DOE/ER/40150--681

CEBAF

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Environmental Protection Program Plan

This Plan includes the following documents:

**Environmental Monitoring Program and Plan
Long Range Environmental Protection Plan
Groundwater Protection Management Program Plan
Waste Minimization Program Plan
Pollution Prevention Awareness Program Plan**

October 1, 1995

**Continuous Electron Beam Accelerator Facility
Operated by: Southeastern Universities Research Association, Inc.
for the Department of Energy
12000 Jefferson Avenue
Newport News, VA 23606**

MASTER

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ENVIRONMENTAL PROTECTION PROGRAM PLAN

EXECUTIVE SUMMARY

This document presents the Continuous Electron Beam Accelerator Facility (CEBAF) ENVIRONMENTAL PROTECTION PROGRAM PLAN (EPPP). The Southeastern Universities Research Association, Inc. (SURA) is the managing and operating contractor for this major system acquisition for the U.S. Department of Energy under contract DE-AC05-84ER-40150. CEBAF is located in Newport News, Virginia. CEBAF's construction activities began in February 1987. Low power accelerator operations and the equipment testing for the first of the many planned nuclear physics experiments commenced in FY 1994.

Section 1 provides an overview of CEBAF, including its background, site history, natural setting, and mission.

Section 2 describes CEBAF's organization and assignments of responsibility.

Section 3 presents the status of CEBAF's environmental protection program, which includes public health implications. Accomplishments to date are noted, including the results of the "finding of no significant impact" (FONSI) for the National Environmental Policy Act's (NEPA) mandated Environmental Assessment (EA). The status of CEBAF's environmental permitting efforts are summarized. Significant activities and events are also noted.

Section 4 describes the Environmental Monitoring Program that started during FY 1990. The compilation of all environmental baseline information is addressed in this program. Operational site environmental monitoring will begin in 1996 as commissioning activities are completed and high power operations commence.

Section 5 details CEBAF's Long Range Environmental Protection Plan. Key public health and environmental protection objectives are defined, along with activities necessary to ensure program success.

Section 6 presents Special Environmental Program Plans. The included plans address waste minimization and pollution prevention awareness. Of particular significance is CEBAF's Groundwater Protection Management Program. Close attention will be paid to the effects that accelerator commissioning activities and operations may have on the groundwater. Mitigation measures for any adverse effects that might arise are defined and will be employed if necessary.

Section 7 lists CEBAF's reporting requirements for the overall EPPP.

Section 8 lists relevant documents used in the development of this program plan.

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ACRONYMS

ALARA	As Low as Reasonably Achievable
ARR	Accelerator Readiness Review
BCP	Buffered Chemical Polish
CEBAF	Continuous Electron Beam Accelerator Facility
CFR	Code of Federal Regulations
COD	Chemical Oxygen Demand
COE	U.S. Army Corps of Engineers
CRRP	CEBAF Radiation Review Panel
CSO	CEBAF Site Office - DOE
CX	Categorical Exclusion
DEQ	Virginia Department of Environmental Quality
DOE	U.S. Department of Energy
DOELAP	DOE Laboratory Accreditation Program
EA	Environmental Assessment
EH-24	DOE Headquarters Office of Environmental Audit
EH&S	Environment, Health, and Safety
EML	Environmental Monitoring Laboratory
ENVPD	Environmental Protection Division - Oak Ridge DOE
EPA	Environmental Protection Agency
EPIP	Environmental Protection Implementation Plan
EPPP	Environmental Protection Program Plan
ES&H	Environment, Safety, and Health
FONSI	Finding of No Significant Impact
FY	Fiscal Year
GPMP	Groundwater Protection Management Program
HRSD	Hampton Roads Sanitation District
HWC	Hazardous Waste Coordinator
I&C	Instrumentation and Controls
IH	Industrial Hygiene
LAFB	Langley Air Force Base
LDR	Land Disposal Restrictions
M&O	Management and Operations
MSL	Mean Sea Level
NASA	National Aeronautics and Space Administration
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOV	Notice of Violation
NPDES	National Pollutant Discharge Elimination System
ORO	Oak Ridge Operations (Office) - DOE
ORPS	DOE Occurrence Reporting and Processing System
PP	Pollution Prevention
RADCON	Radiological Control
RCG	Radiation Control Group
RCRA	Resource Conservation and Recovery Act
SA/QA	Self Assessment/Quality Assurance
SARA	Superfund Amendments and Reauthorization Act
SER	Site Environmental Report
SPCC	Spill Prevention, Control, and Countermeasure (Plan)
SQG	Small Quantity Generator
STAR	Scientific and Technological Assessment Report
SURA	Southeastern Universities Research Association, Inc.
TLD	Thermoluminescent Dosimeter
TOC	Total Organic Carbon
VARC	Virginia Associated Research Campus
VPA	Virginia Pollution Abatement (Permit)
VPDES	Virginia Pollutant Discharge Elimination System
WMin	Waste Minimization

2 CONTINUOUS ELECTRON BEAM ACCELERATOR FACILITY
4 SOUTHEASTERN UNIVERSITIES RESEARCH ASSOCIATION
 Newport News, Virginia

6 ENVIRONMENTAL PROTECTION PROGRAM PLAN

10 SECTION 1
12 CEBAF OVERVIEW

14 An important objective in the successful operation of the Continuous Electron Beam Accelerator
16 Facility (CEBAF) is to ensure protection of the public and the environment. To meet this
18 objective, the Southeastern Universities Research Association, Inc., (SURA) is committed to
 working with the U.S. Department of Energy (DOE) to develop, implement, and manage a
 sound and workable environmental protection program at CEBAF.

20 1.1 BACKGROUND

22 For several years nuclear science recognized the need for an electron accelerator with a
24 continuous beam and an energy in the multi-billion electron volt region in order to pursue studies
26 of nuclear structures and behaviors and the forces governing the clustering of individual
28 nucleons in the nuclear medium. In 1983, the Nuclear Science Advisory Committee of the DOE
30 and the National Science Foundation appointed a Panel on Electron Accelerator Facilities to
32 review and evaluate electron accelerator proposals to meet this need and to recommend the
34 facility that would best satisfy the United States' requirements for basic nuclear research with
 electromagnetic probes. The SURA proposal for the construction of an accelerator capable of
 providing high-duty-factor beams throughout the energy range from 0.5 to 4.0 billion electron
 volts was accepted. SURA signed a Research and Development contract with the DOE in
 August 1984 and a Management and Operations (M&O) contract in April 1988. A new M&O
 contract became effective on July 1, 1995.

36 In September 1985, the DOE directed CEBAF management to proceed with a Scientific and
38 Technological Assessment Report (STAR) on superconducting RF (radio frequency) linac
40 technology. In November 1985, the STAR review committee determined that superconducting
42 RF technology was appropriate for CEBAF and on December 4, 1985, the DOE requested that
 superconducting RF technology be used for CEBAF. This technology was the focal point of the
 Conceptual Design Report (February 1986). Construction began in February 1987.

44 An Environmental Assessment (EA) was completed in January 1987 resulting in a Finding of No
46 Significant Impact (FONSI). The EA was reviewed in November-December 1989 and again in
48 September 1993 to determine whether any significant changes had occurred at CEBAF that
50 would affect the FONSI. These EA reviews indicated that, though some changes had occurred,
 the project had not exceeded the EA analysis envelope and that the FONSI was still valid. No
 changes have occurred since that review that significantly impact the environment. The
 National Environmental Policy Act's (NEPA) categorical exclusions for some environmental
 activities have been approved and are discussed in Section 3.3.

52 1.2 REGIONAL OVERVIEW

54 CEBAF is located in Newport News, Virginia. The city is bounded on the east by York County
56 and the city of Hampton; on the northwest by the city of Williamsburg and James City County;
58 on the southwest by the James River; and on the southeast by Hampton Roads and the city of
60 Norfolk. CEBAF is located just east of Jefferson Avenue, less than one mile to the west of
62 Interstate 64. Refer to Exhibit 1-1 for a regional view. Also, within a one mile radius are two
schools, a cemetery, and tracks of the railroad. The site is just south of Oyster Point Road and
just north of Oyster Point Industrial Park. Newport News-Williamsburg International Airport
is located two miles north of the site.

64 1.3 SITE HISTORY

66 Approximately 162 acres comprise the DOE-owned CEBAF site. Prior to CEBAF being located
68 in Newport News, Virginia, there were several former users of this general area. Immediately
to the east of the CEBAF site, a Bomarc missile site existed during the early 1960's. Eight wooded
70 acres of this area are used for the project. At the site of the Space Radiation Effects Laboratory
(SREL), formerly operated by the National Aeronautics and Space Administration (NASA),
72 there was a 600 million electron volt synchrocyclotron present from 1964 through 1980. The
110 acre NASA site was transferred to the DOE ownership. To complete the 162 acre site,
44 acres of land owned by the city of Newport News were conveyed to SURA in
74 December 1986. This acreage was subsequently conveyed to the DOE in January 1987.

76 Adjacent to the 162-acre site, SURA retains approximately 44 acres for future activities and a
SURA dormitory which is used by guests, visitors, users, and graduate students. Also adjacent
78 to the 162-acre DOE-owned site is a 68-acre parcel owned by the Commonwealth of Virginia
and leased to SURA for its use in support of CEBAF. The main building, the Virginia
80 Associated Research Campus (VARC), and the immediate surrounding area are sub-leased to
the DOE by SURA. Exhibit 1-2 shows the CEBAF site proper.

82 Review by SURA of historical aerial photos of the site and available documentation of prior
84 uses has revealed no evidence of waste disposal or large-scale hazardous materials storage or
use on the DOE property.

88 1.4 NATURAL SETTING

90 CEBAF is sited in the north-central section of Newport News, Virginia, at an average elevation
of 34 feet above-mean sea level (MSL). The CEBAF site is located in the coastal plain of the
92 lower York-James Peninsula, which is characterized by a succession of plains and intervening
scarps. This site is located on the Huntington Flat. It is underlain by the clayey-sand and sand
94 facies of the Columbia Group that represent an aggregate surface formed by the ancestral
James River during the late Pleistocene age. It is composed of four formations, the Tabb, Shirley,
96 Chuckatuck and Windsor. The Columbia Group is underlain by the Yorktown Formation, which
is composed of marine sand, silt, and shells deposited during the Pliocene age.

98 Three major aquifers are present on the site. (1) The uppermost hydrostratigraphic unit
100 encountered at the site is the water table aquifer, which is composed of sediments of the
Columbia Group, (2) an upper artesian aquifer in the lower, coarser Yorktown Formation, and
102 (3) a principal artesian aquifer. The unconfined aquifer present in the Yorktown Formation has
a low yield, with thickness ranging from 15 to 30 m (50 to 100 ft.) below the ground surface.
104 The principal artesian aquifer is present in sediments of the Cretaceous period.

site plans/B&W/Bgen.maps/areamap10Bjm 112/1/94

SITE PLAN

CEBAF

- Boundaries of DOE Owned or Leased Property
- - - Boundaries of SURA Property

0 60 120 180
 Scale: 1 cm = 60 m

The site is located in the watershed of Brick Kiln Creek, which discharges to Big Bethel Reservoir. Big Bethel Reservoir is operated by the U.S. Army and provides drinking water to Ft. Monroe, Langley Air Force Base (LAFB), and the NASA-Langley Research Center. No perennial streams are present on the site. An ephemeral stream flows from on-site drainage channels to Brick Kiln Creek. The site was originally poorly drained, with drainage patterns heavily influenced by previous construction. Localized ponds that occur during periods of heavy precipitation are drained by surface runoff and groundwater recharge. The site elevation ranges from 27 to 38 feet above MSL, which is above the 100-year floodplain level of 13 feet above MSL.

The forests on the site are mainly of two types: oak-loblolly pine and loblolly pine. Loblolly pine makes up less than 20% of the canopy in this forest type on the site. Hardwood species include southern red oak, swamp chestnut oak, white oak, water oak, red maple, sweetgum, yellow poplar, and others. The understory is sparse and includes, among other species, numerous highbush blueberry, some sourwood, and scattered American holly, greenbrier, and Japanese honeysuckle.

Animals that need ground vegetation are not overly abundant although the site has some wooded areas. There is little ground cover in the wooded areas and in previous construction areas vegetation is limited. There are a few pockets of year-round water, so amphibians such as frogs, toads, and salamanders do take up residence. Arboreal wildlife species are plentiful, and include squirrels and many species of birds. Bird species observed include pileated woodpeckers, downy woodpeckers, killdeer, and common crows as permanent (year-round) resident species at the site.

The meteorology of the site is strongly affected by the nearby marine environment. The Chesapeake Bay moderates the climate and weather, with land-sea breezes dominating the wind patterns during much of the year. The mean monthly temperature at the Norfolk International Airport, the closest and most representative National Weather Station, ranges from about 6°C (41°F) in January to 26°C (79°F) in July. The record low temperature is -17°C (2°F) while the record high temperature is 39°C (103°F). The average yearly temperature is 15°C (59°F). Normal annual precipitation is 110 cm (43 in.), spread evenly throughout the year. Extreme precipitation events, caused by hurricanes or tropical cyclones, have deposited as much as 30 cm (12 in.) of rain in 24 hours on the area. Average annual snowfall is 18 cm (7 in.), but up to 35 cm (14 in.) has fallen in a month. Because of the proximity of the bay, fog is common in the area. Heavy fog, reducing visibility to less than 0.4 km (0.25 mile), occurs an average of 23 days/year.

Severe weather, as thunderstorms, occurs for short periods during an average of 37 days/year. Tornadoes are rare in coastal Virginia but may be spawned by severe thunderstorms, either during spring, when associated with frontal activity, or during summer and early fall, when associated with hurricane or tropical-cyclone activity. Hurricanes average less than one per year in Virginia.

1.5 DEMOGRAPHY

A portion of the CEBAF site, which is just north of Oyster Point Industrial Park, was previously occupied by a 600-MeV proton synchrocyclotron operated by NASA in the building that is now called the Test Lab. Thus the community is accustomed to the presence of an accelerator in this location.

160 Data from the 1990 Census of Population shows the CEBAF site to be located in a heavily
162 populated census tract. The city of Newport News grew from a population of 144,903 in 1980
164 to 170,045 in 1990. The current estimated city population is 180,463. CEBAF is located in
Neighborhood Statistical Area 15. The Hampton Roads Standard Metropolitan Statistical
Area includes all southside (e.g. Norfolk and Chesapeake) and peninsula (e.g. Newport News
and York County areas).

166 1.6 MISSION AND PROGRAM

168 CEBAF houses a high intensity, continuous wave electron accelerator for nuclear physics
170 research. Its principal scientific goal is to understand the quark structure of the nucleus and the
172 behavior and clustering of individual nucleons in the nuclear medium, and simultaneously to
understand the forces governing this behavior.

174 To achieve this goal, CEBAF has designed and completed construction of a world-class electron
176 accelerator facility. Accelerator commissioning activities continue in 1995 and low power
178 operations are underway to serve the nuclear physics research community. Power levels are
180 maintained within a controlled DOE-approved Accelerator Safety Envelope. Implicit in the
182 scientific goal is the support of the facility users, the conducting of an in-house research
184 program using CEBAF and complementary facilities, and the continuous improvement of the
accelerator and experimental equipment to keep pace with the needs of the users. The design
and construction of conventional and support facilities, the north and south linacs (linear
accelerators), recirculation arcs, end stations, switchyard, tunnels, beam dumps, counting
house, central helium liquefier, offices, shops and laboratories, support the primary mission of
CEBAF.

186 With the initiation of a quality movement at CEBAF in 1993, a Laboratory mission statement
188 was developed: "CEBAF's mission is to provide forefront scientific facilities, opportunities,
190 and leadership essential for discovering the fundamental nature of nuclear matter, to partner
192 with industry to apply its advanced technology, and to serve the nation and its communities
through education and public outreach, all with uncompromising excellence in environment,
health, and safety."

194 1.7 CEBAF ENVIRONMENTAL POLICY

196 "CEBAF is committed to the preservation, protection and where possible, the
198 enhancement of our environment in all areas of operations. This includes the
200 obvious goals of meeting or exceeding all applicable local, state, and federal
202 requirements, as well as fostering responsible stewardship by our personnel of all
204 natural resources both in the workplace and at home in the community. CEBAF
promotes a proactive policy in environmental matters - one that anticipates and
addresses problems before they become a regulatory matter. As part of the
community, CEBAF has been and will remain committed to this policy which
makes not only ecological, but economical sense."

206 Responsible staff draft and propose policies through the CEBAF Environment, Health, and
208 Safety (EH&S) Manual chapter development process. The policies are reviewed within the
organization, as well as by the CEBAF EH&S Committee and the laboratory Director's Council.
The Director provides the final level of review and approval.

214 SECTION 2
216 ORGANIZATION AND RESPONSIBILITIES

218 2.1 THE DEPARTMENT OF ENERGY (DOE)

220 The DOE Oak Ridge Operations (ORO) Office has overall responsibility for all environmental
222 monitoring, compliance, and protection activities at CEBAF. Within ORO there are two
organizations with specific responsibilities for these activities; these are:

- 224 1. The Oak Ridge Environmental Protection Division (ENVPD);
226 2. The CEBAF Site Office (CSO).

226 The ENVPD provides technical support to implement the appropriate requirements of
228 environmental protection programs. The ENVPD is divided into two branches: the
230 Environmental Operations branch and the Environmental Remediation branch. The
232 Environmental Operations branch covers areas, such as the Clean Air and Water Acts, the
234 National Environmental Policy Act, and radiological requirements. The Environmental
Remediation branch is responsible for activities that include groundwater programs, Resource
Conservation and Recovery Act (RCRA) activities and remedial actions. A further
responsibility delineation is presented in the current Environmental Protection Implementation
Plan (EPIP).

236 The CSO is responsible for oversight of the CEBAF Environmental Protection Program. Key
238 positions in the CSO include the Site Office Manager, Deputy Manager, and the ES&H Manager.
240 A detailed breakdown of the CSO responsibilities and authorities is presented in the EPIP.

242 2.2 SOUTHEASTERN UNIVERSITIES RESEARCH ASSOCIATION

244 SURA is the management and operations contractor for CEBAF and has the responsibility for
246 conducting environmental protection program activities including laboratory analysis, data
management and reporting, waste management and minimization activities, and the
248 management of pollution prevention systems. SURA assures that subcontractors performing
services requiring certification (e.g. sampling, analyzing, and refrigerant recovery) appropriately
250 certify their work in accordance with the applicable requirements. The CEBAF Director has the
responsibility for coordinating the preparation and development of all environmental policies
and plans for CEBAF. Within CEBAF, there are six organizations with responsibility for the
252 management, implementation, and conduct of environmental protection program activities
within their functional areas:

- 254 * The Directorate
256 * The Office of Project Management & Science Education
* The Office of Technical Performance
258 * The Accelerator Division
* The Administration Division
260 * The Physics Division

262 Portions of CEBAF EH&S Manual are still being written, but are used daily by laboratory staff.
EH&S responsibilities are overlapped and distributed with certain activities shared to

maximize resource utilization. The breakdown for all laboratory EH&S functions and responsibilities is presented here. The CEBAF Organization Chart is shown on Exhibit 2-1. The chart that reflects all staff that serve the facility in an EH&S role is shown on Exhibit 2-2.

Detailed environmental, health, and safety responsibilities for all staff with EH&S responsibility, which is everyone on the site, are or are being incorporated into the EH&S Manual. The general environmental responsibilities for EH&S personnel are presented in the EPIP. A summary of roles that have specific responsibilities for environmental protection programs are presented here.

Laboratory Director

- establish labwide vision for the environmental protection program;
- lead the laboratory in establishing commitments to the preservation, protection, and where possible, the enhancement of our environment in all areas of operations;
- establish environmental protection policy;
- respond to environmental protection interests, including task teams;
- approve and interpret environmental directives;
- review laboratory environmental management guidance.

Associate Directors

- assist in policy development with input from their staff;
- practice and share environmental protection vision with staff;
- take on program responsibility for issues primarily focused in own division;
- address and comply with environmental protection policies and directives;
- establishment and maintenance of programs for environmental protection;
- provide policy implementation advice;
- ensure compliance with policies, directives, laws and regulations;
- establish mechanism to ensure supervisors and employees have adequate knowledge in EH&S areas.

Division EH&S Officers

- advise division management on environmental protection matters;
- stop activities which pose an imminent threat to the environment;
- review requisitions for materials that fall into the hazardous or extremely hazardous substance category;
- work with division EH&S staff to implement environmental protection policy and programs;
- work with EH&S Reporting on environmental protection and compliance issues.

Supervisors

- ensure releases to the environment fall within acceptable levels;
- manage waste in accordance with policies and procedures;
- respond promptly to employee concerns about environmental protection.

SURA*/CEBAF ORGANIZATION

*SURA is a DOE M&O Contractor

EXHIBIT 2-2
CEBAF ENVIRONMENT, HEALTH & SAFETY PROGRAM SPECIALISTS

310 Laboratory Employees, Experimenters and Users

- be aware of environmentally unsound activities and notify appropriate supervisor;
- retain authority to stop activity which produces an imminent threat to the quality of the environment.

314 Associate Director for the Office of Technical Performance

- provide laboratory leadership, oversight, support and coordination of environmental matters;
- review requests from laboratory community and make recommendations to the laboratory Director.

320 Self-Assessment and Quality Assurance Group

- perform independent assessments of EH&S activities;
- coordinate responses to external EH&S assessments.

324 EH&S Reporting Group

- maintain non-radiological environmental permits, licenses and records;
- provide input to the formulation of environmental policies and manuals;
- interface with external agencies on environmental matters;
- assist line management in the implementation of environmental protection programs.

330 EH&S Policies and Manuals Group

- develop and maintain CEBAF environmental policies and manuals for approval by the directorate;
- assist line managers in the translation of these documents into suitable training programs and procedures.

336 CEBAF EH&S Committee

- promote uniformity in CEBAF environmental programs to the extent desirable;
- resolve institutional issues involving environmental factors;
- makes recommendations to the Director on all issues.

342 CEBAF Radiation Review Panel (CRRP)/As Low as Reasonably Achievable (ALARA) Committee

- advises the Radiation Control Group and senior management on matters of radiation safety, policy and procedures.

346 Radiation Control Group (RCG)

- maintain radiation related permits and licenses;
- ensure adequate shielding in all radiation areas.

350 Administration Division's Procurement and Plant Engineering Departments

- assure that construction contracts include environmental protection clauses.

SECTION 3

ENVIRONMENTAL PROTECTION PROGRAM STATUS

CEBAF complies with all U.S. Environmental Protection Agency (EPA) and the Commonwealth of Virginia environmental regulations, including those addressing the protection of public health, as well as applicable DOE guidance. CEBAF will continue to develop programs and procedures to protect the environment and public health based on a combination of external requirements and internal best management practices.

3.1 INDIVIDUAL PROGRAM SUMMARIES

All active and planned environmental protection programs, which also address public health issues, are summarized here.

Environmental Protection Implementation Plan (EPPP)

This plan directs and focuses on how CEBAF will address all environmental protection programs. It presents the current program, the responsible management function, and includes schedule and budgeting information.

Site Environmental Report

CEBAF prepares an annual Site Environmental Report (SER). The SER is prepared by the EH&S Reporting Group, with contributions from appropriate management throughout CEBAF. CEBAF transmits the SER to the CSO who provides it to federal, state, and local public interests. As construction is complete, and commissioning and low power operations are underway, the document emphasis is on the radiological monitoring program.

Environmental Protection Program Plan

The Environmental Protection Program Plan (this document) is a master document that CEBAF uses to incorporate the relevant elements of the CSO/CEBAF Environmental Protection Program. It includes:

Long Range Environmental Protection Plan

CEBAF's plan covers a five-year horizon and has four key objectives for meeting its goal to protect the environment. See Section 5.

Groundwater Protection Management Program Plan

This program has been formulated to ensure protection of the groundwater from pollution. The RCG and EH&S Reporting have coordinated the development of this program. Refer to Section 6.1.

Waste Minimization Program Plan

CEBAF is continuing to develop a waste minimization program by reviewing other programs, utilizing DOE guidance, and by soliciting suggestions for waste minimization. Minimization of all forms of waste is a goal of CEBAF, and most minimization techniques can be applied to all categories of waste. Refer to Section 6.2.1 for further discussion.

404 **Pollution Prevention Awareness Program Plan**

406 CEBAF has established a program for training employees in pollution prevention
408 awareness. Refer to Section 6.2.2 for the program discussion.

410 **Environmental Monitoring Program**

412 CEBAF's environmental monitoring program has two major components. The
first consists of characterizing sources of pollution. The second component is to
414 analyze the spread of pollutants to the boundaries of particular sites and
beyond, if necessary. This involves measurements and samples taken primarily
416 from a network of groundwater monitoring wells. The program has two phases:
Preoperational Monitoring Program - scheduled to end 12/31/95 and
Operational Monitoring Program - scheduled to start 1/1/96. Meteorological
418 and hydrological data will be acquired as necessary as a part of this plan. Refer
to Section 4.

422 **Environmental Quality Assurance (QA) Program**

An Environmental QA program that addresses each element of CEBAF's
424 environmental monitoring and surveillance program is being written as
chapter 6712 of the EH&S Manual. The EH&S Reporting Group works with the
426 DOE to assure that any procedures and records generated are consistent with
the applicable guidance from DOE Order 5700.6C and CEBAF's QA program.

430 **ALARA Program**

The ALARA Program as provided in the RADCON Manual is predicated on the
432 premise that no radiation exposure will be allowed without corresponding
benefit. It calls for a cost versus benefit analysis for processes which alter
434 radiation exposure levels. This is applied to release of radioactivity to the
environment. The selection of best available technology for reducing the
436 radioactivity content of effluent is balanced against projected impact of
exposure to the general population.

438 Initial ALARA training shall be provided to a cognizant subset of line managers.
440 The training is being expanded to include techniques for minimization of
radioactive waste and avoiding creation of mixed waste.

444 **3.2 PROGRAM OBJECTIVES**

446 The goals in preserving and protecting the environment and public health are achieved
by meeting or exceeding all applicable local, state, and federal requirements.

448 The current environmental protection program implementation plan has these basic
450 objectives:

- 452 1. Review new conditions that may require permitting actions;
- 454 2. Ensure that all permits are maintained by producing reports or notifications
for local, state, and federal agencies in a timely manner;

3. Establish an on-site environmental baseline (physical, chemical, radiological, and biological) through end of 1995 that accurately characterizes preoperational environmental quality;
4. Monitor Laboratory support activities (beginning FY 1990) and accelerator commissioning and operations (beginning FY 1994) to ensure that planned effluent releases (radioactive and non-radioactive) are within established standards;
5. Minimize or eliminate the use of hazardous substances;
6. Implement contingency plans and ALARA measures to prevent effluent releases and to minimize and control environmental consequences of planned or unplanned effluent releases (radioactive and non-radioactive).

As part of the activities for assuring a safe, healthy, and environmentally responsible facility, CEBAF has conducted an Accelerator Readiness Review (ARR) process. The purpose of the ARR activity was to assure that CEBAF was ready at each stage for conducting tests, commissioning, and operations in a safe, healthy, and environmentally sound manner. The process was a systematic and comprehensive self assessment that examines the status of equipment, personnel, and procedures with an emphasis on safety, worker and public health, and environmental protection. It was being conducted in four phases as equipment was installed and integrated into the machine system. The results of each self assessment was presented before a fully independent peer review committee to assure completeness in the process.

Reviews of proposed modifications or new facilities during early planning are to be conducted and documented by the EH&S Officers within their functional area with concurrence by the EH&S Reporting Office on special issues to ensure that there will be no adverse environmental impacts. These issues are being developed along with the relevant EH&S Manual chapters.

CEBAF's EPPP is currently on track and in good stead. CEBAF, through the CSO, has applied for and obtained all environmentally related permits and other sanctions for CEBAF construction and operation. Permits are maintained and updated, and reports/notifications produced as necessary. The Environmental Assessment (EA) provided information and guidance regarding environmental considerations.

3.3 ENVIRONMENTAL ASSESSMENT

An EA was prepared by the DOE for the Newport News location and alternative sites in January 1987. The conclusion of the review of the report for the Newport News site was that "no significant environmental impacts are predicted;" consequently, an Environmental Impact Statement was not necessary. Highlights of the Newport News CEBAF site EA are summarized:

- Air quality in the vicinity of CEBAF would be negligibly affected by local, short-term emissions of fugitive dust, vehicle and equipment exhaust, and solvent fumes. A non-significant amount of cooling tower drift may deposit downwind of the site;
- Groundwater levels at the proposed site could be lowered by dewatering during construction and by dewatering in the end station area;

- The potential exists for induced radioactivity in groundwater and soils; however, proper design and careful operation of the accelerator will minimize this potential, and no significant impacts are expected;
- Storm water runoff and discharge from site drainage during construction could potentially introduce contaminants into nearby waterways. Good construction and engineering practices will minimize impacts;
- Some erosion and alteration of topography is likely;
- Species present are not endangered or threatened, and no environmentally-sensitive areas requiring protection were identified;
- Ambient noise is expected to increase but will not affect any sensitive receptors;
- No significant atmospheric releases of radionuclides are expected from the operation of CEBAF.

In November 1989, CEBAF reviewed the EA at DOE's request and analyzed significant technical, operational, and construction changes to the project to ascertain that the EA and the Finding Of No Significant Impact (FONSI) were still valid. The review concluded that no changes had occurred which compromised the basis of the project's environmental documentation and status.

In December 1989, at the request of the Under Secretary, DOE, a review of CEBAF's NEPA documentation was conducted to determine its adequacy in light of increased Departmental priority in this area. Areas assessed during the review were: commitments made in the EA, recent changes in regulation and policy, and changes to the project and site since the EA. The review by the CSO, SURA, and an independent consultant concluded that the NEPA documentation was still current and sufficient.

CEBAF performed a NEPA review in September of 1993. The majority of NEPA related activities still fall under the EA. A summary of changes, none of which significantly impact the environment, was forwarded to the DOE. No significant changes have occurred since that review.

CEBAF has developed a program for reviewing activities for NEPA compliance. CEBAF has identified a number of areas where NEPA exclusions apply. There are seven active categorical exclusions (CXs), that are listed in Exhibit 3-1. The regulations will be reviewed annually to determine other activities being performed that may be covered by a CX. If found, CEBAF will apply to the DOE for approval.

3.4 ENVIRONMENTAL PERMITS

A number of environmental permits, identification numbers, and other sanctions have been obtained for CEBAF in a timely fashion. Local, state, and federal agencies were all involved in this process. The Commonwealth of Virginia has been delegated to have primary responsibility for most federal environmental regulatory programs. It operates through the Virginia Department of Environmental Quality (DEQ). Exhibit 3-2 lists the reports and notifications where information is shared annually or as required.

EXHIBIT 3-1
CURRENT CATEGORICAL EXCLUSIONS

DOE I.D. No.	Subpart D I.D.	Category
CEBAF-001-94	B 1.2	Training Exercises and Simulation Activities
CEBAF-002-94	B 1.5	Improvements to Cooling Water Systems
CEBAF-003-94	B 1.10	Routine Onsite Storage of Activated Material
CEBAF-004-94	B 1.11	Fence Installation Activities
CEBAF-005-94	B 1.15	Siting, Construction, and Operation of Small-Scale Buildings and Structures
CEBAF-006-94	B 1.16	Asbestos Maintenance and Removal Activities
CEBAF-007-94	B 3.1	Site Characterization and Environmental Monitoring Activities

Exhibit 3-3 presents notifications and reporting requirements that are either completed or there are no present reporting issues requiring action.

Reports or notifications are being produced as required and submitted to the appropriate agency via the CSO. Most of the active environmental documents presented in Exhibit 3-2 must be kept current, i.e., updates and/or reports are submitted monthly, quarterly, annually, or as necessary.

Following are descriptions of each current permit or permit application only.

**3.4.1 Industrial Wastewater Discharge Permit
Hampton Roads Sanitation District (HRSD)**

The permit was received in October 1987. Monthly sampling for chemicals selected by HRSD began in October 1989, but was discontinued at HRSD's request after one month. The Laboratory's permit was updated in September 1990 to include newly constructed facilities and facilities under construction. The permit was amended in March 1994 to reflect more representative flow discharges from the three monitoring areas.

The Industrial Wastewater Discharge Permit establishes a pH limit of no less than 5.0 for sewage leaving the CEBAF site. CEBAF monitors the pH through a subcontractor, who take grab samples and reports the data to CEBAF. The HRSD independently and randomly takes grab samples. Sampling is performed monthly. No violations of the pH limit have occurred.

Exhibit 3-2

PERMITS AND NOTIFICATIONS
Ongoing or Annual Issues

	Program Document	Class	Purpose	Status	Agency	Date Issued/ Completed	Effective Dates	Applicable Law
1	Industrial Wastewater Discharge Permit No. 0117	P	Limit wastes to be discharged to sewerage	Active	Hampton Roads Sanitation District	October 1987	March 1, 1993 - March 1, 1996	Clean Water Act; HRSD Industrial Wastewater Discharge Regulations
2	Virginia Pollution Abatement Permit No. VPA 01001	P	Specify maximum allowable groundwater activation on site. Assure groundwater unaffected at and beyond site boundary	Active	DEQ - Water Division	June 1989	June 1999	Safe Drinking Water Act; Virginia State Water Control Laws
3	Permit to Withdraw Groundwater No. GW 0030800	P	Allows dewatering of area under end stations	Active	DEQ - Water Division	Approved November 1, 1994	November 1, 1994 - October 31, 2004	Ground Water Management Act of 1992; Virginia State Water Control Laws
4	Cross-Connection & Backflow Prevention Program	R	Provide protection of potable water supply	Active	City of Newport News	May 1988	Annually in May	Safe Drinking Water Act
5	Above Ground Storage Tanks	R	Coordinate oil spill prevention under a SPCC Plan	Active	EPA	In internal review		10 CFR 110 and 112; Federal Water Pollution Control Act
6	Hazardous Chemical Inventory	N	Notification of emergency planning groups of chemical storage	Active	State and Local Emergency Response Groups			EPCRA
7	Air Pollution Sources	R	Update of Air Pollution Emission Sources	Active	DEQ - Air Division	December 1987	Annually in March	Clean Air Act; Virginia Air Pollution Control Laws
8	Planned Radionuclide Release		Registration of Planned Radiation Source		Dept. of Health; Bureau of Radiological Health			NESHAP; Virginia Radiation Protection Regulations
		N	Notification of construction activity	Complete		August 1987	Until Operations Started	
		N	Notification of start of operations	Active		February 1995	Upon Start of Operations	

Class Codes:

P: Permit

R: Report

N: Notification

Exhibit 3-3

PERMITS AND NOTIFICATIONS

No Present Issues

	Program Document	Class	Purpose	Status	Agency	Date Issued/ Completed	Effective Dates	Applicable Law
1	Hazardous Waste Activity Identification No. VA 7750090030	N	Manage generation of hazardous waste as a Small Quantity Generator	Active	DEQ - Waste Division	July 1987	As long as remain a SQG	RCRA; VA Hazardous Waste Management Regulations
2	NPDES/VPDES	P	Assure discharges to surface water preserve water quality	Active	DEQ - Water Division			Clean Water Act; VA State Water Control Laws
	Permit Application	P	During construction activities	n/a at present		Application submitted in October 1992	Determined not needed	
	Permit - Industrial use	P	During normal operation	n/a			Determined not needed in May '94	
3	Underground Storage Tanks	N	Identification of USTs	n/a	DEQ - Water Division	All removed		RCRA (Subtitle I); VA State Water Control Laws
4	Above Ground Storage Tanks	N, R	Coordinate oil spill prevention	n/a	DEQ - Water Division			Virginia Above Ground Storage Tank Regulations
5	Planned Radiation Source	N	Registration of planned radiation source	exempt	Department of Health, Bureau of Radiological Health	DOE prime contractors exempt May 1988	n/a	Virginia Radiation Protection Regulations
6	Unplanned Release Notifications	N	Provide emergency response groups with information about release	after a release	EPA; DEQ			CERCLA, EPCRA, Clean Water Act, VA Air Regulations; VA Water Regulations

Class Codes:

P: Permit

R: Report

N: Notification

596 All Notices of Violation (NOVs) and the 1994 Administrative Order are
discussed under Environmental Events in Section 3.12.

598
600 3.4.2 National Pollutant Discharge Elimination System Permit Application
DEQ, Water Division

602 Because of the extensive dewatering activities required for accelerator and end
604 station construction, the DEQ Water Division was queried about the requirement
for CEBAF to obtain a National Pollutant Discharge Elimination System
606 (NPDES) permit for direct discharge of the dewatering effluent. The DEQ
informed CEBAF in 1987 that no permit was required, as the discharge involved
uncontaminated groundwater.

608
610 The Clean Water Act of 1990 included more stringent requirements for control of
stormwater associated with industrial activity. Accordingly, CEBAF submitted
612 an NPDES application for stormwater discharge from construction activities to
the DEQ on October 22, 1992. In May 1994 CEBAF was informed by the DEQ
614 that a general industrial NPDES (now VPDES, as the state has been delegated
authority) permit for stormwater discharges was not required. CEBAF is aware
616 that with any new construction that disturbs five or more acres of land, a new
VPDES construction permit would be required.

618
620 3.4.3 Virginia Pollution Abatement Permit
DEQ, Water Division

622 The Virginia Pollution Abatement (VPA) Permit, (#VPA01001) issued by the
DEQ, Water Division, is to ensure that CEBAF's operations do not degrade the
624 quality of the offsite groundwater. Groundwater leaving the CEBAF site shall
not exceed the baseline groundwater parameters established during
626 preoperations. A well monitoring program provides the mechanism for making
this determination. The permit was issued on June 16, 1989.

628
630 Preoperational monitoring ends December 31, 1995. Operational monitoring
under this permit will start on January 1, 1996. A proposal to modify permit
632 terms and conditions that would apply when operational monitoring begins was
submitted in July 1995 to the DEQ.

634 3.4.4 Permit to Withdraw Groundwater
DEQ, Water Division

636
638 On December 6, 1989, the DEQ Water Division designated the Virginia Peninsula
as a Groundwater Management Area. A registration statement was prepared
and submitted by DOE to the DEQ Water Division to grandfather CEBAF
640 groundwater withdrawal activities in effect as of December 6, 1989. The
Certificate of Groundwater Right was approved by the DEQ
642 on October 30, 1990. This certificate allowed the continued withdrawal of up to
27,900,000 gallons of groundwater per month with the actual quantity
644 withdrawn substantially less than this value.

The Virginia General Assembly passed legislation during 1992 revising the conditions for all such certificates. CEBAF prepared an application in December 1992 for a revised Certificate of Groundwater Right, in accordance with the requirements of the DEQ under the Groundwater Management Act of 1992. After review, the DEQ determined that a permit was required. Permit No. GW0030800 was issued on November 1, 1994. It authorizes a total of 23,036,790 gallons to be withdrawn in a calendar year. The maximum that can be withdrawn in any calendar month is six million gallons. The normal withdrawal rates are on the order of 600,000 gallons per month.

3.5 CORPS OF ENGINEERS (COE)

Prior to and during the construction stages of the project, the COE had requested the submittal of CEBAF construction drawings and environmental permits for review. The COE was concerned with the following issues:

- The 'No Discharge Certificate', which later was issued as the VPA Permit, was of interest as the discharge of storm drainage from the CEBAF site reaches a local drinking water reservoir;
- The pumped groundwater from the end station dewatering would be discharged directly into the storm drainage system. The plans were reviewed to assure that silt control techniques were included, as this water flows to the subject reservoir;
- A gross beta radiation measurement that was later demonstrated not to be significantly different from other readings;
- The concern about the lack of an audible alarm at a wastewater lift station in the accelerator area that resulted in CEBAF incorporating it into the design.

Upon issuance of the VPA Permit, a copy was submitted to the COE.

3.6 FY 1991 ENVIRONMENTAL PROTECTION APPRAISAL

This environmental protection appraisal was conducted in January-February 1991 by the DOE ORO Office. The purpose of the appraisal was to evaluate the effectiveness of CEBAF's implementation of the environmental requirements imposed by the Commonwealth of Virginia, federal agencies, and the DOE. The appraisal identified no major regulatory nonconformance. One minor hazardous waste recordkeeping problem was the only environmental regulatory noncompliance issue. The appraisal assessed general environmental management proficiencies in air, water, asbestos, polychlorinated biphenyls, and hazardous waste issues. The assessments of environmental quality assurance and groundwater evaluation gave rise to numerous suggested improvements. These are still being addressed through the Office of Technical Performance's Self-Assessment/Quality Assurance (SA/QA) Group's tracking program.

3.7 ENVIRONMENTAL MANAGEMENT APPRAISAL

CEBAF's initial environmental management appraisal was conducted in March 1993 by the DOE Headquarters Office of Environmental Audit (EH-24). The goal of this appraisal was the verification of the management of environmental protection programs.

The final report of this March 1993 appraisal team concluded that CEBAF was meeting the permitting and regulatory requirements associated with the operation of the Laboratory. The appraisal also confirmed previous CEBAF environmental assessment activities. These CEBAF assessments noted the need for continuing the ongoing documentation and formalization of the various portions of the Laboratory's environmental protection program.

CEBAF's Action Plan addressed each of the findings. The findings noted have been delegated to an affected, responsible staff member to develop a complete corrective action plan for each applicable finding. This person is also responsible to report progress through the tracking program mentioned above. Action items are still being addressed.

3.8 ORO MANAGEMENT APPRAISAL OF ES&H AND QA

In March of 1993, the ORO appraisal team evaluated how CEBAF met performance objectives in organizational structure; corporate culture, and policy; communication; facility management; training and certification; DOE and regulatory requirement control; self-assessments; performance measurement; occurrence reporting and tracking. No threats to public health or environment were found. Some findings remain open and are being addressed as noted above.

3.9 ORO MULTIDISCIPLINARY FUNCTIONAL APPRAISAL

This appraisal, which focused on ES&H and QA issues, was conducted by the DOE ORO Office and took place from April 25 to May 13, 1994. There were a number of environmental deficiencies noted, including lack of or incomplete documentation and improper performance of procedures. Findings and corrective actions continue to be addressed through the Self-Assessment/Quality Assurance Group as noted in 3.7 above.

3.10 CONTRACTING OFFICER'S REPRESENTATIVE SUMMARY PERFORMANCE APPRAISAL

This appraisal is provided by the CSO on an annual basis. The CSO objectives for SURA for 1995 stressed the necessity for additional addressing of environmental issues. No threats to the environment were noted. The findings are being addressed as noted above.

3.11 RADON LEVELS ASSESSMENT

CEBAF buildings were checked for radon levels between December 1988 and January 1989. The EPA has set a level of four picocuries per liter of air as the recommended maximum acceptable reading for radon in residential buildings. Radon levels in CEBAF's buildings are within these limits. In addition, the U.S. Department of Energy sponsored a radon survey of DOE facilities. As part of this survey, nine detectors were provided for positioning in CEBAF buildings. The detectors were positioned, and the ninety day sampling period started in November 1989 and was completed in February 1990. This survey also indicated levels at CEBAF are well within

the EPA guideline (four picocuries per liter of air). Most recently, radon tests were conducted in CEBAF's underground accelerator and end stations during December 1991; all results were less than the guideline level. There are no plans to perform additional testing at this time.

3.12 ENVIRONMENTAL EVENTS

Occurrences: There were no CEBAF activities during 1993, 1994 nor 1995 to date that created significant problems with respect to radioactive or nonradioactive pollutants.

There were two events that occurred in CY 1992. Neither incident presented a potential for significant on-site or off-site environmental damage and both were reported to the DOE Occurrence Reporting and Processing System (ORPS) as OFF-NORMAL (lowest of three severity levels) events.

- The first event, the leaking of a drum containing a waste acid mixture, occurred in a bay at the Acid Storage Building, and was noticed as the transport subcontractor was preparing to load the drum onto the truck. The 55 gal. drum contents were fully contained in a secondary containment area. Immediate actions included vacating the area, restricting access, and summoning site management and the onsite Chemical Assistance Team, who neutralized the spilled acid. An environmental services firm removed and packaged the neutralized chemical and restored the area. The need for drum testing and written procedures for chemical containment structures was addressed.

- The second event was the rupture of a discharge line on a recently relocated Kinney pump inside the Central Helium Liquifier building. The guard notified the appropriate laboratory staff. Immediate action included pumping oil from the building floor and placing oil dry sorbent on pavement areas. Approximately 40 gals. of oil were recovered from the building floor and approximately 20 gals. were absorbed on the outside pavement. No oil was transported offsite via storm or other drains. Procedures to address proper installation of equipment were addressed by line management.

NOVs: There were four NOVs of CEBAF's Industrial Wastewater Discharge Permit during CY 1992 and 1993, one Administrative Order in 1994, and one NOV in 1995 to date. Two of the NOVs were for submittal date discrepancies, and had no environmental effect.

- A February 1992 HRSD sample of the wastewater from the Accelerator site and the Experimental Equipment Laboratory building (combined) was analyzed by HRSD and found to exceed 0.5 mg/l zinc. CEBAF received a NOV in May 1992. Until the NOV was received, CEBAF was not aware that HRSD had placed this limit for zinc, which is a factor of 10 lower than the Federal Drinking Water Standard. The current regulations do state a 5.0 mg/l daily maximum and a 2.0 mg/l monthly average for zinc.

- A February 1993 NOV resulted from a November 20, 1992 cadmium level of 0.119 mg/l versus a permit limit of 0.1 mg/l. Efforts were made by CEBAF staff to determine the cause of the slightly elevated cadmium level and a February 12, 1993 cadmium discharge. Speculation leads to a possible QA/QC error by the HRSD laboratory conducting analysis or perhaps a one time onsite discharge. No cause was determined and there has been no recurrence of this anomaly.

- 804
- 806 • A March 1994 Administrative Order was received. It addressed potential
808 discharges to floor drains from oil containing equipment. An action plan to ensure
that no unsuitable discharges could migrate to floor drains was instituted and all
items completed in 1994.
 - 810 • A February 24, 1995 NOV addressed the lack of timely performance of calibration
812 of permitted meters. One meter certification was submitted late and two electronic
meters certifications were not performed, as believed to not be necessary. The
814 calibration of the electronic meters was completed in September 1995.
- 816 Upgrade: All groundwater monitoring wells were brought up to current quality
standards to ensure long term monitoring stability in 1995.

818

820 **SECTION 4**

822 **ENVIRONMENTAL MONITORING PROGRAM AND PLAN**

824 **4.1 INTRODUCTION**

826 SURA uses environmental monitoring as a primary method to ensure a strong environmental
protection program. The program continually assesses the environment within the CEBAF site.
828 Monitoring encompasses all potential effluents from facility activities. Monitoring activities are
selected to be responsive to both routine and potential releases of effluents unique to CEBAF.

830 CEBAF's monitoring program is designed to verify that planned radiation exposures, as well as
832 non-radioactive effluent releases, are below permissible limits and that Laboratory support
activities and accelerator commissioning and operations have not affected the environment's
834 quality.

836 Environmental monitoring is accomplished in two parts: effluent monitoring and environmental
surveillance. Environmental monitoring may over time provide useful information about
838 CEBAF's operational performance. This program's final home will be in Chapter 6711 of the
EH&S Manual, which is now in development. It will be reviewed annually and upgraded every
840 three years. The EPPP will continue to include the program's Plan.

842 The program is also divided into two functional areas, dependent on accelerator operational
activities: preoperational monitoring and operational monitoring. The preoperational
844 monitoring program has been underway since 1989 and will continue through
December 31, 1995. The operational monitoring portion of the program will commence on
846 January 1, 1996.

848 **4.2 OBJECTIVES AND GOALS**

850 **4.2.1 Overall Program Objectives**

852 The primary objective of the CEBAF Environmental Monitoring Program is to establish a
854 strategy for environmental monitoring and surveillance in accordance with legal and regulatory

requirements and to provide data to support environmental management decisions. This program documents a sitewide monitoring and surveillance plan that assesses the effect of past, current, and future CEBAF activities by measuring and monitoring effluents from facility activities, accelerator operations, and by surveillance through measuring, monitoring, and calculating the effects of those activities and operations on the environment and public health. Effluent monitoring shall be conducted to satisfy the following program objectives:

- Verify compliance with applicable federal, state and local effluent regulations and DOE environmental protection policies and requirements;
- Determine compliance with commitments made in Environmental Assessments or other official documents;
- Evaluate the effectiveness of effluent handling and controls;
- Identify potential environmental problems and evaluate the need for remedial actions or mitigative measures;
- Monitor compliance with permit conditions and to provide data for permit revisions and or new permit requests'
- Detect, characterize, and report unplanned releases.

Environmental screening is being completed in the course of the preoperational monitoring program. As accelerator operations and experimental work are the potential sources of effluents, a long term surveillance program is planned and defined in the operational monitoring program. This environmental surveillance program has the following objectives:

- Verify compliance with applicable environmental laws and regulations;
- Verify compliance with environmental commitments;
- Characterize and define trends in the physical and chemical condition of environmental media;
- Establish an environmental quality baseline;
- Provide a continuing assessment of pollution abatement programs;
- Identify and quantify new or existing environmental quality programs.

Determination of sampling frequency and type will be based upon specific facility needs. Effluent monitoring shall be conducted to provide representative measurements of the quantities and concentrations of pollutants in liquid and airborne discharges and in solid wastes. Standard collection and analysis methods will be used.

Because CEBAF is a unique facility, the degree of environmental assurance that our activities require was a consideration in the determination of a plan for monitoring. The monitoring plan is consistent with facility needs along with regulatory requirements and applicable DOE directives. Auditable monitoring records are kept in accordance with the requirements of the CEBAF Quality Assurance Plan and Chapter 6712, Environmental Quality Assurance, of the CEBAF EH&S Manual. This program shall serve as a management tool to support decisions about future activities and operations.

4.2.2 Special Preoperational Program Objectives

SURA and the DOE have taken over land and facilities that were occupied previously and used for a number of different purposes. This previous use and the significant development in the

area just beyond our site boundary may have led to various kinds of contamination within the site boundary.

The objective of the preoperational monitoring portion of the program is to perform a study of environmental issues prior to the start of regular operations of the CEBAF accelerator. The contents of the study include the elements to:

- characterize existing physical, chemical and biological conditions that could be affected;
- establish background levels of radioactive components;
- characterize pertinent environmental and ecological parameters;
- identify potential pathways for human exposure or environmental impact as a basis for determining the nature and extent of subsequent routine operational and emergency effluent monitoring and environmental surveillance programs.

The result of the preoperational program will be the delineation of the environmental baseline. This 'Environmental Baseline', the approved delineation of chemical, biological, physical and radiological characteristics, will represent the starting level to evaluate the effects of CEBAF's operations on the environment. The end of 1995 will end the data input to the baseline.

This is being accomplished by conducting environmental surveillance prior to full accelerator operations. Environmental monitoring is being performed as integrated sections of the accelerator are brought on-line for testing, commissioning, and low power operations. Any noted differences from the baseline or expected changes to conditions will be investigated so that effects to the environment's quality are not indicative of an undesired state or trend.

Future measurements will be compared with this baseline to enable a solid framework for making environmental management decisions. The latest hydrogeological report and program review concluded that no additional data collection, beyond what was already being done, was necessary to complete the environmental quality baseline.

4.2.3 Special Operational Program Objectives

The laboratory's primary environmental protection goal is to minimize disturbance within both the site limits and beyond the site boundary and have no effects on public health. Measurements will be taken, most according to State guidelines and permits, and will be compared with the baseline to determine effects, if any.

4.3 ORGANIZATION AND STAFF RESPONSIBILITIES

As the main environmental protection activity on the site is centered around accelerator operations, the RCG has taken the primary responsibility for managing environmental monitoring activities. The RCG is responsible to delineate the environmental status of all areas that could have potential radiological impacts. The EH&S Reporting Group coordinates program information for non-accelerator related activities. Active staff that have non-radiological monitoring responsibilities are:

- the RCG for the accelerator and experimental activity effects (monitoring of pH, TSS etc.);
- Plant Engineering for industrial wastewater requirements and boiler emissions;
- Accelerator Division EH&S staff for general environmental sampling for the site.

- 952 Line management is responsible to ensure that all staff and subcontractors performing sampling and/or analysis:
- 954 • are appropriately trained and/or certified to follow stated and written protocols for the assigned or contracted tasks;
- 956 • are using sampling and analysis protocols that are EPA-sanctioned or comparable methods approved by the DEQ;
- 958 • are appropriately addressing all quality assurance measures.

960 The CEBAF Radiation Review Panel will review environmental monitoring information for conformity with expected results on an ongoing basis. Results showing significant deviation will
962 be further analyzed.

964

4.4 MONITORING AND SURVEILLANCE PROGRAMS

966

4.4.1 Overall Program

968

970 Monitoring and surveillance shall be conducted to satisfy the program objectives and EH&S Manual policies, as well as programs and procedures as developed by line management.

972

4.4.1.1 Rationale

974

EFFLUENT MONITORING RATIONALE

976

Effluent monitoring shall comply with applicable regulations and shall be conducted to provide representative measurements of the quantities and concentrations of pollutants in liquid and airborne discharges and in solid wastes. Additional objectives are to:

978

- Provide monitoring stations to monitor influents and effluents in accordance with applicable regulations;

980

- Define sample collection programs that are adequate to characterize effluents and are representative of CEBAF needs;

982

- Utilize standard analyses whenever methods are required by regulatory programs. Conduct other analyses based on site-specific conditions;

984

- Provide auditable records of all monitoring data.

986

SURVEILLANCE RATIONALE

988

The scope of environmental surveillance encompasses all potential effluents, including chemical and radioactive materials. Surveillance activities are selected to be responsive to both routine and potential releases of effluents according to the severity of a possible impact on the environment or public health. Environmental surveillance provides for the measurement and interpretation of the impact of CEBAF operations on the public and the on-site and offsite environment.

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992

994

Numerous samples are collected and analyzed based on regulatory requirements and site programs. Measured concentrations of radioactive materials and chemicals are compared to applicable standards, concentration guides, natural levels, and previous results.

996

998

4.4.1.2 Environmental Issue Review

The site has been reviewed to address all media that could be affected by facility activities, including accelerator operations. All significant air, liquid, and solid waste discharges or releases requiring concern are addressed in this Plan, many involving radiological concerns. Monitoring requirements are in place for air emissions, groundwater quality maintenance, process water releases, as well as for hazardous and radioactive waste streams. CEBAF provides the capabilities to detect and quantify planned and unplanned releases of chemicals, oils, and radionuclides, consistent with the potential for offsite environmental or public health impact and to support consequence assessments as necessary.

On-site activities, even with proper controls, still have the potential to produce impacts on the environment. The main environmental pathways considered here include: air, groundwater, surface water, and soils.

The potential for airborne or liquid releases are evaluated and documented in this Program. Based on this documentation, effluents that do not have the potential for environmentally harmful or public health risk releases need no further discussion. Effluents and/or releases that have potential for environmental contamination or public health shall be monitored in accordance with regulatory and program requirements. Depending on programmatic changes, additional environmental characterizations will be performed on an as-needed basis.

Emissions and effluents that could result from the construction, commissioning, and operational activities at CEBAF include the following:

TYPE	MEDIA	SOURCE CATEGORY	ENVIR. RISK	PUBLIC HEALTH RISK	ADDRESSED ACTIONS
gaseous emission	air	diesel & gas vehicles	0	1	IH programs
		solvent & paint fumes	1	0	IH programs
		boilers	0 to 1	0	Fuel Use Tracked by Plant Engineering
		irradiated air venting	0 to 1	0	RADCON programs *
		cryogenic discharges	0	0	IH programs
		CFC releases	0 to 1	0 to 1	Tracked by Plant Engineering
		other chemical releases	0 to 1	0 to 1	IH and spill control programs
particulate emissions	air	cooling tower drift and fugitive dust	0 to 1	0	RADCON and IH programs

radio-nuclide emissions	air	accelerator operations	0 to 1	0 to 1	RADCON programs *
liquid effluents	surface water	dewatering operation	0 to 1	0 to 1	Plant Engineering Program
	surface water	sump pump effluents	0	0	RADCON programs *
	sanit. sewer	cooling tower blowdown	0	0	Industrial Wastewater Discharge Permit
	sanit. sewer	general indust. waste	0 to 1	0	Industrial Wastewater Discharge Permit
	sanit. sewer	irradiated process cooling water	0 to 1	0	Industrial Wastewater Discharge Permit *
solid wastes	air & ground	hazardous wastes	1 to 2	1 to 2	Haz Waste Program
	ground	special wastes	0 to 1	0 to 1	Waste Management Program
	ground	refuse	0	0	Plant Engineering Program
	air & ground	medical waste	0 to 1	0 to 1	Regulated Medical Waste Program
	ground	radioact. waste	0 to 1	0 to 1	RADCON programs
	ground	mixed waste	1 to 2	1 to 2	RADCON & hazardous waste programs
radio-nuclide emissions	ground water	accelerator operations & experimental programs	0 to 2	0 to 1	RADCON programs
oil spills	ground, & surface water	oil transfer operations, leaking equipment	0 to 2	0	SPCC Plan, Emergency Management Plan
chemical spills	sanit. sewer & ground	spills and leaks, transfer operations	0 to 2	0 to 2	Emergency Management Plan
noise levels	air	equipment	0	0 to 1	Plant Engineering Program

1028 * program results are included in SER

1030 Risk 0: no chance or insignificant risk

Risk 1: insignificant to small effects or risk

1032 Risk 2: small effects to medium hazard risks

1034 For radionuclide air emissions, all doses calculated for direct radiation exposure to the maximally exposed individual are well below boundary dose limits established for high energy accelerators by DOE.

1036

1038 Solid wastestreams are characterized and quantified by tracking usage and disposal
1040 quantities. Hazardous and non-hazardous waste manifests records are maintained. All
streams are identified and controlled as necessary according to existing and new policies
and procedures.

1042
1044 Significant impacts from radiological activity are not expected. The design and shielding
of the accelerator structure will minimize the uncontained beam energies.

1046 Only two hazardous chemicals are on site in significant quantities that require reporting
1048 under Superfund Amendments and Reauthorization Act (SARA) Title III. They are
hydrogen fluoride (as hydrofluoric acid) and nitric acid.

1050

Ecological Issues

1052 Characteristics for environmental and ecological parameters have also been identified.
They include the following areas of concern:

1054

1056 Wetlands - Pools that form during wet seasons support little aquatic vegetation. The
Corps of Engineers determined that these areas do not qualify as wetlands.

1058 Wildlife - There is no habitat for the two endangered species that could reside in this
1060 area, the bald eagle and the peregrine falcon. The U.S. Fish and Wildlife Service concurs
that only transient individuals of endangered or threatened species may occur at the
site.

1062

1064 Floodplain - The site ranges in elevation between 22' and 34' above mean sea level, with
all above the 100-year floodplain level of 12'.

1066 Aquatic resources - There were no permanent streams, ponds, or other aquatic habitats
1068 on or near the site prior to construction. One permanent stream at the dewatering site
now exists.

1070 Groundwater resources - Groundwater at the site is ample, with one layer being shallow
and influenced by site drainage. Dewatering at the end stations is performed and may
1072 result in lowering the local water table. Groundwater is not used on the CEBAF site.
Dewatering is authorized by a Permit to Withdraw Groundwater.

1074

4.4.1.3 Effluent Monitoring Performance

1076
1078 The program and activities addressed in this program are detailed in Appendix A of
this document. Other issues of note are itemized here.

1080 An on-site analysis laboratory is being established to obtain timely monitoring results
1082 during operations. The lab will have tritium monitoring and gamma spectroscopy
equipment which will be sensitive enough to detect levels of radioactivity that could
1084 affect the environment. Subcontractors will continue to be used to provide services to
complete the monitoring program requirements.

1086

4.4.1.4 Environmental Surveillance Performance

1088 Appendix B of this document presents the program and activities included in the
environmental surveillance program. Other issues of note are addressed here.

1090 A series of rainwater and groundwater samples have been analyzed to the lowest
1092 detection limits possible. This will assist in assessing natural background levels.

1094 **Air Monitoring**

1096 Non-radiological: Boiler/stack/vent outputs are identified either per manufacturer
information, monitoring or using best engineering judgment by Plant Engineering.

1098 Radiological: Site boundary monitoring is performed for radionuclide presence. It is
1100 performed according to NESHAP (National Emission Standards for Hazardous Air
1102 Pollutants) regulation. The maximum effective dose to any member of the population
residing offsite was determined to be 2.14×10^{-4} mrem/year for 1994. The calculated
radiation exposure to the general population from CEBAF testing, commissioning, and
low power operations in 1994 was approximately 7.26×10^{-4} person-rem.

1104 The EPA dispersion computer code AIRDOS is run on the CEBAF VAX and includes all
1106 the demographic and agricultural data for the area surrounding CEBAF. The PC version
of CAP-88 has also been acquired and has been used to reevaluate emissions. End
1108 station releases have been factored in, and the results compared to updated guidelines
as they are formulated in response to the Clean Air Act. The annual release rates
1110 including the offsite dose assessment are published in the SER.

1112 **Groundwater Monitoring**

1114 The VPA Permit issued by the DEQ, Water Division, is required to ensure that CEBAF's
commissioning activities and operations do not adversely affect offsite groundwater or
1116 surface water. Groundwater leaving the CEBAF site shall not exceed the parameters
established during the baseline period. An updated analytical protocol for Calcium-45
1118 was submitted to the DEQ on February 6, 1990 regarding the procurement of
radiochemical services from an accredited laboratory with more appropriate turnaround
times. It was approved.

1120 The VPA Permit identifies groundwater sampling variables (e.g., tritium, sodium-22, pH,
1122 etc.) and sampling frequencies. Environmental baseline data collection and analysis
began in October 1989. Data from the groundwater sampling can be found in RCG Tech
1124 Note 93-016. A new preliminary data summary report is being compiled that will
incorporate all sampling information through June 1995.

1126 **Surface Water Monitoring**

1128 Non-radiological: There is no surface water monitoring being conducted at CEBAF.
Monitoring at the two ditches leaving the site is being considered for operational
1130 monitoring. Surface water runoff goes into Brick Kiln Creek which eventually runs into
Big Bethel Reservoir. The water quality of Big Bethel Reservoir is surveyed annually by
1132 the Army Environmental Hygiene Agency.

1134 Quantities pumped at the dewatering point are monitored and information is submitted
to the DEQ. The discharge stream is analyzed for the same parameters as the
1136 groundwater.

1138 Radiological: One sample point at the end station dewatering discharge is sampled for
the same criteria as listed in the VPA permit.

1140

1142

Soil/Sediment Monitoring

Non-radiological: No soil monitoring was or is being performed.

Radiological: Soil samples have been taken to irradiate soil with accelerator radiation followed by gamma spectra analysis and wash-out with water to simulate groundwater effects. The results obtained are consistent with assumptions used in the calculations.

Surface measurements of the CEBAF site have been made using portable radiation detector equipment. Soil samples for laboratory gamma spectrum analysis for correlation with the surface radiation measurements were also taken. The six dual channel microprocessor based fence-post gamma and neutron monitors are capable of measuring natural background radiation levels. These are currently collecting data for establishing the baseline.

4.4.2 Preoperational Program Specifics

4.4.2.1 Preoperational Background Data

Groundwater from six wells has been sampled and analyzed for radiological and non-radiological parameters since October 1989. In addition, the dewatering discharge during construction was sampled and the stream from the permanent dewatering operation continues to be sampled. Sampling was performed monthly for the first year; the frequency was changed to one per quarter starting in October 1990. In January 1995, four new wells and two replacement wells were added to the background data collection program.

Sampling and analysis are being performed according to the terms of the VPA Permit. It is performed quarterly, with the following wells being sampled: GW-2, GW-3, GW-7, GW-8, GW-15 and GW-17. The wells added in 1995 are BDA-1, BDB-1, BDC-1, BSY-1, GW-6a and GW-15a, which replaced GW-15. Refer to Exhibit 4-1 for map of wells available for sampling in 1995.

Groundwater is analyzed for these parameters:

- Radiological: Total Radium, Strontium-90, Calcium-45, Gross Alpha, Gross Beta, Beryllium-7, Sodium-22, Sodium-24, Manganese-54, Cobalt-60, Cesium-134, Tritium, Thorium-230 and Thorium-232.
- Non-Radiological: pH, Conductivity, COD, Copper, Lead, Iron, Manganese, Nickel, Sodium, Zinc, Hardness and total organic carbon (TOC).

Well sampling and analysis results are reported by SURA to the DOE CEBAF Site Office for transmittal to the DEQ by the tenth of each month following the month in which the data are received.

SURA has performed a recent hydrogeologic assessment of the site. This review is almost complete and the results are being used to evaluate past technical issues and address future activities.

4.4.2.2 General Information

Groundwater samples are collected and analyzed by subcontractors using approved EPA or equivalent procedures. Two examples of the required methods are: Total

Radium, reference USEPA (1980), Method No. 903.0 and 904.0; and Strontium-90, reference USEPA (1980), Method No. 905.0. A complete listing is provided in the VPA Permit. Given the time needed for analyses, samples are currently taken, typically, during the first week of any given quarter.

The background data will be collected through the end of December 1995. A summary report is being prepared by a consultant to be submitted to the DEQ. It will include the following:

- a summary of all collected background data on the groundwater wells;
- a statistical analysis of the data for the wells showing the 99th percentile confidence level for each parameter using an EPA-methodology or comparable method approved by the DEQ.

The report will be updated after January 1996 to incorporate the last two quarters of analytical results. The last two quarters of data should have only a minimal effect on the previous data.

Sampling to date has shown that no significant amount of contaminants has been added to the groundwater as it passed through the CEBAF site. Variations based on construction effects were evident.

4.4.3 Operational Program Specifics

4.4.3.1 Operations Data

A total of 31 wells will be sampled and analyzed during operations. The samples acquired will be analyzed for pH, Conductivity, TOC, Gross Alpha, Gross Beta, Tritium, Sodium-22, Sodium-24, Beryllium-7, and Calcium-45. Sampling frequency will be monthly for one year after which the frequency may be reduced, with DEQ approval, to once per quarter. The sampling, analyzing, and reporting procedures to be followed are the same as identified previously.

The following action levels (where mitigation measures must be considered) have been established by the DEQ for the "A" wells (inner) with the same values serving as limitation levels for the "B" wells.

Tritium	5000 pCi/l
Manmade Radioactivity	1 mrem/yr

At no time are the "C" wells (outer) to exceed the background levels established during pre-operations. Refer to Exhibit 4-1 for a map of planned operational wells.

4.4.3.2 Sensitivity and Precision Levels for Radionuclides

The minimum quantification and detection units achievable for chemical parameters are a function of the method used and its instrumentation. The EPA Contract Laboratory Program has established standard quantification and detection limits for the relevant methods. The monitoring of radionuclides shall continue to be analyzed at the following sensitivity and precision levels called out in Table 3 in Appendix B.

MONITORING WELL LOCATIONS

1244 **4.5 METEOROLOGICAL MONITORING**

1246 CEBAF has not established a formal meteorological program to serve the site. Activities at the
1248 site have been reviewed and do not have far reaching implications.

1250 Concentrations of airborne radionuclides at the site boundary are calculated using a computer
1252 modeling program, AIRDOS-PC. Wind direction precipitation and temperature for LAFB are
used as input.

1254 **4.6 QUALITY ASSURANCE**

1256 Subcontractors and qualified staff perform all collection and analytical procedures. The
1258 collection of CEBAF groundwater samples for baseline purposes to date is in accordance with
1260 approved programs and procedures. All subcontractor laboratories used for this effort
1262 participate in the EPA Laboratory Intercomparison Program for the analytical procedures
1264 involved. Participation in the DOE Environmental Monitoring Lab Program for radionuclides is
a criterion for subcontractor selection for radiological programs. Additional samples will be
included in sampling contracts to allow for blind or double blind samples, duplicate samples,
and blanks as a part of an expanded QA process. For day-to-day environmental monitoring
handled by the industrial hygiene staff, the subcontracted labs used are certified under required
state programs.

1266 Relevant quality control and assurance measures are detailed in the subcontractor's QA
1268 Manuals and are being addressed in the EH&S Manual Chapter 6712, Environmental Quality
Assurance.

1272 **4.6.1 Chain-of-Custody Procedures**

1274 Custody is defined as: A sample being in a person's physical possession; in their view after the
1276 person has taken possession; secured by the same person so that no one can tamper with the
sample; or secured by that person in an area that is restricted to authorized personnel.

1278 Chain-of-Custody procedures are used to establish the traceability of samples for analysis.
1280 Sample identity is maintained by proper labeling. The Chain-of-Custody form is used to record
the transfer of possession and custody of samples and to ensure the integrity of samples from
the time of collection through data reporting. Each person involved in the chain of possession
1282 must sign a Chain-of-Custody form when sample custody is relinquished or received.

1284 **4.6.2 Quality Assurance in Sampling Procedures**

1286 Samples at all locations are collected using documented procedures. These procedures ensure
1288 that samples are representative of the media from which they are collected and will yield
reliable and consistent results. They incorporate established standards and procedures when
1290 applicable.

1292 Standard Operating Procedures are developed and used by the line organizations to document
all monitoring and surveillance procedures in use. The certified subcontractors who perform
1294 monitoring and surveillance activities use specific procedures that have been developed in
accordance with established standards, practices, and protocols. Field log books and chains-
1296 of-custody document sample collection, handling, and preserving techniques employed.

4.6.3 Quality Assurance in Analysis

Samples are analyzed using standard analytical procedures. Data quality is verified by a continuing program of analytical laboratory quality control, participation in interlaboratory cross-checks, and replicate sampling and analysis. When applicable to the analysis requested, analytical labs must be certified. A range of radiochemical spikes are used to test the vendor's ability to achieve the required sensitivity for each parameter and their reliability in detecting accelerator-produced radionuclides at or below the concentration guide standards. Subcontractors have performed their own QA using blind tests, duplicates and spikes. CEBAF does its own QA using the same methods. Results are compared to prepared concentrations and shall be published annually in the Site Environmental Report.

Currently CEBAF uses several subcontract laboratories for chemical analytical work. The vendors are certified by the Commonwealth of Virginia EPA and may participate in the USEPA Contract Laboratory Program. The labs performing radioanalysis may participate in DOE's EML quality assurance program.

4.7 REPORTING AND NOTIFICATIONS

There are a variety of reporting and notification requirements listed under different regulations and permit conditions. CEBAF complies with all requirements.

4.7.1 Air Requirements

- Non-radiological: An annual emission survey of insignificant processes is submitted to the state on an annual basis. Eight boilers, all fired by natural gas, are the only reportable emission sources.
- Radiological: The CSO received permission from the EPA to construct the CEBAF facility. Calculations have been completed for full facility operations. CEBAF will provide this data to the CSO to support continued permitting activities concerning NESHAPS. Notification to the EPA of the start of operations has been provided by the CSO in August 1995.

4.7.2 Groundwater Requirements

- Non-radiological: CEBAF provides quarterly information to the DEQ on quantities withdrawn under the Permit to Withdraw Groundwater. An optional annual withdrawal usage report is provided to the DEQ.

The VPA Permit presently requires sampling and analysis of some non-radiological parameters be performed quarterly. The analysis results from the groundwater monitoring are submitted to the DEQ.

- Radiological: Sampling and analysis for baseline radiological measurements is performed quarterly. Under the VPA Permit mentioned above, the results from the radioanalysis of the samples are also submitted to the DEQ.

1350 **4.7.3 Surface Water Requirements**

1352 Though this measurement is for a groundwater source, it occurs as the groundwater
1354 enters the surface drainage system. The results from the 'Dewater' sampling point are
also included with the VPA data submittal.

1356 **4.7.4 Environmental Baseline Termination And DOE Presentation**

1358 Prior to the commencement of accelerator operations, the Environmental Baseline
1360 measurements will be concluded, analyzed, and tabulated. The data analysis and
1362 conclusions will be submitted to the DOE by the RCG and EH&S Reporting for review
and approval. Upon approval by the DOE, the groundwater baseline information, as
1364 requested by the state, will be transmitted to the DEQ for review and acceptance.

1366 **4.7.5 Monitoring After the Baseline Completion**

1368 As commissioning and operations begin, groundwater monitoring will be performed and
1370 results transmitted to the DEQ on a monthly basis for at least 1996. Radiological
1372 measurements will be the primary focus of operational monitoring. A revised VPA
Permit has been proposed to the DEQ. This revision, as approved, will set forth the
specific conditions to which CEBAF must comply.

1374 Other parameters of concern:

- 1376 • Identification and measurements of other factors will be formally addressed with the
development of expanded policies and procedures and the relevant EH&S Manual
chapters on environmental protection and public health areas.
- 1378 • The RCG and EH&S Reporting will continue to verify the effects of future accelerator
1380 commissioning and operations on the environment and keep appropriate parties and
1382 agencies informed.

1384

SECTION 5

1386 **LONG RANGE ENVIRONMENTAL PROTECTION PLAN**

1388 **5.1 OVERALL PROGRAM REQUIREMENTS**

1390 In the long range, SURA will continue to address and comply with current and new
federal, state, and local laws and regulations. SURA and the DOE have recently signed
1392 a new M&O contract. The contract lists some specific requirements for protection of
both the environment and of public health. A few of the key points are listed here.

- 1394 • Line manager commitment to ensure that documentation provided to agencies has
been reviewed for accuracy and that all protocols have been observed.
- 1396 • CEBAF shall assist the DOE in complying with specified environmental acts and
executive orders as noted.

- 1398 • SURA shall research laws on an ongoing basis, identify required actions as well as inconsistencies, and incorporate the laws into activities and actions.
- 1400 • Provision of an environmental protection program management and implementation plan that describes systems that will ensure that environmental and public health requirements are taken into account throughout all phases of activities. The current
- 1402 EPIP shall serve as this document for 1995.

1404 5.2 PLAN OBJECTIVES

1406 CEBAF's Long Range Environmental Protection Plan covers a five-year horizon and has five key objectives for meeting its goal to protect the environment and public health.

- 1408 • To ensure that all permits are maintained by producing reports or providing information for local, state, and federal agencies in a timely manner.
- 1410 • To establish an on-site environmental baseline that accurately characterizes preoperational environmental quality by defining the physical, chemical, radiological, and biological parameters.
- 1412 • To monitor laboratory support activities and accelerator commissioning and operations to ensure that planned effluent releases are minimized and remain within
- 1414 established standards.
- 1416 • To incorporate measures that will aid in preventing releases to the environment in the early stages of the planning process. This includes incorporating engineering and administrative controls.
- 1418 • To make waste minimization and pollution prevention a key part in both planning and daily activities and operations.

1420 5.3 STRATEGIES TO MEET IDENTIFIED NEEDS

1422 General EH&S Philosophy of Responsibility:

1424 Fundamental to the lab's EH&S program is the commitment that line management bears primary responsibility for EH&S issues in their areas of operation. Consequently, the

1426 EH&S effort is accomplished programmatically by line managers who have advisory input from EH&S program specialists distributed throughout the organization where

1428 their specific expertise is needed most. In addition, the EH&S staff serve as a functional resource for the Laboratory as a whole. There is also an oversight and reporting function

1430 in the Office of Technical Performance.

1432 SURA's approach to implementing its EH&S program for CEBAF must also ensure that the program is extended to visiting researchers and the public. Minimization of property

1434 damage is another important goal. Finally, the philosophy of the program is to stress a proactive, rather than reactive, approach to defining and resolving health, safety, and

1436 environmental protection issues. Some of the EH&S staff have received training about influencing behavior patterns to allow EH&S to be addressed in a proactive manner.

1438 ES&H Management Plan:

1440 CEBAF prepares an ES&H Management Plan submittal for the DOE ES&H Management Plan initiative. The CEBAF submittal addresses EH&S issues for the next five year

1442 period. The most recent Plan addressed FY 1997 to FY 2001.

1444 Items from this document reiterate short range goals but detail the Laboratory
1446 commitment to fulfill the Laboratory mission in "conducting physics experimentation
and its activities in a safe, healthy and environmentally sound way".

1448 The ES&H Management Plan includes plans to incorporate the above program objectives
into various functional areas that have environmental protection consequences.

1450 1. Management and oversight including inspections, advice, reporting, self
assessment, accelerator readiness, and conduct of operations.

1452 2. Radiation protection including the need to monitor environmental and public
health effects.

1454 3. Industrial hygiene including chemical inventory tracking, material safety data
sheet management, and indoor air quality monitoring.

1456 4. Environmental activities that address management, oversight, and reporting
functions specifically related to regulations, including submittal for the
1458 replacement of refrigeration equipment that uses chlorofluorocarbons.

1460 5. Emergency preparedness which includes all the training and activities needed
to respond to accidents and incidents.

1462 **Other Long Term Strategies:**

1464 There is an existing EH&S Concern resolution process that is advertised and known
throughout the Laboratory. This concern resolution process has been incorporated in the
CEBAF EH&S Manual. A process chart is attached as Exhibit 5-1.

1466 Task force teams are utilized to tie in affected line management and the EH&S staff
1468 from around the laboratory to address specific environmental issues. The CEBAF
suggestion system was started in March 1995. Laboratory staff have been encouraged
1470 to utilize this suggestion program for all areas including those in the environmental,
waste minimization, and pollution prevention areas.

1472 EH&S Manual environmental chapter development is progressing and includes input
1474 from all levels of CEBAF staff to create a true working document. The implementation
plan for this manual, that addresses safety and health as well, includes training of all
1476 staff for whatever requirements are identified by their supervisor.

1478 Upper management has provided support to encourage the above listed activities. The
matrixed (shared staff) structure of the Policies and Manuals Group allows maximum
1480 use of all EH&S resources at the laboratory to support the Manual development.
Interfaces across the lab are shown on Exhibit 5-2.

1482

1484 **5.4 AVAILABLE LONG RANGE RESOURCES**

1486 The CEBAF EH&S Committee is a working group that serves under the laboratory
Director. The Committee assists in the sitewide implementation of environmental
1488 programs. It is the resource that can approach the Director for issue resolution. There
are three subcommittees that are represented on this committee: Emergency
1490 Preparedness, EH&S Training, and the CEBAF Radiation Review Panel.

EH&S Concern Resolution Process

CEBAF EH&S Guidance Development and Implementation

1/10/94

1494 The CEBAF Radiation Review Panel serves to advise the RCG and senior management
1496 on matters of radiation safety, policy and procedures and to advise on environmental
1498 issues when requested.

1496 The Radiation Control Group provides radiological expertise for the entire laboratory.
1498 The group resides in the Accelerator Division. They are responsible to maintain
1500 radiation related permits, implement permit conditions, and identify personal safety
1502 and public health issues.

1502 The Office of Technical Performance functional area provides leadership, oversight,
1504 support and coordination of environmental matters through the EH&S Reporting,
1506 SA/QA, and Policies and Manuals Groups. Their functions are described in Section 2.2.

1506 The purpose of the Chemical Assistance Team is to secure the area, assess injury and
1508 damage potential, and assist the Newport News Fire Department Hazardous Material
1510 Team in the event of a hazardous material spill. Chemical Assistance Team members
1512 inform and educate staff about chemical hazards and serve as sources of information on
1514 hazardous chemicals, spill prevention, spill detection, cleanup techniques and
1516 procedures, and licensed organizations with expertise in control recovery.

1512 The Clean Air Act Team has been established to coordinate air quality issues across the
1514 site. The main issue addressed in 1995 was to coordinate a review of all emission
1516 sources to determine if any permitting was necessary. None were found to be required.

1516 A second environmental resource team, the Waste Minimization/Pollution Prevention
1518 Team is available to assist staff. Activities in 1994 included environmental policy
1520 development and 1995 actions primarily focused around handling special requests and
1522 concerns. A short-term process improvement team developed a working hazardous
1524 waste program in 1994 and early 1995. General waste management issues are the
1526 current focus.

1526 SECTION 6

1528 SPECIAL ENVIRONMENTAL PROGRAM PLANS

1530 6.1 GROUNDWATER PROTECTION MANAGEMENT PROGRAM PLAN

1532 Implementation of the Groundwater Protection Management Program (GPMP) is the most
1534 important aspect of the environmental protection program. Groundwater quality is the state
1536 DEQ's primary environmental concern.

1536 The formal GPMP is under development as a chapter in the EH&S Manual, which will be its
1538 final home. The EPPP will continue to address the program's Plan. The chapter is still under
1540 development as the recent hydrogeologic study results are incorporated into the program. Also
1542 members of the 1994 ORO appraisal team have agreed to provide input to enhance the quality
of the document. The final program will be reviewed annually in the EH&S Manual chapter
review process, and will be updated as needed, but at least every three years.

1544 **6.1.1 Introduction**

1546 Groundwater is a vital source of water. Many surface waters receive a major part of
1548 their flow from groundwater. It is also a major drinking water resource. Groundwater
1550 may be contaminated by toxic or hazardous materials leaking from landfills, waste
1552 treatment sites, or other sources which may not be known to either the public or the
regulatory agencies. Any contamination could present potential problems to any
member of the population. Because of this, both the federal government and the
Commonwealth of Virginia regulate groundwater in a number of different ways.

1554 The purpose of this program is to reiterate the importance of environmental safety and
1556 quality in the workplace and explain the various regulations and guidelines governing
groundwater protection. Any operation or process that withdraws water from the
ground or discharges contaminants to the ground is subject to the requirements of this
program.

1560 **6.1.2 Responsibilities**

1562 The GPMP identifies the responsibility that each individual or role has in preventing
groundwater pollution. Some of the identified responsibilities are presented here:

- 1564 • All Laboratory staff and experimenters are aware of the potential of
environmentally unsound activities that could result in spills or leaks. They are also
aware of the proper course of action to alert response personnel.
- 1566 • Plant Engineering provides technical expertise to design and implement
environmental protection measures regarding groundwater withdrawal.
- 1568 • The RCG has many responsibilities including:
 - 1570 • monitoring site performance in accordance with the VPA Permit conditions
and with other regulations;
 - 1572 • management of the disposal of water collected from accelerator and
experimental area accumulation processes.
- 1574 • One of the EH&S Reporting Group's responsibilities is to develop and implement
general pollution prevention strategies and programs.

1576 **6.1.3 Qualifications**

1578 Training and qualification requirements are identified in this Program, with new
1580 requirements being incorporated with each program review. The RCG staff responsible
for environmental monitoring regarding groundwater is required to be trained to perform
1582 or oversee any required sampling and analysis. Other personnel involved will also be
appropriately qualified. All environmental sampling is currently being performed by a
1584 certified subcontracted laboratory.

1586 **6.1.4 Program Summary**

1588 CEBAF Environmental Protection programs have been established to allow the
continued wise use of water resources and the desired maintenance of all water quality
1590 parameters. The GPMP is part of the Water Quality Management program. Other
water resources, systems, and protection programs are discussed in the EH&S Manual
Chapter 6730, Water Quality Management.

1592 The main guiding law of the overall program is the Clean Water Act whose objective is
1594 to "restore and maintain the chemical, physical and biological integrity of the nation's

waters." CEBAF, which includes all affiliated people and organizations, complies with applicable regulations that address the preservation of the groundwater resource and the maintenance of its quality to the maximum practicable extent.

The federal government and the Commonwealth of Virginia regulate groundwater in a number of different ways. Excluding hazardous material and oil spills, CEBAF has two operations that could have potential impacts on our local groundwater resources. Both operations were addressed in the EA that was prepared for the site, and both have been adapted to minimize environmental impacts.

- One operation is the continued withdrawal of groundwater for construction and structural purposes. The affected area is directly below the three experimental halls.
- The second action that could have an impact is the contamination of the groundwater on the site or beyond the site limits because of construction activities and accelerator operations.

Note that the state's largest concern is with the potential for radiological contamination of the groundwater.

Groundwater Resource Protection - Quantity

CEBAF withdraws groundwater from below the three experimental halls (Hall A, B and C) to preserve the integrity of each of the concrete structures. The water is pumped to a single discharge that empties into a drainage channel. CEBAF makes no use of this water. The channel is graded to allow the water to flow south and off the site. The water eventually flows to the Big Bethel reservoir. The original construction dewatering was allowed by a Certificate of Groundwater Right that was approved by the DEQ. That Certificate allowed withdrawal of up to 27,900,000 gallons of groundwater per month, though the actual amount pumped was significantly less.

Under the Groundwater Management Act of 1992, CEBAF applied for and received a Permit to Withdraw Groundwater. It was granted on November 1, 1994. The total monthly withdrawal limit is 6,000,000 gallons, for which the normal average is about 600,000 gallons.

Groundwater Resource Protection - Quality

The DEQ issued CEBAF a VPA Permit to ensure that CEBAF's construction and operations do not degrade the quality of on-site or offsite groundwater. Groundwater leaving the CEBAF site shall not exceed the groundwater parameters established during preoperations. These parameters were determined in the course of site development, permit requirements, and from experience with similar accelerators. Refer to the Environmental Monitoring Program, which is discussed in Section 4. A groundwater monitoring plan uses well sampling as the mechanism for making the determination that program and permit commitments are met. It is presented in the Groundwater Surveillance section in Appendix B.

A summary of VPA Permit monitoring and management requirements follows:

- **Water Quality** - The permit limits groundwater concentrations of substances that facility construction or operations may contribute to the groundwater.
 - During the preoperational phase of the accelerator facility, samples of background water quality parameters are obtained at identified monitoring wells. These samples are analyzed for several metals, radionuclides, pH, and other parameters.

- 1648 • During the operational phase of the accelerator facility, groundwater samples
will be taken at identified monitoring wells for comparison with the
preoperational baseline values obtained for the water quality parameters.
- 1650 • Monitoring Records - Records of analyses and any other information which results
from groundwater monitoring must be retained for at least three years.
- 1652 • Reportable Events - Unusual or extraordinary events that could adversely affect
1654 groundwater quality must be reported to the DEQ by the EH&S Reporting Group
within 24 hours of the notification of the event. Reportable events include spills,
1656 wastewater handling equipment breakdown, failure of pollution management
activities, and floods.
- 1658 • Facility Changes - Any facility modification that may add a new discharge or
additional pollutants may require a new permit. A permit application must be made
at least 180 days prior to commencement of proposed discharges.

1660

Surface Water Impacts to or from Groundwater

1662 Surface water quality is maintained by discharging only unpolluted waters such as
rainwater or groundwater to the environment. The potential sources of contamination of
1664 surface waters from groundwater withdrawals are:

- 1666 • Releases of hazardous substances to surface water or to the ground: These releases
must be prevented and have been addressed in the EH&S Manual Water Quality
1668 Management chapter. Such releases may be reportable to emergency response
agencies.
- 1670 • Potential leaks from equipment or system malfunctions: These potential problems
have triggered the development of a Spill Prevention, Control, and Countermeasure
1672 (SPCC) Plan. The SPCC Plan addresses measures to prevent releases from oil
containing equipment and is addressed in Chapter 6732 of the EH&S Manual.
- 1674 • Contamination of surface water from construction pumping due to rainwater and
groundwater accumulating in excavated areas: This is covered through state VPDES
permitting requirements, when applicable.
- 1676 • Water within the tunnels may become radioactive from exposure to radiation from
the high energy electron beam: The Water Management Plan for the Accelerator
1678 Areas provides containment for water from accelerator operations so that it can be
sampled by the RCG prior to being discharged.
- 1680 • Radiological contamination of groundwater surrounding the tunnel and end stations:
The groundwater is shielded from exposure to radiation only, however, only minimal
1682 amounts of radiation are expected. Groundwater pumped from under the end
stations is sampled under the VPA Permit terms.

1684

1686 6.1.5 Procedures

1688 Specific procedures on particular program elements are addressed by hiring qualified
subcontractors to perform most of the activities involved in this GPMP. Additional
1690 procedures will be written, as needed, using information available from fellow
accelerator laboratory resources as possible. Existing and planned procedures shall
1692 address: well inspection, well sampling (a site-specific procedure exists), monitoring
well installation, well abandonment, and quality control issues.

1694

1696 6.2 WASTE MINIMIZATION AND POLLUTION PREVENTION PROGRAMS

1698 INTRODUCTION

1700 The DOE has a policy which states its commitment to waste reduction, which includes the
1702 development and implementation of Waste Minimization (WMin) and Pollution Prevention
1704 (PP) programs. In order to comply with DOE requirements, as well as other Federal and State
regulations, CEBAF is implementing the following Waste Minimization and Pollution prevention
programs. Since the goals of these two programs are similar, they are in the process of being
combined into one comprehensive program that will cover:

- 1706 • policies to avoid or reduce the production of hazard^{ous} substances, pollution, or
wastes;
- 1708 • guidelines for recycling or reusing materials as possible;
- requirements to consider WMin and PP in research plans and design activities.

1710 CEBAF is also in the process of developing a policy statement on the overall WMin/PP
1712 Program. It will incorporate issues applicable to the Waste Management Program. The DOE
1714 supports this effort through an Energy Research Task Force. CEBAF's current program
documents the need for waste minimization, prescribes a plan for waste minimization, and
1716 strives to improve staff awareness of the need for WMin and PP. This program is based on
source reduction, material substitution, and maintaining an effective recycling program.
Strategies can likely be applied to all waste categories. When these strategies are utilized
correctly, CEBAF will realize the benefits of :

- 1718 • reduced waste production, which will result in reduced waste disposal costs;
- 1720 • an increase in the reuse of materials, which will reduce the amount of new materials
being purchased;
- 1722 • an increase in the amount of recycled materials, which will reduce the amount of
solid waste going to the landfill;
- 1724 • a more efficiently managed waste disposal program;
- improved operational efficiency;
- enhanced occupational safety to employees;
- 1726 • reduced releases of hazardous chemicals.

1728 LEGAL REQUIREMENTS

1730 These program plans are designed to comply with all DOE, Federal, and State requirements,
including:

- 1732 • The Pollution Prevention Act of 1990;
- Waste Minimization Program (58 Federal Register);
- 1734 • RCRA hazardous waste reduction requirements;
- applicable portions of DOE orders 5400.1, 5400.3, and 5820.2A.

1736

CEBAF aims to meet all requirements of these documents by identifying all possible waste streams and setting forth policies that will cover source reduction, material substitution, and recycling for each of the waste streams.

SITE DESCRIPTION

CEBAF is located on 162 acres of DOE land and other non-DOE property as described in Section 1.2. The facility has six major buildings, an accelerator complex, and several other smaller facilities. There are approximately 680 employees that include full-time staff, students, and casual employees. There are a number of subcontractors performing operations such as security and janitorial services.

The majority of the waste produced at CEBAF is office paper (mostly from the six major facilities), cardboard and wood (from shipping and receiving), and buffered chemical polish (BCP) acid waste (from cavity processing in the Test Lab). There are already programs in place at CEBAF to address reduction and handling of some of the wastes produced on site, including:

- recycling of office papers and cardboard, for example;
- reuse of BCP acids to minimize waste acid production;
- procurement of environmentally friendly products to replace hazardous or toxic ones.

PROGRAM OBJECTIVES AND GOALS

The objectives of CEBAF's WMin and PP plans are to reduce the quantity of materials brought on-site, to reduce the on-site inventory of chemicals and hazardous materials, to reuse materials the maximum number of times, to recycle all materials possible, and to properly dispose of all non-recyclable materials. CEBAF aims to implement effective WMin and PP programs by:

- educating CEBAF personnel regarding program policies;
- instilling a desire into CEBAF personnel to implement the program policies;
- maintaining records of waste production and comparing against benchmark values to ensure program effectiveness;
- promoting the use of less toxic or non-hazardous materials;
- emphasizing material substitution, process modification, and closed-loop recycling;
- seeking alternative means of disposal, such as on-site treatment and waste exchange.

The goals of this program are to reduce waste production at all possible levels and to achieve and maintain minimum waste production levels.

STAFF RESPONSIBILITIES

All staff

- identify the waste streams in your work area;
- eliminate, substitute, or reuse materials where possible;
- recycle materials when possible;

- 1782 • perform proper inventory maintenance;
- consider WMin and PP during all research plans and design activities;
- 1784 • implement WMin and PP where feasible;
- dispose of non-recyclable materials in an appropriate manner.
- 1786 • EH&S staff
- 1788 • suggest less toxic and non-hazardous materials to encourage substitution;
- assist in eliminating unnecessary chemical inventory in your division;
- 1790 • dispose of hazardous waste through the HWC;
- develop policies and procedures for inventory control;
- 1792 • maintain hazardous waste areas to eliminate the possibility of a spill to the environment.
- 1794 • EH&S Reporting
- 1796 • maintain land disposal restriction (LDR) forms and hazardous waste manifests for all hazardous waste disposal;
- 1798 • provide guidance for waste reduction and handling procedures.
- 1800 • Line Management
- ensure maintenance and proper disposal of all waste in your work area;
- 1802 • look for possible process changes that can reduce or eliminate waste production;
- eliminate the use of unnecessary hazardous materials in your area through inventory maintenance.
- 1804
- 1806 Purchasing staff
- 1808 • search for environmentally friendly alternatives to substitute for toxic or hazardous materials, coordinate with EH&S staff;
- 1810 • purchase products containing recycled materials when possible.

1812

1814 WASTE MINIMIZATION AND POLLUTION PREVENTION PROGRAM PLANS

1816 The plans outlining the Waste Minimization and Pollution Prevention programs at CEBAF are addressed here. The WMin Plan details the different waste streams on site and how minimization is addressed for each. Employee training on waste identification, minimization, and pollution prevention is addressed.

1820

1820 6.2.1 Waste Minimization Program Plan

1822 It is difficult not to produce any wastes. CEBAF is committed to minimizing pollution of the environment by employing WMin programs and activities. The program and responsible roles will be further defined in the new EH&S manual. The basic elements of this program are to document the need for WMin, to prescribe a plan and goals for

1826 WMin implementation, and to improve staff awareness of the need to include WMin in
their work function.

1828 General methods of minimizing the generation of waste at CEBAF include:

- reduction of hazardous materials that are brought on-site;
- 1830 • maximizing the use of products before declaring them waste;
- product substitution for more environmentally-friendly materials;
- 1832 • inventory control;
- reclamation, neutralization, and recycling as secondary measures.

1834 CEBAF currently emphasizes source reduction, material reuse, and recycling to minimize
waste production. In addition to these traditional methods, CEBAF encourages waste
1836 minimization by putting the financial responsibility of hazardous waste disposal
directly on the generating department or internal group. For example, the cost of
1838 disposal of a single 55 gallon drum of acid waste can be as high as \$1,000 per barrel,
which is an explicit incentive to the user to minimize waste.

1840 Summaries of each of CEBAF's waste streams and how, if possible, related waste
minimization activities are being performed are presented below. Categories of waste
1842 and potential waste include: hazardous, radioactive, mixed, special, infectious
regulated, industrial wastewater, recyclables, and refuse.

1844

1. Hazardous Waste

1846 Hazardous waste is managed in accordance with RCRA. CEBAF is a small quantity
generator (SQG) of hazardous waste. An SQG is defined as an industry that generates
1848 between 100 kg and 1000 kg of hazardous waste per month and has no more than 6000
kg of hazardous waste at one time. Approximately 12,600 pounds (5725 kg) of
1850 hazardous waste was shipped offsite in 1994 and, as of August 1995, approximately
7030 pounds (3195 kg) has been shipped offsite. The cost of hazardous waste disposal
1852 in 1994 and thus far in 1995 is approximately \$21,000. Production of hazardous waste
reached a maximum during the 1992-1993 period as accelerator components were being
1854 assembled at CEBAF. Hazardous waste production has decreased significantly since
the end of 1993, as the initial production activity has been completed. The processes
1856 that produce the majority of hazardous waste at CEBAF still include etching niobium
components with the acid mixture and cleaning of niobium and stainless steel
1858 components with solvents. Waste BCP acid and non-chlorinated solvents are the
predominant hazardous waste streams at CEBAF.

1860

1862 RCRA status historically has been determined by tracking quantities of waste based on
the offsite disposal records. This method does not provide accurate monthly generation
rates. The new program now in place ensures that the Hazardous Waste Coordinator
1864 (HWC) is responsible to provide accurate monthly generation rates and on hand
quantities to EH&S Reporting, who verifies that SQG levels are being maintained.

1866

1868 Every effort is being made to maximize reuse of the acids and solvents used at CEBAF.
The acids are used on the order of twelve times (up from 3 times in previous years) prior
to being declared waste. The waste acids are being advertised in a hazardous waste
1870 exchange, but no reuser has yet been identified. CEBAF is currently looking into a
system that would remove metals from wastestreams for reclamation. The HWC is
1872 identifying potential on-site and offsite reusers of acetone and methanol. Reuse of the

1874 solvent would minimize new material purchases and would exempt that wastestream from RCRA regulation.

1876 Other wastes disposed of as hazardous include crushed fluorescent bulbs and lead
1878 contaminated rags and clothing. These materials are currently handled by the HWC,
and are shipped offsite for treatment and disposal. Other non-typical hazardous
1880 wastes are also generated at CEBAF and are collected during a hazardous waste
roundup that is performed twice yearly by the Laboratory Industrial Hygienist. All
1882 outdated chemicals and materials that are no longer needed are collected, lab packed,
and disposed of through normal hazardous waste disposal methods. Reduction of these
1884 wastes is attempted through procurement and inventory control, as well as personnel
training and education.

1886 Tracking and reporting of hazardous waste disposal is managed using manifest records
and LDR forms. Manifest records and LDR forms are prepared by the subcontractor
1888 and verified by the HWC prior to shipment.

1890 There are several licensed subcontractors that CEBAF uses to remove hazardous wastes
and transport them to approved sites. The companies that handled our hazardous
1892 waste in calendar year 1994 and to date in 1995 are: Heritage Environmental Services
of North Carolina; Clean Harbors of Baltimore, Maryland; Clean Harbors of
1894 Connecticut; Chemical Conservation Corp. of Georgia; Laidlaw Environmental Services
of North Carolina; Chem Met Services of Michigan; and Spring Grove Resource Recovery
1896 of Ohio. Transportation of the waste was handled by Clean Harbors Environmental
Services; Heritage Transport, Inc.; and W.L. Black & Associates.

1898

1900 **2. Radioactive and Mixed Waste**

1902 Small amounts of radioactive wastes are accumulated in the specially marked barrels
within the accelerator and experimental areas. Not enough waste has been collected to
1904 date to warrant making arrangements for disposal. There has been no mixed waste
created to date. The production of radioactive and mixed waste is minimized by a very
aggressive radiation control program and through education of radiation workers. The
1906 RCG is investigating locations where low level wastes can be disposed in the future.
EH&S Reporting will assist in obtaining necessary authorization.

1908

1910 Policy and procedures for the handling, storage, and disposal of radioactive and mixed
waste are found in the site-specific Radiological Control Manual. This program will be
1912 addressed in Chapter 6760, Waste Management, of the EH&S Manual.

1914 **3. Special Wastes**

1916 There are a variety of special waste materials that are currently found at CEBAF.
Included in this category are: empty aerosol cans, batteries of various types, empty
1918 liquid containers, liquid wastes such as ethylene glycol and latex paint, oily wastes and
debris, solid paint, and some uncatalyzed epoxies.

1920 One current program to control the disposal of a special waste is the collection and
recycling of used oil. About 500 gallons of used oil are generated annually at CEBAF
1922 from change out of oil in industrial vehicles, diesel welding machines, vacuum pumps,
and other pieces of equipment which use oil. Used oil is collected in drums and
1924 provided temporary secured storage on site. The oil is picked up at little or no cost by a
used oil collection company, which sells the oil for use in industrial furnaces. Used oil is

1926 not considered a hazardous waste in the Commonwealth of Virginia, but the disposal
1928 and recycling process is monitored by the DEQ, Waste Division. There are currently no
feasible ways for reducing the quantity of waste oil produced at this facility.

1930 Current efforts of controlling special waste production and disposal are aimed at
1932 coordinating all of the waste streams so that each has only one manager. This would
enable accurate generation quantities to be computed and documented. These quantities
1934 can then be benchmarked, and used to determine where waste minimization procedures
would be feasible and economically desirable. These quantities can also be used as a
1936 basis with which to compare future generation rates. Another benefit of utilizing a
central manager for a particular area is that it will eliminate duplication of collection
1938 efforts around the site.

1940 4. Regulated Infectious Waste

1942 Quantities of waste disposed through the medical office are quite small. A manifest
tracking method has been established to fulfill regulatory requirements. There are no
1944 plans to further minimize wastes in this program.

1946 5. Industrial Wastewater

1948 CEBAF-generated sanitary and industrial waste is routed through underground pipes to
the HRSD waste disposal system. Both HRSD and SURA periodically monitor sanitary
1950 waste for chemical characteristics such as pH. The cost for sanitary waste disposal for
CEBAF during the period of August 1994 to August 1995 is approximately \$33,500.
1952 Portable toilets are provided through subcontractors to remote areas, such as the
accelerator construction site, where no fixed facilities are available. Wastes from the
1954 portable toilets are hauled to an HRSD dumping station by a licensed subcontractor that
is an HRSD Indirect Permit Holder.

1956 There are no known ways to reduce the quantity of sanitary waste that is produced at
CEBAF. However, as processes that use water are identified, opportunities for waste
1958 minimization will be evaluated.

1960 6. Recycled Materials

1962 Although recycling itself is not a waste minimization program, it is the most responsible
way to deal with the waste that is generated at CEBAF. In an effort to reduce the
1964 quantity of solid waste that is landfilled, CEBAF has implemented a site-wide recycling
program. CEBAF employees are strongly encouraged to use the recycling bins that are
1966 located around the site.

1968 In addition to used oil, CEBAF currently recycles the following non-hazardous materials:

- 1970 • a variety of paper products including office papers, magazines, and colored
papers;
- newspapers;
- 1972 • cardboard;
- aluminum cans;
- 1974 • scrap metal.

1976 An assigned manager in Plant Engineering is responsible for coordinating most of these
1978 waste streams. Benchmarking values may likely be available for future comparison as
1980 waste minimization efforts are evaluated. Minimization of the solid waste stream shall
continue to be stressed to CEBAF staff through education and emphasizing reduction
and reuse of materials.

1982

7. Refuse

1984 The principal sources of dry, non-recyclable refuse are office waste and shipping and
1986 receiving packaging. Paper and wood are the primary waste contents. Daily janitorial
services move the waste from the point of origination to outdoor, covered, metal boxes
1988 (dumpsters). The only wet waste stream at CEBAF is food waste generated by the
CEBAF Center cafeteria. Wet cafeteria waste is put in plastic bags and deposited in
1990 dumpsters. A subcontractor service removes the waste on a scheduled basis and is on
call for more frequent pickup if needed. These wastes are disposed of in approved local
1992 landfills. The cost of refuse disposal for 1994 was approximately \$24,000. With the
enhanced office paper recycling program, refuse generation has decreased significantly
1994 over the last few months. Recycling efforts will be continued to reduce this waste stream
even further.

1996

6.2.2 Pollution Prevention Awareness Program Plan

1998 Pollution Prevention (PP) goes hand-in-hand with waste minimization, and is defined as
2000 "any practice which reduces the amount of hazardous waste, pollutant, or contaminant
entering the waste stream.....prior to recycling, treatment, or disposal".

2002 CEBAF is committed to minimizing pollution of the environment and to ensuring that
employees are aware and knowledgeable about PP. The PP Awareness Program was
2004 established in response to a DOE program requirement which emphasizes employee
awareness through training, awareness campaigns, and incentives and awards. The
2006 program and responsible roles will be further defined in the EH&S Manual. Several
programs are already in place, so staff members may simply be informed about their
2008 existence and the identity of the responsible coordinator for each operation. The
WMin/PP Task Team will address issues that include incorporating PP statements into
group mission statements as appropriate. CEBAF's program focuses on the following
2010 general PP practices.

1. General Pollution Prevention Awareness

2012 The line management organization is responsible for developing and performing general
employee and subcontractor training, including all specialized training based on the
2014 materials used in their work areas. The training includes PP suggestions as well as
serving as an aid to reinforce the existing laboratory community's environmental
2016 awareness. Site beautification efforts comprise the balance of CEBAF's pollution
prevention awareness program. CEBAF's EH&S Reporting function and the WMin/PP
2018 Task Team informs the staff members of community pollution prevention activities and
recycling outlets for residential wastes, and encourages the reduction of waste
2020 production wherever possible. EH&S Reporting informs and enlightens line management
and the staff of relevant changes to the environmental protection laws, regulations, and
2022 guidance documents.

2024

2. Oil Spill Control

A SPCC Plan has been prepared by Plant Engineering. This SPCC Plan focuses on oil spill prevention and control issues aimed at preventing the release of oil or oil products into the environment. Most of the potential oil spill sources already have secondary containment measures in place to minimize the chance of a spill. The SPCC Plan will be incorporated in the EH&S Manual and appropriate personnel are being alerted and trained as required.

3. Hazardous Waste Generation Activity

Hazardous waste has been a significant part of CEBAF's focus in PP activities. CEBAF is a SQG of hazardous wastes, staying within or under the SQG requirements. An identification number, VA 7750090030, providing traceability information per RCRA, was received in July 1987. Hazardous wastes generated on-site are properly contained, identified, and prepared for transport in the Chemical Storage Building, located adjacent to the Test Lab. An acid storage building supports accelerator assembly operations and is used to store acid supplies and used acid. The hazardous waste disposal operation is managed by the HWC.

All hazardous waste generators will be given additional guidance by the HWC in the near future about their responsibilities in minimization of hazardous waste generation. Awareness of, and exposure to, the hazardous waste PP program will provide the generators with the knowledge and desire to minimize hazardous waste production in future processes.

4. Chemical Usage

A range of chemicals is used in the treatment and finishing of fabricated niobium RF cavities. The area used for these processes is located in a ventilated enclosure and has adequate protection to prevent release of contaminants into the environment. All wastewater effluents arising from the processes are collected, sampled, and analyzed prior to discharge to the sanitary sewer. If effluents are found not to conform with the standards acceptable for the sanitary sewer, approved alternative methods of disposal must be used; e.g., removal by a licensed subcontractor. Plumbing consists of double walled pipes to prevent break-through, and the storage area is provided with multiple-containment measures.

Floor drains in the buildings where oils and chemicals are present are sealed and spills will be captured. At the neutralization tanks, no rinse water is discharged until an acceptable pH is obtained and other conditions imposed by HRSD are met. Any effluents found not to conform to the limits established by the HRSD will be mitigated, or an alternative method of disposal will be adopted. Appropriate storage areas are provided for chemicals to help eliminate the possibility of a spill. CEBAF completed a review of all floor drains and their discharge points in 1994. This review and all follow-up actions assured CEBAF environmental staff that there are no chemicals, oils or other unauthorized substances in the vicinity of floor drains that have potential to enter either the sewer system or the surface water system.

Air emissions from the above processes are controlled to less than the limits set by the DEQ, Air Division, by proper design of scrubbers, air flow rates, and vent heights.

5. Radioactivity and Emissions

2074 When the accelerator beam is in use, there is a possibility of radiation activation of
2076 unshielded areas around the beam path. The accelerator operations will create a potential for activation of:

- groundwater;
- 2078 • sump pump water discharges to surface water;
- beam dump cooling water release to the sanitary sewer;
- 2080 • ion-exchange resin beds in North and South Linac Service Buildings;
- 2082 • ion-exchange resin beds in the High Power Beam Dump Service Buildings for Halls A and C.

2084 All activated or radioactive materials will be handled in accordance with best available
2086 technologies and disposed of in accordance with current regulations. On-site storage
2088 and decay will be used to reduce the radioactivity content when applicable. Only trained personnel are permitted to handle radioactive materials and access to these materials is controlled by the RCG.

2090 Licensed subcontractors are available to dispose of any of the above activated materials. Disposal will be in accordance with applicable regulations and DOE guidance including DOE Order 5400.5.

2092

6. Design and Implementation

2094 Pollution prevention has been designed into many aspects of operations at CEBAF. One
2096 of the main concerns at the site is in the area of the operating electron accelerator. Here are a few strategies that have been incorporated into actual facilities:

- 2098 • Beam Dumps: The beam dumps are designed to absorb the total power of the beams and will, as a consequence, become the most radioactive components.

2100 There are three major beam dumps associated with the end stations, and have been
2102 or are being constructed based on an effective design used at another laboratory. The primary materials are aluminum, which has low activation potential, and water, which is the major absorber material. The saturated activity of aluminum decays by some 100,000-fold during 10 days cool-down following shutdown of the accelerator beam. The water, which is dominated by the short lived oxygen-15 when the accelerator is not running, decays substantially within a few minutes. Within a few hours after accelerator shutdown, the radiation level will be quite low. The presence of the longer-lived beryllium-7 in water requires special procedures since this radionuclide is strongly absorbed in the ion-exchange resin water purifiers. The resins require special handling techniques to deal with this problem. Tritium will also build up slowly in recirculated cooling water, and the effect of radiolysis could potentially cause the release of tritium and carbon-11 to the environment. This is limited by the installation of hydrogen recombiners, which renders such cooling circuits essentially closed loop systems. Water will not be released from such closed loops other than under controlled conditions.

2116 In the event of a leakage of water from the beam dump, the water lost will be completely contained within a liner underneath the beam dump. Pipes will be led through double containment to ensure that no uncontrolled release can occur. This
2118 water will be collected in a storage tank and monitored for activity prior to

2120 approved disposal. Another containment liner is also used under the beam dump
2122 cooling building, which houses the beam dump heat exchangers (which are separated
2124 from cooling towers by an intermediate cooling system). This means two heat
exchangers must have tube leaks for beam dump water to reach a cooling tower. A
tertiary control for any spillage is curbed service buildings that will contain water
until monitored for proper disposition.

- 2126 • Radioactive Water Control at Sumps: Water from the accelerator area sumps will be
monitored periodically for radionuclide concentrations.
- 2128 • Electron Beam Losses: The electron beam will be monitored by the accelerator's
2130 instrumentation and control (I&C) system, a network of computer-supported devices
2132 linked to a Machine Control Center where operators control the accelerator. The I&C
2134 system has many functions; one of them is to provide data about any losses of
electrons from the beam. Such losses would cause neutrons to be knocked out of
2136 nearby materials. These neutrons can induce slight radioactivity in the groundwater
by a process called neutron spallation. Data from the I&C system will be used as
input to "tune" the accelerator so that the beam can be corrected to avoid losses of
electrons. In sum, one purpose of the I&C system is to keep neutron production,
caused by electron losses, below the levels that the concrete tunnel is designed to
shield against.
- 2138 • Accelerator Termination in an Emergency: In the unlikely event of a natural disaster,
2140 such as an earthquake, less than 0.001 second notice is required for the accelerator to
be stopped. Stopping the accelerator terminates the production of all prompt
2142 radiation and the introduction of radionuclides in the groundwater.
- 2144

SECTION 7

2146 ENVIRONMENTAL REPORTING REQUIREMENTS

2148

2150 The following reports are produced by CEBAF, primarily coordinated through the EH&S
 2152 Reporting function. The first section lists documents prepared for the DOE. The second
 section are reports submitted to regulatory agencies through the CSO.

2154

<u>Report</u>	<u>Agency</u>	<u>Frequency</u>
Radioactive Effluent/On-Site Discharge/Unplanned Releases	DOE/CSO*	Annually/ As Necessary (April 1)
Unplanned Release of Radio- active Materials in Effluents (DOE Form F-5821.1)	DOE/CSO*	As Necessary
"Environmental Occurrence" includes ORPS and Emergency Response Notifications	DOE/CSO**	As Necessary
Environmental Protection Implementation Plan	DOE/CSO***	Annually (November 1)
Environmental Protection Program Plan	DOE/CSO/ORO	Annually (October 1)
Site Environmental Report	DOE/CSO*** Copy sent to Public Distribution	Annually (June 1)
TRI Chemical Release Report	DOE/CSO (for DOE info only)	Annually, As Necessary (July 1)

2156

2158 * Reports forwarded to Waste Information Systems Branch, LMIT, Idaho Falls,
Idaho 83415

2160 ** Reports forwarded to DOE Headquarters Emergency Operations Center.

*** Report forwarded to EH-1, with copies to Program Senior Officials

2162

2164

2166

	<u>Program****</u>	<u>Agency</u>	<u>Report and Frequency</u>
2168	Industrial Wastewater Discharge Permit	Hampton Roads Sanitation District	Monthly pH Reports. Automatic Renewal each five years. Other reports or action plans upon request.
2170	Cross-Connection and Control	City of Newport News	Annual Backflow Prevention Inspection Results
2172	Air Pollution Source Identification	DEQ, Air Division	Annual report on boiler emissions and other information upon request.
2174	VPA Permit	DEQ, Water Division	Quarterly Monitoring Reports. Other reports upon request.
	Permit to Withdraw Groundwater	DEQ, Water Division	Quarterly Pumpage and Use Reports and Annual Usage Report.
	RAD-NESHAPS*	DEQ, Air Division	Annually after start of operations
	Hazardous Chemicals/ Community Right-to-know	DEQ, Waste Division	Annual submittal of SARA Title III Tier II Report
	**** Reports submitted through the DOE/CSO.		
	# Required after operations begin.		

2176

SECTION 8

REFERENCE DOCUMENTS

2178

2180

2182 Air Emissions Inventory, July 1995.

2184 CEBAF Administrative Manual, October 1995.

2186 CEBAF Environment, Health, and Safety Manual.

2188 CEBAF Environmental Protection Implementation Plan, April 1994.

2190 CEBAF Environment, Safety, and Health Management Plan
FY 97-FY01, March 1995.

2192 CEBAF Final Safety Assessment Document, April 1994.

2194 CEBAF Preliminary Safety Analysis Report, November 1989.

2196 CEBAF Preliminary Safety Manual, March 1989, Revised May 1992.

2198 CEBAF Quality Assurance Manual, Revision 3.4, May 1995.

2200 Hydrogeologic Review, Final Draft, March 1995.

2202 SURA/CEBAF Site Environmental Report for
2204 Calendar Year 1994, June 1995.

2206 U.S. Department of Energy
Environmental Assessment
2208 Continuous Electron Beam Accelerator Facility
Newport News, VA DOE/EA-0257, January 1987.

2210 Wells, C., "Evaluation of Ground Water Analyses for Samples
2212 Collected from September 1989 to March 1993", Radiation Control
Group Note 93-016, June 10, 1993.

2214

2216

2218

2220

2222

EPFP:1995 EPFP Document: 10/9/95:bb

Environmental Protection Program Plan

APPENDIX A

Effluent Monitoring Requirements

(extracted from draft CEBAF EH&S Manual Chapter 6711, Environmental Monitoring Program's Appendix T-1)

Air Monitoring

NESHAP

Asbestos Activities

Airborne Radionuclide Emissions

Conventional Air Emissions

Surface Water Discharges (Effluents)

Non-Radiological Discharges

Radiological Discharges to Surface Waters

Quality Assurance

Introduction

This part of the Environmental Monitoring Program is to establish a strategy for environmental monitoring that ensures compliance with legal and regulatory requirements as directed by Federal, State, and local agencies. The monitoring program provides data to support environmental management decisions. This appendix presents the factors required to assess the effect of past, current, and future CEBAF activities by measuring and monitoring effluents from CEBAF operations. Surveillance through measuring, monitoring, and calculating the effects of those operations on the environment and public health is addressed in Appendix B.

Because CEBAF is a unique facility, the degree of environmental assurance that our activities require was a consideration in the determination of a program for monitoring that is consistent with facility needs along with regulatory requirements, best management practices, and applicable DOE guidance. The program acknowledges the importance of monitoring as a critical element of an effective environmental protection program.

Effluent Monitoring Requirements

Effluent monitoring shall comply with applicable regulations and shall be conducted to provide representative measurements of the quantities and concentrations of pollutants in liquid and airborne discharges. Objectives are presented in Section 4.2 of the EPPP.

AIR MONITORING

All airborne emissions are evaluated and their potential for release of harmful materials to the environment is assessed. Prior to making modifications to systems that produce airborne emissions (e.g. the cavity production process) or to facilities that could affect airborne emission

quantities or quality (an accelerator energy upgrade) or to the installation of any new facility, the project shall be evaluated and the monitoring needs assessed.

NESHAP

The National Emission Standards for Hazardous Air Pollutants (NESHAP) regulations set forth emission limits, as well as monitoring, recordkeeping, and operational requirements, for processes and activities generating emissions containing certain hazardous air pollutants. The standards for asbestos and radionuclides are the only two NESHAP standards that currently affect CEBAF operations.

Asbestos Activities:

Asbestos removal on site is done in strict accordance with the NESHAP regulations, per the CEBAF Asbestos Management Plan.

Airborne Radionuclide Emissions

Airborne radionuclide emissions from DOE facilities such as CEBAF are subject to provisions of 40 CFR 61 Subpart H and applicable portions of DOE Order 5400.5. This portion of the monitoring program is designed to comply with those regulations. The principal source of airborne radionuclide emissions from CEBAF are the result of the radioactivation of air due to the interactions of the accelerated electron beams with matter in the course of operating the physics research program.

The research program intends to accelerate electrons to 4 MeV to serve three experimental areas. The accelerator will deliver the electrons to stationary targets in the three experimental areas (Hall A, Hall B and Hall C). The particles produced and the interactions involved are used by the researchers to study the basic structure of the atomic nucleus.

During the acceleration process, the beam traverses beam pipes evacuated to high vacuum. The high vacuum is necessary to prevent unwanted particle interactions which would result in undesirable loss of beam as well as the production of unwanted radioactivity in both the accelerator components and the air. Thus, the principal production of airborne radionuclides occurs unavoidably when the low energy electron beams are incident on the target stations described above.

These target stations generally consist of a relatively thin target followed by a more massive beam absorber. The interactions in the target produce particles used by the physics experiments while the main beam is stopped in the beam dump for each hall. All target stations are surrounded by concrete and earth shields which absorb the beam energy and contain the vast majority of the radioactivity produced by the beam. The air in the vicinity of these targets becomes radioactive for two reasons. First, the electron beam often traverses a small amount of air in interacting with the target since it is impractical to operate the targets in vacuum. Second, the electrons interacting with the target produce large numbers of "secondary" particles which are emitted in all directions and hence produce activation in the air surrounding the target station.

The principal radionuclides expected to be produced include H-3 (12.6 year half-life), and Be-7 (53.1 day). The following short-lived positron-emitters may be produced: C-11 (20.38 min. half-life), N-13 (9.97 min. half-life), and O-15 (2.04 min. half-life). Also of note are beta-emitters Cl-38 (37.3 min), Cl-39 (55.5 min), and Ar-41 (1.83 hr). Measurements used to determine the composition of these radionuclides have been

performed at other electron accelerator facilities. These compositions are dependent upon the configuration of the target geometry, which may change periodically due to the changing needs of the experiments.

The applicable limit on annual effective dose equivalent due to such emissions to members of the public residing offsite are specified by the regulations to be 10 mrem (0.1 mSv). Given the small value of this limit, the most practical method for demonstrating compliance is to monitor the emissions as they leave a ventilation stack and to calculate the effective dose equivalent at offsite locations using CAP-88 or AIRDOS-PC. This approach is the general method followed at CEBAF. Measurements at receptor locations are rejected as being technically infeasible given the small effective dose equivalent offsite.

During testing and commissioning operations in Hall C, the airborne radionuclide releases were continuously monitored using calibrated Geiger-Mueller based stack monitors. The maximum dose equivalent rates to members of the public have been calculated using the AIRDOSE code. Results are documented in the annual SER.

Geiger-Mueller based stack monitors will be installed at Halls A and B as they become operational. Under conditions of current operation, Hall C is the primary recipient of the vast majority of the accelerated beam. The Hall C station contributes less than 0.01 mrem/year offsite. All such stack monitors have continuous read-out using a data-logging system. They are operated and calibrated following the EPA-approved procedures in §61.93 and references cited herein, despite the fact that the 0.1 mrem/year threshold for required monitoring is not exceeded.

The ventilation systems in the halls are designed so that the associated stack monitors measure essentially all of the airborne radionuclide releases due to the operation of the target station. The radionuclide and effluent releases to air from these target stations will be taken into account for reporting purposes by multiplying the total number of electrons delivered annually to these targets by the number of curies released per electron as determined by the average of the values found for the target stations covered by the stack monitors. The additional significant releases determined in this manner will be included in the releases documented in the SER and reported, as requested, to the EPA.

Conventional Air Emissions

Monitoring of conventional emissions shall be in accordance with the requirements of applicable Federal, State, and local regulations authorized by the Clean Air Act (42 U.S.C. 7401, et. seq.), Section 118. No operating permits are required by the EPA or the State. CEBAF is an insignificant source of air pollution as documented in an Air Emission Report prepared under a subcontract in July 1995. There have been no known instances of non-compliant emissions.

An annual emission report is submitted to the Virginia DEQ. In previous years the report presented all emissions from all activities at the laboratory. As emissions from non-boiler processes were all insignificant, this information no longer needs to be submitted. Presently, only the calculated boiler emissions are submitted. No significant new sources of air emissions are expected. This information is presented in the SER.

SURFACE WATER DISCHARGES (EFFLUENTS)

All liquid effluent streams are evaluated and their potential for release of harmful materials to the environment is assessed. Prior to making modifications to liquid effluent systems (e.g. the acidic rinsewater neutralization tanks) or to facilities that could affect effluent release quantities or quality (e.g. a machine energy upgrade) or to the installation of any new facility, the project shall be evaluated and the monitoring needs assessed.

Non-Radiological Discharges (Effluents)

Under the authority of the Clean Water Act (33 U.S.C. 1251, et. seq.) the EPA has promulgated regulations for monitoring liquid effluent discharges to surface waters. Section 402 of the Act establishes the National Pollutant Discharge Elimination System (NPDES) whereby the agency issues permits that control and limit the discharge of any pollutant to the waters of the United States. Federal regulations defining NPDES requirements for monitoring nonradioactive effluents, for both construction activity and for industrial use, are as follows:

- 40 CFR Part 123, "State Program Requirements"
- 40 CFR Part 124, "Procedures for Decision-making"
- 40 CFR Part 125, "Criteria and Standards for the National Pollutant Discharge Elimination System"
- 40 CFR Part 129, "Toxic Pollutant Effluent Standards"

The state administers this law under its VPDES program. In 1993, as the major construction of the facility was nearing completion, the state determined that no NPDES Permit for construction activity was required. If construction disturbing five or more acres is planned, a VPDES Permit would be appropriate. If needed, the VPDES permit would contain specific effluent limitations and monitoring requirements for flow measurement and sampling. Any monitoring requirements would be referenced in future revisions of this program. The state reviewed CEBAF operations in 1994 and determined that no VPDES Permit for industrial activity was required.

Current activities and operations result in a discharge of non-contact cooling water to various surface waters on-site. Many of the surface water outfalls, such as sump pumps, contain mixtures of cooling water, stormwater and/or treated waters. Sumps from the accelerator and experimental areas discharge to designated ditches and are monitored for radiological parameters at regular, periodic intervals. The two sumps in the high power beam dump areas will have dedicated sampling equipment. There are no non-radiological concerns involved with the discharge of this water.

Industrial Wastewater

Discharged to the sanitary sewer system are managed under a permit with the Hampton Roads Sanitation District (HRSD). CEBAF performs monthly monitoring of pH at each of three sampling points. Area ABC covers VARC, Trailer City, CEBAF Center and the Residence Facility. Area D covers the Test Lab. The Area EF flow is from the Experiment Equipment Lab and the buildings on the accelerator site.

HRSD also performs monthly monitoring of pH at each of the three areas. Also checked in 1994 and 1995 are zinc for Area D and cadmium for Area EF. On an annual basis, HRSD prepares seven daily composite samples for each of the three areas and analyzes them for

parameters of concern. In 1994, the analysis addressed zinc, cadmium, copper, chromium, lead, nickel, silver, BOD, COD, TSS and TP. In 1995, the concentrations for all the above, less silver, were determined.

Groundwater Withdrawal

Groundwater is pumped to a surface water ditch from under the end stations. A sample of water is taken quarterly from this dewatering discharge for chemical, as well as radiological, analysis. Analysis includes trace metals [Cu, Fe, Mn, Ni, Pb, Zn], radioactive parameters, and pH, Chemical Oxygen Demand (COD), conductivity, Total Organic Carbon (TOC), and hardness. These parameters were selected as improbable, yet possible, contaminants originating from various operations on site.

Potential chemical or oil spills to the ground or surface water system would trigger a control response upon discovery. The ground or surface water would be sampled before clean-up if necessary to assess the condition. Sampling would be performed at the end of cleanup to ensure that the effects of the spill had been minimized or eliminated.

Radiological Discharges to Surface Waters

Radioactivation of soil can occur near the primary beam targeting and dump areas. Concrete and steel shields have been included in the design of the accelerator and experimental areas to minimize radioactivation of surrounding soil.

Water collected by sump pits within the tunnels is either pumped to the surface or collected in retention tanks. To provide information to estimate annual on-site and offsite releases of radioactive effluents, samples of water are taken periodically from sumps and tanks located around the accelerator complex and end station areas. An annual sampling plan is being developed by the RCG. Sample sites are being selected for their proximity to areas of potential soil radioactivation resulting from accelerator operations, such as target and beam dump locations and to other possible routes of radiocontamination of surface waters, such as closed loop cooling systems. Generally speaking, sumps closest to areas of maximum soil activation are to be sampled for tritium and gross beta most frequently.

The dewatering discharge from the end stations mentioned in the previous section is also sampled for radionuclides on the same quarterly basis. During preoperations the sample is being analyzed according to the terms of the VPA Permit for gross alpha, gross beta, tritium, sodium-22, sodium-24, beryllium-7, and calcium-45. Other radiological parameters identified in the permit that are not accelerator related are: total radium, strontium-90, manganese-54, cobalt-60, cesium-134, thorium-230, and thorium-232. Operational monitoring for gross beta, tritium, sodium-22, beryllium-7, and manganese-54 has been proposed to be included in a new permit modification.

Beam dump cooling water from the Hall A and Hall C high power beam dumps, which will have low tritium levels, is planned to be discharged into the local sewer system as set forth in the Virginia Radiation Protection Regulations, Section 5.301 to 5.303. These regulations set the annual disposal limit at 5 curies (185 Gbq). Water will be withdrawn from each dump system at a rate of about 25 gallons per day. The quantity pumped and the tritium levels will be recorded by a pumping-metering-scintillation device. Also a second sampling rig will take discrete proportional samples of each discharge. The annual quantities discharged will be tracked against the regulatory maximum of 5 curies a year.

Environmental Protection Program Plan

APPENDIX B

Environmental Surveillance Requirements

(extracted from draft CEBAF EH&S Manual Chapter 6711, Environmental Monitoring Program's Appendix T-2)

Criteria and Summary of Environmental Surveillance

Groundwater Radiological Surveillance

Monitoring Wells

Monitoring Program

Groundwater Chemical Surveillance

Surface Water Surveillance

Soil/Sediment Surveillance

Radiochemicals

Pesticides

Penetrating Radiation Monitoring

Quality Assurance

Introduction

The objective of the laboratory's environmental surveillance program is to establish a strategy for environmental surveillance that ensures compliance with legal and regulatory requirements and applicable DOE policy. This appendix documents how the laboratory will provide surveillance through measuring, monitoring, and calculating the effects of facility operations on the environment and public health.

Environmental Surveillance Requirements

The scope of environmental surveillance encompasses all potential effluents, including chemical and radioactive materials. Surveillance activities are selected to be responsive to both routine and potential releases of effluents according to the severity of a possible impact on the environment or public health. Environmental surveillance provides for the measurement and interpretation of the impact of CEBAF activities and operations on the public and on the site and offsite environment. Objectives are presented in Section 4.2 of the EPPP.

Numerous samples are collected and analyzed according to a predefined plan or as needed in response to a concern. Measured concentrations of radioactive materials and chemicals are compared to applicable standards, concentration guides, natural levels, and previous results.

CRITERIA AND SUMMARY OF ENVIRONMENTAL SURVEILLANCE

The criteria for environmental surveillance are derived from requirements set forth in applicable Federal, State, and local regulations, and in applicable DOE policy. The primary pathways available for movement of radioactive materials and chemicals from CEBAF activities and operations to the public are the atmosphere, surface water, and groundwater. Environmental surveillance consists of collecting and analyzing samples and of measuring penetrating radiation. Past monitoring data illustrates that the concentrations of radionuclides in environmental samples are detectable on-site near operating facilities and decrease with distance from the sources. Samples are collected and radiation is measured in areas that extend from on-site operating areas to the site boundary. Ground and surface water is sampled at locations near operating areas, along potential transport pathways, as well as in locations away from the potential contamination sources. In addition to water surveillance, samples of soil shall be collected and radiation measured to determine the effectiveness of effluent controls and to ascertain any build-up of radioactive materials from long-term operations.

The potential radiation doses received by the public are calculated from environmental surveillance data when radionuclide concentrations are measurable. However, data from most on-site locations do not indicate a measurable effect from CEBAF operations. Dose estimates when the concentrations are too low to be detected by surveillance are calculated using data from effluent measurements. The dose from the air pathway is also calculated for regulatory compliance with the AIRDOS-PC model as specified in 40 CFR 61. Calculations based on effluent data show the concentrations offsite to be at background levels and, for most radionuclides, to be below the level that can be detected by monitoring.

GROUNDWATER RADIOLOGICAL SURVEILLANCE

Radioactivation of soil can occur near the primary beam targeting and beam dump areas. Design strategies use massive concrete and steel shields around beam enclosures to minimize soil radioactivation and groundwater contamination. CEBAF's groundwater protection strategies are documented in the CEBAF Groundwater Protection Management Plan.

Samples of water taken routinely from monitoring wells located on the CEBAF site are analyzed for accelerator produced radionuclides and radionuclides that could have been produced by other sources. The grab method is used to collect water samples. The sampling is performed by subcontractors that follow the site-specific practices defined in a RCG Standard Operating Procedure. Sampling frequency has been based on the conditions of our VPA Permit for preoperational monitoring.

Monitoring Program Description

Compliance with the VPA Permit is the chief driver behind the groundwater monitoring program. From machine design controls, existing shielding measures, and calculations a minimum of any kind of radioactive material or groundwater activation is expected on site. The program is split into preoperational and operational monitoring as described in Section 4 of the EPPP. No increase over preoperational levels is expected offsite.

Samples from monitoring wells are collected only after purging the well casing. Three bore volumes of the well casing is used as a purge volume. The purpose of the purging is to eliminate stagnant water in the wellbore and adjacent strata, allowing the collection of a sample that is

representative of the insitu quality of the groundwater near the particular well. All monitoring wells have been installed without dedicated pumps for sample extraction. Bailers are used to obtain samples from the wells. The sampling procedures require that the groundwater elevation from mean sea level be recorded.

All sampling and analysis protocols are EPA sanctioned or are comparable methods approved by the DEQ. Procedures are documented in the VPA Permit conditions and in the site-specific sampling procedure.

1. Preoperational Background Data

The preoperational monitoring program has almost completed establishing an environmental quality baseline of groundwater parameters to provide a basis for comparison with operational values.

Groundwater from six wells and the dewatering point was sampled and analyzed beginning in October 1989. Sampling was performed monthly for the first year and the frequency changed to once per quarter in October 1990. The wells are listed in Table 1. As testing and commissioning continued, five additional wells were installed in early 1995 in the vicinity of the beam switchyard and end stations, areas that are potential sources of groundwater contamination. They have been monitored quarterly in 1995. The wells installed in 1995 are noted in Table 1 and are analyzed for the same parameters. See Exhibit 4-1 for well locations.

**TABLE 1
MONITORING POINTS**

1989 baseline monitoring wells:	GW-2, GW-3, GW-7, GW-8, GW-15, and GW-17 (formerly Arc(W)(A))
Groundwater discharge point:	Dewater
1995 baseline monitoring wells:	BDA-1, BDB-1, BDC-1, BSY-1, GW-6a and GW-15a (replaced GW-15) which was abandoned to allow a road realignment)

The parameters being analyzed are shown in Table 2.

**TABLE 2
GROUNDWATER SAMPLE VARIABLES**

Total Radium	Sodium-24	pH	Manganese
Strontium-90	Manganese-54	Conductivity	Nickel
Calcium-45	Cobalt-60	COD	Sodium
Gross Alpha	Cesium-134	Copper	Zinc
Gross Beta	Tritium	Iron	Hardness
Beryllium-7	Thorium-230	Lead	TOC (Total Organic Carbon)
Sodium-22	Thorium-232		

Prior to accelerator operations startup, a report will be submitted to the state which includes the following:

- a summary of all collected background data on the groundwater wells; and
- a statistical analysis of the data for the wells showing the 99th percentile confidence level for each parameter using an EPA-methodology or comparable method approved by the state.

This report, which will be prepared using a standard EPA methodology, is under subcontract.

2. Operations Data

As full accelerator operations are scheduled to be underway by January 1, 1996, the VPA Permit requires that operational monitoring be performed monthly. A proposed modification to the VPA Permit was submitted in July 1995. Until otherwise notified, the original permit conditions are applicable.

A total of 31 wells will be sampled and analyzed during operations. There will be 'A', 'B' and 'C' wells, labeled as to proximity to the accelerator beam. The 'A' wells are or will be positioned closest to the beamlines. These should be the first wells that would show any contamination levels. The 'B' wells, which include existing GW-10 and GW-11, are positioned a hundred feet or so beyond the 'A' wells. These wells will register any contamination that has extended beyond agreed upon distances from the beamline. The 'C' wells are positioned in a pattern inside of, but near, the site boundary. Five of the eleven wells currently sampled are 'C' wells. Refer to Exhibit 4-1 which shows the existing and planned monitoring well locations.

The samples acquired will be analyzed for the parameters shown in Table 3.

TABLE 3
OPERATIONAL GROUNDWATER SAMPLE VARIABLES

Gross Alpha	Sodium-24	pH
Gross Beta	Beryllium-7	Conductivity
Tritium	Calcium-45	TOC
Sodium-22		

Sampling frequency will be monthly for one year after which the frequency may be reduced, with state approval, to once per quarter. The sampling, analyzing, and reporting procedures to be followed are the same as noted above.

Action levels (where mitigation measures must be considered) have been established by the permit for the "A" wells and "B" wells as shown. The "C" wells shall be monitored to ensure that they do not exceed the established background levels.

Tritium	5000 pCi/l (picocuries per liter)
Man made Radioactivity	1 mrem/yr (millirems per year)

3. Sensitivity and Precision Levels for Radionuclides

The minimum quantification and detection units achievable for chemical parameters are a function of the method used and its instrumentation. The EPA Contract Laboratory Program has established standard quantification and detection limits for the relevant methods. The monitoring of radionuclides will continue to be analyzed at the following sensitivity and precision levels:

TABLE 4
RADIONUCLIDE LEVELS

Parameter	Sensitivity pCi/l	Precision pCi/l
Total Radium	1	+/- 1
Strontium-90	2	+/- 2
Calcium-45	1	+/- 1
Gross Alpha	3	+/- 3
Gross Beta	4	+/- 4
Beryllium-7	600	+/- 600
Sodium-22	40	+/- 40
Sodium-24	60	+/- 60
Manganese-54	30	+/- 30
Cobalt-60	10	+/- 10
Cesium-134	10	+/- 10
Tritium	1000	+/- 1000
Thorium-230	1	+/- 1
Thorium-232	1	+/- 1

The term "sensitivity" for the groundwater analyses means the detection limit which is that concentration which can be counted with a precision of plus or minus 100 percent at the 95 percent confidence level (1.96 standard deviations).

GROUNDWATER CHEMICAL SURVEILLANCE

CEBAF has no significant non-accelerator facilities or devices that contribute to groundwater contamination. However, under the VPA Permit terms, CEBAF monitors groundwater for the preoperational and operational parameters noted in Tables 2 and 3 above. All monitoring points in Table 1 are evaluated for chemical parameters.

The National Interim Primary Drinking Water Regulations of the Safe Drinking Water Act apply to the aquifers on the site. There are no drinking wells in the vicinity of the CEBAF site.

SURFACE WATER SURVEILLANCE

Although radionuclides associated with CEBAF operations may be routinely identified in sumps discharging into ditches on site, concentrations are expected to be well below applicable standards and will likely remain undetectable in the ditch and dewatering sampling locations.

2 A sampling program to take annual samples from on-site ditches is being considered to start in
4 1996. Analysis for accelerator-produced radionuclides (H-3, Be-7, Na-22, Ca-45, Mn-54, and
6 Co-60) is being discussed.

8 SOIL/SEDIMENT SURVEILLANCE

10 There is no regulatory requirement to monitor soil for contamination at CEBAF.
12 Radioactivation of soil can occur near the primary beam targeting and dump areas. The
14 accelerator operations have a minimal, non-measurable effect on soil. Beam line designs have
incorporated shielding within the beam enclosures to minimize radioactivation of surrounding
soil.

16 Radiochemicals

18 The sampling and analysis of soil is a useful approach to determining the accumulated amounts
20 of long-lived radioactive contaminants and stable contaminants that deposit on the ground or
22 within sediments. The critical factors necessary to provide this information are sampling
location, time of sampling, frequency of sampling, sample size, and maintenance of the integrity
24 of the sample prior to analysis. Soil/sediment shall be sampled periodically to determine and
to document the radiochemical composition around selected water discharge points at CEBAF.
26 Samples shall be taken annually at selected effluent discharge points at CEBAF for analysis of
radionuclide accumulation within the soil/sediment medium. These sample sites shall be
28 selected according to their proximity to active operational areas or site boundary discharges.
Every effort shall be made to select sampling plots and individual sample cuts that are as
homogeneous as possible, avoiding tilled areas or areas of unusual wind influence. Only areas
in the accelerator vicinity have been sampled. No baseline samples are necessary.

30 An assessment of contributions from operations will be done by comparing results with baseline
32 values. Comparison of results in this manner provides an indication of trends or increases in
the concentration of contaminants in the environment attributable to CEBAF operations.

36 Chemical and Oil Spills

38 Monitoring shall be performed as a follow up to a chemical or oil spill that occurred in a water
40 channel or on the ground surface. Sampling would be done to identify the extent of
contamination and again at the end of clean-up activity to verify satisfactory completion.

42 Pesticides

44 Pesticides are used on site to control weeds and insects. These pesticides are applied by
46 personnel licensed by the State. Sampling of neighboring creeks, ditches and adjacent areas is
conducted if runoff is suspected.

PENETRATING RADIATION MONITORING

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- Operation of the accelerator shall inevitably result in production of some penetrating radiation (primarily neutrons and muons) outside of the accelerator shielding. Although most of the shielding has been designed to be adequate for foreseeable routine circumstances, there are some locations (usually in the experimental areas) which are thinly shielded and which rely on radiation/activated interlocks for personnel protection. In either case, monitoring for purposes of determining actual radiation levels both on and off the site is necessary.
- A network of monitors shall be used to monitor penetrating radiation, (e.g., environmental thermoluminescent dosimeters (TLDs) and data loggers). There are three stations that have neutron and gamma detecting devices positioned in the accelerator area.
- The detectors are connected to a data logger which automatically records the radiation levels. Environmental TLDs, exchanged and read each quarter, provide additional information on radiation levels sitewide and at the boundaries.

DOE CORRESPONDENCE APPROVAL SHEET

LOG NUMBER: 950410

TO: K. Dean Helms, CEBAF Site Office Manager
FROM: Carter B. Ficklen, EH&S Reporting Manager
SUBJECT: CEBAF Environmental Protection Program Plan

Document Author_____
Date

Associate Director Approval

_____
Date Send to _____ for
Additional QA Review*_____
Reviewer's Signature_____
Date

Sent:

Date

cc: H. Grunder L. Cardman
J. Coleman N. Isgur
J. Domingo J. Kelly
B. Hartline L. Even
R. Sundelin B. May
J. Boyce S. Prior

bcc:

*To be designated by respective AD under whom document is generated.

The Continuous Electron Beam Accelerator Facility

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