who supply the disposal site with Important to Safety material, items and services

must be evaluated and approved by CNS Quality Assurance. Secondly, the material and items are receipt inspected by a qualified Quality Control Inspector prior to being placed in service. These actions ensure that material, items and services comply with the applicable design, quality and regulatory requirements.

The CNS Quality Assurance/Quality Control Department is responsible for verifying compliance to the QA Program and implementing procedures. The Quality Assurance Department is comprised of managers, specialists and inspectors who are certified to national standards and who are independent of the work activities they monitor. The verification activities include a series of inspections, surveillances and audits of the activities performed at the Disposal Site. Formal internal audits of all of the functional areas covered by the QA Program are conducted at least once per year. The results of these inspections, surveillances and audits are reported to senior management for evaluation and development of corrective action. Any deficiencies identified are entered into the CNS Corrective Action Program. This Program requires that each deficiency is evaluated for cause and appropriate corrective actions are developed to fix and prevent recurrence of the deficiency. Corrective action plans are reviewed and approved by the Quality Assurance Department. Further, the Quality Assurance Department verifies effective completion of corrective actions prior to closing the issue.

The records system maintained by CNS includes the retention of those records essential to demonstrate quality and compliance to requirements. Records are prepared, reviewed, approved and maintained in accordance with established procedures and are readily retrievable. The records are retained in a secure and controlled environment.

5.7 Training and Emergency Response Program

5.7.1 Training Program

CNS provides training to its employees and contract personnel to effectively and safely perform the duties of their position.

All personnel are required to take the General Employee Training (GET). The GET is designed to provide employees and contract personnel with the basics of safety, security, quality and radiation protection fundamentals. The fundamental information is necessary to better understand the requirements of the individual's job, safety requirements and the various regulations under which CNS operates.

In addition to GET, individualized training is provided to each employee and contract personnel based on their job responsibilities. The individual's supervisor is responsible for identifying the training requirements. The individualized training may include the following training topics:

- Radiation Worker Training
- Transportation Training
- Heavy Equipment Operator Training
- Hazardous Materials Training
- Emergency Response Training

5.7.2 Emergency Response Program

The Emergency Response Program provides the guidelines for emergency preparedness to ensure that the:

- Disposal site is operated to limit radiation exposure and the release of radioactive materials in an emergency;
- capability exists for measuring and assessing the significance of an accidental release of radioactive materials;
- capability exists for responding to nonradiological emergencies (e.g., fires and chemical spills);
- appropriate emergency equipment, procedures, and training are provided;
- notifications are promptly made to appropriate state and local agencies; and
- necessary recovery actions are taken to return the disposal site to a safe condition after an emergency.

A Facility Emergency Response Team is comprised of individuals with experience and training in responding to radiological incidents, nonradiological incidents, and medical emergencies. These individuals undergo initial and annual training. CNS can also provide biennial training to local fire, medical, and law enforcement personnel covering radiological protection during incidents when requested. The training includes a tour of the facility and identification of areas of special precautions.

Annual emergency response exercises are conducted to maintain readiness. The exercises are critiqued and corrective actions are taken to improve the program.

5.8 Environmental Health and Safety

The Environmental, Health and Safety (EH&S) Program defines the environmental, health and safety requirements and designated protocols to be followed by CNS employees at the disposal site. The CNS health and safety program is established through a series of safety procedures which include the applicable requirements of the Occupational Safety and Health Administration (OSHA) regulations. The program applies to all CNS employees as well as CNS subcontractors and visitors to the site. The program provides guidance for field monitoring, sample collection and data analysis, and engineering and administrative controls. As part of this

program, CNS personnel monitor and plan for chemical and biological hazards, physical hazards (such as confined spaces), vibration and noise hazards, and other environmental hazards.

EH&S personnel also evaluate effectiveness of the CNS personnel protective equipment program, administer the industrial hygiene air monitoring program, and provide oversight for environmental compliance in the area of hazardous and non-hazardous waste management.

The Environment, Health and Safety Subcommittee of the Safety Review Board is an integral part of the program incorporating individuals from different disciplines in evaluations of program effectiveness (including periodic inspections) throughout the facility.

5.9 Physical Security

This section describes the physical security system for the disposal site. Objectives of the program are to:

- Maintain access control by monitoring the entrance and departure of authorized persons;
- Provide means for responding to emergency situations;
- Protect facility personnel and equipment;
- Detect unauthorized entries; and
- Provide means for responding to unauthorized entries.

The security system maintains surveillance 24 hours a day, 7 days a week. Personnel are stationed at site entry and exit locations.

The restricted area of the site is bounded by a six-foot high fence. Vehicle access gates at the Site and Administration buildings are motor-operated and controlled from a security monitoring station at each building location. All other site access gates are locked and manually-operated, with keys maintained by security. Both "No Trespassing" and "Radioactive Materials" signs are installed and maintained along the perimeter of the restricted area fence.

CNS security also controls unrestricted areas. The unrestricted areas that require security measures include CNS-controlled property that is part of the facility but located outside the radiological control area. These include disposal site support facilities, off-site environmental monitoring locations and other adjacent CNS properties.

Security personnel perform routine physical facility inspections. During non-operational hours, the guard on duty ensures that administrative areas, gates, and buildings are secure and verifies that the alarm systems are operational.

A security guard at the entrance to the facility restricted area ensures that people entering the restricted area are properly badged. Security guards control sign in/out logs and maintain active surveillance of the facility. Before entering or exiting the restricted area, vehicles may be inspected by security personnel for prohibited items.

Security guards are responsible for controlling and issuing keys and locks to facility personnel. They are also responsible for issuing to authorized employees permanent identification badges which must be worn on-site. Individuals with authorized access but not having a permanent badge (i.e., visitors, vendors, contractors) must obtain a visitor badge from the security guard. The security guard on duty verifies the names of the people issued badges and the types of badges issued. In addition, the security guard confirms the current standing of permanently-issued badges.

5.10 Community Education and Communication

For over 30 years, CNS has maintained an "open door" policy with respect to visitors to the disposal site as well as open and active lines of communication with community leaders, residents, and organizations. These lines of communication serve to support education of the public in matters related to LLRW disposal and have kept information about the disposal site and its operation accessible to the public. Continuation of an open, public LLRW disposal process, maintenance of effective lines of communication, and education of the public will remain integral elements in the future successful operation of the disposal site.

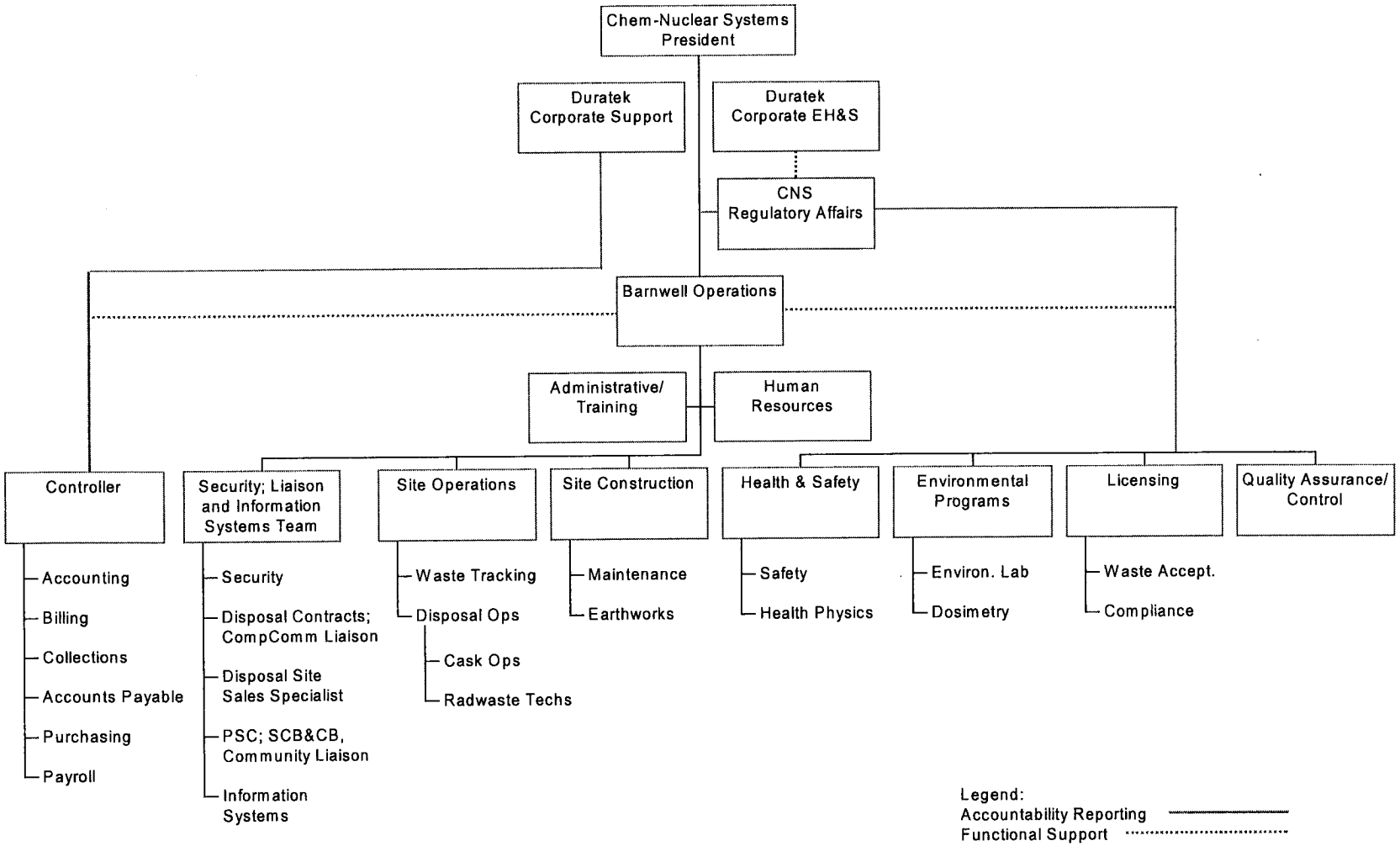
5.11 Organization Structure

CNS is a subsidiary of Duratek, Inc. (Duratek). The mission and focus of the CNS organization is operation of a regional LLRW disposal site located in Barnwell County, SC. This section defines key elements of the CNS organizational structure, discusses direct costs associated with the CNS organization and identifies indirect costs allocated to the disposal organization from other parts of the parent company. A basic organization/function chart for CNS is provided as Figure 5.11-1. Functional teams are described in the following sections.

5.11.1 Disposal Operations Team

This team includes personnel and costs directly involved in waste handling operations and site construction/earthworks activities at the disposal site. Included in this team are the Site Operations Coordinator and the Site Construction Coordinator. Also included are Radwaste Technicians, Cask Operating Technicians, Crane Operators, Equipment Operators, Maintenance Mechanics, and Waste Tracking Database staff.

Figure 5.11-1
Disposal Operations Functional Organizational Chart



5.11.2 Commission/Compact Liaison Team

This team includes personnel and costs associated with required interfaces with the SC Public Service Commission, the SC Budget and Control Board, and the Atlantic Compact Commission. It also includes liaison and interaction with generators of LLRW to manage annual disposal volumes in accordance with the legislated annual volume limits. Activities associated with education of members of the public on matters relative to LLRW disposal and liaison with local elected officials relative to disposal site operations are also included here.

5.11.3 Disposal Administration Team

This team includes management, supervision, training support and security guards for the disposal site. It also includes finance, accounting, billing, and accounts payable support for waste disposal operations.

5.11.4 CNS Regulatory Affairs and Licensing Team

This team includes costs associated with review and renewal of the disposal license and disposal related permits; pre-approval of waste shipments through the Prior Notification Process; review of shipping paperwork to verify compliance with US DOT regulations, Barnwell Site Criteria, and License 097; and document control. Included here are Licensing and Regulatory Affairs management and Barnwell licensing support.

5.11.5 Barnwell Health Physics Team

This team includes the Radiation Safety Officer for the disposal site, a Health Physics Manager, and Health Physics Technicians to support waste receipt and disposal operations; and instrument calibration.

5.11.6 Barnwell Support Services Team

This team forms a pool of costs to be allocated as indirect costs to business units with significant activities located in the Barnwell Area. This allocation will be divided between Disposal and other Duratek business units based on approximate head counts. Included in this team are Barnwell area Human Resources personnel; the Security Supervisor; Barnwell area Information Systems (IS) Technical Support Analyst; and costs such as utilities, janitorial services, telefax, postage, and trash pick up and county landfill charges.

5.11.7 Safety

This team is a pool of costs for personnel and supplies related to safety for activities in the Barnwell area. The safety and loss control manager is included in this unit. Costs from this team will be allocated to Disposal and other Duratek business units based on approximate head counts.

5.11.8 Quality Assurance/Quality Control

This team provides quality assurance program support and direct quality control support required for disposal operations.

5.11.9 Barnwell Environmental and Dosimetry Lab

The Barnwell Environmental and Dosimetry Lab (BEDL) primarily supports the disposal site. Labor, material, and other costs are captured in this unit or charged to appropriate projects. The BEDL conducts environmental monitoring, characterization and groundwater modeling studies, and engineering design for the disposal facility. Records of environmental and regulatory compliance are maintained by the BEDL in electronic databases. The BEDL also maintains dosimetry records for the disposal site, field services, and other business unit personnel. The cost for dosimetry processing, records and reports for other units are transferred to those units through a project number.

5.11.10 Parent Company Indirect Costs

Disposal operations receives various kinds of administrative support from parent company business units. This support typically includes services such as general ledger maintenance, fixed asset depreciation accounting, purchasing and receiving warehouse support, accounts receivable collections, legal counsel support, Environmental, Health and Safety support, and quality assurance oversight. Costs for these services and support are collected in appropriate "pools" and allocated to lines of business throughout the company using appropriate allocation methods.

5.11.11 CNS Charges to Other Units

Some personnel assigned to the CNS organizational structure may occasionally charge labor costs to other projects or business units within the parent company organization. These costs will be charged based on the employee's hourly rate plus fringe.

5.12 Operations and Efficiency Plan

CNS retained Project Time & Cost, Inc. (PT&C) to develop an independent Operations and Efficiency Plan (O&E Plan) for the CNS Barnwell Disposal Facility. The plan was delivered to CNS on May 31, 2002, and provided by CNS to the Commission on June 26, 2002. The evaluation methodologies and report findings as related to facility resource level requirements and functional areas are summarized here. The O&E Plan does not define staffing level for the facility; however, it does address resource level requirements in terms of man-hours and dollars.

5.12.1 Methodology

The PT&C technical approach for development of the O&E Plan for the facility was based on application of the Activity Based Costing (ABC) methodology to define and analyze the current operations of the facility. Efforts focused on developing a model based on the CNS FY 2002/2003 planned operations and then to develop the O&E Plan for the follow-on years by adjusting the waste dependent and variable cost components of the model.

The ABC methodology is a structured approach designed to define work and the associated resource requirements to produce a product or provide a service. Unlike other approaches, ABC evaluates the activities required to operate a facility rather than from the size of the staff available to do so. General Electric Company, in a program to identify and control the indirect costs associated with their manufactured products, first utilized the ABC methodology in 1963. The methodology is intended to allow the user to better understand how resources are utilized; therefore, providing a clearer understanding to support more effective management.

PT&C used a four-phase approach to develop the Barnwell O&E Plan.

Phase I – Assessment of Operations

In the initial phase, PT&C focused on organizing and defining the scope of the current Barnwell operation. To accomplish this, PT&C developed the following:

1. *Work Breakdown Structure* - The initial step of the ABC methodology was to establish a work breakdown structure (WBS) for the work at the facility. This WBS was constructed based on the way work is accomplished at the facility and was not developed to define a group or department at the site. This WBS provided the common framework to support: scope development and definition, resource assignment, cost type identification, cost distribution and cost analysis.

2. *Technical Scope* – PT&C developed a detailed scope of work (SOW). To develop the SOW, PT&C cost engineers, supported by a technical consultant team, spent approximately two weeks at the CNS facility documenting the current scope of operations in the terms of the WBS. To develop this information, the team reviewed documentation, participated in site tours, observed waste handling operations and met with site personnel.

Phase II – Development of Activity Based Cost Estimate

Using the WBS and technical scope developed in Phase I, PT&C developed a detailed "bottoms-up" ABC estimate in order to model the Barnwell operational scope and cost for FY 2002/2003. Upon completion of the initial draft ABC estimate, representatives of PT&C returned to the site for two days and conducted a line-by-line review with site personnel to ensure that the technical scope of operations and the resource assignments were accurately represented. Following this review, PT&C was able to balance and finalize the estimate, which yielded a model for planned FY 2002/2003 operations.

Phase III – Analysis

After completing the ABC estimate, the FY 2002/2003 model was analyzed to determine which tasks and associated activities were essential to facility operations and to identify those tasks which are waste volume dependent.

Phase IV – Development of Operations and Efficiency Plan

Using the information developed during the first three phases of this process, PT&C built the O&E Plan using the following steps.

1. Model Development – PT&C used the scope, cost and work product data collected during the Phase I work to develop an ABC model of the CNS FY 2002/2003 operations budget. An electronic cost-estimating platform was used to develop the fully annotated cost model.
2. Cost Identification – Using the WBS and the technical scope developed during Phase I, PT&C sorted the tasks into cost categories: Waste Dependent, Waste Dependent Taxes and Fees, Fixed, Semi-Variable, Vault Costs, Trench and Other Direct Costs. These cost components are defined in the PT&C document.
3. Scenario Development – Using the FY 2002/2003 estimate as a template, the PT&C cost engineers established three scenarios for each fiscal year that the facility will be receiving waste on a national basis (FY 2002/2003 through FY 2007/2008). PT&C also established a long-term minimum operations scenario (which was based on waste projection for Atlantic Compact waste only) for FY 2008/2009 and beyond. The fiscal year scenarios were based on the minimum, most likely, and the maximum waste volume projections. This methodology yielded an expected cost and resource requirement range for each fiscal year.

5.12.2 O&E Plan Summary

PT&C developed the O&E Plan based on their evaluation of the functional areas described in Section 5 of this report. They established a maximum, most likely and minimum operations scenario, based on waste volume. PT&C's results are summarized below.

Table 5.12.2-1
PT&C OPERATING COST SUMMARY

Fiscal Year	Maximum	Most Likely	Minimum
2002/2003	$10,951,950	$10,490,037	$9,165,033
2003/2004	$10,390,971	$9,712,792	$8,816,985
2004/2005	$10,210,684	$9,343,976	$8,628,397
2005/2006	$9,793,038	$9,132,071	$8,285,714
2006/2007	$9,598,581	$8,658,669	$8,016,478
2007/2008	$9,629,080	$8,263,391	$7,811,791
2008/2009	$7,253,064	$7,253,064	$6,978,093

Using the labor data from PT&C's estimating models, Table 5.12.2-2 provides a range of the overall labor and full-time equivalent (FTE) requirements to operate the Facility at the cost levels shown in Table 5.12.2-1. For planning purposes, PT&C determined that a FTE at the facility would be equivalent to 1800 man-hours. PT&C cautions that the O&E Plan is not a staffing plan; therefore, the FTE count provided does not necessarily equal the employee count for the facility. One difference, for example, between the FTE analysis and a staffing plan is the use of 1800 man-hours per year per FTE as compared to 2080 hours per year per person in a staffing plan. The 280 hour difference is made up of vacation, holidays and sick time. The operating costs outlined in the O&E Plan took this difference into account by use of an appropriate fringe multiplier applied to labor costs.

Table 5.12.2-2
PT&C OVERALL LABOR & FULL-TIME EQUIVALENT (FTE) REQUIREMENTS

Fiscal Year	Maximum		Most Likely		Minimum	
	Man-Hours	FTE	Man-Hours	FTE	Man-Hours	FTE
2002/2003	104,751	58	102,572	57	95,131	53
2003/2004	100,840	56	97,449	54	93,035	52
2004/2005	98,822	55	95,187	53	91,786	51
2005/2006	97,416	54	92,963	52	90,363	50
2006/2007	96,483	54	91,325	51	89,389	50
2007/2008	95,169	53	89,696	50	88,333	49
2008/2009	85,946	48	85,946	48	85,104	47

Beginning in FY 2008/2009, the Barnwell facility will be accepting Atlantic Compact waste only. Based on the anticipated reduction in

waste volume, the cost range provided above is intended to be the approximate annual cost to operate the facility in the current configuration, i.e. open daily to receive waste. PT&C indicates that if a more aggressive plan to modify site designs and operations were developed, some savings might be realized; however, they further note that these savings may not be significant due to the fact that a considerable amount of preparation would be required before such a facility would be operational.

5.13 Collaborative Review

On April 14, 2003, the Commission issued Order No. 2003-188. This Order directed CNS to file a statement regarding a collaborative review of the O&E Plan. In response to the order, participants from the following organizations met several times:

S.C. Public Service Commission
S.C. Department of Health & Environmental Control
S.C. Budget & Control Board
Atlantic Compact Commission
S.C. Consumer Advocate
Chem-Nuclear Systems

The parties, after completing a collaborative review of the O&E Plan, reached consensus that the information provided in the O&E Plan is a valid representation of disposal site operations and that the plan can be used as a baseline for establishing a method for determining allowable costs in future Commission proceedings. The parties identified three cost categories (variable costs, fixed costs and irregular costs) for operating the Barnwell disposal site. The parties also reached consensus on recommendations provided for the Commission's consideration.

The Budget & Control Board's consultant, URS, reviewed the WBS and estimates prepared by PT&C as part of the O&E Plan. URS submitted spreadsheets that compared its cost and time estimates with those prepared by PT&C. Review of the information, followed by discussion among the parties, formed the basis for identification of cost categories, which were then narrowed to the final three. Once each work activity was categorized, a review of the time estimates and the resulting dollars ensued, with particular emphasis on those activities where the differences were considerable.

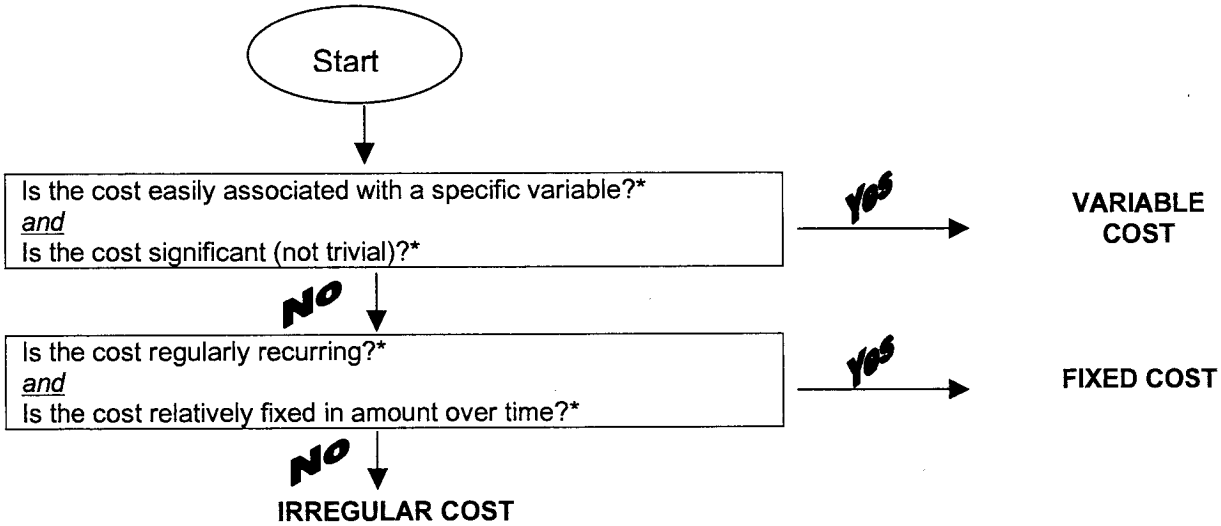
URS visited the Barnwell disposal site to review how the employees perform certain activities. Using data gathered at that visit, URS prepared another spreadsheet for a subsequent meeting between the parties. This meeting included a collaborative review of those items upon which the parties had not yet reached consensus and a review of a draft consensus report outline. A final review meeting was held and consensus was obtained. The Report of the Collaborative Review was submitted to the Public Service Commission on June 16, 2003.

5.13.1 Cost Categories

A spreadsheet of Barnwell disposal site estimated costs was developed to tabulate the estimate. Each activity was identified by WBS element, and included associated cost type, expense category and dollar estimates.

The O&E Plan identified seven cost types, some of which are facility-specific and some could be seen as overlapping from one category to another. Through the collaborative review discussions, the participants determined that three generic cost types represent all the WBS elements. A working definition in Figure 5.13-1 was developed and used to classify each of the costs as variable, fixed or irregular. Fixed costs are regularly recurring and relatively constant over time. Variable costs are readily associated with a specific variable and change as the variable changes. Irregular costs occur on an intermittent basis and cannot be easily associated with a specific variable.

FIGURE 5.13-1
WORKING DEFINITIONS FOR PURPOSES OF COST CLASSIFICATION



*The two questions in each box establish qualitative tests and should be considered together. For example, if the cost is obviously and directly associated with an easily measurable variable (Box 1, Q1), then the magnitude of the cost (Q2) is less important in determining whether it is a variable cost. Similarly, if the cost is huge (Q2), then it can still be a variable cost even though its association with a measurable variable is not as obvious and direct as some others (Q1).

5.13.1.1 Fixed Costs

The majority of the costs of Barnwell disposal site operations are fixed costs. Elements such as health and safety, security, licensing, environmental monitoring, training, administration, QA/QC, finance/accounting and human resources, continue independent of the amount of waste arriving at the site. Fixed costs may change over time due to pay raises or supplier increases which are beyond control of the site operator.

The parties agreed that the costs identified as fixed costs would not change significantly with changes in waste volumes received. Independent review of the estimated fixed costs required to operate the Barnwell disposal site was performed by URS using the O&E Plan WBS, and the two estimates agreed by about 5% ($293,356) as a result of collaborative discussions among the parties.

5.13.1.2 Variable Costs

The variable costs include certain materials costs and certain labor costs directly associated with the receipt and disposal of waste. The parties agreed that the costs identified as variable costs will likely decrease as the amount of waste received each year decreases in accordance with current statutes. The parties agreed that the methods already established by the Commission staff for determining the variable material cost rates (i.e., costs for concrete disposal vault purchases and trench amortization) are reasonable and appropriate and should remain in effect. As a result of the collaborative review process, the parties established variable waste dependent labor costs using information from the O&E Plan.

Variable Material Costs

Variable material costs may be affected each year by such factors as the cost of each type of vault, the number of each type of vault used, the amount of trench space used (determined by the size, shape and type of waste container received, and the number of vaults used in each trench). The method established for determining variable costs rates for vaults and trench amortization involves examination of the volume of waste received by waste classification (Class A, Class B, Class C, and slit trench volume) and the volume of each waste classification disposed of in each respective trench. The total cost for vaults used in a trench plus the total cost of trench amortization divided by the total waste volume disposed in each trench provides a variable cost rate by trench.

Variable Waste Dependent Labor Costs

Variable waste dependent labor costs are included in the activities directly associated with waste acceptance, inspection, and disposal. While the volume of waste in various classifications has been useful in establishing

variable cost rates for the material costs associated with vaults and trench amortization, variable labor rates can be more appropriately developed for specific work activities based on the following independent variables related to the amount of waste received for disposal:

- number of vaults used for disposal of waste
- number/type of shipments (vans, vertical casks, horizontal/slit trench casks)
- number of waste containers received

The labor costs associated with certain activities defined in various WBS elements described in the O&E Plan are directly related to the amount of waste received as measured or indicated by one of these independent variables. The parties further agreed that the labor rates for a specific WBS activity or a group of WBS elements should be based on different independent variables.

Other Variable Costs

The O&E Plan describes other variable costs (Atlantic Compact Commission surcharges, payments to the Decommissioning Trust Fund and the Perpetual Care and Maintenance Fund). These costs are established on a per cubic foot basis and are included in the statutory requirements for operating the disposal site.

5.13.1.3 Irregular Costs

Through collaborative review, the parties identified some costs that tend to be irregular as defined in Section 5.13.1. Examples of ongoing irregular costs include trench construction, license renewal, large component disposal, insurance premiums and surface water management improvements. Irregular costs can be tracked and controlled separately and are easily audited by the Commission staff in their annual audit. The site operator will request reimbursement with the allowed operating margin for irregular costs in the appropriate application to the Commission.

5.13.2 Use of the Operations and Efficiency Plan

The O&E Plan provides a structure for managing, analyzing and communicating information about costs associated with operating the Barnwell disposal site. The WBS section with its hierarchical structure and cost detail provides a framework to align the company's accounting system to collect annual costs at a level of

detail to allow better analysis. For fiscal year 2003/2004 and beyond, the accounting system can be aligned to accumulate costs in categories of fixed, variable and irregular costs consistent with agreements reached during the collaborative review. The O&E Plan also provides a logical method to communicate the various categories of costs incurred in operation of the Barnwell disposal site.

The Report of the Collaborative Review concludes that the method described for determining waste-dependent labor rates is a good approach. The parties participating in development of this approach requested the Commission use this method for determining allowable waste dependent labor costs for fiscal year 2003/2004 and beyond. Changes in the low-level radioactive waste disposal market or regulatory changes could cause the rates established by this collaborative effort to not accurately forecast costs. If such a situation were to occur, one or more of the parties would request a waste dependent labor rate change in accordance with S.C. Code Ann. 1976 Section 49-46-40(B)(4)(supp. 2002). A combination of the O&E Plan structure and actual costs would form the basis for such a request.

5.13.3 Recommendations of the Parties

Through the collaborative review process and use of the O&E Plan, the parties identified and developed four recommendations for the Commission's consideration. These recommendations are summarized below.

The parties established that the costs identified as "fixed costs" are valid costs of operating the Barnwell disposal site. The parties recommended that the Commission allow the operating company to be reimbursed for actual dollars spent plus, where applicable, the statutory operating margin for each of these identified fixed costs.

The costs identified as "variable costs" will vary with the amount of waste, type of shipments, and the number of containers received at the Barnwell disposal site. The variable costs include waste dependent labor and materials. The parties recommended that the Commission continue to use the previously accepted method of establishing material rates by waste classification for vault purchases and trench amortization. The parties also recommended that the Commission establish the waste dependent labor rates associated with each vault, van waste shipment, cask waste shipment, slit trench waste shipment, total shipments, and total containers received at the Barnwell disposal site.

The costs identified as "irregular costs" are likely to be different each year. The parties recommended that the Commission allow the operating company to be reimbursed for actual dollars spent

plus, where applicable, the statutory operating margin for each of these identified irregular costs.

The parties agreed that operating efficiencies are important to cost reduction efforts and that CNS should continue efforts to improve efficiencies in all aspects of operations.

6.0 TEN-YEAR COST PLAN SUMMARY

Section 6 outlines CNS' 10-year cost plan as required by §48-46-40 (B) (6) of the 1976 SC Code of Laws (as amended).

Section 6.1 summarizes criteria and assumptions used in developing the ten-year financial projections in Section 6.2. Section 6.1 also provides schedules and justifications for activities such as trench construction, decommissioning and other special projects in support of disposal operations.

Section 6.2 provides summary financial estimates for Fiscal Years 2003/2004 to 2012/2013. Operational costs provided are consistent with the O&E Plan and the Report of the Collaborative Review. CNS also provides a discussion regarding operations during the in-region-only period and the potential impact of suspended operations.

6.1 Least Cost Operating Plan Summary

CNS considers the functional areas described in Section 5 of this LCOP as the current baseline requirements for disposal operations. For the most part, these functional areas are not likely to change during the ten-year period, although resources required in certain areas may decrease. For FY 2003/2004 and future years, CNS has developed cost projections based on the O&E Plan and further refinements made to the plan during the collaborative review. It must be recognized that factors outside CNS' control may affect waste volume received in a particular year. These factors include disposal pricing, license revisions or modifications at other disposal sites and other regulatory or statutory changes. CNS also recognizes that changing regulatory requirements or site conditions could affect future operating conditions. An opportunity to address changed conditions and new information is available since the LCOP is updated and resubmitted annually to the Commission.

CNS assumes three fundamental time periods during the remaining life of the disposal facility:

(1) Eight years of operation receiving LLRW disposal volumes up to the maximum allowed amounts. This period extends from FY 2000/2001 to FY 2007/2008, with FY 2000/2001 through FY 2002/2003 operations complete and documented in this report.
(2) Thirty years of operation as an "in-region-only" disposal facility. The initial two years of this period will be used to complete closure activities on most of the disposal site. As additional areas are

completed during the thirty-year period, they will be closed. CNS assumes this period will end in 2038 recognizing that the in-region-only period may extend less than or beyond thirty years depending on site capacity and other considerations.

(3) One hundred years of institutional control following the in-region-only disposal operations period. CNS assumes this period will end in 2144.

During the next five years of operations (FY 2003/2004 to 2007/2008), CNS assumes that the site receives the maximum allowed volumes of waste and that the basic operational approach remains essentially the same as current practice. Current market conditions support the use of maximum allowed volumes in cost estimates over this period. Costs of operations should decrease during this period given the same regulatory requirements and suitable site conditions for trench construction and site maintenance.

During the in-region-only operations (of which this plan addresses the first five), CNS estimates waste volumes at 8,000 ft^3 per year. Under these conditions, full-time disposal crews and oversight functions may not be necessary. The first two years of the in-region-only operations period will consist of implementing final closure on the remaining parts of the site and potentially transitioning to a new mode of operations. Experience gained over the next few years of operations will form a basis on which effective in-region operations plans can be developed.

The final period, institutional control, begins following in-region-operations and completion of remaining closure activities. After DHEC approval of proper site closure and stabilization, the site property, which is leased from the State, will be transferred to the State. The SC B&CB will assume responsibility for the property and all buried materials. Their responsibilities will include site maintenance and monitoring paid from the Extended Care Maintenance Fund. During this period, the custodial agency may hire qualified contractors to manage the site.

6.1.1 Waste Volume and Characteristics

Waste volumes and characteristics are primary factors affecting disposal facility planning. These data directly impact the cost of disposal operations as well as trench design, construction and closure schedules.

§48-46-40 (A)(6) of the 1976 SC Code of Laws (as amended) establishes limits on waste volume that can be received at the disposal site for the five years of disposal operations between FY 2003/2004 and 2007/2008. For this time period, CNS assumes waste receipts at the maximum allowed levels. The last five years of the 10-year planning period of this LCOP differ in that waste may be received only from within the Atlantic Compact region. For this period, CNS estimates annual average waste receipts at 8,000

cubic feet (as shown in Table 6.1.1-1); recognizing that annual volumes may vary, especially in later years, to support decommissioning activities within the compact.

Table 6.1.1-1
Projected Radioactive Waste Volumes*

Fiscal Year	Maximum Allowed Volumes by Statute	Volume (Cubic Feet)	Number of Slit Trench Shipments
2000/2001	160,000	**125,989**	**43**
2001/2002	80,000	**57,763**	**11**
2002/2003	70,000	**65,660**	**14**
2003/2004	60,000	60,000	12
2004/2005	50,000	50,000	12
2005/2006	45,000	45,000	12
2006/2007	40,000	40,000	12
2007/2008	35,000	35,000	12
2008/2009	NA	8,000	6
2009/2010	NA	8,000	6
2010/2011	NA	8,000	6
2011/2012	NA	8,000	6
2012/2013	NA	8,000	6

* Actuals in bold

In Table 6.1.1-1, CNS has separately listed the projected number of slit trench shipments. These shipments, although representing a small fraction of total waste volume, require significant manpower in preparation for and during offload. Slit trenches are small trenches for which the construction schedule is determined by the projected number of shipments rather than volume.

6.1.2 Projected Trench Construction and Site Use

The projected volumes in Table 6.1.1-1 have been used along with the optimal trench and vault configuration study of the O&E Plan to estimate trench construction requirements and land use for FY 2003/2004 through 2012/2013. CNS is currently performing disposal operations in Trenches 86, 95 and Slit Trench 21.

During the next five years, CNS anticipates constructing five new slit trenches and one B/C style trench. Future trench locations are shown on Drawing B-500-D-300, Rev. 2, in Appendix B. CNS has located proposed trenches adjacent to existing trench areas to ensure efficient use of available disposal area and to minimize area requiring enhanced cap. Table 6.1.2-1 identifies projected trench requirements by year. New trenches constructed over the next five years will occupy approximately 1.2 acres.

During the in-region-only period, CNS anticipates shifting disposal operations to the large contiguous area designated as in-region operations area on Drawing B-500-D-300. Further evaluations will be required prior to selection of optimal designs for use during the in-region-only operations period. This evaluation will consider findings of the O&E Plan, in-region-period operating conditions,

regulatory requirements and experience gained during the next few years as waste volumes continue to decrease.

Table 6.1.2-1
Projected Trench Requirements

Fiscal Year	Trench
2003 / 2004	Proposed Slit #1
2004 / 2005	Proposed Slit #2
2005 / 2006	Proposed Slit #3, Proposed B/C #1
2006 / 2007	Proposed Slit #4
2007 / 2008	Proposed Slit #5
2008 / 2009	In-Region Operations Area
2009 / 2010	In-Region Operations Area
2010 / 2011	In-Region Operations Area
2011 / 2012	In-Region Operations Area
2012 / 2013	In-Region Operations Area

6.1.3 Other Disposal Operations Activities

In addition to the routine disposal operations activities and support described in Section 5, CNS anticipates that other disposal-related work will arise during the ten-year period. CNS foresees work and study in the following areas:

- Storm water management improvements
- Disposal operations practices and efficiencies
- Trench and vault design changes
- Environmental monitoring enhancements and evaluations

During FY 2003/2004, CNS plans to continue its work on storm water management improvements at the facility. This activity is driven by regulatory requirements for use of best management practices at the facility. Planned improvements will provide efficient and effective surface water management during site operations and tie into the larger plan to construct closure water management features on the disposal site (see Section 6.1.4.2).

In response to DHEC requests and new information from the O&E Plan, CNS continues to evaluate its disposal practices and system designs to account for decreased waste volumes and changing types of waste received. CNS believes that during the in-region period, new trench designs and new modes of disposal operations may be warranted. Any significant changes will require research, development, design work and approval to implement. Such costs are non-routine, but must be anticipated as the site transitions to in-region operations.

CNS also anticipates continued reviews by DHEC and other regulatory agencies of CNS' operations, including monitoring and maintenance programs. Based on our experience, CNS expects environmental monitoring program enhancements or special

projects may be required periodically to address regulatory questions or CNS findings. CNS has also embarked on activities aimed at optimizing the efficiency of environmental monitoring.

6.1.4 Decommissioning Tasks

This section summarizes decommissioning tasks planned during FY 2003/2004 through FY 2012/2013. During the first five years of this period, CNS plans to implement certain decommissioning activities in parallel with routine disposal operations as recommended in the O&E Plan. After five years, CNS may only accept waste from the Atlantic Compact Region, which is anticipated to produce on the order of 8,000 ft^3 per year. At these volumes, only small areas of the site will be required to manage and dispose of waste. During the first two years of in-region operations, CNS will complete remaining closure activities for most of the site (Phase I Closure), leaving only the facilities and areas required for future in-region operations.

Planned decommissioning activities include (1) continued capping of completed site areas in accordance with DHEC-approved plans and procedures, (2) construction of closure surface water management features, (3) establishment of a records storage facility, (4) decommissioning of structures and equipment, (5) final site survey, (6) development of an updated closure groundwater monitoring plan, and (7) performance objectives evaluation. These tasks are summarized below with a schedule provided in Appendix A. As in the past, CNS will seek funding of approved closure activities from the Decommissioning Trust Fund.

6.1.4.1 Site Capping

This activity involves the installation of multi-layer engineered cap on completed trenches at the facility. During the ten-year period, CNS anticipates four phases of capping: Phases 6 through 9. Enhanced cap locations are shown on Drawing B-500-D-300.

Table 6.1.4.1-1
Ten-Year Plan Enhanced Capping Schedule

Cap Phase	Construction Start Date	Area (Acres)
6	2003	17.7
7	2004	5.3
8	2005	3.3
9	2008	11.7
Total		38.0

6.1.4.2 Closure Water Management

The disposal site consists of two major surface water drainage areas. About three-fourths of the site drains to water management ponds on the west side of the Barnwell disposal site. The remainder of the site currently drains to a detention basin on the southeast corner of the site. Beginning during fiscal year 2003/2004, CNS plans to begin closure-related improvements to water management in the west drainage area. During years 2008 and 2009, CNS will perform additional surface water management construction activities for the southeast part of the disposal site.

6.1.4.3 Records Storage Facility

CNS plans to develop a facility at the Barnwell disposal site for long-term storage of site records and environmental samples. CNS will maintain this facility until the records are transferred to the site custodian for use during the long-term care period of the closed disposal site.

6.1.4.4 Decommissioning of Structures and Equipment

During the two-year closure period, CNS will decommission disposal site support facilities and equipment, retaining only facilities and equipment needed for in-region operations, for other CNS operations or for later use by the site custodian. For in-region operations, disposal site support activities may be consolidated into fewer facilities.

6.1.4.5 Final Site Survey

During year 2009, following closure of completed trench areas of the site, CNS will undertake an extensive soil sampling and survey program to ensure that the site surface is free of contamination and that direct gamma radiation is essentially background.

6.1.4.6 Ground Water Monitoring Plan and Well Abandonment

Based on the findings of performance assessment studies, CNS plans to update its site closure groundwater monitoring plan. As part of developing the closure groundwater monitoring plan, CNS will select an appropriate network of wells for long-term monitoring.

Monitoring wells determined to be redundant or ineffective will be recommended for removal from the program. CNS plans to request approval from DHEC to abandon wells as appropriate during the next five years.

6.1.4.7 Performance Objectives Evaluation

During the two-year closure period, CNS will update its site performance evaluation. A comprehensive report evaluating compliance with site performance objectives will be developed to facilitate acceptance of the final closure of decommissioned parts of the disposal facility.

6.2 Financial Evaluation

6.2.1 Financial Projections (FY 2003/2004 to FY 2012/2013)

In this section, CNS provides a projection of operating costs and revenue for the 10-year planning period. These estimates have been developed incorporating the actual costs of operating the Barnwell disposal site as well as the findings and agreements of the O&E Plan and the collaborative review. These estimates represent the best currently-available information.

Summary level cost estimates for FY 2003/2004 and subsequent years are presented in Table 6.2.1-1 along with CNS' estimate of revenue. The operating costs for FY2000/2001 and FY2001/2002 are actual values, and for FY 2002/2003 an estimated actual value.

Table 6.2.1-1
Revenue / Cost Summary

Fiscal Year[1]	Projected Volume	Gross Revenue[2] (in mill $)	Costs (in mill $)				Net Revenue (in mill $)[5]
			Operating Cost[3]	Operating Margin	Surcharges, Taxes, and Fees[4]	Total	
2000 / 2001	125,989	70.06	9.25	2.68	2.94	14.87	55.19
2001 / 2002	57,763	32.44	9.09	2.27	2.17	13.53	18.91
2002 / 2003	65,660	37.73	9.76	2.62	2.11	14.49	23.24
2003 / 2004	60,000	34.02	9.21	2.46	2.16	13.83	20.19
2004 / 2005	50,000	28.79	8.42	2.23	2.03	12.68	16.11
2005 / 2006	45,000	26.17	8.06	2.13	1.96	12.15	14.02
2006 / 2007	40,000	23.56	7.89	2.08	1.90	11.87	11.69
2007 / 2008	35,000	20.94	7.94	2.10	1.83	11.87	9.07
2008 / 2009	8,000	5.50	6.76	1.75	1.48	9.99	(4.49)
2009 / 2010	8,000	5.50	6.76	1.75	1.48	9.99	(4.49)
2010 / 2011	8,000	5.50	6.76	1.75	1.48	9.99	(4.49)
2011 / 2012	8,000	5.50	6.76	1.75	1.48	9.99	(4.49)
2012 / 2013	8,000	5.50	6.76	1.75	1.48	9.99	(4.49)

(1) Shown are actuals for FY 2000/2001 and FY 2001/2002 and estimated actuals for FY 2002/2003. The FY 2001/2002 actual includes intangible asset amortization for both FY 2000/2001 and FY 2001/2002.

(2) Gross revenue is the estimated total of all revenue for waste received for disposal. Projected revenue is in current dollars based on current revenue rate, recognizing that receipt of large components or special pricing may affect future actual revenue.

(3) Operating cost is the cost of disposal operations for which CNS receives 29% operating margin. Also included in this category are costs for intangible asset amortization and other costs identified as allowable by the Commission upon which no 29% margin is allowed. All estimates are in current dollars.

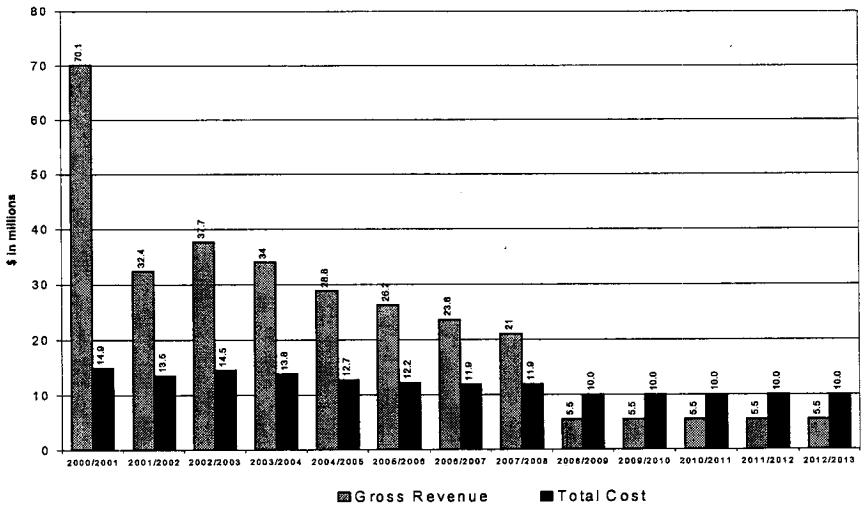
(4) Surcharges (for SCB&CB, Commission, etc.), taxes, and license fees related to disposal operations are allowable costs distributed from gross revenue.

(5) Net revenue includes money designated for Barnwell County and for South Carolina generator rebates. Interest accrued on cash flows is not included in this table.

Projected revenue is estimated assuming current Atlantic Compact and out-of-region price structures and projected waste volume. As described in Section 6.1, a number of factors outside CNS' control may affect waste volumes and revenues.

During the next five years of operations, CNS projects a general decline in operating costs as shown in Figure 6.2.2-1 below. The cost decrease primarily reflects reductions in waste-dependent variable costs (e.g. vaults, labor, taxes and fees).

Figure 6.2.2-1
Gross Revenue/Cost Projections



Although the net revenue shown in Table 6.2.1-1 indicates a negative value for in-region operations in FY 2008/2009, CNS would anticipate a large decrease in actual operational costs associated with the decreased waste volumes and change in operating approach. CNS anticipates a smaller workforce, consisting of a small full-time regular crew supplemented as needed with company and temporary personnel. The O&E Plan presents an operations scenario comparable to CNS' current practice, with waste dependent costs reduced in direct proportion to expected waste volume reductions. The costs shown in Table 6.2.1-1 and Figure 6.2.2-1 reflect O&E Plan estimates as modified by the collaborative review. CNS expects the actual costs collected in the categories of fixed, variable and irregular over the next few years to form a revised basis for costs during the in-region only period.

6.2.3 In-Region-Only Operations

Beginning with fiscal year 2008/2009, CNS will accept waste only from the Atlantic Compact states (South Carolina, Connecticut and New Jersey). Based on recent historical data, CNS estimates average annual regional waste volume at approximately 8,000 ft^3. CNS assumes the "in-region-only" period will last thirty years,

thereby encompassing current Atlantic Compact power plant decommissioning schedules. In order to operate a disposal facility at such low volumes for an extended period of time, CNS has suggested changing the fundamental operating approach as outlined below. The O&E Plan recommends, and CNS concurs, that an evaluation of operational feasibility of potential operating alternatives is warranted.

In assessing potential in-region operating alternatives, one consideration is the impact of operations on the in-region small volume waste generators with limited capability to store waste at their facilities. As an option, waste from these small generators could be stored for up to six months at the disposal site between periods of disposal operations. This ability to store waste at the disposal site would eliminate any adverse impact of modified site operations on small waste generators. Based on recent historical data small generators from the three compact states typically produce a total of less than 630 cubic feet of waste per year. Storage of these amounts for up to six months would have little or no impact on disposal operations or site maintenance.

To efficiently and safely manage disposal operations during the "in-region-only" period, a possible scenario could include:

- Segregating disposal operations areas away from other completed site areas;
- Placing in a final closure condition completed parts of the disposal site; and
- Paying for maintaining and monitoring those parts of the disposal site placed in final closure from the Extended Care Maintenance Fund.

CNS has identified on CNS Drawing B-500-D-300 in Appendix B an area designated for in-region operations, which should provide more than 800,000 ft^3 disposal capacity. During in-region operations, CNS may transition to using this part of the disposal site exclusively. The area is contiguous to but separate from other disposal areas, provides significant potential disposal capacity and is positioned to allow disposal of large component decommissioning waste. Segregation also allows environmental and radiological monitoring to be focused on a single small operating area, improving efficiency, reducing cost, and enhancing environmental safety.

Under this operating scenario, all other parts of the disposal site can be brought to a closure configuration, including installing multi-layer enhanced caps, final contouring and grassing. A further result is that site maintenance should be substantially less for closed site areas. The limited operations areas will require routine maintenance to maintain offloading areas, to manage active trench water accumulation and to control runoff and erosion. However,

the in-region operations area can be developed as needed, thereby minimizing areas of active operations.

CNS anticipates developing enhanced vault and trench configurations for the in-region-only period. Recommended configurations will consider findings of the O&E Plan, as well as other operational, technical and regulatory factors affecting designs and operations.

6.3 Suspended Operations

CNS has evaluated the possibility of "suspended operations." Suspension of operations must be considered if "...the volume of waste disposed during a forthcoming period of time does not appear sufficient to generate receipts that will be adequate to reimburse the site operator and its operating margin". In such a case, CNS must provide the SCB&CB plans for discontinuing acceptance of waste (suspension of operations) until there is sufficient waste to cover allowable costs.

Table 6.2.1-1 shows estimated operating costs versus projected revenue generated for each fiscal year of the ten-year period. For the first five years of the current planning period, CNS' evaluation found that for maximum allowed waste volumes and under the current pricing structure, suspension of operations should not be required.

For the in-region operations period, assuming current operating practices and assumptions of the collaborative review, estimated annual operating costs will exceed revenue. In future LCOP updates, CNS anticipates in-region cost projections will be refined based on tracking of actuals and evaluations of alternate operating models.

7.0 REVIEW OF ALTERNATIVES

Preceding sections of the LCOP describe historical, current and future operations of the LLRW disposal site. The LCOP describes changes and improvements in the site's regulations, design and operations. Historically, each enhancement to operations generally involved careful consideration of alternatives, multiple technical and regulatory reviews, and further refinement after implementation. Future operation of the site will also involve some incremental changes to improve trench and vault configurations and efficiency of operations. Any alternative operational approaches will require further study, development and regulatory approval before implementation.

In light of the mandated waste volume reductions, CNS is currently evaluating technical changes to site design and operations to enhance operational efficiency. Toward this goal and as directed by the Commission, CNS, during FY 2001/2002, retained a consultant to develop an O&E Plan for the Barnwell facility. The O&E Plan has addressed least cost operational strategies and labor requirements for future years and optimal vault and trench configurations. To the

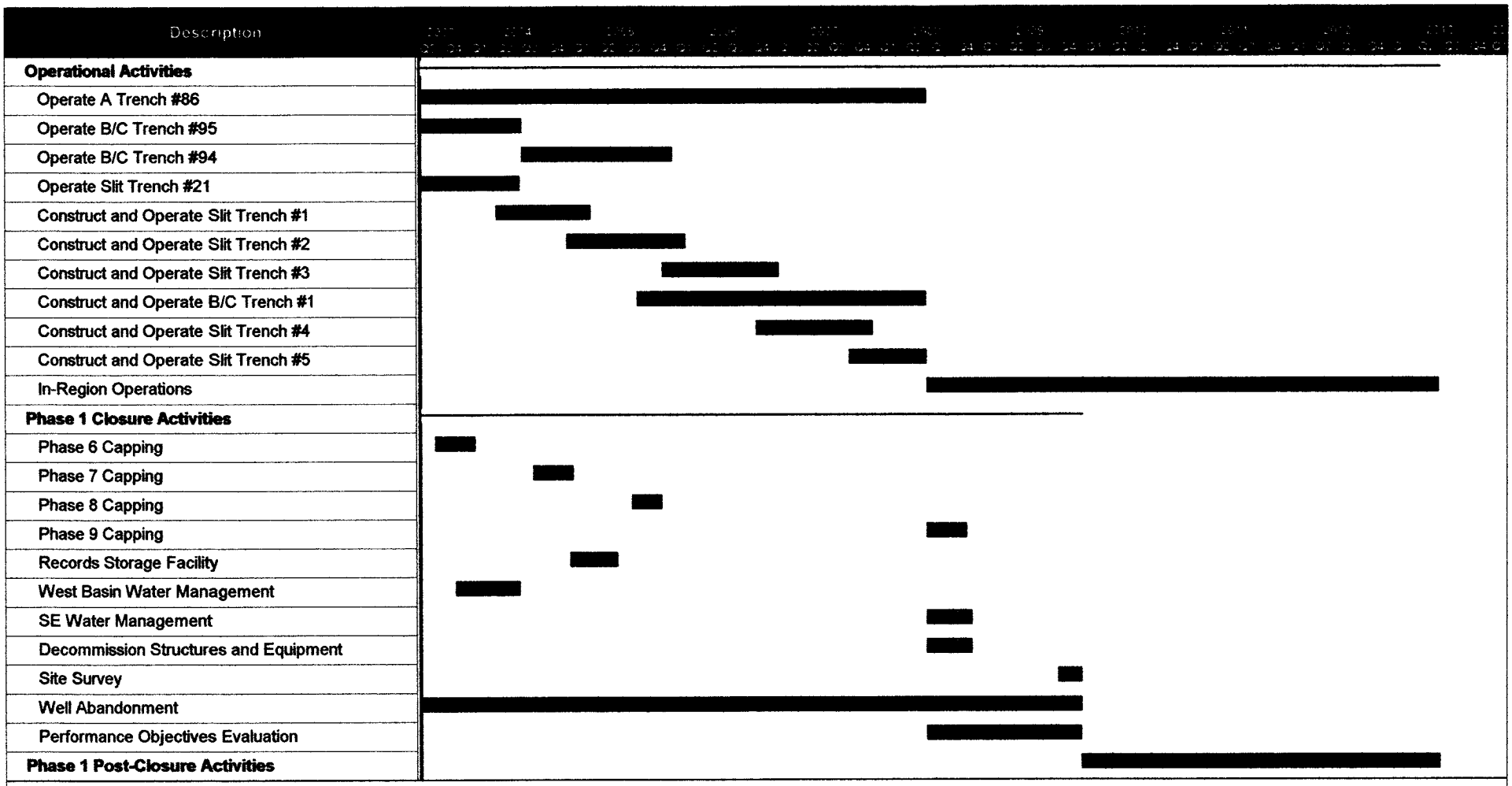
extent appropriate at this time, the results of this study have been incorporated in this update to the LCOP.

The O&E Plan documents an evaluation of alternative vault and trench configurations for use at the Barnwell disposal site. It identifies potential "optimal" cost-effective designs appropriate to site and operating conditions. The evaluation demonstrates that current practice at the Barnwell disposal facility is the most cost-effective of the alternatives identified. The findings also indicate that more expensive alternatives may be required to operate at low waste volumes and to address differing soil conditions at the facility. Based on CNS' review of the O&E Plan, CNS believes further study of alternate trench and vault configurations is warranted, especially as related to planning for in-region-only operations.

CNS will continue to follow national developments and technical proposals for alternative methods of LLRW disposal. CNS personnel have and will continue to participate in national-level conferences and associations related to LLRW disposal. Should an alternative method for disposal demonstrate itself to be clearly superior (in safety and performance characteristics) to the methods currently used at the Barnwell Facility, CNS will consider proposing such a method for licensing consideration by DHEC.

APPENDIX A

TEN-YEAR PLAN ACTIVITIES SCHEDULE



FY 2003/2004 Least Cost Operating Plan
Ten Year Schedule
Chem-Nuclear Systems

APPENDIX B

10 YEAR LAND UTILIZATION PLAN DRAWING

(B-500-D-300, REV. 2)