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JUL 18 1990

U.S. Department of Energy Environment, Safety and Health

DOE/EH--0140-Vol.1

DE90 013605

Tiger Team Assessment of the Brookhaven National Laboratory

June 1990

**U.S. DEPARTMENT OF ENERGY
WASHINGTON, DC 20585**

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PREFACE

DEPARTMENT OF ENERGY

TIGER TEAM ASSESSMENT
OF THE
BROOKHAVEN NATIONAL LABORATORY

UPTON, NEW YORK

This final report contains findings and concerns identified during the Tiger Team Assessment of the Department of Energy's (DOE's) Brookhaven National Laboratory (BNL), Upton, New York. This assessment was conducted by the Department's Office of Environment, Safety and Health (ES&H) between March 26, and April 27, 1990.

The scope of the assessment was comprehensive, covering all areas of ES&H activities and waste management operations. Compliance with applicable Federal, State, and local regulations; applicable DOE Orders; and internal BNL requirements was assessed. In addition, the assessment included an evaluation of the adequacy and effectiveness of the DOE and the site contractor, Associated Universities, Inc. (AUI), management, organization, and administration of the ES&H programs at BNL.

At the conclusion of the on-site assessment activities, a draft report was submitted for factual review to the Office of Energy Research; the Office of the Assistant Secretary for Nuclear Energy; the Office of Environmental Restoration and Waste Management; the Chicago Operations Office; the Brookhaven Area Office; AUI; and Federal, State, and local regulatory agencies. This final report reflects the factual changes from that review.

DOE management was briefed on assessment findings and concerns on May 10 and 11, 1990. Congressional briefings were held on June 11 and 14, 1990.

The Brookhaven Tiger Team Assessment is part of the larger, comprehensive DOE Tiger Team Independent Assessment Program planned for DOE facilities. The assessment program is part of a 10-point initiative announced by Secretary of Energy, Admiral James D. Watkins, Ret., on June 27, 1989, to conduct independent compliance oversight and management assessments of the ES&H programs and waste management operations at DOE facilities. The objective of the initiative is to provide the Secretary with information on the compliance status of DOE facilities with regard to ES&H requirements, root causes for noncompliance, adequacy of DOE and contractor ES&H management programs, response actions to address the identified problem areas, and DOE-wide ES&H compliance trends and root causes.

June 1990
Washington, D.C.

Executive Summary

EXECUTIVE SUMMARY

This report documents the results of the Department of Energy's (DOE's) Tiger Team Assessment conducted at Brookhaven National Laboratory (BNL) in Upton, New York, between March 26 and April 27, 1990. This independent assessment was conducted by a team comprised of professionals from the Department, contractors, and consultants. The purpose of the assessment was to provide the Secretary of Energy, Admiral James D. Watkins, Ret., the status of environment, safety and health (ES&H) programs at the Laboratory.

The BNL is a multiprogram laboratory operated by the Associated Universities, Inc., (AUI) for DOE. The missions of BNL include research in high-energy physics, nuclear physics, life sciences, nuclear medicine, materials sciences, and chemical sciences. Management of the Laboratory operations is assigned to the Brookhaven Area Office (BHO) under the Chicago Operations Office (CH). The three responsible Headquarters (HQDOE) offices include Energy Research (ER), Nuclear Energy (NE), and Environmental Restoration and Waste Management (EM). The BNL is the thirteenth DOE facility to be reviewed by a Tiger Team. It is the first nondefense facility to be visited by a Tiger Team.

The scope of the assessment included a review of management systems and operating procedures and records; observations of facility operations; and interviews at HQDOE, CH, and BNL. Subteams in four areas performed the review: ES&H, Occupational Safety and Health, and Management and Organization.

The following four activities at the Laboratory were directly affected by this assessment:

AQUIFER RESTORATION PROJECT - The New York State Department of Environmental Conservation sent a letter to BHO on February 26, 1990. The letter required the Laboratory to terminate the surface discharge of untreated contaminated groundwater from the Aquifer Restoration Project because of inadequate demonstration of hydraulic containment of the plume. However, the discharge was still occurring during the Tiger Team Assessment. The State reaffirmed their position during an interview with Tiger Team members and the discharge was subsequently halted.

MONITORING WELL INSTALLATION PROGRAM - The continuation of the Laboratory site monitoring well installation program was halted primarily because of a potentially inadequate program design.

BROOKHAVEN MEDICAL RESEARCH REACTOR - The Environmental Subteam's evaluation of the hydrogeologic conditions and the associated groundwater contamination called attention to the use of contaminated well water to cool the Medical Research Reactor and raised a question as to whether the cooling water discharge met State standards. The Reactor, which had been administratively shut down for other reasons, will not be restarted until an acceptable alternative is determined.

ENVIRONMENTAL MEDIA SAMPLING - The environmental media sampling was discontinued because the Laboratory had not identified Occupational Safety and Health Administration/Act (OSHA) requirements for protection of hazardous waste workers, including training requirements.

The BNL is in the process of improving its ES&H programs. Commitment has been clearly stated by senior management. Progress has been made as the Laboratory prepared for this assessment. However, progress is limited by an insufficient number of staff and a lack of needed expertise and rigor. Laboratory management has acknowledged the need for ES&H expertise, both in terms of technical knowledge and regulatory requirements, and is moving ahead to obtain the needed expertise in some of the disciplines.

The Laboratory has clearly demonstrated a long-standing disciplined and technically inquisitive approach to scientific programs, including a system of checks and balances. This approach needs to be applied to the ES&H programs and facility maintenance. This will greatly improve the Laboratory's ability to conduct critical self-assessment, which is a major step in developing a sound ES&H program. Knowledge and discipline together with the availability of clear checks and balances in the Laboratory organizational structure will go a long way toward fulfilling the Department and Laboratory management's common goal of safe and environmentally sound operations while achieving scientific objectives.

The CH has taken actions to increase staffing at BHO in an effort to fulfill its line management responsibilities. However, oversight of BNL operations by BHO, CH, and ER is not adequate. This inadequacy is due to a lack of resources and the fractionated assignment of line-management responsibilities for ES&H versus scientific activities. Lessons can be learned from the oversight concept and process being developed with NE for reactor operations. Also, both short-term and long-term resource requirements to address ES&H and facility maintenance have to be clearly identified and prioritized so that funding decisions can be made at the appropriate Department management level with an understanding of the resultant benefits.

The findings, concerns, and probable root causes identified by the Team are summarized in the following sections and reflect a snapshot in time. It is our expectation that BNL, BHO, CH and ER will use these findings, concerns, and probable root causes as they identify root causes for resolution as part of the Action Plan.

Environment

Strengths noted by the Environmental Subteam were that the Laboratory, for the most part, has the professional capability of conducting a comprehensive environmental program and that it is committed to complying with environmental regulations and DOE Orders. The Subteam concluded that reporting required by Secretary of Energy Notice No. 7 (SEN 7) was generally adequate for the Laboratory, although the Subteam noted several deficiencies that the Laboratory had not previously identified. In addition, several findings identified deficiencies that had been noted as early as the 1987 Environmental Survey but had not yet been corrected.

The Environmental Subteam identified 37 findings dealing with lack of conformance to Federal and State laws and regulations, County codes, DOE Orders, and 27 findings in which best management practices were not attained. Key concerns relate to inadequate hydrogeologic, surface water, air, and soil characterization, and the inadequate control of activated materials.

The causal factors for these and other environmental findings include the lack of standard operating procedures for many Laboratory environmental programs, the lack of audits and reviews, the perception of low risk resulting in limited commitment of financial and personnel resources, and inadequate training of personnel charged with the tasks of environmental control.

Two noteworthy practices were identified by the Environmental Subteam. The first involved exceptional procedures used for the disposition of chemicals under the control of personnel terminating work or experimental activities at BNL, and the second concerned a Legionella bacteria prevention program for cooling towers.

Safety and Health

The Safety and Health (S&H) Subteam noted strengths in both the Medical Services discipline, where one Noteworthy Practice was identified, and in the Plant Engineering Division's sitewide maintenance program. Several improvements have taken place in many areas since the September 1989 comprehensive Technical Safety Appraisal of the Laboratory, including the following:

the packaging and transporting of hazardous materials, an increased emphasis on occupational safety, a decline in occupational accident rates, greater attention to the construction safety program, and a marked improvement in the safety training program.

One Category II concern was identified addressing significant risks or substantial noncompliance with DOE Orders (but not involving a situation where a clear and present danger exists to workers or members of the public). That concern addressed a substantial noncompliance with OSHA requirements regarding hazard communication training. In addition, one concern was cited as a Hazard Level 1, having the potential for causing a severe occupational injury or fatality. The concerns were primarily identified in the areas of fire protection, formality of operations, quality verification, organization and administration, technical support, and radiation protection.

In general, Laboratory-wide policies, controls, and management communication have not been designed to ensure a uniform and consistent safety program. Management followup activities are lacking resulting in noncompliance with safety and health requirements; and since each department is autonomous in its safety responsibility, many aspects of the safety program are fragmented and inconsistent, and not in compliance with safety and health requirements.

Occupational Safety and Health Administration/Act (OSHA) Compliance

Approximately 200 apparent violations of OSHA and DOE workplace safety and health standards and regulations were detected during the OSHA review. Although none of the violations can be classified as an "imminent danger," about half were classified as "serious."

The findings can be categorized in the following three areas: (1) electrical hazards, (2) hazard communication, and (3) portable fire extinguishers. Most construction findings were in the area of asbestos control, and were caused by application of incorrect asbestos requirements.

The deficiencies identified were attributable largely to the lack of uniform management controls in verifying sitewide compliance with OSHA requirements, a weakness in training, a lack of formality in safety-related operations, and a lack of close management oversight.

Management and Organization

The Management Subteam found that both the Department and Laboratory staffs generally accept the DOE goal of full compliance with ES&H requirements. However, the following key management findings were supported by the Environmental and S&H Subteams assessments. Communication of Laboratory ES&H policies and directives to the working level is not adequate. Laboratory internal oversight has been insufficient and has not been adequately independent of line organizational responsibilities. The Laboratory lacks a safety and health plan to identify and prioritize ES&H deficiencies and concerns. Both staffing and funding resources need to be increased to meet Departmental expectations within the time schedule. Operations and Program Office oversight of the Laboratory ES&H programs have been insufficient.

Probable Root Causes

The Team identified four root causes for the findings and concerns identified during the assessment. First, Department and Laboratory management have not uniformly accepted the need for high-level attention to the new ES&H expectations. Second, Department and Laboratory management appear to underestimate the difficulty of meeting ES&H requirements. Third, Laboratory management lacks sufficient control of the ES&H program. Finally, an adequate system of checks and balances in the overall ES&H program is lacking.

TIGER TEAM ASSESSMENT REPORT

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ACRONYMS AND ABBREVIATIONS

ACM	Asbestos Containing Material
ADD	Accelerator Development Department
ADM	Action Description Memorandum
AGS	Alternating Gradient Synchrotron
ALARA	As Low As Reasonably Achievable
ANSI	American National Standards Institute
AOC	Area of Concern
AQCR	Air Quality Control Region
ARARS	Applicable or Relevant and Appropriate Requirements
AST	Aboveground Storage Tank
ATF	Accelerator Test Facility
AUI	Associated Universities, Inc.
BAT	Best Available Technology
BGRR	Brookhaven Graphite Research Reactor (Also GRR)
BHO	Brookhaven Area Office (DOE)
BIRP	Brookhaven Incident Report Program
BLIP	Brookhaven Linear Isotope Production Facility
BMP	Best Management Practice
BMRR	Brookhaven Medical Research Reactor (Also Known as MRR)
BNL	Brookhaven National Laboratory
CAA	Clean Air Act
CEARP	Comprehensive Environmental Assessment and Response Program
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CH	Chicago Operations Office (DOE)
CLIF	Chemistry Linac Irradiation Facility
CLP	Contract Laboratory Program
CO	Certificate to Operate
COC	Chain of Custody
CPAF	Cost Plus Award Fee
CSF	Central Steam Facility
CWA	Clean Water Act
CY	Calendar Year
D&D	Decontamination and Decommissioning
DAS	Department of Applied Science
DCG	Derived Concentration Guide
DMR	Discharge Monitoring Report
DOE	Department of Energy
DOL	Department of Labor
DOP	Dioctyl Phthalate

DOT	Department of Transportation
DP	Defense Programs
DQAR	Designated Quality Assurance Representative
EA	Environmental Assessment
EDE	Effective Dose Equivalent
EE/CA	Engineering Evaluation/Cost Analysis
EH	Office of the Assistant Secretary for Environment, Safety and Health
EIS	Environmental Impact Statement
EM	Office of Environmental Restoration and Waste Management (DOE)
EMP	Environmental Monitoring Program
EOC	Emergency Operations Center (DOE)
EOF	Emergency Operations Facility
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act (Also Known as SARA Title III)
ER	Office of Energy Research (DOE)
ERS	Effluent Removal System
ES&H	Environment, Safety and Health
ESO	Engineering Services Order
FFA	Federal Facility Agreement
FFCA	Federal Facility Compliance Agreement
FIFRA	Federal Insecticide, Fungicide, and Rodenticide Act
FR	Federal Register
FS	Feasibility Study
FY	Fiscal Year
GFCI	Ground Fault Circuit Interrupter
GPM	General Plant Maintenance
GPP	General Plant Project
GRR	Graphite Research Reactor (Also Known as BGRR)
HE	High Explosives
HEPA	High-Efficiency Particulate Air
HFBR	High Flux Beam Reactor
HP	Health Physics
HQDOE	Headquarters, Department of Energy
HSWA	Hazardous and Solid Waste Amendments
HWMF	Hazardous Waste Management Facility
IAG	Interagency Agreement
IRT	Incident Response Team
IWS	Inactive Waste Site

LDR	Land Disposal Restricted
LES	Laboratory Emergency Supervisor
LEPC	Local Emergency Planning Committee
LINAC	Linear Accelerator (Bldg. 930)
LP&EC	Loss Prevention and Environmental Control

M&O	Management and Operations
M&TE	Measuring and Testing Equipment
MEV	Million Electron Volts
MRR	Medical Research Reactor (Also Known as BMRR)
MREM	Millirem
MSDS	Material Safety Data Sheet
MSL	Mean Sea Level
MSR	Maintenance Service Request
MTF	Memoranda-to-File
MW	Megawatt

NCP	National Oil and Hazardous Substances Pollution Contingency Plan (Also Known as National Contingency Plan)
NCR	Nonconformance Report
NCRP	National Council on Radiation Protection and Measurements
NE	Nuclear Energy
NEPA	National Environmental Policy Act
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOD	Notice of Deficiency
NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NSLS	National Synchrotron Light Source
NYCRR	New York Compilation of Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation

OJT	On-the-Job Training
OMA	Office of Military Applications
OMC	Occupational Medical Clinic
OSHA	Occupational Safety and Health Administration/Act
OSR	Operational Safety Requirement
ORR	Occupancy Readiness Reviews

PA	Preliminary Assessment
PCB	Polychlorinated Biphenyls
PM	Particulate Matter
PPB	Parts Per Billion
PPM	Parts Per Million
PR	Preliminary Review
PRP	Potentially Responsible Party
PTC	Permit to Construct

QA Quality Assurance
QC Quality Control

R Roentgen
R&D Research and Development
REM Roentgen Equivalent Man
RCRA Resource Conservation and Recovery Act
RFA RCRA Facility Assessment
RFI RCRA Facility Investigation
RFP Request for Proposal
RI Remedial Investigation
RI/FS Remedial Investigation/Feasibility Study
RMW Radioactive Mixed Waste
ROD Record of Decision
RTG Radioisotopic Thermoelectric Generator

SA Safety Assessment
S&A Sampling and Analysis
S&EP Safety and Environmental Protection
S&H Safety and Health
SAR Safety Analysis Report
SARA Superfund Amendments and Reauthorization Act
SCDHS Suffolk County Department of Health Services
SCSC Suffolk County Sanitary Code
SDWA Safe Drinking Water Act
SEPC State Emergency Planning Commission
SFMP Surplus Facilities Management Program
SOP Standard Operating Procedure
SPCC Spill Prevention, Control, and Countermeasures
SPDES State Pollutant Discharge Elimination System
SSB Soils/Sediments/Biota
STP Sewage Treatment Plant
SWMU Solid Waste Management Unit

TCA Trichloroethane
TLD Thermoluminescent Dosimeters
TSA Technical Safety Appraisal
TSCA Toxic Substances Control Act
TSP Total Suspended Particulate
TSS Total Suspended Solid
TTA Tiger Team Assessment

UOR Unusual Occurrence Report
UST Underground Storage Tank

VOC Volatile Organic Compound
VSI Visual Site Inspection

WCF	Waste Concentration Facility
WMP	Waste Management Plan
WTS	Waste Transfer System
WTP	Water Treatment Plant
WWTP	Waste Water Treatment Plant

1.0 Introduction

1.0

INTRODUCTION

On June 27, 1989, Secretary of Energy, Admiral James D. Watkins, Ret., announced a 10-point initiative to strengthen environment, safety and health (ES&H) programs and waste management operations in the Department of Energy (DOE). One of the initiatives involved conducting independent Tiger Team Assessments (TTAs) at DOE operating facilities. The Office of Special Projects in the Office of the Assistant Secretary for Environment, Safety and Health (EH) has the responsibility to conduct TTAs for the Secretary of Energy.

The Brookhaven National Laboratory (BNL) is a multiprogram laboratory operated by the Associated Universities, Inc. (AUI) for DOE. The missions of BNL include scientific and medical research, energy technology development, environmental restoration, and associated support functions. Management of BNL operations is assigned to the Brookhaven Area Office (BHO) under the Chicago Operations Office (CH). The responsible Headquarters, DOE (HQDOE) offices include the Office of Energy Research (ER), the Assistant Secretary for Nuclear Energy (NE), and the Office of Environmental Restoration and Waste Management (EM). BNL is the thirteenth DOE facility to be reviewed by a Tiger Team.

1.1

Purpose

The purpose of the Brookhaven TTA is to provide the Secretary of Energy with concise information on

- current ES&H compliance status at the site and the vulnerabilities associated with that compliance status,
- root causes for noncompliance,
- adequacy of DOE and AUI ES&H management programs, and
- adequacy of response actions needed to address identified problem areas.

This information will assist DOE in determining patterns and trends in ES&H compliance and probable root causes and will provide guidance for management to take needed corrective actions.

1.2

Scope

The scope of the Brookhaven TTA is comprehensive in terms of evaluation of BNL management systems, facilities, and operations in the ES&H areas. The Team reviewed management systems and operating procedures and records, observed facility operations,

and conducted interviews at HQDOE, CH, and BNL (both DOE and AUI). The ES&H areas reviewed included, but were not limited to,

- compliance with applicable Federal, State, and local regulations, requirements, permits, agreements, and enforcement actions;
- compliance with DOE Orders requirements for ES&H activities;
- compliance with the Occupational Safety and Health Administration/Act (OSHA) regulations and standards;
- adequacy of DOE and site contractor ES&H management programs, including planning and budgeting, organization, resources, training, and relationships with regulatory agencies and the public;
- conformance with applicable "best" or "accepted industry practices"; and
- identification of root causes.

1.3 Approach

The TTA at the BNL was conducted in accordance with the Tiger Team Guidance Manual, February 1990, and followed accepted audit techniques. The assessment was conducted by a team of specialists from various DOE offices and contractor organizations. The team was managed by a senior DOE manager and supported by four experienced Subteam Leaders, one for each of the four disciplines of Environment, Safety and Health (S&H), OSHA, and Management and Organization. In addition, an EH Senior Safety Manager provided guidance and direction for the conduct of the safety and health assessment. Team members, with their area of responsibility and work-related experience, are identified in biographical information included as Appendix A.

The TTA is not an exhaustive review of all facilities and operations at BNL. Rather, each Subteam focused on major facilities and operations of interest to conduct an evaluation that was representative of the overall status of the BNL ES&H programs. The Environmental Subteam assessment schedule is given as Appendix G for information. The S&H Subteam performed a focused Technical Safety Appraisal (TSA) since a comprehensive TSA was performed by EH in September 1989 (see Appendix B). This focused TSA complements the 1989 TSA, and the resulting concerns are numbered consecutively to facilitate preparation of the action plan.

The Environmental Subteam performed an audit of all elements of the BNL environmental program; issues related to management are

referred to the Management Subteam for followup. Similarly, the OSHA Subteam performed an OSHA-type compliance inspection. An evaluation of the adequacy of the BNL OSHA and occupational safety/industrial safety program was conducted by the S&H Subteam. The S&H Subteam conducted a comprehensive, multidisciplined appraisal following the TSA protocol. To ensure consistency in review of the BNL ES&H programs, the causal factors identified by all the subteams and management evaluation of the safety and health program are considered by the Management Subteam in the identification of probable root causes.

A systematic approach was implemented to perform the probable "root cause" analyses. This approach, depicted in Figure 1-1, begins with the analysis and evaluation of detailed background information and assessment data by the individual Subteams to develop their findings and concerns. These individual findings are integrated by the Subteams through identification of probable causal factors. The last step in the process is a collective determination of a set of probable root causes for the findings and concerns identified by the Subteams.

The TTA process includes four distinct phases: planning, on-site assessment, report, and followup.

PLANNING

Planning for the Brookhaven TTA included the issuance of an introduction and information request memorandum, a preassessment site visit, an initial review of the requested documentation provided to the Tiger Team by BNL, and development of an assessment agenda.

The preassessment site visit by the Tiger Team Leader, the Environmental and S&H Subteam Leaders, EH Senior Safety Manager, and representatives from the EH Office of Special Projects was conducted on February 21 and 22, 1990. The CH Manager, the BHO Manager, and BNL management provided overviews of site operations and the ES&H program. The Tiger Team Leader and Subteam Leaders discussed the TTA program and necessary support requirements for the on-site assessment. Regulatory representatives from the State of New York and Suffolk County attended the preassessment meetings and discussed regulatory issues, with respect to BNL, that are of concern to their agencies.

The assessment approach and agenda were provided to BNL prior to initiation of the assessment so that counterparts for each technical area to be reviewed could be identified.

Figure 1-1. Tiger Team Assessment Approach.

ASSESSMENT

The on-site activities for the Brookhaven TTA took place from March 26 through April 27, 1990. On-site activities included document review; observation of routine operations and response actions to incidents; interviews with DOE and site contractor personnel and personnel from Federal, State, and local regulatory agencies; and review of previous audits and assessments. Using these sources of information, the Tiger Team developed findings and concerns as discussed below.

An aerial survey was conducted by the DOE Remote Sensing Laboratory (managed by EG&G Energy Measurements, Inc., for the Nevada Operations Office) to identify areas of radiation contamination in the environment and to collect other data to assist the Tiger Team effort. Preliminary data from the aerial radiological survey conducted in March 1990 are included in Appendix E. Extensive aerial photography of the site was also taken for use by the Team; an aerial photography of BNL and surrounding area is shown in Figure 1-2.

REPORT

Section 2.0 is an overall summary of the key TTA findings, concerns, and noteworthy practices identified by the four Subteams. Sections 3.0 through 6.0 contain the Environmental, S&H, OSHA, and Management findings and concerns, respectively.

For the Environmental and Management Subteams, each identified issue is categorized as either a "Compliance Finding" or a "Best Management Practice (BMP) Finding." Compliance findings are conditions that, in the judgment of the Team, may not satisfy applicable ES&H regulations, DOE Orders (including internal DOE memoranda, where referenced), internal ES&H site operating standards, enforcement actions, agreements with regulatory agencies, or permit conditions. BMP findings are derived from regulatory agency guidance, Draft DOE Orders, accepted industry practices, and professional judgement. Within these categories, the finding is prefaced by a statement of "Performance Objective." The performance objectives for compliance findings are derived from promulgated regulations and the final DOE Orders, consent orders, agreements, and permit conditions. The performance objectives for BMP findings are derived from regulatory agency guidance, accepted industry practices, and professional judgment. The findings for the Environmental and Management Subteams are not necessarily arranged in order of relative significance.

In conducting the environmental assessment, the Team considered policy and Federal, State, and local regulations, standards, and codes from the technical perspective without regard to possible legal questions such as sovereign immunity and the legal

Figure 1-2. Aerial photograph of Brookhaven National Laboratory and surrounding area.

applicability of certain State or local regulations to DOE facilities. Findings may be based on policies as well as State and local laws and regulations that are not necessarily legally binding on DOE. Findings are not intended, and should not be construed, to create any legal rights or as any waiver by DOE.

For the S&H Subteam, each identified issue is developed into a "concern," which is supported by finding(s), having the characteristics of being explicit (stating the problem), measurable (auditable), and justifiable. A concern addresses a situation that in the judgment of the S&H Subteam: (1) reflects less than full compliance with a DOE safety and health requirement or mandatory safety standard; (2) threatens to compromise safe operation; or (3) if properly addressed, would substantially enhance the excellence of that particular situation even though that part of the operation was judged to have a currently acceptable margin of safety. Because of this last category addressing the excellence of the operation, more concerns are reported than would result from a strictly compliance-oriented assessment.

The objective of the OSHA Subteam review of the BNL facilities was to measure workplace safety and health against OSHA regulations. The apparent violations were directly related to the OSHA standards of Title 29 Code of Federal Regulations (CFR) 1910, General Industry and 29 CFR 1926, Construction. An occurrence was listed as a citation if at the time of the sighting it did not meet an OSHA requirement.

In addition to identifying finding and concerns, the four Subteams look for exceptional practices in accomplishing performance objectives. Any noted exceptional practices, which may have general application at other DOE facilities, are identified as "Noteworthy Practices," and are documented for the purpose of information transfer.

The assessment reflects a fixed point in time. The Team acknowledges where BNL, BHO, or CH have identified an ES&H concern. Improvements in the ES&H areas that were planned, but were not completed at the time of this assessment, are identified as findings or concerns if the Team judged them to be necessary to satisfy ES&H requirements or BMPs.

The findings and concerns identified by the S&H and OSHA Subteams were verbally presented to representatives from HQDOE, CH, BHO, and AUI at closeout briefings on April 12, 1990. The overall Tiger Team closeout briefings were conducted on April 27, 1990, for representatives from the organizations listed above and the Federal, State, and local regulatory agencies.

This Draft Tiger Team Report was transmitted to the HQDOE, Program Senior Officials; Manager, CH; AUI; and Federal, State,

and local regulators for technical and factual accuracy review following the closeout meeting. Upon receipt of comments, the Tiger Team will be responsible for the preparation and issuance of the final report.

FOLLOWUP

AUI, together with CH and BHO, will prepare a draft action plan that addresses the findings and concerns identified by the Tiger Team. The draft action plan will be submitted by the Manager, CH, to the Program Senior Officials for review and approval with the concurrence of the Tiger Team and EH. The Secretary will approve the final action plan and direct its implementation.

1.4 Facility Description

The BNL occupies about 5300 acres of flat land in Suffolk County on Long Island, New York. Most of the site is wooded, except for a developed area of about 1680 acres. Its location, about 60 miles east of New York City, places BNL at the approximate geographical center of Long Island. Neighboring communities include Brookhaven Township (in which BNL is situated), Patchogue 10 miles west southwest, Bellport 8 miles southwest, Center Moriches 7 miles southeast, Riverhead 13 miles due east, Wading River 7 miles north northeast, and Port Jefferson 11 miles northwest. Refer to Figure 1-3 for site location and neighboring communities.

Suffolk County has a total population of 1,300,000 of which 380,000 live in Brookhaven Township. Even though the township has the largest population in Suffolk County, its large area yields a population density of only 1400 persons per square mile. The neighboring eastern townships of Riverhead and Southampton have even lower densities at less than 300 persons per square mile. There has been a continuing development of suburban housing and shopping centers just west of the BNL site in recent years.

The climate of Long Island is coastal, with extremes being moderated in summer by southerly ocean breezes and in winter by the large water masses of Long Island Sound and the Atlantic Ocean. Severe local thunderstorms and tornadoes are virtually nonexistent, but occasional hurricanes do wreak havoc on the island, causing wind damage and localized flooding. Precipitation is evenly distributed throughout all seasons, averaging 42 inches per year. This rainfall pattern is especially important because precipitation is the only source of potable water throughout Long Island. Rainfall, which is absorbed into and through the soils, filters into the aquifer to form a primary water reserve whose maximum natural yield is estimated to be 1.15 billion gallons per day. The Environmental Protection Agency (EPA) has designated this aquifer to be a

Figure 1-3. Brookhaven National Laboratory site location map.

Source: BNL, 1985

sole-source aquifer (i.e., an aquifer that provides 50 percent or more of the drinking water for an area). Management and protection of this irreplaceable resource has led the Township of Brookhaven to adopt a master plan that zones land use to preserve the aquifer. Brookhaven is the first Long Island community to take this step.

The BNL site, along with most of Suffolk County, is covered with scrub oak and pine. Most of the vegetation is secondary growth; the only virgin white pine grove (the Prosser Pines at Yaphank) lies 2 miles west of the BNL property line. As surrounding areas have been cleared for development, the Laboratory site is becoming increasingly important as a refuge for wildlife. BNL shelters about 30 species of mammals, including an ever-increasing herd of white-tailed deer. About 180 species of birds have been recorded on-site. About 33 of these species are year-round residents, whereas the remainder are transients, using the Atlantic Flyway in their migration routes north and south. The preservation of wetlands and feeding areas will continue to encourage breeding and flock expansion, not only at BNL but all over Long Island.

The site was used by the U.S. Army during World Wars I and II, when it was called Camp Upton. The name Upton is still used as the official post office address. The Atomic Energy Commission was given title to the property in 1947, then transferred ownership; first to the Energy Research and Development Administration in 1975, then to DOE in 1977. The gradual transition from Army camp to campus-style research facility has been a continuous process at BNL. Many of the older, wooden frame buildings have been modified and are still in use and stand as a contrast to the new, permanent buildings.

1.5 Overview of Major BNL Operations

As a DOE multiprogram laboratory, BNL has three major functions:

- Design, construct, and operate large research facilities such as particle accelerators, nuclear reactors, and synchrotron storage rings for research in high-energy and nuclear physics, chemistry, biology, and energy-related life and environmental sciences.
- Carry out long-term, high-risk programs in the basic sciences (using the unique facilities mentioned above) which have a potential long-term benefit.
- Expand the technology base of the nation, especially in areas where work is best performed in an institutional setting that is independent of all proprietary interests.

To carry out this mission, BNL has maintained a full-time staff of 3300 to 4000 employees. In addition, each year about 1500 off-site personnel participate in research on shorter-term projects as collaborators, consultants, or students. Operations are currently housed in 354 buildings with a total floor space of about 3,654,000 square feet, including trailers and modular buildings.

To carry out the multifaceted studies BNL must perform to fulfill its mission, a number of major scientific facilities have been provided for staff use. The following is a brief summary of these operations:

- The High Flux Beam Reactor (HFBR) is fueled with enriched uranium, and moderated and cooled by heavy water. The HFBR is currently not operating but will operate at a routine power level of 40 megawatts (MW) thermal. This domed, 94,300-square-foot facility (Bldg. 750) is utilized for projects in the Physics Department (60 percent), Chemistry Department (23 percent), Biology Department (16 percent), and other areas (1 percent). Multiple beam lines are available for simultaneous experiments by a number of research teams.
- The Brookhaven Medical Research Reactor (BMRR) is fueled with enriched uranium, moderated and cooled by light water, and operates intermittently at power levels up to 3 MW thermal. This 11,300-square-foot structure (Bldg. 491) provides irradiation services for the Medical Department (33 percent), Chemistry Department (8 percent), Safety and Environmental Protection (S&EP) Division (8 percent), Reactor Division (4 percent), Physics Department (1 percent), and to outside organizations for research (46 percent).
- The Alternating Gradient Synchrotron (AGS), a proton accelerator, operates at energies of up to 33 giga-electron volts (GeV) in studies involving high-energy physics research and particle detection. The machine complex has a diameter of 840 feet and was upgraded in 1969 to permit operation at higher intensities. The Physics Department and outside universities are the largest users.
- The 200 million electron volts (MeV) Linear Accelerator (LINAC) (Bldg. 930) serves as an injector for the AGS described above. It also supplies a continuous beam of protons for producing radioisotopes by spallation reactions in the Brookhaven Linac Isotope Production Facility (BLIP) (Bldg. 931B).

- The Tandem Van de Graaff Generator, the Vertical Accelerator, and the Research Van de Graaff Generator are operated by the Physics Department for use in medium-energy physics research, as well as special nuclide production. Housed in Bldg. 901A, the Tandem Van de Graaff Generator is connected to the AGS by a 2000-foot tunnel. This interconnection of the two facilities permits the injection of intermediate-mass ions into the AGS, where such ions can be accelerated to energies of up to 15 GeV per atomic mass unit. Ions can then be extracted and sent to AGS experimental halls for physics research.
- The National Synchrotron Light Source (NSLS) (Bldg. 725) uses a linear accelerator and a booster synchrotron as an injection system for two electron storage rings:
 - 2.5-GeV x-ray ring used for x-ray diffraction studies
 - 700-MeV vacuum ultraviolet ring for spectroscopy studies.

In addition to these major Laboratory facilities, many other programs involve the use of radionuclides or irradiation for scientific purposes. For example, the Department of Applied Science and the Medical Department develop and process special-purpose radionuclides jointly for general use. Other similar programs are carried out in the Chemistry Department and in the Biology Department.

The foregoing overview summarizes those activities that can generate most of the BNL environmental problems. For example, nearly all of the BNL airborne radioactive effluents are generated at the HFBR, the BLIP, and the Research Van de Graaff Generator, with minor contributions from the Medical Research Center and the Chemistry Department. The HFBR and BLIP are the major generators of liquid radioactive wastes, with smaller contributions coming from the "hot" waste water at the Hot Laboratory, the Decontamination and Hot Laundry Facility, and the Waste Concentration Facility.

2.0 Key Findings, Noteworthy Practices, and Casual Factors

2.0 KEY FINDINGS AND CAUSAL FACTORS

2.1 Environment

2.1.1 Key Findings and Noteworthy Practices

The Environmental Subteam identified 66 findings in this assessment of BNL. None of the findings reflect situations that present an immediate risk to public health or the environment. Thirty-seven findings reflect problems in which the standards of Federal, State of New York, or Suffolk County laws or regulations, or DOE Orders have not been met. Twenty-seven findings represent conditions in which BMPs are not employed. Two findings represent noteworthy practices in use at BNL. The Environmental Subteam identified the following three key findings which represent potential compliance issues with regard to Federal and State regulations, DOE Orders, or BMPs:

- Inadequate Characterization of the Hydrogeologic Regime
The hydrogeologic regime at BNL has not been adequately characterized to define the vertical and horizontal extent of contamination; the relationship and interactions between the upper glacial aquifer and the lower Magothy Aquifer; the extent of the Gardiners Clay, the critical aquitard separating the two aquifers; and the local groundwater flow paths and velocities at specific areas of known contamination (Finding GW/CF-1).
- Inadequate Management of Activated Material - The radiation survey equipment, procedures, and recordkeeping; employee radiation survey training; storage methods for activated materials; and procedures for unrestricted release of materials are not adequate to ensure that a member of the public does not receive an effective dose equivalent that exceeds the DOE 5400.5 dose limit (Finding RAD/CF-1).
- Lack of Adequate Identification and Characterization of Emissions, Effluents, and Soils - BNL has not adequately identified and characterized its radiological and chemical emissions to the air, liquid effluent discharges to the surface water and groundwater, and contaminated site soils (Findings A/BMPF-3, SSB/BMPF-1, SW/BMPF-1, and RAD/BMPF-1).

The first two of these key findings are individual compliance findings that appear in the groundwater and radiation sections (Sections 3.4.3 and 3.4.8, respectively). The third key finding is comprised of four individual BMP findings that appear in the air, soils/sediments/biota, surface water, and radiation sections. These key findings are summarized in Section 3.3 and

are more fully described in the individual finding discussions in Section 3.4.

Also significant are the two noteworthy practice findings identified in the environmental assessment. The first of these findings is performing analyses for Legionnaires bacteria in large on-site cooling towers. The second noteworthy practice finding is a termination/transfer procedure that helps prevent staff turnover from causing the accumulation of unknown chemicals in the laboratories.

2.1.2 Causal Factors

For the Environmental Subteam findings as a group, 16 causal factors were identified as contributing factors. However, some of these causal factors contributed more frequently than others to individual findings. The five causal factors that appeared most frequently are policy implementation, procedures, reviews and appraisals, resources, and training. Other causal factors appeared less frequently.

- Policy implementation appeared most frequently, in 80 percent of the findings. In many cases, the inability of BNL to fully implement Federal, State, local, DOE, or BMP standards appeared to result from other causal factors, including procedures, reviews and appraisals, resources, and training.
- Procedures appeared as a causal factor in 40 percent of the findings. In these findings, BNL procedures, such as standard operating procedures (SOPs) or Safety Guides needed to ensure implementation of Federal, State, local, DOE, or BMP standards, were either absent or incomplete, or were not being followed correctly by all applicable personnel.
- Reviews and appraisals also appeared as a causal factor in 40 percent of the findings. This factor appeared to contribute to findings in two distinct ways. In the first case, BNL had not been able to implement corrective actions in response to findings from previously conducted reviews and appraisals or had not prevented the problems, once corrected, from recurring. In the second case, BNL internal review processes were either missing or flawed and subsequently failed to identify existing problems.
- Lack of resources appeared as a causal factor in 23 percent of the findings. In these findings, BNL was typically already aware of the problem but had not corrected the problem due to a lack of financial and personnel resources. In some cases, BNL had assigned

a low priority to correcting the finding due to the perception that the problem had comparatively little risk. A significant example of this is the key finding on the lack of adequate identification and characterization of emissions, effluents, and soils. In other findings, the lack of resources could be attributed to the DOE funding process for large-scale capital projects under which corrective actions need to be identified and budgeted several years prior to beginning construction.

- Training appeared as a causal factor in 20 percent of the findings. In these findings, personnel had been inappropriately excluded from existing training programs or training programs were either incomplete or missing.

2.2 Safety and Health

2.2.1 Key Concerns and Noteworthy Practices

The S&H (TSA) Subteam identified concerns in all of the safety disciplines examined during the appraisal. The most important concerns, based on hazard severity and compliance considerations, were related to Industrial Hygiene, Occupational Safety, and Fire Protection. Important concerns were also expressed in Organization and Administration.

The key concerns in these areas indicate:

- Disconnects in the lines of communication are a major cause of the deficiencies in the safety performance of the Laboratory. For the most part, the intermediate management levels have passed the Laboratory Director's general direction and guidance on without further amplification or specificity. Because these Laboratory-wide policies and controls have not been designed to ensure a uniform and consistent safety program, appropriate specification or safety direction is not effected and the safety line of communication is effectively severed. This is further exacerbated by the absence of any followup or feedback mechanism. Since each department is autonomous in its safety responsibility many aspects of the safety program are thus fragmented, unfocused, inconsistent, not in compliance, and there is failure to establish prior priorities.
- High standards of safety are held by some individuals, but are not universally required nor exhibited, nor widely appreciated and practiced among all facility personnel. While on the threshold of a modern safety

culture in some areas, there remains a deep seated and pervasive attitude at BNL that safety is a necessary evil, that a rigorous approach to safety is incompatible with the research-oriented mission of the laboratory, that safety compliance should be minimal, that good science equates to satisfactory safety performance, and that BNL's pioneering of many safety disciplines implies an unbroken lead in the community obviating a need for improvement and suppressing any urgency for necessary corrective actions.

- Competence exists in the staff of essential safety organizations, but these resources are stretched thin, especially in fire protection, where staff and funding constraints appear to account for the majority of fire protection deficiencies identified.
- There is little evidence of systematic development of safety policy and procedures, and a lack of formality in the management of safety policy in the line organizations and its administration through orderly systems of procedures, controls, and documentation. Procedures written and used by operating groups do not undergo formal periodic review, revision, and approval by S&EP personnel.
- Implementation of DOE Orders is inconsistent and sluggish, with major deficiencies noted in OSHA hazard communication requirements (a Category II Concern), OSHA compliance in general industry and construction standards, and fire protection standards and codes.
- Planning for safe activities is sporadic and perfunctory and suffers from the lack of adequate procedures and disciplined approach to safety problems. When procedures exist, they are not always followed with consistency or rigor, and deviations frequently occur without full documentation and evaluation.
- Controls are not applied by either the Laboratory or BHO to verify compliance with safety procedures and requirements. Implementation of quality assurance (QA) programs is spotty. Of the 17 programs in various stages of development or implementation in BNL's QA program, evolving since early 1985, only one is considered fully implemented. Four of 21 BNL organizations have yet to develop an approved QA program.
- Technological excellence exists in the research arena but is not equaled in the safety program where there is need for improvement in knowledge of OSHA and sitewide

staff appreciation of the relationship between housekeeping and fire hazards.

- Overall performance and documentation of technical support activities at BNL are performed in a thorough manner only at the reactor areas. Other areas exhibited inconsistencies in preparation of timely Safety Analysis Reports (SARs), which are often completed after the fact. For the most part, nonreactor areas did not employ Operational Safety Requirements and did not adequately identify, document, test, and maintain safety systems and safety equipment. Also, an envelope of parameters in which experiments or classes of experiments can be safely operated has not been developed.
- BNL has not adequately addressed the release of nonradioactive toxic materials and specific emergency scenarios in their respective facility SARs and emergency preparedness, nor has equipment required to respond to such events been identified, dedicated, or made easily retrievable in the event of emergency.

One Category II concern was expressed, addressing significant risks or substantial noncompliance with DOE Orders (but not involving a situation where a clear and present danger exists to workers or members of the public). This concern addressed a substantial noncompliance with OS&H requirements regarding hazard communication training.

One Noteworthy Practice was identified, in the Medical Services discipline. In addition to having excellent protocols for jobs with unusual hazards necessitating special medical examinations and surveillance, Occupation Medicine Clinic physicians obtain additional updated information about job hazards from the employee's supervisor. This occurs prior to conducting a pre-employment, periodic, return to work, or rehire physical examination.

2.2.2 Root Causes

Several root causes may be identified for the deficiencies in BNL safety performance:

- CH, BHO, and BNL management have not established controls which would be effective in verifying compliance with safety procedures and requirements.
- BNL management has not established an effective mechanism to promulgate comprehensive safety policy to all levels or to provide feedback on its effectiveness.

- Weakness in training and a lack of formality in safety-related operations have resulted in widespread noncompliance with Federal regulations and DOE Orders.
- Lack of definitive sitewide safety policies has resulted in inconsistent safety performance throughout the laboratory.
- CH and BHO have not exercised close safety oversight of BNL; frequent effective inspections, assessments, and followups required to assure an appropriate level of safety performance are absent.
- A rigorous approach to safety is still viewed by many at BNL as incompatible with the research-oriented mission of the laboratory.

2.3 Occupational Safety and Health

2.3.1 Key Findings and Noteworthy Practices

Over 200 instances of noncompliance with OSHA regulations were found. About half met the OSHA definition of "serious violations," but none met the definition of "imminent danger." Two BNL practices were considered noteworthy. These are the compliance with regulations found in the Fire Department, and the thoroughness and usefulness of the description of hazards in the BNL Safety Manual.

There are serious deficiencies in the BNL electrical safety program. Evidence for this is the many apparent serious violations of the OSHA electrical regulations. Among the apparent serious violations is the absence of ground fault circuit interrupters at many critical locations, the lack of a determination that the grounding circuits function on electrical hand tools, and the use of temporary wiring in lieu of permanent building wiring. Additionally, frayed wiring and removal of grounding prongs were also found in several locations along with improper wiring in hazardous locations.

The Hazard Communications Program at BNL has not been implemented in the spirit or letter of the OSHA regulations. The training of employees is moving at a slow pace, material safety data sheets (MSDS) are not always available at the work sites and are missing for some materials, and welding supplies and materials have been completely overlooked by the program.

Several apparent serious violations of the OSHA machine guarding regulations indicate that there are major deficiencies in BNL's regular machine guarding inspections.

Little construction was in progress at the time of the inspection. However, apparent serious violations of OSHA construction regulations were observed. One was that the required procedures were not being followed during asbestos removal. Another is the lack of roll-over protection for construction equipment. An effective operational construction safety program would have been able to identify and correct these deficiencies.

2.3.2 Causal Factors

BNL does not lack the technical expertise to address the violations of the OSHA regulations. The S&EP staff has ample knowledge, skill, and ability to correct these problems. However, the apparent violations, which were found after inspecting approximately 10 percent of the facilities, indicate that there is not an effective and active program to identify and correct OSHA violations. Causal factors identified include the following:

- BNL does not have a stated policy in their Safety Manual of compliance with OSHA regulations.
- Discussions with employees indicate that active communication between the S&EP Division and the operating programs needs improvement.
- Autonomy of operating programs is not a reason for inadequate oversight and assistance to research and other programs with their occupational safety and health problems. If there were a more active involvement by S&EP, the many apparent OSHA violations would not have been present.

2.4 Management

2.4.1 Key Findings

The Management Subteam found both the DOE and BNL staffs generally supportive of the DOE goal of full compliance with ES&H requirements. The Subteam found actions to meet these goals already under way but not sufficiently advanced to indicate their overall effectiveness. Obstacles were found that will need to be overcome. The key management findings that follow address these obstacles:

- Communication of BNL ES&H policies and directives to the working level in the form of consistent, standardized procedures is not adequate.
- BNL internal oversight needed to ensure that the ES&H program meets DOE and other regulatory requirements has

been insufficient. BNL internal oversight has also not been sufficiently independent of line organizational responsibilities.

- BNL does not have an integrated safety and health plan that identifies and prioritizes ES&H deficiencies and concerns. Both staffing and the rate of funding for ES&H improvements need to increase to meet DOE expectations on an acceptable time schedule.
- There has been inadequate oversight of BNL ES&H programs by ER, CH, and BHO.
- ER, CH, and BHO have not had sufficient, qualified staff to ensure the adequacy of the BNL ES&H programs.

2.5 Summary of Probable Root Causes

The Team believes that the probable root causes of the assessment findings and concerns identified during this TTA are as follows:

- Senior DOE and contractor management have not uniformly accepted the need for high-level attention to the new ES&H expectations. This emphasis on ES&H has presented a challenge to senior DOE and BNL management, in terms of meeting ES&H requirements with a minimum impact on research.
- DOE and BNL appear to underestimate the difficulty of meeting ES&H requirements. The new expectation of meeting all DOE and regulatory requirements all of the time, along with major technical complexities, requires a level of effort and expertise that goes beyond the level that has been allocated to date.
- BNL management lacks control of the ES&H program. BNL does not appear to recognize the consistency and formality needed to meet current DOE ES&H goals and expectations; in that, Laboratory-wide controls on safety- and environment-related activities through the requirement and enforcement of SOPs are not required.
- The BNL Director does not have an adequate system of checks and balances in the ES&H program. A lack of independence in the appraisal program is not offset by sufficient external oversight. The overall DOE and BNL oversight program is inadequate and does not provide the quality of information needed for DOE and BNL management to make the best ES&H decisions.

3.0 Environmental Assessment

3.0 ENVIRONMENTAL ASSESSMENT

3.1 Scope

The scope of the BNL environmental assessment was comprehensive, covering all environmental media and applicable Federal, State, and local regulations and requirements; DOE Orders; and BMPs. The environmental disciplines addressed in this assessment include air, soil, vegetation and biota, surface water, hydrogeology, waste management, toxic and chemical materials, radiation, QA, inactive waste sites, and requirements of the National Environmental Policy Act (NEPA) and cultural and natural resource laws and regulations.

3.2 Approach

The Environmental Subteam assessment of the BNL was conducted in accordance with the Tiger Team Guidance Manual, February 1990, and followed accepted audit techniques. The assessment was conducted by a team managed by a Subteam Leader and an Assistant Subteam Leader from the DOE Office of Environmental Audit and technical specialists from other DOE offices and support contractors. The names, responsibilities, affiliations, and biographical sketches of the team members are provided in Appendix A.

The environmental assessment of the BNL included three phases: planning, on-site activities, and reporting. During the planning phase, a letter was sent to the site requesting information about the site. A preassessment site visit was then conducted. Information gathered from both the response to the letter and the preassessment site visit formed the basis for an Environmental Subteam's on-site agenda. Once on-site, the team members modified the original agenda as more information was obtained and additional areas of interest were identified. This daily agenda, which reflects the BNL areas covered by the Subteam, is included as Appendix G.

The on-site activities for the Brookhaven TTA took place from March 26 to April 27, 1990. On-site activities included document review; interviews with DOE and site contractor personnel, and personnel from Federal, State, and local regulatory agencies; reviews of previous audits and assessments; and daily Team debriefs which were open to the DOE, the site, and the regulators. Using these sources of information, the Tiger Team developed findings as discussed below.

For the Environmental Subteam, each identified problem is categorized as either a "Compliance Finding" or a "BMP Finding." Compliance findings are conditions that, in the judgment of the assessment team, may not satisfy applicable ES&H regulations, DOE

Orders (including internal DOE memoranda, where referenced), internal ES&H site operating standards, enforcement actions, agreements with regulatory agencies, or permit conditions. BMP findings are derived from regulatory agency guidance, Draft DOE Orders, accepted industry practices, and professional judgement. Within these categories, the finding is prefaced by a statement of "Performance Objective(s)". The performance objectives for compliance findings are derived from promulgated regulations and the final DOE Orders, consent orders, agreements, and permit conditions. The performance objectives for BMP findings are derived from regulatory agency guidance, accepted industry practices, and professional judgment. The findings are not necessarily arranged in order of relative significance.

In addition to identifying findings, the three Subteams look for exceptional practices in accomplishing performance objectives. Any noted exceptional practices are identified as "Noteworthy Practices," which have general application to DOE facilities and are documented for the purpose of information transfer.

3.3 Environmental Assessment Summary

The Environmental Subteam identified 66 findings in its assessment of BNL. None of the findings reflect situations that present an immediate risk to public health or the environment. Thirty-seven findings reflect problems that do not meet the requirements of Federal, State of New York, or Suffolk County laws or regulations, or DOE Orders. Twenty-seven findings represent conditions in which BMPs are not employed. Two findings represent noteworthy practices in use at BNL. The titles of the environmental findings are presented in Table 3.3-1 by media or discipline, as appropriate.

As part of the Environmental Subteam assessment, other reports on environmental compliance or environmental problems were reviewed. These reports include the 1987 Environmental Survey Preliminary Report of BNL and a recent status report of the subsequent action plan developed by BNL in response to the Survey. The Subteam also reviewed a 1989 Resource Conservation and Recovery Act (RCRA) Compliance Assessment by Black & Veatch and several monthly environmental compliance status reports prepared by BNL in response to the 1989 Secretary of Energy Notice No. 7 (SEN-7) on DOE Policy on line-management responsibility to achieve environmental compliance at DOE facilities.

**TABLE 3.3-1
ENVIRONMENTAL FINDINGS**

AIR FINDINGS

A/CF-1	Lack of Air Certificates to Operate
A/CF-2	Improper Operation of Digester Flare
A/CF-3	Effluent Tritium Sampling Deficiencies
A/CF-4	Improper Asbestos Disposal
A/CF-5	Lack of Required Gasoline Pump Labels
A/BMPF-1	Ambient Air Monitoring Deficiencies
A/BMPF-2	Lack of High Efficiency Particulate Air filter Differential-Pressure Testing and Replacement Standard Operating Procedures
A/BMPF-3	Lack of an Air Emissions Inventory
A/BMPF-4	Lack of Atmospheric Dispersion Studies for Emergency Response Incidents
A/BMPF-5	Lack of Consistency in Airborne Tritium Concentrations
A/BMPF-6	Laboratory Contamination of Tritium-in-Air Samples
A/NPF-1	Prevention of Legionella in Cooling Tower Emissions

SOILS/SEDIMENTS/BIOTA FINDINGS

SSB/BMPF-1	Inadequate Characterization of On-Site Soils and Sediments
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SURFACE WATER/DRINKING WATER FINDINGS

SW/CF-1	Discharges Not Specified in the Brookhaven National Laboratory State Pollutant Discharge Elimination System Permit
SW/CF-2	State Pollutant Discharge Elimination System Permit Exceptions
SW/CF-3	Inadequate Wastewater Sampling

SW/CF-4	Late Submittal of Discharge Monitoring Reports
SW/BMPF-1	Lack of Adequate Characterization and Identification of Liquid Effluents
SW/BMPF-2	Lack of Antisiphon Devices
SW/BMPF-3	Deteriorating Sewer Lines
SW/BMPF-4	Lack of Wastewater Diversion and Water and Wastewater Sampling Procedures
SW/BMPF-5	Sewage Treatment Plant Deficiencies

HYDROGEOLOGY FINDINGS

GW/CF-1	Inadequate Characterization of the Hydrogeologic Regime
GW/CF-2	Groundwater Contamination
GW/CF-3	Improper Screen Placement in Monitoring Wells at the Current Landfill
GW/CF-4	Improper Abandonment of Monitoring Wells at the Current Landfill
GW/BMPF-1	Insufficient Well Abandonment/Cross-Contamination Between Aquifers
GW/BMPF-2	Inadequate Monitoring Well Construction and Maintenance
GW/BMPF-3	Improper Groundwater Sampling Procedures

WASTE MANAGEMENT FINDINGS

WM/CF-1	Discharge of Untreated Hazardous Waste Groundwater from the Aquifer Restoration Project
WM/CF-2	Lack of Fire Protection at the Hazardous Waste Management Facility
WM/CF-3	Inadequate Container Management and Hazardous Waste Determination at the Hazardous Waste Management Facility
WM/CF-4	Lack of Required Monitoring Wells at the Active Solid Waste Landfill

WM/CF-5	Inadequate Inspections, Recordkeeping, and Reporting at the Active Solid Waste Landfill
WM/CF-6	Inadequate Management of Hazardous Waste in Accumulation Areas
WM/CF-7	Improper Disposal of Hazardous Solvent-Contaminated Wastes
WM/CF-8	Inadequate Contingency Plan Distribution and Arrangements with Local Authorities
WM/CF-9	Lack of Recordkeeping and Reporting of Medical Waste Incineration
WM/CF-10	Lack of a Valid Landfill Operating Permit
WM/BMPF-1	Storage of Land-Disposal-Restricted Mixed Waste
WM/BMPF-2	Inadequate Procedures and Personnel Training for Proper Emergency Operation of the Hazardous Waste Management Facility Area
WM/BMPF-3	Out-of-Service Solvent Degreaser Not Emptied
WM/NPF-1	Termination/Transfer Procedure

TOXIC AND CHEMICAL MATERIALS FINDINGS

TS/CF-1	Inaccurate and Inadequate Information in the Annual Polychlorinated Biphenyls Reports
TS/CF-2	Inadequate Secondary Containment for Polychlorinated Biphenyl Items and Containers
TS/CF-3	Inadequate Labeling of Polychlorinated Biphenyl Items and Transport Vehicles
TS/CF-4	Inadequate Toxic and Hazardous Material Storage and Handling Controls
TS/BMPF-1	Lack of Standard Operating Procedures for the Management of Toxic and Hazardous Materials
TS/BMPF-2	Improper Storage of Pesticides
TS/BMPF-3	Inadequate Notification of Polychlorinated Biphenyl Equipment

QUALITY ASSURANCE FINDINGS

QA/CF-1	Inadequate Detailing of Purchase Requests for Analytical Support of Environmental Monitoring
QA/CF-2	Inadequate Control of Document Revisions
QA/BMPF-1	Inadequate Chain-of-Custody Procedures
QA/BMPF-2	Lack of Standard Operating Procedures for Common Analytical Laboratory Protocols

RADIATION FINDINGS

RAD/CF-1	Inadequate Management of Activated Material
RAD/CF-2	Inadequate Radiological Environmental Monitoring Documentation
RAD/BMPF-1	Inadequate Characterization of Effluent Streams for Radiological Constituents

INACTIVE WASTE SITES FINDINGS

IWS/CF-1	Inadequate Implementation of the National Contingency Plan
IWS/CF-2	Inadequate Program for Emergency Planning and Community Right-to-Know Act
IWS/CF-3	Lack of a Developed and Implemented Community Relations Plan
IWS/CF-4	Lack of an Administrative Record
IWS/CF-5	Inadequate Search for Inactive Waste Sites
IWS/BMPF-1	Incomplete Spill Reporting Procedure

NATIONAL ENVIRONMENTAL POLICY ACT FINDINGS

NEPA/CF-1	Inappropriate National Environmental Policy Act Determination
NEPA/BMPF-1	Outdated Sitewide Environmental Impact Statements
NEPA/BMPF-2	Delays in National Environmental Policy Act Approval and Determination Process

BNL has made progress in correcting many of the problems identified in previous assessments. However, some findings in the TTA correspond closely to problems identified in previous assessments. Thus, BNL has been aware of previous deficiencies but has been slow to correct the problems due to a variety of reasons, including inadequate oversight and reviews and the perception of low risk equating to limited commitment of financial and personnel resources.

BNL was placed on the National Priorities List (NPL) in November 1989 as a result of releases of hazardous substances from several on-site inactive waste sites. Prior to this time, BNL had made some progress in the characterization and cleanup of a few of its inactive sites and releases, particularly at sites where limited removal actions provided adequate remediation. These actions included emptying and cleaning the aboveground radioactive waste tanks at the Waste Concentration Facility and removing and properly disposing of several drum and tank storage areas around the facility. In addition, the use of cesspools to receive and dispose of laboratory and sanitary wastewater is being phased out as facilities are connected to the central sewer system. However, remedial actions taken at other inactive sites have not been performed in accordance with the DOE Order planning and administrative requirements of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). These actions include the Aquifer Restoration Project near the Hazardous Waste Management Facility (HWMF).

As a result of the NPL listing, DOE has entered into negotiations with the State of New York and EPA on an interagency agreement (IAG). This agreement, which is to be finalized in the near future, will provide the framework and schedule for cleanup under the CERCLA process. It addresses approximately 23 "areas of concern" that will require comprehensive investigation to ensure proper remediation. In addition, other sites may be added as "areas of concern."

For groundwater, which has become contaminated beneath BNL as a result of past site activities and the presence of inactive waste sites, the Laboratory has devoted considerable time and energy, and will need to continue to dedicate resources, to characterizing this medium. Although BNL has attempted to correct some previously identified groundwater monitoring program deficiencies, these problems generally have not been adequately corrected. Progress has been made in the areas of determining well construction, the use of dedicated sampling pumps, abandonment of inactive wells, installation of tamper-proof well caps, appropriate disposal of purge water, and an accurate sitewide map showing all wells; however, future work in this area will be needed. Little progress has been made in installing wells screened at the proper depth intervals and in providing adequate identification markings on all wells.

BNL is performing a groundwater restoration project at the HWMF. However, a number of other areas of groundwater contamination have not been adequately characterized, including the Former Landfill Area; the active solid waste landfill; potable Well Nos. 1, 2, 10, and 11; process supply Well No. 104; the Sewage Treatment Plant (STP); the meadow marsh and substation well area; the Bldg. 650 sump discharge area; and off-site areas which may potentially be contaminated as a result of past BNL operations. These areas will likely be addressed in the IAG. Newly identified groundwater findings address additional groundwater monitoring program deficiencies, the potential for cross contamination between aquifers as a result of past BNL activities, and an inadequate hydrogeological characterization.

In the area of toxic and hazardous materials, BNL is continuing to bring storage facilities for such materials into conformance with Suffolk County regulations. In 1987, BNL and BHO entered into an agreement with Suffolk County to conform to the technical standards of County requirements for storage of toxic and hazardous materials, including secondary containment, overfill protection, corrosion protection, and protection from exposure to precipitation. Although not all BNL drum and tank storage areas conform to these standards, representatives of the Suffolk County Department of Health Services (SCDHS) are pleased with the progress at BNL and believe that BNL is keeping to the spirit and intent of the 1987 agreement. A continuing area of concern is the management of polychlorinated biphenyls (PCBs) and pesticides. BNL has had inadequate PCB inventories, handling procedures, containment facilities, and annual reporting since the 1987 Environmental Survey. The 1987 environmental Survey found deficient handling controls for pesticides. These deficiencies are only now being addressed due to the low priority that BNL has given to this concern.

In the area of QA, a QA plan for sitewide environmental monitoring has been developed and is now in place. However, inadequate sample custody procedures have been identified as a new concern. The adequacy of such procedures may become important in helping to ensure the validity of environmental monitoring data used in site remediation activities.

In the area of radiation, BNL has made limited progress in several areas. The QA plan for sitewide environmental monitoring includes procedures for radioactive contamination analyses, but the new procedures have not yet been implemented. BNL has started to characterize various effluent streams and on-site soils for radionuclides. In addition, the practice of managing activated equipment and shielding is now subject to a written policy, management criteria, and survey technique, but these controls are not yet fully in place. Storage of activated

materials on-site in uncontrolled areas is a previously identified finding for which little corrective action has occurred.

In the air section, several previously identified concerns have yet to be properly addressed by BNL. These include an inadequate sitewide inventory of air emissions and several existing unpermitted sources. BNL also lacks procedures to ensure that air emission points are identified and evaluated to determine whether a permit is necessary and to ensure that the necessary permit applications are submitted. Another previously identified concern is the lack of pressure differential gauges across all high-efficiency particulate air (HEPA) filters. In response to the 1987 Environmental Survey, BNL only provided gauges across the HEPA filters specifically identified in the finding. Still another recurring finding is potential tritium contamination of environmental air samples brought to the on-site laboratory located in an area with high tritium background levels. Improvements have been made in the control of organic emissions from vapor degreasers and in the use of an approved integrated dose assessment model. A noteworthy practice finding for air is that new chilled-water cooling towers will be tested for the bacteria known to cause Legionnaires Disease.

For surface water, previously identified issues have generally been addressed in the characterization and analysis of surface water runoff and the redirection of building discharges from cesspools and storm sewers to the sanitary sewer system. However, further work in these areas is needed. Although the majority of wastewater is directed to the sanitary sewer system, BNL is still using some cesspools for the disposal of wastewater, and the phase-out of cesspool operation is expected to continue in the future. Additionally, several unpermitted discharges were identified during the assessment, and the need for an inventory and characterization of liquid discharges was determined. One previously identified concern is the integrity of the BNL sanitary sewer system. However, BNL has performed a visual sewer line integrity study and has begun a program to replace and repair the leaking sewer lines. Line repair and replacements are expected to continue for several years.

In the area of waste management, BNL has devoted considerable attention and resources to correcting previously identified concerns. Past concerns that have been corrected include characterization of mixed waste streams, characterization and remediation of potentially contaminated soils and leachate resulting from hazardous and radioactive waste management activities, inadequate RCRA training for employees, and secondary containment of waste oil and radioactive waste storage tanks. One area for which corrective actions still need to be performed includes inadequate waste accumulation areas. Newly identified findings include concerns in the operation of the active solid

waste landfill, the HWMF, the Aquifer Restoration Project, the Medical Department medical waste incinerator, and future compliance with the RCRA land disposal restrictions.

It should also be noted that a noteworthy practice for waste management, the use of an employee termination/transfer procedure to help prevent the generation of "orphaned" and unknown chemicals, is being used in some BNL laboratories.

The most significant findings presented in the Environmental Assessment are the following:

- Inadequate Characterization of the Hydrogeologic Regime - The hydrogeologic regime at BNL has not been adequately characterized to define the extent of contamination, aquifer relationships, subsurface stratigraphy, and local flow pathways on- and off-site. The vertical and horizontal extent of contamination has not been adequately characterized; the areal extent and integrity of the Gardiners Clay, the only potential aquitard separating the upper glacial aquifer and the lower Magothy Aquifer, have not been determined; and the groundwater flow paths and velocities at specific areas of known contamination have not been determined.
- Inadequate Management of Activated Material - BNL management of activated material is inadequate to ensure that a member of the public does not receive an effective dose equivalent that exceeds DOE 5400.5 dose limit as a result of the release of material for unrestricted use. Inadequacies were identified in the availability of survey instruments, employee training, accessible storage areas, surveys in high-background areas, recordkeeping, the unrestricted release of unsurveyed and inadequately surveyed materials, and unapproved survey methods.
- Lack of Adequate Identification and Characterization of Emissions, Effluents, and Soils - BNL has not adequately identified and characterized its radiological and chemical emissions to the air, liquid effluent discharges to the surface water and groundwater, and contaminated site soils. A sitewide air emissions inventory has not been performed to identify and characterize all emissions points. An inventory and characterization of the process flows to the State Pollutant Discharge Elimination System (SPDES) outfalls also has not been performed. Site soils have not been sufficiently characterized to determine the presence and extent of contamination and to prevent the further spread of contamination.

3.4 ENVIRONMENTAL ASSESSMENT FINDINGS

3.4.1 Air

3.4.1.1 Overview

The purpose of the air portion of the environmental assessment was to assess the current operating practices with regard to (1) regulations promulgated under the Clean Air Act, State of New York and Suffolk County regulations on air pollution control, and other pertinent statutes; (2) DOE Orders; and (3) BMPs. Table 3.4.1-1 lists applicable regulations, guidelines, and DOE Orders used to evaluate the air discipline.

The general approach to the air assessment included the following activities: (1) an examination of the major facilities and sources including emission control systems and effluent monitoring systems, (2) interviews with BNL personnel, (3) an inspection of the BNL ambient air quality monitoring network, and (4) a review of site documents and files.

Table 3.4.1-1
List of Applicable Air
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
40 CFR 50-88	Clean Air Act Implementing Regulations	EPA
6 NYCRR Chapter 3	Air Resources	NYSDEC
New York State Air Guide-I	Guidelines for the Control of Toxic Ambient Air Contaminants	NYSDEC
Suffolk County Sanitary Code, Article 10	Air Pollution Control	NYSDEC
DOE 5400.1	General Environmental Protection Program	DOE
Draft DOE 5400.XY	Radiological Effluent Monitoring and Environmental Surveillance	DOE
DOE 6430.1A	General Design Criteria	DOE

Argon-41, oxygen-15, and tritium are the radionuclides released in largest amounts from the BNL facilities. . Because of its short half-life (2 minutes), oxygen-15 has a negligible impact on the collective dose equivalent (total population dose) beyond the site boundary and within 50 miles. At the site boundary, it is estimated that oxygen-15 contributes about 10 to 25 percent of the dose equivalent. It is estimated that in a typical year argon-41 (half-life of 110 minutes) is responsible for about 93 percent of the total population dose, with most of the remainder contributed by tritium (half-life of 12 years). All other radionuclides (radioiodines, inert gases, and metals) contribute less than 1 percent of the total population dose.

Argon-41 is discharged from the BMRR stack at Bldg. 491. Tritium oxide is discharged from the HFBR through the stack at Bldg. 705, the Van de Graaff Accelerator (both tritium gas and tritium oxide) at Bldg. 901, the Chemistry Department stack at Bldg. 555, and the Linac Isotope Facility at Bldg. 931. Oxygen-15 is discharged from the BLIP stack at Bldg. 931. A wide variety of other radionuclides (including radioiodines) of minor importance are discharged from the Hot Laboratory through the stack at Bldg. 705, the HFBR, the Linac, and the Incinerator (Bldg. 444). Particulates containing many radionuclides produced by activation are discharged from many stacks including those mentioned above and various machining or processing operations.

Nonradiological air emission sources are found in many BNL buildings. Several criteria pollutants (particulate matter, SO₂, NO_x, and CO) are emitted from the Central Steam Facility (CSF) (Bldg. 610). Sources of volatile organic compounds (VOCs), which are either ozone precursors or toxic air pollutants (or both) are widely dispersed throughout the site. Several blueprint machines are sources of ammonia. Although BNL handles very large quantities of lead primarily for shielding purposes, the emissions, primarily from recycling and melting operations (Bldgs. 650 and 208), are small. The air portion of the environmental assessment identified five compliance findings, six BMP findings, and one noteworthy practice finding. The nature of these findings indicates that the BNL air pollution and radiological and nonradiological air emissions programs need some corrections. Several air findings (one compliance finding and three BMP findings) relate to monitoring (or lack of monitoring) for radionuclides, both at sources and in the ambient air. The noteworthy practice finding credits BNL in the analysis of potential emissions from cooling towers. Although the quality and credibility of some of the monitored and modeled radiological emissions and ambient air data are somewhat questionable, the collective data indicate that the radiological emissions and the ambient air impact of BNL are nearly insignificant. Information on the total nonradiological air emissions from BNL is incomplete.

3.4.1.2 Compliance Findings

A/CF-1 Lack of Air Certificates to Operate

Performance Objective: Title 6, New York Compilation of Rules and Regulations (NYCRR) 201 requires that "no person shall operate an air contamination source without having a valid certificate to operate issued by the commissioner." Also, as a BMP, a rigorous process to identify all potential sources that may require air permits should be implemented. Such procedures frequently involve construction of "roof maps," which identify all vents even those which do not require permits (e.g., intake vents and plumbing vents).

Finding: BNL has not identified all operating air emission sources that may require certificates to operate (COs) in accordance with 6 NYCRR 201, and BNL does not have a rigorous process to systematically identify existing sources in accordance with BMPs.

New York State Department of Environmental Conservation (NYSDEC) regulations do not clearly identify "de minimis" quantities of air emissions, below which sources do not require COs. As a result of audits and surveys conducted during several years prior to the TTA, several small sources were identified that do not have, but may require, COs. During the 1987 Environmental Survey (Appendix I, A-1), small sources were identified as operating without certificates. Actions were taken on some of these but, at present three have not been submitted to the (NYSDEC) for a CO, as shown in Table 3.4.1-2.

In an effort to identify additional uncertified sources, BNL has conducted, from 1988 to the present, surveys and investigations of air emissions. These have resulted in the identification of 14 sources that may require COs (Table 3.4.1-2).

Although BNL intends to continue these surveys on an annual basis, they have not been sufficiently rigorous in identifying all sources. For example, five previously unidentified sources, which may require COs, have been identified by the Tiger Team as shown on Table 3.4.1-2.

The cause of this finding appears to be related to inadequate procedures for periodically assessing the compliance status of air sources, and inadequate reviews/audits and oversight by BHO.

It is apparent, however, that inadequate quantification of "de minimus" quantities of air emissions below which a CO is not required in NYSDEC regulations as they apply to small air sources is a contributing cause.

Table 3.4.1-2
Potential BNL Air Emissions Sources Requiring
Certificates to Operate - April 1990

<u>Building</u>	<u>Process Description</u>	<u>Reference</u>
924	Coil Cable Degreaser	a
423	Parts cleaners (3)	a
452	Parts cleaners (2)	a
423	Gasoline Station	b,d
630	Gasoline Station	b,d
197	Fiche Duplicator	c
458	Spray Booth	c
510	Metal Cutting Saw	c
535B	Welding Hood	c
815	Welding Hood	c
902	Spray Booth	c
903	Brazing Process	c
924	Spray Booth	c
911	Paint Spray Booth	c
912	Mult. Part. Spectro.	c,d
587	Digester Stack Flare	d
935	Nitric Oxide Gas System	c,d
922	Dayton Sand Blaster	d
919A	Sandblasters (2)	d
815	Batch Reactor Hood	d
348	Calibration Paint Hood	c,d

Reference Code:

- a DOE Environmental Survey, 1987; application pending
- b BNL Survey, 1990-present; application filed, 4/90
- c BNL Survey, 1988-present; application pending
- d Tiger Team Assessment, 1990

A/CF-2 **Improper Operation of Digester Flare**

Performance Objective: 6 NYCRR, Chapter III, Part 200.7 states:
 "Any person who owns or operates an air contamination source which is equipped with an emission control device shall operate such device and keep it in a satisfactory state of maintenance and repair in accordance with ordinary and necessary practices, standards and procedures, inclusive of manufacturer's specifications, required to operate such device effectively."

Finding: The flare installed at the STP sludge digester is out of operation frequently because of a lack of necessary maintenance which is required by 6 NYCRR, Chapter III, Part 200.7.

A flare was installed at the STP sludge digester in 1968 to prevent offgas (containing methane) from entering the atmosphere. The flare is equipped with a pilot light fueled with compressed propane to ensure a continuous source of ignition. During the TTA, it was noted that the flare and the pilot light were frequently not lit. STP personnel indicated that the pilot light often is blown out light winds. Relighting the pilot is accomplished manually.

No application has been filed for a CO for this flare (see Finding A/CF-1).

The cause of this finding appears to be policy implementation and reviews. The policy established by the State of New York regulations is not being implemented. No previous audits, surveys, or reviews have called attention to this deficiency.

A/CF-3 Effluent Tritium Sampling Deficiencies

Performance Objective: Stack sampling should be performed in a manner that ensures compliance with Federal and DOE requirements in 40 CFR 60, Appendix A; DOE 5484.1; DOE 5400.1; and Draft DOE 5400.XY. These requirements attempt to ensure that representative effluent samples are taken.

Finding: The BNL tritium sampler at the Bldg. 901 effluent stack is located such that a representative sample, as required by DOE Orders and 40 CFR 60, is not obtained.

A significant portion of the tritium emissions from BNL comes from the stack at Bldg. 901. The location of the tritium sample extraction probe, close to a 45 degree bend within this stack, precludes the capture of a representative sample. Tritium gas and tritium oxide are the parameters of concern in this sampling. While both are expected to be in the gaseous form under most conditions, some water droplets (containing tritium oxide) may be found, especially during periods of high pumping from the Van de Graaff experiments. In addition, wide variations in concentration probably occur over short periods of time making it difficult to obtain truly representative samples of gaseous species with the current location of the sample probe.

The cause of this finding appears to be policy implementation and review. The policies detailed in Federal regulations and DOE Orders have not been properly implemented, and reviews have failed to detect this deficiency.

Improper Asbestos Disposal

Performance Objective: Regulations promulgated for National Emission Standards for Hazardous Air Pollutants (NESHAPs) (40 CFR 61) require that all asbestos removed from use be disposed of in approved landfills. In addition, the solid waste permit issued to BNL by NYSDEC requires placards to indicate the area of the current landfill that contains asbestos waste. BMP requires that such placards use the wording contained in 40 CFR 61.156.

Finding: Asbestos has been placed in an area at the AGS scrapyards that is not an approved asbestos disposal area in accordance with 40 CFR 61. In addition, placards designating the asbestos containing areas in the current landfill did not contain appropriate language in accordance with BMPs.

The TTA included inspection of several scrapyards and the current landfill and identified two improper asbestos disposal locations at the AGS scrapyards (the steel shielding yard). One of these contained a 6-foot length of 2-inch pipe wrapped with asbestos. Nearby, a small pile of asbestos insulation was found.

The landfill was inspected while asbestos was being placed in a trench for permanent disposal. Although the large area where asbestos has been disposed of was fenced and designated as an Asbestos Disposal Area, the signs did not contain the wording specified in 40 CFR 61.156. The wording specified is:

"Asbestos Waste Disposal Sta.
Do Not Create Dust
Breathing Asbestos is
Hazardous to Your Health."

The solid waste permit issued to BNL by NYSDEC contains a requirement for placards to indicate that the area contains asbestos waste, but does not contain the above wording. However, BMPs require that the language found in 40 CFR 61 be used whenever State permits do not contain specific wording. The language is not required by the 40 CFR 61 regulation because BNL covers the disposal area daily with nonasbestos fill.

The cause of this finding appears to be reviews, procedures, and policy implementation. Current oversight activities do not include reviews to find items disposed of improperly. The procedure establishing the proper wording on signs has not been implemented. Previous audits, surveys, and reviews did not indicate this regulatory requirement.

Lack of Required Gasoline Pump Labels

Performance Objective: 40 CFR 80.22 requires gasoline pumping stations with storage tanks of at least 550-gallon capacity to

have appropriate signs posted concerning unleaded and leaded gasoline dispensing. For unleaded gasoline, the regulation requires that each pump stand contain a label: "Unleaded Gasoline" and that a sign be posted in the vicinity of the pumps stating: "Federal law prohibits the introduction of any gasoline containing lead or phosphorus into any motor vehicle labeled 'Unleaded Gasoline Only'."

Finding: The BNL Gasoline Station (Bldg. 423) did not have the appropriate "Unleaded Gasoline" labels on the pumps and did not have signs in the vicinity restricting the use of leaded gasoline as required by 40 CFR 80.22.

The BNL station is used for providing fuel to on-site vehicles. The BNL station has two 8000-gallon storage tanks and dispenses only unleaded gasoline. During an inspection conducted as part of the TTA, neither the "Unleaded Gasoline" labels nor the label citing the Federal restriction of the introduction of leaded gasoline into vehicles requiring unleaded gasoline was present. Proper labels were placed on the pumps during the TTA.

The cause of this finding appears to be related to lack of review and policy implementation. The policy for labeling cited in 40 CFR 80.22 had not been implemented, and review of air quality requirements by BNL or BHO personnel had not revealed this deficiency.

3.4.1.3 Best Management Practice Findings

A/BMPF-1 Ambient Air Monitoring Deficiencies

Performance Objective: Radionuclide ambient air samplers should be placed in locations and configurations that will yield consistent, representative results for use in assessing public exposure. Draft DOE 5400.XY, page V-18, paragraph 8d(3), provides guidance for acceptable ambient air sampler exposure. Other relevant guidance is found in Probe Siting Criteria for Ambient Air Quality Monitoring (Appendix I, A-17). The draft Order states, "Unless documented site-specific evidence exist to justify otherwise, the sample(s) at each air sampling station should be collected at a height of 2.0 m above ground level (approximately the height of inhalation for adults), in a location free from unusual localized effects or other conditions (e.g., in proximity to a large building, vehicular traffic) that could result in artificially high or low concentrations." Radionuclide air sampling systems should be designed and operated to ensure that valid and defensible samples are being collected.

Finding: The siting and design of the radionuclide air sampling stations at BNL do not provide measurements that are representative of human exposure in the vicinity of the Laboratory in accordance with current BMPS as indicated in Draft DOE 5400.XY.

Ambient air monitoring is carried out in the vicinity of BNL to measure air concentrations of tritium oxide and to collect particulates and radiohalogens. The particulates are counted for alpha and beta radioactivity, and periodically composites are analyzed for gamma-emitting radionuclides. Amine-impregnated charcoal, used to collect radiohalogens, is routinely analyzed for gamma-emitting radionuclides.

Until recently, particulate and radiohalogen samples were collected at four points (northeast, southeast, southwest, and northwest) on (or near) the BNL perimeter and two points closer to the center of the site. Recently, however, vandalism has eliminated the northeast perimeter station. Since one of the on-site stations (near the STP) is in the northeast direction, this station is temporarily serving to monitor air quality in that direction. Tritium oxide is monitored at 16 points on (or near) the site perimeter. Three of the tritium oxide sample points are collocated with particulate samplers. The other tritium oxide samplers are at somewhat remote locations and are battery powered.

All five operating particulate samplers and six of the tritium oxide samplers were visited during the TTA. None of the battery powered tritium oxide samplers are at the recommended 2.0-m elevation, and there is no background sampling station for tritium oxide.

The particulate samplers are at the correct elevation but have several deficiencies which preclude the collection of representative samples:

- All intakes are too close to the small buildings used to shelter the pumps, meters, and auxiliary equipment.
- To avoid wetting of the samples, the samples are collected in an inverted position which can permit some of the particles to dislodge when the sample is being removed.
- The three perimeter stations are all impacted by trees. Tall, somewhat distant trees and short, nearby trees impact the northwest and southeast stations. Only tall, somewhat remote trees affect the southwest station.

- Sample flow rate is lower than at conventional "High Volume" samplers, but this is compensated for by the use of smaller filters. However, the higher flow and larger filters have been shown by experience to collect more representative samples.
- No background air monitoring stations are in operation for particulates.

The BNL air sampling measurements are substantially below many applicable standards. Therefore, the observed deficiencies serve to challenge the credibility and defensibility of the measured air concentrations but not the conclusion that BNL is in compliance with all standards and applicable health criteria for the air pathway.

BNL has a project to upgrade the air sampling stations in Calendar Year (CY) 1990.

The cause of this finding is related to inadequate policy implementation and reviews. The policy found in Draft DOE 5400.XY has not been implemented. Previous reviews, including most BNL, CH, and HQDOE audits and surveys, did not call attention to these deficiencies.

A/BMPF-2 Lack of High Efficiency Particulate Air filter
Differential-Pressure Testing and Replacement
Standard Operating Procedures

Performance Objective: Written procedures dictating annual testing of HEPA filter efficiency, continuous measurement of the differential pressure across filters, periodic replacement of filters, and other policies to ensure performance of HEPA filters are standard within DOE. Measurement of differential pressure is required by DOE 6430.1A for all new sources. Current practice within DOE extends this requirement along with routine recording and establishment of filter replacement action levels to all existing sources as a BMP.

Finding: BNL SOPs for the HEPA filter testing and maintenance program do not contain certain elements that are in accordance with BMPs.

HEPA filters have received wide acceptance within DOE, including BNL, as state-of-the-art controls against release of radionuclide particulates. However, BNL SOPs do not require differential pressure monitors across all filters, do not provide for routine recording of the differential pressure data, and do not contain appropriate action levels for filter replacement. Additionally SOPs do not regulate use of HEPA filters beyond a normal useful

life. Examples of problems identified during the TTA that may be attributed to SOP inadequacies include the following:

- HEPA filters with no differential pressure monitors were found in Bldgs. 801, 750, 463, 931, and 462.
- Filters with damaged monitors, which render data invalid, were found in Bldgs. 490 and 555.
- The filters in Bldg. 750 have not been replaced in more than 20 years.

SOPs in use at most DOE sites require (in addition to annual testing of HEPA filter efficiency) that the differential pressure across each bank of filters be closely monitored with routine recording of these data and appropriate action levels when the filters are in use. Such monitoring can warn when filters are loaded and also serve to warn of a damaged filter. Periodic recording of the pressure drop is necessary to detect any change in the differential pressure.

Little information is available on the useful life of HEPA filters. Research conducted on aged HEPA filters at Lawrence Livermore National Laboratory (Appendix I, A-3) shows that aged filters can suffer a loss of tensile strength yet still be capable of passing the standard dioctyl phthalate test of efficiency. However, the study contains no definitive advice on a maximum useful life. The study was conducted on lightly loaded filters which had been in service for 13 to 14 years.

The cause of this finding appears to be procedures, policy implementation, and reviews. Standard procedures have not been developed, standard policies have not been implemented, and the site has not responded fully to previous audits, surveys, and reviews on this subject.

A/BMPF-3 Lack of an Air Emissions Inventory

Performance Objective: Estimates of significant air emissions from all sources are necessary to properly manage air control programs in accordance with current industry practice.

Finding: BNL has not developed a detailed annual inventory of air emissions as an aid to controlling air emissions in accordance with current industry practice.

The purpose of an extensive and accurate air emissions inventory is to guide the air portion of a waste minimization effort. Several previous reviews including a 1985 DOE audit (Appendix I, A-19), the 1986 Blass report (Appendix I, A-2), and the DOE Environmental Survey (Appendix I, A-1) cited BNL for the lack of

an air emissions inventory. Both the Blass report and the DOE Survey report stressed volatile organic emissions, which have not yet been assessed. In addition, BNL handles large quantities of a number of inorganic chemicals (many of which are on the list of toxic chemicals), and emissions of these compounds have not been inventoried. The State of New York "Guidelines for the Control of Toxic Ambient Air Contaminant" (Appendix I, A-18) also contains many of the chemicals that BNL uses in large amounts; these emissions also have not been inventoried.

Many industrial companies did not assemble accurate emissions inventories until the regulations promulgated under Title III, Section 313 of the Superfund Amendments and Reauthorization Act (SARA) called for annual submission of Form R reports for emissions (to all media) of chemicals on a list of about 325 toxic chemicals. Most dischargers, surprised at the magnitude of the air releases, began intensive campaigns to reduce emissions. Most of these campaigns have been effective.

Laboratory complexes, such as the national laboratories, are exempt from the Section 313 reporting requirements. However, the usefulness of such a report makes it apparent that sound management requires the assembling of accurate data even if a facility is not required to submit it to any regulatory agency. In fact, at several DOE facilities, which are required to submit the Form R annual report, local management requires an estimate of emissions (to all media) of all chemicals used in large quantities (e.g., over 10,000 pounds per year), even those that are not on the Section 313 list of toxic chemicals.

Currently no actions are under way at BNL to rectify this shortcoming. Although the limitations for emissions from permitted sources can easily be summed and tabulated, such an inventory would be of little use since (1) only a small fraction of emissions are from sources that require permits and (2) permit limitations are maximum allowable amounts, which seldom reflect actual releases.

The cause of this finding appears to be inadequate policy implementation concerning the current industry practice of inventorying emissions sources. This finding had been mentioned in past audits and reviews. BNL, in responding to the DOE Environmental Survey finding on inventorying emissions (Appendix I, A-1), indicated to HQDOE that the personnel and financial resources required to address the finding were too great in light of the low risk posed by the emissions as perceived by the site. The failure of HQDOE to respond to this proposed action ("No Action") was perceived by BNL as concurrence.

A/BMPF-4

Lack of Atmospheric Dispersion Studies for
Emergency Response Incidents

Performance Objective: Studies to assess the need for remote, low-level meteorological towers to be used to determine dispersion patterns are considered current industry practice within DOE.

Finding: BNL has not performed studies to determine the need for remote meteorological towers to be used in the event of air releases in accordance with current practice at other DOE facilities.

In the event of an airborne release, the BNL single meteorological tower is used to predict the direction of travel and the pattern of dispersion of the release plume as wind speed, direction, and turbulence cause the concentration of the chemicals involved to decrease. However, BNL has not performed studies to determine the need for remote towers to track the release plume.

As emergency response preparedness has received increased attention, many facilities have realized that predicting such dispersion patterns with a single meteorological tower can yield erroneous results. Basically, such a prediction assumes that wind direction, speed, and turbulence will be the same at all distances from the tower. A number of studies conducted by the National Oceanographic and Atmospheric Administration for DOE facilities have shown that even in flat terrain, such as in the vicinity of BNL, surface irregularities cause wind direction, speed, and turbulence to change at relatively short distances from the release. This can result in erroneous conclusions concerning the most affected areas of the nearby community. The cause of this finding appears to be review and design. The basic design of the tracking system has never been reviewed to determine its accuracy in predicting concentrations of releases in nearby areas. Previous reviews have not pointed out this deficiency.

A/BMPF-5

Lack of Consistency in Airborne Tritium
Concentrations

Performance Objective: Current industry practice requires that whenever two methods of estimating releases and calculating doses differ substantially, a study should be made to determine the reasons for the discrepancies and to initiate corrective action as required.

Finding: Although tritium emissions from BNL are low, discrepancies of a factor of between two to five times the monitored BNL-perimeter tritium concentrations and those

concentrations predicted by atmospheric dispersion modeling of the stack releases are resulting in data reliability concerns beyond those accepted by current industry practices.

An investigation was completed in 1984 of the discrepancy that the measured values of tritiated water in ambient air are two to five times those predicted by the atmospheric modeling of the BNL stack releases to the perimeter (Appendix I, A-4). The study contained recommendations for future studies, such as tracking the plume from the HFBR stack with tracer chemicals. To date these recommendations have not been implemented. Data presented in the 1988 monitoring report show that this discrepancy still persists. Until this discrepancy is resolved, the possibility that an unknown source of tritium, which is not included in the model, cannot be completely ignored. Nevertheless, the dose calculated using the higher values (the monitored values) is low. The dose at the highest perimeter location in 1988, for example, was 0.006 mrem/year, compared with the "de minimis" dose (i.e., no action required) of 0.1 mrem/year for new sources under NESHAPs.

The on-site Environmental Analytical Laboratory in which ambient air samples are processed has a higher tritium-in-air concentration than any of the perimeter locations. Finding A/BMPF-6 discusses the possible contamination of ambient air samples in the laboratory. The low escape velocity of gas from the HFBR stack, which allows downdraft during periods of atmospheric inversion, is apparently the cause of the high tritium concentrations near the laboratory. Downdraft might be an explanation of the discrepancy, since it is not accounted for in the atmospheric model.

The cause of this finding appears to be QA, risk, and resources. The quality of the monitoring and modeling information has not been scrutinized with sufficient rigor to explain the discrepancy. The risk involved has not been perceived as sufficient to warrant extensive additional resources such as the tracer studies mentioned previously.

A/BMPF-6 Laboratory Contamination of Tritium-in-Air Samples

Performance Objective: Current industry practice requires that processing of effluent samples and ambient air samples be conducted in laboratories remote from each other to preclude contamination of the ambient air samples by the more concentrated effluent samples.

Finding: Ambient tritium air sampling equipment is being prepared and staged, and low-concentration tritium analyses are being conducted, in the same laboratory as high-concentration

tritium effluent analyses. These practices may be resulting in contamination of the ambient air samples and are not in accordance with current industry practice.

Equipment for ambient air sampling and stack sampling is prepared and staged and the analyses for both low-concentration ambient samples and high-concentration stack samples are processed in the same Bldg. 535 Analytical Laboratory. The DOE Environmental Survey (Appendix I, A-1) cited the possibility of laboratory contamination of low-concentration ambient samples by higher concentration stack samples as a possible explanation of recurring, unexplained, higher-than-normal levels of tritium at the site perimeter. Although BNL has taken steps to keep the processing of effluent samples remote from the areas in which ambient air samples are processed, the possibility of contamination still exists as long as the samples are processed in the same laboratory.

The cause of this finding appears to be policy implementation, risk, and resources. The policy established by current industry practice has not been implemented, and BNL did not regard the risks involved as compelling when compared with the facility resources required.

3.4.1.4 Noteworthy Practice Findings

A/NPF-1 Prevention of Legionella in Cooling Tower Emissions

Finding: After start-up of the new chilled-water system at BNL, monthly analyses will be made to determine the presence and concentration of bacteria known to cause Legionnaires Disease in the recirculating cooling tower water.

Several outbreaks of Legionnaires Disease in the United States have been traced to the presence of Legionella bacteria in nearby cooling towers. Qualitative and quantitative analyses to determine the presence of Legionella are not common practices. However, only by such testing can inhalation of such bacteria by the nearby population be prevented. Once detected, control by increased dose of chlorine and other biocides should be relatively simple.

BNL has recently completed the first phase of the installation of a chilled-water system that will circulate chilled water to a number of BNL buildings. This system will result in the phase-out of several old cooling towers. Subsequent phases will extend the system to most BNL buildings. In the chilled-water system, the recirculating water is chilled indirectly in heat exchangers with water that is then cooled in conventional cooling towers. To ensure that Legionella is not present in the cooling tower

water, BNL has contracted with the Drew Chemical Company to include Legionella testing in the parameters that are determined monthly. If detected, the above-mentioned steps will be taken to eliminate this bacteria. If experience indicates frequent detection of Legionella, testing can be extended to the other BNL cooling towers, especially since old towers would be more prone to bacterial growth. Large cooling tower complexes, such as at the DOE Gaseous Diffusion Plants, have been tested for Legionella. However, this testing appears to be one of the first instances in which modest-sized towers in the DOE complex are tested.

3.4.2 Soils/Sediments/Biota

3.4.2.1 Overview

The purpose of the soils, sediments, and biota portion of the environmental assessment was to: (1) evaluate the environmental monitoring programs of these media, (2) evaluate the potential for and actual contamination of these media by radiological and nonradiological constituents as a result of past and present operations, and (3) compare the environmental monitoring data results of these media with applicable concentration guidelines and requirements as presented in Table 3.4.2-1.

Table 3.4.2-1
List of Applicable Soils/Sediments/Biota
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
DOE 5400.1	General Environmental Protection Program	DOE
DOE 5400.4	Comprehensive Environmental Response, Compensation and Liability Act Requirements	DOE
DOE 5400.5	Radiation Protection of the Public and the Environment	DOE
Draft DOE 5400.XY	Radiological Effluent Monitoring and Environmental Surveillance	DOE

The general approach to the soils, sediments, and biota assessment included a review of the environmental monitoring program, observation of known or suspected contamination sources, and observation of contaminant release controls or stabilization procedures. Additionally, BNL personnel performing or responsible for these activities were interviewed, and associated documentation was reviewed.

The soils at BNL consist primarily of the Sassafras, Plymouth, and Duke's series. These soils are derived from loess and from outwash sand and gravel. Soil textures range from coarse sand to finer sandy loam. The soils are underlain by crudely stratified silica-rich sand with variable amounts of gravel and traces of silt and clay-sized particles of Pleistocene age.

Sediment at BNL occurs in man-made ponds (i.e., on-site recharge basins) and the Peconic River watershed (Appendix I, RAD-1). There is relatively little direct runoff into surface streams because the sandy, highly permeable soils allow rapid water penetration.

BNL is located in the Oak-Chestnut Forest Region, and a large percentage of the site supports pine-oak forest in various stages of succession from clearing or fire. Over 200 species of mammals, birds, reptiles, amphibians, and fish have been observed on-site. No species are unique to the site and none are noticeably more common than in similar habitats elsewhere. No endangered species are present at BNL (Appendix I, RAD-58).

Aquatic biota are routinely sampled and analyzed by BNL. Additionally, the SCDHS routinely samples off-site soil and off-site vegetation which is given to BNL for analysis. These media are only analyzed for radioactive contaminants. Routine monitoring of on-site soils, on-site vegetation, sediments, or terrestrial biota is not currently performed (Appendix I, RAD-1, 6, and 48).

On-site soils, sediments, and terrestrial biota samples have been collected on a nonroutine basis for specific investigations or as site wildlife have become available (e.g., from road kills). These investigations have been conducted to evaluate the effects of inactive waste sites and contaminated areas on various media and terrestrial biota. Additionally, samples are also analyzed to support removal or decontamination and decommissioning activities. The results of the analyses performed for these investigations are documented in the BNL annual environmental monitoring reports (Appendix I, RAD-1, 6, and 48).

The soils, sediments, and biota portion of the environmental assessment contains one BMP finding. This finding addresses the characterization of on-site soils and sediments. Associated

findings are also addressed in the Inactive Waste Sites Section. No compliance or noteworthy practice findings were identified.

3.4.2.2 Compliance Findings

None

3.4.2.3 Best Management Practice Findings

SSB/BMPF-1 Inadequate Characterization of On-Site Soils and Sediments

Performance Objective: Characterization of on-site soils and sediments should be adequate to support pathway analyses, dose assessments, and decisions necessary for decontamination and decommissioning, environmental restoration, contamination control, and contamination prevention programs. DOE 5400.1 states that DOE policy is a commitment to good environmental management of all its programs at all its facilities. This environmental management includes correcting existing environmental problems, minimizing risks to the environment or public health, and anticipating and addressing potential environmental problems before they pose a threat to the quality of the environment or the public welfare.

Finding: On-site soils and sediments have not been sufficiently characterized in accordance with the policy stated in DOE 5400.1 to determine the presence of contamination and, if present, the extent of the contamination and the controls necessary to prevent the spread of this contamination.

Known and suspected areas of on-site soil and sediment contamination are present at BNL. These areas include, but are not limited to, the HWMF and surrounding areas, AGS steel storage scrap yard, meadow marsh project, cesium-137 contaminated landscaping soil, recharge basins, soil activation around accelerators, and the Bldg. 650 drainage outfall, which is no longer connected to the building. Samples have been collected from some of these areas for reconnaissance purposes and, generally, only radiological constituents are analyzed. However, sampling programs designed to determine the extent of contamination and all constituents present have not been performed. As a result, the controls (posting or removal) that may be necessary to prevent the spread of contamination either to other areas or media cannot be accurately assessed.

An example of the need for characterization of on-site soils is the unintentional spreading of cesium-137 contaminated landscaping soil during the late 1950s, which was thought to have originated from the HWMF.

BNL is aware of these situations and in 1989 performed radiological constituent studies at a number of on-site locations. Additionally, BNL is continuing these radiological studies in 1990 and has submitted plans to conduct a sitewide soil characterization program for radiological and hazardous constituents. This characterization program is scheduled to be conducted in 1992.

The causal factors noted for the inadequate characterization of on-site soils and sediments appear to be inadequate implementation of DOE 5400.1 policy for good environmental management to minimize risks to the environment or public health and inadequate resolution of appraisal, audit, and review findings. These deficiencies were identified during the DOE Environmental Survey performed in April 1987, and corrective action has not been completely implemented.

3.4.3 Surface Water/Drinking Water

3.4.3.1 Overview

The purpose of the surface water assessment was to evaluate compliance with regulations promulgated in response to the Clean Water Act and the Safe Drinking Water Act, DOE Orders, and BNL policies and procedures. It also included a review of the adequacy of the water and wastewater treatment plants; the Spill Prevention, Control, and Countermeasures Plan; and facility compliance with the SPDES Permit. Table 3.4.3-1 lists applicable regulations and guidelines used to evaluate the surface water discipline.

Table 3.4.3-1
List of Applicable Surface Water
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
Clean Water Act, 40 CFR 112	Oil Pollution Prevention	EPA
Clean Water Act, 40 CFR 122/123	National Pollutant Discharge Elimination System (NPDES)/ State Pollutant Discharge Elimination System (SPDES)	EPA

Table 3.4.3-1--Continued
List of Applicable Surface Water
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
Clean Water Act 40 CFR 136	Guidelines Establishing Testing Procedures for the Analysis of Pollutants	EPA
Clean Water Act	SPDES Permit NY-0005385	NYSDEC
Clean Water Act, 6 NYCRR 612-614	Bulk Storage and Oil Spill Response Regulations	NYSDEC
Clean Water Act, 6 NYCRR 650, 652, 654	Sewage and Wastewater Treatment Plant Regulations	NYSDEC
Clean Water Act, 6 NYCRR 750-758	SPDES	NYSDEC
Clean Water Act	DMR Manual for Completing the Discharge Monitoring Report for the National Pollutant Discharge Elimination System (NPDES) - April 1988	NYSDEC
Safe Drinking Water Act, 40 CFR 141/142	National Primary Drinking Water Regulations	EPA
Safe Drinking Water Act, 40 CFR 143	National Secondary Drinking Water Regulations	EPA
Safe Drinking Water Act, 10 NYCRR 5	Drinking Water Supplies	NYSDOH
Suffolk County Sanitary Code, Article 4	Water Supply	SCDHS
Suffolk County Sanitary Code, Article 7	Water Pollution Control	SCDHS

Table 3.4.3-1--Continued
List of Applicable Surface Water
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
DOE 5400.1	General Environmental Protection Program	DOE
DOE 5484.1	Environmental Protection, Safety, and Health Protection Information Reporting Requirements	DOE
DOE 6430.1A	General Design Criteria	DOE

The general approach to the surface water/drinking water assessment included tours of the sewage and water treatment plants, the bulk petroleum storage facility, and sources and points of liquid effluent discharges; and observations and review of the environmental monitoring program. Additionally, BNL personnel performing or responsible for these activities were interviewed and associated documentation was reviewed.

BNL derives its water supply from groundwater through on-site wells. An on-site water treatment plant treats a portion of the well water for removal of iron. That well water is combined with other well water that has been chlorinated and pH-adjusted. Deionized water is also produced for use at various locations on-site. All applicable drinking water requirements are being met by the facility.

BNL also has an on-site STP that receives laboratory and sanitary wastes. It consists of a clarifier and six sand filters; sludge from the clarifier is reduced in volume in a digester while the liquid effluent is discharged from the sand filters into the Peconic River. Other liquid discharges such as noncontact cooling water and storm water runoff are discharged to five recharge basins. Because the soil is highly permeable, about 50 percent of the storm water infiltrates into the groundwater, 44 percent is consumed by evapotranspiration, and 6 percent is land runoff (Appendix I, SW-3). The Peconic River flows from northwest to southeast across the northeast corner of the site. Occasionally, there is no flow in the Peconic River upstream of the STP and at the site boundary because of the high permeability of the soil.

Surface water discharges at BNL are regulated by NYSDEC, and inspections are conducted by SCDHS. BNL contains six discharge points that are permitted under a SPDES Permit -- the STP and the five recharge basins. There is also a sixth basin that receives water treatment plant filter backwashes. It is not presently included in the SPDES Permit under which the site is operating. This discharge was listed as Outfall 007 when the existing permit was issued in May 1983, although it was deleted by the State on December 21, 1983. However, it will be listed as a discharge on the new permit which is being developed. The permitted discharges are monitored as stipulated in the permit. The most frequent permit exception in 1989 was low pH in the STP outfall. Nonetheless, the site was in compliance with 99 percent of its discharge limits.

There are nine surface water/drinking water findings. Four are compliance findings and five are BMP findings. The compliance findings deal with unpermitted discharges and violations of SPDES requirements. The BMP findings concern lack of a discharge inventory, lack of certain procedures, lack of antisiphon devices, deteriorating sewer lines, and deficiencies in the STP.

3.4.3.2 Compliance Findings

SW/CF-1 Discharges Not Specified in the Brookhaven National Laboratory State Pollutant Discharge Elimination System Permit

Performance Objective: BNL is required to have an SPDES Permit for discharges of wastes to surface water, groundwater, the surface of the ground, or to a disposal system. In applying for an SPDES Permit, 6 NYCRR 752.1(b)(i) requires a facility to list all operations contributing waste water to an outfall.

Finding: Many liquid waste discharges at BNL are not listed in the existing Laboratory SPDES Permit, in accordance with 6 NYCRR 752.1(b)(i).

BNL has several waste discharges that are not included in the existing SPDES permit. These discharges have been identified by BNL, Suffolk County, and the Tiger Team as shown on Table 3.4.3-2. This table, however, is not meant to be complete since only those discharges to storm drains, cesspools, dry wells, and the ground surface are included. Some of the discharges to the sanitary sewer, which pass through a monitored SPDES discharge point, are not identified in the table or the existing SPDES Permit. These include the plating operation in the Instrumentation Division and the film processing operations in the Photography and Graphic Arts, Medical, Biology, and NSLS facilities. Additionally, some discharges to the SPDES-permitted recharge basins are not listed in the Permit or the table. These include the copper-contaminated deionizer regeneration wastes

Table 3.4.3-2
Discharges Observed or Identified to the Tiger Team
That Are Not Specified in the Present SPDES Permit

Building Number	Description of Discharge	Discharges To			Awareness	
		Cesspool or Dry Well	Storm Sewer or Recharge Basin	Ground	BNL ^a	Regulatory Agency ^b
EM Sta 6	Effluent from Resin Water Processing			X		
168	Emergency Pump Engine Cooling Water			X		
244	Heating Boiler Blow Down			X		
405	Heating Boiler Blow Down			X		
422	Heating Boiler Blow Down			X		
423	Heating Boiler Blow Down	X				
423	Truck Washing Operation			X	X	X
429	Sanitary Drains	X			X	X
444	Sink Drain	X			X	X
445	Sink and Sanitary Drains	X ^c			X	X
449	Sanitary Drains	X ^d			X	X
452	Sanitary Drains	X ^d			X	X
463	Potting Shed Pesticide Mixing Sink Drain		X		X	
463	Floor Drains		X		X	X
481	Sanitary Drains	X			X	X
555	Solvent Storage (Room 212B) Floor Drain	X			X	X
575	Floor Drains		X		X	X
600	Cooling Tower Basin Overflow	X				
614	Emergency Pump Engine Cooling Water			X		
618	Emergency Pump Engine Cooling Water			X		
619	Emergency Pump Engine Cooling Water			X		
624	Sanitary Drains	X ^d			X	X
624	Water Treatment Plant Recharge Basin Overflows			X		
634	Emergency Pump Engine Cooling Water	X				
635	Emergency Pump Engine Cooling Water	X				
637	Emergency Pump Engine Cooling Water	X				
725	Floor Drains		X		X	X
725	Room X-19C Dark Room Sink Drain		X			

Table 3.4.3-2--Continued
Discharges Observed or Identified to the Tiger Team
That Are Not Specified in the Present SPDES Permit

Building Number	Description of Discharge	Discharges To			Awareness	
		Cesspool or Dry Well	Storm Sewer or Recharge Basin	Ground	BNL ^a	Regulatory Agency ^b
750	Emergency Generator Cooling Water		X			
750	Cooling Tower Blow Down		X		X	X
815	Floor Drains		X		X	X
902	Cooling Tower Blow Down and Flush Water		X			
903	Sanitary Drains	X			X	X
904	Sanitary Drains	X ^d			X	X
905	Sanitary Drains	X ^d			X	X
911	Pump Room Heat Exchanger Flush Water		X			
911	Cooling Tower Blow Down and Flush Water		X			
911	Fluid Cooler Drain and Flush Water		X			
912	Floor Drains		X		X	X
912	Cooling Tower Blow Down and Flush Water (Three Cooling Towers)		X			
912 A	Floor Drains		X		X	X
913 A	Sanitary Drains	X			X	X
913 C	Sanitary Drains	X			X	X
913 D	Sanitary Drains	X			X	X
913 E	Sanitary Drains	X			X	X
914	Floor Drains		X		X	X
914	Sanitary Drains	X ^d			X	X
919	Cooling Tower Blow Down and Flush Water		X			
919	Sanitary Drains	X ^d			X	X
919 A	Sanitary Drains	X ^d			X	X
919 B	Sanitary Drains	X ^d			X	X
922	Floor Drains		X		X	X
925	Sanitary Drains	X			X	X
926	Sanitary Drains	X ^d			X	X
927	Floor Drains		X		X	X
928	Cooling Tower Blow Down and Flush Water		X			

Table 3.4.3-2--Continued
Discharges Observed or Identified to the Tiger Team
That Are Not Specified in the Present SPDES Permit

Building Number	Description of Discharge	Discharges To			Awareness	
		Cesspool or Dry Well	Storm Sewer or Recharge Basin	Ground	BNL ^a	Regulatory Agency ^b
928/929	Floor Drains		X		X	X
928/929	Cooling Tower Sand Filter Backwash Water		X			
930	Cooling Tower Blow Down and Flush Water		X			
930	Floor Drains		X		X	X
935	Sanitary Drains	x ^d			X	X
940	Sanitary Drains	x ^d			X	X
945	Sanitary Drains	x ^d			X	X
960	Sanitary Drains	X			X	X
961	Floor Drains		X		X	X
962	Floor Drains		X		X	X
964	Floor Drains		X		X	X
975	Sanitary Drains	x ^d			X	X
1000 P	Cooling Tower Blow Down and Flush Water		X			
1002 A	Sanitary Drains and Floor Drains	X				X
1004 A	Sanitary Drains and Floor Drains	X				X
1005	Floor Drains		X			
1005 P	Cooling Tower Blow Down and Flush Water		X			
1006 A	Sanitary Drains and Floor Drains	X				X
1008 A	Sanitary Drains and Floor Drains	X				X
T-96	Heating Boiler Blow Down			X		
T-122	Sanitary Drains	x ^d			X	X

FOOTNOTES:

^aBNL was aware of the discharge to the extent that action was planned prior to the Tiger Team visit.

^bRegulatory Agencies had been informed of these sources prior to the Tiger Team visit.

^cSeptic Tank and Leach Field.

^dTie-in to Sanitary Sewer expected to be completed by June 1, 1990.

from Bldg. 930 in Outfall 006 and 1, 1, 1-trichloroethane (TCA) (measured at concentrations as high as 16 micrograms/liter ($\mu\text{g/l}$)) in the BMRR Recharge Basin (Outfall 004). The discharge of regeneration wastes from Bldg. 930 was reported to NYSDEC and SCDHS the day after it was discovered and the discharge was terminated. The presence of TCA in the recharge basin was reported to NYSDEC on February 13, 1990, after the results of samples, taken by BNL in anticipation of new monitoring requirements, were received. The discharge into the BMRR Recharge Basin from Well 104 was terminated on April 6, 1990, as a result of the groundwater contamination discussed in Finding GW/CF-2.

The Laboratory made the NYSDEC, SCDHS, and EPA aware of many of these discharges during the October 1987 SPDES renewal application and subsequent negotiation process.

The causes of this finding appear to be policy, procedures, training, risk, and resources. The lack of policy implementation may be the result of inadequate training to identify waste discharges and an absence of procedures to train the personnel or identify the discharge. Risk and resources may also be involved in that BHO and BNL personnel may have considered that the personnel and financial resources needed to identify existing waste discharges for inclusion into the SPDES Permit were too great in light of the BNL perception of low risk posed by the discharges.

SW/CF-2 State Pollutant Discharge Elimination System
Permit Exceptions

Performance Objective: As described in 6 NYCRR 751 and under the Laboratory SPDES Permit No. NY0005835, BNL is required to comply with the limitations and standards established in its discharge permit.

Finding: The BNL STP periodically exceeds pH discharge limits established in the SPDES Permit.

During 1989, there were 22 exceptions to the SPDES Permit limits for pH, one each for total suspended solids (TSS), iron, ammonia-nitrogen, and four for residual chlorine at the STP outfall. An examination of the records shows that all SPDES exceptions, except pH, were infrequent and had no identifiable trends. However, pH exceptions to the permit (water less than 5.8 pH units) have been persistent at the outfall.

In June 1989, BNL attempted to raise the pH levels in the STP outfall by adding dry lime to the discharge from the dosing tanks to the sand filter. The practice appeared to be successful in

raising the pH levels; however, there were two exceptions to the permitted TSS limit in 1990 as a result of the lime additions. BNL discontinued the use of lime on January 17, 1990.

The cause of the finding appears to be inadequate policy implementation, which resulted in exceptions to the permit. Additional causes of the exceptions appear to be inadequate STP design that does not allow for pH adjustment and, potentially, changes in the system such as increased infiltration of rainfall into the sewer system (see Finding SW/BMPF-3).

SW/CF-3 Inadequate Wastewater Sampling

Performance Objective: As described in 40 CFR 122.41(j)(4), "Monitoring," and under the Laboratory SPDES Permit No. NY0005835, BNL is required to perform sampling and analysis in accordance with the techniques prescribed in 40 CFR 136 and amendments thereto.

Finding: The STP wastewater sample temperatures may not be maintained in accordance with the SPDES Permit requirements prior to analysis.

BNL personnel collect effluent from the STP in keeping with most of the conditions of the Laboratory SPDES Permit. However, during observation of a sampling event, it was noted that there is no thermometer in the composite sampling unit that can be used to indicate that the sample temperature is being maintained at 4 degrees centigrade as required by 40 CFR 136.

The cause of this finding appears to be lack of policy implementation, reviews, and procedures. The policies, as stated in the SPDES Permit, are not implemented, and there are no reviews to ensure that the requirements of the permit are being carried out. Also, there is no written SOP to identify the proper procedures to be followed by the STP operator for collection of wastewater samples (see Finding SW/BMPF-4).

SW/CF-4 Late Submittal of Discharge Monitoring Reports

Performance Objective: BHO is required by the terms contained in SPDES Permit No. NY0005835 to submit Discharge Monitoring Reports (DMRs) for each month, no later than the 29th of the following month. Additionally, BHO requests by letter each month that BNL submit the DMRs by the 25th of each month.

Finding: DMRs are not always submitted by BHO to the regulatory agencies within the 28-day period specified in SPDES Permit No. NY0005835.

Twelve of the DMR transmittal letters from BHO to the State for the 16-month period from November 1988 through February 1990 had dates later than the required due date of the 28th of the following month. Most of these were only a few days late; however, three were almost a month late:

<u>Reporting Month</u>	<u>Transmittal Date</u>
December 1988	February 23, 1989
January 1989	March 21, 1989
April 1989	June 22, 1989

BHO requests that BNL submit the DMRs by the 25th of the month. BNL missed this date six times in the 16-month period. Three of these were submitted by the 28th of the month. The other three were submitted after the 28th of the month:

<u>Reporting Month</u>	<u>Transmittal Date</u>
December 1988	February 10, 1989
January 1989	March 7, 1989
November 1989	January 2, 1990

Both the site and the State are aware of these problems. The site received Notices of Failure to Submit DMRs for the December 1988 and April 1989 submissions.

This finding appears to be caused by the lack of personnel resources, which is interfering with the implementation of a policy for timely submission of the DMRs.

3.4.3.3 Best Management Practice Findings

SW/BMPF-1 Lack of Adequate Characterization and
 Identification of Liquid Effluents

Performance Objective: Section 705.B.1 of the Suffolk County Sanitary Code prohibits the discharge of toxic and hazardous substances and other wastes to surface water, groundwater, the surface of the ground, or disposal systems without a permit issued by or acceptable to the commissioner. In accordance with sound environmental management practice and as a method of operating in accordance with Section 705.B.1, the Laboratory should identify and characterize its liquid effluents.

Finding: BNL has not adequately characterized the SPDES outfalls or other point source discharges and has not completely inventoried all process flows which discharge to them in accordance with sound environmental management practice.

BNL has not adequately characterized the outfalls or other point source discharges and inventoried specific process discharges to them. This lack of information limits the Laboratory's ability to provide complete information to regulatory agencies for permit preparation. Additionally, BNL liquid releases to the surface water, soils, and groundwater cannot be adequately assessed, and the potential buildup of contaminant levels resulting from surface water discharges into the soil cannot be assessed (see Finding RAD/BMPF-1).

To assist in characterizing its outfalls, BNL has plans to install flow proportional samplers on all SPDES discharges. In addition, specific process discharges, which are not included in the existing SPDES Permit, have been identified within the past 2 1/2 years as a result of a Suffolk County facility inspection and the BNL internal audit program (see Finding SW/CF-1). NYSDEC was provided this information and, on March 16, 1990, they requested that BNL analyze rinsewaters from photographic processing in the Graphic Arts Department and from the circuit board processing unit in the Instrumentation Division to aid in preparing a new SPDES permit. Additional process discharges were also identified during the TTA (see Finding SW/CF-1).

This finding appears to be caused by lack of policy implementation that requires the identification and characterization of liquid outfalls. An apparent contributing factor to inadequate policy implementation is the lack of BNL procedures requiring periodic full characterization and identification of waste streams. In addition, the operating personnel who knew that the boiler blowdown was being discharged to the ground were not trained to identify this situation as an unpermitted discharge.

SW/BMPF-2 Lack of Antisiphon Devices

Performance Objective: 10 NYCRR 5.31 requires suppliers of potable water to install backflow prevention devices to prevent contamination of the potable water distribution system in the event of loss of pressure in the distribution system. Good management practice requires prevention of contamination of potable water system within buildings by not allowing hoses that are attached to faucets to lie in a sink without antisiphon devices. These devices prevent backsiphoning of wastes from the sink.

Finding: Antisiphon devices are not installed, as would be required by BMP, on a few faucets observed with hoses attached and lying in sinks.

Hoses lying in sinks were attached to faucets without antisiphon devices in the following four locations: the Veramat Room in Bldg. 118, the Hot Machine Shop in Bldg. 462, Dilution Room

9-436 in Bldg. 490, and the Machine Shop in Bldg. 510. In the event of loss of pressure due to a line break or maintenance within a building, any liquids in the associated sinks could be siphoned into the water lines if the faucets were open. The four instances cited above were the only deficiencies noted in approximately 100 sinks observed during the assessment. It should be noted that there were several faucets with attached hoses lying in sinks that did have antisiphon devices.

The causes of this finding appear to be lack of written policy and procedures, risk, and barriers and controls. There are no policies and procedures requiring that antisiphon devices be installed or that hoses attached to faucets not be allowed to lie in sinks. The risk involved in this practice may not have been adequately assessed, and there are no barriers and controls to prevent contamination of water lines due to backsiphoning from sinks.

SW/BMPF-3

Deteriorating Sewer Lines

Performance Objective: Sound environmental management practices dictate that sewage collection systems be repaired and maintained to minimize contamination of soils and groundwater through sewer line exfiltration or, conversely, to prevent overloading of waste treatment facilities due to infiltration of storm water.

Finding: Sewer lines at BNL are not being maintained in accordance with sound environmental management practices.

Sewers were originally built on-site in 1917, repaired by the Army in 1940, and have been extended and modified through the years so that there are presently about 31 miles of sewer lines. An internal inspection of 32,600 feet of sewers by a contractor (Appendix 1, SW-1) indicated that 6,945 feet or about 20 percent of the lines examined were in need of repair or replacement. Cracked and broken pipes, open joints, defective manholes, and root intrusion were some of the problems identified, which could result in either exfiltration of the wastewater to the soil or infiltration of storm water to the sewer.

The fact that the average daily flow of 0.7 to 0.8 million gallons per day can increase to 1.3 million gallons per day during heavy rainfalls provides further evidence of leaks into the sewers. Although some of this increase may be due to roof drains connected to the sanitary sewer rather than the storm sewer, groundwater infiltration through deteriorated portion of the sewer lines also contributes to the flow.

Since infiltration occurs during storm events, it is likely that exfiltration of wastes from the sewer lines to the surrounding soil and groundwater can occur during dry weather. Since the

sewer lines carry laboratory waste can contain toxic and hazardous wastes, the opportunity for soil and groundwater contamination may occur.

The Laboratory is aware of this problem and has initiated a sewer replacement program with the first phase identified in a 1993 General Plant Project Line Item and a second phase planned for 1994 or 1995 (Appendix H, I-SW-28).

The cause of this finding appears to be policy implementation, procedures, barriers and controls, and risk. The policy of maintaining the sewer lines has been ineffectively implemented as a result of a lack of procedures on sewer line maintenance requirements. In addition, the Laboratory did not adequately assess the risk to the environment caused by exfiltration.

SW/BMPF-4 Lack of Wastewater Diversion and Water and Wastewater Sampling Procedures

Performance Objective: Best industry practice is to have formalized SOP for all operations at a facility.

Finding: BNL has no formalized written procedures, as would be required by best industry practices, for the collection of potable water samples and STP wastewater samples, and for the handling of wastewaters that are diverted to the BNL STP emergency holding lagoons.

Operators at the water treatment plant and the STP collect and analyze samples required under terms of their permits. Although there are written procedures for the analyses of the samples, there are no procedures describing proper methods to be used for the collection of samples.

In addition, an automatic monitoring station for pH, radiation, and conductivity is located in the sewer trunk line, 1-hour upstream from the STP, to detect whether wastewater flowing into the STP requires diversion because of elevated contaminant levels. If the monitor detects abnormal levels, flow to the STP is diverted into lined holding lagoons adjacent to the STP. Although STP operators are required to notify S&EP prior to discharging wastewater from the holding lagoon, written procedures for controlling, treating, and releasing the wastewater have not been prepared.

The cause of this finding appears to be inadequate policy implementation, procedures, risk, and resources. Although the policy is clear as to the sampling and discharge requirements, no procedures have been developed for collecting samples or controlling the discharge. This may result from a perception that the risk of not properly collecting samples or of not

controlling the discharges is small. In addition, inadequate personnel resources have been allocated to correct this finding.

SW/BMPF-5

Sewage Treatment Plant Deficiencies

Performance Objective: As described in Section 61.1 of the Great Lakes-Upper Mississippi River Board of Sanitary Engineers Recommended Standards for Sewage Works (commonly known as the Ten-State Standards), STPs shall have more than one clarifier capable of independent operation for all plants where design flow exceeds 100,000 gallons per day. The Ten-State Standards have been adopted by NYSDEC as its recommended design criteria for STPs.

Finding: The BNL STP lacks a backup clarifier as required by NYSDEC's recommended design criteria for STPs.

BNL has an on-site STP with a current average flow of 700,000 to 800,000 gallons per day. The STP has only one clarifier, although it has the capacity to handle more than twice the average flow. There is no back-up unit that can be used when the clarifier needs cleaning or maintenance. In the past, the clarifier was bypassed once every 3 years for cleaning, inspection, and maintenance. Raw sewage was diverted to Filter Beds Nos. 7 and 8. This practice was discontinued 5 years ago when the use of these filters was halted because effluent from these filter beds discharged directly to the Peconic River without being monitored.

BNL is aware of the deficiency. The BNL Sanitary Utility Master Plan 1989-2000 (Appendix I, SW-1, page 6-6) calls for construction to start on a new primary clarifier in March 1994. NYSDEC has not made an issue of this lack of multiple treatment units because BNL has a history of generally being in compliance with the SPDES discharge limits.

This finding appears to be caused by an ineffective STP design that does not allow for maintenance work on the existing clarifier without causing STP operational difficulties. Also, the original STP was built by the Army in the 1940s prior to development of the standards. Since BNL took over the facility in 1947, the STP, including the clarifier installed in 1968, has been adequate for the mission of the Laboratory and, in fact, still provides greater than 99 percent compliance with the SPDES discharge limits (Appendix I, SW-17, page 50). As such, the risk has been perceived to be small and, therefore, has not merited the resources necessary to implement the upgrade.

3.4.4 Hydrogeology

3.4.4.1 Overview

The purpose of the groundwater portion of the environmental assessment of BNL was to evaluate both the programmatic and technical status of groundwater protection and monitoring as it relates to applicable regulations, industry guidance, and BMPs. Applicable regulations include the requirements of DOE Orders, RCRA, and CERCLA/SARA as presented in Table 3.4.4-1. Industry guidance includes publications developed as part of both the RCRA and CERCLA programs by EPA, and BMPs are current practices in industry and government programs.

Table 3.4.4-1
List of Applicable
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Titles</u>	<u>Authority</u>
40 CFR Parts 264 and 265	Standards and Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities	EPA
EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9950.1	RCRA Ground Water Monitoring Technical Enforcement Guidance Document	EPA
OSWER Directive 9355.3-01	Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA	EPA
OSWER Directive 9283.1-2	Guidance on Remedial Actions for Contaminated Ground Water at Superfund Sites	EPA
OSWER Directive 9502.00-6D	RCRA Facility Investigation (RFI) Guidance	EPA
40 CFR 141 and 143	Primary and Secondary Drinking Water Standards	EPA
DOE 5400.1/5484.1	General Environmental Protection Program	DOE

Table 3.4.4-1--Continued
List of Applicable
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Titles</u>	<u>Authority</u>
6 NYCRR Section 360	Solid Waste Management Facilities	NYSDEC
6 NYCRR Sections 700-705	Water Quality Regulations	NYSDEC
15 NYCRR Section 602	Water Supply Applications for Long Island Wells	NYSDEC
Suffolk County Sanitary Code Articles 4, 7, 12, and 15	Water Supply, Water Pollution Control, Toxic and Hazardous Materials Storage and Handling Controls, Radiation Control	SCDHS

The general approach to the groundwater assessment included interviews with BHO and BNL staff, review of geologic and hydrologic reports, and examination of site documents and field logs. Additionally, on-site tours were conducted to verify the information gathered from the assessment. The data and information collected from these activities were evaluated with respect to Federal, State of New York, and Suffolk County regulations and DOE Orders, as identified in Table 3.4.4-1.

The stratigraphic sequence beneath BNL consists of three aquifers and two aquitards. The three aquifers form a system that the EPA has designated as a sole-source aquifer in accordance with Section 1424(e) of the Safe Drinking Water Act. The shallow surficial aquifer is represented by upper Pleistocene glacial deposits, which consist of broadly stratified clean sand and gravel, with little clay or silt. These deposits are approximately 80 to 150 feet thick beneath BNL and are underlain by the Gardiners Clay, a Pleistocene unit which acts as an aquitard to groundwater movement. The Gardiners Clay has a thickness ranging from 0 to 30 feet and is generally a dark gray to green sandy clay. The areal extent of the Gardiners Clay beneath BNL has not been adequately delineated. The clay, where present, is a good marker between the underlying Magothy Formation and the upper Pleistocene glacial deposits.

The Magothy Formation, which comprises the Magothy aquifer, lies beneath the Gardiners Clay and extends to a depth of 800 to 900 feet. It is a Cretaceous-age unit, which is primarily composed of alternating layers of sand, gravel, and silty/sandy clays. The Raritan Clay aquitard underlies the Magothy aquifer. This unit is approximately 200 feet thick and is composed of dark gray or black lignitic clay, with some silty/sandy clay and lenses of sand and gravel. The Raritan Clay is the upper member of the late-Cretaceous Raritan Formation. Below the Raritan Clay lies the Lloyd Sand, a 300-foot-thick sequence of coarse-to-fine sands with some quartz gravel and soft clay. The Lloyd aquifer is an important source of drinking water for the coastal communities of Long Island, and lies 1200 to 1500 feet beneath the BNL site. It is underlain by a granitic bedrock. The bedrock represents the lower boundary of the water-bearing deposits in the BNL area.

Current information developed on the site indicates that portions of the shallow glacial aquifer have been and continue to be contaminated with organics, inorganics, and radionuclides from inactive waste sites and also, in the case of radionuclides, from BNL sewage treatment plant discharges into the Peconic River. Studies have been conducted at BNL to establish the hydrogeologic parameters beneath the site. Approximately 180 groundwater monitoring, recovery, and supply wells have been installed at the site, although some of these have been abandoned (Appendix I, GW-1, GW-3). The monitoring well network is currently being modified and expanded, and the activities include well upgrade, abandonment, and new well installation.

In addition, process supply wells (one active, several inactive) that penetrate the first aquitard, and several test holes that penetrate two aquitards beneath BNL. These represent potential conduits for aquifer cross-contamination. Well 104, which is screened in both the shallow glacial aquifer and the underlying Magothy aquifer, has been shown to be contaminated with some organics (Appendix I, GW-11, GW-12).

As mentioned earlier, there is an active groundwater monitoring program at BNL. Quarterly groundwater samples are obtained from a network of monitoring wells in the vicinity of several locations where the potential for groundwater contamination exists or has been confirmed (Appendix I, GW-12). These include areas adjacent to

- the on-site recharge basins,
- the sand filter beds at the STP,
- the Peconic River,
- the Waste Concentration Facility,

- the CSF,
- the HWMF,
- the former landfill area,
- the sump at Bldg. 650,
- the army landfill ("X-26" site),
- the current landfill, and
- the AGS Bubble Chamber area.

In addition to the on-site monitoring program, Suffolk County currently collects groundwater samples from selected off-site wells and provides BNL with split samples for radionuclide analyses (Appendix I, GW-12). Suffolk County also periodically analyzes some off-site groundwater samples for organics and supplies BNL with the data.

The findings that follow this overview detail the specific aspects of the BNL groundwater monitoring and characterization programs that do not meet compliance and BMP requirements. There are four compliance and three BMP findings for groundwater at BNL. One of the compliance findings deals with inadequate hydrogeologic characterization, one deals with known groundwater contamination which exceeds standards, and the other two deal with incorrect well screen placement and well abandonment at the current landfill. The BMP findings deal with insufficient well abandonment and cross-contamination between aquifers, inadequate monitoring well construction and maintenance, and improper groundwater sampling procedures. The reader is also referenced to the Waste Management, Inactive Waste Sites, Surface Water, and QA Sections of this report for parallel findings.

3.4.4.2 Compliance Findings

GW/CF-1 Inadequate Characterization of the Hydrogeologic Regime

Performance Objective: Both CERCLA and the National Contingency Plan (NCP), 40 CFR 300.430, have guidelines for contamination assessments which state that the groundwater regimes should be adequately characterized to understand flow and other hydrogeologic features. DOE 5400.4, CERCLA Requirements, states that DOE shall respond to inactive waste sites in accordance with CERCLA and the NCP.

Finding: The hydrogeologic regime at BNL has not been adequately characterized to define aquifer relationships, subsurface stratigraphy, extent of contamination, background conditions, and

local flow pathways in accordance with DOE 5400.4 and 40 CFR 300.430.

Characterization of the hydrogeologic regime at BNL has been undertaken in limited areas of the site. Several attempts have been made by subcontractors to define the hydrogeologic and contaminant conditions. BNL efforts have focused on a 1977 oil spill event near the Central Steam Facility (CSF) (Appendix I, GW-10), the Aquifer Restoration Project to remediate a contaminant plume near the HWMF (Appendix I, GW-7), an upgrade and closure of waste disposal sites (Appendix I, GW-6), an assessment of the former landfill (Appendix I, GW-9), and a 1988 study which upgraded and expanded the BNL monitoring well network (Appendix I, GW-1). These studies have added to the information about the shallow hydrogeologic regime in specific areas of the site. However, there is no comprehensive understanding of the sitewide hydrogeologic regime.

In particular, the following information gaps prevent an adequate definition of the hydrogeologic conditions beneath the BNL site: (1) vertical and horizontal extent of groundwater contamination, (2) knowledge of background conditions, (3) areal extent of the Gardiners Clay, (4) relationships between the shallow glacial aquifer and the underlying Magothy aquifer, and (5) groundwater flow paths and velocities at specific areas of known contamination. These are described in more detail in the following paragraphs.

Vertical and Horizontal Extent of Known Contamination. There is insufficient information regarding the vertical and horizontal extent of groundwater contamination at the BNL site. The only aquifer currently being evaluated at BNL is the shallow glacial aquifer. No wells in the existing network allow for routine sampling of the Magothy Formation or the Lloyd Sand. A series of well logs (Appendix I, GW-11) are available that address the lithology of the Magothy Formation, but these are general in nature and do not identify individual clay units that may act as aquitards or confining layers to deeper, more permeable zones.

Over 100 wells monitor the upper 100 feet of the shallow glacial aquifer. The placement of these wells and the selection of screening intervals have been inadequate to properly define the nature and extent of shallow groundwater contamination at such areas as the former landfill, the HWMF, the current landfill, the STP, the meadow marsh, Bldg. 650, and areas off-site along the southeastern BNL boundary. Specifically, the following inadequacies exist:

- Most of the monitoring wells immediately south and southeast of the former landfill are screened 1 to 16 feet below the water table and are not able to accurately detect any "floaters" that may be

contaminating the water table surface. Additionally, no wells are located immediately south-southeast of the former landfill, which is reported to be the direction of groundwater flow in this area (Appendix I, GW-1, GW-3).

- The groundwater beneath the HWMF has been shown to be contaminated with VOCs and radionuclides. The plume, which originates at the HWMF and extends south and southeastward, was mapped horizontally by BNL in 1986 (Appendix I, GW-7) but has not been adequately redefined since then. In addition, there may be an insufficient number of wells to provide an accurate horizontal plume definition. The vertical extent of the plume was mapped from photoionization detector readings from four soil borings and groundwater samples from three wells. However, the data from the four soil borings were inappropriately used to define the bottom of the groundwater plume because the photoionization detector may not be sufficiently sensitive and there may be a poor correlation between groundwater and soil contamination. As a result, the vertical extent of the plume is based on limited data, and it remains poorly defined and inadequately characterized. In addition, the Aquifer Restoration Project, which was implemented in 1986 (Appendix I, GW-7), did not have a sufficient data base to determine the effects of pumping and recharge on the HWMF-specific hydrogeologic regime. For instance, the pump-and-recharge method may be adversely affecting the shallow groundwater regime beneath the HWMF, causing gradient reversals which may be diverting the contamination plume to unaffected areas or capturing other plumes for which the aeration project is inappropriate. The BNL assumption that the Aquifer Restoration Project would effectively contain the contaminant plume was not substantiated prior to the implementation of the remediation program. Furthermore, inadequate data have been collected to show that the aquifer restoration project has been effective in controlling the plume both vertically and horizontally.
- The groundwater downgradient of the current landfill has been shown to be contaminated with elevated levels of tritium, iron, and lead (see Finding GW/CF-2). Since the existing monitoring wells (W6, WT, 1K, 2C, and W9) are screened approximately 3 to 15 feet below the water table, there is no knowledge of aquifer conditions at the top of the water table or at depths below 35 feet. Any "floaters" or "sinkers" originating from the current landfill could possibly remain undetected in the existing monitoring well network.

It should be noted that the water table surface in the BNL area has been shown to vary significantly through the years, and longer screens are necessary in shallow wells to compensate for this variation. It should also be noted that this concern has been expressed by BNL and that steps are being taken to install new wells with properly screened intervals. In addition, two of the required monitoring wells that were listed in the 6 NYCRR 360 Solid Waste Landfill Permit were inadvertently abandoned during a recent monitoring well upgrade and expansion project (Appendix I, GW-1) (see Finding GW/CF-4 and related Finding WM/CF-4). If not replaced, the absence of these two wells will restrict the hydrogeologic assessment of the current landfill and will leave a noticeable gap in the data regarding contaminant tracking and plume characterization. The State, however, has said that the loss of these two wells will not affect their compliance requirements since the subject area will be part of a Remedial Investigation/Feasibility Study (RI/FS).

- The shallow glacial aquifer beneath the STP, the meadow marsh area, and the Bldg. 650 sump area has been shown to be contaminated, yet no characterization has been conducted which defines the horizontal and vertical extent of the respective plumes.
- No adequate studies have been undertaken to appropriately characterize the nature and extent of off-site groundwater contamination. Groundwater flow direction has been traced to the boundary only, and no determination has been made to date regarding the flow between the boundary and off-site receptors. Off-site hydrogeologic features such as groundwater divides, surface water bodies, and nearby pumping wells should be evaluated by BNL to properly assess the potential migration of contaminants to areas beyond the BNL boundary. For example, groundwater contamination was detected in monitoring Well No. 130-02 following an August 1989 sampling event (Appendix I, GW-17). This well is located along the southern site boundary, and the contaminants were TCA [(11 parts per billion (ppb))] and 1, 1-dichloroethylene (4 ppb). Subsequently, four residential wells approximately 700 to 800 feet south of Well No. 130-02 were sampled by Suffolk County and were also found to be contaminated with TCA (up to 340 ppb) and 1, 1-dichloroethylene (up to 14 ppb) (Appendix I, GW-18). There is an industrial park between the southern site boundary and the contaminated wells. Additionally, there is currently very limited hydrogeologic information in this area. As a result, the source of contamination cannot presently be

identified, although BNL and the County are currently formulating a plan of action to define the source (Appendix I, GW-18). No studies, however, have been completed by BNL to determine the migration potential of the contaminants detected in monitoring Well No. 130-02.

Four of the potable wells, which were drilled into the lower intervals of the glacial aquifer (Wells No. 1, 2, 10, and 11), have been shown to be contaminated. No characterizations have been conducted to determine the nature, extent, and possible source of this lower-glacial contamination. Additionally, one of the supply wells (Well No. 104) has been shown to be contaminated with TCA. This well is completed within the Magothy Formation, and multiple screens intersect both the glacial aquifer and the Magothy aquifer (see Finding GW/BMPF-1). Likewise, no characterizations have been conducted to determine the nature, vertical extent, and source of this contamination. Finally, no studies have been implemented to address the effects these wells (both potable and supply) have had on the glacial and Magothy aquifers as a result of historic pumpage.

Knowledge of Background Conditions. No adequate studies conducted to date accurately characterize and define the background groundwater conditions beneath and upgradient to BNL. It is currently unknown whether certain organic and inorganic contaminants (such as those listed in Finding GW/CF-2) are being contributed by off-site sources or are naturally occurring in the subsurface soils beneath BNL. BNL is aware of the data gap regarding upgradient groundwater quality, and is initiating plans to install a series of perimeter wells along the western, northern, and eastern site boundaries to provide this information. However, BNL has not formally developed plans to assess the possibility that some parameters, such as iron and pH, may be occurring in elevated concentrations beneath the site due to natural geologic and geochemical processes.

Areal Extent of the Gardiners Clay. Although the Gardiners Clay is suspected to underlie much of the BNL site and act as an aquitard to separate the glacial aquifer from the Magothy aquifer, BNL has not undertaken the necessary investigations to establish the occurrence and physical characteristics of the Gardiners Clay. In fact, most BNL reports simply imply that the Gardiners Clay begins along the northern boundary of BNL and thickens to the south. However, some well logs from the BNL area do not identify the Gardiners Clay as a subsurface unit, suggesting that it is either very thin or non-existent in scattered areas beneath BNL. Additionally, several supply wells and test holes have penetrated the Gardiners Clay, and may have adversely affected its ability to behave as an aquitard if it is shown that the Gardiners Clay served as an aquitard prior to well penetration. However, no investigations or studies have been

conducted to verify the existence of the Gardiners Clay or to determine its effectiveness as a barrier to groundwater movement.

Relationships Between the Shallow Glacial Aquifer and the Magothy Aquifer. Because the lateral and vertical extent and physical characteristics of the Gardiners Clay have not been adequately mapped or defined, there is a lack of information regarding the relationships between the shallow glacial aquifer and the deeper Magothy aquifer. It has not been ascertained if the two saturated zones are in direct or indirect communication, if flow directions differ in each aquifer, or if discrete head differences exist in local areas of known contamination.

Groundwater Flow Paths and Velocities at Specific Areas of Known Contamination. At each area of known contamination, BNL has not established the localized flow direction paths or velocities to characterize the extent of contamination and migration potential. No plume maps have been generated and no aquifer tests have been conducted at sites other than the HWMF aquifer restoration area.

It should be noted that the above-mentioned groundwater contamination areas were discussed in the 1987 DOE Environmental Survey (Appendix I, GW-3), yet no adequate characterizations have been implemented to determine the nature and extent of the groundwater contamination in those areas and to resolve the concerns expressed in the Survey. In addition, the IAG currently being negotiated between DOE, EPA, and NYSDEC will require the implementation of RI/FSSs at these areas to characterize the groundwater regimes. These RI/FSSs will conform to the guidelines established under CERCLA (OSWER 9502.00-6D) and will require the establishment of a properly-constructed groundwater monitoring network that will yield representative samples of the affected aquifer(s) over a long-term period. The monitoring well network currently in existence at BNL does not conform to these guidelines and will require further modifications and additional wells with properly placed screens, better maintenance, and more appropriate construction materials (see Finding GW/BMPF-2 and related Finding IWS/CF-1).

It should also be noted that a current program of monitoring well upgrade, abandonment, and new well installation was initiated in 1989 following a site geohydrological evaluation (Appendix I, GW-1). The conclusions and recommendations derived from this evaluation did not fully address the inadequacy of the hydrogeologic characterization and have not resolved the issues of improperly placed screens, inappropriate well construction materials, deficient characterization of deeper aquifers, lack of wells in strategic areas, and the insufficient determination of the nature and extent of aquifer contamination.

The causes for the inadequate characterization of the BNL hydrogeologic regimes appear to be personnel, resources, supervision, and review. The BNL site has no staff hydrogeologist to make and implement policy, coordinate the investigations of subcontractors, and provide a uniform and programmatic approach to the characterization of the hydrogeologic regime. As a result, the BNL approach to supervising the hydrogeologic assessment of the areas of concern has been fragmentary and loosely coordinated. Inadequate review of past investigations has caused data gaps and inadequate characterizations to go unnoticed and unresolved.

GW/CF-2 Groundwater Contamination

Performance Objective: 6 NYCRR 703.5 (Appendix I, GW-14) establishes standards for Class GA groundwater. These standards are contained in Part 703.5(a)(3)(b), include both organic and inorganic chemicals, and are similar to the constituents and standards set forth in 40 CFR 141, Subparts B and G.

Finding: Groundwater beneath certain areas of BNL, including the southern boundary, exceeds applicable standards and guidelines for certain chemical constituents as established by the State of New York.

BNL routinely monitors the groundwater from which it derives its potable water. This monitoring has detected several exceedences of groundwater quality standards at various locations. These locations include the following:

- **Current Landfill** - Groundwater samples collected from monitoring wells at the current landfill indicate that Wells WR, WS, WT, 1K, 2C, and W9 have levels of iron and manganese that exceed the State standards. Additionally, benzene, toluene, and xylene (BTEX) levels in Wells WR, 2C, and W9 have exceeded the State standards (see related Finding GW/CF-1).
- **Former Landfill** - Groundwater samples collected from monitoring wells at the former landfill indicate that levels of iron in wells 1I, WQ, and WP exceed the State standard. Manganese in Well D1 exceeds the State standard. In addition, Well WP has TCA in excess of the State standard (see related Finding GW/CF-1).
- **HWMF** - Groundwater samples collected from monitoring wells at the HWMF indicate that all of the wells have pH levels that are lower than the State standard. Additionally, Levels of TCA and trichloroethylene in wells MW-8 and MW-13 exceed the State standard. Well MW-2 has tetrachloroethylene in excess of the State standard (see related Finding GW/CF-1).

- Potable wells - Levels of iron in potable Wells No. 6 and No. 7 exceed the State standard (see related Finding GW/CF-1).
- Process supply well - Process supply Well No. 104 has been shown to contain TCA at a level that exceeds the State standard. In addition, this well is screened in both the glacial aquifer and the Magothy aquifer, and may be acting as a conduit for aquifer cross-contamination (see Finding GW/BMPF-1).
- BNL southern perimeter - Groundwater samples collected from a monitoring well along the BNL southern boundary (Well No. 130-02) indicate that levels of TCA exceed the State standards (see Finding GW/CF-1). TCA (11 ppb) was detected in monitoring Well No. 130-02 following an August 1989 sampling event (Appendix I, GW-17).

It should be noted that the exceedances of State groundwater standards for several constituents, particularly iron and pH, may be related to elevated background levels. These elevated levels may be naturally occurring or from off-site sources. This has not been evaluated on a BNL site-specific basis by comparing nearby background values (unaffected by waste disposal areas) with the observed exceedances and deriving a reasonable and geochemically sound assessment of BNL-attributed contamination (See Finding GW/CF-1).

BNL is aware of groundwater contamination at the above-listed areas and continues to monitor groundwater quarterly. The groundwater contamination at these areas was identified as a finding in the 1987 DOE Environmental Survey (Appendix I, GW-3). There have been no adequate characterizations, including the 1988 evaluation by an outside contractor (Appendix I, GW-1), to determine the nature, extent, and migration potential of the contaminants of concern (see Finding GW/CF-1). It should also be mentioned that the contamination south of the HWMF was addressed in a 1985 aquifer restoration study (Appendix I, GW-7) and a remediation project was implemented in 1986. This project, however, has not addressed the contamination characterization issue (see Finding GW/CF-1) and is currently being scrutinized by BNL and regulatory agencies (Appendix H, I-GW-7).

Although BNL is attempting to begin characterization activities, including the installation of background wells to define off-site conditions, much of the groundwater characterization work will depend on the issuance of the IAG currently being negotiated between DOE, EPA, and NYSDEC.

The causal factors contributing to this finding appear to be policy implementation, procedures, training, risk, and resources. Although the Federal, State, and local policy to limit groundwater contamination is in place, there was no procedure in effect at BNL to initiate an aggressive contamination characterization whenever contamination levels exceeded established standards, and there were no adequately trained BHO or BNL personnel to formulate a program to address the contamination issue. The sources of the groundwater contamination associated with historical activities were not considered to be of sufficient environmental risk by BNL, BHO, and the regulators to allocate sufficient resources to reduce the risk. Likewise, the resources needed to reduce the risk were deemed inappropriate due to historical industry practices or past regulatory climate.

GW/CF-3 Improper Screen Placement in Monitoring Wells at the Current Landfill

Performance Objective: 6 NYCRR 360-2.11(c)(1)(i) requires that groundwater monitoring wells must be capable of detecting landfill-derived groundwater contamination within the critical stratigraphic section and that wells monitoring the unconfined water table should be screened to ensure that the water table can be sampled at all times.

Finding: All five of the wells that monitor the current landfill are not screened at depths that ensure accurate detection of landfill-derived groundwater contamination as required in 6 NYCRR 360-2.11(c)(1)(i).

Monitoring Wells W6, WT, 1K, 2C, and W9 are screened at depths varying from 3 to 15 feet below the water table (see Finding GW/CF-1). With these screened intervals and the variable water table at BNL, the wells are currently incapable of accurately detecting any landfill-derived contamination that may be at the surface of the water table or in the upper 5 feet of the unconfined aquifer. It should be noted that this concern has been expressed by BNL and that steps are being taken to install new wells with properly screened intervals.

The causal factors that may have contributed to this finding are inadequate policy implementation, personnel, and supervision. BNL did not properly implement the policy of establishing an effective groundwater monitoring network that would comply with State regulations. Additionally, site personnel assigned to conceptually design the current landfill monitoring well network were not cognizant of proper well network design and screen placement rationale. Furthermore, proper supervision of these personnel by an experienced hydrogeologist could have resolved the issue prior to well screen installation.

Improper Abandonment of Monitoring Wells at the
Current Landfill

Performance Objective: 6 NYCRR 360-2.11(a)(8)(vi) requires that abandoned wells at solid waste landfills be fully sealed in a manner appropriate for the geologic conditions to prevent contaminant migration through the borehole. It further requires the overboring or removal of the casing to the greatest extent possible (minimally, the upper 5 feet of the boring or casing must be removed) followed by perforation of any casing left in place. Additionally, the well must be sealed by injecting a cement bentonite grout under pressure. The screened interval of the borehole must be sealed separately and tested to ensure its adequacy before sealing the remainder of the borehole.

Finding: Regulatory compliance monitoring Wells WR and WS at the current landfill were not abandoned in accordance with 6 NYCRR 360-2.11(a)(8)(vi).

Monitoring Wells WR and WS were inadvertently abandoned on March 2, 1990 (see related Finding WM/CF-10). The techniques used to abandon these wells (Appendix H, I-GW-4, I-GW-10) did not follow the specifications for monitoring well construction and abandonment (GW-15). The wells were abandoned by hand-digging 1 to 2 feet down, removing the upper 1 to 2 feet of casing, tremie-pumping a cement-bentonite grout into the screen, and allowing the grout to infiltrate through the screen overnight. The next day, the remainder of the casing was filled with a cement-mixture to ground surface and a marking tag was placed in the cement.

In using this method, the performance objective requirements were not satisfied. The casing was not removed to a minimum of 5 feet below grade, the screen and casing remaining in the borehole were not perforated, and the screen was not tested to ensure the adequacy of the grout seal before plugging the remainder of the borehole. Because the wells were abandoned improperly, the potential exists for aquifer contamination through the inadequately sealed borehole (see related Finding GW/BMPF-1).

The causal factors that may have contributed to this finding are human factors, supervision, QA and quality control, and policy implementation. The personnel assigned to abandon wells at BNL did not follow the specifications they were given and were not properly supervised to verify that the correct procedures were being followed. The procedures for well abandonment had been given to the subcontractor, but compliance to these requirements was not verified through field supervision or review. Policy was not implemented in that regulatory requirements were not followed.

3.4.4.3

Best Management Practice Findings

GW/BMPF-1

Insufficient Well Abandonment/Cross-Contamination
Between Aquifers

Performance Objective: Industry practice and regulatory agency personnel generally recommend that wells and boreholes which are not used for regulatory compliance should be abandoned in a manner to ensure that no contamination will migrate through the remaining borehole, casing, or screen and that the aquifer(s) being penetrated are not subjected to contamination from overlying or underlying saturated zones.

Finding: As many as 22 nonregulatory wells have been abandoned using procedures that do not satisfy standard industry practices or general agency recommendations.

A well abandonment program has been initiated by BNL to remove any existing wells that are unserviceable, incorrectly installed, or otherwise incapable of yielding data that meet current regulatory requirements (Appendix I, GW-1, GW-15). This program was implemented in March 1990, and the personnel assigned to accomplish the field work did not follow the specifications they were given (see related Finding GW/CF-4). For instance, overboring or screen and casing removal was not attempted prior to abandoning the wells. Additionally, the grout used to plug the screens was allowed to infiltrate into the screens overnight and was not tested the next morning to ensure that an adequate seal had been accomplished throughout the screened interval. These inadequacies occurred on as many as 22 wells.

As an additional note, three supply wells (Wells Nos. 101, 102, and 103) were drilled into the Magothy aquifer in 1958 and were reconstructed in 1959 to abandon the old screen and set the new screen in the glacial aquifer. This abandonment technique involved cutting the original casing above the screen, pumping grout into the old screen, and removing the casing above the abandoned screen (Appendix H, I-GW-16). New screen was then installed and a new gravel pack was added. As a result, the old screen still lies below the wells and is plugged with cement. However, the borehole annulus of each well is potentially still open, and it penetrates the glacial aquifer, the Gardiners Clay, and the upper intervals of the Magothy aquifer. The integrity of the method used to seal the borehole annuli and plug the original screens of Wells 101, 102, and 103 cannot be fully verified because the work was conducted in 1959, and no details are available other than sketches (Appendix I, GW-11). It can, however, be determined from the sketches that the cement slurry was pumped into all three wells at depths above the Gardiners Clay. Since the intervals of the borehole annuli which penetrate the Gardiners Clay may remain open below the cement plug, aquifer

mixing may be occurring within the abandoned gravel pack and along the abandoned well and screen casings.

Furthermore, numerous exploratory boreholes and old army wells have been drilled across the BNL site (Appendix H, I-GW-16) that were probably not abandoned and remain as potential conduits. These include 300-foot, 600-foot, and several 1200- to 1500-foot exploratory boreholes and possibly two old Army/USGS wells that were drilled 1200 to 1500 feet into the Lloyd Sand aquifer.

The causal factors contributing to this finding appear to be policy implementation, training, and supervision. No policy was in effect at BNL to implement an aggressive characterization of existing and former wells or borings that may have penetrated the aquitards beneath the site. Additionally, there were no adequately trained personnel to formulate a program to address the well abandonment issue concerning existing monitoring wells, supply wells, or historic wells and borings. Furthermore, there were no personnel with the appropriate hydrogeological expertise to supervise the subcontractors involved in well abandonment and the review of historical well data.

GW/BMPF-2 Inadequate Monitoring Well Construction and Maintenance

Performance Objective: Industry practice and technical guidance documents (Appendix I, GW-16) typically provide that monitoring wells should be screened, constructed with appropriate materials, and maintained such that representative samples can be collected, cross-contamination can be minimized, surface infiltration can be prevented, and wells can be readily identified.

Finding: Many of the monitoring wells at BNL are not properly identified, screened, constructed with appropriate materials, or adequately maintained and, therefore, are not in accordance with current industry practices or site requirements.

Approximately 180 monitoring wells are on the BNL site. Twenty-five of these wells were physically inspected, and the drilling and completion logs of an additional 25 wells were reviewed during the TTA. Of the 50 wells that were either reviewed or inspected, 35 were found to have problems that involved the following:

- Inappropriately screened wells. Most of the existing monitoring wells immediately south and southeast of the former landfill are screened 20 feet below the water table and are not able to accurately detect any "floaters" that may be contaminating the water table surface. At the current landfill, Wells W6, WT, 1K, 2C, and W9 are screened approximately 5 to 15 feet below the water table, and there are no wells to

characterize aquifer conditions at the top of the water table immediately downgradient of the landfill. In addition, Wells D8 through D15, which are located throughout the site, were installed approximately 20 feet deeper than requested and have screens that do not serve the intended purpose of monitoring the top of the water table.

- Potentially improper construction material. Approximately 40 of the wells that have been retained and upgraded by BNL for monitoring purposes are constructed of carbon steel casing. This material, although acceptable by industry standards in the past, is becoming increasingly less acceptable for CERCLA and RCRA investigations.
- Inadequate maintenance. The BNL site does not currently have an established program for routine and nonroutine maintenance of monitoring wells. Wells that require maintenance are identified in the field by sampling personnel on a quarterly basis, and an informal request is made to Plant Engineering to initiate the needed repairs. There is no procedure to either make the request in writing or to followup the request with inspections or inquiries. As a result, many wells remain unrepaired for months. An on-site inspection of approximately 25 monitoring wells across the BNL site revealed that 23 of the wells had one or more of the following deficiencies:
 - Eight wells had no concrete pads.
 - Three wells had broken or unacceptable concrete pads.
 - One well needed an extension on the polyvinyl chloride riser (the steel protective casing was too tall for the existing riser).
 - Seven wells had well caps that were too small and allowed the introduction of fluids and contaminants into the well casing during pumping. The larger size caps are available on the market and would be more effective in ensuring a that a proper seal has been applied on top of the well.
 - Six wells had no caps.
 - Two wells had broken caps.

- Insufficient well identification markings. There are two monitoring well numbering schemes in use at BNL: an old scheme that uses the original well identification numbers and a new system generated by Plant Engineering that employs the site grid number as a component of the well identification. Well construction, repair, and abandonment are accomplished from a list utilizing the new numbering scheme; however, groundwater sampling and field inspections are conducted utilizing the old scheme. As a result, the newer wells have the new numbers on the protective casings while the older wells have the old numbers. Some wells, however, have no numbers on the casing. An on-site inspection of approximately 25 monitoring wells across the BNL site revealed the following:
 - Fourteen wells had identification plates with the new grid numbering system.
 - Nine wells had identification plates with the old numbering system.
 - Two wells had no identification number.

BNL is aware of some of the problems discussed in this finding but not to the extent that solutions have been readily apparent and aggressively pursued. For instance, the 1988 groundwater study (Appendix I, GW-1) evaluated the existing well network and concluded that some of the wells were inappropriate but overlooked the data gaps represented by improper screen placement. Additionally, BNL was aware that some wells were constructed with improper materials but did not fully address the issue of carbon steel casings in a CERCLA regulatory environment. Furthermore, S&EP personnel were aware of the shortcomings related to having no organizational control over monitoring well maintenance and numbering (Appendix H, I-GW-4, I-GW-10, I-GW-12, and I-GW-15) but did not actively seek a resolution of the problem.

The causal factors that contributed to this finding appear to be policy implementation, training, supervision, change, and barriers and controls. The policy for establishing an acceptable groundwater monitoring network has not been adequately implemented, because many wells in the network remain unacceptable. The Plant Engineering personnel responsible for monitoring well construction and completion are not adequately trained to recognize the factors that control the viability of a monitoring station. Additionally, those personnel are not being directed by an experienced supervisor who is cognizant of monitoring well requirements and acceptable practices. The numbering and identification schemes for the monitoring wells have undergone a recent change and have not been fully adopted by

S&EP personnel. The well numbering and identification methods at BNL are confusing and represent a barrier that hinders proper well identification. Furthermore, the fact that S&EP does not have sufficient control over monitoring well installation and maintenance also represents a barrier that hinders the establishment of an acceptable groundwater monitoring system.

GW/BMPF-3 Improper Groundwater Sampling Procedures

Performance Objective: Industry practice and technical guidance documents (Appendix I, GW-16, GW-19) typically provide that monitoring wells should be sampled in such a manner that a representative aliquot is obtained and that the collection processes and techniques do not jeopardize the integrity of the sample.

Finding: Groundwater sampling techniques employed by BNL jeopardize the integrity and representativeness of the sample in that the sampling techniques do not conform to standard industry practices and technical guidance documents.

During an on-site observation of the techniques and procedures used by BNL to sample one groundwater well, several inconsistencies with established industry practices were noted. These inconsistencies include the following:

- The sampling personnel did not know the water volume purged from each well. The amount of water to be purged is computed on a time basis, in which a constant pumping rate is assumed. No check was made to determine if the pumping rates corresponded to the volumes required to adequately purge the well prior to sampling. As a result, the amount of water removed from the well casing is never verified.
- Only one pH and conductivity measurement was taken while the well was being purged. It is an established industry practice to take these measurements several times during purging and to purge a sufficiently-recharging well until these measurements have approached stabilization. This will ensure that all stagnant water has been removed from and around the well casing and that fresh formation water is entering the screen. BNL SOP EM-25, "Groundwater Sampling at Wells (2 inches or larger) Equipped with Bladder Pump and Purge Pump," addresses the purging and sampling of wells (2-inch diameter or larger) with dedicated pumps, but it does not stipulate that these measurements are to be taken to ensure that the well has been adequately purged.

- Potentially contaminated water entered the well casing during purging and sampling. Water was allowed to spill around the pump air line hose, which may have been contaminated, during the pumping activity and drip back into the well through the top of the casing. The top of the casing was partially open because the well cap was too small.
- Exhaust fumes from the pump compressor were entering the well casing and the sample bottles during the purging and sampling activities. While the compressor was running, it was 2 feet away and upwind from the well.
- There was insufficient decontamination of personnel and equipment prior to and during sampling. A sampling team member put gasoline in the compressor with an ungloved hand, then proceeded to touch the discharge and sampling tube assembly with the same ungloved hand. Additionally, the outside of the sample filter assembly was not decontaminated from the previous sampling event. Water was splashing onto the outside of the filter assembly, getting on the hands of the sampler, and carrying with it the residues from the previous well. Furthermore, a sampling team member manually inserted the filter paper into the assembly after touching the potentially contaminated filter assembly.
- Chain-of-custody procedures were not followed upon delivery of the samples to the on-site laboratory. The gamma and strontium-90 samples were retained by the sampling personnel for additional preparation. However, they were included on the chain-of-custody receipt document that was signed by the laboratory (see Finding QA/BMPF-1).

The causal factors contributing to this finding appear to be policy implementation, procedures, training, and supervision. BNL has not implemented the policy that requires samples to be collected using techniques that are in accordance with established industry practices and technical guidance documents. The procedures that are in effect do not satisfy the requirements of established practices and guidance documents. Also, sampling personnel have not received the proper training to conduct state-of-the-art sampling and to fully understand the rationale and implications of purging, decontamination, and chain-of-custody. Furthermore, their activities are not monitored by supervisory personnel experienced in sampling procedures, requirements, and standard practices.

3.4.5 Waste Management

3.4.5.1 Overview

The purpose of the waste management portion of the BNL environmental assessment was to: (1) evaluate the current hazardous, radioactive, mixed (hazardous and radioactive), medical, and nonhazardous solid waste management practices at BNL; (2) evaluate the compliance status of BNL with respect to Federal and State waste management regulations and DOE Orders; (3) evaluate the waste management practices with respect to industry-accepted BMPs; and (4) evaluate the compliance status of BNL underground storage tanks with respect to Federal regulations.

The general approach to the waste management assessment included discussions with BNL and BHO staff and regulators; review of BNL documents, correspondence, and other records; and observations of BNL facilities and activities. The information collected from these activities was evaluated with respect to applicable Federal and State regulations and DOE Orders, as identified in Table 3.4.5-1, and current industry BMPs.

Table 3.4.5-1
List of Applicable Waste Management
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
DOE 5400.3	Hazardous and Radioactive Mixed Waste Program	DOE
DOE 5820.2A	Radioactive Waste Management	DOE
6 NYCRR 360	Solid Waste Management Facilities	NYSDEC
6 NYCRR 370-374	Hazardous Waste Management Regulations	NYSDEC
40 CFR 148	Hazardous Waste Injection Restrictions	EPA
40 CFR 260-271	Hazardous Waste Management Regulations	EPA
40 CFR 280	Underground Storage Tanks	EPA
40 CFR 259	Medical Waste Tracking and Management	EPA

BNL generates hazardous, radioactive, mixed, medical, and nonhazardous solid wastes. Each of these waste streams is managed on-site by a variety of methods.

BNL is regulated as a hazardous waste full-quantity generator and storage facility operator. Hazardous wastes include used and unused laboratory chemicals and solvents, waste oil contaminated by toxic solvents, and debris contaminated by hazardous constituents from on-site remedial actions. Except for the debris, these wastes are collected by generators, transferred to on-site accumulation areas and, then, to a central storage facility, the HWMF, which is a RCRA interim status storage facility. Hazardous waste debris is transferred directly to the HWMF from its area of generation. Hazardous wastes at the HWMF are periodically shipped to off-site RCRA-permitted treatment and disposal facilities. Many non-RCRA-regulated chemical wastes (e.g., nonhazardous waste paint) are also managed in this fashion.

Nonhazardous waste motor oil is collected and periodically shipped off-site to permitted facilities. Nonhazardous waste oil (exclusive of waste motor oil) from known sources, which is not contaminated with toxic solvents or radioactive materials, is not regulated by hazardous waste regulations and is burned in the BNL CSF.

Currently generated radioactive wastes are all low-level wastes and include compactible and noncompactible solids, aqueous liquids, and waste oil. These wastes are managed either in a manner similar to hazardous wastes (solids and waste oil) or transferred to the Waste Concentration Facility (WCF) (aqueous wastes). The WCF separates this waste into a trace-tritium-contaminated condensate and a concentrated slurry. The condensate is currently transferred by truck to the STP, where it is metered within limits into the BNL SPDES-permitted outfall. The slurry is solidified in cement at the HWMF. The solidified slurry and other radioactive solids are stored at the HWMF awaiting periodic off-site disposal shipments to the Hanford Site. The radioactively contaminated waste oil and other low-level and transuranic radioactive wastes that are no longer generated at BNL are stored at the HWMF pending the future availability of off-site disposal facilities. In addition, large pieces of unneeded activated scrap are stored at the Former Landfill Area (see Section 3.4.8) pending off-site disposal at Hanford as radioactive waste.

Mixed wastes, including radioactively contaminated spent cleaning solvents, scintillation liquids, and solvent and waste oil mixtures, are transferred to the HWMF and stored there pending the availability of off-site treatment or disposal facilities. Hazardous nonhalogenated scintillation liquids contaminated only by tritium and carbon-14 at deregulated levels are shipped off-

site to a RCRA-permitted treatment facility. In addition, BNL is planning arrangements with another RCRA-permitted facility allowed to accept halogenated solvents and waste oils contaminated with other radionuclides. BNL mixed wastes are primarily land-disposal-restricted wastes.

Medical wastes either are autoclaved at the Biology and Medical Departments facilities with the liquid residues discharged to the STP and the solids disposed of as solid waste, or are incinerated in either of two on-site incinerators. One incinerator receives clean (i.e., non-radioactive) medical wastes, and the second receives medical wastes contaminated by short-lived tracer radionuclides (e.g., phosphorus-32) that have been allowed to decay to background levels.

Nonputrescible, nonhazardous solid wastes and asbestos are collected and disposed in the active solid waste landfill which is scheduled to be closed in December 1990 in accordance with Long Island Landfill regulations. Putrescible solid wastes are transported off-site and disposed in the Brookhaven Town Municipal Landfill.

Waste management activities at BNL are performed by the S&EP Division (hazardous, radioactive, mixed, asbestos, and radioactive medical wastes), the Plant Engineering Division (putrescible and nonputrescible solid wastes and nonhazardous, nonradioactive waste oil), and the Medical and Biology Departments (nonradioactive medical wastes).

In addition to the waste management activities summarized above, two other hazardous waste management issues at BNL include the storage of PCB containing waste oil at the CSF and the operation of a contaminated groundwater remediation (aeration) system adjacent to the HWMF.

The CSF had been used previously to burn hazardous waste fuels received from off-site. Although this activity is no longer occurring, approximately 286,000 gallons of fuel oil contaminated with low-level PCBs are stored at the CSF from this program. Storage of this oil is regulated under both the Federal Toxic Substances Control Act regulations and the New York hazardous waste management program; however, at this time, NYSDEC has chosen to waive hazardous waste storage requirements in lieu of the terms of a 1987 Federal Facilities Compliance Agreement (FFCA) between BNL and the EPA Region II Administrator on this subject (see Section 3.4.6.1)(Appendix I, WM-77; Appendix H, I-WM-72).

A pumping-aeration-seepage and pumping-seepage system has been used for several years in an attempt to contain and remove a plume of contaminated groundwater near the HWMF.

With regard to underground storage tanks, BNL currently has six active underground tanks subject to Federal regulations. These six tanks and an additional 44 active and inactive underground tanks are subject to a Memorandum of Understanding between the County and BNL concerning local Suffolk County regulations. The compliance status of the 44 additional underground tanks is discussed in the Section 3.4.6.

A total of 14 waste management findings were identified at BNL. These findings include 10 compliance findings, three BMP findings, and one noteworthy practice. These findings primarily address hazardous waste container management practices and emergency response facilities and procedures, solid waste landfill operations (groundwater monitoring, permitting, inspections, record keeping, and reporting), and medical waste tracking.

3.4.5.2 Compliance Findings

WM/CF-1 Discharge of Untreated Hazardous Waste Groundwater from the Aquifer Restoration Project

Performance Objective: Groundwater contaminated with hazardous constituents, once removed from the ground by pumping, is required to be managed as a hazardous waste and is subject to the RCRA requirements in 40 CFR 148, 262, 265, and 268, and 6 NYCRR 372 and 373 in accordance with the EPA "contained in" rule.

Finding: Groundwater pumped from the BNL Aquifer Restoration Project is discharged to a seepage basin and is not being managed in accordance with RCRA underground injection requirements in 40 CFR 148 or RCRA waste accumulation and facility requirements in 40 CFR 262 and 265 and 6 NYCRR 372 and 373.

The Aquifer Restoration Project has been operating on-site for several years using two modes of operation for the purpose of remediating and preventing the spread of a plume of contaminated groundwater believed to be originating from beneath the HWMF. The plume contains approximately 300 parts per billion (ppb) of 1, 1, 1-trichloroethane as well as other halogenated organic compounds and tritium at lower concentrations.

In the winter mode, which is operated for several months each year, the contaminated groundwater is pumped from the aquifer and discharged directly to a seepage basin without treatment. In this mode, the untreated groundwater meets the definition of a hazardous waste in 40 CFR 261.3 and is, therefore, required to be managed in accordance with RCRA hazardous waste requirements. In the summer mode of operation, the pumped groundwater is treated by spray aeration before discharge to the seepage basin. The activity may not be subject to full RCRA regulation.

NYSDEC has been aware for several years that the untreated groundwater discharge was occurring from the winter mode (Appendix H, I-WM-86). Approximately 3 months prior to the TTA, NYSDEC advised BHO in writing to cease the pumping of groundwater (Appendix I, WM-78). The primary reason for shutting down the winter mode of operation was the belief that the system was not resulting in a hydraulic containment of the contaminated groundwater plume. As a result of possible miscommunication between NYSDEC and BNL/BHO, the discharge was not stopped. Discussions held between Tiger Team members and NYSDEC reconfirmed the State's desire to cease operations (Appendix H, I-IWS-5). Pumping and discharge were then discontinued during the TTA.

Important technical and regulatory concerns being evaluated by BHO, BNL, and NYSDEC are the lack of information on the effectiveness of the system to hydraulically contain the plume (see Finding GW/CF-1) and the effect of CERCLA authority in preempting the need for a RCRA Permit.

Causal factors contributing to this finding appear to be policy implementation and design. The policy of understanding and meeting RCRA requirements applicable to the BNL Aquifer Restoration Project has not been fully implemented. RCRA authority over the contaminated groundwater was not considered in the design of the Aquifer Restoration Project winter mode of operation.

WM/CF-2 Lack of Fire Protection at the Hazardous Waste Management Facility

Performance Objective: 6 NYCRR 373-3.3 requires hazardous waste management facilities storing flammable wastes to be equipped with a water supply of adequate volume and pressure to supply water hose streams, foam producing equipment, automatic sprinklers, water spray systems, or equivalent fire suppression equipment.

Finding: The facilities at the HWMF used to manage flammable hazardous and mixed wastes, including Bldgs. 444, 448, and 483, are not equipped with fire suppression systems as required by 6 NYCRR 373-3.3.

Several buildings at the HWMF are used to manage flammable hazardous and mixed wastes. Bldg. 448 is used in part to store drums of flammable mixed waste scintillation liquid (approximately 12 drums at the time of the TTA). Bldg. 444 is used to stage and store smaller quantities of flammable solvents and chemicals. Bldg. 483 is used in part to accumulate and store drums of flammable hazardous wastes. None of these buildings are equipped with sprinkler systems.

The nearest fire station is located 1.7 miles from the HWMF, and the nearest fire hydrant is located at the active solid waste landfill approximately one-quarter mile from the HWMF.

BNL has been aware of the lack of fire protection and initiated a capital improvement project at the HWMF in 1987 (Appendix I, WM-79). The improvements include new and upgraded storage and work areas at the HWMF that will be equipped with dry chemical fire suppression systems. The improvements are scheduled for completion during Fiscal Year (FY) 1991. In addition, two modular sheds with built-in dry chemical fire suppression systems are currently being prepared for hazardous waste storage at the HWMF.

Causal factors contributing to this finding appear to be design and policy implementation. The buildings currently in use were not designed to meet the current regulatory requirements. The policy for ensuring that RCRA fire protection requirements are met has not been implemented.

WM/CF-3 Inadequate Container Management and Hazardous Waste Determination at the Hazardous Waste Management Facility

Performance Objective: 6 NYCRR 373-3.9 requires hazardous wastes to be stored in closed containers that are in good condition. 40 CFR 262.34 requires all containers of hazardous waste accumulated in and transferred from hazardous waste accumulation areas to be marked as hazardous waste and dated with their accumulation start date. 40 CFR 268.50 requires containers of land-disposal-restricted (LDR) hazardous waste stored at hazardous waste management facilities be marked with their contents and accumulation start dates. 6 NYCRR 372.2 requires a hazardous waste determination be performed on all solid wastes. DOE 5400.3 requires mixed wastes to be managed in accordance with the appropriate RCRA requirements.

Finding: The interim RCRA Storage Facility (HWMF) contains hazardous wastes, potentially hazardous wastes, and mixed wastes that are stored in inadequately marked, undated, open, and corroded containers. Some wastes at the facility are not adequately characterized in accordance with the requirements of 6 NYCRR 373-3.9, 6 NYCRR 372.2, 40 CFR 262.34, 40 CFR 268.50, and DOE 5400.3.

The following containers were holding either hazardous wastes, potentially hazardous wastes, and mixed wastes at the HWMF (Bldgs. 444, 446, 448, and conex-type trailer buildings) and were not being stored in accordance with RCRA requirements:

- Marking

- Approximately 12 small and medium size cylinders of unknown potentially hazardous compressed gases were being stored outside in a concrete vault without markings as to their hazardous status.
- All (approximately six) drums of radioactively-contaminated halogenated LDR solvents and radioactively and LDR solvent-contaminated waste oil were being stored in four conex trailers east of Bldg. 446 without markings as to their hazardous status (the conexes in which they are stored were labeled as mixed waste).
- Numerous potentially hazardous and hazardous waste paints, including some LDR hazardous waste paints, were being stored in containers without markings as to their hazardous status in the southwest end of Bldg. 444.
- Approximately twenty containers of solidified radioactive waste, some of which are mixed waste and at least one of which is LDR mixed waste, were being stored in the blue mixed waste conex on the southeast side of Bldg. 446 without markings as to their hazardous status. These containers had been packaged for off-site shipment in 1980 but could not be shipped and were subsequently unpacked in 1981. Because the various containers cannot be correlated to specific waste tracking forms, it was not possible to determine which were hazardous and which were non-hazardous.

- Dating

- None of the LDR wastes discussed above under "Marking" had accumulation start dates.
- Accumulation start dates were not found on 10 drums of potentially LDR solvent- and radioactively contaminated soil (monitoring well cuttings) that were being stored outdoors in two concrete vaults on the southeast side of Bldg. 448.
- Accumulation start dates were not on approximately 100 drums of radioactively and potentially LDR solvent-contaminated soil and macadam being stored in Bldg. 448.

- At least two bottles of laboratory chemicals were being stored in the toxics bay in Bldg. 444 without accumulation start dates.
- Open Containers
 - Approximately 15 of the containers of solidified radioactive and mixed waste discussed above under "Marking" were stored without lids.
 - Several of the 10 drums of soil discussed above under "Dating" were left open.
- Corroded Containers
 - The cylinders of compressed gases discussed above under "Marking" were severely corroded.
 - One 30-gallon drum, among the containers of radioactive and mixed waste discussed under "Marking," was severely corroded.
- Waste Determination
 - The cylinders of compressed gases discussed above under "Marking" had not received an adequate hazardous waste determination.
 - The 100 drums of soil/macadam discussed above under "Dating" had not received an adequate hazardous waste determination.

With regard to container marking and dating practices, the site-wide procedures for marking and dating allow for small lots of several containers to receive a single tag with a tracking number and the appropriate chemical information and accumulation start date (Appendix I, WM-37). The remaining containers in the lot are not tagged, but instead the tracking number is written on them without the chemical information and accumulation start dates. This has resulted in inadequately labeled and undated containers. In addition, the procedure for tagging the waste requires the container to be dated at the time it is removed from the accumulation point for transport to the HWMF, not at the time it is removed from the point of generation to be transported to a 90-day accumulation area. Therefore, the dates on the tags may be up to several weeks later than the true accumulation start date.

Causal factors contributing to this finding appear to be policy implementation; procedures; and appraisals, audits, and reviews. The policies for meeting RCRA requirements at the HWMF have not been adequately implemented. Complete, up-to-date, approved

procedures for ensuring that RCRA requirements are met at the HWMF are not maintained. The required weekly inspections of the HWMF have not effectively identified the failure to meet specific RCRA requirements.

WM/CF-4 Lack of Required Monitoring Wells at the Active Solid Waste Landfill

Performance Objective: The solid waste landfill permit issued to BNL under 6 NYCRR 360-2 requires quarterly monitoring of seven wells.

Finding: Two of the seven monitoring wells listed on the active solid waste landfill operating permit issued under 6 NYCRR 360-2 have been inadvertently abandoned such that they can no longer be used for required quarterly monitoring.

The BNL active solid waste landfill permit requires quarterly monitoring of seven wells, identified as W6, WT, WS, WR, 1K, 2C, and W9. These wells are monitored for specific conductivity, pH, chlorides, silver, cadmium, chromium, copper, iron, mercury, lead, zinc, gross alpha, gross beta, and tritium (Appendix I, WM-85).

On March 2, 1990, wells WR and WS were inadvertently abandoned in lieu of two other wells for which abandonment was intended (see Findings GW/CF-4 and GW/BMPF-1). Wells WR and WS were intended to be upgraded. As a result, monitoring of wells WR and WS can no longer occur. At the time of the TTA, NYSDEC had not yet been advised of the inadvertent well abandonment and the need for BNL to drill replacement wells (Appendix H, I-WM-82).

Causal factors contributing to this finding appear to be policy implementation, personnel, training, and barriers and controls. The policy for meeting the groundwater monitoring requirements at the active solid waste landfill has not been adequately implemented. Personnel performing well abandonment are not familiar with the overall BNL groundwater monitoring program and have not been adequately trained to identify the correct wells for abandonment. The well numbering and identification methods at BNL are confusing and represent a barrier that hinders proper well identification (see Findings GW/BMPF-1 and GW/BMPF-2).

WM/CF-5 Inadequate Inspections, Recordkeeping, and Reporting at the Active Solid Waste Landfill

Performance Objective: 6 NYCRR 360-1.14(h) requires solid waste landfill operators to periodically perform self-inspections of facilities and equipment and maintain a log of the inspections. 6 NYCRR 360-2.17(q) requires solid waste landfill operators to perform weekly random inspections of incoming waste. Beginning in 1990, 6 NYCRR 360-2.17(t) requires solid waste landfill

operators to submit to NYSDEC by March 1 an annual report on landfill operation for the previous year. Current industry practices require written procedures for such inspections.

Finding: At the active solid waste landfill, BNL does not perform inspections, has no written procedures to conduct inspections, and has not submitted an annual operations report in accordance with 6 NYCRR 360-2 and current industry practices.

The active solid waste landfill at BNL has operated since 1967 and is currently used to dispose of nearly all nonputrescible solid waste generated on-site. The landfill is scheduled to begin closure in December 1990 in accordance with the Long Island landfill restrictions.

BNL is not maintaining records of the required periodic facility and equipment inspections and does not have written procedures to perform the inspections. In addition, BNL is not performing the required weekly random inspections of incoming waste and, subsequently, is not maintaining records of any inspections (Appendix H, I-WM-54, I-WM-55). Finally, BNL has not maintained records of the quantities of refuse, construction and demolition debris, and other potential waste streams (e.g., tires and yard waste) data necessary to complete the required annual landfill operations report for 1989. BNL has not provided the report to BHO for submission to NYSDEC; the report was due to NYSDEC on March 1, 1990 (Appendix H, I-WM-55, I-WM-82). However, BNL has maintained records on the quantity of asbestos disposed of in the active landfill.

On March 27, 1990, BHO sent blank copies of the report forms to BNL and requested BNL to complete them for 1989 landfill operation and return them to BHO within 60 days. Since complete waste type and quantity information is not available, BNL will not be able to accurately complete the report.

Causal factors contributing to this finding appear to be policy implementation, procedures, resources, and change. The policy of being cognizant of and meeting all applicable regulatory requirements at BNL has not been fully implemented. Enough resources have not been committed to determine and remain cognizant of the current regulatory status of all BNL environmentally regulated activities. In the case of landfill inspections, no written procedures are being used to either perform the inspections or to maintain inspection and corrective action records. In the case of the landfill annual report recordkeeping and reporting, appropriate BNL personnel had not been aware of the change in the regulatory requirements.

Inadequate Management of Hazardous Waste in Accumulation Areas

Performance Objective: 6 NYCRR 372.2 and 40 CFR 262.34 require proper marking [6 NYCRR 372.2(a)(8)(i)], dating [372.2(a)(8)(ii)], segregation (40 CFR 265.177, by reference), inspections (40 CFR 265.174, by reference), closed containers (40 CFR 265.173, by reference), aisle space to allow inspection (BMP), and limited access (BMP) to 90-day accumulation areas and satellite accumulation areas for hazardous waste. DOE 5400.3 requires that mixed wastes be managed in accordance with RCRA requirements.

Finding: Approximately 25 percent of the hazardous waste 90-day and satellite accumulation areas that were inspected do not meet all applicable requirements in 6 NYCRR 372.2, 40 CFR 262 and 265, and BMPs for marking, dating, segregation, inspections, closed containers, aisle space, and limited access.

BNL has approximately 27 90-day accumulation areas and 100 satellite accumulation areas for hazardous waste. Approximately 40 of these areas were inspected. The following examples were observed where hazardous wastes in 90-day accumulation areas and satellite accumulation areas are not being managed in accordance with regulatory requirements and BMPs:

- Marking
 - At the S&EP Laboratory (Bldg. 535), approximately 14 gallons of hazardous mixed waste solvent scintillation liquid in a satellite accumulation area were not marked as hazardous waste.
 - At Applied Math (Bldg. 515), Plant Engineering Plumbing Shop (Bldg. 452), Applied Science (Bldg. 815), and Nuclear Energy (Bldg. 703) hazardous waste solvent contaminated rags and paper towels were being accumulated as hazardous waste in unmarked containers in satellite accumulation areas.
 - At the Chemistry Department (Bldg. 555), numerous containers of nonhazardous solid radioactive waste, such as miscellaneous laboratory equipment, were incorrectly marked with hazardous waste labels in a radioactive waste storage area being used for mixed waste accumulation.

- Dating
 - At the Physics Department (Bldg. 510) 90-day accumulation area, several undated containers were being stored.
 - At the AGS/ADD (Accelerator Development Department) 90-day (Bldg. 911A) accumulation area, numerous unknown potentially hazardous wastes were being stored.
- Segregation
 - At the Chemistry Department (Bldg. 555) 90-day accumulation area, a container of waste sodium hydroxide was not properly segregated from several containers of acids.
 - At the AGS/ADD (Accelerator Development Department) 90-day (Bldg. 911A) accumulation area, hazardous wastes were segregated in two sheds, one for flammables and one for nonflammables. Potentially incompatible acids and bases were not segregated further, as a rule, within the shed for nonflammables.
- Inspections
 - At the Physics Department (Bldg. 510) 90-day accumulation area, records documenting weekly inspections were not maintained.
- Closed Containers
 - At the S&EP Laboratory (Bldg. 535), a 1-gallon can of waste solvent rinse scintillation fluid was kept open in a satellite accumulation area in a hood.
 - At Plant Engineering Plumbing Shop (Bldg. 452), Applied Science (Bldg. 815), and Nuclear Energy (Bldg. 703), hazardous waste solvent contaminated rags and paper towels were being accumulated as hazardous waste in open containers in satellite accumulation areas.
- Aisle Space
 - At the Chemistry Department (Bldg. 555), the radioactive waste storage area being used for the purpose of storing hazardous mixed waste was so

full that it was not possible to inspect the containers without risk of personnel contamination.

- Limited Access

- At the Physics Department (Bldg. 510) 90-day accumulation area, the area was located in an unlocked flammables cabinet on an outdoor loading dock.

Causal factors contributing to this finding appear to be policy implementation; procedures; and appraisals, audits, and reviews. The policy with respect to meeting regulatory requirements at hazardous waste accumulation areas has not been effectively implemented throughout the various departments at BNL. In addition, the various departments do not have their own procedures with respect to operation of hazardous waste accumulation areas. Finally, in some cases the failure to meet the regulatory requirements of 90-day accumulation areas has been identified in previous audits at BNL; however, the problems have recurred.

WM/CF-7

Improper Disposal of Hazardous Solvent-Contaminated Wastes

Performance Objective: 6 NYCRR 371 requires that solid wastes, once mixed with hazardous wastes, be managed as hazardous wastes, and treated and disposed of in a hazardous waste management facility.

Finding: Small quantities of waste towelette wipes that have been contaminated with hazardous waste solvents are disposed of as solid waste in the BNL on-site active landfill without being managed as hazardous waste in accordance with 6 NYCRR 371.

BNL personnel use towelette wipes to clean off hazardous solvents applied to electrical or mechanical components with an aerosol can. The principle solvent used in these activities is 1, 1, 1-trichloroethane (Hazardous Waste No. F001).

Departments and buildings with certain small laboratories and shops where hazardous solvent-contaminated wipes were managed as nonhazardous solid wastes included but were not limited to Applied Math (Bldg. 515), Physics (Bldg. 510), and Plant Engineering (Bldg. 452).

Many other laboratories and shops are segregating this waste stream for management as a hazardous waste. These areas include many locations in the AGS, Accelerator Development, Applied Science, and Nuclear Energy Departments. Sitewide guidance on this concern had been distributed to all supervisors in a

periodic safety newsletter several weeks before the TTA in response to recent guidance received by BNL from CH (Appendix I, WM-80, WM-81).

Causal factors contributing to this finding appear to be policy implementation; procedures; training; and appraisals, audits, and reviews. The policy with respect to the handling of solvent-contaminated wastes as hazardous wastes has not been effectively implemented throughout the various departments at BNL. Existing departmental and sitewide procedures, training programs, and audits do not address the disposal requirements of solvent-contaminated wastes.

WM/CF-8 Inadequate Contingency Plan Distribution and Arrangements with Local Authorities

Performance Objective: 6 NYCRR 373-3.3(g) requires operators of RCRA hazardous waste storage facilities to make emergency arrangements with any local authorities that may be called on to respond to an emergency at the facility. 6 NYCRR 373-3.4(d) requires operators of RCRA hazardous waste storage facilities to distribute copies of the contingency plan to these same local authorities.

Finding: The BNL RCRA contingency plan was not distributed to off-site local authorities that may be called on to respond in the event of a hazardous waste emergency at the HWMF, and the standing agreements with these off-site authorities were not amended to address hazardous waste emergency concerns in accordance with 6 NYCRR 373-3.3 and 373-3.4.

BNL operates a RCRA interim status hazardous waste storage facility at the HWMF and is, therefore, required to make emergency arrangements with local authorities and to develop and distribute copies of a contingency plan to local authorities.

Emergency procedures and activities for the HWMF are outlined in the following two documents:

- The draft HWMF Local Emergency Plan, identifies the plans, procedures, positions, responsibilities, and equipment descriptions that are to be followed in response to emergencies (see Appendix I, WM-82). This plan is required to be consistent with all information in the Laboratory Emergency Response Plan and the "Yellow Book," which address sitewide emergency response activities.
- The RCRA contingency plan was developed for submittal to the NYSDEC as part of the BNL RCRA Part B/Part 373 permit application (see Appendix I, WM-83). This plan is an appendix to the HWMF Local Emergency Plan and is

required to be consistent with all information in the Laboratory Emergency Response Plan and the "Yellow Book."

BNL maintains emergency response agreements with several off-site local authorities, including University Hospital, the State University of New York at Stony Brook, Suffolk County Fire and Rescue Mutual Aid, the Suffolk County Police Department, and other local authorities. These agencies represent the second tier of emergency response groups that may be called on to respond in the case of an emergency at the HWMF. The first tier of response is provided by the on-site Medical Department, Fire Rescue Brigade, and security personnel.

However, the agreements with off-site local authorities do not identify the HWMF or address any specific hazardous waste concerns in accordance with NYCRR requirements. In addition, neither the HWMF local emergency plan nor the RCRA contingency plan has been distributed to these off-site local authorities in accordance with NYCRR requirements.

Causal factors contributing to this finding appear to be policy implementation and risk. The policy of meeting all applicable regulatory requirements with respect to hazardous waste management emergency response has not been fully implemented at BNL. The risk corresponding with a major emergency at the HWMF has not been evaluated with respect to the NYCRR requirements.

WM/CF-9 Lack of Recordkeeping and Reporting of Medical Waste Incineration

Performance Objective: 40 CFR 259, Subpart G, requires on-site medical waste incinerator operators to keep specific records on incinerator operations between June 22, 1989, and June 22, 1991, and to submit a report to EPA by February 6, 1990, that includes information on incinerator operation between June 22 and December 22, 1989.

Finding: BNL has not maintained adequate records on the medical waste incinerator operated by the Medical Research Department, and BHO has not submitted their report on medical waste incinerator operation to EPA in accordance with 40 CFR 259, Subpart G.

BNL operates two medical waste incinerators, one located at the HWMF and one located south of the Medical Research Department (Bldg. 490). Although records are maintained for both of these incinerators, the record log for the Medical Research Department incinerator does not include the total quantity of medical waste and the total quantity of regulated medical waste for each incineration cycle (Appendix H, I-WM-41).

In addition, the on-site medical waste incineration report required to be submitted by February 6, 1990, was not submitted at the time of the TTA, although the information for the incinerator at the HWMF has already been transcribed onto the report form (Appendix I, WM-84). Because the records for the incinerator near Bldg. 490 are not complete, it may not be possible to provide accurate information for the report form.

Causal factors contributing to this finding appear to be policy implementation, reviews, supervision, and procedures. Policies with respect to fulfilling the requirements of the Medical Waste Tracking regulations have not been implemented. At one of the medical waste incinerators, personnel responsible for ensuring adequate recordkeeping were not aware of the recordkeeping requirements due to lack of supervision, reviews, and oversight. BNL has not developed procedures to ensure that the requirements of the Medical Waste Tracking regulations are met.

WM/CF-10

Lack of a Valid Landfill Operating Permit

Performance Objective: 6 NYCRR 360-2 requires solid waste landfills to maintain valid permits for operation or to obtain a consent order/compliance agreement from the NYSDEC.

Finding: The BNL active solid waste landfill is currently operating under an expired permit and has not been able to receive a permit renewal in accordance with 6 NYCRR 360-2 or a consent order for continued operation from the NYSDEC.

The BNL active solid waste landfill began operation in 1967 and is scheduled to remain in operation until December 1990, at which time it is to be closed in accordance with the Long Island Landfill regulations in 6 NYCRR 360-8. While in the past this landfill is believed to have received small quantities of hazardous and radioactive waste and putrescible waste, the landfill currently is allowed to accept only non-hazardous, nonradioactive, nonputrescible solid waste and asbestos.

The most recent operating permit for the landfill was issued April 16, 1985, and expired April 30, 1988. In January 1988, BHO and BNL approached NYSDEC to begin permit renewal negotiations, at which time NYSDEC advised BHO and BNL that the permit could not be renewed because several monitoring wells surrounding the landfill had been contaminated by landfill leachate with iron in excess of the limitation in 6 NYCRR 703-6 and tritium in excess of background levels (see Finding GW/CF-2). NYSDEC advised BHO and BNL that in lieu of a permit, the landfill could only continue operation under a consent order, and a draft consent order was issued to BHO in August 1988. BHO, BNL, and NYSDEC met in November 1988 and May 1989 to negotiate the terms of the order, and BHO has subsequently contacted NYSDEC several times to request a final consent order. However, primarily due to the low

priority of the consent order to NYSDEC, a revised draft or final order has not been issued. This has resulted in continued operation of the landfill without a valid permit or a signed consent order (Appendix I, WM-85; Appendix H, I-WM-82).

Causal factors contributing to this finding appear to be policy implementation, change, and barriers and controls. The policy of meeting all applicable regulatory requirements with respect to permitting of the active landfill has not been achieved. The changing regulatory requirements (i.e., the required closure of landfills on Long Island) have resulted in the low priority that the NYSDEC has given to issuing an operating permit renewal or a consent order for a landfill that will soon be closed. This low priority is acting as a barrier preventing the issuance of either a permit or a consent order.

3.4.5.3 Best Management Practice Findings

WM/BMPF-1 Storage of Land-Disposal-Restricted Mixed Waste

Performance Objective: In authorized states, 40 CFR 268.50 prohibits the storage of LDR hazardous wastes for purposes other than to accumulate such quantities as necessary to facilitate proper recovery, treatment, or disposal (New York will become an authorized state in May 1990). Pursuant to the byproduct rule (52 FR 15937), radioactive wastes containing hazardous constituents (i.e., mixed wastes) are considered hazardous under RCRA.

Finding: BNL is currently accumulating and storing LDR mixed waste for purposes other than accumulating such quantities as necessary to facilitate proper recovery, treatment, or disposal, which will not be in accordance with 40 CFR 268.50 once mixed waste authorization in New York becomes effective.

BNL currently accumulates mixed waste scintillation cocktails, cleaning solvents, and waste oil. These waste streams, as well as other mixed wastes that are no longer generated, are stored at the HWMF in conex-type trailer buildings and in Bldg. 448.

Mixed waste scintillation cocktails are typically hazardous due to their toxic solvent content (toluene) and are radioactive due to low levels of tritium, carbon-14, or various activation products. Mixed waste cleaning solvents are primarily 1, 1, 1-trichloroethane that have become radioactively contaminated. Mixed waste oil is typically hazardous due to contamination by toxic solvents (primarily 1, 1, 1-trichloroethane).

These wastes, which will become regulated as LDR mixed waste in May 1990 when New York State authority over mixed wastes becomes effective, will continue to be accumulated in the future. For some of these wastes, such as cleaning solvents and waste oil,

off-site treatment and disposal are not currently possible since there are no operating facilities that can accept these wastes. This has resulted in the extended storage of these wastes. However, for mixed waste scintillation cocktails, BNL is using an off-site mixed waste treatment facility that is allowed to accept limited quantities of tritium- or carbon-14-contaminated scintillation solvent. BNL is also planning to make arrangements with a second RCRA-permitted facility allowed to accept halogenated LDR solvents and waste oils that are contaminated with other radionuclides.

BNL has been aware of the problem regarding accumulation and storage of LDR mixed waste and has advised HQDOE of its LDR mixed waste generation and storage backlog through a survey response on the subject of mixed waste generation and storage. Some departments at BNL, such as the Biology Department, are working toward reducing the generation rate of the mixed waste scintillation cocktails by mandatory substitution with nonhazardous scintillation media. However, other departments are still using solvent-based cocktails and will continue to use them in the foreseeable future.

To address the issue of accumulation and storage of LDR mixed waste on a national level, HQDOE, in December 1989, requested EPA to enter into FFCAs with all DOE facilities that faced existing or future LDR compliance uncertainty. Several EPA regions have initiated FFCA negotiations with certain DOE facilities, but EPA Headquarters has not yet responded to the DOE proposed approach of using FFCAs to address this problem. HQDOE is planning to followup with EPA on this request in the near future. It should be noted that FFCA negotiations to address mixed waste LDR concerns at BNL have not been initiated.

Causal factors contributing to this finding appear to be policy implementation and change. For wastes currently being accumulated and stored, BNL departments are still undergoing administrative and procedural changes to reduce or eliminate the mixed waste streams. BNL has not been able to implement EPA requirements restricting storage of LDR mixed waste because of the changing, more restrictive storage regulations.

WM/BMPF-2

Inadequate Procedures and Personnel Training for
Proper Emergency Operation of the Hazardous Waste
Management Facility Area

Performance Objective: Approved procedures and trained, experienced personnel should be used in hazardous and explosive waste detonation activities in accordance with current industry standards.

Finding: Approved procedures and trained, experienced personnel are not available for use of the HWMF Detonation Area in accordance with current industry practices.

The Detonation Area at the HWMF is used infrequently to destroy hazardous reactive wastes and to devalve compressed gas cylinders by shoot-and-burn or explosives techniques. The area was last used in 1985.

The potential for emergency operation of the HWMF Detonation Area is discussed in the BNL Part B/Part 373 application for a hazardous waste storage facility (Appendix I, WM-83). However, the site does not have approved procedures for emergency operation of the area. Two draft procedures for use of the area have been developed; however, these procedures are incomplete (Appendix I, WM-86, WM-87). Additionally, the personnel who would perform emergency explosive detonations have not received current training in this area (Appendix H, I-WM-52).

Causal factors contributing to this finding appear to be policy implementation, procedures, and training. The policies for developing and maintaining procedures and training for detonation activities have not been implemented at the HWMF Detonation Area.

WM/BMPF-3 Out-of-Service Solvent Degreaser Not Emptied

Performance Objective: Current industry standards require that solvent degreasers be properly emptied when they are shut down and the solvent make-up is to be changed.

Finding: The inactive solvent degreaser in the Bldg. 452 electronics shop has not been emptied in accordance with current industry standards.

The 1, 1, 1-trichloroethane solvent degreaser in the Bldg. 452 electronics shop was last used approximately 3 years before the TTA, at which time it was taken out of service so that the solvent could be replaced with a less hazardous alternative. Since that time various solvents have been considered, but none have been determined to be appropriate in terms of performance as well as safety and environmental considerations (Appendix H, I WM-44, I-WM-45).

After the degreaser was taken out of service, it was not emptied; therefore, the waste solvent was not managed as a hazardous waste. Instead the solvent has slowly evaporated. Some solvent and sludge still remain in the degreaser.

Causal factors contributing to this finding appear to be procedures and appraisals, audits, and reviews. BNL and the Plant Engineering Department (which operates the shop) do not have procedures that address the maintenance of out-of-service

equipment and the associated waste management concerns. The problem of not maintaining out-of-service equipment has not been identified in past appraisals, audits, and reviews.

3.4.5.4 Noteworthy Practice Findings

WM/NPF-1 Termination/Transfer Procedure

Finding: The Applied Science and Chemistry Departments use a termination and transfer procedure and form that requires terminating, transferring, or temporary leave personnel to provide dispositions for all chemicals remaining in their work area.

Many BNL employees participate in specific programs and experiments. Since the programs and experiments can last for less than a year or for a few years, this can result in a relatively high turnover of technical personnel. To prevent the accumulation of unknown chemicals or chemicals of unknown integrity, the Applied Science and the Chemistry Departments require personnel departing for any reason to complete a Termination and Transfer Form (Appendix I, WM-88, WM-89). This procedure requires the departing employee to provide documentation for final disposition for all chemicals in his/her workplace. Methods for disposition include disposal, re-use, acceptance by another employee, or some other specified use. The form must provide the necessary disposition information and acceptance signatures and is required to be approved by the next higher level of administration. Use of this procedure and form helps prevent the undesirable accumulation of chemicals and wastes after the employee departs.

3.4.6 Toxic and Chemical Materials

3.4.6.1 Overview

The toxic and chemical materials assessment evaluated the status of BNL with regard to applicable Toxic Substances Control Act (TSCA); Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA); DOE Order requirements; New York State regulations; and Suffolk County codes. The use, storage, and disposal of PCBs and pesticides were compared to regulations promulgated under TSCA and FIFRA, respectively. The storage and handling of all materials defined by Suffolk County Sanitary Codes (SCSC) as toxic or hazardous materials were assessed for conformance with County regulations. The specific regulatory requirements against which BNL was assessed are presented in Table 3.4.6-1.

Table 3.4.6-1
List of Applicable Toxic and Chemical Materials
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
DOE 5482.1	Environmental Safety and Health	DOE
40 CFR 761	Polychlorinated Biphenyls (PCB) Manufacturing, Processing, Distributing in Commerce, and Use Prohibitions	EPA
40 CFR 165	Subpart C - Pesticides and Containers	EPA
Suffolk County Sanitary Code, Article 12	Toxic and Hazardous Materials Storage and Handling Controls	SCDHS
Suffolk County Sanitary Code, Article 7	Water Pollution Control	SCDHS

This assessment was accomplished through discussions with BNL personnel; a review of written policies, procedures, internal inspection reports and inventories, and external audit reports; and inspection tours of the site research and support facilities.

By the end of 1989, all site PCB Transformers were either removed, processed, or retrofilled and reclassified non-PCB. The PCB equipment remaining at BNL is comprised of one PCB regulator and over 1000 PCB-containing capacitors. There is one building at the HWMF designated for PCB Items in storage for disposal.

During the activities of the BNL Alternative Liquid Fuels program, PCB-contaminated fuel was delivered in 1984 and mistakenly mixed with PCB-free fuel prior to the receipt of test results. As a result, the site is in possession of 286,000 gallons of PCB-contaminated fuel oil for which it is awaiting permission to burn. DOE and BNL have entered into a compliance agreement with EPA which permits burning the oil contingent on State approval. DOE is presently negotiating a compliance agreement with the State on this issue.

Pesticides are applied to the site facilities and grounds by Plant Engineering personnel who have established a restrictive program for pesticide use. The Biology Department applies

pesticides, including two "restricted-use" pesticides (Lannate and PennCap M), at the department hothouses and on 5.25 acres of research fields. Both Biology and Plant Engineering have State-certified applicators with current licenses.

BNL stores both commercial products and generated waste in numerous aboveground and underground tanks as well as bulk and drum storage facilities. All of these items are considered toxic or hazardous materials and regulated by Suffolk County.

The procurement of research and maintenance chemicals at BNL is reviewed weekly by the Occupational Health and Safety Services group. They use this information to maintain current MSDS, which are available to Laboratory personnel on request. This purchasing information is also used to identify first-time users of chemicals who are contacted and instructed on potential chemical hazards and techniques for safe chemical use.

The toxic and chemical materials assessment identified four compliance findings and three BMP findings. The compliance findings deal with TSCA recordkeeping, PCB labeling and containment, and County regulations on toxic and hazardous materials storage and handling facilities. The BMP findings involve improper use of pesticides, inadequate procedures in toxic and hazardous materials management, and notification of the Fire Department about PCB equipment.

3.4.6.2 Compliance Findings

TS/CF-1 Inaccurate and Inadequate Information in the Annual Polychlorinated Biphenyls Reports

Performance Objective: 40 CFR 761.180(a) requires that the Annual PCB Report contain

- the total kilogram weight of any PCB Items in PCB Containers remaining in service, including the identification of container contents;
- the total kilogram weight of any items in PCB Containers for any PCBs or PCB Items removed from service and the location of the initial disposal or storage facility; and,
- the total number of PCB Large High-Voltage or Low-Voltage Capacitors.

Finding: The total weight of PCB Items in service and the total weight of PCBs or PCB Items removed from service have not been included in past Annual PCB Reports as required by 40 CFR 761, and the location of the owner/operator of the initial disposal or storage facility was not included in the 1985 and 1986 Annual PCB

Reports. Additionally, the total number of PCB Large Capacitors has been inaccurately reported in past Annual PCB Reports, such that the requirements of 40 CFR 761 have not been followed.

The Annual PCB Reports generated since 1985 (Appendix I, TS-5, TS-6, TS-7, TS-8) do not contain information on the total weight of PCB Items in service or the total weight of PCBs or PCB items removed from service. In addition, the Annual PCB Reports of 1985 and 1986 do not contain the location of the owner/operator of their initial disposal or storage facility.

A letter (Appendix I, TS-9) dated September 29, 1981, indicated that over 300 large capacitors at Bldg. 930 should have been removed from the PCB inventory. However, these capacitors have been tallied into the site PCB inventory rendering the Annual PCB Reports inaccurate for the past 9 years. In addition, large capacitors are located at AGS Bldgs. H-10 and F-10 and Department of Applied Science Bldg. 815, which may contain PCBs but are not in the PCB inventory. Efforts are underway to contact the manufacturers for determination of PCB concentrations and volumes in suspect capacitors.

Efforts to acquire an accurate inventory of PCB Items at BNL were initiated by S&EP in 1987 but apparently were unsuccessful. A renewed effort to gain accurate PCB equipment information was begun in February 1990. In the latest PCB equipment survey, penalties incurred by the Laboratory for errors in the inventory will become the financial responsibility of the division. This appears to have focused more divisional interest in this problem.

The causal factors contributing to the omissions noted in this finding appear to be inadequate implementation of regulatory requirements; inadequate response to previous appraisals, audits, and reviews (Appendix I, TS-2, TS-11); and insufficient QA reviews to identify the omissions.

TS/CF-2 Inadequate Secondary Containment for
 Polychlorinated Biphenyl Items and Containers

Performance Objective: 40 CFR 761.65(b) requires that PCB Items be stored for disposal in a containment area having a volume equal to at least two times the internal volume of the largest PCB Article or PCB Article Container or 25 percent of the total stored volume, whichever is greater. In addition, the containment must be constructed of smooth and impervious materials. SCSC, Article 12, Section 760-1215, also requires impervious drum containment for toxic or hazardous material sufficient to hold 30 percent of the total stored volume.

Finding: The volume and material used to contain PCB Articles and PCB Article Containers stored for disposal at Bldg. 448 of the HWMF do not meet the requirements of 40 CFR 761.65(b) or the SCSC, Article 12, Section 760-1215, and 13 out of 20 PCB Containers were found not to be stored in contained areas pursuant to 40 CFR 761.65(b).

BNL uses steel containment trays at the HWMF rather than the building floor and walls as secondary containment for storing its PCB Items. The tray dimensions, as provided in Appendix 10 of the RCRA Part B permit application (Appendix I, TS-10), were used to calculate a containment volume of approximately 143 gallons. Using the current HWMF practice of stacking drums 16 per tray, 40 CFR 761.65 would require a containment volume of 220 gallons and the SCSC, Article 12, would require at least 264 gallons. Despite the regulatory volume inadequacies, the actual volume of PCB liquid in the containers at the time of this assessment would have been accommodated in the event of a leak.

Approximately 80 percent of the visible surface area of the containment trays was rusted. This renders them not the smooth and impervious material required by regulation for the facilitation of leak detection and spill cleanup activities. The containment trays have been in service for 8 to 10 years and had never been moved or inspected for leaks. It was reported (Appendix H, I-TS-14) that a subsequent inspection by HWMF staff found no visible holes in the trays when tested by putting them in front of a strong light source. This testing method may not be adequate to locate pinhole leaks and seepage through rust spots.

Thirteen out of 20 PCB Article Containers in storage for disposal were found outside of the secondary containment trays in Bldg. 448 at the HWMF. It was determined by the dates on the drums that the materials had been removed from service within the past week. It was verified by other team members on a subsequent visit that all PCB Containers were moved into secondary containment trays.

The secondary containment issues raised in this finding appear to be caused by inadequate implementation of regulations; deficient designing of containment trays, which do not have the proper containment volume and have a tendency to rust under operational conditions; improperly using barriers and controls to comply with containment volume requirements; and not adequately responding to previous appraisals, audits, and reviews (Appendix I, TS-2, TS-3, and TS-4).

Inadequate Labeling of Polychlorinated Biphenyl
Items and Transport Vehicles

Performance Objective: 40 CFR 761.40 requires that specific PCB Items and transport vehicles be marked with a properly sized (ML or Ms) label, as illustrated in section 761.45(a). 40 CFR 761.65 requires that PCB Articles and PCB Containers shall be dated when stored for disposal. In addition, site policy (Appendix I, TS-1) states that all capacitors should be labeled with appropriate markings.

Finding: There are several instances at BNL where PCB labeling, as required by 40 CFR 761, is either missing or improperly marked.

This finding is based on building inspection tours of all PCB-related areas and interviews with cognizant staff. Specific observations which led to this finding include the following:

- There was no ML marker found on a drum in the PCB storage area in Bldg. 448 of the HWMF, as per 40 CFR 761.40(a), and most of the PCB Items were not dated, as per 761.65(c).
- Vehicles that transport PCB Items at BNL were not marked pursuant to 40 CFR 761.40(b).
- The fenced access to the PCB Large High-Voltage Capacitors in AGS Bldg. 928 was not marked, as required under 761.40(c), and the ML marker on the capacitor bank door was incorrectly sized, as required by 761.45(a).

The absence of PCB labels on drums and some capacitors was resolved as the TTA was in progress. Verbal plans to implement corrective actions on other labeling deficiencies were made as the problems were identified.

The marking problems are the result of deficiencies in implementing PCB regulations, writing operational procedures (see Finding TS/BMPF-1), and training personnel to deal with PCB issues. With regard to PCBs and PCB items placed "in storage for disposal," the site is following State regulations and handling PCBs as a hazardous waste. As a result, little attention has been paid to the need for writing procedures and providing training that implements the regulations promulgated under TSCA. The consideration of Federal regulation regarding labeling PCB Items "in use" has been recently addressed in the BNL PCB Program established in February 1990, although it is not fully implemented.

Inadequate Toxic and Hazardous Material Storage and Handling Controls

Performance Objective: SCSC, Article 12, regulates the use of "all available practical methods of preventing and controlling water pollution" with regard to all storage and handling of these materials. Article 12 regulations require the following:

- specific containment and monitoring equipment for new (since 11/1/82) and existing underground storage facilities, outdoor aboveground storage facilities, indoor storage facilities, transfer facilities, and bulk storage facilities; and
- specific containment specifications for storage of portable tanks and containers.

BNL entered into an agreement (Appendix I, TS-13) with Suffolk County in 1987 in which the site agreed to conform with the applicable environmental requirements of Article 12. The agreement states that the site will "work in good faith" to achieve a "reasonable schedule for upgrading facilities as required."

Finding: BNL does not store and handle all toxic and hazardous materials commensurate with SCSC, Article 12.

BNL operations require the need to handle and store both commercial products and generated wastes which Article 12 defines as toxic or hazardous materials. The site stores these materials in aboveground tanks, underground tanks, and bulk warehouse facilities.

Deficiencies at BNL regarding Article 12 concerning storage and handling of toxic and hazardous materials are listed by category below and summarized in Table 3.4.6-2:

- Aboveground storage tanks (ASTs) - Visual inspections were done on 37 of 49 tanks, and approximately 32 percent were found to have deficiencies.
- Underground storage tanks (USTs) - Record reviews or visual inspections were done on all 49 tanks, and approximately 39 percent were found to have deficiencies.
- Drum and bulk storage facilities - Visual inspections were done on eight facilities and four have deficiencies.
- Transfer facilities - Visual inspections were done both facilities and both have deficiencies.

**Table 3.4.6-2
Assessment Summary of Article 12 Deficiencies**

Tank No. or Facility	Type of Storage Facility	Category of Article 12 Deficiency			
		No Overfill Protection	No Corrosion Protection	Exposure to Precipitation or Moisture	Inadequate Containment
457-2	AST	X			No Berming
479-3 ^a	AST	X			No Berming
610-2	AST	X			No Berming
610-31	AST	X			No Berming
611-5 ^a	AST	X			
611-6 ^a	AST	X			
750-2	AST	X			No Berming
750-3	AST	X			No Berming
811-4	AST				No Berming
811-5	AST				No Berming
930-1 ^a	AST	X			No Berming
930-2 ^a	AST	X			No Berming
444-1	UST	X			
445-2 ^b	UST	X	X		Not Double Walled
463-1 ^b	UST	X	X		Not Double Walled
463-2 ^b	UST	X	X		Not Double Walled
527-1 ^b	UST	X	X		Not Double Walled
633-1	UST	X			
650-1 ^b	UST	X	X		Not Double Walled
650-2 ^b	UST	X	X		Not Double Walled
650-3 ^b	UST	X	X		Not Double Walled
650-4 ^b	UST	X	X		Not Double Walled
811-8 ^c	UST	X	X		Surface of Tank Vault Unsealed
811-9 ^c	UST	X	X		Surface of Tank Vault Unsealed
811-10 ^c	UST	X	X		Surface of Tank Vault Unsealed
811-11 ^c	UST	X	X		Surface of Tank Vault Unsealed
811-12 ^c	UST	X	X		Surface of Tank Vault Unsealed
811-13 ^c	UST	X	X		Surface of Tank Vault Unsealed
830-1 ^b	UST	X	X		Not Double Walled
830-2 ^b	UST	X	X		Not Double Walled
927-1 ^b	UST	X	X		Not Double Walled

Table 3.4.6-2--Continued
Assessment Summary of Article 12 Deficiencies

Tank No. or Facility	Type of Storage Facility	Category of Article 12 Deficiency			
		No Overfill Protection	No Corrosion Protection	Exposure to Precipitation or Moisture	Inadequate Containment
HWMF Conexes	Drums				No Administrative Controls
Bldg. 448	Drums				Insufficient Berm, No Administrative Controls
Bldg. 479 ^a	Drums			X	No Berming
Bldg. 482	Bulk			X	No Administrative Controls
Bldg. 158	Bulk				Possible Discharge to Ground
Motor Pool	Transfer				No Berms or Holding Tanks
CSF	Transfer				No Berms or Holding Tanks

^a Engineering and design for upgrades to Article 12 standards have been completed. Construction and/or installation to be completed in 1990.

^b Tank removal or removal/replacement has been included in BNL tank upgrade program and is pending.

^c These tanks have been identified as 811-1 through 811-6 in pre-1988 site records.

The site was aware of all the deficiencies cited.

The site developed a phased plan resulting in a facilities upgrade schedule to continue through CY 1991. The plan addresses the tasks of completing inventories, facility registrations, and the upgrading of USTs, ASTs, transfer facilities, bulk storage areas, and drum storage facilities. A cognizant SCDHS representative stated (Appendix H, I-TS-23) that BNL has been conscientiously working with the SCDHS to inventory, register, and upgrade their facilities at a rate which meets County expectations.

A policy was set in the agreement with Suffolk County to conform to the environmental concerns of Article 12, and a plan was developed for the timely implementation of policy. County expectations have been met with regard to schedules. Therefore, the sole causal factor playing a role in this finding appears to be the inadequacy of resources to complete the upgrading of facilities at a faster pace.

3.4.6.3 Best Management Practice Findings

TS/BMPF-1 Lack of Standard Operating Procedures for the
Management of Toxic and Hazardous Materials

Performance Objective: ANSI/ASME NQA-1, "Nuclear Quality Assurance-1," (NQA-1), Basic Requirements 6 and 9 set standard industry practice to control processes, where quality cannot be determined by inspection and testing alone, by writing and approving procedures that describe exactly how the process is to be performed.

Finding: BNL has no formally approved, written procedures for the use, handling, and storage of toxic and hazardous materials by site personnel as required by standard industry practice in NQA-1.

PCBs, pesticides, and chemical products are used, handled, and stored in various areas of BNL. Examples of deficiencies in developing written procedures are as follows:

- The HWMF, AGS Department, and Department of Applied Sciences are in possession of PCBs and/or PCB Items; however, no operational procedures have been written for use, handling, and storage of PCBs and PCB Items (see TS/CF-3).
- The Plant Engineering Division and the Biology Department regularly work with pesticides; however, no operational procedures have been written for use, handling, and storage of pesticides (see TS/BMPF-2).
- The Supply and Material Division is tasked with storage of chemical products in accordance with SCSC, Article 12; however, there are no guidance documents regarding storage of these materials in bermed areas. The result of not establishing these guidances may lead to exceedances of volume restrictions within specific bermed areas (see TS/CF-4).

The causes that effect this finding appear to relate to the lack of site policy implementation with regard to the NQA-1 Basic Requirements 6 and 9 and inadequate review of policy to ensure that quality is achieved in the use, handling, and storage of toxic and hazardous materials.

TS/BMPF-2 Improper Storage of Pesticides

Performance Objective: 40 CFR 165.10 recommends procedures and criteria for the storage of pesticides and pesticide containers that include

- identification signs being placed on pesticide storage rooms to advise and warn of their hazardous nature, with adequate measures taken to ensure personal safety in areas where pesticides are classed as highly or moderately toxic; and
- dry pesticides in damaged or opened paper bags being placed in a sound container that can be sealed.

Finding: There is improper storage of dry pesticides, and no sign on the entrance leading from the coffee break area to the Hothouse pesticide storage area in the Biology Bldg. 463 pursuant to the recommendations of 40 CFR 165.10.

Pesticides classed as highly or moderately toxic and one "restricted-use" pesticide (Lannate) are stored within a locked cabinet in the pesticide storage and mixing room in Bldg. 463. There was no identification sign on the open entrance to the room. Additionally, the stored, dry pesticides inside the cabinet were found damaged and opened with no secondary packaging that can be sealed. The opened bags of dry pesticides released their contents into the air when handled. There is a particular concern with regard to adequate measures to ensure personal safety in this area because the adjacent room is used for eating (see Section 4.5.14.2 Concern OS.3-1). These items were promptly corrected while the assessment team was still on-site.

The factors appearing to cause the observations in this finding involve insufficient implementation of Federally recommended guidelines for storing pesticides; the lack of any formal written operating procedures for any of the activities that involve pesticide storage (see Finding TS/BMPF-1); and inadequate response to previous appraisals, audits, and reviews, such as the 1987 Environmental Survey (Appendix I, TS-11). In addition, the conduct of internal appraisals may not be adequate since a 1988 safety appraisal of the area found no problems (Appendix I, TS-12).

TS/BMPF-3 Inadequate Notification of Polychlorinated Biphenyl Equipment

Performance Objective: Fire response personnel with primary jurisdiction should be notified as to the location of all PCB equipment and the name and telephone number of the person to be contacted, in the event of a fire, in keeping with the objectives set forth in 40 CFR 761.30(a)(1)(vi) with respect to PCB Transformers.

Finding: The BNL Fire/Rescue Group has not been notified by the S&EP Division of the location of PCB equipment, and the

Fire/Rescue Group does not have a current inventory of PCB equipment in Run Books in accordance with the objectives set forth in 40 CFR 761.30(a)(1)(vi).

BNL Fire/Rescue Group personnel (Appendix H, I-TS-12) stated that they do not receive an updated inventory of all PCB equipment from the S&EP Division. Although information supplied to the Fire/Rescue Group contained an inventory of PCB transformers, oil switches, and the regulator in Building 901, it did not contain information on PCB capacitors throughout the site.

A spot check of the building diagrams in the Fire/Rescue Group run books, which act as the reference guide to hazards in each building, identified the location of PCB Transformers that no longer contained PCBs. The Run Books contained memoranda copies sent to the Fire Chief describing the disposition of these former PCB Transformers, but this information had not resulted in changes to the building diagrams.

BNL is in the process of updating their hazard inventory, which will be used by the Fire/Rescue Group, but there is no site guidance that PCB equipment be considered as part of the inventory. In addition, the site PCB program (Appendix I, TS-1) has no requirement for reporting information other than PCB transformers to the Fire/Rescue Group.

The causal factors that appear to contribute to this finding involve policy and QA issues. The site policy dealing with PCB issues has not included concerns associated with the potential hazards of PCB fires. This is a concern because the total volume of PCBs in some buildings may be large, as is the case in Bldgs. 919-B, H-10, F-10, 928, and 929. The inaccuracy of the run book diagrams reflects on the QA procedures surrounding the updating of these hazard reference guides.

3.4.7 Quality Assurance

3.4.7.1 Overview

The purpose of this QA assessment was to evaluate the BNL QA Program application to the generation of sound, verifiable, and traceable chemical and radiological data. Table 3.4.7-1 lists the specific regulations and guidelines used to evaluate BNL during this assessment.

The scope of this review included discussions and interviews with BNL staff; a review of site QA policies, procedures, analytical methods, previous audit reports, laboratory records, and analytical contracting agreements; and an evaluation of QA practices against data quality objectives.

Table 3.4.7-1
List of Applicable Quality Assurance
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
DOE 5400.1	General Environmental Protection Program	DOE
DOE 5700.6B	Quality Assurance	DOE
NQA-1	Quality Assurance Program Requirements for Nuclear Power Plants	ANSI/ASME
40 CFR Part 136	Guidelines Establishing Test Procedures for the Analysis of Pollutants	EPA
EPA/600/06	Handbook for Analytical Quality Control in Water and Wastewater Laboratories	EPA
EPA/600/4-79-020	Methods of Analysis for Water and Wastes	EPA
EPA Contract Laboratory Program	Statement of Work for Organic Analysis (Revision 4/89)	EPA

Data generated by the BNL S&EP Analytical Laboratory are used in support of site environmental activities and to demonstrate compliance with Federal and State regulations, as well as DOE Orders. The S&EP Analytical Laboratory generates most of the radiological and routine chemical data used in support of the site environmental monitoring program. It is also responsible for industrial health and safety analyses, hazardous waste analyses, and in assuring the receipt of PCB-free fuels for the CSF. The site uses outside contractors for SPDES permit-required analyses reporting, physical characterization of hazardous wastes for disposal, and most of the chemical analyses for site special projects relating to groundwater and soil sampling.

There are four findings in the QA section, two compliance findings on analytical contracting practices and document control, and two BMP findings on inadequate chain-of-custody practices and the lack of SOPs.

3.4.7.2 Compliance Findings

QA/CF-1 Inadequate Detailing of Purchase Requests for Analytical Support of Environmental Monitoring

Performance Objective: Section 4.0 of the BNL QA Program requires that personnel responsible for the purchase of services shall ensure that procurement requirements of purchase requests are clear, complete, and include a description of the technical requirements, any special handling, imposition of requirements on subcontractors, and documentation of QA requirements.

Finding: The procurement requirements of purchase requests written for environmental analytical support (Appendix I, QA-2, QA-3, QA-4) are not sufficiently clear and complete to ensure the receipt of quality data, which is the objective of the BNL QA Manual (Appendix I, QA-1).

For specific parameters supporting environmental monitoring efforts, BNL requires the use of outside analytical contractors. These services are procured through the use of purchase requests. The procurement requirements that have been either missing or not clear and complete enough in three of five purchase requests reviewed include

- specific acceptable methods of analysis and the required limits of detection for each method,
- a detailed description or specific citation that fully defines the specific QA protocols and QA documentation deliverables required,
- a listing of requirements that must be imposed on any subcontractor used in support of the contract, and
- provisions for auditing the contractor to ensure compliance with contracted QA requirements and expectations regarding technical competence.

The causes that led to this finding appear to involve inadequate policy implementation of site QA requirements with regard to satisfying the data quality objectives set by environmental testing and monitoring programs. The deficiency in implementing this policy seems to be linked to personnel who lack the experience of specifically defining the requirements for the analyses they are requesting.

QA/CF-2 Inadequate Control of Document Revisions

Performance Objective: The BNL QA Program guidance on document control (Item 6.0) establishes the policy regarding implementation of revisions. It requires that issuers of a

revision are responsible for directing the user on the correct disposition of obsolete quality-related documents and for "obtaining any necessary verification that such action has been taken." In addition, BNL QA Guide, BNL-QAG-405, Section 3.4, states the need for document control to be a formal, documented process which allows for the traceability of the documents.

To ensure traceability, the process should include

- the signed receipt of the revision by the user, and
- either a signed and dated witness to the users destruction of the obsolete document, or
- the physical return of the obsolete document with written verification of receipt by the issuer.

Without these procedural precautions, there is no verifiable and traceable assurance that the document control loop is complete.

Finding: S&EP Division does not have verification procedures for the control of revisions to quality-related documents as required by the BNL QA Program.

S&EP has written many controlled quality-related documents such as manuals, SOPs, and project plans to implement environmental programs. These documents require systematic revision and, therefore, the need for assuring that obsolete versions of these documents are disposed of properly. Written distribution lists are developed for revisions, but there is no verification process at S&EP to ensure the receipt of revisions and proper disposition of obsolete documents (Appendix H, I-QA-1).

The causal factors that lead to this finding appear to be inadequate policy implementation, QA, and human factors. It was stated that the BNL QA Office does not use a verifiable, traceable system for document control of revisions for sitewide, quality-related documents (Appendix H, I-QA-2) (see Section 4.4.1.2 Concern QA.7-3). The BNL policy is clear; however, the site guidance is not evident in writing or in practice. This inadequacy in implementing this aspect of the QA program may be attributable to human factors, in that, cognizant personnel may not have established a rigorous document control protocol due to the potentially cumbersome tracking system it might require (Appendix H, I-QA-1, I-QA-2).

3.4.7.3 Best Management Practice Findings

QA/BMPF-1 Inadequate Chain-of-Custody Procedures

Performance Objective: DOE 5400.1 requires the inclusion of chain-of-custody procedures as an element of environmental

monitoring and surveillance programs. Chain-of-custody procedures are developed to create an accurate written record of sample possession that can be traced from the moment of collection through its disposal. In keeping with standard industry practice for environmental monitoring and investigation, the following items are created in chain-of-custody procedures to ensure sample identity and integrity: forms for sample collection, transfer, and delivery; permanent logs for sample check-in, interlaboratory tracking, and disposal; designation of a sample custodian and alternate to be responsible for laboratory custody procedures; and written SOPs to address all aspects of the custody process, i.e., collection, receipt, storage, tracking documentation, and disposal of samples (Appendix I, QA-5).

Finding: The site has not developed adequate chain-of-custody procedures to assure constant sample tracking in keeping with standard industry practices.

Plant Engineering and S&EP require the collection and analysis of samples to support environmental monitoring, hazardous waste, and oil testing activities. These samples undergo numerous custody transfers which are not being adequately performed or documented to ensure sample integrity and identification. The areas that are not adequately addressed at BNL are

- development and use of forms for collection, transfer, and delivery for all facility-generated samples,
- bound log books for sample check-in and disposal,
- development of an interlaboratory tracking system with permanent documentation,
- designation of a sample custodian and alternate dedicated to sample tracking responsibilities, and
- development of detailed SOPs to address chain-of-custody requirements for collection, receipt, storage, and disposal of samples, as well as document control procedures (see Finding GW/BMPF-3).

The primary factors that appear to bear on this finding are lack of policy implementation, QA and quality control, and training. The DOE policy from which implementation should arise is given in DOE 5400.1; however, DOE guidance for implementing this policy is not evident. This lack of guidance by HQDOE, CH, and BHO on policy implementation appears to have led to deficiencies in developing and implementing operational procedures and proper training to ensure adequate quality control and QA of sample

data. Additionally, the site has not written a BNL QA Guide that addresses chain-of-custody considerations such that implementation can be initiated by its divisions and departments.

QA/BMPF-2 Lack of Standard Operating Procedures for Common Analytical Laboratory Protocols

Performance Objective: The EPA sets the environmental industry practice for controlling the quality of analytical laboratory data by recommending that formal SOPs be written to describe exactly how routine laboratory operations and QA practices are to be performed.

Finding: There are no formally approved, written procedures for some S&EP Analytical Laboratory operations as recommended by standard industry practice.

Numerous operations are routinely used in environmental analytical laboratories to ensure the quality of data generated on a daily basis. Generally these operations are standardized in SOPs. The operations at the S&EP Analytical Laboratory that have not been addressed by written SOPs are

- control of laboratory data documentation;
- cleaning of laboratory glassware;
- data handling, storage, and retrieval;
- tracing of analytical standards and reagents;
- laboratory sample tracking procedures; and
- generation and maintenance of control charts;

The Analytical Laboratory is practicing accepted industry operational and QA procedures; however, these have not been formally codified.

The cause for this finding appears to be inadequate laboratory policy implementation, with regard to industry practice, to ensure that quality is achieved in generating and tracking environmental data. Human factors appear to have played a role, in that cognizant personnel may have not identified the need for formalizing these procedures; therefore, they were not written.

3.4.8 Radiation

3.4.8.1 Overview

The purpose of the radiation portion of the environmental assessment was to evaluate environmental radiation protection

programs to determine the compliance status with Federal, State, and local regulations; DOE Orders; and BNL policies and procedures. Table 3.4.8-1 lists applicable regulations, requirements, and guidelines used for this evaluation.

Table 3.4.8-1
List of Applicable Radiation
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
DOE 5400.1	General Environmental Protection Plan	DOE
DOE 5400.4	Comprehensive Environmental Response, Compensation, and Liability Act Requirements	DOE
DOE 5400.5	Radiation Protection of the Public and the Environment	DOE
Draft DOE 5400.XY	Radiological Effluent Monitoring and Environmental Surveillance	DOE
DOE 5482.1B	Environment, Safety and Health Appraisal Program	DOE
DOE 5484.1	Environmental Protection, Safety, and Health Protection Information Reporting Requirements	DOE
DOE 5820.2A	Radioactive Waste Management	DOE
40 CFR 61	National Emission Standards for Hazardous Air Pollutants	EPA
40 CFR 191	Environmental Standards for Radioactive Wastes	EPA
DOE/EH-0070	External Dose-Rate Conversion Factors for Calculation of Dose to the Public	DOE

Table 3.4.8-1 (Continued)
List of Applicable Radiation
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
DOE/EH-0071	Internal Dose Conversion Factors for Calculation of Dose to the Public	DOE
PNL 6577/UC-610	A Guide to Reducing Radiation Exposure to As Low As Reasonably Achievable (ALARA)	DOE

The general approach to the environmental radiation assessment included review and observation of the environmental and emission/effluent monitoring programs, current environmental radiation-related practices, potential contaminant sources and release controls, dose calculation methodologies, and the radiochemistry laboratory facilities and operations. BNL personnel performing or responsible for these activities were interviewed, and associated documentation was reviewed. Additionally, the results of an aerial radiological survey performed during the TTA were reviewed and ground-truthed.

As a part of the environmental radiation protection assessment, reviews were coordinated with other team specialists to ensure that all potential environmental radiation issues were evaluated in sufficient detail. Coordination with the Air, Soils/Sediments/Biota, Surface Water/Drinking Water, and Hydrogeology Specialists was necessary to evaluate monitoring programs and emission/effluent controls. Assessing the adequacy of the management of radioactively contaminated waste also required coordination with the Waste Management Specialist. A QA Specialist was consulted to evaluate radiochemistry QA and control procedures, and the Inactive Waste Sites Specialists were consulted to evaluate the potential hazard from inactive or contaminated areas. Radiation protection observations were also shared between the other Subteams.

The background radiation in the vicinity of BNL is both natural and manmade. Sources include cosmic radiation, natural airborne radioactivity resulting from upper atmospheric cosmic interactions, natural radioactive materials in the soil, fallout

from past worldwide atmospheric nuclear weapons detonations, radiation resulting from the operation of various site accelerators, and accidental releases (Appendix I, RAD-1, 6, and 48).

The radiological environmental monitoring programs at BNL routinely evaluate stack air emissions, ambient air, water effluents, surface water, groundwater, aquatic biota, off-site soil, and off-site vegetation for radiological constituents. Special studies are conducted on a nonroutine basis to investigate the effects of inactive waste sites or contaminated areas on various media and terrestrial biota. Additionally, samples are also analyzed for radiological constituents to support removal or decontamination and decommissioning activities (Appendix I, RAD-1, 6, and 48).

The radiation portion of the environmental assessment contains two compliance findings and one BMP finding. The compliance findings address management of activated material and radiological environmental monitoring. The BMP finding addresses characterization of effluent streams. Other findings resulting from the radiological assessment are also addressed in the Air (3.4.1), Soils/Sediments/Biota (3.4.2), Surface Water/Drinking Water (3.4.3), Quality Assurance (3.4.7), and Inactive Waste Sites (3.4.9) Sections of this report. No noteworthy practices were identified.

3.4.8.2 Compliance Findings

RAD/CF-1 Inadequate Management of Activated Material

Performance Objective: DOE 5400.5 states that the exposure of members of the public to radiation sources as a consequence of all routine DOE activities shall not cause, in a year, an effective dose equivalent greater than 100 millirem (mrem). The BNL Safety Guide, Procedure 3.5.0, covers the criteria and survey technique for the release of material for unrestricted use. This procedure dictates the release limits, what instruments are to be used in the surveys, how the surveys are to be performed, and what records are to be generated. Additionally, DOE 5400.5 further states that activated material may be released for unrestricted use only if the criteria and survey techniques used in assessing whether these materials can be released are approved by the Assistant Secretary for Environment, Safety, and Health (EH-1). This approval requirement becomes effective on May 8, 1990.

Finding: The BNL management of activated material is inadequate to ensure that a member of the public does not receive an effective dose equivalent that exceeds the DOE 5400.5 dose limit as a result of the release of material for unrestricted use.

BNL generates activated material as a result of the operation of on-site accelerators. Additionally, BNL releases equipment and material from such operations for unrestricted use (Appendix H, I-RAD-26). Documented criteria and a survey technique have been approved by CH. These criteria allow for the release of material that has a gamma level of less than 10 microRoentgen per hour above background. Material at BNL can be activated at the on-site accelerators at levels ranging from background to possibly 10 Roentgen per hour. Safety Guide Procedure 3.5.0 was recently generated and incorporates most of the criteria and survey technique approved by CH, although the modification does not reflect the special cases of material exposed directly to high-energy particle beams.

A review of the management of activated material, Safety Guide Procedure 3.5.0, and the criteria and survey technique used for the release of activated material for unrestricted use revealed the following deficiencies:

- The instruments that are specified to be used in Safety Guide Procedure 3.5.0 were not always available or used by personnel performing the surveys of potentially activated material (Appendix H, I-RAD-26 and 28).
- Not all personnel that perform the surveys of potentially activated material had been trained on Safety Guide Procedure 3.5.0.
- Personnel that perform the surveys of potentially activated material had not received training on the criteria and survey technique (Appendix H, I-RAD-26 and 28).
- Many of the on-site areas that contain activated material were not locked, adequately controlled, or adequately identified (i.e., activated material was available for unintentional or unauthorized off-site removal). Examples are the storage area north of the AGS, the two storage areas east of the AGS, and the AGS activated material storage area east of the Waste Concentration Facility. The latter area contained material that occupied an area approximately 600 feet in length. It is believed that this area contained both activated and nonactivated material. However, only four small signs near the center warned that activated material was present. It was not clear if the signs were intended to identify the entire storage area as containing activated material or just the small portion near the center.

- Surveys were not always being performed in areas where the background dose rate was less than 20 microRoentgen per hour as specified in the criteria and survey technique (Appendix H, I-RAD-26 and 28). If the survey is performed in an area that exceeds this dose rate, it can mask the true dose rate generated by the activity in the material.
- Records of the surveys were not currently documented as required by Safety Guide Procedure 3.5.0 (Appendix H, I-RAD-26 and 28).
- Items that may be potentially activated were not being evaluated as they leave the BNL site using the criteria and survey technique.
- The dump monitor may not be sensitive enough to detect activated material at the dose rate limit specified in the criteria and survey technique if it were shielded by other material. This monitor radiologically surveys trucks containing waste material for disposal in landfills as they leave the site or on-site surplus storage areas.
- During the TTA, unidentified activated material which exceeded the release criteria was located in an uncontrolled and unmarked area west of the T 86-90 complex. This area also contained large amounts of apparently nonradioactive material. Therefore, the activated material could be unintentionally moved off-site.
- The procedure used by BNL to release activated material for unrestricted use was not adequately modified to reflect the special cases of material exposed directly to high-energy particle beams as stated in the criteria and survey technique developed by BNL and approved by CH. Such exposure results in internal activation, which is not always detectable by surface survey techniques.
- BNL is releasing activated material for unrestricted use using criteria and a survey technique that do not have the appropriate EH-1 approval. However, this approval is not required until the DOE 5400.5 requirement becomes effective.

These deficiencies could result in an underestimation of the dose that a member of the public could receive as a result of the release of activated material for unrestricted use. Although no evidence was identified during the assessment that activated material exceeding the dose limit contained in DOE 5400.5 has

been released for unrestricted use, the deficiencies identified above on the management of activated material at BNL cannot preclude this possibility.

Although the site was aware of all of these observations except for the activated material located west of the T 86-90 complex, BNL has not adequately implemented their policy to control activated material on-site to prevent its unintentional or unauthorized movement off-site. BNL has not adequately implemented the requirements contained in DOE 5400.5, Safety Guide Procedure 3.5.0, or the criteria and survey technique. Additionally, although BNL is aware that the criteria and survey technique used in assessing whether activated material can be released for unrestricted use must be approved by EH-1, BHO has yet to initiate a process to seek such approval.

The deficiencies noted for the management of activated material at BNL are attributed to the lack of policy implementation, inadequate procedures, inadequate training, and inadequate barriers and controls. The requirements in DOE 5400.5 and Safety Guide Procedure 3.5.0 have not been implemented by BNL. The criteria and survey technique are not adequate in that they do not incorporate the special cases of material exposed directly to high-energy particle beams. Not all personnel that perform surveys have been trained on Safety Guide Procedure 3.5.0, and no personnel that perform surveys have been trained on the criteria and survey technique. The control of the areas which contain activated material is inadequate to prevent unintentional or unauthorized removal.

RAD/CF-2 Inadequate Radiological Environmental Monitoring Documentation

Performance Objective: DOE 5400.1 states that a critical element of monitoring is QA and verification. The order also requires that auditable records be established in accordance with the requirements of DOE 5700.6B. The S&EP QA Manual establishes policy and requirements on the performance, documentation, and reviews of S&EP activities. Additionally, as a BMP, a plan should be developed that contains the rationale and design criteria for the monitoring program, extent and frequency of monitoring and measurements, procedures for laboratory analyses, QA requirements, program implementation procedures, and direction for the preparation and disposition of reports. DOE 5400.1 requires that an environmental monitoring plan containing these elements be written for BNL by November 11, 1991.

Finding: Documentation of the radiological environmental monitoring program is inadequate with respect to the requirements of DOE 5400.1, the requirements of the S&EP QA Manual, and BMPs.

BNL currently releases radioactive constituents to the environment as a result of routine operations. As part of the radiological environmental monitoring program, BNL routinely evaluates stack air emissions, ambient air, water effluents, groundwater, aquatic biota, and off-site soil and vegetation for radiological constituents. BNL has sampling personnel who collect all routine on-site samples. Off-site samples are collected by the SCDHS. The on-site radiological laboratory analyzes all radiological constituents except strontium-90, which is analyzed by an off-site laboratory. These activities fall under the direction of S&EP.

A review of the radiological environmental monitoring program, field sampling activities, radiological laboratory, and associated documentation revealed the following deficiencies:

- There are no written criteria for the proper placement and design of sampling or measurement locations for the radiological environmental monitoring program (Appendix H, I-RAD-15).
- There is inadequate written rationale for the initial selection of sampling or measurement locations for the radiological environmental monitoring program.
- No procedure requires the annual review of sampling or measurement locations to determine if conditions of or around these locations have changed in a manner that no longer meets proper initial siting or sampling design criteria (see Finding A/BMPF-1).
- The rationale for the radiological parameters analyzed/measured at sampling or measurement locations is not adequately documented.
- Sampling procedures used by the SCDHS for the collection of off-site soil and vegetation samples are not specified by BNL, nor has BNL audited or accompanied SCDHS personnel on these activities (Appendix H, I-RAD-15).
- The on-site radiological laboratory procedures for analyses performed on the liquid scintillation counter are not documented, although some are in draft form.
- Control limits for the efficiency and background parameters of the liquid scintillation counter have not been established to indicate inadequate operating performance.
- No procedure specifies how radiological quality control data are to be processed or used (i.e., managed).

These deficiencies result in the inadequate documentation of the radiological environmental monitoring program as a whole. BNL is aware of these deficiencies and has initiated many of the actions necessary to meet the current requirements of DOE 5400.1, the requirements of the S&EP QA Manual, and the future requirements of DOE 5400.1.

The causes of deficiencies noted in the documentation for the radiological environmental monitoring program at BNL are attributed to the lack of policy implementation; inadequate procedures; insufficient appraisals, audits, and reviews; and inadequate QA and quality control. The requirements of DOE 5400.1 and the requirements of the S&EP QA Manual have not been fully implemented. Procedures do not exist for some activities performed for the radiological environmental monitoring program. No S&EP audits of the radiological environmental monitoring program have been performed. Quality control for the liquid scintillation counter has not been established.

3.4.8.3 Best Management Practice Findings

RAD/BMPF-1 Inadequate Characterization of Effluent Streams for Radiological Constituents

Performance Objective: Current industry practices as identified in Draft DOE 5400.XY provide guidance for radiological effluent monitoring and environmental surveillance. The guidance includes, but is not limited to, the evaluation of all effluent streams to determine potential for releases of radioactive material. These evaluations are to be used to determine the best available technology (BAT) treatment of effluent streams. BAT treatment should be provided to protect groundwater and prevent the buildup of radionuclides in soil (e.g., in recharge basins). Additionally, these evaluations are to be reassessed annually and the results reviewed to determine effects on the documentation of the rationale for the effluent monitoring systems, BAT treatment, exposure pathway analysis, ambient monitoring systems, constituents analyzed at effluent and ambient monitoring systems, laboratory practices, and computer programs.

Finding: BNL has not adequately characterized its effluent streams for radiological constituents to meet the guidance of Draft DOE 5400.XY.

BNL releases radioactive constituents to the environment via air and liquid effluent streams as a result of routine operations. The radiological environmental monitoring program routinely evaluates stack air emissions and water effluents for radiological constituents. A review of the radiological environmental monitoring program indicated deficiencies that affect the completeness of monitoring activities and ability to assess effects on the reviews required in Draft DOE 5400.XY.

- BNL has not measured air emissions from the BMRR since 1978. The emissions from this facility are calculated based on a correlation of operating power and time versus measured releases as determined from the 1978 study (Appendix H, I-RAD-15). This type of study has been performed two other times previous to the 1978 study for the BMRR, and each time different values were obtained. Therefore, it is probable that the value used is not representative of current conditions. Properly assessing this source is important since the release of argon-41 from the BMRR results in the highest component of the calculated population dose from routine site operations.
- Air releases from BNL accelerators are also calculated based on the type of beam used and operating time. These emissions have never been measured for comparison with calculated releases (Appendix H, I-RAD-15).
- Many individual laboratories in various buildings, e.g., Biology (Bldg. 463), use radioactive material in their work. These sources have not been adequately evaluated to determine the potential for atmospheric emissions of radioactive material (see Finding A/BMPH-3).
- The liquid releases from buildings using radioactive material have not been adequately evaluated to determine the potential for radioactive liquid releases, with the exception of releases from the Biology (Bldg. 463) (see Finding SW/BMPF-1).

Although the site is aware of each of these observations, the only action BNL has taken has been to submit a request to perform a re-analysis of the air emissions from the BMRR in 1991. A formal program to rectify the remainder of the identified concerns has not been developed (see Finding RAD/CF-2).

The deficiencies noted for the characterization of effluent streams for radiological constituents at BNL are attributed to inadequate policy implementation, lack of procedures, inadequate resources, and inadequate design. The guidance in Draft DOE 5400.XY has not been implemented by BNL. No procedures require or cover characterization of effluent streams for radiological constituents. Personnel and equipment resources are not available to accomplish these characterizations and perform the annual reviews in a timely manner. Sampling locations and equipment currently in place are not adequate to easily perform these characterizations.

3.4.9 Inactive Waste Sites

3.4.9.1 Overview

The purpose of the inactive waste sites portion of the environmental assessment was to evaluate: (1) management of inactive waste sites located at the Laboratory; (2) management and conduct of studies to respond to the cleanup of these sites; (3) compliance with Federal, State, and BNL requirements dealing with inactive waste sites such as CERCLA or Superfund, as amended by SARA, RCRA Corrective Action provisions, and DOE 5400.4; and (4) adherence to the provisions of the Emergency Planning and Community Right-to-Know Act of 1986 (EPCRA), which is a stand-alone title (Title III) of SARA.

The general approach to the inactive waste sites assessment included interviews with BHO, BNL, and regulatory agency (EPA and NYSDEC) staff, review of EPCRA and environmental restoration documents and records, and on-site verification. The information collected from these activities was evaluated with respect to Federal and State regulations and DOE Orders, as identified in the Table 3.4.9-1.

Table 3.4.9-1
List of Applicable Inactive Waste Site
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
Public Law 99-499	Superfund Amendments and Reauthorization Act of 1986	EPA
RCRA Section 3008(h)	Interim Status Corrective Action Orders	EPA
40 CFR 300	National Contingency Plan	EPA
40 CFR 302	Designation, Reportable Quantities, and Notification	EPA
40 CFR 355	Emergency Planning and Notification	EPA
40 CFR 370	Hazardous Chemical Reporting: Community Right-to-Know	EPA
40 CFR 373	Reporting Hazardous Substance Activity When Transferring Federal Real Property (proposed)	EPA

Table 3.4.9-1 (Continued)
List of Applicable Inactive Waste Site
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
DOE 5484.14	CERCLA Program (superseded by DOE 5400.4)	DOE
DOE 5400.4	CERCLA Requirements	DOE
DOE 5484.1	Environmental Protection, Safety, and Health Protection Information Reporting Requirements	DOE
DOE 5500.2A	Emergency Notification, Reporting, and Response Levels	DOE
New York State	Inactive Hazardous Waste Disposal Sites CERCLA (State Superfund)	NYSDEC
6 NYCRR 595	Releases of Hazardous Substances - Reporting, Response and Corrective Action	NYSDEC
6 NYCRR 597	List of Hazardous Substances	NYSDEC
BNL SOP #RP-5	Environmental Protection Section's Procedure for Oil/Chemical Spills Emergency Response at BNL	BNL
BHO #BHO-01	Brookhaven Incident Reporting Program (BIRP)	DOE-BHO

One of the initial activities in the ongoing assessment process of inactive waste sites at BNL was the 1986 Installation Assessment Report (the DOE equivalent of a Preliminary Assessment), which addressed eight inactive waste sites at BNL (Appendix I, IWS-12). Three of the Installation Assessment Report sites were later evaluated for risk using the EPA Hazard Ranking System. One of these sites, the Former Landfill Area, scored 30.0, which is above the 28.5 threshold for inclusion on the NPL or Superfund List. The entire BNL site was proposed for

the NPL in July 1989 and finalized in November 1989 (Appendix H, I-IWS-1). BNL is also included on the New York State Registry of Inactive Hazardous Waste Disposal Sites as a Classification 2 site which, by definition, indicates that information exists that BNL poses a significant threat to the public health or the environment. Additional, potential inactive waste sites have been identified during other investigations conducted by the site, the RCRA Facility Assessment for BNL in 1987 (Appendix I, IWS-29), and the HQDOE Environmental Survey (Appendix I, IWS-36).

An IAG is being negotiated among the EPA, NYSDEC, and DOE. When finalized (expected in the near future), the agreement will require BNL to characterize and remediate inactive waste sites through the CERCLA-NCP process and to satisfy RCRA corrective action requirements. As part of the IAG, inactive waste sites are to be incorporated into an Areas of Concern (AOC) list. This list is to include previously identified inactive waste units, including inactive SWMUs, and is to be updated as new sites are identified.

Five inactive waste sites have undergone or are now undergoing response actions. Three sites -- the Bldg. 830 Pipe Leak, the Paint Shop, and the Old Firehouse -- have had piping and/or soils removed as part of their remediation. Currently two sites -- the Spray Aeration Site at the HWMF and the CSF Leach Pit -- are being mitigated for environmental contamination.

BNL contains hazardous chemicals and extremely hazardous substances in excess of threshold planning quantities and is therefore subject to the emergency planning requirements of EPCRA. However, operations at the laboratory exempt it from the requirements for toxic chemical release reporting under EPCRA.

There are five compliance findings and one BMP finding for inactive waste sites at BNL. Four of the compliance findings deal with inadequate implementation of the NCP and DOE 5400.4 and its predecessors, while the fifth deals with inadequate implementation of EPCRA. The BMP finding addresses inadequate EPCRA spill reporting procedures.

3.4.9.2 Compliance Findings

IWS/CF-1 Inadequate Implementation of the National Contingency Plan

Performance Objective: DOE 5400.4, CERCLA Requirements, states that DOE shall respond to inactive waste sites in compliance with the NCP (40 CFR 300). The NCP [finalized March 8, 1990; 55 Federal Register (FR) 8666] requires removals be undertaken by the lead agency (i.e., DOE) in conformance with 40 CFR 300.410 and 40 CFR 300.415. In addition, if remediation of a site is

required, the lead agency shall also perform RI/FSS to characterize the nature of and the threat posed by the hazardous materials and gather data to support analysis and design of work plans and response actions pursuant to the requirements of 40 CFR 300.430. In addition, the predecessor to DOE 5400.4 (DOE 5480.14) contained a five-step process for identification, evaluation, and remediation of inactive hazardous waste disposal sites on DOE installations.

Finding: BNL has not conducted removals and remedial activities for inactive waste sites in accordance with the requirements of DOE 5400.4, its predecessor, and the NCP (40 CFR 300).

BNL is on the NPL (Appendix H, I-IWS-1) and has 23 presently identified inactive waste sites. These sites are listed in the draft IAG as AOCs. This AOC list may be supplemented in the future by other potential inactive waste sites. Some of these sites have undergone or are undergoing response actions but these actions have not been, or are not being, performed in accordance with the NCP, DOE 5400.4, or its predecessor. Examples include the following:

- BNL has not performed RI/FSS to adequately characterized the vertical and horizontal extent of contamination in groundwater, surface soils, and subsurface soils at their inactive waste sites or the sitewide hydrogeology (see Findings GW/CF-1 and SSB/BMPF-1). Therefore, there is a limited basis for determining appropriate response actions. For example, the extent of subsurface soil contamination present at the Spray Aeration Site at the HWMF has not been characterized sufficiently. As a result, the ongoing spray aeration may not be the most appropriate response action.
- BNL has not adequately inventoried contaminants that may be present at their inactive waste sites. As a result, there is a limited basis for the removal or inclusion of contaminated areas on the AOC list. Examples include the removal of the Ashfill Area from the list due to the limited amount of information regarding the contents of the Ashfill Area. It should be noted that the Ashfill Area is to be addressed in the SWMU Classification Report as required in the IAG. Although the Potable Wells have been included on the AOC list, the source of contamination for these wells has yet to be identified and is not on the current AOC list.
- BNL has not properly assessed alternative removal actions and remediation activities at their inactive waste sites. For example, engineering evaluations/cost

analyses or other similar evaluations were not conducted for removal actions at the Cesspools associated with Bldgs. 51, 197, 244, 348, and 422; the Bldg. 830 Line Leak; the Paint Shop; and the Old Firehouse. Also, NYSDEC has recently indicated that an adequate assessment of remedial alternatives did not occur for the aquifer restoration project at the HWMF due to inadequate data on which to base a selection (Appendix I, IWS-55).

- BNL did not develop adequate work plans for their removal actions and the remedial activities associated with the Spray Aeration Site at the HWMF. Additionally, available BNL documentation did not contain work plans for the removal actions at the Paint Shop, the Bldg. 830 Line Leak, and the Old Firehouse. In 1988, BNL sent an RI/FS Work Plan for the Current Landfill to the EPA Region II office for approval, but it was rejected by the EPA as being too general, incomplete, and not in conformance with RI/FS guidance (Appendix I, IWS-56).
- There were inadequate and inappropriate agency and public interactions for nontime critical removals at several inactive waste sites at BNL. For example, the Spray Aeration Site at the HWMF was not formally approved by the EPA and NYSDEC (Appendix H, I-IWS-1, I-IWS-5), in part due to delays in information being sent to the regulatory agencies (Appendix H, I-IWS-5). Agency concerns were also not addressed by BHO as evidenced by the lack of action by BHO to incorporate EPA and NYSDEC comments into the selection and design of the response action at the Spray Aeration Site (Appendix I, IWS-54). In addition, EPA and NYSDEC comments regarding the Current Landfill RI/FS Work Plan were also not addressed. However, the site is planning to address the Current Landfill through the terms of IAG.
- BNL has taken removal actions without adequately characterizing the site. Cesspools associated with Bldgs. 51, 197, 244, 348, and 422 have undergone partial removal activities at BNL without proper characterization of potential contamination in the surrounding soils. These cesspools were partially excavated and backfilled without benefit of additional studies to determine the effectiveness of the removal action. Further investigations are to be conducted under the IAG.

BNL has taken actions to remedy some of these issues. DOE is currently negotiating an IAG with the EPA and NYSDEC which will require BNL to characterize and remediate their inactive waste sites through the CERCLA-NCP process. BNL has implemented a groundwater (see Finding GW/CF-1) and soils (see Finding SSB/BMPF-1) characterization study. Monthly compliance reports are now produced, and BNL has issued a Request for Proposal for a Community Relations Plan, as a first step in initiating a formal remedial process (see Finding IWS/CF-3). Dialogue between BHO, the EPA, and NYSDEC has increased during the past year as evidenced by the planned formation of a technical review committee and greater interchange of technical information and data.

The apparent causes of this finding are lack of policy implementation, lack of resources, lack of reviews, lack of supervision, and change. BHO is not implementing policies since the requirements for removals and RI/FSs of inactive waste sites in DOE 5400.4, and its predecessor and the NCP have not been instituted. There was a lack of agency (NYSDEC) resources available to BNL due to their involvement with several other sites that required more attention (Appendix H, I-IWS-22). Because of this, NYSDEC did not develop more interaction and did not prompt BHO in this regard (Appendix H, I-IWS-22). Insufficient review of the design of the Spray Aeration Site at the HWMF resulted due to delays in regulatory agencies receiving the appropriate data. Until recently, there was a lack of programmatic supervision because at the time of the above activities BNL did not have a program in place to oversee the implementation of the regulations. BNL, BHO, CH, and HQDOE have also not implemented changes or provided guidance resulting from revisions in the NCP and DOE 5400.4 in a timely manner.

IWS/CF-2 Inadequate Program for Emergency Planning and
Community Right-to-Know Act

Performance Objective: 40 CFR 370 implements Sections 311 and 312 of EPCRA (SARA Title III). It requires applicable facilities, such as BNL, to submit a list of hazardous chemicals present at the facility in excess of minimum threshold levels and a Tier I or Tier II form [if requested by the local emergency planning committee (LEPC), state emergency planning commission (SEPC), or the fire department with jurisdiction over the facility] to the SEPC, LEPC, and jurisdictional fire department. 54 FR 41904 (October 12, 1989) delays the lowering of threshold levels to 0 pounds for 1 year until October 19, 1990.

EPCRA Section 303(d) requires applicable facilities to notify the LEPC of a facility emergency coordinator and to inform the LEPC of any changes at the facility, such as changes in the facility coordinator.

Finding: BHO has either not provided or has inaccurately provided EPCRA lists, forms, and notifications. Therefore, BHO is improperly implementing 40 CFR 370 and EPCRA Section 303(d).

BNL has prepared a list of hazardous chemicals and a Tier II form [as requested by the SEPC (Appendix H, I-IWS-18)] for 1988. Both were sent by BHO to the SEPC and the LEPC, as required by regulation (Appendix H, I-IWS-37, 38, 40, and 41). The Laboratory is also in the process of preparing a Tier II form for 1989 (Appendix H, I-IWS-6 and 18). Review of these documents as well as other EPCRA information for BNL indicates the following deficiencies:

- BHO submitted a complete list of hazardous chemicals on-site (approximately 3,000) rather than only those that exceed threshold planning quantities (approximately 29), as required in 40 CFR 370.21(b).
- The list of hazardous chemicals submitted was not grouped by hazard category, as required in 40 CFR 370.21(b).
- The Tier II form submitted for 1988 does not specify the building(s) at which each hazardous chemical or extremely hazardous substance is located, as is required by the form instructions.
- The methodology used in completing the Tier II form for 1988 resulted in an underreporting of the amounts of chemicals present at the site. On the Tier II form, amounts are generally to be reported in order of magnitude ranges (except at higher ranges). Examples of underreported chemicals include maximum daily amounts of sodium hydroxide (reported - 100 to 999 pounds, estimated actual - 10,000 to 99,999 pounds) (Appendix H, I-IWS-17), sodium hypochlorite (reported - 100 to 999 pounds, estimated actual - 1,000 to 9,999 pounds) (Appendix H, I-IWS-17), and fuel oil (reported - 100,000 to 999,999 pounds, estimated actual - 10,000,000 to 49,999,999 pounds) (Appendix H, I-IWS-18).
- The Tier II form for 1989, which was to have been submitted to the LEPC, SEPC, and local fire department by March 1, 1990 (40 CFR 370.25), has not been sent at the time this finding was being developed (April 9, 1990).
- The BNL Fire/Rescue Group, which is the local fire department that has jurisdiction over the site, was not sent the list of hazardous chemicals or the 1988 Tier II form, as required by 40 CFR 370.21(a) and 40 CFR 370.25(b) (Appendix H, I-IWS-9).

- The facility emergency coordinator initially identified to the LEPC has changed. However, the LEPC has not been formally notified of the new coordinator, as required in EPCRA Section 303(d).

BNL is aware of the underreporting of chemical amounts on the Tier II form and is in the process of correcting the inventory methodology that resulted in the misreporting. This has led to the delay in the 1989 form submission, as described above (Appendix H, I-IWS-6 and 18). The Laboratory has provided an additional staff member on a part-time basis to assist in the preparation of EPCRA reports. BNL is also aware of the lack of citing specific locations of chemical storage in the 1988 Tier II form; this apparently resulted from a management decision not to include such information (Appendix H, I-IWS-6).

The causal factors for this finding appear to be policy implementation, training, reviews, and supervision. Existing policy in the form of EPCRA statutory and regulatory requirements have not been adequately implemented. BHO and BNL personnel assigned to oversee and implement the EPCRA program have not been trained with regard to their responsibilities or the requirements of EPCRA. In addition, the submittals or the need for submittals apparently were not reviewed for adequacy, and the personnel developing EPCRA submittals were not adequately supervised.

IWS/CF-3

Lack of a Developed and Implemented Community Relations Plan

Performance Objective: The NCP [40 CFR 300.430(c), as finalized on March 8, 1990, in 55 FR 8666] requires specified community relations activities, including development and implementation of a community relations plan. DOE 5400.4, CERCLA Requirements, states that DOE shall respond to inactive waste sites in compliance with the NCP.

Finding: BHO and BNL have not prepared and implemented a community relations plan for current environmental restoration activities and, therefore, have not met the requirements of DOE 5400.4 and 40 CFR 300.430(c).

BNL is on the NPL and is conducting cleanup activities for its inactive waste sites. Examples are the current activities at the CSF Leach Pit and the Spray Aeration Site at the HWMF (Appendix H, I-IWS-2, I-IWS-3). Additionally, the site is performing field studies in an attempt to begin to characterize other inactive waste sites. A community relations plan has not been prepared and implemented to date for these activities. As a result, interested parties are not made aware of remedial plans, activities, and resultant data, and have no input into the remedial process.

BNL is aware of this deficiency and has distributed press releases in the past, but indicated that these efforts are oriented more toward public relations than a formal community relations plan (Appendix H, I-IWS-1). The Public Affairs Office has sent out an RFP for a community relations plan in anticipation of the community relations requirements in the upcoming IAG (Appendix H, I-IWS-1). Commencement of this procurement began when DOE 5400.4 became final in October 1989.

The apparent causes of this finding are lack of policy implementation, lack of resources, lack of supervision, and change. BHO and BNL are not implementing policies since the requirements for a community relations plan in DOE 5400.4 and 40 CFR 300.430(c) of the NCP have not been instituted. There has also been a lack of personnel resources to begin and implement a community relations plan. Until recently, there was a lack of programmatic supervision because at the time of the above activities, BHO and BNL did not have a program in place to oversee the implementation of the regulations. BNL, BHO, CH, and HQDOE have also not implemented changes or provided guidance resulting from revisions in the NCP and DOE 5400.4 in a timely manner.

IWS/CF-4 Lack of an Administrative Record

Performance Objective: The NCP [40 CFR 300.800(b), as finalized on March 8, 1990 in 55 FR 8666] requires that the Federal agency in charge of the facility responding to inactive waste sites compile and maintain the administrative record for that facility. The administrative record is to contain the documents that form the basis for the selection of a response action and is to be located in a place of public access. The documents in an administrative record are to include factual information, guidance documentation, technical literature, and decision documents. DOE 5400.4, CERCLA Requirements, states that DOE shall respond to inactive waste sites in compliance with the NCP.

Finding: BHO does not have an administrative record for inactive waste site response actions that have been and are being conducted on-site and, therefore, has not met the requirements of DOE 5400.4 and 40 CFR 300.800(b) of the NCP.

BNL is on the NPL and has inactive waste sites for which it is conducting and has conducted response actions. Examples are the past activities at the Paint Shop, Bldg. 830 Pipe Leak, and the Old Firehouse; while current activities include the CSF Leach Pit and the Spray Aeration Site at the HWMF (Appendix H, I-IWS-2, I-IWS-3). Additionally, the site is performing field studies in an attempt to begin to characterize other inactive waste sites. Documentation of these activities has not been placed in an administrative record. As a result, there is no guarantee that proper documentation exists to develop records of decision for

remedial actions and for completion of cleanup activities at BNL inactive waste sites. As an example, documentation of the removal actions taken at the BNL Paint Shop is incomplete (Appendix I, IWS-30, IWS-31, IWS-32, IWS-33, IWS-34, IWS-35). Present documentation lacks detailed information and diagrams specific to the soil removal activities conducted at the Paint Shop. In addition, BHO does not have any discreet files related to the removal action associated with the Paint Shop (Appendix H, I-IWS-4).

BHO will be required to develop an administrative record in response to the upcoming IAG. Although BNL is aware of the lack of an administrative record (Appendix H, I-IWS-1), they believe that documentation is available for such a record and cite their extensive groundwater monitoring data base as an example (Appendix H, I-GW-10). Considerable documentation also exists for the Bldg. 830 Pipe Leak (Appendix H, I-IWS-10).

The apparent causes of this finding are lack of policy implementation, lack of resources, lack of supervision, and change. BHO is not implementing policies since the requirements for an administrative record in DOE 5400.4 and 40 CFR 300.800(b) of the NCP have not been instituted. There has also been a lack of personnel resources to begin and maintain an administrative record. Until recently, there was a lack of programmatic supervision because at the time of the above activities BNL did not have a program in place to oversee the implementation of the regulations. BNL, BHO, CH, and HQDOE have also not implemented changes or provided guidance resulting from revisions in the NCP and DOE 5400.4 in a timely manner.

IWS/CF-5 Inadequate Search for Inactive Waste Sites

Performance Objective: DOE 5400.4, CERCLA Requirements, states that DOE shall respond to inactive waste sites in compliance with the NCP. The NCP (40 CFR 300.410 and 40 CFR 300.420, as finalized on March 8, 1990, in 55 FR 8666) requires that the lead agency base Preliminary Assessments (PAs) on readily available information, portions of which are obtained from reviews of historical documents, interviews, and inspection tours of research and support facilities, and to prepare a report that includes a history of waste handling.

Finding: BHO and BNL have not conducted a complete search for information to assist in discovering and describing inactive waste sites and, therefore, have not met the requirements of DOE 5400.4, 40 CFR 300.410, and 40 CFR 300.420.

As part of the upcoming IAG, BNL is developing an AOC list that presently contains 23 known inactive waste sites. Due to the lack of a complete search, some inactive waste sites may not yet be identified, some known sites are inadequately described, and

known inactive waste sites have not been included on the AOC list. Examples include the following:

- A review of Army records has not been undertaken to determine if additional inactive waste sites stemming from Army activities at the site prior to 1947 exist at BNL. A review of these records may also yield information regarding the contents of the Former Landfill and the Ashfill Area.
- Past site data and practices have not been thoroughly investigated to determine the existence of all potential unknown inactive waste sites, including potential sites on property excised by BHO north of the current site boundary 15 to 20 years ago (Appendix H, I-IWS-23). For example, a previously unknown abandoned UST at the CSF was first discovered during the TTA, even though the tank appears on a 1948 drawing of the CSF and the tank access cover and vent pipe were previously visible above the tank.
- The lack of an historical document review contributes to inadequate characterization of the sources of several known areas of contamination such as the Potable Wells, the aquifer contamination at the HWMF, the Former Landfill Area, the Ashfill Area, and the Off-Site Tritium plume which is believed to originate at the Meadow Marsh Experiment and the Peconic River outfall. This deficiency also contributes to the data gaps in the monitoring well program. Additionally, there are data gaps regarding formerly abandoned wells, and suspected deep borings and wells (see GW/BMPF-1).
- The lack of a comprehensive sitewide historical review may be contributing to known inactive waste sites not being added to the AOC list. Although sites are placed on the list when adequate information is available, the lack of a complete historical search precludes the addition of known inactive waste sites that have limited information. Examples of such sites are the cesspools at Bldgs. 51, 197, 244, 348, and 422.

BNL performed an historical evaluation as part of the Installation Assessment Report (Appendix I, IWS-12) (required by DOE 5480.14, which has now been superseded by the current DOE 5400.4) and the PA (Appendix I, IWS-29). However, BNL is aware that this and subsequent searches are inadequate. An additional search is a specific element of the forthcoming IAG and will be performed when the IAG is implemented. It is recognized that the AOC list may be updated at any time.

The apparent causes of this finding are lack of policy implementation, lack of resources, lack of supervision, and change. BHO and BNL are not implementing policies since the requirements for an historical records search in DOE 5400.4, and 40 CFR 300.410 and 40 CFR 300.420 of the NCP have not been performed. There have also been inadequate personnel resources to conduct a complete historical search. Until recently, there was a lack of programmatic supervision because at the time of the above activities BHO and BNL did not have a program in place to oversee the implementation of the regulations. BNL, BHO, CH, and HQDOE have also not implemented changes or provided guidance resulting from revisions in the NCP and the DOE 5400.4 in a timely manner.

3.4.9.3 Best Management Practice Findings

IWS/BMPF-1 Incomplete Spill Reporting Procedure

Performance Objective: 40 CFR 355 implements Section 304 of EPCRA. It requires that spills of hazardous substances in excess of reportable quantities that go beyond the facility boundary be reported to the LEPC and SEPC.

Finding: Spill reporting procedures, which are documented in BNL SOP No. RP-5, do not fully describe all the necessary contacts in the event of an EPCRA-reportable spill, as described in 40 CFR 355.

The BNL S&EP Division SOP No. RP-5 (Appendix I, IWS-48) is the governing document with regard to petroleum and hazardous substance (including radionuclides) spill response (I-IWS-7 and 8). Within the SOP is a list of government agencies to be contacted in the event of a spill. Although this summary contains several of the contacts that are required to be made in the event of a CERCLA- and State-reportable spill, including the EPA National Response Center, NYSDEC, and SCDHS, there are no listings of the LEPC. Immediate verbal notifications with written followup reports are required to be made to the LEPC as well as the SEPC in the event of an EPCRA-reportable spill.

The causes of this finding appear to be procedures and human factors. The Federal requirements for spill reporting, as delineated in 40 CFR 355, are not identified in the BNL procedures for spill response. This may be because BNL personnel consider this a relatively minor and infrequently used reporting requirement; therefore, its inclusion in the procedures is not essential (Appendix H, I-IWS-7).

3.4.10 National Environmental Policy Act

3.4.10.1 Overview

The purpose of NEPA portion of the environmental assessment was to (1) evaluate compliance with the NEPA, Council on Environmental Quality (CEQ) regulations, and DOE NEPA Guidelines, Orders, and Memoranda; (2) evaluate NEPA management structure and NEPA review processes; and (3) identify inappropriate and inadequate NEPA procedures and documentation. Table 3.4.10-1 lists the applicable regulations and requirements used to evaluate NEPA compliance.

Table 3.4.10-1
List of Applicable NEPA
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
P.L. 91-90	National Environmental Policy Act (NEPA)	U.S. Congress
40 CFR 1500-1508	Regulations for Implementing the Procedural Requirements of NEPA	CEQ
10 CFR 1021	Compliance with the National Environmental Policy Act	DOE
52 FR 47662-47670	DOE Compliance with NEPA; amendments to the DOE NEPA Guidelines	DOE
DOE 5440.1C	NEPA	DOE
DOE 5400.1	General Environmental Protection Program	DOE
DOE 5400.4	Comprehensive Environmental Response, Compensation, and Liability Act Requirements	DOE
N/A	DOE Environmental Compliance Guide (1981)	DOE
N/A	DOE NEPA Compliance Guide (Draft) 1988	DOE

Table 3.4.10-1 (Continued)
List of Applicable NEPA
Regulations/Guidelines

<u>Regulations/ Guidelines</u>	<u>Title</u>	<u>Authority</u>
N/A	NEPA Guidance related to Memorandum-to-file and Categorical Exclusion (March 25, 1988)	DOE
SEN-15-90	Secretary of Energy Notice Concerning the National Environmental Policy Act (February 15, 1990)	DOE
N/A	Interim Procedural Guidance for Implementation of SEN-15-90 (March 2, 1990)	DOE

The general approach to the NEPA assessment included interviews with BHO and BNL staff members responsible for NEPA compliance, on-site verification, review of NEPA documentation and NEPA review and tracking procedures. The sitewide 1977 environmental impact statement (EIS) and the 1978 ISABELLE EIS were reviewed for their adequacy as reference documents from which to tier future NEPA documents. The use of categorical exclusions, memoranda-to-file (MTFs), action description memoranda (ADMs), and environmental evaluation forms were evaluated for consistency with DOE NEPA requirements. Responsibility for the NEPA program at BNL is assigned to the S&EP Division under the Associate Director for Reactor Safety and Security.

Recently the NEPA program at BNL has undergone two major changes. The first reflects guidance given at a CH workshop in July 1989; based on this guidance formal BNL NEPA procedures were written (BNL NEPA Implementation Action Plan for Environmental Compliance, August 15, 1989). The second reflects issuance of Secretary of Energy Notice No. 15-90 (SEN 15-90) on February 5, 1990, after which it was necessary to revise the August 1989 procedures. At the time of the TTA, the revised BNL procedures had been issued (February 26, 1990), but were not fully integrated into site NEPA planning and compliance.

Prior to FY 1990, NEPA procedures, planning, and documentation at BNL were inadequate and inconsistent with HQDOE guidance. BHO and CH oversight was deficient. However, documentation regarding compliance of BNL activities with Federal, State, and local environmental requirements for a variety of projects indicates the review and concurrence by the appropriate regulatory agencies have taken place.

The NEPA assessment focused on NEPA activities at BNL that followed the issuance of the August 1989 procedures. In general, the BNL NEPA procedures are consistent with the CH guidance. Minor omissions were not considered deficiencies by the NEPA Environmental Subteam because NEPA guidance from HQDOE is presently evolving in response to SEN-15-90.

Since the start of FY 1990, BNL has written NEPA procedures, incorporated NEPA reviews into their planning, implemented a computerized NEPA tracking system for construction projects, and provided NEPA training to management staff. In addition, a full-time NEPA coordinator was hired in the S&EP Division. These efforts reflect a genuine commitment by BNL staff to the Secretary's initiative for full DOE compliance with NEPA.

In summary, the NEPA assessment resulted in one compliance finding related to an inadequate NEPA determination, and two BMP findings related to deficiencies in the sitewide EIS and to delays in the DOE NEPA approval process and determinations.

3.4.10.2 Compliance Findings

NEPA/CF-1 Inappropriate National Environmental Policy Act Determination

Performance Objective: The DOE NEPA Guidelines (52 CFR 47662) and DOE 5440.1C require that a Responsible Supervisory Official make appropriate NEPA determinations for all DOE activities.

Finding: A NEPA determination was made by CH for the AGS Booster Facility that may not be in accordance with DOE NEPA Guidelines and DOE 5440.1C.

It should be noted that for a MTF to be an appropriate decision, the impacts of the proposed action must be clearly insignificant. If the impacts of a proposal that is not categorically excluded are not clearly insignificant, then DOE must analyze the impacts in an environmental assessment (EA) or an EIS. In the 1989 CH response to Secretary Watkins' request for review of MTFs (Appendix I, N-32), the Operations Office noted that the 1988 MTF for the AGS Booster "...could be regarded as questionable in terms of process in that some analysis (but not an EA or EIS) was used to arrive at the conclusion that impacts were insignificant." However, CH considered the decision to be

technically sound, because there were "no significant impacts" from the project. The CH response goes on to state that because the "facility is already operational," no corrective action is required. However, the AGS Booster is not operational as the Booster machine components have just begun to be installed. Therefore, the CH decision not to take corrective action on the AGS Booster MTF may be inappropriate.

The causal factor may be inadequacies in the BHO and CH QA and quality control program, which resulted in misinformation on the status of the Booster facility. Additionally, HQDOE oversight of the MTF was lacking and, therefore, the questionable NEPA determination was not identified early on.

3.4.10.3 Best Management Practice Findings

NEPA/BMPF-1 Outdated Sitewide Environmental Impact Statements

Performance Objective: 40 CFR 1502.9 (c) requires preparation of a supplemental EIS if there is either (1) substantial changes in a proposed action or (2) significant new circumstances or information relevant to environmental concerns. CEQ guidance (46 FR 18036) states that 40 CFR 1502.9 requirements should be re-evaluated if an EIS is for an ongoing program or is more than 5 years old. 40 CFR 1502.20 and 40 CFR 1508.28 encourage tiering of subsequent environmental analyses at a site, but the EIS must reflect current site conditions.

Finding: The 1977 sitewide EIS (Appendix I, N-01) and the 1978 ISABELLE EIS (Appendix I, N-2) are out-dated according to NEPA requirements and are inappropriately being used for tiering (Appendix I, N-33).

The 1977 sitewide EIS and the ISABELLE EIS lack analyses for several impact categories required by DOE NEPA guidance issued since 1981. As indicated by the following examples, the EISs do not reflect current site conditions, regulatory requirements, and DOE Orders:

- The EISs (both the sitewide EIS and the ISABELLE EIS) are no longer representative of site conditions because of the recent New York State Wild, Scenic and Recreational River System Act of 1988. The Peconic River is now designated as a scenic river (Appendix I, N-17).
- The EISs lack documentation for current wetlands mapping done by the NYSDEC which identifies wetland areas on the BNL site (Appendix H, I-N-5).

- The sitewide EIS lacks specific statements regarding compliance with natural and cultural resource protection laws. Since the issuance of the EIS, BNL correspondence with the NYSDEC (including the State Historic Preservation Officer regarding the site cultural resources) (Appendix H, I-N-4, I-N-5) and the U.S. Fish and Wildlife Service (regarding endangered species) indicates that letters from regulatory agencies have been obtained for specific projects to augment conditions reported in that EIS.
- Construction and modification effects and decontamination and decommissioning for ongoing and reasonably foreseeable future actions are not considered in the sitewide EIS. Since this EIS was prepared, the following have occurred:
 - The developed area of the site has essentially doubled with the addition of the ISABELLE ring (Appendix I, N-2, N-12).
 - The HFBR has been upgraded from 40 MW to 60 MW (Appendix I, N-9).
 - There has been an approximate 20 percent increase in facilities, for example, the NSLS (Appendix I, N-15).
- Currently accepted dose calculation methods (Appendix I, N-16; Appendix H, I-N-6) and risk assessment methodology were not used in the EISs. For example:
 - An accident analysis is discussed for the HFBR, but it is not based on the "worst" reasonably foreseeable accident conditions, and does not consider the 50 percent upgrade (Appendix I, N-20).
 - Effects of operations and accident events are not considered for workers.
- Neither of the EISs reflect current regulatory requirements promulgated under the Clean Air Act (40 CFR 61), RCRA, and CERCLA, as well as other State Laws and County Codes.
- The sitewide EIS, which is being used for ongoing programs at BNL, is more than 13 years old.

In addition to the outdated EISs, BNL indicated in a September 8, 1989, letter (Appendix I, N-33) that all environmental reviews done on BNL projects since 1977 have been

covered under the umbrella of the sitewide and ISABELLE EISS. While the evaluations presented in the EISS are generally valid for current activities at BNL, the above issues reduce the applicability of the EISS for tiering purposes.

Appraisals, audits, reviews, QA, mechanisms and quality control mechanisms by HQDOE and CH have failed to identify that the sitewide and ISABELLE EISS are out-dated. The causal factors for BNL reliance on out-dated EISS for tiering environmental analyses at the site relate to the lack of DOE implementation of guidance concerning the use of sitewide EISS that are more than 5 years old. However, in response to SEN-15-90, HQDOE has prepared a draft agency-wide policy for development and updating of sitewide EISS. The draft policy is presently undergoing agency review.

NEPA/BMPF-2 Delays in National Environmental Policy Act
Approval and Determination Process

Performance Objective: The DOE NEPA approval process and resulting Section D determinations (i.e., either categorical exclusion, environmental assessment, or environmental impact statement) for construction and routine maintenance activities should be completed in a timely fashion.

Finding: The BHO, CH, and HQDOE NEPA approval process and Section D determinations are not completed in a timely fashion with the result that funded FY 90 BNL projects are lagging (Appendix H, I-N-8, 9, 10, 11, 17).

Efficient project management requires timely decisions at the start of the funding cycle. The following examples are given to illustrate delays in NEPA determinations:

- The average time before documents were sent from BHO to CH was 1 to 1.5 months using a sample of 37 documents [FY 1990 GPPs (Appendix I, N-21) and line items] submitted by BNL to BHO for NEPA determinations.
- Approximately 37 documents were submitted by BHO to CH between January 24 and March 27, 1990; 33 were still outstanding at the time of the TTA (it should be noted that in mid-February some delay may have been caused by the initial implementation of SEN-15-90). Twelve of these outstanding documents were first submitted January 24, 1990, 16 were submitted in mid-March, and 17 were submitted between March 21-27, 1990. Two of the submittals were awaiting additional information from BNL at the time of the TTA.

- The NEPA approval process for the Relativistic Heavy Ion Collider was started in July 1988 with the BNL submittal to BHO and CH of an environmental analysis to accompany the conceptual design report (Appendix H, I-N-9). In June 1989, CH requested an ADM. In August 1989, BHO submitted the ADM (Appendix I, N-12) to CH. In mid-February 1990, a HQDOE NEPA determination was issued directing ER to prepare an EA (Appendix I, N-14). BHO did not receive an official notification of this NEPA determination until April 10, 1990. Project funding is scheduled to start in October of 1990. However, equipment development and fabrication cannot start until an EA and Finding of No Significant Impact are issued by HQDOE.

Casual factors for the delays in the DOE approval process and NEPA determinations relate to lack of procedures and resources. BMP requires timely decision making for projects. HQDOE, CH, and BHO procedures do not address timely reviews. Also, inadequate CH and BHO personnel resources have resulted in delays.

4.0 Safety and Health Assessment

4.0

SAFETY AND HEALTH

4.1

PURPOSE

The purpose of the S&H Subteam appraisal was to assess the effectiveness of representative safety and health programs at the BNL through the evaluation of activities at selected facilities and in selected safety disciplines.

4.2

SCOPE

The safety and health portion of the TTA was a TSA conducted in accordance with established procedures. The following BNL safety and health program elements were reviewed as a part of this TSA: Organization and Administration, Operations, Maintenance, Training and Certification, Nuclear Criticality Safety, Auxiliary Systems, Technical Support, Site/Facility Safety Review, Emergency Preparedness, Radiological Protection, Industrial Hygiene, Occupational Safety, Fire Protection, Quality Verification, and Medical Services.

4.3

APPROACH

The S&H Subteam evaluation was conducted from March 26 - April 12, 1990. The evaluation was conducted by a team of experts assembled by EH, Office of Safety Appraisals (OSA). Team members consisted of HQDOE staff, employees of DOE contractors, and outside consultants. The S&H Subteam was led by a Team Leader from the OSA. Guidance and direction were provided by an EH Senior Safety Manager. Biographical sketches of each team member and their areas of responsibilities are provided in Appendix A-3.

TSAs are operationally focused. As such, in terms of safety, health, and quality verification, the site and selected facilities were appraised relative to operations, and the condition of equipment and facilities. This approach is based upon the assumption that the facility and its equipment have been appropriately designed, constructed, and tested, and that safety reviews or the SARs adequately evaluate the risks presented by the operation of the facility. The evaluation thus addresses whether current operations are being conducted within the operational safety procedures established for specific facilities and activities.

The S&H Subteam activities were guided by the performance objectives and supporting criteria contained in the "Performance Objective and Criteria for Technical Safety Appraisals at Department of Energy Facilities and Sites," February 1990. The findings identified by the S&H Subteam were obtained in three ways: (1) observing routine operations, and the physical

condition of the site and facilities; (2) interviewing management, staff, operators, and craft personnel; and (3) reviewing policy statements, records, procedures, and other relevant documents. A concern addresses a situation that in the judgment of the S&H Subteam: (1) reflected less than full compliance with a DOE safety and health requirement or mandatory safety standard, (2) threatened to compromise safe operation, or (3) if properly addressed would substantially enhance the excellence of that particular situation even though that part of the operation was judged to have a currently acceptable margin of safety. Because of this last category for addressing the excellence of the operation, more concerns are reported than would result from a strictly compliance-oriented appraisal.

As a result of the individual findings, 69 concerns are identified in this section of the report. The findings that support each concern are listed immediately in the front of the concern. All of the concerns were judged to be Category III, except IH.6-2, which was judged to be Category II. The category rating, potential hazard, and level of noncompliance for each concern were determined by using criteria contained in Section 4.8.

Drawing upon the extensive experience of its members, the S&H Subteam has made an effort to identify some of the responsible factors in each statement of concern. However, the S&H Subteam recognizes that this effort is at best imperfect due to the subteam's relative unfamiliarity with the details of the contractors' overall operations. Therefore, the S&H Subteam believes that the contractors should consider the findings, and even the statements of concern, as possibly symptomatic of some set of deeper root causes and should search out and correct those root causes so that there will be reasonable assurance that improvements in the safety of the operation will be sustained.

This is the second sitewide TSA to be performed at the BNL, the first was conducted in September 1989 (see Appendix B). Because of the proximity to the first TSA, and because response to both TSAs will be through a single action plan responsive to the Tiger Team report, this second TSA is additive to the previous, and these remarks are cumulative, reflecting both new concerns, which have been numbered consecutively to the September 1989 effort, confirmation of the previous findings, and improvements.

4.4 SAFETY AND HEALTH ASSESSMENT SUMMARY

Safety is considered a line responsibility at BNL, and safety responsibility and authority flow from the Laboratory Director down through Department and Division Heads to the working level. However, disconnects in the lines of communication provide major contributions to deficiencies in the safety performance of the Laboratory. Direction and guidance issued from the Laboratory

Director level are general in content and broad in scope, designed to give maximum latitude and responsibility to the Associate Directors and their subordinate Department Chairpersons. For the most part, the intermediate management levels below the Laboratory Director have passed the direction and guidance on without further amplification or specificity. Because these laboratory-wide policies and controls have not been designed to ensure a uniform and consistent safety program, appropriate specification of safety direction is not effected and the safety line of communication is effectively severed. This is further exacerbated by the absence of any follow up or feedback mechanism to ensure effectiveness of the original instruction. Since each department is autonomous in its safety responsibility many aspects of the safety program are thus fragmented, unfocused, inconsistent, not in compliance, and there is failure to establish proper priorities. On the other hand, experimental activities function well at the scientist-to-scientist level, where the actions of liaison scientists and engineers assure that experiment and personnel relations remain smoothly functional.

Senior management is involved in site safety activities. This involvement is particularly noted in the comprehensive annual operating review of individual departments where the participation by the Laboratory Director; the Associate Director for Reactor, Safety and Security; and the cognizant Department Associate Director has been effective and has resulted in establishing some sitewide consistencies. In fact, when a particular aspect of the safety program is approached comprehensively, in a sitewide manner, success and consistency usually result. BNL's effective facility safety review system is an example of this approach, where three sitewide safety review committees are working: the Cryogenic Safety Committee, the Reactor Safety Committee, and the Laboratory Safety Committee.

High standards of safety are held by some individuals, but are not universally required nor exhibited, nor widely appreciated and practiced among all facility personnel. The Laboratory's personnel injury incidence (possibly because of their reporting criteria) remains the highest among DOE research establishments, although this has been declining since 1988. Competence exists in the staff of essential safety organizations, but these resources are stretched thin, especially in fire protection, where staff and funding constraints appear to account for the majority of fire protection deficiencies identified.

There is little evidence of systematic development of safety policy and procedures. Also, there is a lack of formality in the management of safety policy in the line organizations and its administration through orderly systems of procedures, controls, and documentation. Procedures written and used by operating groups do not undergo formal periodic review, revision, and approval by S&EP personnel. In addition, S&EP does not track for

review and revision their own procedures, as required by DOE and good practice. Inadequate documentation poses an unintended, and even unanticipated, threat to safety of workers and experimenters.

Implementation of DOE Orders is inconsistent and sluggish, with major deficiencies noted in OSHA hazard communication requirements (a Category II Concern), OSHA compliance in general industry and construction standards, and fire protection standards and codes. After a slow start, the Laboratory is making progress in compliance with DOE 5480.11 training, but the external radiation dosimetry program is still not accredited through the Department of Energy Laboratory Accreditation Program, and internal audits of the internal dosimetry program are lacking.

Planning for safe activities is sporadic and perfunctory and suffers from the lack of adequate procedures and disciplined approach to safety problems. Maintenance performed by the Plant Engineering Division is a glowing exception, where activities are conducted in a safe and efficient manner, established policies are followed and consistently applied, and the laboratory-wide computerized Job Control Accounting and Recording System will not accept a work order without a completed health and safety block.

Controls to verify compliance with safety procedures and requirements are not applied by either the Laboratory or the BHO. Implementation of QA programs is spotty. Of the 17 programs in various stages of development or implementation in the BNL QA Program, evolving since early 1985, only one is considered fully implemented. Four of 21 BNL organizations have yet to develop an approved QA program. On the other hand the struggling QA Office is doing a creditable job of providing assistance and guidance to the BNL organizations, and is conducting independent audits, but its time and staffing resources are insufficient to provide the increased coverage needed Laboratory-wide.

While on the threshold of a modern safety culture in some areas, there remains a deep seated and pervasive attitude at BNL that safety is a necessary evil, that a rigorous approach to safety is incompatible with the research-oriented mission of the laboratory, that safety compliance should be minimal, that good science equates to satisfactory safety performance, and that BNL's pioneering of many safety disciplines implies an unbroken lead in the community obviating a need for improvement and suppressing any urgency for necessary corrective measures. We recognize a change in attitude will take diligence at all levels, but it must occur expeditiously.

Technological excellence exists in the research arena, but is not equaled in the safety program, where there is need for

improvement in knowledge of OSHA and sitewide staff appreciation of the relationship between housekeeping and fire hazards.

When procedures exist, they are not always followed with consistency or rigor, and deviations frequently occur without full documentation and evaluation. Although radioactive contamination control has been strengthened, and related training has improved, continued attention and emphasis are needed. As low as reasonably achievable (ALARA) documentation needs greater emphasis on environmental releases and contamination control, and implementation procedures need to be addressed to bring the program into compliance with DOE 5480.11. A significant radiological contamination incident related to the HFBR occurred during the TTA. The ongoing investigation had not been completed prior to the end of the appraisal; however, our observations indicate the BNL and the CH response is appropriate.

Overall performance and documentation of technical support activities at BNL are performed in a thorough manner only at the reactor areas. Other areas exhibited inconsistencies in preparation of timely SARs, which are often completed after the fact, opening up the possibility for excessive construction costs and undesirable compromises of safety protection in the facilities. For the most part, nonreactor areas did not employ Operational Safety Requirements and did not adequately identify, document, test, and maintain safety systems and safety equipment. Also, an envelope of parameters in which experiments or classes of experiments can be safely operated has not been developed.

Although recognized, BNL has not adequately addressed the release of nonradioactive toxic materials and specific emergency scenarios in their respective facility SARs and emergency preparedness. Also, equipment required to respond to such events has not been identified, dedicated, or made easily retrievable in the event of emergency. Required training for emergency management response personnel is not in place.

Although a comprehensive annual operating review of each BNL Department having more than office-type functions is performed, the scope of these reviews is not in strict compliance with DOE Orders. The triennial appraisal of the BNL safety review system has not been performed. Areas of potential conflict of interest exist among those who have independent safety review responsibility. For example, Chairmen/members of experiment review committees sometimes consider their own experiments, and areas of safety review do not report high enough in the BNL management structure to keep upper management sufficiently informed with respect to safety activities.

Improvements in the safety program have been noted. Packaging and Transportation for Hazardous and Radioactive Materials is being addressed, with a new policy document issued in March 1990,

and a Packaging and Transportation Manual expected in October 1990. Occupational accident rates show a decline since 1988, and increased emphasis has been placed on Occupational Safety. The construction safety program has received greater attention, stressing contractor safety requirements, and systems for establishing and communicating safety requirements and verifying conformance have been developed. There has been a marked improvement in the BNL training program, with the creation of a sitewide training task force, upgrading of courses, lesson plans, training procedures, on-the-job training, examinations, and records. BNL has been responsive sitewide to DOE 5480.11 training. Strengths were noted in the Plant Engineering Division.

Several root causes may be identified for the deficiencies in BNL safety performance: (1) CH, BHO, and BNL management have not established effective controls for verifying compliance with safety procedures and requirements; (2) BNL management has not established an effective mechanism to promulgate comprehensive safety policy to all levels or to provide feedback to establish its effectiveness; (3) Weakness in training and a lack of formality in safety-related operations have resulted in widespread noncompliance with Federal regulations and DOE Orders; (4) Lack of definitive sitewide safety policies has resulted in inconsistent safety performance throughout the laboratory; (5) CH and BHO have not exercised close safety oversight of BNL. Frequent effective inspections, assessments, and followups required to ensure an appropriate level of safety performance are absent;* (6) a rigorous approach to safety is still viewed by many at BNL as incompatible with the research-oriented mission of the laboratory.

The dedicated and highly competent staff at BNL is capable of substantially improving overall safety performance. This improvement can be realized by full acceptance of safety as an equal partner with the research mission, a sitewide approach to safety policy (which has been successful at BNL), procedures and training, and a pro-active approach toward compliance with Federal regulations and DOE Orders. Improvement can be demonstrated through better workplace practices and documentation.

* It should be noted that as a consequence of the September 1989 TSA, BHO implemented a new safety inspection program at BNL in November 1989. However, this new program is in its infancy, and its efficacy toward remedying this root cause remains to be demonstrated.

4.5 SAFETY AND HEALTH FINDINGS AND CONCERNS

4.5.1 Organization and Administration

4.5.1.1 Overview

The review of BNL was accomplished by interviews with Associate Laboratory Directors, Department Chairpersons, Safety Coordinators, Safety Officers, and Division Heads. An extensive array of documentation was reviewed and evaluated.

The organizational structure of BNL most closely resembles that of a large research university. With this concept in mind, the direction and guidance that are issued from the Laboratory Director level are general in content and broad in scope. Laboratory-wide policies and controls are not designed to ensure a uniform and consistent safety program within the Laboratory. They are designed to give maximum latitude and responsibility to the Associate Directors, who, in turn, confer the responsibility of specificity upon the Department Chairpersons. The result is that responsibility for safety policy implementation and operation resides in the Office of each of the Department Chairpersons.

The ability of Department Chairpersons and their support staff directly determine the effectiveness of both formulation and communication of safety policies to their staff. Likewise, the effectiveness of the implementation of the safety policy and procedures rests directly on the Departmental Chairpersons.

To produce a desirable result, this type of approach to the concept of line-management responsibility requires a strong, independent oversight and audit function that reports to the highest levels of management and has the ability to commission outside reports on everything from facility management to economic feasibility of forms of advanced research. The Team found S&EP functions limited both by staffing, by the concept of their being required to provide service to the programmatic staff, and by the potential conflict of interest for independent safety assessments.

Further, the type of line-management approach to safety employed by BNL requires that Associate Directors be aware not only of new programs that must be funded, staffed, and supported, but that they recognize and accept responsibility for funding, staffing, and supporting the type of "housekeeping" that goes with running major experimental programs or facilities. This commitment to operations as well as to new programs become more critical as the number of experimenters or the number of auxiliary programs increases.

The Team found little evidence of systematic development of safety policy and procedures, which should include complete paper trails from the Associate Director level of any given line of management at the Laboratory to the technician or operator who ultimately reports to him. Further, the Team found a lack of formality in the management and administration of safety policy in the line organizations. Failure to use orderly systems of procedures, controls, and documentation can pose an unintended, and even unanticipated, threat to safety of workers and experimenters.

The S&EP attempts to provide what amounts to a safety and health service by stationing Safety Representatives at the major facilities and departments. While these programs appear to work well on a routine basis, the effectiveness of this approach has the potential of being limited since the programmatic office has the responsibility for the facility or site at which the activity takes place. In fact, both the authority and responsibility are inaccurately attributed to the S&EP Division by personnel of other organizational entities.

Some line management from the Associate Director level down through the Department Chairpersons have failed to provide the charter and definitive direction for safety review committees, allowing these to be set up on an ad hoc basis. Although the committee activities considered by the Team provided generally appropriate reviews, the proliferation of unchartered review committees tends to spread the responsibility to the degree that no one is accountable.

A similar effect of the reliance on maximum management flexibility/minimal guidance from the highest levels of management is the spotty implementation of writing of mission and function statements, the writing of definitive job descriptions for all personnel who have safety responsibilities and authorities, and the establishment of measurable safety goals and objectives at all levels of responsibility.

The Team found that control systems for technical support and administrative information varied greatly in their implementation. For example, some department and division QA manuals that should be signed and dated are not, and there is no assurance that outdated versions of revisions are returned to document control personnel. This causes documents, which should be maintained in a current status, to be outdated, or causes numerous different versions of the same "controlled" document to be in existence.

The Team, likewise, is concerned that under certain conditions there could be a conflict of interest among those who have independent safety review responsibility. More importantly, the Team is concerned that areas of safety review do not report high

enough in the BNL management structure to keep upper management sufficiently informed with respect to safety activities. At a lower level, it appears that when chairpersons and members of experiment review committees consider their own experiments, they do not disqualify themselves from active participation in the review.

4.5.1.2 Findings and Concerns

OA.1 SITE/FACILITY ORGANIZATION

PERFORMANCE OBJECTIVE

Management should organize and manage the site/facility's work, programs, and resources so that safety and health are an integral part of the personnel duties, and requirements are consistently implemented.

FINDINGS:

- Many first-line supervisors and workers expressed a belief that the Safety Coordinator or the S&EP Representative was responsible for employee safety.
- Many employees interviewed indicated that if they had a safety problem they would involve the S&EP Representative or the Safety Coordinator before their own supervisor.
- The AGS operators on shift work reported to one supervisor for programmatic direction and to another one for line safety direction.
- The investigation committee that reviewed the radiation incident of December 18, 1989, in the Accelerator Test Facility (ATF), Bldg. 820, concluded that a contributing factor to the incident was unclear organizational lines of responsibility.
- The investigation report stated:
 - "From the very first draft of the SAR, the safety responsibility was assigned through the NSLS Department." However, "Comments on the drafts went so far as to suggest a letter of agreement about the responsibilities for safety between the NSLS Chairman, the Assistant Director for Safety, and the other senior management parties whomever they are."
 - "After the incident, the NSLS Dept. Chairman questioned whether he was the most appropriate person to sign the [Unusual Occurrence Report] UOR."

- The investigation committee report also stated: "These evening shifts consisted of personnel from several departments (Physics, Instrumentation, Light Source), with no lead person assigned."
- The investigation report further stated: "The investigation committee doesn't yet understand the organizational lines of the ATF."

CONCERN:
(OA.1-2)
(H2/C2)

Line safety responsibility was not clearly understood and practiced at Brookhaven National Laboratory. (Also see Concerns OA.1-1, Appendix B; OP.1-1, Appendix B; and OP.1-3.)

FINDINGS:

- Employees and first-line supervisors interviewed indicated that the holding of safety meetings varied from one per week in some groups to nonexistent in others.
- The quality of safety meetings varied; some were well planned with preselected safety topics and others were primarily program oriented meetings in which safety was an occasional topic.
- Workers and first-line supervisors interviewed were not aware of their department and division safety goals. (See Concerns OA.3-1, Appendix B; OA.3-2, Appendix B; and OP.1-2, Appendix B.)
- Those interviewed indicated that the policy on attending safety meetings varied from mandatory attendance to just encouraged to attend.

CONCERN:
(OA.1-3)
(H2/C2)

Safety meetings are not regularly scheduled and do not fully promote safety at Brookhaven National Laboratory.

OA.2 ADMINISTRATION

PERFORMANCE OBJECTIVE

Administrative programs and controls should be in place to ensure policies concerning health and safety are administered throughout the facility.

FINDINGS:

- Many management elements that pertain to safety-related items were informally delegated by the Laboratory Director to department and division level managers, and sometimes further delegated to even lower levels of management.
- Management was using memoranda extensively to provide safety policy directives and guidance. Some organizations had compiled in excess of 175 memoranda in the past 15 months. Over 275 memoranda were considered as active instructions.
- No Laboratory-wide document contained all current BNL safety policy statements and safety directives. However, BNL was planning to issue a Laboratory and Department/Division Safety Administrative Procedural Guide. This guide will be issued over a period of time, with the binder and first entries targeted for release in May 1990.
- The physical disposition of the policy directives and guidance memoranda mentioned above varied from retention of all memoranda to "read and dispose."
- No Laboratory-wide policies set requirements for:
 - chartering and formulating department and division safety review committees;
 - establishing and promulgating safety goals and objectives;
 - writing mission and function statements for the various suborganizational elements of the Laboratory;

- writing job descriptions which include safety responsibilities and authorities;
- controlling important safety documents that are necessary for the safe operation of the Laboratory; and,
- conducting regularly scheduled safety meetings to stimulate employees to perform their jobs safely and to strive to meet established safety goals.

CONCERN:
(OA.2-2)
(H2/C2)

Laboratory-wide administrative policies and controls do not ensure that all elements of an effective safety program exist within each department and division. (Also see Concern OA.2-1, Appendix B.)

FINDINGS:

- The Associate Director for Reactor, Safety and Security had a potential conflict of interest in that he had: (1) the responsibility for independent safety overview (provided by the S&EP Division), (2) the line safety responsibility for the Reactor Division, and (3) the three standing, independent laboratory safety committees reporting to him.
- The S&EP Division also had a potential conflict of interest in its three-fold responsibility for:
 - providing line safety responsibility for hazardous waste management;
 - providing advice, guidance, and assistance on safety matters to other departments and divisions; and,
 - providing independent safety overview of the hazardous waste management area, as well as those departments and divisions for which it provides advice and assistance.
- Some former BNL employees have been used as consultants to provide independent safety review on programs that they helped develop and implement.
- When the chairperson or members of some experiment safety review committees were

responsible for an experiment that was being reviewed by their own committee, they did not always disqualify themselves from participating on the review committee.

CONCERN:
(OA.2-3)
(H2/C2)

A potential conflict of interest exists among those who have both independent safety review responsibilities and line safety responsibility or past safety responsibility for the program.

OA.3 MANAGEMENT OBJECTIVES

PERFORMANCE OBJECTIVE

Site/facility management objectives should ensure commitment to safe operation, including enforcement of approved work practices and procedures.

- FINDINGS:**
- The DOE TSA Team that visited BNL in September 1989 noted the following regarding the formulation and implementation of goals:
 - "The BNL environment, safety, and health goals are neither definitive nor measurable and, in many cases, lack specific departmental action plans to accomplish the Laboratory-wide goals, as well as the specific departmental goals. Safety goals were also not embraced or appreciated by all Laboratory Management." (Also see Concern OA.3-1, Appendix B.)
 - "Measurable goals and performance indicators are not used at many facilities to effectively improve performance and safe operation." (Also see Concern OP.1-2, Appendix B.)
 - Workers and first-line supervisors interviewed were not aware of their department and division safety goals or objectives. Most of those interviewed thought that the current safety goals were one or more of the following:
 - clean up their work space;
 - perform their work safely;
 - increase safety awareness; or,
 - eliminate or reduce potential hazards.

CONCERN: Measurable and definitive goals are not being
(OA.3-2) developed and promulgated to all Laboratory
(H2/C2) employees.

OA.7 DOCUMENT CONTROL

PERFORMANCE OBJECTIVE

Document control systems should provide correct, readily accessible information to support site/facility operations.

FINDINGS:

- The Management Information Systems Division QA Manual was not a controlled document. It included pages from other documents that were outdated and the sources of these pages were not noted. Similar problems were also noted in the QA manuals for the Medical Department and Instrumentation Division.
- The BNL Safety Manual was not strictly controlled by copy number, and there was no follow-up system to ensure that copies were kept up-to-date.
- At the Medical Department, the procedures for the radiochemistry production of strontium-90 were neither dated nor signed.
- The Report of the Investigation Committee on Radiation Incident in Building 820 at BNL, December 18, 1989 concluded that the following document control issues were contributing factors and recommended that:
 - "Written and approved (by NSLS and S&EP) operating procedures which clearly define interim modes of operation should be established by Facility personnel."
 - "There should be some formal notification from the Assistant Director for Safety to the organization that the SAR is approved."
- The DOE TSA Team that visited BNL in September 1989 noted that:
 - "Management is not ensuring control of vital safety documentation and operating logs." (Also see Concern OA.7-1, Appendix B.)
 - "BNL, in general, does not have policy and procedures establishing the requirements for facility operations logs, their content,

use, and review." (Also see Concern OP.2-1, Appendix B.)

- Indexes of operating procedures, checklists, drawings, technical manuals and other documents pertinent to the operation of the facilities do not exist or were not available at the facility, and many documents important to the safe operation of the facility were not always available at the facility. (Also see Concern OP.3-1, Appendix B.)

CONCERN:
(OA.7-3)
(H2/C2)

The Brookhaven National Laboratory document control system does not ensure, as required by ANSI/ASME NQA-1, that QA documents important to the safe operation of a facility are available when needed and controlled.

4.5.2 **Quality Verification**

4.5.2.1 Overview

The quality verification appraisal activities at BNL were guided by seven performance objectives that focused on the development and implementation of an approved QA program. Interviews were conducted with management and QA personnel, selected documents were reviewed, and a sampling of departments and divisions were visited with selected activities observed. Those Departments and Divisions visited were: AGS, NSLS, Central Shops, BMRR, Instrumentation, Plant Engineering, Medical, Supply & Materials, Nuclear Energy, Contracts & Procurement, Physics, and Accelerator Development. Selected activities were observed in the following Bldgs.: 911, 928, 930, 725, 462, 479, 207, 208, 120, 535-B, 134-C, 600, 610, 452, 490, 801, 211, 703, 130, 197-C, 830, 938, 355, 510, 902-A, 935, and 924.

The BNL QA program has been an evolving one. A Laboratory QA policy was issued February 1, 1985. This policy, in part, states that each department, division, and project shall establish and implement QA programs that are appropriate to its activities, in terms of providing increased confidence, programmatic satisfaction, and safety. Four years later this policy was reiterated in a memorandum by the Director to all employees. Even so, four of 21 BNL organizations had yet to develop an approved QA program. Of the 17 programs in various stages of development or implementation, only the Reactor Division program was considered by BNL to be fully implemented. The Reactor Division was not reviewed during this appraisal. Seven others were actively attempting to formalize their QA activities. Each department and division had appointed a Designated Quality Assurance Representative (DQAR) to represent the organization in matters pertaining to quality and to serve as the focal point for the QA activities within the organization.

The BNL QA Manager had developed a generic Laboratory QA Manual that serves as an excellent guide in the establishment of QA programs. The manual includes necessary requirements for QA programs intended to meet NQA-1 standards, and limited requirements for QA programs intended to satisfy independent scrutiny and verification of research projects. The QA Office was doing a creditable job of providing assistance and guidance to the BNL organizations and conducting independent audits. The training provided by the QA Office had increased the awareness of BNL personnel of the need for their participation in the QA program. The staffing level of the QA Office and the time allocated by the Department and Division DQARs, however, was insufficient to provide the increased coverage needed Laboratory-wide.

A QA Steering Committee, consisting of 12 members selected from a cross-section of Laboratory management, meets quarterly and makes recommendations to the Associate Director for Management and Physical Plant concerning the development and implementation of formal QA programs throughout the Laboratory. The QA Steering Committee functions and lines of communication are not addressed in the BNL QA Manual. The QA Steering Committee had encouraged QA awareness and formalization of QA activities through recommended initiatives from each of the Laboratory departments and divisions.

The QA program had received additional emphasis in recent years as a result of both internal and external reviews. Current Laboratory action plans address those findings. Observations made during this appraisal confirmed that all milestones had not been met. Concerns have been noted for six of the seven appraisal performance objectives. No potential concern is noted for the performance objective for receiving and pre-installation inspections. The BMRR facility and storage areas were reviewed, and documentation was found to be complete and adequate.

Provisions were established for the control of purchased material, equipment, and services. The Division of Contracts and Procurement was in the process of developing a basis for evaluation of supplier performance. One of the data bases will contain information on nonconforming material supplied by that supplier. However, most users/requisitioners have yet to complete nonconformance reports required to provide feedback to the Division of Contracts and Procurement.

BNL policy for a documented procedure to be established, implemented, and maintained by each department and division for the calibration and control of measuring and test equipment, and associated standards, was appraised in detail. All aspects of the Laboratory operations and activities (i.e., operations, research, maintenance, etc.) were affected by the lack of implementation of a calibration program. The need for a calibration program that is accepted by all users of measuring and test instruments is evidenced by the number of findings.

The Laboratory Director has made it clear that safety and quality are line responsibilities. In carrying out this responsibility, each department and division is to verify the adequacy and effectiveness of its quality program by planned audits. Immediate corrective action is to be taken when deficiencies that will adversely affect quality, reliability, or safety are discovered. The independent verifications (by both the QA Office and the DQARs) of quality attainment within the departments, divisions, and projects were not adequate to enable BNL management to review and evaluate implementation of QA programs as required by Laboratory policy and DOE 5700.6B.

The CH had not conducted timely quality verification audits as required by DOE 5700.6B.

4.5.2.2

Findings and Concerns

QV.1 QUALITY PROGRAMS

PERFORMANCE OBJECTIVE:

Administrative programs and controls should be in place to ensure policies concerning quality are administered for each facility throughout the site.

FINDINGS:

- The BNL QA Policy was issued February 1, 1985, by the Laboratory Director. This policy, in part, stated that each department shall establish and implement QA programs that are appropriate to its activities, in terms of providing increased confidence, programmatic satisfaction, and safety. Four years later, this policy was reiterated in an April 3, 1989, memorandum by the Director to all employees.
- Full implementation of the departments and divisions QA programs was paced by the preparation, review, approval, and issuance of the supporting procedures. The BNL QA Manual provides guidance procedures to the departments, divisions, and projects for development of QA programs based upon CH 5700.6 and ANSI/ASME NQA-1. Seventeen of the 21 departments and divisions identified by BNL as needing to develop programs had formalized them in varying degrees ranging from preliminary issues to formal release and distribution.
- The BNL status report for October 1, 1989, through December 31, 1989, revealed that the departments and divisions had a widely varying rate of progress in developing and implementing their QA programs.

CONCERN:

See Concern QV.1-1, Appendix B.

FINDINGS:

- The QA Steering Committee and its functions were not addressed in the BNL QA Manual. This Committee had been in existence since 1984. The charter was in the form of a "charge" to the committee and was found on page 29 of the BNL Committee Handbook. The document was

revised January 1990 to update the term of membership of committee members.

- It was unclear how the important discussions and recommendations of the Committee are forwarded to the Directorate as a whole. The meeting frequency of the QA Steering Committee was quarterly, or at the request of the chairperson. Meeting minutes were published and distributed to the committee members. The last meeting was held February 9, 1990. The QA Steering Committee was charged with making recommendations to the Associate Director for Management and Physical Plant concerning the development and implementation of formal QA programs throughout the Laboratory. The recommendations were documented in the meeting minutes and distributed to committee members. There was no specific distribution to the Director's Office, although three members are Associate Directors.

CONCERN:
(QV.1-3)
(H2/C2)

The Quality Assurance Steering Committee functions and lines of communication are not addressed in the Brookhaven National Laboratory Quality Assurance Manual.

FINDINGS:

- The QA Office had not performed all of the audits scheduled for the past 3 years. Some of the departments and divisions had been audited more than once, whereas about half of the 21 departments or divisions had not been formally audited.
- QA audits are required by DOE 5700.6B to be performed as a primary activity by any organization that implements QA criteria or requirements. The BNL Laboratory Director's policy states that it is the responsibility of the BNL QA Manager, or his delegates, to periodically audit BNL Departments to ensure compliance with their procedures.
- The QA Office did not have an adequate audit tracking system regarding audit responses, follow up, and closeout.
- The BNL QA Manual assigns responsibility to department and division management to review and evaluate the implementation of their QA

programs to make certain that they are being carried out in a timely and effective manner.

- The DQAR is assigned the responsibility in the BNL QA Manual to audit the implementation of the QA program(s) and procedures, to make certain that they are being followed in a timely and consistent manner, and to report status and problems to the Department or Division Head. Also, the DQARs are to prepare status reports for the Laboratory QA Manager. Some departments and divisions, for example the Division of Contracts & Procurement, had chosen to give this auditing assignment to other than the DQAR.
- Some of the DQARs had performed internal audits, whereas the majority had not. Many of the departments and divisions (14 of 21) had completed the preparation of their 1990 and 1991 internal QA audit schedules, and others were preparing theirs.

CONCERN:
(QV.1-4)
(H2/C2)

Quality assurance audits at Brookhaven National Laboratory conducted by both the Quality Assurance Office and Designated Quality Assurance Representatives do not cover all departments and divisions as required by Laboratory policy. (Also see Concern QV.1-2, Appendix B.)

FINDINGS:

- The BNL QA Office was staffed with three full-time professional QA personnel - one of whom was the QA Manager.
- The BNL QA Manager was responsible for the development of a generic Laboratory QA program and procedures for providing professional QA assistance and guidance to the BNL departments, divisions, and projects and periodically auditing to ensure compliance with procedures.
- Each department and division had appointed a DQAR to represent the organization in matters pertaining to quality and to serve as focal points for the QA activities. Most of these DQARs had other primary duties, thus the time spent on quality matters was only minimal in those cases.

CONCERN: See Concerns QV.1-1, Appendix B, and QV.1-4.

FINDINGS:

- CH had not performed a formal QA appraisal in the last 4 years. The workshop held in 1987 does not qualify as an appraisal.
- The CH QA appraisal scheduled for 1988 was cancelled due to participation by CH in the TSA conducted in 1987.

CONCERN: The Chicago Operations Office had not conducted
(QV.1-5) timely quality verification audits as required by
(H2/C2) DOE 5700.6B.

QV.2 PROCUREMENT AND SUPPLIER CONTROL

PERFORMANCE OBJECTIVES:

Provisions should be established for the control of purchased material, equipment, and services; for selection and control of suppliers; and for assessing the adequacy of procurement activities.

FINDINGS:

- The Division of Contracts and Procurement was in the process of developing a basis to evaluate supplier performance. One of the data bases will contain information on nonconforming material supplied by that supplier.
- The Inventory Procurement Accounts Payable system presently listed shipping memorandum numbers for material that was returned to the supplier. This is only a small percentage of the nonconformances associated with purchased material. The system did not capture information on nonconforming material that was reworked or dispositioned "use-as-is."
- Most users/requisitioners had not completed the nonconforming report portion of Form BQF-003, "Inspection/Test Record Form" and provided feedback to the Division of Contracts and Procurement. A formal commitment had been made by the Laboratory for full implementation by June 30, 1990.

CONCERN: (QV.2-1) (H2/C2)

Brookhaven National Laboratory does not currently have a system in place for the evaluation and control of suppliers based on their past performance.

QV.4 CALIBRATION PROGRAM

PERFORMANCE OBJECTIVE

Provisions should be made to ensure that tools, gages, instruments, and other measuring and testing devices are properly identified, controlled, calibrated, and adjusted at specified intervals.

FINDINGS:

- Policy, as expressed in the BNL QA Manual, requires a documented procedure to be established, implemented, and maintained by each department and division for the calibration and control of measuring and test equipment (M&TE), and associated standards.
- Not all departments, divisions, and projects had such a program. The milestone was to have all procedures documented by March 31, 1990.
- Some departments and divisions had established a calibration program, but implementation had not taken place. Listings of equipment requiring periodic calibration were not readily available for most departments and divisions. The Laboratory-wide milestone was to have listings of safety MT&E prepared by May 31, 1990, with calibration to be completed by March 31, 1991.
- The NSLS was in the process of documenting (QAP-901) and implementing a system for calibrating and maintaining MT&E used for activities affecting the safety of its work. The NSLS Control Room had three oscilloscopes used for beam control, of which the recalibration for two (LINAC, VUV & X-ray beams) had exceeded the dates for recalibration as noted by the calibration labels affixed by the service company that last repaired the scopes.
- The Central Shops had recently (March 31, 1990) documented its calibration system in SOP 3.8.0, "Control of Measuring and Test Equipment." The Central Shops had also specified calibration frequencies for specific MT&E. However, the calibration program had not been fully implemented. A number of micrometers and

calipers used for final acceptance inspection were being used even though the recalibration date had been exceeded. Also, some of the inspection M&TE had not been put in the calibration system.

- Calibration of electrical instruments for use by the AGS technicians was performed by Instrument Repair and Calibration Section (Bldg. 923) of the Experimental Planning and Support Division of AGS. This instrument laboratory maintains electrical standards which are transfer standards. The transfer standards were calibrated by the BNL primary standards at the Standards Laboratory in the Instrumentation Division. A digital voltmeter that had not been formally calibrated and labeled was used to calibrate some user instruments. Also at the AGS:
 - Instruments submitted by users were not always calibrated; some were just checked to reference points. Results of check or calibration were indicated on tape strips by notation, i.e., "Cal 3-23-90." Other information, such as calibration due date and the calibrating laboratory, was not indicated.
 - The calibration log book was maintained in an informal manner, and in many cases traceability information for the instrument was not documented.
- The vacuum leak standards in use in the Magnet Division, Accelerator Development Department (Bldg. 902), were not maintained in a manner that provides traceability to the primary standard. Also at Bldg. 902:
 - Vacuum leak standards were not assigned unique identifier numbers.
 - Leak standards were reworked and tested with incomplete documentation of helium gas specification/grade and log book information.
 - A BNL uniquely modified vacuum leak standard of high-precision measuring capability had no part number or serial number assigned, and it was used as a transfer standard.

- Vacuum leak standards did not always display unique identification and calibration labels that indicate complete calibration status.
- In the Magnet Division coil winding operation (Bldg. 924), and assembly, welding, and testing operations (Bldg. 902), some inspection and setup gages were not included in a calibration recall program. Also in Bldgs. 902 and 924:
 - Some dimensional gage blocks and gaging shims were not assigned unique identification numbers.
 - A special gage master (identified as "DSS") was observed to be deformed, which makes questionable its use and reliability as a reference standard.
 - Calibration frequency intervals to verify continuing accuracy of gages had not been established.
 - Calibration data and calibration certificates normally were not requested for gages manufactured by Central Shops.

CONCERN: See Concerns QV.4-1, Appendix B, and MA.5-2.

QV.5 IDENTIFICATION AND CONTROL OF HARDWARE/MATERIALS

PERFORMANCE OBJECTIVE

Provisions should be established to identify and control the use or disposition of hardware, materials, parts, and components as well as to ensure that incorrect/defective items are not used.

FINDINGS:

- None of the DQARs interviewed produced a current listing of all personnel designated by the Department or Division Head to review and approve use-as-is or repair disposition for items that had been assigned to QA Classification Category A-1 or A-2. Such listings are required by the BNL QA Manual, Part II, Section 800, BNL-QAG-801, "Nonconforming Material Control," which also states that material designated as nonconforming will be reviewed and dispositioned by authorized personnel, who will also attempt to establish the root cause and prescribe corrective action.
- The BNL QA Office did not receive copies of Nonconformance Reports (NCRs) from the various departments and divisions.
- Individual departments and divisions had insufficient numbers of NCRs to track, analyze, and trend.
- Most department and division users/requisitioners had not completed the NCR portion of Form BQF-003, "Inspection/Test Record" and had not provided a copy to Contracts and Procurement. (See Concern QV.2-1.)

CONCERN: (QV.5-2) (H2/C2)

A formal system for the disposition of nonconforming materials has not been implemented by all Brookhaven National Laboratory departments and divisions.

FINDINGS:

- Spare parts and an only spare assembly tachometer generator, (QA Category A-2) for the AGS were maintained in locked steel cabinets at the Motor Generator Power Supply Area. This tachometer generator at AGS was observed to be

stored under conditions that allowed paint spillage on it.

- The tachometer was subsequently cleaned without review, approval, and documentation.
- Category A-2 spare parts (electrical brushes) observed in the AGS storage area were not tagged to indicate inspection status or category classification (Quality Level).
- Spare Radiation Averager circuit boards (Category A-2) for the Neutral Beam Test Facility were observed to be stored on an office shelf in Bldg. 830. These items were not tagged for identification of QA Category or inspection status.
- Persons interviewed indicated that storage of spare parts in offices by the user was a common practice.

CONCERN:
(QV.5-3)
(H2/C2)

Identification, control, and storage of safety-related hardware and materials are not being performed in accordance with ANSI/ASME NQA-1 requirements.

QV.6 INSPECTIONS

PERFORMANCE OBJECTIVE

Prerequisites should be provided in written inspection procedures with provisions for documenting and evaluating inspection results.

FINDINGS:

- No record of inspection or calibration was available at the Magnet Division or Central Shops on master gage (Drawing No. 25-704.05-3) date marked "10-13-88."
- Magnet Division master gage, Drawing No. 25.545.11-2 was inspected rather than calibrated by Central Shops. Variables data were not requested or reported.
- Requisitioners of shops fabricated items requesting inspection by the Central Shops Quality Control Section are under the perception that all dimensions on all parts are inspected 100 percent. Discussions with DQARs at NSLS and Physics confirmed this understanding. The Central Shops SOP 3.0.0, "Quality Control Section Responsibilities," paragraph 3.0.6.2 "Full Inspection," indicate that "100 percent" inspections are not always performed.

CONCERN: (QV.6-1) (H2/C2)

Personnel requesting inspections and tests do not always provide acceptance instructions or procedures describing the effort to be performed and the criteria for acceptance, as required by ANSI/ASME NQA-1.

QV.7 CONTROL OF SPECIAL PROCESSES

PERFORMANCE OBJECTIVE

Provisions should be established to ensure the acceptability of special processes such as welding, heat treating, non-destructive testing, and chemical cleaning, and that special processes are performed by qualified personnel using qualified procedures and equipment.

FINDINGS:

- Welding procedures developed by users and instructions provided in Central Shops SOPs did not provide specific instructions on the control of weld rod material.
- At the Welding Station for the Bldg. 902 Magnet Assembly Area, some stainless steel welding rods were observed to be without identification flags. They were mixed with flagged rods in the weld rod storage cabinet. The multiple types and sizes of welding rods in use at this welding station increase the need for positive controls.
- Requirements for welding rod suppliers to identify welding rod by markings or color codes on each rod or flagging each welding rod were not indicated in procedures.

CONCERN: (QV.7-1) (H2/C2)

Material identification requirements are not adequately provided in welding rod control procedures and practices.

4.5.3 **Operations**

4.5.3.1 Overview

The review of the BNL safety program in the area of facility operations was performed by reviewing the BNL Safety Manual, SARs, operating procedures (where they existed), operating logs, formal audits and appraisals, and other Laboratory documents. In addition, interviews were conducted with Safety Officers, the S&EP Division Head, operations personnel and their management, including Department Chairpersons and the Associate Director for Reactor, Safety and Security. General inspections of facilities were conducted in Bldgs. 725A, 930, 901, 491, 938, 939, 535, 911, 928, 906, 701, 820 and 528.

Unless otherwise noted, the findings and concerns in operations do not include reactors. However, the BMRR was inspected, the operating logs were reviewed, and the Reactor Supervisor (Group Leader) was interviewed. No potential concerns were found. The HFBR is still shut down. Line management, Safety Officers, and facility operations personnel had a good attitude toward improving the safety of their operations. Interviews with supervisors or operators at facilities visited led to the conclusion that, in general, operators and supervisors were knowledgeable of their facilities, including the operators in the central control room. However, qualifications of supervisors and operators could not be verified because of insufficient records of training, testing, and on-the-job performance in specific areas of assigned responsibilities.

Department Chairpersons and Division Heads, as a general practice, pass the numerous memoranda issued by the Laboratory Director's Office down to lower levels in the organization, without formal amplification or other guidance. Considering the lack of overall policies, guidelines, and procedures, operations personnel at some facilities have developed practices that are good. For example, the operations staff of the AGS distributes copies of shift logs to key personnel daily and makes them available in the control room area conference room for interested parties to read. They also developed a control room log system that provides a history of operations that is informative, includes off-normal conditions, and is traceable chronologically. The operations staff of other facilities has generally not been as perceptive.

Most of the findings leading to concerns resulted from lack of policy and guidelines from Department Chairpersons and Division Heads who have been delegated responsibility to "develop programs specific to their needs." This may be the root cause of most deficiencies, such as, lack of organization charts down to lower levels of operations, lack of job and functional descriptions of

each person and organizational unit, lack of clarity of responsibility and authority within operations organizations, and lack of clear understanding of responsibilities and authorities of organizations interfacing with operations. Departmental policies and guidelines have not been issued, by Department Chairpersons and Division Heads, such that all elements of a good safety program are implemented.

Some action was initiated by the Directors' Office prior to this visit to correct deficiencies in specific areas of safety. If these deficiencies still exist, they are included in this report. Several committees have been formed to address the issues and recommend corrective action. Schedules have been set for completion of each of these efforts. Areas being examined by BNL include preparation, control, content, and use of operating procedures; guidelines on SAR preparation; organization charts; tracking recommendations for improving safety; and conduct of operations. Efforts already implemented by line management have not resulted in correction of the total problem. For example, the directive issued on requirements for organization charts was not followed-up with formal guidance by the Department Chairpersons and Division Heads. This resulted in unclear charts being distributed for AGS operations and operational personnel interaction with other organizations. Success of the program will depend upon appropriate implementation of the guidelines by the Department Chairpersons and Division Heads.

4.5.3.2 Findings and Concerns

OP.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE

Operations organization and administration should ensure effective implementation and control of operations activities.

- FINDINGS:**
- In operations in AGS, documentation of the organizational structure and the interface with other organizations was not clearly defined.
 - Operations personnel in AGS did not always understand their interface with experimenters and Safety Officers and the parent organization of the experimenters.
 - In the Chemistry Department and AGS, responsibilities and authorities of management, supervisory, and professional positions were not well-defined. In most cases, formal, approved job descriptions did not exist. The advertisement used to fill a vacant position which emphasizes qualification rather than job description was generally accepted to be the job description.

CONCERN: Operations personnel do not clearly understand
(OP.1-3) their authority and responsibility.
(H2/C2) (Also see Concern OA.1-2.)

- FINDINGS:**
- The organization chart for operations at the AGS distributed by memorandum on March 20, 1990, was not signed as required by Laboratory policy (Memorandum from H. C. Grahn, February 16, 1990).
 - Formal instructions from Department and Division Heads typically did not exist and typically did not require operation organization charts, showing operations line of authority and interrelationship of other organizations that may affect safety, to be reviewed and concurred in by all affected organizations before they are approved.

- The operation organization structure at lower levels was developed into chart form without the benefit of guidance on format and use of solid versus thin or dotted lines. This practice does not provide clarity with respect to lines of authority, and some charts implied lines of authority that were not factual.

CONCERN:
(OP.1-4)
(H3/C2)

Formal policy and guidelines from Department Chairpersons and Division Heads do not exist for development, review, approval, and issuance of organization charts. (Also see Concern OA.1-2.)

FINDINGS:

- The Associate Director for Safety issues memoranda to Department Chairpersons and Division Heads identifying safety problems and issues. Department Chairpersons and Division Heads, in turn, usually pass these same memoranda to lower levels, rather than developing a policy or providing specific instructions related to the need.
- Operations personnel expressed concern that they may not be following the latest requirements because it is cumbersome to check so many references.
- All Department Chairpersons and Division Heads had been assigned responsibility "to develop programs and a department/division policies and procedures manual specific to their needs." Informal programs have been established; however, few policy and procedures manuals have been published.

CONCERN:
(OP.1-5)
(H2/C2)

Department Chairpersons and Division Heads are not effectively formulating and issuing policy for their organizations which is specific for their needs.

FINDINGS:

- The suggestive "should" rather than the directive "shall" has extended to the operations level.
- Action words used in policy and guidance documents, such as may, should, will, must and shall, were not defined in BNL policy or safety documents. ANSI standards normally define

shall, should, and may. Nonuniformity in the use of the words "should" and "shall" has an adverse impact on safety and reliable operation.

- Operations-level personnel expressed concern with the use of "should" as a means of emphasizing responsibility because this word implies authority to vary from the BNL Safety Manual.

CONCERN:
(OP.1-6)
(H2/C2)

Use of the suggestive "should" in policy and guidance documents results in accountability for safety-related responsibilities not being clearly established.

OP.2 CONDUCT OF OPERATIONS

PERFORMANCE OBJECTIVE

Operational activities should be conducted in a manner that achieves safe and reliable operation.

FINDINGS:

- At facilities visited except AGS and NSLS, Department Chairpersons and Division Heads had not provided formal policies and guidelines concerning the conduct of facility operations. (For all smaller facilities reviewed, including the two cyclotrons in the Chemistry Department, the Radiation Effects Facility and the Neutral Beam Test Facility, all the below-listed findings apply. For larger facilities, such as the AGS, NSLS, and Tandem Van de Graaff, most of the below-listed findings apply).
- Written requirements or guidance did not exist for types, completeness, style, or format for operational records.
- Operating procedures, safety documents, and check lists did not generally exist. Neither operating procedures nor check sheets were routinely used at small facilities.
- At the smaller facilities, operating logs were not adequate to allow reconstruction of events during the past shift(s).
- Written facility policies and procedures, requiring supervisors and managers to monitor operations to identify and correct problems, did not exist.
- Where procedures existed, provisions were not made to periodically assure the procedures were adequate for the intended task, including shift turnover.
- Formal procedures did not exist to ensure that equipment status changes were appropriately documented and communicated to appropriate shift personnel in a timely manner.
- Management guidelines did not exist for deviating from procedures during an emergency.

- Documents, drawings, and other operator references were not authorized and properly controlled.
- Written procedures existed for bypassing radiation safety systems, but did not exist for other equipment and systems.
- Written requirements did not exist requiring maintenance of operating records that contain data for evaluating unusual occurrences and trends that could lead to procedure and equipment changes.

CONCERN: See Concerns OP.1-5; OP.2-1, Appendix B; and OP.3-1, Appendix B.

OP.4 FACILITY STATUS CONTROLS

PERFORMANCE OBJECTIVE

Operations personnel should know the status of the systems and equipment under their control, and should know the effect of non-operational systems and equipment on continued operations. They should ensure that systems and equipment are controlled in a manner that supports safe and reliable operation.

FINDINGS:

- There were no Laboratory-wide formal safety requirements for local identification of safety system components. The AGS began identifying safety system components in response to recommendations in UOR 87-13: AGS Radiation Safety System Fault.
- Requirements did not exist for acknowledging awareness of changes to systems or procedures by individuals or groups who might be affected by such changes. A recent change had been made at the Neutral Beam Test Facility without all affected individuals or groups having been informed.

CONCERN: (OP.4-1) (H2/C2)

A configuration control system did not exist requiring identification of safety-related components in the field and requiring formal review and approval before changes are made that may affect safe operation.

4.5.4 **Maintenance**

4.5.4.1 Overview

During the course of this appraisal, all Performance Objectives in the Maintenance area were addressed. Interviews were conducted with personnel from the Reactor Division, Safety and Environmental Protection Division, Plant Engineering Division, Central Shops Division, NSLS Department, and AGS Department. Interviews included managers, supervisors, and technicians. The following buildings were visited; 535, 913, 488, 931B, 462, 170, 930, 490, 725, 134, 933, 901, and 459.

Maintenance activities that are performed by the Plant Engineering Division through the "Intra Laboratory Request" system are conducted in a safe and efficient manner. Policies contained in the BNL Safety Manual are followed and consistently applied by the Plant Engineering Division. The "Intra Laboratory Request" contains a section that requires the requester to specify the applicability of health and safety considerations. The Laboratory-wide computerized work control system, Job Control Accounting and Recording System, will not accept the work order unless the health and safety block has been completed. It is not clear that the health and safety section is always filled out by qualified personnel. Plant Engineering is developing maintenance procedures for activities they consider necessary. A review of completed procedures indicates that they are of high quality.

Maintenance activities conducted by programmatic device organizations are less formal than those conducted by Plant Engineering, and improvements are needed to upgrade them to current good practice levels. A steering committee has been formed to address the operation and maintenance of programmatic equipment.

MA.1 ORGANIZATION AND ADMINISTRATION**PERFORMANCE OBJECTIVE**

Maintenance organization and administration should ensure effective implementation and control of maintenance activities.

FINDINGS:

- Within the AGS, numerous groups were responsible for maintenance activities.
- Many maintenance activities and associated health and safety practices were informally implemented and were not consistent within the AGS Department. Individual organizations within the Department had developed independent systems for implementation of maintenance activities and health and safety practices.
- The various AGS groups conducted maintenance activities with different practices and procedures, both formal and informal.
- BNL policies for health and safety were applied inconsistently among the various AGS groups which had maintenance responsibilities. The "Safety Instruction Form" from the BNL Safety Manual was not always used.

CONCERN:
(MA.1-3)
(H2/C2)

Formal or uniform maintenance programs are not consistently implemented at the Alternating Gradient Synchrotron Facility.

MA.2 CONDUCT OF MAINTENANCE

PERFORMANCE OBJECTIVE

Maintenance should be conducted in a safe and effective manner to support each facility condition and operation on the site.

- FINDINGS:**
- Work orders or work requests were not uniformly prepared or used in the NSLS and AGS Departments.
 - Maintenance activities were often conducted with only oral instructions, and there was no record of actual work performed, post-maintenance testing, or certification of satisfactory completion.
 - Within the AGS and NSLS Departments, it was not clear who had specific authority to initiate maintenance activities.

CONCERN:
(MA.2-2)
(H2/C2)

Documentation of maintenance activities for programmatic equipment is incomplete, and procedures for work control are not sufficient to ensure safe and efficient maintenance.

MA.5 CORRECTIVE MAINTENANCE

PERFORMANCE OBJECTIVE

The material condition of components and equipment should be maintained to support safe and effective operation of all facilities on the site.

FINDINGS:

- A classification of operational control instrumentation that requires calibration did not exist for the AGS or NSLS.
- Procedures were not in place for calibrations that will provide reproducible data and acceptance criteria.
- All control room instrumentation was not calibrated or was being used when indicated calibration dates had been exceeded.
- Tolerances for normal operation of control instrumentation had not been established to alert operators of drifting or failed signals.

CONCERN: (MA.5-2) (H2/C2)

A calibration and testing program which identifies instrumentation requiring periodic calibration and/or testing is not in place. (Also see Concern QV.4-1, Appendix B.)

MA.8 PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE

Maintenance procedures and related documents should provide appropriate directions and guidance for work and should be used to ensure that maintenance is performed safely and effectively.

FINDINGS:

- With the exception of the Plant Engineering Department, maintenance procedures and records were not developed or maintained in a uniform manner.
- A BNL procedure development policy was not consistently implemented for maintenance procedure development at the department level.
- Maintenance procedures ranged from excellent to nonexistent from department to department and within individual departments.
- Many existing procedures were informal, not adequately reviewed and approved, and lacked validation.
- Procedure compliance requirements were not clearly stated or were not enforced at the facility level.
- Policies and practices were often issued by memorandum.
- "Intra Laboratory Requests" and safety instructions were not always filled out or were filled out improperly; namely, without sufficient information for maintenance personnel in regard to specific health and safety concerns.

CONCERN: (MA.8-2) (H2/C2)

Maintenance procedures and documentation of maintenance activities for programmatic equipment frequently do not enable maintenance to be carried out in a controlled and safe manner. (Also see Concerns RP.3-5 and RP.3-7.)

4.5.5 **Training and Certification**

4.5.5.1 Overview

This appraisal included interviews with training personnel in the Safety and Environmental Protection, Reactor, Plant Engineering, and Safeguards and Security Divisions as well as in the AGS, NSLS, Medical, and Nuclear Energy Departments. Documentation of training plans and procedures, classroom lesson plans, on-the-job training, examinations, and personnel training records was reviewed and evaluated.

There is considerable evidence of a commitment at BNL to bring training and certification programs into compliance with DOE requirements and good practice standards. There are also indications that some groups are moving slowly in their training program improvements. A task force on training has been formed to determine the Laboratory-wide status of and needs for training and documentation. The task force is gathering information from the many divisions and departments and plans to make recommendations and issue guidance later this year. It is clear that initial training content, certification, and documentation will receive adequate attention, but it is not clear that regularly scheduled retraining and certification will receive similar attention.

The Training Group in the S&EP Division is responsible for general safety training Laboratory-wide; e.g., radiation protection, industrial safety, industrial hygiene, respirator training, and hazardous material handling. The group is diligently upgrading courses; preparing lesson plans; and drafting procedures for classroom training, on-the-job training, examinations, and the maintenance of training records. Their training facilities are minimal for effective group instruction. Except for one small, dedicated S&EP training room and a dedicated conference room, classes are generally given in other conference rooms around the Laboratory.

Laboratory-wide safety training has been particularly active in recent months. Department and division supervisors have received special training to the new requirements of DOE 5480.11. The radiation worker training course has been revised to reflect the new requirements, and all radiation workers are receiving this training as quickly as possible. As required, an introductory right-to-know course has been given to almost everyone in the Laboratory. A survey is under way to determine the chemicals used in various laboratory areas to allow for specific hazards training. S&EP safety representatives at the various Laboratory departments and divisions receive special training in health physics, industrial hygiene, and industrial safety. Because of

incomplete documentation, however, it cannot be verified that health physics technician training meets DOE Orders requirements.

Many other divisions at BNL have programmatic safety-related training responsibilities. The Reactor Division has documented training programs for operators and maintenance personnel of both the HFBR and the BMRR. The division is now conducting the initial self-evaluation of current training programs relative to the new accreditation requirements in DOE 5480.18. Reactor operators and supervisors as well as fissile material handlers in the Isotopes and Special Materials Group are trained annually in criticality safety principles and control procedures, as required by DOE Orders. The Security Division has an effective performance-based training program. Plant Engineering has significantly strengthened its training programs with specific course requirements, lesson plans, and training records. However, not all of their important safety-related training courses have certification exam requirements. Accelerator facilities do not have a documented, performance-based training program for initial and on-going operator and maintenance personnel qualification and certification.

Both the AGS and the NSLS have recently prepared guidelines for the conduct of operations which spell out training requirements. On-the-job training using a checklist is becoming more formal. Facility-specific, safety-related training requirements generally have increased. Laboratory-wide safety training and certification requirements for employee and visitor users of high-radiation facilities, however, need additional attention.

4.5.5.2

Findings and Concerns

TC.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE

The training organization and administration should ensure effective implementation and control of training activities.

FINDINGS:

- With the exception of the Reactor Division, Plant Engineering, and the Security Group, performance-based job task analysis for operations had not been performed. Lesson plans were not formalized. Qualification and certification records were inadequate.
- The AGS Operator Training Program was comprised of informal on-the-job training without a checklist. Documented evaluations of performance were not required; qualification was certified by the assistant head of operations.
- NSLS operators received an introductory training lecture and viewed training video tapes. On-the-job training was a scheduled activity, but a check list had not been developed. Documented evaluation of performance was not used for certification.
- In Plant Engineering, certification testing in important safety-related courses, e.g., that for training of crane operators and riggers, had not been implemented.
- Individual training records at operating facilities were not kept uniformly Laboratory wide. The content of the training records varied from good at the Reactor Division and Plant Engineering to unavailable in several departments.

CONCERN:

See Concerns TC.1-1, Appendix B, and TC.1-2, Appendix B.

TC.4 GENERAL EMPLOYEE/PERSONNEL PROTECTION TRAINING

PERFORMANCE OBJECTIVE

General employee and personnel protection training programs should ensure that site/facility personnel, subcontractors, and visitors have an understanding of their responsibilities and expected safe work practices and have the knowledge and practical abilities necessary to effectively implement personnel protection practices associated with their work.

- FINDINGS:**
- DOE 5480.11 requires radiation worker training every 2 years. BNL had upgraded its training course to meet the DOE requirement. All new employees who were occupational workers received training to the new course content. However, all existing occupational workers were not trained to the new requirements by January 1, 1990.
 - BNL had requested an extension of time to meet the requirement for all radiation workers, but no formal response had been received from HQDOE.
 - Only one single exam was used to certify radiation worker training. A passing grade requirement had not been established.

CONCERN: All radiation workers at Brookhaven National Laboratory have not been trained and certified to meet the requirements of DOE 5480.11.
(TC.4-1)
(H2/C1)

- FINDINGS:**
- Employee and visitor users at the NSLS view an 11-minute safety orientation videotape and then sign a certification form. The videotape content was to be expanded to about 30 minutes to provide additional coverage of radiation safety. Exams were not required for certification.
 - By June 1990 access to the AGS ring, LINAC area, or primary beam lines will be permitted only for personnel who have received AA 256 Key training and Lock out/Tag out training. Exams were not to be required for certification.

- Radiation worker training (film-badge course) was required to obtain a radiation worker film badge. A passing grade for certification was not required on the exam. This training course was available each Monday for employee and visitor users. Until the training is completed, users are issued a red film badge, which requires escort in radiation areas.

CONCERN:
(TC.4-2)
(H2/C1)

Safety training and certification requirements for employee and visitor users are not in compliance with DOE 5480.11 at many Brookhaven National Laboratory facilities.

TC.5 MAINTENANCE PERSONNEL

PERFORMANCE OBJECTIVE

The maintenance personnel training qualification programs should develop and improve the knowledge and skills necessary to perform assigned job functions.

- FINDINGS:**
- At the AGS, a maintenance manual was used as a guide for on-the-job training. Certification evaluations were not used, and no formal documentation of training was maintained.
 - At the NSLS, maintenance was performed by equipment operators. There was no formal documentation of training, and qualification evaluations were not required.
 - Maintenance training at the BMRR was carried out according to a check list. Certification exams were not required.
 - In Plant Engineering, lesson plans had been developed for maintenance training. However, formal exams were not required to qualify maintenance personnel.

CONCERN:
(TC.5-1)
(H2/C2)

At most Brookhaven National Laboratory facilities, there is no maintenance training and qualification program to ensure safe and effective maintenance activities. (Also see Concern TC.3-1, Appendix B.)

TC.9 RADIOLOGICAL PROTECTION PERSONNEL

PERFORMANCE OBJECTIVE

The radiological protection personnel training and qualification program should develop and improve the knowledge and skills necessary to perform assigned job functions.

FINDINGS:

- Health physics technicians received 3 months of training, which included both classroom instruction and applications; however, detailed lesson plans and records of certification exams were not readily available.
- In 1988 a 5-day (40 hours) commercial health physics course was given on site to technicians, but exam records were not readily available.
- A self-paced computer-based health physics package was available for generic training. The package had a single comprehension test in each section, and test scores were recorded in the computer memory.
- Training records of health physics technicians were not available to verify certified training every 2 years.
- The Building Safety Services Group Leader stated that all health physics technicians would be certified under the accredited program required by DOE 5480.18; however, that program plan does not require submittal until November 1990.

CONCERN: (TC.9-1) (H2/C1)

Documentation of the health physics training program required to verify that technicians receive certified training in compliance with DOE 5480.11 is incomplete and not readily available.

4.5.6 **Auxiliary Systems**

4.5.6.1 Overview

During the course of this appraisal, all Performance Objectives except Storage and Handling of Fissile Material were addressed. This area was covered under Nuclear Criticality Safety. Interviews were conducted with personnel from the Reactor Division, S&EP Division, Plant Engineering Division, Central Shops Division, NSLS Department, and AGS Department. Interviews included Managers, Supervisors, and Technicians. The following buildings were visited: 535, 913, 488, 931B, 462, 170, 930, 490, 725, 134, 933, 901, and 459.

In general, the auxiliary systems at BNL were reliable. Technical Specifications and SAR requirements were being met at the BMRR and NSLS Facilities. Radioactive and nonradioactive waste volumes were relatively small. Waste minimization had been emphasized since 1987, and efforts to reduce storage and accumulation of hazardous materials continue to receive BNL upper management attention.

Engineered safety features and safety systems at the BMRR were maintained, and surveillance was being performed in accordance with approved procedures, and the requirements for testing were being met. Cleanup systems were being maintained at the required purity for circulating coolant and associated equipment.

AX.5 VENTILATION SYSTEMS**PERFORMANCE OBJECTIVE**

Ventilation systems should reliably direct all airborne effluents from contaminated zones or potentially contaminated zones through cleanup systems to ensure that the effluent reaching the environment is below the maximum permissible concentration and is ALARA.

FINDINGS:

- Pressure drop instrumentation was not installed on all high-efficiency particulate air filters to detect incipient clogging of filters and system failures. An example was the Machine Shop "hot" area.

CONCERN:
(AX.5-1)
(H2/C2)

High-efficiency particulate air filters without pressure drop instrumentation cannot be monitored for clogging or penetration on a continuous basis.

4.5.7 **Emergency Preparedness**

4.5.7.1 Overview

The emergency preparedness evaluation used as a basis the seven performance objectives listed under that heading in the DOE TSA document. These objectives covered organization and administration, emergency plan and implementing procedures, training, drills and exercises, facilities and equipment, assessment and notification, and personnel protection. The sites visited to perform this assessment included the S&EP Office Building Annex (Bldg. 129), the Emergency Operations Facility (EOF) (Bldg. 50), the Occupational Medical Clinic (Bldg. 490), the Calibration Facility (Bldg. 348), the Atmospheric Sciences Facility (Bldg. 51) and the Hazardous Waste Facility (Bldg. 445).

An extensively revised and upgraded BNL Emergency Plan is currently under review. The two reactor emergency plans were last revised in 1988 and also need to be formally reviewed and updated to correct identified deficiencies. Implementation procedures, which may be required during an emergency, are in place but not specifically referenced in the appropriate plans for easy retrieval. These plans have not adequately addressed the release of non-radioactive toxic materials and specific emergency scenarios identified in their respective facility SARs. The problem is recognized and in the process of solution.

Emergency response personnel have been identified and appear competent and experienced in their own special fields. However, a required training program for coordinating the response of these individuals and to address other training needs is not in place.

A modified BNL sitewide emergency exercise, held in September 1989, failed to demonstrate proper coordination and appropriate actions by all individuals or organizations. One follow up integrated exercise has since been conducted. Others are planned but have not been scheduled. However, more frequent drills are held by elements of the emergency response organizations. These have been useful in providing some measure of the required training verification.

Deficiencies in the current EOF Building design and equipment were noted and are acknowledged by Laboratory management. An alternate EOF Building has been selected but not equipped.

Equipment available to handle credible accident scenarios involving radioactive materials is adequate. For accidents involving nonradioactive toxic materials, the equipment required has not been identified and dedicated or made easily retrievable in the case of an emergency.

Deficiencies in the testing of radiation monitoring instrumentation to satisfy required performance standards were identified.

4.5.7.2 Findings and Concerns

EP.2 EMERGENCY PLAN AND IMPLEMENTING PROCEDURES

PERFORMANCE OBJECTIVE

The emergency plan, the emergency plan implementing procedures, and their supporting documentation should provide for effective response to operational emergencies.

- FINDINGS:**
- The BNL Emergency Plan did not fully address the consequences of, and the response to, an emergency involving the uncontrolled release of toxic, nonradioactive materials as required by SARA Title III, 1986.
 - The HFBR and BMRR Emergency Plans did not specify the postulated accident scenarios which would trigger the responses associated with the emergency action levels defined by DOE. (The HFBR Emergency Plan has since been revised to correct this deficiency and has been approved.)
 - The last documented revisions of the HFBR and BMRR Emergency Plans were in 1988. These plans, and others dated before 1989, had not undergone an annual review.

CONCERN: See Concerns EP.1-1, Appendix B; EP.2-1, Appendix B; and EP.6-1, Appendix B.

EP.3 EMERGENCY RESPONSE TRAINING

PERFORMANCE OBJECTIVE

Emergency response training should develop and maintain the knowledge and skills for emergency personnel to respond to and control an emergency effectively.

- FINDINGS:**
- On-site personnel who have to manage protective actions in the event of emergency had been identified. However, the training program required for these individuals was not in place.
 - An emergency exercise held in September 1989 identified certain weaknesses. One table-top drill and one integrated exercise have since been held. Others are planned but have not been scheduled.

CONCERN: See Concern EP.3-1, Appendix B.

EP.5 EMERGENCY FACILITIES, EQUIPMENT, AND RESOURCES

PERFORMANCE OBJECTIVE

Emergency facilities, equipment, and resources should adequately support site/facility emergency operations.

- FINDINGS:**
- Potential exposures of occupants of the present EOF Building resulting from a release of toxic or radioactive materials under unfavorable meteorological conditions had not been evaluated.
 - The EOF Building did not have sufficient equipment to ensure that its occupants were not unknowingly or unnecessarily exposed to toxic or radioactive materials in the event of a release of such materials.
 - The EOF Building ventilation system intake was not filtered to prevent exposure to its occupants resulting from airborne toxic or radioactive particulates.
 - An alternate EOF building had been designated in the event that the primary EOF was not habitable. However, it was not equipped or ready for use.

CONCERN: See Concern EP.5-1, Appendix B.

- FINDINGS:**
- The emergency response radiation monitoring equipment had not been tested to demonstrate conformance with the specifications listed in ANSI N320-1979.
 - A lack of equipment and facilities prevented compliance with sections of this standard.
 - The test results for identical instrument models tested at other laboratories or DOE facilities had not been employed as a means of meeting the ANSI requirements.
 - A waiver for exemption from certain requirements of the ANSI standard had not been requested from DOE.

CONCERN:
(EP.5-2)
(H2/C1)

The radiation monitoring equipment designated for use during an emergency response does not meet all of the requirements of ANSI N320-1979.

4.5.8 **Technical Support**

4.5.8.1 Overview

Six of the eight performance objectives in this functional area were addressed in this appraisal. Environmental Impact was not addressed as it was addressed in detail by the Environmental Subteam. Criticality Safety was covered in a separate functional area by the S&H Subteam (see Section 4.5.9). This appraisal included visits to the NSLS, the AGS, the BMRR, the Tandem and Small Van de Graaff Accelerators, the Relativistic Heavy Ion Collider construction site, two Cyclotrons, the Inhalation Toxicology Facility, and the Positron Beam Facility. Discussions were held with representatives of the Plant Engineering Division, the S&EP Division, the Reactor Division, the Chemistry Department, the Medical Department, the NSLS Department, the AGS Department, and the Department of Applied Science. These activities involved visits to Bldgs. 134, 179, 480, 490, 491, 535, 555, 725, 901, 901-A, and 912.

Overall performance and documentation of technical support activities at BNL are performed in a thorough manner only at the reactor areas. Other areas exhibited inconsistencies in preparation of timely SARs and other documents. For the most part, nonreactor areas did not employ Operational Safety Requirements (OSRs) and did not adequately identify, document, test, and maintain safety systems and safety equipment. A wide variety of organizations provide technical support at BNL. The Plant Engineering Division provides design and construction management for capital improvement projects and is well-organized to provide this support in an effective manner. Technical support for on-going operational activities is largely provided by groups within the various operating departments.

OSRs are employed for reactor operations but not for most other activities at BNL. A new Occupational Health and Safety Guide entitled, "Safety Analysis Reports," was in draft form at the time of this appraisal. This document, as drafted, will require generation of OSRs from each SAR as well as a list of safety systems and devices. If fully implemented, this could lead to alleviation of three of the concerns expressed in this appraisal.

Reactor engineering was appraised only for the BMRR, since the HFBR was out of service at the time of this appraisal. These activities were adequately documented and were in conformance with DOE Orders.

Facility modifications are generally conducted in conformance with DOE Orders. However, frequently these modifications are undertaken and sometimes completed before the SAR is completed and approved. This practice could lead to excessive construction

costs as well as to undesirable compromises of safety protection in the facilities, and a concern is expressed in this area.

Occupancy Readiness Reviews (ORRs) are conducted near the completion of each construction project. Often, these are conducted in two stages, one to allow beneficial occupancy to permit setting up equipment for testing purposes within the new facility, and a second which leads to the status of "occupancy readiness." Documentation is not always clear as to which of these reviews is being performed. The emphasis of both types of ORR is on the construction performed and the inclusion of adequate safety features. Few, if any, of the documented findings, following conduct of recent ORRs, relate to operational activities to be conducted in the facility or to adequacy of training or procedures for the conduct of these activities. A concern is expressed in this area.

Packaging and Transportation of Hazardous and Radioactive Materials was undergoing significant upgrade at the time of this appraisal. A new policy statement on this subject was issued by the Laboratory Director on March 23, 1990. These activities will culminate with preparation of a packaging and transportation manual by October 1, 1990. In view of this changing situation and the satisfactory progress being made, this performance objective was not assessed in detail during this appraisal.

TS.2 PROCEDURES AND DOCUMENTS**PERFORMANCE OBJECTIVE**

Technical support procedures and documents should provide appropriate direction, allow for adequate record generation and maintenance for important activities, and should be properly and effectively used to support safe operation of all facilities on the site.

FINDING:

- Over 20 nonreactor SARs were reviewed; operational safety requirements or limits were identified only for the one concerning the Live Fire Range.

CONCERN:
(TS.2-3)
(H2/C2)

Operational safety limitations are not identified for most nonreactor facilities. (Also see Concern EA.4-1.)

FINDINGS:

- None of the over 20 nonreactor SARs reviewed identified safety systems or devices along with requisite testing and maintenance requirements.
- None of the Safety Coordinators interviewed in nonreactor organizations were aware of any other documented identification of safety systems or devices, or of any documented requirements for testing and maintenance of such devices.

CONCERN:
(TS.2-4)
(H2/C2)

In nonreactor areas, safety systems and devices are not fully identified, and special testing or maintenance requirements are not stipulated for such equipment.

TS.3 FACILITY MODIFICATIONS

PERFORMANCE OBJECTIVE

Technical support services required by each facility on the site to execute modifications should be carried out in accordance with sound engineering principles that should assure proper design, review, control, implementation, and documentation in a timely manner.

FINDINGS:

- An ORR was performed for beneficial occupancy of the Positron Beam Facility in Bldg. 480 on December 5, 1989, but the SAR had not yet been issued. The ORR memorandum, in fact, suggested two additional items for incorporation in the SAR.
- An ORR for beneficial occupancy of the Inhalation Toxicology Facility was performed on February 6, 1990, but the SAR had not yet been submitted to the Laboratory Safety Committee for approval.
- An ORR for beneficial occupancy of the Accelerator Test Facility was performed on April 20, 1989; the SAR was later recommended for approval on September 27, 1989.

CONCERN: (TS.3-2) (H2/C2)

Safety Analysis Reports are not prepared before completion of a facility design or of a facility modification.

FINDINGS:

- BNL performs ORRs in connection with construction of new facilities in accordance with BNL Occupational Health and Safety Guide No. 1.3.2. These reviews cover primarily the facilities and equipment that were part of the construction project and seldom include activities to be performed in the facility.
- Review of the memoranda concerning ORRs performed during the preceding 6 months showed no instance of a finding relative to the experiments, procedures, training, or activities to be performed in the new facility.

- Neither the ORR for beneficial occupancy performed on April 20, 1989, nor the final ORR performed on March 23, 1990, for the Accelerator Test Facility in Bldg. 820, contained any finding relative to the experimental activities to be performed in the new facility.
- An UOR (UOR-89-28) was issued for a radiation incident occurring at the Accelerator Test Facility in Bldg. 820 on December 18, 1989. The report of the incident investigating committee stated that the lack of a complete safety review of the experimental setup and planned interim operations was a major factor causing this incident.

CONCERN:
(TS.3-3)
(H2/C2)

Brookhaven National Laboratory Occupancy Readiness Reviews do not satisfy the requirements for the more conventional Operational Readiness Reviews.

TS.4 EQUIPMENT PERFORMANCE TESTING AND MONITORING

PERFORMANCE OBJECTIVE

Effective equipment performance testing and monitoring should be performed by technical support groups to ensure that equipment and system performance is within established safety parameters and limits.

FINDINGS:

- No formal system has been established for performance testing and monitoring of all safety-related equipment outside of the reactor areas.
- Through interviews it was found that some equipment is run as needed and only repaired or replaced when it fails.

CONCERN: (TS.4-3) (H2/C2)

No formal sitewide system has been established for performance testing and monitoring of equipment within established safety parameters and limits. (Also see Concern TS.4-1, Appendix B.)

4.5.9 **Nuclear Criticality Safety**

4.5.9.1 Overview

This appraisal included discussions with the Criticality Officer, HFBR Plant Manager, Reactor Training and Procedures Manager, and Isotopes and Special Materials Group Leader. Documentation of nuclear criticality safety training, procedures, analyses, and audit reports was reviewed and evaluated. Fissile storage areas were visited at the HFBR, Bldg. 750, and Hazardous Waste Facilities, Bldg. 446.

Policy for the nuclear criticality safety program at BNL is defined and documented in the BNL Safety Manual. Although nuclear criticality safety is a line responsibility delegated by the Laboratory Director to the various departments and divisions, a Criticality Officer is appointed to advise upper management on the safe handling of fissile materials. The responsibilities of the Criticality Officer are clearly defined. A concern about the degree to which the Criticality Officer is independent of operations has been expressed.

Although analyses required to ensure criticality safety are the responsibility of operations within specific departments and divisions, they are reviewed and approved by the Criticality Officer and the Reactor Safety Committee. Conservative sitewide nuclear criticality safety mass limits are spelled out in the BNL Safety Manual. Greater mass limits for specific applications have been adequately supported by documented analyses.

Other than reactor fuel for the HFBR and the BMRR, only small quantities of fissile materials are used at BNL. This greatly reduces the risk of a criticality accident. Written procedures, which include conservative limits and administrative controls to ensure the safety of operations, cover the movement of both fresh and spent fuel for the reactors. Fuel is moved and placed in storage by trained fissile material handlers. Fuel is stored safely in approved facilities; however, more attention could be given to the good practice of eliminating combustible materials in the storage areas. Storage areas are appropriately posted, but more attention could be given to the uniform quality of the signs. Nuclear criticality safety practices are audited annually for compliance with regulations and good standards.

The HFBR does not have a criticality alarm system or nuclear accident dosimeters as required by DOE Orders. However, an alarm system has been ordered and is scheduled to be installed and operational in 1991. Appropriate emergency procedures and exercises remain to be addressed.

4.5.9.2

Findings and Concerns

CS.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE

All operations with fissionable material should be conducted to provide effective nuclear criticality control during all activities.

FINDINGS:

- According to the BNL Safety Manual, the safe use of fissionable material is a line responsibility. Nevertheless, the Associate Director for Safety had appointed a Criticality Officer to advise him and the Reactor Safety Committee on matters related to criticality safety.
- Although the Criticality Officer was in the Reactor Analysis Division, for criticality safety he reported to the Associate Director of Reactor, Safety and Security. The Reactor Operations group also reported through the Reactor Division to the Associate Director of Reactor, Safety and Security.
- The Reactor Safety Committee also reported to the Associate Director of Reactor, Safety and Security.

CONCERN:
(CS.1-1)
(H2/C1)

The criticality safety program is not independent of operations in compliance with ANS 8.1-1983 as required by DOE Orders. (Also see Concern OA.2-3.)

CS.5 CRITICALITY ALARM SYSTEM AND EMERGENCY PROCEDURES

PERFORMANCE OBJECTIVE

All reasonable steps should be taken to mitigate the consequences of a nuclear criticality accident.

FINDINGS:

- The June 1987 TSA of the HFBR expressed a concern that the criticality alarm system did not meet all the requirements of DOE 5480.6. (DOE 5480.6 implements the requirements of DOE 5480.5.)
- As a response to that concern, BNL presented an analysis to verify that safe mass requirements, even with double contingency, can be achieved with administrative procedures requiring that only five fresh fuel elements be handled at a time outside of the fuel shipping container.
- DOE 5480.5 requires that a criticality alarm system be installed in all locations where the quantity of fissionable materials exceeds specified limits, regardless of administrative procedures.
- BNL intends to install and put into operation a criticality alarm system at the HFBR by January 31, 1991.
- At the HFBR fissile fuel storage areas, nuclear accident dosimeters were not used as required by DOE 5480.11, and criticality emergency exercises and drills were not conducted.

CONCERN: (CS.5-1) (H2/C1)

A criticality alarm system, nuclear accident dosimeters, and emergency procedures and drills have not been implemented to cover the fissile fuel storage areas at the High Flux Beam Reactor in compliance with DOE 5480.5.

4.5.10 **Experimental Activities**

4.5.10.1 Overview

The experimental facilities at the BNL consist of four major user-based facilities and their ancillaries. There are also numerous smaller, program-oriented experimental facilities.

The four major experimental facilities include: the AGS, the NSLS, the Tandem Van de Graaff, and the HFBR. This assessment covered all of the major facilities, except the HFBR, and many of the smaller facilities.

In terms of numbers of users/experimenters, the largest facility is the NSLS. This facility has over 2000 general users consisting of BNL scientific and technical staff, and scientists and engineers from various sectors of industry, from the university community, and from the international high-energy and nuclear physics community.

The second largest facility, in terms of numbers of users/experimenters, is the AGS. Of the approximately 650 users, the BNL staff comprise 15 to 20 percent with the remainder coming from university, industry, and international scientific sources.

The Tandem Van de Graaff Generator is the third major experimental facility at BNL. The user/experimenter community at this facility numbers about 100. Most of these users are from Federal Government Departments other than the DOE, as well as contractors.

In general, the Team found that experimental activities functioned well at the scientist-to-scientist level. The organizational units responsible for the experimental facilities have instituted User Programs by which a staff member from the facility becomes the liaison scientist, and thereby, the official spokesman for the experiment. The liaison scientist shepherds the experiment through the required safety and experiment review committees and through staff review. A liaison engineer also serves as the experiment fabrication/construction interface with the BNL technicians and craftsmen to ensure that the experiment is constructed as approved. This utilization of "liaisons" ensures that experiment and scientist-to-scientist relations remain smoothly functional during both preoperational activities and during experiment operations.

Although this program of experiment development and implementation is one of the more formally defined at BNL, there are still portions for which adequate planning and implementation are suspect, as evidenced by documentation and procedures.

In summary, there are two branches of these overall experimental programs: experiment conception and implementation and experiments/facilities operation. Although experiment conception and implementation appears to work well on the liaison scientist and liaison engineer concepts, the Team had two significant concerns. The first concern arises in the safety review and subsequent operation of the experiments/facilities because the safety review committees charters lack sufficient detail to fully define the mission and authority of the committee. This can lead to incomplete safety review, unsafe operations, and failure to complete necessary information.

Secondly, an envelope of parameters in which the experiments or classes of experiments can be operated safely has not been developed and formalized at the various departments and divisions.

EA.2 EXPERIMENTAL ACTIVITIES**PERFORMANCE OBJECTIVE**

All proposed experiments should be approved by an independent Safety Review Committee before they are performed.

FINDINGS:

- Charters for department and division experiment safety review committees were primarily memoranda appointing the team leader and members. Some general guidelines regarding authority and responsibility were usually included.
- Of the charters for the department and division experiment safety review committees reviewed by the TSA Team, none included all of the elements of a good committee charter; i.e., length of appointment of members, quorum required to act, meeting frequency, multi-discipline review capabilities, group interaction during reviews, reporting level, and complete scope of authority and responsibility.
- The committee which reviewed the radiation incident that occurred on December 18, 1989, in the Accelerator Test Facility (ATF), Bldg. 820, concluded that the lack of a complete safety review of the experimental setup and planned interim operations were major factors in the incident.

CONCERN:
(EA.2-1)
(H3/C2)

The charters for the department and division experiment safety review committees did not fully define the body, scope, and authority of the committee.

EA.4 OPERATION OF EXPERIMENTS

PERFORMANCE OBJECTIVE

Experiments performed in any facility on the site should not present undue risk or significantly increase the risk previously evaluated for the facility or the site.

FINDINGS:

- Experiments performed at BNL have been reviewed by an experiment safety review committee. However, it was not always clear what degree of change in the experiment prompts additional review by the experiment safety review committee.
- Some of the larger experiments had an SAR that defined the boundaries of safe operation; however, for smaller or shorter term experiments, this safe envelope of operation was not always defined.
- There was no Laboratory-wide policy or guidance regarding the development of boundaries of safe operation for experiments.

CONCERN: (EA.4-1) (H2/C1)

The boundaries of safe operation were not developed for each experiment or class of experiments at the various departments and divisions at the Brookhaven National Laboratory, as required by DOE 5481.1B. (Also see Concern TS.2-3.)

4.5.11 **Site/Facility Safety Review**

4.5.11.1 Overview

All six performance objectives for facility safety review were addressed during this appraisal. Interviews were held with the chairmen of each of the three sitewide safety review committees as well as with the chairmen of two NSLS safety review committees and the AGS radiation safety committee. Interviews were also conducted with Safety Coordinators in the NSLS, Chemistry, Medical, and Applied Science Departments as well as persons responsible for safety reviews in the S&EP Department. An interview was also conducted with the Associate Director for Reactor, Safety and Security regarding the triennial appraisal program. These activities involved visits to Bldgs. 51, 134, 179, 197, 460, 490, 535, 555, 703, 725, 902, and 912.

BNL has an effective facility safety review system which meets most aspects of DOE Orders regarding such reviews. However, two concerns are expressed regarding lack of compliance with specific DOE Orders requirements.

BNL has three sitewide safety review committees. All three are chartered in the BNL Safety Manual and report to the Associate Director for Reactor, Safety and Security. These are the Cryogenic Safety Committee, the Reactor Safety Committee, and the Laboratory Safety Committee. The first two committees cover reviews in their respective technical specialty areas, while the third covers all other reviews. Appropriate topics are reviewed by each committee, and each is staffed by members having the capability for multidisciplinary reviews with in-depth technical competence. Adequate written minutes are maintained by each committee.

In addition, many of the departments have their own safety committee for review of topics prior to submittal to the sitewide committees and for review of other topics not required to be submitted to those committees. For example, the NSLS Department has two such committees, one to review use of beam lines by experimenters and one to review other department activities. The department committees all perform useful functions, but the quality of the charters, reviews, and minutes varies by department. For some, the documentation is in need of review and upgrade.

A comprehensive annual operating review of each BNL Department having more than office-type functions is performed, and a third of the departments having merely office-type functions are included each year. In Fiscal Year 1990, a total of 19 such reviews are scheduled. Each review lasts about 1 week, and closeout sessions are attended by the Laboratory Director; the

Associate Director for Reactor, Safety and Security; and the cognizant department Associate Director. This is a commendable practice. A concern is expressed regarding the scope of these reviews not being in strict compliance with DOE Orders.

A triennial appraisal of the BNL safety review system has not been performed, and a concern is expressed about this deficiency. However, BNL is making plans to undertake such reviews in 1991, and preliminary plans should provide effective triennial reviews when they are implemented.

Operating experiences at BNL are evaluated and appropriate actions are taken to improve safety and reliability.

4.5.11.2 Findings and Concerns

FR.4 ANNUAL FACILITY SAFETY REVIEW

PERFORMANCE OBJECTIVE

An annual operating review of the facility should be performed by a committee appointed by top contractor management.

- FINDINGS:**
- Annual safety reviews are performed for each department having experimental, operational, or other physical activities. For departments having only office-type functions such reviews are performed every 3 years. Review teams are appointed by the Associate Director for Reactor, Safety and Security.
 - These review teams did not specifically review the safety aspects of procedures and some other operational activities.

CONCERN:
(FR.4-1)
(H2/C1)

Periodic facility safety reviews do not include a safety review of all procedures and operational activities as required by DOE 5482.1B.

FR.5 TRIENNIAL APPRAISAL OF SITE/FACILITY SAFETY REVIEW SYSTEM

PERFORMANCE OBJECTIVE

A triennial appraisal of the safety review system should be performed by contractor management.

FINDING:

- Except for reactors, BNL had not been performing a triennial appraisal of the safety review system as required by DOE 5482.1B, although planning had started so that a program can be implemented beginning in 1991.

CONCERN:
(FR.5-1)
(H2/C1)

Brookhaven National Laboratory does not perform a triennial appraisal of the safety review system.
(Also see Concern SR.7-1, Appendix B.)

4.5.12 Radiological Protection

4.5.12.1 Overview

The Radiological Protection Program at BNL was reviewed in the context of the performance objectives listed in the DOE guide for TSAs. The buildings and facilities visited during the course of this appraisal included the S&EP Division complex (which houses the whole body counting facility, the bioassay laboratory, and the dosimetry records: Bldgs. 535, 535A, and 129), the Calibration Facility (Bldg. 348), the Hazardous Waste Management Facility (Bldg. 445), NSLS (Bldg. 725), the Accelerator Department (Bldg. 911), AGS (Bldg. 913), the AGS LINAC (Bldg. 930), the Brookhaven LINAC Isotope Production Facility (Bldg. 931B), the Medical Hot Laboratory (Bldg. 801), the Tandem Van de Graaff (Bldg. 44), the Medical Research Department (Bldg. 490), the Occupational Medicine Clinic (Bldg. 490), and the Biology Department (Bldg. 463).

The S&EP Division is organized and managed by well-qualified professionals. They understand their responsibilities and strive to maintain a safe and efficient program.

The internal audit program (Tier II) operated by S&EP for radiation safety meets the requirements of DOE 5480.11, but often the resultant report lacks depth and the wording of the recommendations lacks strength. The incident investigation program is well administered, and improvements are under way to increase trending analyses to identify root causes.

Radiological protection procedures written and used by operating groups do not undergo formal periodic review, revision, and approval by S&EP personnel. Similarly, all procedures written by S&EP for their own personnel are not properly tracked for periodic review and revision as required by DOE and by good practice. The Radiation Work Permit system is weak and does not fully satisfy ALARA concerns.

Posting of controlled and radiation zones was generally good with minor exceptions, which are being corrected. Access into building laboratory areas lacks proper controls.

The external radiation dosimetry program is operated by an outside vendor not currently accredited through the Department of Energy Laboratory Accreditation Program. The vendor is attempting to correct the deficiencies and BNL and DOE are closely monitoring its progress.

Internal dosimetry performed on-site consists mainly of urinalysis for tritium and the use of the whole body counter for internal gamma emitters. Most other bioassay samples go to an

outside laboratory. There is an S&EP Division QA check of the whole body counter operation but no independent audit. Similarly, there has been no independent audit of the bioassay program. The program otherwise meets the requirements of DOE 5480.11.

The radiation monitoring instruments are adequate in quantity and quality and are calibrated at regular intervals although the interval for some portable instruments (1 year) is excessive. Some deficiencies in the calibration facility capabilities were noted. A related problem is the failure to properly check instruments in the field between calibrations.

Contamination control was lacking in the areas where isotopes are routinely handled but is being strengthened. Training, a major factor in contamination control, has improved but needs reinforcement and documentation.

A draft ALARA document, currently under review, lacks sufficient emphasis on environmental releases and contamination control. Moreover, implementation procedures, necessary to bring the individual department ALARA programs into compliance with DOE requirements, have not been developed.

4.5.12.2 Findings and Concerns

RP.3 RADIOLOGICAL PROTECTION PROCEDURES AND POSTING

PERFORMANCE OBJECTIVE

Radiation protection procedures for the control and use of radioactive materials and radiation generating devices should provide for safe operations and for clearly identified areas of potential consequences.

- FINDINGS:**
- Radiological safety procedures, developed by the AGS, NSLS, and Medical Departments to provide guidance in the safe conduct of their operations, were often in the form of memoranda.
 - Many of these procedures did not undergo formal review, either initially or periodically, for possible needed changes or additions.
 - There was no tracking scheme to ensure that the required reviews and revisions occur.
 - A written procedure used in Bldg. 801 had no listed responsible author, organization, or date.

CONCERN:
(RP.3-5)
(H2/C2)

Many radiation protection procedures developed and used by operations personnel are outdated or do not apply accepted good practices. (Also see Concern MA.8-2.)

- FINDINGS:**
- S&EP Division requires documented reviews of their procedures every 3 years.
 - A procedure developed by S&EP (BSS-2, "Landfill Monitor Procedure") was 5 years old and had no signatures.
 - Instructions, developed by S&EP for their use at the Hazardous Waste Management Facility, were outdated and unsigned procedures issued in 1986 (e.g., HWM-001,-010,-015...).

CONCERN: Procedures issued by S&EP are not being
(RP.3-6) effectively tracked for review, revision, and
(H2/C2) approval.

FINDINGS:

- The Radiation Work Permit form did not contain all the elements necessary to be considered to safely perform a job that may involve radiation exposure, a release of radioactive material, or spread of radioactive contamination.
- A Safety Instruction form existed that provides additional information that should be part of the Radiation Work Permit for many anticipated procedures.
- The Radiation Work Permit system did not ensure ALARA considerations prior to all jobs including those involving modest exposure rates.

CONCERN: The existing Radiation Work Permit form lacks
(RP.3-7) information required to ensure work is performed
(H2/C1) safely and does not ensure "as low as reasonably achievable."

FINDINGS:

- A child was discovered playing in a laboratory in the Physics Building over a weekend. At least one adult was present. The laboratory was not a radiologically controlled area.
- There were no signs at the entrances of some radiologically controlled rooms or laboratories at the Medical Department clearly restricting entry only to authorized personnel.
- There were no signs at the entrances to many laboratory buildings, where radiation sources or radioactive materials are used, directing visitors to a receptionist or central office and prohibiting unlimited access to laboratory areas.

CONCERN: Brookhaven National Laboratory does not have an
(RP.3-8) effective program to control access to
(H2/C3) radiological areas.

RP.7 INTERNAL RADIATION DOSIMETRY

PERFORMANCE OBJECTIVE

The internal radiation dosimetry program should ensure that personnel radiation exposures are accurately determined and recorded.

FINDINGS:

- The S&EP bioassay program had not recently undergone an internal audit.
- The S&EP whole body counter program had not undergone an internal audit, although it had undergone an internal QA review.

CONCERN: (RP.7-1) (H2/C1)

- The Safety and Environmental Protection Division internal dosimetry program has not undergone an internal audit as required by DOE 5482.1B.

RP.8 FIXED AND PORTABLE INSTRUMENTATION

PERFORMANCE OBJECTIVE

Personnel dosimetry and radiological protection instrumentation used to obtain measurements of radioactivity should be calibrated, used, and maintained so that results are accurately determined.

FINDINGS:

- The strongest Cesium source available at the calibration facility was not adequate to allow calibration, in conformance with ANSI N323 requirements, of all high-range gamma instruments in use at the laboratory.
- Calibration of the neutron instruments to the accuracy required by the ANSI standards was not possible because of the lack of accuracy of the BNL neutron calibration source.
- Equipment did not exist to test instrument response for temperature, humidity, and energy dependence as required by ANSI N323.
- Many instruments were not checked for their over-range response as required by ANSI standards because of the lack of calibration sources of sufficient strength.
- Many radiation monitoring instruments, fixed and portable, were not source-checked properly in the field to verify that they were maintaining calibration during the period between their annual calibrations.
- Portable radiation monitoring instruments are calibrated annually. ANSI 323 recommends more frequent calibration for instruments subjected to hard usage.

CONCERN:

See Concern RP.8-1, Appendix B.

RP.11 ALARA PROGRAM

PERFORMANCE OBJECTIVE

A formally structured, auditable program should be in place with established milestones to ensure that exposures are maintained ALARA.

FINDINGS:

- A Laboratory ALARA program did not exist. However, there was a draft ALARA Program Guideline Document which was nearing the final review and approval stage. This guide will be incorporated into the BNL Safety Manual. The guide is intended to provide guidance to help operating groups in developing their own ALARA program.
- The draft ALARA Program Guideline was based on personnel dose levels. Reducing environmental releases and contamination levels was given little emphasis.
- Existing ALARA programs at the individual facilities were difficult to audit and did not adequately address contamination control, environmental releases, and reasonable efforts to reduce even low exposures.
- There were no ALARA implementation procedures in the areas of auditing, trending, and training.

CONCERN:

See Concern RP.11-1, Appendix B.

4.5.13 **Industrial Hygiene**

4.5.13.1 Overview

The emphasis of this evaluation was on the Industrial Hygiene Program. In addition to the offices and laboratory of the Industrial Hygiene group (Bldg. 535), field surveys or interviews were made at the NSLS (Bldg. 725), the Chemistry Building, (Bldg. 555), and the Occupational Medical Clinic (Bldg. 490).

Contacts were with operating, supervisory and senior management professional staff. Industrial hygiene program requirements have expanded in recent years, as new standards have been adopted and previous standards broadened or reinterpreted. Important examples are hazard communication, hearing conservation, and respiratory protection.

No deficiencies were noted in hearing conservation. However, the hazard communication and respiratory protection programs were not in line with requirements. Since deficiencies have been noted previously, and are addressed in action plans, status will be summarized in this overview, and concerns will be expressed only where implementation schedules are not being met, or are overly generous in the amount of time allowed.

Hazard communication is the area with the greatest amount of work remaining. The BNL decision to operate under the laboratory provisions of the standard has delayed the effective date of training requirements. The OSHA Final Rule for Occupational Exposures to Hazardous Chemicals in Laboratories, effective May 1, 1990, requires more training than the Laboratory provisions of the Hazard Communication Standard. This OSHA policy change adds to the scope of the BNL compliance effort. The compliance dates in BNL action plans called for "generic" training to be completed by the end of June 1990 and more detailed training to be completed by December 1990. Although the Laboratory expresses confidence that those target dates will be met, plans are lacking in specific commitments of time and personnel necessary to comply.

The existence of Laboratory programs which predate the standards and the longstanding issue regarding the regulatory approaches to laboratories appear to have contributed to a lack of urgency. As a result, specific compliance plans, with firm commitments of time and resources, have yet to be developed.

Upgrading the respiratory protection program is also necessary. The Laboratory is proceeding to provide annual training for users of negative-pressure respirators to include quantitative fit testing. Supervisory training is also in progress.

Communication between Industrial Hygiene and the Occupational Medical Clinic was explored, and no major failings were perceived. A potential need for more systematic communication is recognized.

Sampling priorities, protocols, and reports have been documented in an Industrial Hygiene Policies and Procedures Manual, which appears fundamentally sound.

Laser inspections and procedures have been improved and appear to comply with ANSI Z136.1.

Overall, increased attention to the selection of priorities and the establishment of schedules with specific commitments of time and resources seems in order.

4.5.13.2 Findings and Concerns

IH.4 SURVEILLANCE OF HEALTH CONCERNS

PERFORMANCE OBJECTIVE

Appropriate surveillance of activities should be conducted to measure industrial hygiene performance and ensure the continual effectiveness of controls.

- FINDINGS:**
- The Permissible Exposure Limits are usually expressed as 8-hour time-weighted averages, but often are based upon chronic effects based upon exposure over a working lifetime.
 - BNL Industrial Hygiene had recognized the long-term nature of exposure estimates which would be of most use to allied health professions (e.g., Medical, Epidemiology). For some exposures, data were developed to integrate total exposure (e.g., noise, asbestos). This practice had not been extended to apply to other hazards encountered in the work environment.

CONCERN: Industrial hygiene data are not developed to allow
(IH.4-1) long-term exposure estimates for many substances.
(H2/C2)

IIH.6 PERSONNEL COMMUNICATION PROGRAM

PERFORMANCE OBJECTIVE

Site/facility personnel should be adequately informed of chemical and biological stresses that may be encountered in their work environment.

FINDINGS:

- Hazard communication training was incomplete.
- The amount of specific training required had been expanded by the publication of OSHA 29 CFR 1910.1450.
- Plans to accomplish hazard communication training commitments lacked specifics.
- Realistic dates for compliance with the training requirements for hazard communication had not been established.

CONCERN: (IIH.6-2) (H2/C1) (CAT II)

Brookhaven National Laboratory is not in compliance with 29 CFR 1910.1200 and unlikely to comply with deadlines established in 29 CFR 1910.1450.

4.5.14 Occupational Safety

4.5.14.1 Overview

The emphasis of this evaluation was on the program for Occupational Safety. In addition to the offices of the Occupational Safety Group (Bldg. 535), field surveys or interviews were conducted at the Biology Building (Bldg. 463), the Chemistry Building (Bldg. 555), the Plant Engineering Offices (Bldg. 134), and the Waste Water Treatment Plant. Contacts were with line and staff management professionals, and a few nonsupervisory personnel. Inadequacies identified previously, and included in action plans, are addressed in this overview.

Accident rates have substantially exceeded average for the DOE-regulated community. Analysis of accident factors, using data provided by Investigated Incident Reports, UORs, Recordable and Lost Workday accidents, have been previously found inconsistent and/or poorly documented. Root cause analysis and tracking of remedial actions have also been found inadequate. Current Laboratory action plans address these previously expressed findings. The monthly Occupational Health Review meeting group has formed a subcommittee to assist in accident/incident reduction planning and programming. Documents describing increased emphasis on occupational safety have been distributed and were available. A "Team Safety" program rewards and recognizes operating units for achieving periods of 8-12 weeks without a lost workday injury. Accident record trends show a continuing decrease starting in 1988. While accident rates continue to exceed DOE averages, the positive trend and the increased management emphasis are believed related.

Construction safety has been a source of major concern in recent years. A double-fatality accident in 1986, involving construction activity, was the only instance in which a BNL employee has been fatally injured. However, independent evaluations of the Laboratory ES&H program have identified significant risks on construction projects, including a condition during a September 1989 TSA which required an order to stop work.

The construction safety program has received substantial emphasis in the last few years. Plant Engineering has developed a program stressing contractor safety requirements at the pre-bid, award, and project implementation stages. Additional staffing has been provided. This system establishes and communicates requirements and verifies conformance of contractors, at each stage of the project. It incorporates applicable standards and is in line with recommendations of the insurance industry for effective loss control on major construction projects.

Protective equipment requirements and usage, lock out/tag out, and interlock maintenance have been the subject of critical comments in previous evaluations. Letters indicating management attention to these concerns have been distributed.

4.5.14.2 Findings and Concerns

OS.3 MANAGEMENT OF SAFETY CONCERNS

PERFORMANCE OBJECTIVES

Physical and/or other environmental stresses arising in the work place should be identified, evaluated, and controlled.

- FINDINGS:**
- The Biology Department, Bldg. 463, contained a pottery shed adjacent to an office area. Pesticides were stored and mixed in the shed. Food and beverages were consumed in the office area.
 - Doors between the shed and the office area were noted in an open position.
 - While there is a sink in the shed, there is another within the office area, and coffee cups were hanging on a pegboard over the office-area sink.
 - There were no requirements for door closure or signs to remind employees of the need to wash hands in the shed after working there.
 - After the team expressed its concern, the Biology Department immediately installed signs requiring the door to remain closed at all times.

CONCERN: All pesticide hazards arising in the work
(OS.3-1) place are not identified and controlled.
(H2/C2)

OS.5 COMPLIANCE WITH OCCUPATIONAL SAFETY STANDARDS

PERFORMANCE OBJECTIVE

Work places should be free of uncontrolled physical safety concerns and be in compliance with DOE-prescribed occupational safety standards.

- FINDINGS:**
- Two catch basins at the waste water treatment plant can receive and hold water in depths of 7 feet or more.
 - The polymeric material which forms the sides and bottom of the basin can itself be slippery. Algae and other growth can further contribute to slip hazards.
 - Two incidents of an employee slipping into the basin were reported to the TSA team.
 - There were no provisions for emergency egress or rescue from the catch basin.

CONCERN:
(OS.5-3)
(H1/C1)

Egress or rescue capability is not provided for the catch basins as required by the Occupational Safety and Health Act, Section 5(a)(1).

4.5.15 **Fire Protection**

4.5.15.1 Overview

During this TSA, procedures relating to fire protection equipment testing and inspection were reviewed. Fire protection inspection and test procedures were reviewed on a selected basis. (See Appendix C for details.) Proposed and existing budget items for fire-protection related improvements were appraised. Interviews were held with the fire protection engineer, deputy manager of facilities maintenance, safety coordinators of the selected buildings, and Fire Rescue Brigade shift captain. The AGS (Bldgs. 912, 918, 922 & 923 with associated mobile trailer and modular units), Chemistry (Bldg. 555), Physics (Bldgs. 510 and 515), NSLS (Bldg. 725), Accelerator Development Dept. (Bldgs. 901 and 905), Medical Research Center (Bldg. 490), Biology (Bldg. 463), Tandem Van de Graaff (Bldg. 902), Central Shop (Bldg. 462), Water Treatment (Bldg. 624), Steam Plant (Bldg. 610) were physically surveyed. Other buildings noted in this report were observed by the September TSA Team fire protection engineers. Related findings and concerns from that appraisal were discussed with the BNL fire protection engineers.

BNL does not presently meet all DOE standards and NFPA codes pertaining to its facilities. While identification of major hazards and physical protection improvement measures have been documented by BNL, limited funding has delayed implementation of many of the original 171 recommendations from the 1974 Factory Mutual Engineering Association Report.

A detailed analysis of fire protection risks has not been updated since the 1984 Professional Loss Control Report. Without this total analysis of the facility, including life safety, a consolidated long-range improvement plan cannot be implemented. It is recognized that BNL is over 40 years old with buildings dating back to the 1940s. However, without a plan assessing the mission requirements and actual serviceable life of the plant, BNL cannot reach the Improved Risk Criteria. The key to this plan will be reasonable and sustained funding for upgrades, based upon existing and proposed studies conducted by BNL.

The fire protection organizational structure is well defined and understood. However, some procedures need to be updated to refer to field forms and frequencies of activities now employed by the staff. Some of the functions of a fire protection engineer, such as facility appraisals and risk analyses, cannot be routinely performed due to a lack of adequate staffing. Long-term funding limitations have resulted in fire protection improvement items from key independent studies, dating from 1974, not being corrected in a timely manner. CH has not conducted a formal

Industrial Safety and Fire Protection Appraisal since 1987 (an appraisal was made in 1988, but no formal report was developed).

Many buildings at the Laboratory do not meet NFPA 101, "Life Safety Code." A Survey Plan of Action was developed by BNL in April 1989. Personnel exposure to toxic gases from hazardous materials areas can occur during a fire evacuation due to unrated doors and enclosures to the rooms adjacent to egress hallways (e.g., Reactant Storage at Medical Research Center and Hazardous Waste Storage area of Biology). Inadequate horizontal and vertical subdivision is provided in some major buildings to ensure safe evacuation.

A quantitative analysis of risk has not been formally documented to ensure that an off-site release of toxic materials will not occur under a Maximum Credible Fire Loss at the AGS. An SAR is being developed.

The fire loss of a transformer in the substation areas adjoining the AGS may involve adjacent transformers, cable trays, or building structures due to inadequate separations. This condition could lead to a protracted outage for operations while awaiting the installation of replacement equipment.

Formal analysis of Maximum Credible Fire Loss has not been provided in key facilities. Cooling tower exposures to the Chemistry and Physics Buildings, unprotected cable trays in the AGS and NSLS, and areas shielded from sprinkler protection at the NSLS and AGS are of principle concern. The large undivided spaces of the AGS and NSLS pose a value subject to loss greater than \$25 million.

The Fire Department appears to be well trained and prepares detailed pre-fire plans for response.

Flammable liquid quantities in laboratory areas are generally larger than encountered in general industry practice for similar occupancies. Combustible storage in ventilation areas and utility corridors pose a potential for smoke spread throughout building areas. Combustible materials and evidence of smoking were encountered within cable trays areas. Portable trailers adjacent to the AGS pose an exposure to the exterior tiers of cable trays and the AGS building wall. Extensive roof leakage was noted throughout the Laboratory, posing a large-scale damage potential to important equipment and experiments.

Limited fire protection staff and funding constraints appear to account for the majority of issues covered in this appraisal. An effort has been made by BNL and S&EP to identify and prioritize these issues as they are encountered.

A positive program involves the installation of Emergency Information signs at each laboratory, instrument shop, and chemical storage area. The signs have card slots identifying emergency contacts, department responsible for the room, radiation hazards, toxic hazards, flammable liquids (over 1 gallon in quantity), and utilities present in the room. Instructions for completing the cards are on the sign. Periodically, the cards must be reviewed and updated. This practice provides easily accessible information to the emergency responder, as well as raising the awareness of the occupants to the potential hazards in their areas.

Automatic sprinkler riser control valves are both monitored by the proprietary alarm system for tampering and locked in the fully open position with nonbreakable shackle locks and chains. This good practice, together with regularly recorded inspections of the valve, ensures that water supplies to sprinkler protection are not inadvertently shut-off by unauthorized personnel. This maximizes the effectiveness of both the electronic supervision and deterrence of the locks.

FP.1 ORGANIZATION AND ADMINISTRATION**PERFORMANCE OBJECTIVE**

Fire Protection organization and administration should ensure the effective implementation and control of fire protection equipment and activities.

- FINDINGS:**
- BNL has provided an additional fire protection engineer; however, a further increase in staff is needed to meet the DOE Fire Protection Resource Manual requirement.
 - There were no documented job qualification requirements for fire protection engineers.

CONCERN: See Concern FP.1-1, Appendix B.

- FINDINGS:**
- Approximately \$3 million (M) was provided for improvements in fire protection (primarily for the on-site fire alarm system) in FY 1989 and an additional \$1.7M was provided in FY 1990. The majority of recommendations have not been completed.

CONCERN: See Concern FP.1-2, Appendix B.

- FINDING:**
- Formal Annual Industrial Safety and Fire Protection Appraisal had not been conducted by CH since 1987.

CONCERN:
(FP.1-3)
(H2/C1)

The Chicago Operations Office has not conducted Fire Protection Appraisals of Brookhaven National Laboratory facilities at the frequency required by DOE 5480.7.

- FINDING:**
- A pre-printed inspection form was being used during fire protection water supply valve inspections but was not required by the test procedure.

- A written protocol, stipulating flow sites and gauge locations for annual loop and source tests, was not provided in the water testing procedures, but an informal draft had been developed and was sometimes used.
- Consistent fire water supply test locations were not being used, thereby, making it difficult to "trend" historical test data. A decline in water supplies to an area or steady increases in pipe friction loss may not be identified in a timely manner.

CONCERN:
(FP.1-4)
(H2/C2)

All requirements for testing frequency and documentation for fire protection equipment are not clearly identified in Brookhaven National Laboratory fire protection procedures.

FP.2 LIFE PROTECTION

PERFORMANCE OBJECTIVE

All facilities on site should provide adequate life safety provisions against the effects of fire.

- FINDINGS:**
- A complete life safety appraisal of all Laboratory buildings has not been made.
 - In 1976, Gage-Babcock Associates conducted a Life Safety study of 15 facilities at BNL. Thirty percent of the recommendations were implemented.
 - Since considerable changes in occupancy and code requirements had occurred, BNL developed a Survey Plan of Action on April 27, 1989. This survey had not been conducted.
 - Dead-end corridors with inadequate warning signs were encountered in the AGS, Chemistry, and Biology complexes.
 - Travel distances within AGS complex beam hall exceed NFPA 101-1988, 5-6.2 and needs analysis in NSLS.
 - The doors to the Reactant Storage Rooms in the Medical Research Center (e.g., Room 9-283) were blocked open and communicated with the hallway.
 - The waste pickup area, Room 121A, of the Biology Building, had both flammable and mixed waste. The room had unsealed wall penetrations and unprotected doorways. In these areas, toxic products of combustion would spread easily to the surrounding operations making life safety evacuation difficult. This would increase chemical contamination within the facilities or result in a release of contamination outside of the buildings.

CONCERN: See Concern FP.2-1, Appendix B.

FP.4 IMPAIRMENT OF OPERATIONS

PERFORMANCE OBJECTIVE

The site should not be vulnerable to being shut down for an unacceptable period as the result of a credible fire.

- FINDINGS:**
- The transformer yard at the southwest end and the substation at the north end of Bldg. 912 were located within 10 feet of the corrugated steel frame exterior walls of the AGS. The individual transformers were in close proximity to one another. Neither individual dikes, division walls, nor fire protection were provided to control the spread of burning oil or shrapnel. The fire loss or explosion of one transformer may involve adjoining units, cable trays, or the AGS building walls.

CONCERN:
(FP.4-2)
(H2/C2)

The transformer yard arrangement does not meet the criteria of Factory Mutual Data Sheet 5-4, Table III for equipment and building separation.

FP.5 PROPERTY PROTECTION

PERFORMANCE OBJECTIVE

A maximum credible fire, as defined in DOE 5480.7, Section 6.f, should not result in an unacceptable property loss.

- FINDINGS:**
- Specific Fire Hazard Analyses had not been performed on routine basis to identify those areas where a fire could have a significant programmatic impact that could shut down the operation or facility for a period greater than 6 months for all areas. The impact of a fire on operations could not be determined because of the lack of fire risk analysis or fire hazards analysis reports.

CONCERN: See Concern FP.5-1, Appendix B.

- FINDINGS:**
- The wood frame and combustibile fill cooling tower atop the Chemistry Building is nonsprinklered and is adjacent to the metal frame mechanical penthouse.
 - The wood frame and combustibile fill cooling tower atop the Physics Building was no longer in use and is nonsprinkler protected.

CONCERN: A fire involving either the Chemistry or Physics complex cooling towers may result in direct damage to the buildings in excess of the "improved risk" criteria of DOE 5480.7.
(FP.5-2)
(H2/C2)

- FINDINGS:**
- In the NSLS, Room 1-110, ventilation equipment and duct work near the ceiling posed an obstruction to the sprinkler above.
 - Automatic fire protection was not provided within the hutches along the beam lines of the NSLS, resulting in obstructed areas from roof sprinklers, above.
 - A 10-foot x 10-foot Hypolon hood had been erected over the Laser Electron Gamma Source which obstructs ceiling sprinklers from this

equipment. Obstructed areas of otherwise adequately sprinkler protected buildings can allow fires to grow in intensity and spread products of combustion to surrounding areas.

- An undocumented decision was made not to provide automatic sprinkler protection at the roof level of the AGS Complex based upon the height of the building (80 feet) and relative insensitivity of the heads to a fire at the floor. This has resulted in an implied occupancy standard.
 - A combustible storage area existed below the open metal grating of the power supply transformers in Bldg. 912 at Column A-2, and automatic sprinkler protection was not provided.
 - Many small carpenter and maintenance areas; a welding area; and enclosed mezzanine, control room, office, and restroom areas are nonsprinkler protected in the AGS.
- Hypolon shrouds were installed around accelerator targets at AGS and NSLS. Line-type heat detection was provided; however, ribbon cable, power supplies, and hydrogen gas contributed to a fuel loading that had the potential for a sustained fire.
- An extensive network of cable chases and tunnels, as well as the beam enclosures (tunnels) themselves, had limited access to fire protection and a heavy concentration of combustible plastic insulated signal and power cables in AGS.
- While the overall beam-line complex was non-combustible, the sensitivity of equipment to smoke damage and the values of equipment in combustible, nonsprinklered areas may result in a fire loss in excess of the "improved risk" criteria outlined in DOE 5480.7.
- The portable laminar air units, used for maintenance of light beam equipment at the NSLS complex measure 5 feet by 7 feet and were constructed of plastic sheeting and particle board on a steel frame form and were an obstruction to the sprinkler protection above. A fire originating inside a portable laminar

air unit during service may result in direct loss and programmatic impact in excess of improved risk criteria from DOE 5480.7.

CONCERN:
(FP.5-3)
(H2/C2)

Combustible areas obstructed from sprinklers at the National Synchrotron Light Source and small combustible operations of the Alternating Gradient Synchrotron are not protected in accordance with Factory Mutual Data Sheet 2-8 for Highly Protected Risks.

FINDINGS:

- Fire protection is not provided for the computer in Room 2-198 of the Physics complex.
- The Digital Equipment Corporation Vax 11/750 in Room 2-208 of the Physics Complex did not have automatic fire protection.
- The computer tape storage in Room 2-211 of the Physics complex may represent vital data acquired through a long or difficult research process (actual status unknown). This area did not presently have automatic fire protection.
- The computer tape storage in the second and third floor corridor of the Physics complex contains data of likely importance to experimental programs or research. This area did not presently have automatic fire protection.
- While automatic sprinkler protection had been provided for the basement tape storage vaults of the Physics complex, a critical records review had not been conducted to determine the need for further off-site duplicate storage (NFPA 232).
- In the Biology complex, the STEM I and II Rooms were protected by only Halon 1301 automatic fire suppression.
- The computer room used for processing experimental data in the Chemistry complex was not equipped with automatic fire protection.
- Combustible paper storage was present within the open area of the computer room of the Chemistry Complex in excess of daily use.

- Openings in the walls (including a non-rated glass-windowed door) for the Chemistry computer would allow smoke to reach this area from the surrounding nonsprinklered operations.
- In the computer rooms surveyed, floor-puller apparatus were unavailable for access to the raised floor. In the event of fire, these apparatus would be important to gain access to the raised floor.
- No formal study of critical or vital records has been made for this media.
- The raised floor in Experiment 814 Counting House was imbalanced and causes the tape drives to sway. Damage may result to the tape drive units or data, due to foot traffic in the Counting House.

CONCERN:
(FP.5-4)
(H2/C1)

Automatic Fire protection of critical records, off-site vital records storage, and the arrangement of equipment are not consistently provided for electronic data and computer apparatus as required by DOE 5480.7 and mandatory standards.

FINDINGS:

- Roof leaks were noted in the AGS, Accelerator Development Department, Biology, Chemistry, and Physics Buildings.
- \$10M magnet in operation at the AGS had a shroud in place to prevent damage from roof leaks.
- The roof of the Bldg. 814, Counting House, was actively leaking during the survey.
- Tall grasses and two trees (approximately 12 feet high) were growing from the roof of the Physics building.

CONCERN:
(FP.5-5)
(H2/C1)

The maintenance of roof decks is inadequate to prevent damage to critical equipment and experiments and weakening to windstorm damage per DOE 5480.7.

FINDINGS:

- Plastic-insulated cables in trays represent a significant combustible loading which can produce both dense, corrosive smoke and signal and power system damage. While testing by BNL and by Fermi laboratories concluded that little or no hazard was posed by such cables, loss experience throughout industry, as well as extensive full-scale testing by Factory Mutual Research Corporation, has shown otherwise.
- Multitiered cable trays extended throughout the AGS and Tandem Van de Graaff Accelerator complexes. The trays had multiple layers of plastic-covered cables 8 inches apart. Vermiculite-filled plastic bags used for fire stopping are not listed or approved material and did not cover the entire width of the trays.
- Cables below the raised floor in the Upper Terminal Room of the AGS (Bldg. 911) were not protected by automatic sprinklers despite their heavy concentration.
- There were cables in moderate groupings both above and below the NSLS LINAC. Despite the presence of heat detectors in the LINAC, there was no fire protection for this concentration of combustible cables.
- While automatic sprinklers were provided in the cable tunnel adjacent to the Terminal Room of the AGS, cables in lower trays were shielded from the heads at the ceiling. (See Concern FP.5-3.)

CONCERN:
(FP.5-6)
(H2/C2)

Cable tray arrangements do not meet the criteria of Factory Mutual Data Sheet 5-31, and the impact of a fire involving this material has not been recently analyzed.

FINDINGS:

- Vertical subdivision was not adequately provided within the utility corridors of the Chemistry and Physics Buildings by providing smoke-tight, fire resistive seals around pipe, cable, and duct openings.
- Rated fire walls were not provided between the maintenance areas and the beam line of the NSLS despite an equipment value of nearly \$30M.

- Walls were not fire rated assemblies between the Instrument Shop and storage areas adjoining the NSLS beam lines.
- The AGS Experimental Floor (Bldg. 912) was a largely open area without fire walls for beam line subdivision or separation from adjoining office and equipment areas.
- The Accelerator Development Department complex lacked fire walls between building sections and exposed high-valued equipment to smoke damage during fire suppression activities. The lack of fire walls during times of impairment to sprinkler protection may subject the entire facility to a fire.

CONCERN:
(FP.5-7)
(H2/C2)

The lack of fire walls, smoke barriers, or sealed vertical cut-offs poses a loss potential in excess of the improved risk criteria of DOE 5480.7.

FINDINGS:

- In at least 18 buildings at BNL, the Maximum Credible Fire Loss appears to exceed \$1M because of the lack of installed automatic fire protection systems (mainly fire sprinkler systems). Examples include Bldgs. 50, 179, 422, 477, 480, 510, 526, 555, 801, 815, 820, 901, 902, 905, 912, 918, 929, and 930.
- Formal Maximum Credible Loss Analyses had not been performed for all major buildings to determine the dollar loss potential.
- The east experimental area rectifier trailers, Experiment 778 Trailer, Bldg. 912, and wood frame roof over the Beam Line "C" had been provided with exterior urethane foam insulation. These structures are adjacent to the main AGS Beam Line Building and below 10 levels of exterior mounted cable trays. A fire involving low-valued structures adjacent to Bldg. 912 may cause major damage to the building and important cables in excess of DOE 5480.7, DOE/EV-0043, and good practice for Highly Protected Risks.

CONCERN:
(FP.5-8)
(H2/C1)

Brookhaven National Laboratory has not determined through formal and regularly scheduled analyses that a maximum credible fire will not result in an unacceptable property loss, as required by DOE 5480.7.

FP.7 PROGRAM IMPLEMENTATION

PERFORMANCE OBJECTIVE

A fire protection engineering program should be in place to effectively provide and maintain an "improved risk" level of fire protection.

- FINDINGS:**
- Experiment 719 Counting House, Bldg. 912 in the AGS Beam Line complex was provided with an automatic Halon 1301 fire suppression system. However, the cable penetrations in this module were not sealed.
 - The lower terminal room in the AGS complex did not have a gas-tight barrier established for cables penetrating the wall to the control room. Some Halon protected areas of the Alternating Gradient Synchrotron are not sealed to maintain extinguishing agent concentration, per NFPA-12A.

CONCERN: See Concern FP.7-1, Appendix B.

- FINDINGS:**
- Standpipe cabinets in the NSLS, Physics, and AGS complexes had solid metal or partial glass and metal doors which were not labeled and were painted the same colors as the surrounding walls. Standpipe locations were not readily discernable from surrounding walls and would be difficult to identify in an emergency.
 - Fire Extinguisher locations were not visible from both sides of the corridors in the Chemistry, Biology, and Physics complexes.
 - A study and purchase of additional Class A extinguishers were being conducted.

CONCERN: See Concern FP.7-2, Appendix B.

- FINDINGS:**
- The laboratory flammable liquids storage and use practices generally meet NFPA 45. However, quantities up to 15 gallons of Class I flammables (not including other Class II and

III flammable quantities) were observed on open laboratory benches or in hoods in excess of good practice. The overall level of flammable liquids is not governed by an ALARA policy for the Laboratory. Flammable liquids used or stored in laboratories are not controlled in their use and storage in accordance with good practice.

- When stored within the rooms, flammable liquids in the Medical Research Center, Biology, and Chemistry laboratories, were placed either in the laboratory hoods or in single thickness metal or wood cabinets lacking a known fire resistance or means of spill containment.
- Many of the laboratory hoods throughout BNL had electrical receptacles within the work space. The hoods can be used for handling and dispensing flammable liquids and gases (both heated and unheated). A flammable vapor or liquid splash environment is possible. Many laboratory hoods built before 1981 did not have electrical receptacles that meet hazard classification criteria of NFPA 45 Section 6-9.4. for existing (not labeled) or new installations (not outside of ventilation).
- The four hoods for perchloric acid in the Chemistry Building did not have automatic sprinkler protection. The perchloric acid hoods did meet fire protection requirements per NFPA 45 Section 6-12.7. However, in industry, these hoods are provided with automatic sprinkler protection as well.

CONCERN: See Concern FP.7-4, Appendix B.

FINDINGS:

- An independent consultant was reviewing the existing doors and walls to identify fire separations.
- Unsealed penetrations containing pipes, cable trays, and conduit extended through floors and walls in the AGS and NSLS complexes.

CONCERN: See Concern FP.7-6, Appendix B.

- FINDINGS:**
- Expanded plastic insulation on ductwork was noted in Bldgs. 197, 477, 510 (basement), 555, 815, 902, 905, 911, and 930.
 - Testing by Factory Mutual Research Corporation has shown that sprinkler protection alone cannot protect this material and that a fire resistive thermal barrier over the surface is needed.

CONCERN: See Concern FP.7-7, Appendix B.

- FINDINGS:**
- Wood frame combustible trailers located adjacent to the corrugated metal on the steel frame exterior wall of Bldg. 943 were in poor physical condition.
 - The close proximity of these combustible structures makes them a major fire exposure to a significant operating building with inadequate separation, per DOE/EV-0043, "Standard on Fire Protection for Portable Structures."

CONCERN: See Concern FP.7-9, Appendix B.

- FINDINGS:**
- Compressed gas cylinders were stored directly against the fence of the transformer yard at the southeast corner of Bldg. 912 and within 10 feet of transformers. Compressed gas cylinders in the above area pose an undue exposure to transformers adjacent to Bldg. 912, per Factory Mutual Loss Prevention Data Sheet 5-4, Table III.
 - Acetylene and oxygen cylinders stored along the transformer yard fence at the southeast corner of Bldg. 912 were less than 5 feet apart. The cylinder storage arrangement provided inadequate separation to prevent the co-mingling of flammable gases and oxygen, per NFPA 51.
 - There was no guard rail around the compressed gas cylinder storage at the transformer yard along the southeast corner of Bldg. 912 to prevent mechanical damage from traffic in the area. There was inadequate guarding for the

cylinder storage, per the Compressed Gas Cylinder Association guidelines.

CONCERN:
(FP.7-10)
(H2/C1)

Precautions for the storage and use of compressed gas cylinders are not in accordance with improved risk practices.

FINDINGS:

- Stock was stored up to the ceiling in such areas as the Block 12 corridor of the Medical Research Center and in laboratories of the Biology Building (including Room B-229). In these automatic sprinkler protected buildings, the stock height was closer than the 18 inches minimum clearance from the sprinkler deflector specified by NFPA 13.
- Automatic sprinkler riser control valves in NSLS and AGS were located in the center of the building accessible only from the inside. In a fire, when the system is out of service for repair, access to return the system to operation at the interior riser valves will be difficult by the responder.

CONCERN:
(FP.7-11)
(H2/C2)

Automatic sprinkler systems at Brookhaven National Laboratory are not always arranged and maintained according to improved risk as outlined in the NFPA Fire Protection Handbook.

FINDING:

- There was no diking to contain hydraulic fluid (mineral oil) from the elevator equipment rooms of the Chemistry, Physics, or AGS complexes. Burning oil may spread to surrounding areas, increasing damage to important equipment.

CONCERN:
(FP.7-12)
(H2/C1)

There is no diking around elevator hydraulic tanks and pumps per NFPA 30 Section 2-4.1.1 which can allow burning oil to spread to surrounding equipment.

FINDINGS:

- Extensive use of portable electric cords was noted in the NSLS, Accelerator Development Department, and AGS complexes instrument maintenance facilities. Many of these units were fed from ceiling receptacles with no

strain relief and each served multiple appliances.

- Fiberglass insulation had been installed directly on top of the suspended mineral tile ceiling and lighting of the B-Wing, Bldg. 902. A overheating condition may develop at the light fixtures resulting in gradual deterioration of the wiring insulation or fire. This modification measure may exceed the lighting fixture manufacturer's instructions, U.L. listing criteria, or NFPA 70 requirements for air circulation.
- The Helium circulation pumps and associated equipment in the Axion Area of the Accelerator Development Department produced water condensate at start-up which drips on to equipment below, posing a potential of electrical short circuit and fire.
- Electrical directories in the circuit panel boxes of the AGS were not up-to-date in accordance with 29 CFR 1910 and NFPA 70 requirements for circuit identification.
- Evidence of vermin (e.g., raccoons, rats, and mice) entering building electrical areas from the outside through openings in exterior walls for the passage of cable trays had been established. Vermin may cause major damage to electrical equipment by shorts or fire.
- The outer insulating jacket of cables in the floor tray of Bldg. 912, adjacent to column A-2, were cracked.
- Review of cables in several other trays in Bldg. 912 showed cross-sectional crushing, bulging of the outer jacket, and chafing.
- Branches from surrounding bushes adjacent to the southeast corner of Bldg. 912 extended into the exterior cable trays.

CONCERN:
(FP.7-13)
(H2/C1)

Cable and wiring circuits are not fully maintained in accordance with NFPA 70 "National Electric Code."

FINDINGS:

- Combustible records were stored in the vicinity of cooling fan ducts in the first and second floor mechanical rooms of the Chemistry complex.
- Combustible boxes, wood cabinets, and flammable gases were stored on each floor of the utility corridor extending directly from the first floor to the third floor of the Chemistry complex. A fire within the combustible or flammable storage may allow the smoke to be spread to surrounding areas by ventilation ductwork or natural "flue effect," exposing personnel to toxic fumes and gases and extending damage to adjacent rooms.
- Combustible urethane foam insulation overspray from surrounding trailer module roofs has accumulated in adjacent cable trays around the exterior of the AGS. Combustible debris and urethane overspray may become ignited and damage important cables in the trays.
- The AGS Beam Line complex was a largely nonsprinklered structure. However, combustible wood materials were used in the construction of catwalks and maintenance cribs, and combustible wood crates were stored atop beam line tunnels. The use of combustible materials for construction of "incidental" facilities posed an unnecessary fire and smoke damage exposure to important programmatic equipment which can easily be substituted with noncombustible materials.

CONCERN:
(FP.7-14)
(H2/C2)

The presence of combustibles in critical equipment or otherwise unprotected areas, such as at the Alternating Gradient Synchrotron, poses an avoidable fire risk.

FINDINGS:

- Evidence of tobacco smoking was observed in and around transformers, throughout cable trays, in and around operating oil filled pumps of the AGS Beam Line complex (Bldg. 912).

CONCERN:
(FP.7-15)
(H2/C2)

Tobacco smoking is an ignition source to transient combustibles in the Alternating Gradient Synchrotron, a largely unprotected and important facility.

FINDINGS:

- There were four oil-cooled transformers (250 gallon capacity each) located along the AGS beam separator line.
 - The terminal cables were supported by 2-inch x 4-inch boards, held in place by the weight of each cable.
 - The majority of bolts for the transformer lids were missing.
 - Heavy oil deposits were across the top of each transformer.
 - The transformers lacked either an automatic fire suppression system or vault enclosure.

CONCERN:
(FP.7-16)
(H2/C2)

Maintenance, cable support, and fire protection for the transformers near the beam separator line of the Alternating Gradient Synchrotron are not in accordance with the manufacturer's instructions or Factory Mutual Data Sheet 5-4.

4.5.16 **Medical Services**

4.5.16.1 Overview

This appraisal addressed all five performance objectives applicable to medical services provided by the Occupational Medical Clinic (OMC). During the course of this appraisal the following locations on- and off-site were visited: University Hospital, Health Science Center; State University of New York at Stony Brook, Occupational Health Program, Department of Preventive Medicine, Radiology, Nuclear Medicine Services and the Radiation Safety Facility; Berkner Hall (Bldg. 488); Medical Research Center (Bldg. 490); Occupational Medicine Clinic (a wing of Bldg. 490); Biology (Bldg. 463); NSLS (Bldg. 725); Sewage Treatment Facility (Bldg. 575); Steam Plant (Bldg. 610); Safety Division (Bldg. 525-129); Compton House (Bldg. 170); Police Headquarters (Bldg. 50); Firehouse (Fire Department) (Bldg. 599); Administration Data Processing (Bldg. 459); and Administration (Bldg. 460).

BNL has a clearly defined and well-structured occupational medicine program which is adequately staffed and directed by an experienced and competent Medical Director. The Medical Director has been on the job less than a year but with the active support of top management has made and continues to make great improvements in the program.

The last medical audit of this site by HQDOE, was in March 1987. No written report of this audit has been received by BNL. This HQDOE Medical Appraisal is being done concurrently with the TTA. Past appraisals were inadequate in relation to the Medical Clinic activities.

There is an open line of communication between the Medical Director and top management of both BNL and BHO and excellent personal relations exist. Services to protect personnel from site hazards are made available to all employees and users by Occupational Medicine, Industrial Hygiene, Health Physics, and Safety. Medical examinations, screening, and testing are adequate for preemployment, periodic, and termination observations. In addition, there are 27 protocols for Medical Surveillance Examinations mandatorily imposed on those employees subjected to special occupational hazards, such as asbestos, etc.

Treatment is adequate for both simple occupational and non-occupational injuries and illnesses. More serious conditions are referred to local hospitals, specialists, or the patient's private physician. This system reduces BNL health care costs, reduces time away from employment, and aids employee morale. The Clinic Staff is well trained and maintains proficiency by annual continuing education required to maintain their state licenses.

Two of the four physicians are Board Certified Specialists in Occupational Medicine. Several were "Q-cleared" even though only a few sites at BNL are so restricted.

Even though policies, procedures, and practices of the OMC have not had the scrutiny given to Industrial Hygiene, Health Physics and Safety, OMC procedures are well documented, adhere to BNL and DOE Directives, and are kept current in manuals in OMC. An on-site first-level life support (ABC) equipped ambulance staffed by EMTs is available 24 hours a day at the Firehouse as is an Emergency Truck. Relations between OMC and the Fire Rescue Brigade are excellent. When OMC is not operational, the Fire Rescue Brigade is trained and responsible for triage and transport of medical emergencies. Two helicopters are on call for special emergencies. Depending upon the requirements of the incident, transport time is from 5 to 20 minutes to various hospitals, including State University of New York at Stony Brook Medical Center, where the Medical Director is on the Faculty of Occupational Medicine and a member of the Radiation Safety Committee of the Medical Center.

The OMC Program meets or exceeds the provisions of DOE 5480.8, "Contractor Occupational Medical Program." Therefore, no recommendations are in order; however, some concerns are noted. First, injury incidence at BNL is too high. This places demands on the OMC staff's time which could be used on preventive work. Second, more of the OMC staff's time should be devoted to observation of work sites to further develop preventive programs. Third, no formal program exists to periodically review and audit OMC policies, procedures and practices. Fourth, the Health Awareness and Wellness Program is not being fully implemented in view of the Health Promotion Staff Specialist vacancy.

Noteworthy practices included facilities, trained staff, and protocol for handling radiation contaminated persons. Provisions exist for handling contaminated persons, as do protocols for medical surveillance of special hazards in the work place. Placing the Medical Director on the new four-man Task Force on Safety and Environmental Protection and on the Occupational Health Review Committee is to be commended. The OMC Form provided for supervisors to forward employee occupational information to physicians prior to physical examinations is particularly beneficial in a Laboratory operation with few routine activities.

4.5.16.2 Findings and Concerns

MS.2 PROCEDURES AND DOCUMENTATION

PERFORMANCE OBJECTIVE

Procedures and documentation should provide appropriate direction, record generation, and support of the medical services for the facility and site.

FINDING: • A formal program to systemically track the correction of identified deficiencies and deviations from prescribed practices did not exist in OMC.

CONCERN: A formal tracking program does not exist in the
(MS.2-1) Occupational Medical Clinic.
(H2/C2)

MS.4 REVIEW AND AUDIT

PERFORMANCE OBJECTIVE

Policies, procedures, and practices for medical services should be reviewed and audited periodically to ensure continued effectiveness of the medical services.

- FINDING:**
- Periodic audits or appraisals of OMC have not been conducted.
 - OMC was appraised by an outside expert in Occupational Medicine in March 1987. However, the results of that audit were lost in HQDOE, and a written final report was not received by BNL or OMC.
 - Formal self-assessments on an annual basis, as an integral part of the formal annual self-assessments of Health Physics, Industrial Hygiene and Safety, are the minimum audit/appraisal required for progressive occupational medical programs; they are also not performed.

CONCERN:
(MS.4-1)
(H2/C2)

Policies, procedures, and practices of the Occupational Medical Clinic are not periodically reviewed and audited as required by good practices.

MS.5 PERSONNEL COMMUNICATION PROGRAM

PERFORMANCE OBJECTIVE

Site/facility personnel should be adequately informed of the medical hazards that may be encountered and of the medical services that are available.

FINDINGS:

- The OMC has prepared a well-developed, comprehensive Health Awareness and Wellness Program for BNL. However, this program was not fully implemented.
- This highly important preventive medicine program of the OMC cannot be implemented or function effectively without the aggressive leadership of the Health Promotion Staff Specialist. This position was vacant.

CONCERN: (MS.5-1) (H2/C3)

The Health Awareness and Wellness Program is not fully implemented for Brookhaven National Laboratory by the Occupational Medical Clinic.

4.6

SPECIAL STUDY - HIGH FLUX BEAM REACTOR COBALT-60 CONTAMINATION INCIDENT

Response to the incident was aggressive. When the number of contamination incidents indicated a nonroutine situation existed, the BHO notified both HQDOE and the CH within 24 hours. Within 48 hours, CH had declared a Type B Incident and designated an Investigation Team. Concurrently, BNL established an Incident Response Team (IRT).

The BNL IRT was initially disorganized due to uncertainty in the scope of the potential contamination. However, in cooperation with BHO and CH representatives, BNL established a HFBR Contamination Incident Response Plan. The initial list of personnel thought to have been associated with HFBR operations was expanded through the use of security access lists to include anyone who might have entered the HFBR facility during the time-frame in question. At the request of CH and the Investigation Team, all access to the HFBR facility was restricted to those individuals associated with operations that were absolutely necessary (i.e., those required by Technical Specifications). This contained the source of the contamination until the necessary surveys and controls could be instituted, and it preserved the environment for the CH investigation team.

At the time of the incident, a new portal monitor had recently been installed and was operational. However, a requirement that all personnel leaving the facility use the portal monitor had not been established. Of the 189 personnel identified to date, all were being interviewed to determine whether or not they had used the portal monitor when exiting the facility - other less sensitive frisking methods were available. All individuals who had not used the more sensitive portal monitor would have both their homes and personal automobiles surveyed for possible contamination. In addition, all individuals known to have been contaminated were also whole body counted.

Overall response by both BHO and CH appeared comprehensive and appropriate. The Type B investigation is still in progress, and the root cause of the contamination has yet to be determined. The reader is referred to the official report of the Type B Investigation Team from CH for additional information specific to the operations (e.g., information as to what may have generated the hot particles, and identified deficiencies that led to the loss of control of the contamination). Due to the nature (discrete particles) and activities involved, it appears that any exposures will be significantly less than the limits for both occupational workers and for members of the general public.

4.7 NOTEWORTHY PRACTICES

Noteworthy Practices are exceptional ways of accomplishing a Performance Objective or some aspect of it. Other DOE facilities are encouraged to adopt these practices when they are applicable to their operation. One Noteworthy Practice was found in OMC during this audit. This is described in this section.

MS.1 ORGANIZATION AND ADMINISTRATION

PERFORMANCE OBJECTIVE: Site and Facility organization and administration should ensure effective implementation and control of the Medical Services program.

NOTEWORTHY PRACTICE: Aside from having excellent protocols (27) for jobs with unusual hazards necessitating special medical examinations and surveillance, OMC physicians obtain additional updated information about job hazards from the employee's supervisor. Prior to conducting a pre-employment, periodic, return to work, or rehire physical examination, OMC sends form OMC 8/83; Rev. 4/85 (see Section IV, IH.1, Appendix B, for a sample of the form) to the employee's supervisor who fills it out and returns it prior to the examination.

This provides the Occupational Physician with current, detailed information on job hazards and working conditions which aids the physician in proper, safe, and healthful job placement. This practice is particularly helpful in any organization having wide diversity in operations - such as BNL. The use of this attached form in Occupational Safety has been recognized as a noteworthy practice in previous BNL TSA. (Also see Section IV, IH.1, Appendix B.)

4.8 SYSTEM FOR CATEGORIZING CONCERNS

Each concern contained in this report has been characterized using the following three sets of criteria:

- A. CATEGORY I: Addresses a situation for which a "clear and present" danger exists to workers or members of the public. A concern in this category is to be immediately conveyed to the managers of the facility for action. If a clear and present danger exists, the Assistant Secretary for Environment, Safety, and Health, or his designee, is informed immediately so that consideration may be given to exercising the Secretary's facility shutdown authority or directing other immediate mitigation measures.

CATEGORY II: Addresses a significant risk or substantial noncompliance with DOE Orders (but does not involve a situation for which a clear and present danger exists to workers or members of the public). A concern in this category is to be conveyed to the manager of the facility no later than the appraisal close-out meeting for immediate attention. Category II concerns have a significance and urgency such that the necessary field response should not be delayed until the preparation of a final report or the routine development of an action plan. Again, consideration should be given to whether compensatory measures, mitigation, or facility shutdown are warranted under the circumstances.

CATEGORY III: Addresses significant noncompliance with DOE Orders, or the need for improvement in the margin of safety, but is not of sufficient urgency to require immediate attention.

- B. Hazard Level 1. Has the potential for causing a severe occupational injury, illness, fatality, or loss of the facility.

Hazard Level 2. Has the potential for causing minor occupational injury or illness, major property damage, or has the potential for resulting in, or contributing to, unnecessary exposure to radiation or toxic substances.

Hazard Level 3. Has little potential for threatening safety, health, or property.

- C. Compliance Level 1. Does not comply with DOE Orders, prescribed policies or standards, or documented accepted practices. The

latter is professional judgment based on the acceptance and applicability of national consensus standards not prescribed by DOE requirements.

Compliance Level 2. Does not comply with DOE references, standards, guidance, or with good practice (as derived from industry experience, but not based on national consensus standards).

Compliance Level 3. Has little or no compliance considerations; these concerns are based on professional judgment in pursuit of excellence in design or practice (i.e., these are improvement for their own sake--not deficiency driven).

4.9

CATEGORIZATION AND TABULATION OF CONCERNS

Using the criteria in Section 4.8 "System for Categorizing Concerns," all of the Concerns have been categorized as Category III for seriousness except IH.6-1. Sections 4.9.1 and 4.9.2 are provided as convenient reference tables. However, the user is cautioned to read the basis for each Concern, provided in Section 4.5, in order to fully understand it.

4.9.1

Categorization of Concerns*

<u>Concern Number</u>	<u>Potential Hazard Level</u>	<u>Compliance Level</u>
OA.1-1	3	2
OA.1-2	2	2
OA.1-3	2	2
OA.2-1	2	2
OA.2-2	2	2
OA.2-3	2	2
OA.3-1	2	2
OA.3-2	2	2
OA.5-1	1	2
OA.6-1	3	2
OA.7-1	2	2
OA.7-2	2	1
OA.7-3	2	2
QV.1-1	2	1
QV.1-2	2	1
QV.1-3	2	2
QV.1-4	2	2
QV.1-5	2	2
QV.2-1	2	2
QV.4-1	2	2
QV.5-1	2	2
QV.5-2	2	2
QV.5-3	2	2
QV.6-1	2	2
QV.7-1	2	2
OP.1-1	3	2
OP.1-2	3	2
OP.1-3	2	2
OP.1-4	3	2
OP.1-5	2	2
OP.1-6	2	2
OP.2-1	3	2
OP.3-1	2	2
OP.3-2	2	2
OP.3-3	2	2
OP.4-1	2	2
OP.5-1	2	2
OP.5-2	2	2
OP.6-1	3	2
OP.6-2	1	1
OP.7-1	2	1

* This categorization include the concerns from the BNL TSA, October 1989.

<u>Concern Number</u>	<u>Potential Hazard Level</u>	<u>Compliance Level</u>
OP.8-1	2	2
OP.9-1	2	2
OP.10-1	2	2
MA.1-1	2	1
MA.1-2	2	2
MA.1-3	2	2
MA.2-1	2	2
MA.2-2	2	2
MA.5-1	2	2
MA.5-2	2	2
MA.7-1	2	1
MA.8-1	2	2
MA.8-2	2	2
TC.1-1	2	2
TC.1-2	2	2
TC.2-1	2	2
TC.3-1	2	2
TC.4-1	2	1
TC.4-2	2	1
TC.5-1	2	2
TC.9-1	2	1
AX.5-1	2	2
EP.1-1	2	2
EP.2-1	2	1
EP.3-1	2	1
EP.5-1	2	2
EP.5-2	2	1
EP.6-1	2	1
TS.1-1	2	2
TS.2-1	2	2
TS.2-2	2	2
TS.2-3	2	2
TS.2-4	2	2
TS.3-1	3	2
TS.3-2	2	2
TS.3-3	2	2
TS.4-1	3	2
TS.4-2	3	2
TS.4-3	2	2
TS.8-1	3	1
CS.1-1	2	1
CS.5-1	2	1

<u>Concern Number</u>	<u>Potential Hazard Level</u>	<u>Compliance Level</u>
EA.2-1	3	2
EA.4-1	2	1
SR.1-1	2	1
SR.7-1	2	1
FR.4-1	2	1
FR.5-1	2	1
RP.3-1	3	2
RP.3-2	2	2
RP.3-3	2	2
RP.3-4	1	2
RP.3-5	2	2
RP.3-6	2	2
RP.3-7	2	1
RP.3-8	2	3
RP.4-1	2	2
RP.5-1	3	2
RP.7-1	2	1
RP.8-1	2	1
RP.9-1	3	2
RP.11-1	3	2
IH.4-1	2	2
IH.5-1	2	1
IH.6-1	2	1
IH.6-2**	2	1
OS.3-1	2	2
OS.4-1	2	1
OS.4-2*	1	1
OS.4-3	1	1
OS.5-1	1	1
OS.5-2	2	1
OS.5-3	1	1
OS.6-1	2	1
OS.6-2	2	1
FP.1-1	1	2
FP.1-2	1	2
FP.1-3	2	1
FP.1-4	2	2
FP.2-1	1	1

* This concern is a Category I. ** This concern is a Category II. All other concerns are Category III.

<u>Concern Number</u>	<u>Potential Hazard Level</u>	<u>Compliance Level</u>
FP.3-1	2	1
FP.4-1	3	1
FP.4-2	2	2
FP.5-1	3	1
FP.5-2	2	2
FP.5-3	2	2
FP.5-4	2	1
FP.5-5	2	1
FP.5-6	2	2
FP.5-7	2	2
FP.5-8	2	1
FP.7-1	3	1
FP.7-2	3	1
FP.7-3	2	2
FP.7-4	2	1
FP.7-5	2	1
FP.7-6	2	1
FP.7-7	2	1
FP.7-8	2	1
FP.7-9	2	2
FP.7-10	2	1
FP.7-11	2	2
FP.7-12	2	1
FP.7-13	2	1
FP.7-14	2	2
FP.7-15	2	2
FP.7-16	2	2
MS.2-1	2	2
MS.4-1	2	2
MS.5-1	2	3
PT.2-1	3	1
PT.3-1	3	1
PT.4-1	3	1
PT.5-1	2	1
PT.6-1	2	1
PT.6-3	3	1
FS.2-1	2	2
FS.3-1	2	3
FS.5-1	2	3
FS.6-1	2	1
FS.6-2	2	2

4.4.1 ORGANIZATION AND ADMINISTRATION

- CONCERN:** Lines of authority and responsibility cannot
(OA.1-1) always be traced on existing organization charts
(H3/C2) nor are organization charts controlled or
approved. (See also Concern OP.1-1.)
- CONCERN:** Line safety responsibility was not clearly
(OA.1-2) understood and practiced at Brookhaven National
(H2/C2) Laboratory. (Also see Concerns OA.1-1,
Appendix B; OP.1-1, Appendix B; and OP.1-3.)
- CONCERN:** Safety meetings are not regularly scheduled and do
(OA.1-3) not fully promote safety at Brookhaven National
(H2/C2) Laboratory.
- CONCERN:** Administrative policies and controls are not in
(OA.2-1) place to ensure the conditions that are necessary
(H2/C2) for a healthful and safe workplace.
- CONCERN:** Laboratory-wide administrative policies and
(OA.2-2) controls do not ensure that all elements of an
(H2/C2) effective safety program exist within each
department and division. (Also see
Concern OA.2-1, Appendix B.)
- CONCERN:** A potential conflict of interest exists among
(OA.2-3) those who have both independent safety review
(H2/C2) responsibilities and line safety responsibility or
past safety responsibility for the program.
- CONCERN:** The BNL environment, safety, and health goals are
(OA.3-1) neither definitive nor measurable and in many
(H2/C2) cases lack specific departmental action plans to
accomplish the BNL-wide goals as well as the
specific departmental goals. Safety goals are
also not embraced or appreciated by all Laboratory
management. (See also Concern OP.1-3.)
- CONCERN:** Measurable and definitive goals are not being
(OA.3-2) developed and promulgated to all Laboratory
(H2/C2) employees.

* This tabulation includes the concerns from the BNL TSA,
October 1989.

CONCERN: Interlock problems, including their use, misuse, (OA.5-1) and nonreporting, have not been evaluated, and the (H1/C2) root cause of the problems determined; nor has corrective action been taken to upgrade and enforce this primary system of personnel protection. (See also Concerns RP.3-4 and TS.4-1.)

CONCERN: Personnel programs do not ensure that specific job (OA.6-1) descriptions and job qualifications are (H3/C2) established for all positions that affect safe and reliable operations.

CONCERN: Management is not ensuring control of vital safety (OA.7-1) and operating documents. (H2/C2)

CONCERN: The AGS and the 60-inch Cyclotron are not in (OA.7-2) compliance with DOE 5481.1B, which requires an SAR (H2/C1) for each DOE facility.

CONCERN: The Brookhaven National Laboratory document (OA.7-3) control system does not ensure, as required by (H2/C2) ANSI/ASME NQA-1, that documents important to the safe operation of a facility are available when needed and controlled.

4.4.2 QUALITY VERIFICATION

CONCERN: Documented and approved quality assurance plans (QV.1-1) are not all in place at BNL as required by the (H2/C1) BNL Quality Assurance Manual and DOE 5700.6B.

CONCERN: Independent verifications, surveillance, and (QV.1-2) audits of quality attainment within the (H2/C1) departments, divisions, and projects are too few to enable the BNL Director and his line managers to review and evaluate the implementation of their quality assurance programs, as required by DOE 5700.6B.

CONCERN: The Quality Assurance Steering Committee functions (QV.1-3) and lines of communication are not addressed in (H2/C2) the Brookhaven National Laboratory Quality Assurance Manual.

CONCERN: Quality assurance audits at Brookhaven National (QV.1-4) Laboratory conducted by both the Quality Assurance (H2/C2) Office and Designated Quality Assurance Representatives do not cover all departments and divisions as required by Laboratory policy. (Also see Concern QV.1-2, Appendix B.)

CONCERN: The Chicago Operations Office had not conducted
(QV.1-5) timely quality verification audits as required by
(H2/C2) DOE 5700.6B.

CONCERN: Brookhaven National Laboratory does not currently
(QV.2-1) have a system in place for the evaluation and
(H2/C2) control of suppliers based on their past
performance.

CONCERN: The BNL policy for calibration of measuring and
(QV.4-1) testing equipment is not implemented by all
(H2/C2) departments and divisions.

CONCERN: BNL management is not enforcing its basic policies
(QV.5-1) for nonconformance issues.
(H2/C2)

CONCERN: A formal system for the disposition of
(QV.5-2) nonconforming materials has not been implemented
(H2/C2) by all Brookhaven National Laboratory departments
and divisions.

CONCERN: Identification, control, and storage of safety-
(QV.5-3) related hardware and materials are not being
(H2/C2) performed in accordance with ANSI/ASME NQA-1
requirements.

CONCERN: Personnel requesting inspections and tests do not
(QV.6-1) always provide acceptance instructions or
(H2/C2) procedures describing the effort to be performed
and the criteria for acceptance, as required by
ANSI/ASME NQA-1.

CONCERN: Material identification requirements are not
(QV.7-1) adequately provided in welding rod control
(H2/C2) procedures and practices.

4.4.3 OPERATIONS

CONCERN: The responsibilities and authorities of each
(OP.1-1) position in the organization are not uniquely
(H3/C2) defined in a formal document made available to the
staff at large. (See Concern OA.6-1.)

CONCERN: Measurable goal and performance indicators
(OP.1-2) are not used at many facilities to effectively
(H3/C2) improve performance and safe operations. (See
Concern OA.3-1.)

CONCERN: Operations personnel do not clearly understand
(OP.1-3) their authority and responsibility.
(H2/C2) (Also see Concern OA.1-2.)

CONCERN: Formal policy and guidelines from Department
(OP.1-4)
(H3/C2) Chairpersons and Division Heads do not exist for development, review, approval, and issuance of organization charts. (Also see Concern OA.1-2.)

CONCERN: Department Chairpersons and Division Heads are not
(OP.1-5)
(H2/C2) effectively formulating and issuing policy for their organizations which is specific for their needs.

CONCERN: Use of the suggestive "should" in policy and
(OP.1-6)
(H2/C2) guidance documents results in accountability for safety-related responsibilities not being clearly established.

CONCERN: BNL, in general, does not have policy and
(OP.2-1)
(H3/C2) procedures establishing the requirements for facility operations logs, their content, use, and review.

CONCERN: In general, the BNL process for procedure
(OP.3-1)
(H2/C2) preparation, approval, modification, distribution, and safety impact determination is inconsistent, not formalized, and undocumented.

CONCERN: A policy controlling the posting and
(OP.3-2)
(H2/C2) implementation of operating aids in the control rooms does not exist.

CONCERN: The operation of the NSLS and REF facilities
(OP.3-3)
(H2/C2) is not in compliance with their Safety Analysis Reports.

CONCERN: A configuration control system did not exist
(OP.4-1)
(H2/C2) requiring identification of safety-related components in the field and requiring formal review and approval before changes are made that may affect safe operation.

CONCERN: The control, use, and content of operating
(OP.5-1)
(H2/C2) procedures for experiments are not sufficient to ensure that the experimenter is provided a well-defined safe operating envelope.

CONCERN: Controls and procedures are not in place to
(OP.5-2)
(H2/C2) ensure that access to the NSLS experiment floor area is restricted to authorized and trained users and escorted visitors.

CONCERN: Management has not established standards and directives providing a clear concise statement of acceptable operating states for facilities and experiments.
(OP.6-1)
(H3/C2)

CONCERN: BNL Health and Safety Guide 1.5.1, "Lock-Out/Tag-Out Requirements" is not being enforced as required by DOE 5483.1A and 29 CFR 1910.147.
(OP.6-2)
(H1/C1)

CONCERN: The housekeeping in some facilities is poor and is not in accordance with DOE 5483.1A, 29 CFR 1910.22, and generally accepted industrial practice. (See also Concerns OS.5-1 and FP.7-4.)
(OP.7-1)
(H2/C1)

CONCERN: The depth and breadth of operator knowledge is not commensurate with acceptable industrial practices at facilities of comparable sophistication and complexity.
(OP.8-1)
(H2/C2)

CONCERN: BNL has not developed and implemented coding convention standards (color, size, shape, position and nomenclature) for facility components and equipment.
(OP.9-1)
(H2/C2)

CONCERN: The current shift turnover process does not assure effective and accurate transfer of essential information regarding the facility status between crews and interacting members of the same crew.
(OP.10-1)
(H2/C2)

4.4.4 MAINTENANCE

CONCERN: A uniform, BNL-wide maintenance program, consistent with the requirements of DOE 4330.4, industry standards, and good practices is not provided by the current organizational structure.
(MA.1-1)
(H2/C1)

CONCERN: The responsibility for the maintenance activity at NSLS is not defined.
(MA.1-2)
(H2/C2)

CONCERN: Formal or uniform maintenance programs are not consistently implemented at the Alternating Gradient Synchrotron Facility.
(MA.1-3)
(H2/C2)

CONCERN: Many BNL facilities are crowded with equipment (which in some cases is unused) and may impact safe effective operation, industry safety standards, and good operating practices.
(MA.2-1)
(H2/C2)

CONCERN: Documentation of maintenance activities for
(MA.2-2) programmatic equipment is incomplete, and
(H2/C2) procedures for work control are not sufficient to
ensure safe and efficient maintenance.

CONCERN: Lack of consistent application of safety require-
(MA.5-1) ments in maintenance shop areas promotes unsafe
(H2/C2) conditions and contributes to the potential for
accidents and injury.

CONCERN: A calibration and testing program which identifies
(MA.5-2) instrumentation requiring periodic calibration
(H2/C2) and/or testing is not in place. (Also see
Concern QV.4-1, Appendix B.)

CONCERN: Documentation of maintenance requirements,
(MA.7-1) procedures and activities is incomplete and not
(H2/C1) sufficiently accurate to ensure safe and effective
maintenance. This lack of documentation may
affect the continuity of operations of
one-of-a-kind and other special equipment should
existing experienced personnel retire or transfer.

CONCERN: Documentation of maintenance data and information
(MA.8-1) is not adequate to support a maintenance history
(H2/C2) program. (See also Concern TS.4-1.)

CONCERN: Maintenance procedures and documentation of
(MA.8-2) maintenance activities for programmatic equipment
(H2/C2) frequently do not enable maintenance to be carried
out in a controlled and safe manner. (Also see
Concerns RP.3-5 and RP.3-7.)

4.4.5 TRAINING AND CERTIFICATION

CONCERN: BNL has no lab-wide training policy or require-
(TC.1-1) ments for initial and ongoing qualification
(H2/C2) programs. (See also Concern OA.6-1.)

CONCERN: Training records of each individual's training
(TC.1-2) participation and performance are not documented
(H2/C2) at BNL in several departments and divisions.

CONCERN: BNL does not have formalized lesson plans to
(TC.2-1) ensure adequacy of safety training.
(H2/C2)

CONCERN: BNL has not developed and documented qualification
(TC.3-1) standards and evaluation methods to adequately
(H2/C2) verify trainee competence in maintenance
activities.

CONCERN: All radiation workers at Brookhaven National Laboratory have not been trained and certified to meet the requirements of DOE 5480.11.
(TC.4-1)
(H2/C1)

CONCERN: Safety training and certification requirements for employee and visitor users are not in compliance with DOE 5480.11 at many Brookhaven National Laboratory facilities.
(TC.4-2)
(H2/C1)

CONCERN: At most Brookhaven National Laboratory facilities, there is no maintenance training and qualification program to ensure safe and effective maintenance activities. (Also see Concern TC.3-1, Appendix B.)
(TC.5-1)
(H2/C2)

CONCERN: Documentation of the health physics training program required to verify that technicians receive certified training in compliance with DOE 5480.11 is incomplete and not readily available.
(TC.9-1)
(H2/C1)

4.4.6 AUXILIARY SYSTEMS

CONCERN: High-efficiency particulate air filters without pressure drop instrumentation cannot be monitored for clogging or penetration on a continuous basis.
(AX.5-1)
(H2/C2)

4.4.7 EMERGENCY PREPAREDNESS

CONCERN: The magnitude and consequences of emergencies involving nonradioactive hazardous materials have not been identified, nor have BNL emergency plans or emergency organization structures been well defined to respond to this type of emergency. (See also Concerns PT.5-4, PT.6-2, and FP.3-1.)
(EP.1-1)
(H2/C2)

CONCERN: Not all local emergency plans are being kept current in accordance with the requirements of the BNL Laboratory Emergency Response Plan.
(EP.2-1)
(H2/C1)

CONCERN: Neither initial nor continuing training programs for most emergency response personnel have established formal qualification/requalification requirements. (See also Concern TC.1-1.)
(EP.3-1)
(H2/C1)

CONCERN: The BNL Emergency Operations Facility is not equipped to facilitate the control of all postulated emergencies.
(EP.5-1)
(H2/C2)

CONCERN: The radiation monitoring equipment designated for use during an emergency response does not meet all of the requirements of ANSI N320-1979.
(EP.5-2)
(H2/C1)

CONCERN: Emergency assessment and notification practices
(EP.6-1) and procedures are not based on current DOE
(H2/C1) emergency event classifications or protective
action guides.

4.4.8 TECHNICAL SUPPORT

CONCERN: BNL has no formal system to ensure review of
(TS.1-1) proposed actions by interfacing organizations
(H2/C2) whose interests might be impacted.

CONCERN: Engineering personnel who design facility
(TS.2-1) modifications do not all have cognizance of or
(H2/C2) full access to documents that define the safety
requirements for individual facilities.

CONCERN: There is no system of procedures for formal
(TS.2-2) interchange of information between technical
(H2/C2) and operations/maintenance staffs that ensures
operation/maintenance practices and designs are
consistent.

CONCERN: Operational safety limitations are not identified
(TS.2-3) for most nonreactor facilities. (Also see
(H2/C2) Concern EA.4-1.)

CONCERN: In nonreactor areas, safety systems and devices
(TS.2-4) are not fully identified, and special testing
(H2/C2) or maintenance requirements are not stipulated for
such equipment.

CONCERN: Many of the BNL organizations do not have
(TS.3-1) written procedures controlling design and review
(H3/C2) of modifications.

CONCERN: Safety Analysis Reports are not prepared before
(TS.3-2) completion of a facility design or of a facility
(H2/C2) modification.

CONCERN: Brookhaven National Laboratory Occupancy
(TS.3-3) Readiness Reviews do not satisfy the requirements
(H2/C2) for the more conventional Operational Readiness
Reviews.

CONCERN: There is no comprehensive program for systematic
(TS.4-1) evaluation of equipment performance. (See also
(H3/C2) Concerns OA.5-1, MA.8-1, QV.1-2, and QV.5-1.)

CONCERN: Not all performance testing and monitoring files
(TS.4-2) are readily auditable by a third party for
(H3/C2) verification of compliance with requirements.
(See also Concern QV.1-2.)

CONCERN: No formal sitewide system has been established for
(TS.4-3) performance testing and monitoring of equipment
(H2/C2) within established safety parameters and
limits. (Also see Concern TS.4-1, Appendix B.)

CONCERN: The BNL Annual Site Environmental Report was not
(TS.8-1) distributed on the schedule required by
(H3/C1) DOE 5400.1.

4.4.9 NUCLEAR CRITICALITY SAFETY

CONCERN: The criticality safety program is not independent
(CS.1-1) of operations in compliance with ANS 8.1-1983 as
(H2/C1) required by DOE Orders. (Also see
Concern OA.2-3.)

CONCERN: A criticality alarm system, nuclear accident
(CS.5-1) dosimeters, and emergency procedures and drills
(H2/C1) have not been implemented to cover the fissile
fuel storage areas at the High Flux Beam Reactor
in compliance with DOE 5480.5.

4.4.10 EXPERIMENTAL ACTIVITIES

CONCERN: The charters for the department and division
(EA.2-1) experiment safety review committees did not
(H3/C2) fully define the body, scope, and authority of the
committee.

CONCERN: The boundaries of safe operation were not
(EA.4-1) developed for each experiment or class of
(H2/C1) experiments at the various departments and
divisions at the Brookhaven National Laboratory,
as required by DOE 5481.1B. (Also see
Concern TS.2-3.)

4.4.11 SITE/FACILITY SAFETY REVIEW

CONCERN: The Ad Hoc Committee for the review and approval
(SR.1-1) of table-top and planned larger (non-Radiation
(H2/C1) Effects Facility) experiments are not in
compliance with DOE 5482.1B, Section 9.d.

CONCERN: BNL is not in compliance with DOE 5482.1B in all
(SR.7-1) programmatic areas reviewed in this TSA.
(H2/C1)

CONCERN: Periodic facility safety reviews do not include a
(FR.4-1) safety review of all procedures and operational
(H2/C1) activities as required by DOE 5482.1B.

CONCERN: Brookhaven National Laboratory does not perform a
(FR.5-1) triennial appraisal of the safety review system.
(H2/C1) (Also see Concern SR.7-1, Appendix E.)

4.4.12 RADIOLOGICAL PROTECTION

CONCERN: Implementation of some aspects, particularly
(RP.3-1) radiation worker retraining, of DOE 5480.11 will
(H3/C2) not be accomplished by January 1, 1990, as
specified in BNL's implementation plan. (See also
Concern TC.2-1.)

CONCERN: BNL does not have uniform posting in radiation
(RP.3-2) areas.
(H2/C2)

CONCERN: In general, there are no formal, documented
(RP.3-3) departmental radiation protection procedures
(H2/C2) which implement the guides in the BNL Safety
Manual.

CONCERN: Many of the interlock systems are not consistent
(RP.3-4) with the BNL Safety Manual. (See also
(H1/C2) Concern OA.5-1.)

CONCERN: Many radiation protection procedures developed and
(RP.3-5) used by operations personnel are outdated or do
(H2/C2) not apply accepted good practices. (Also see
Concern MA.8-2.)

CONCERN: Procedures issued by the Safety and Environmental
(RP.3-6) Protection Division are not being effectively
(H2/C2) tracked for review, revision, and approval.

CONCERN: The existing Radiation Work Permit form lacks
(RP.3-7) information required to ensure work is performed
(H2/C1) safely and does not ensure "as low as reasonably
achievable."

CONCERN: Brookhaven National Laboratory does not have an
(RP.3-8) effective program to control access to
(H2/C3) radiological areas.

CONCERN: External radiation exposure control is not
(RP.4-1) adequate to minimize exposures or to quickly
(H2/C2) recognize that higher than normal exposure is
being received by personnel.

CONCERN: The commercial film badge service provided to BNL
(RP.5-1) is not accredited under DOELAP.
(H3/C2)

CONCERN: The Safety and Environmental Protection
(RP.7-1) Division internal dosimetry program has not
(H2/C1) undergone an internal audit as required by
DOE 5482.1B.

CONCERN: Calibration of radiation protection instruments
(RP.8-1) does not meet ANSI N323 as required by DOE 5480.4.
(H2/C1)

CONCERN: Air monitoring systems do not ensure reliable
(RP.9-1) estimates of air activity.
(H3/C2)

CONCERN: BNL does not have a documented ALARA program.
(RP.11-1)
(H3/C2)

4.4.13 INDUSTRIAL HYGIENE

CONCERN: Industrial hygiene data are not developed to allow
(IH.4-1) long-term exposure estimates for many substances.
(H2/C2)

CONCERN: BNL does not comply with the respiratory
(IH.5-1) protection and laser safety standards required by
(H2/C1) DOE 5480.4. Internal audits have failed to
identify these deficiencies.

CONCERN: The BNL hazard communications program, required
(IH.6-1) by DOE 5480.4 and 5483.1A, has not been fully
(H2/C1) implemented.

CONCERN: Brookhaven National Laboratory is not in
(IH.6-2) compliance with 29 CFR 1910.1200 and
(H2/C1) unlikely to comply with deadlines established in
(CAT II) 29 CFR 1910.1450.

4.4.14 OCCUPATIONAL SAFETY

CONCERN: All pesticide hazards arising in the work
(OS.3-1) place are not identified and controlled.
(H2/C2)

CONCERN: The priority given to safety is not adequate to
(OS.4-1) ensure that safety performance meets DOE
(H2/C1) expectations as required by DOE 5483.1A.

CONCERN: BNL is not controlling hazardous conditions at its
(OS.4-2) construction activities and is not enforcing
(H1/C1) construction safety standards as required by
(CAT I) DOE 5480.4 and DOE 5480.9.

CONCERN: BNL has not established a formal program to track
(OS.4-3) the corrective actions identified during injury
(H1/C1) and illness recording, investigation, and
reporting.

CONCERN: BNL is not consistently enforcing the use of
(OS.5-1) personnel protective equipment as required by
(H1/C1) DOE 5483.1A.

CONCERN: The BNL Compressed Gas Cylinder Safety Policy
(OS.5-2) and Procedures do not meet DOE 5480.4
(H2/C1) requirements.

CONCERN: Egress or rescue capability is not provided for
(OS.5-3) the catch basins as required by the Occupational
(H1/C1) Safety and Health Act, Section 5(a)(1).

CONCERN: BNL is not posting their injury and illness data
(OS.6-1) as required by DOE 5483.1A.
(H2/C1)

CONCERN: BNL safety training program is not adequate as
(OS.6-2) required by DOE 5483.1A.
(H2/C1)

4.4.15 FIRE PROTECTION

CONCERN: Not all of the fire protection functions required
(FP.1-1) by DOE 5480.7 and BNL Safety Department operations
(H1/C2) procedures and safety directives are being
performed. (See also Concern OA.2-1.)

CONCERN: Fire protection deficiencies are not being
(FP.1-2) corrected in a timely manner. (See Performance
(H1/C2) Objective FP.2, FP.3, and FP.7.)

CONCERN: The Chicago Operations Office has not conducted
(FP.1-3) Fire Protection Appraisals of Brookhaven
(H2/C1) National Laboratory facilities at the frequency
required by DOE 5480.7.

CONCERN: All requirements for testing frequency and
(FP.1-4) documentation for fire protection equipment
(H2/C2) are not clearly identified in Brookhaven National
Laboratory fire protection procedures.

CONCERN: BNL life safety provisions do not meet the
(FP.2-1) minimum requirements of NFPA 101, The Life Safety
(H1/C1) Code, as required by DOE 5480.7-9.1(1).

CONCERN: No quantitative analysis has been performed to
(FP.3-1) ensure that an off-site release of hazardous
(H2/C1) amounts of toxic or radioactive materials will not
occur under maximum credible fire conditions as
per DOE 5480.7-9.a.(3). (See also Concerns EP.1-1
and PT.5-1.)

CONCERN: BNL has not performed an analysis to verify that
(FP.4-1) a credible fire loss could not impair an operation
(H3/C1) in a vital facility for a period greater than six
months, as required by DOE 5480.7-9.b.

CONCERN: The transformer yard arrangement does not meet
(FP.4-2) the criteria of Factory Mutual Data Sheet 5-4,
(H2/C2) Table III for equipment and building separation.

CONCERN: BNL has not determined that a maximum credible
(FP.5-1) fire may result in an unacceptable property loss
(H3/C1) as required by DOE 5480.7, Sections 9.c, 9.d,
10.b.(8), and 10.b.(11).

CONCERN: A fire involving either the Chemistry or Physics
(FP.5-2) complex cooling towers may result in direct damage
(H2/C2) to the buildings in excess of the "improved risk"
criteria of DOE 5480.7.

CONCERN: Combustible areas obstructed from sprinklers
(FP.5-3) at the National Synchrotron Light Source and small
(H2/C2) combustible operations of the Alternating Gradient
Synchrotron are not protected in accordance with
Factory Mutual Data Sheet 2-8 for Highly Protected
Risks.

CONCERN: Automatic Fire protection of critical records,
(FP.5-4) off-site vital records storage, and the
(H2/C1) arrangement of equipment are not consistently
provided for electronic data and computer
apparatus as required by DOE 5480.7 and mandatory
standards.

CONCERN: The maintenance of roof decks is inadequate to
(FP.5-5) prevent damage to critical equipment and
(H2/C1) experiments and weakening to windstorm damage per
DOE 5480.7.

CONCERN: Cable tray arrangements do not meet the criteria of Factory Mutual Data Sheet 5-31, and the impact of a fire involving this material has not been recently analyzed.
(FP.5-6)
(H2/C2)

CONCERN: The lack of fire walls, smoke barriers, or sealed vertical cut-offs poses a loss potential in excess of the improved risk criteria of DOE 5480.7.
(FP.5-7)
(H2/C2)

CONCERN: Brookhaven National Laboratory has not determined through formal and regularly scheduled analyses that a maximum credible fire will not result in an unacceptable property loss, as required by DOE 5480.7.
(FP.5-8)
(H2/C1)

CONCERN: Some sprinkler and halon systems at BNL do not completely conform to DOE 6430.1A-1530-4.1 and -5.25 requirements.
(FP.7-1)
(H3/C1)

CONCERN: The distribution of some portable fire extinguishers in several buildings is not in accordance with NFPA 10 and DOE 6430.1A-1530-7.
(FP.7-2)
(H3/C1)

CONCERN: Housekeeping and the control of ordinary combustibles is not adequate in several buildings at BNL. (See also Concern OS.5-2.)
(FP.7-3)
(H2/C2)

CONCERN: Flammable liquid hazards at BNL are not being controlled in accordance with DOE 5480.7-9.a.(2)(b) and the requirements of NFPA 30.
(FP.7-4)
(H2/C1)

CONCERN: During welding operations, site procedures for the protection of combustibles and use of fire watch personnel were not being followed, as required by NFPA 51B.
(FP.7-5)
(H2/C1)

CONCERN: BNL is not implementing an effective fire barrier maintenance program as required by DOE 5480.7-10.b.(5) and 10.b.(7).
(FP.7-6)
(H2/C1)

CONCERN: Materials with unusually high fire characteristics, notably expanded plastic duct insulation, exist in interior finish applications at BNL, in conflict with DOE 5480.7-9.a.(2)(a) and 6430.1A-0110-6.1. (See also Concern FP.1-1.)
(FP.7-7)
(H2/C1)

CONCERN: Fire water main flows, water storage tanks, and emergency lights and signs are not tested or inspected at NFPA-specified frequencies.
(FP.7-8)
(H2/C1)

CONCERN: Not all portable and modular buildings at BNL
(FP.7-9) conform to the requirements of DOE/EV-0043,
(H2/C2) "Fire Protection for Portable Structures," with
respect to exposure distances and sprinkler
protection.

CONCERN: Precautions for the storage and use of compressed
(FP.7-10) gas cylinders are not in accordance with improved
(H2/C1) risk practices.

CONCERN: Automatic sprinkler systems at BNL are not always
(FP.7-11) arranged and maintained according to improved risk
(H2/C2) risk as outlined in the NFPA Fire Protection
Handbook.

CONCERN: There is no diking around elevator hydraulic tanks
(FP.7-12) and pumps per NFPA 30 Section 2-4.1.1 which can
(H2/C1) allow burning oil to spread to surrounding
equipment.

CONCERN: Cable and wiring circuits are not fully maintained
(FP.7-13) in accordance with NFPA 70 "National Electric
(H2/C1) Code."

CONCERN: The presence of combustibles in critical equipment
(FP.7-14) or otherwise unprotected areas, such as at the
(H2/C2) Alternating Gradient Synchrotron, poses an
avoidable fire risk.

CONCERN: Tobacco smoking is an ignition source to transient
(FP.7-15) combustibles in the Alternating Gradient
(H2/C2) Synchrotron, a largely unprotected and important
facility.

CONCERN: Maintenance, cable support, and fire protection
(FP.7-16) for the transformers near the beam separator line
(H2/C2) of the Alternating Gradient Synchrotron is not in
accordance with the manufacturer's instructions or
Factory Mutual Data Sheet 5-4.

4.4.16 MEDICAL SERVICES

CONCERN: A formal tracking program does not exist in the
(MS.2-1) Occupational Medical Clinic.
(H2/C2)

CONCERN: Policies, procedures, and practices of the
(MS.4-1) Occupational Medical Clinic are not
(H2/C2) periodically reviewed and audited as required by
good practices.

CONCERN: The Health Awareness and Wellness Program is
(MS.5-1) not fully implemented for Brookhaven National
(H2/C3) Laboratory by the Occupational Medical Clinic.

H. PACKAGING AND TRANSPORTATION

CONCERN: BNL has not routinely audited packaging and
(PT.2-1) transportation functions as required by
(H3/C1) DOE 5480.3 and DOE 5482.1B.

CONCERN: BNL does not have policies and procedures for
(PT.3-1) handling, packaging, and shipping hazardous
(H3/C1) materials, substances, and wastes, as required by
the health, safety, and environmental requirements
of DOE 5480.1A, or all the requirements of
DOE 5480.3 and 5480.4. (See also Concern OA.2-1.)

CONCERN: BNL does not have safety oversight of P&T
(PT.4-1) operations as required by DOE 5480.1A.
(H3/C1)

CONCERN: BNL does not conduct handling, storage, intrasite
(PT.5-1) movements, and emergency response aspects of
(H2/C1) hazardous materials, substances, and wastes
(including hazardous, mixed, and radioactive) and
does not have adequate safety requirements to meet
the full intent of the health, safety, and
environmental requirements of DOE 5480.1A. (See
Concern EP.1-1.)

CONCERN: The BNL training program for personnel with P&T
(PT.6-1) functions does not meet the existing
(H2/C1) standards of DOE 5480.3 (7/9/85) for offsite
shipment or 5480.1A for intrasite movements. (See
Concern TC.1-1.)

CONCERN: BNL does not have a spill prevention, control, and
(PT.6-3) countermeasures program which meets all the
(H3/C1) requirements of DOE 5480.4 and 40 CFR 112.

N. FIREARMS SAFETY

CONCERN: Corrective actions and safety complaints are not
(FS.2-1) being pursued on an aggressive, timely, and formal
(H2/C2) basis to reduce BNL's high accident rate involving
security inspectors.

CONCERN: Methods for reporting, evaluation, and tracking of
(FS.3-1) BNL safety performance data are not in keeping
(H2/C3) with accepted industry practice.

CONCERN: The emergency medical response simulation did not
(FS.5-1) follow good industry practice, thereby diminishing
(H2/C3) the quality of the training received as a result
of these drills.

CONCERN: The storage of Engagement Simulation System
(FS.6-1) weapons does not comply with DOE 5480.16.
(H2/C1)

CONCERN: There is potential for an inadvertent mix-up
(FS.6-2) between the Engagement Simulation System weapons
(H2/C2) and spare live-fire weapons which are kept in the
same locked cabinet.

5.0 OSHA

5.0 OCCUPATIONAL SAFETY AND HEALTH

5.1 Scope

The purpose of this compliance assessment was to assess BNL adherence to the Department of Labor (DOL) requirements for workplace safety and health as defined in 29 CFR 1910 and 1926. These regulations contain the standards promulgated by OSHA for workplaces in general industry and in construction activities, respectively.

The assessment did not include all of the 354 buildings at BNL but did include 35 buildings in selected areas. The areas selected were chosen to be representative of BNL management of workplace safety and health based upon the presence of hazardous materials or activities. The facilities selected for inspection included maintenance shops, craft shops, steam supply plant, water and sewage treatment plants, laboratories, and major research facilities. The research facilities included the HFBR and the AGS. The assessment covered approximately 10 percent of the buildings on the site, but because of the selection process, these buildings included a large fraction of the nonoffice workplaces and virtually all of the hazardous workplaces on-site. In addition, a sample of office buildings and other usually low-hazard areas were reviewed.

The shop steward of the largest union local at BNL was interviewed, and his advice was sought in selecting the facilities to be inspected.

There was little on-site construction or renovation under way during the assessment, and all major construction sites were inspected. All inspections followed the procedures specified in the OSHA Field Operations Manual, wherever possible, but differed in that citations of the violations were not posted at the location at which they were observed, and fines were not assessed.

Radiological hazards in the workplace in private industry are regulated by the Nuclear Regulatory Commission under standards which are, in turn, prescribed by OSHA (29 CFR 1910.96). At DOE facilities, DOE 5480.11 contains radiological safety and health standards. Radiological safety and health were not considered in this assessment.

5.2 Approach

The Atomic Energy Act, as amended, and the Occupational Safety and Health Act, as amended, respectively, provide that DOE, as a successor agency to the Atomic Energy Commission, has responsibility for enforcing workplace safety and health at its facilities involving research or nuclear energy applications, and

that such facilities are exempt from inspection by OSHA. DOE 5483.1 states that contractors managing and operating DOE facilities will comply with all workplace standards promulgated by OSHA. In addition, DOE Orders require compliance with other workplace standards beyond the OSHA standards and require that the contractor establish and maintain occupational safety and industrial hygiene programs. This assessment was focused upon the aspect of workplaces with OSHA standards (i.e., with the direct protection of contractor employees from occupational safety and health hazards, rather than, with the programs intended to provide that protection).

BNL has 354 buildings, reported in the latest survey for the DOE property inventory (MA 202, March 28, 1990), with a total of 3,654,485 square feet of floor area. There are approximately 3,300 equivalent full time employees; 18 reactor operators and technicians, 550 electricians, and 50 guards are represented by unions. In the latest DOE Occupational Injury and Property Damage Summary, January-December 1990, BNL ranked 29th out of 32 DOE research contractors in a performance index based upon injury and illness incidence rates, having the highest such rates of any of the major national laboratories.

This inspection was conducted by a team of four professional safety engineers and industrial hygienists from the staff at HQDOE. During the approximate 3-week period of this assessment, the team members walked through the selected workplaces, examining equipment and interviewing BNL employees. Each DOE team member was accompanied by a contractor representative. Where a violation of regulations was observed, it was immediately pointed out to the BNL representative, who, in many cases, was able to direct the commencement of the abatement process.

During the assessment, a hot-line was established through which callers could report places and practices within BNL that they wished the team to investigate, and this number was widely advertised on-site (see Appendix F). Five calls dealing with workplace hazards were received. One call dealt with the use of lead-shielding bricks as door stops in the men's dormitory, and another call concerned poor air quality in a machine shop. Other complaints dealt with ammonia fumes in the blue-print shop, an unsafely positioned switch on a milling machine, and the presence of asbestos in the cafeteria ceiling. All complaints were investigated.

5.3 Summary of the Workplace Safety and Health Assessment

The assessment at BNL resulted in the detection of approximately 200 violations of OSHA and DOE workplace safety and health standards and regulations. None of these violations could be classed as an "imminent danger" (i.e., a workplace situation in

which there was a high probability of death or serious physical harm occurring to an employee). About half of the violations met the OSHA criteria for being "serious," in that, there existed a possibility of death or serious harm, although such an outcome might be unlikely.

While this assessment reviewed a sampling of only 10 percent of BNL buildings, similar violations would be expected elsewhere at the site. BNL corrective measures and preventative programs which follow this assessment should be directed site-wide.

The major areas of concern were found in electrical safety, in the hazards communications program, and in asbestos abatement. Under the category of electrical safety, testing of hand power tools for grounding had not been performed, and some buildings lacked ground fault circuit interrupters (GFCI). The hazards communication program had flaws both in the acquisition of information concerning hazardous materials and in its distribution to the workers. The BNL asbestos removal practices are discussed in Section 5.5, Construction Safety.

5.4 Workplace Safety and Health

Workplace hazards can occur through wear or damage to, or improper maintenance of, machinery or buildings, through errors committed during construction or modifications, or may be found to already exist due to the discovery of a previously unsuspected hazard. To prevent growth in the numbers of hazards in any facility, it is necessary to identify them as quickly as they appear and to correct the condition that permitted them. Large numbers of instances of noncompliance with standards and regulations can be interpreted as evidence that the contractor is not performing workplace inspections at a rapid enough rate to prevent the growth of occupational safety and health hazards at the facility, and the nature of the hazards found can offer clues as to the means of combating future growth.

Although none of the hazards identified at BNL were classifiable as "imminent danger," about half were classifiable as "serious." By far the most common of these were violations of Subpart S of 29 CFR 1910 that contains the OSHA electrical safety regulations. Such violations include frayed electrical insulation, inadequate GFCI protection of power tools, and similar shock hazards. These hazards should have been recognized by the employees in the affected workplaces and by their supervisors. They were not recognized, and this suggests inadequate training in electrical hazards awareness and recognition.

The second most common violation concerned standards contained in Subpart Z, "Toxic and Hazardous Substances," and chiefly involved deficiencies in hazards communications (i.e., the requirement that MSDS containing descriptions of the properties of substances

be freely available to employees exposed to those substances). There were also significant numbers of Subpart L, "Fire Protection," violations, dominated by inadequate fire extinguisher testing; of Subpart D, "Walking-working Surfaces," comprised of tripping and falling hazards; and of Subpart H, "Hazardous Materials," dominated by flammable material storage practices.

Several buildings were inspected and were found to be free of any apparent standards violations while other buildings were found to contain many. This suggests that workplace safety and health are dependent upon the hazards recognition abilities and commitment to correction by the supervisors of the specific workplaces. This dependence could be explained in the BNL Occupational Health and Safety Guide, Section 2.1.0, IV, which places the responsibility for standards compliance upon line supervisors and assigns the S&EP Division the role of providing assistance on request. At the same time, S&EP is to "Audit for compliance with this guide." This requirement is the only sitewide self-appraisal requirement in the guide. There is no requirement for routine, thorough compliance inspections by S&EP. There is no requirement in the guide for upper line management, Laboratory Director and Department Heads, to accompany safety and health professionals on compliance walkthroughs.

5.5 Construction Safety

There was little construction activity present on the site at the time of this inspection. There are no new major facilities being built; only renovation and addition projects were found. As at most DOE sites, there were asbestos removal projects under way. The most common construction activity violations involved these asbestos projects, and were associated with BNL assumption that these projects were short-term, small-scale abatements, rather than long-term, large-scale efforts.

BNL is not in compliance with the OSHA asbestos standard for the construction industry, 29 CFR 1926.58(e)(6). This standard defines regulated areas that must surround removal, demolition, and renovation operations involving asbestos and requires negative pressure enclosures to be established wherever feasible. This standard, however, permits small-scale, short-term maintenance and renovation operations to be less strictly conducted.

BNL claims that all of their asbestos projects are small-scale, short-term operations. This claim is based upon a New York State variance. The variances, however, are from environmental regulations promulgated under the Asbestos Hazard Emergency Response Act of 1986. These regulations are intended to protect

the general public during asbestos removal operations at schools and do not contain provisions for occupational safety and health of the workers involved in the operations.

The BNL Occupational Health and Safety Guide specifies that firms contracting with BNL for construction and other projects are to be overseen by the line organization originating the project. There is, consequently, no uniform sitewide workplace safety and health compliance monitoring of subcontractor employees.

6.0 Management Assessment

6.0 MANAGEMENT ASSESSMENT

6.1 Scope

This Management and Organization assessment evaluated the effectiveness and identified strengths and weaknesses in HQDOE, CH, BHO, and AUI management of ES&H programs as they relate to the BNL.

The evaluation was aided by the cooperative assistance of the many BNL and DOE managers and staff members who provided information to the Management Subteam.

Although an attempt was made to pursue issues beyond the Management and Operations contractor to DOE, given the limited time available, it was not possible to pursue DOE management issues, except superficially. For example, in an instance in which the Departmental directive associated with an ES&H issue was considered inadequate, the Subteam identified this as a contributing cause. The Subteam did not attempt to determine a management finding as to why the Department does not have an adequate directive in place. The Subteam attempted to determine if ER has provided BNL the resources needed to comply with ES&H requirements. This determination proved to be too difficult to make in the time allotted and may not be possible.

6.2 Approach

The Management Subteam conducted its assessment in accordance with the Tiger Team Guidance Manual, February 1990. The Subteam worked with the Environmental and the S&H Subteams to share information and ideas. Management issues that the Environmental Subteam identified during its audit of the BNL environmental program were provided to the Management Subteam. The S&H Subteam conducted a comprehensive multidisciplined appraisal. The causal factors identified by all Subteams and the management evaluation of the safety and health program were considered by the Management Subteam in the evaluation of probable root causes.

The Management Subteam focused primarily on DOE, upper levels of BNL management, and the BNL S&EP Division and its interactions with line organizations. This approach was taken in order to complement the S&H Subteam's detailed management assessment of a number of the line organizations.

The assessment was largely conducted through the use of interviews and document reviews. The personnel who were interviewed ranged from the working level to senior DOE program directors. Organizations in which personnel were interviewed included AUI corporate, BNL, BHO, CH, ER, and EM.

6.3

Management Assessment Summary

The Management Subteam presents its findings using the categories in the report, Preliminary Trend Analysis, DOE Tiger Team Assessments, December 1989. This report was transmitted to Program Secretarial Officers and other DOE organizations by memorandum from the Secretary on January 26, 1990.

These categories are as follows:

- Organization and Administration - Primarily deals with organization structure, assignment of responsibilities, and lines of authority for accomplishing ES&H activities.
- Communication of ES&H Objectives - Primarily deals with the adequacy of systems to communicate ES&H goals, objectives, information, and accountability for ES&H activities.
- Resources - Deals with resource planning systems, formal training programs for ES&H activities, and long-range planning to ensure that ES&H activities are being incorporated in facility operations.
- ES&H Assessment - Reviews contractor and DOE ES&H oversight programs, surveillance policies, and ES&H performance feedback and corrective action systems.
- ES&H Criteria - Reviews the adequacy of the definition and enforcement of ES&H policies and standards.
- DOE Oversight - Deals with all levels of DOE management and oversight of ES&H activities.

The Management Subteam made 22 findings in these six categories. A number were related to deficiencies already identified by the responsible organization and preliminary corrective actions were under way.

The Management Subteam has reached the following summary conclusions:

- All of the DOE and AUI managers interviewed appeared to support the changing emphasis on ES&H compliance but to varying degrees.
- The flow of BNL ES&H policies and directives to the working level in the form of consistent, standardized procedures is not adequate. BNL has adopted a system of

allowing line managers to determine how to implement many ES&H directives. The resulting programs do not meet DOE expectations and requirements.

- BNL internal oversight has been insufficient and has not provided the information needed to ensure that the ES&H program meets DOE and regulatory requirements. This program has also not been sufficiently independent of line organizational responsibilities.
- The line, ES&H, and QA organizations at all levels, both DOE and BNL, are not working together to ensure that the ES&H programs are technically and formally acceptable. While the line organizations have been given ES&H responsibility for their activities, they have not formalized and standardized the ES&H programs in concert with the ES&H and QA organizations. Likewise, the ES&H oversight program does not incorporate all elements of QA.
- BNL does not have an integrated safety and health plan that identifies and prioritizes ES&H deficiencies and concerns. Both staffing and the rate of funding expenditures on ES&H improvements need to increase to meet DOE expectations on an acceptable time schedule. Once a comprehensive plan is prepared and accepted by DOE, resource needs will be clearer.
- Adequate attention has not been given to BNL ES&H programs by ER. As a result of ER's emphasis on research and prior Departmental policies, ES&H problems and oversight were largely left to CH, an organization with little authority to make funding decisions and to balance programmatic and ES&H needs at BNL.
- Oversight of BNL ES&H programs by CH has been insufficient. The environmental and QA oversight was particularly weak. The complexity of environmental regulations demands a much higher level of effort in this vital area. QA oversight by CH has been minimal.
- ER, CH, and BHO have not had sufficient, qualified staff to ensure the adequacy of the BNL ES&H programs.

6.4 Management Assessment Findings

The Management Subteam categorized each of its findings as "Compliance Findings" or "BMP Findings," consistent with Tiger Team guidance. The compliance findings result from failure to meet DOE Orders or Secretarial Notices. The BMP findings result from the failure to meet objectives that the Subteam considers

necessary for good ES&H management. There were no "Noteworthy Practice Findings," that is, management findings that represent beneficial practices that are not found elsewhere within DOE.

6.4.1 Organization and Administration

6.4.1.1 Overview

The Subteam found that BNL is struggling to impose a strict ES&H program on a decentralized organization that is very much like those of large research universities. This is being done with success in the Reactor Division where formality of operations has recently been imposed. The success in the other departments and divisions has been spotty.

Memoranda from the Laboratory Director, in February and March 1988, defined roles and responsibilities for ES&H. First of all, Laboratory employees are responsible for their own safety and for the safety of their fellow workers. Associate Directors must ensure that their programs are safe. The Associate Director for Reactor, Safety and Security has been delegated authority for all ES&H matters including responsibility for setting ES&H policy and directing the ES&H program. The S&EP Division is the principal staff of ADS for ES&H activities. Departments and divisions have prime responsibility for ensuring a safe workplace.

Each Department Chairperson and Division Head has appointed a Safety Coordinator who provides a bridge with S&EP in interpreting guidance and assisting in oversight. Safety Representatives and Building Safety Technicians from S&EP also are assigned to the departments to assist the Safety Coordinator in all areas (environmental protection as well as safety and health). Safety Coordinators and Safety Representatives are an essential link in the BNL ES&H program.

Despite the Director's description of responsibility, the Subteam found that implementation of line responsibility for ES&H by most departments and divisions is inadequate. Supervisors and workers are confused as to responsibility.

Three Laboratory-wide standing committees, Cryogenics Safety, Reactor Safety, and Laboratory Safety assist in ES&H direction. These three standing committees provide policy guidance and reviews. Departmental Safety committees look at day-to-day safety, particularly in experiment review. BNL policy does not address these departmental committees and their scopes of operations, accountability, composition, and procedures; they are established by memoranda.

The QA Office reports to the Associate Director for Management and Physical Plant. The QA Office is, somewhat remotely, located in the back of the Accelerator Development Department

(Bldg. 902B). This lack of visibility seems to weaken the impact of the QA program. No close working relationship between the QA Office and S&EP was observed; this deprives BNL of a strengthened ES&H program which would result from building quality in from the beginning of activities.

Conflicts of interest with respect to the independence of internal oversight exist in the S&EP Division. A conflict of interest with respect to the independence of QA audits exists in the Management and Physical Plant organization. These conflicts are described further in Finding MGMT/CF-4.

The Subteam found that the contract between DOE and AUI is missing two provisions that affect ES&H. Finding MGMT/CF-1 concerns the lack of an indemnification agreement under the Price-Anderson Amendments Act. Finding MGMT/CF-2 addresses the failure to require AUI to comply with DOE Orders and directives on environmental protection.

6.4.1.2 Findings

MGMT/BMPF-1 Lack of Defined Environmental, Safety, and Health Responsibilities and Reporting Relationships

Performance Objective: Management should organize so that the functions, assignments, responsibilities, and reporting relationships of individuals are clearly defined, understood, and effectively implemented. All major parts of environmental protection, safety, and health responsibilities should be included, with emphasis on line management control of ES&H.

Finding: Some elements of the BNL organization do not have clearly defined responsibilities and reporting relationships concerning ES&H implementation.

The Laboratory Director has clearly stated that departments and divisions have line responsibility for ES&H. This message has been received by department chairpersons, division heads, and their immediate staffs but has not spread throughout the workplace. This lack of understanding is compounded by the absence of organization charts that define reporting relationships below the level of principal investigators and section managers. Certain charts, however, are very clear. For example, those for the NSLS and S&EP Division show all reporting relationships down to the workplace level.

Another organizational consideration is that while departmental safety committees are a vital part of the ES&H programs, these committees are poorly chartered and have varying roles throughout BNL.

The understanding of responsibilities and authorities is affected by the lack of emphasis of ES&H in position descriptions. This is discussed further in Finding MGMT-BMPF-3.

The S&H Subteam had multiple concerns related to functions, assignments, responsibilities, and reporting relationships regarding ES&H. These include the following:

- Lines of authority and responsibility cannot always be traced on existing organization charts. (See Concern OA.1-1, Appendix B.)
- Line safety responsibility was not clearly understood and practiced. (See Concern OA.1-2, Section 4.5.1.2.)
- The responsibilities and authorities of each position in the organization are not uniquely defined in a formal document made available to the staff at large. (See Concern OP.1-1, Appendix B.)
- Operations personnel do not clearly understand their authority and responsibility. (See Concern OP.1-3, Section 4.5.3.2.)
- Formal policy and guidelines from Department Chairpersons and Division Heads do not exist for development, review, approval, and issuance of organization charts. (See Concern OP, 1-4.5.3.2.)
- The charters for the department and division experiment safety review committees did not fully define the body, scope, and authority of the committee. (See Concern EA.2-1, Section 4.5.10.2.)

Some of the Environmental Subteam groundwater findings indicate inadequate coordination between the Plant Engineering Division and S&EP Division concerning the construction and maintenance of monitoring wells. (See Findings GW/CF-1, GW/CF-3, GW/CF-4, GW/BMPF-1, and GW/BMPF-2.) A joint effort to correct this situation has been proposed by Plant Engineering and S&EP (Appendix I, M-28).

BNL has started action to define ES&H functions, assignments, and reporting relationships. A program has begun to develop a BNL Administration Procedures and Policies Manual that will contain, among other things, organization charts, and mission and function statements.

Lack of Indemnification Agreement under Price-Anderson Act

Performance Objective: DOE shall enter into indemnification agreements pursuant to the Price-Anderson Act with any person who may conduct under a DOE contract activities that involve the risk of public liability for a nuclear incident. (The Price-Anderson Act of 1988, Public Law 100-408.)

Finding: The contract between DOE and AUI does not include an indemnification agreement under the Price-Anderson Act.

The most recent 5-year rewrite of the contract between DOE and AUI for operation of BNL became effective on January 1, 1988, after the Price-Anderson Act had expired and before it was renewed. As a result, the parties included in the contract a provision for indemnity under Public Law 85-804.

The Price-Anderson Amendments Act of 1988, which renewed and amended the Price-Anderson Act, required the Secretary of Energy to enter into indemnification agreements with persons who may conduct activities under a DOE contract that involve the risk of public liability and provided further that:

"Beginning 60 days after August, 1988, agreements of indemnification under subparagraph (A) shall be the exclusive means of indemnification for public liability arising from the activities described in such subparagraph, including activities conducted under a contract that contains an indemnification clause under Public Law 85-804 entered into between August 1, 1987, and August 20, 1988."

In December 1988, BHO forwarded to AUI a proposed contract modification to include a Price-Anderson indemnification agreement in the contract. The clause proposed was an interim clause which incorporated the requirements of the Price-Anderson Act, as amended, and which required AUI to agree to accept at a later date "any Nuclear Hazards Indemnity clause promulgated by DOE to implement the Act." AUI refused to include the provision in the contract because AUI did not want to agree to include later a clause of which it had no knowledge and no right to negotiate. No further action was taken to negotiate an acceptable indemnity provision. AUI and BHO have both asserted that Price-Anderson indemnity is included in the contract by operation of law as a reason for not pursuing its express incorporation in the contract.

The Price-Anderson Act, as amended, serves a number of functions, one of which is to make DOE contractors, who are indemnified against public liability for nuclear incidents, accountable for their actions by subjecting them to criminal and civil penalties for failure to follow nuclear safety requirements under certain

conditions. The failure of AUI and BHO to persevere to reach agreement on a mutually acceptable clause appears to indicate a lack of understanding of the importance of contractor accountability for nuclear safety performance. The failure of DOE Headquarters to provide firm and practical guidance to the field on interim implementation measures for Price-Anderson contributed to the inaction by BHO and AUI.

MGMT/CF-2 Failure of the Department of Energy Acquisition Regulation to Require Compliance with Departmental Environmental Orders

Performance Objective: With regard to their responsibility for ensuring that operations under their jurisdiction are carried out consistent with sound ES&H practices, DOE line managers ensure that applicable ES&H requirements are included in contracts (DOE 5480.1B).

Finding: The contract between DOE and AUI does not require AUI to comply with DOE Orders and directives on the environment.

A review of the DOE Acquisition Regulation and other procurement directives indicates no such requirement has been imposed and no such guidance has been provided on this issue. The absence of guidance in this matter indicates that HQDOE has not carried through on an integrated environmental program with formalized requirements to ensure adequate commitment to environmental excellence by contractors.

DOE Headquarters is at the present time preparing for publication a proposed rule that will correct this problem. Similarly on March 21, 1990, BNL Counsel recommended that BNL review its subcontract solicitation packages with a view toward including provisions expressly requiring BNL subcontractor compliance with environmental regulations (Appendix I, M-160).

6.4.2 Communication of ES&H Objectives

6.4.6.1 Overview

The communication of ES&H objectives is a pervasive theme throughout the management, environmental, and safety and health assessments because it forms the cornerstone for all other aspects of ES&H compliance from the establishment of broad goals to the development of procedures to formalize routine tasks.

BNL has recently made noticeable progress in communicating a stronger corporate commitment to ES&H issues. This is evidenced by the proposal by AUI to set up an ES&H Review Committee made up of Trustees and consultants; the creation at BNL of a new Associate Director position for Reactor, Safety and Security; and the creation of a Task Force on Safety and Environmental

Protection headed by the BNL Deputy Director. The presence of senior BNL management on walkthroughs, at safety luncheons, and at annual safety operating reviews of individual departments also communicates a positive message at the middle management and worker level of the importance senior management places on site safety.

It is also clear from discussions with AUI corporate staff and BNL management that both the Director and his Directorate-level staff are being held accountable for their ES&H performance by the AUI Board of Trustees and by the Laboratory Director, respectively. BNL has not, however, formalized its senior staff's line-management responsibility for ES&H either through position descriptions which expressly assign responsibility for ES&H performance or through a formal appraisal process which would ensure continued and consistent accountability. On the other hand, all employees occupying exempt and non-exempt positions below the Department Chairperson and Division Head level are made accountable for safety (but not environment) through a formal appraisal system.

Communications between BNL and BHO, which are essential for a successful ES&H program, have improved over the last several years to a point where there is a free and consistent flow of information between the two staffs at various levels.

Although the DOE-AUI contract does not contain an award fee provision for financial incentives for encouraging contractor excellence in ES&H, the BHO and CU annual summary appraisal of AUI does provide a mechanism for DOE to communicate its expectations in ES&H and to hold AUI accountable for meeting those expectations. A review of this process for the last 3 years indicates that BHO and CU could make better use of the process by communicating expectations and evaluations in a more timely manner, appraising ES&H performance against higher standards, and giving more weight to ES&H in rating performance.

As indicated in a number of findings by all three Subteams, BNL has not been successful in communicating goals, objectives, and minimum requirements for ES&H. The safety and health assessment points to disconnects in the line of communication as one reason. (See Section 4.4). Another section of this management assessment points to the failure of BNL to have a formal, standardized system for the communication of goals, objectives, and minimum requirements (MGMT/BMPF-10). The environmental assessment points out that at least some of the BNL and BHO problems with the communication of goals and requirements stems from inadequate staff resources. (See Findings QA/CF-1 and GW/CF-1.)

As indicated in a finding included in this section (MGMT/BMPF-2), communication of mutual concerns and lessons learned among BNL Departments, and from other DOE installations and outside

organizations with similar activities, is almost nonexistent. Such communication is essential for a successful, proactive ES&H program.

6.4.2.2 Findings

MGMT/BMPF-2 Lack of Lessons Learned Program

Performance Objective: Corporate policy and practices shall reflect a strong commitment to excellence in all activities, including ES&H. Management promotes the communication of good and bad performance experiences from within and outside the facility to the potentially affected organizations.

Finding: BNL does not have a formal lessons learned program in place to ensure deficiencies found during internal or external assessments, as well as experiences at other sites, are communicated to potential beneficiaries at BNL and to ensure that the lessons are used.

In pursuing the status of a lessons learned program at BNL, the Subteam was provided one example of a trend evaluation (Appendix I, M-28). In that instance, the internal audit program (departments are assessed at different intervals over a 12-month period) found that all 19 facilities assessed during the first year audits needed to improve the same areas of their hazardous materials programs. While the evaluation readily identified this trend, a functioning lessons learned program would not have needed 19 failures and a trend evaluation to prompt corrective actions.

The problems in the groundwater program cited in findings GW/CF-1, GW/CF-2, GW/CF-3, GW/CF-4, GW/BMPF-1, GW/BMPF-2, and GW/BMPF-3 are prime examples of the potential value of a lessons learned program. Similar groundwater contamination exists at many DOE sites. Some of those sites made the same mistakes that were made at BNL, both in not providing sufficient, if any, peer review of the monitoring proposal, and in the failure to ensure quality well installations.

During the interviews of BHO and BNL management, it was stated that while there is no formal lessons learned program at BNL, the normal communication channels from the Associate Director for Reactor, Safety and Security to the other Associate Directors, along with communication between division and department Safety Representatives, is reasonably successful in transmitting ES&H information. They agreed, however, that improvements are needed (Appendix H, I-M-5 and I-M-18).

MGMT/BMPF-3 Inadequate Personnel Position Descriptions and Appraisals

Performance Objective: Responsibilities and authority for each management, supervisory and professional position shall be well defined through position descriptions, and such employees shall be made accountable for their responsibilities and authority through appropriate performance appraisals.

Finding: Position descriptions for most key positions at BNL do not reflect responsibility for ES&H objectives. There is no formal appraisal system for employees at the Department Chairperson and Division Head level and above.

Current, well-documented position descriptions and appraisal plans are an essential tool for communicating objectives and expectations and assuring accountability for performance. The Subteam reviewed specific and generic position descriptions for the Director through the Department Chairperson and Division Head level at BNL. BNL has no formal or documented appraisal system for employees at the Department Chairperson and Division Head level and above. Therefore, there is no record to document whether AUI and BNL hold these employees accountable for ES&H performance.

Although ES&H is considered a line responsibility at BNL (see Section 4.4), and the Laboratory Director has stated that Department Chairpersons and Division Heads have line responsibility for ES&H (MGMT/BMPF-1), the position descriptions for individuals occupying these positions do not reflect this responsibility. The position descriptions for all Directorate level positions fail to address ES&H responsibility with one exception - the position description of the new Associate Director for Reactor, Safety and Security adequately covers his direct ES&H responsibilities. The generic position description for Department Chairpersons fails to address ES&H performance. The one-paragraph, generic position description for Division Heads provides only that Managers are responsible for the overall safety of the division, but makes no mention of responsibility for the environment.

The safety and health assessment contains a number of findings regarding the lack of clear definition of lines of authority and responsibility for safety. (See Concerns OA.1-1, Appendix B; OA.1-2; OP.1-1, Appendix B; and OP.1-3.) The absence of the formal assignment of responsibility for safety and environmental matters in the position descriptions of senior management no doubt contributes to the problems described in the safety and health assessment.

6.4.3 Resources and Training

6.4.3.1 Overview

The primary vehicle for identifying resource requirements at BNL is the annual budget submission. In the Environment Restoration and Waste Management area, the Environmental Restoration and Waste Management Five-Year Plan is used, together with the budget submission to identify resource requirements.

About mid-November 1989, the BNL Plant Engineering Division provided ER, at ER's request, a list of potential line-item construction projects to be funded from the ER General Purpose Facilities Program for Multiprogram Laboratories. Some BNL safety and health projects were included in this response to ER. In addition, since mid-December 1989, the Plant Engineering Division and the S&EP Division have been working closely to identify and prioritize potential ES&H line item construction projects. Most recently, on March 29, 1990, ER advised that a nondefense facilities modernization project is under way. Within the next few months, it is anticipated that BNL will be given the opportunity to fully identify its safety and health resource requirements.

Because BNL has historically communicated resource requirements to DOE only through the budget process, the Subteam found that DOE has not been fully apprised of what will be required to bring the Laboratory into strict compliance with safety and health requirements. BNL budget submissions have been generally based upon a "realistic" expectation of future years' anticipated funding rather than upon a "requirements" level of funding. Closely related to this concern, the Subteam also found that there is no formalized management plan for dealing with the multiplicity of safety and health issues and associated financial needs in this area.

In the training area, the Subteam assessed the level and type of training provided BNL employees. Several concerns were identified by all of the Subteams in this area, and there is a management finding in this regard. BNL management also recognizes deficiencies in the area of training, and on December 20, 1989, BNL launched a task force effort to determine training needs and requirements. Currently, the task force is gathering information. Recommendations to management in the training area are scheduled for July 1990, with the final report and issuance of guidance scheduled for November 1990.

6.4.3.2 Findings

MGMT/BMPF-4 Inadequate Environmental, Safety, and Health Long Range Planning

Performance Objective: There should be a management plan containing definitive and measurable ES&H goals, and a plan of action for achieving those goals and resolving identified weaknesses and deficiencies.

Finding: BNL does not have a safety and health plan that identifies goals and objectives, identifies problems, and sets forth a plan to correct deficiencies.

In the environmental area, issues and concerns are generally addressed at BNL through the Environmental Restoration and Waste Management Five-Year Plan and the companion BNL Site Specific Plan. DOE requires the development of these documents at its laboratories, including BNL.

However, in the safety and health area, no current planning document at BNL identifies goals, objectives, near and long-term concerns, and problems. Also, no plan deals with these issues. The Subteam found that the BNL S&EP Division started work several months ago on the development of a draft safety and health long-range plan. However, due to a lack of time and requirements in other priority areas, the draft plan has not been completed.

The draft plan does contain several important elements found in good planning documents, *viz*, recognition that both short and long-term goals need to be identified; that a formal plan of action is necessary to ensure an appropriate level of health and safety activity; and that a plan is necessary to ensure worker safety and to ensure compliance with DOE Orders and appropriate laws and regulations. However, this draft plan is concerned with the S&EP Division only rather than BNL as a whole.

In addition to the draft plan referenced above, the Subteam also found that the Plant Engineering Division had taken action recently to identify and prioritize ES&H line item construction requirements at BNL. Although a very positive step, this prioritization process concerned only construction activities.

Despite the complex nature of safety and health activities and the fact that safety and health efforts are spread among numerous Departments throughout the Laboratory, there does not exist a fully coordinated and integrated BNL safety and health management plan. As a result, it is difficult to determine whether or not BNL has a management strategy for comprehensively identifying and prioritizing safety and health needs with the competing requirements for resources at the Laboratory. Even more important, it is difficult to determine whether management has

identified the most pressing safety and health concerns at the Laboratory and developed a strategy for dealing with these concerns.

The Safety and Health Subteam noted in Concern OA.3-1 (Appendix B) that BNL environment, safety, and health goals were neither definitive nor measurable.

MGMT/BMPF-5 Inadequate Staffing for Environmental, Safety, and Health

Performance Objective: Sufficient resources are established and allocated to effectively implement ES&H programs, provide necessary oversight, and afford professional development opportunities.

Finding: BNL does not have sufficient staff to meet existing ES&H requirements.

As of April 1990, BNL is actively recruiting to fill eleven positions within the S&EP Division. Included are both professional (e.g., hydrogeologist) as well as para-professional (e.g., hazardous waste technician) positions. There are also safety and health positions in other departments at BNL for which recruitment activity is occurring.

The increasing emphasis on ES&H significantly increases the demand for qualified staff. Examples of increasing workload include expansion of the environmental monitoring program, additional health monitoring, fire protection engineering support, and increased safety engineering support. BNL management has been generally supportive in providing resources for additional ES&H positions.

In addition, there is a need for additional QA staff. The QA Office has a professional staff of three, including the manager. An evergrowing backlog of work is developing in the QA Office, and scheduled audits are slipping. S&EP has no full-time QA staff and the S&EP Designated Quality Assurance Coordinator devotes only 10 percent of his time to QA. The S&EP Division has identified the need for three additional full-time QA positions (Appendix I, IM-25 and IM-57).

Despite planned increases in staff and active recruitment efforts, the noted shortage of staff can jeopardize the efforts to augment ES&H activities at BNL. These concerns are based on the stiff competition for the limited number of qualified ES&H specialists. The high cost of living in the Long Island area, where BNL is located, further complicates this matter.

MGMT/BMPF-6 Inadequate ES&H Funding Requests

Performance Objective: Funding required to accomplish ES&H goals and objectives should be identified.

Finding: Funding required to achieve full compliance with laws and regulations in the safety and health area has not been fully identified or communicated to DOE.

BNL has not performed a complete evaluation of what is required for strict compliance with the various safety and health laws and regulations. Accordingly, BNL, BHO, CU, and ER have little understanding of the resources required at BNL to achieve strict compliance with safety and health laws and requirements.

The fire protection portion of the S&H Subteam report identifies numerous instances where resources are required to bring facilities up to acceptable fire protection standards. (See Concerns FP.1-1, FP.1-2, FP.2-1, FP.2-2, FP.4-1, and FP.5-1 in Appendix B. Also see FP.5-2 in section 4.) The S&H Subteam also pointed out that a complete life safety appraisal of all plant buildings has not been made. (See Section 4.5.15.2.) Furthermore, BNL may require extensive resources to bring facilities up to current OSHA requirements.

The Subteam could not locate documentation, either through budget requests or other sources, indicating that BNL or DOE management had ever been advised of the full financial requirements for bringing BNL facilities into compliance with safety and health requirements. For example, although three separate line item construction projects have been budgeted and authorized for fire protection improvements, these three projects collectively amount to approximately \$7.5M. This is only a portion of the \$27.5M identified in the 1974 Factory Mutual Engineering Association/Professional Loss Control studies. (See Section 4.5.15.2.) The Team could find no documentation indicating that DOE had been advised of a potential \$27.5M requirement at BNL for fire protection.

Although it is recognized that funding available to support fire protection, life safety, and OSHA requirements is extremely limited, management at all levels including HQDOE, nonetheless, needs to be informed of these requirements in order to develop appropriate strategies for securing the funding to resolve these concerns.

This finding is closely related to the Subteam concern regarding the lack of a long-range plan in the safety and health area wherein problems are identified and a strategy is provided for dealing with safety and health concerns.

It should also be noted that BNL, through the Industrial Safety and Fire Protection Division, recognizes the need to develop a risk analysis for all activities affected by the life safety code for fire protection and OSHA. A report is scheduled to be issued on this matter in the Fall 1990.

MGMT/BMPF-7 Inadequate Environmental, Safety and Health Training Program

Performance Objective: Training is required for quality work performance and for achieving defined goals and objectives in the ES&H area.

Finding: The current BNL training program is inadequate. BNL does not have a documented Laboratory-wide performance-based training program in the ES&H area. Training required of workers and managers to meet all compliance and good management practices has not been fully identified. Concerns about the lack of training, lack of documented training, and failure to meet various compliance requirements relating to training have previously been brought to the attention of BNL management, recently by the 1989 TSA (see Appendix B).

Concerns relating to the training area continue as indicated by findings of the S&H Subteam: lesson plans not formalized (Concern TC.2-1, Appendix B); informal on-the-job training (Section 4.5.5.2, TC.1); lack of documentation regarding training (Concern TC.1-2, Appendix B; Concern TC.5-1; Concern TC.9-1); lack of documented examinations (Concern TC.1-1, Appendix B; Concern TC.4-1; Concern TC.5-1; Concern TC.9-1); lack of required training (Concern TC.1-1, Appendix B; Concern TC.41; Concern TC.9-1); and adequate and inconsistent treatment of training records (Concern TC.1-2, Appendix B). Similarly, the Environmental Subteam identified training deficiencies as a causal factor in a number of findings (e.g., RAD/CF-1, Inadequate Management of Activated Material; TS/CF-3, Inadequate Labeling of PCB Items; WM/CF-7, Improper Disposal of Hazardous Solvent Waste; WM/BMPF-1, Storage of Land Disposal Restricted Mixed Wastes, etc.).

In a December 20, 1989, BNL Memorandum to Department Chairmen and Division Heads, the Associate Director for Reactor, Safety and Security announced that a task force on training would be established to deal with concerns relating to training at BNL. Specific goals of the task force have been defined as follows:

- To determine status of training documentation, including:
 - determination of required training,
 - identification of personnel for training,

- documentation of training course content,
- trainer qualification and certification,
- documentation of formalized on-the-job training,
- certification and recertification procedures;
- To determine standards for training;
- To design "tools" for the reporting of training and training plans and to assist departments and divisions in meeting reasonable training standards; and
- To assist departments and divisions in implementation.

Currently, the task force is gathering information. Recommendations to management are scheduled for July 1990 with the final report and issuance of guidance scheduled for November 1990.

6.4.4 ES&H Assessments

6.4.4.1 Overview

This portion of the assessment was to confirm the adequacy of the Laboratory's management systems and controls related to self assessments, independent reviews, internal appraisals, monitoring, and oversight of performance to ensure implementation of the ES&H requirements and objectives.

The review included an evaluation of the quality, frequency, depth, and scope of BNL self-assessments and independent reviews, and the manner in which noted deficiencies are tracked to remediation.

BNL has implemented a two-tier assessment program within the Laboratory. Departmental inspections are being performed by the line organizations as part of line-management ES&H responsibility, and annual departmental assessments are being performed by the S&EP Division.

Each Laboratory Department is performing a quarterly safety inspection of their spaces in accordance with the BNL Safety Manual. It was noted by BNL that the correction of safety deficiencies observed during these inspections has not been accomplished in a timely fashion (Appendix I, M-10).

The Laboratory has initiated a formal safety assessment program conducted by S&EP to review the performance of ES&H programs at the department and division level. A comprehensive annual

operations review of each BNL Department having more than office-type functions is performed, and a third of the departments having merely office-type functions are included each year. In FY 1990, a total of 19 such reviews are scheduled. Each review lasts about 1 week, and closeout sessions are attended by the Laboratory Director; the Associate Director for Reactor, Safety and Security; and the cognizant department Associate Director. This is a commendable practice. A concern is expressed regarding the scope of these reviews not being in strict compliance with DOE Orders.

A Task Force chaired by the Laboratory Deputy Director has been established to lead the Laboratory effort to bring them into full compliance with the ES&H requirements. One of the major priorities of this group is to ensure proper management of safety and environmental programs in the operating departments and to ensure that these programs are sustained in the long term.

The BNL Self-Assessment of Environment, Safety & Health Issues, conducted in preparation of this TTA, touched on most of the findings identified in this section. The adequacy of the Laboratory's self-assessment programs are lacking the quality and depth necessary to ensure that ES&H deficiencies are identified, reported, and corrected. The BNL self-assessment report further demonstrates the lack of a rigorous self-assessment program at the Laboratory.

The Team found that the BNL self-assessment primarily summarizes ES&H problems for which BNL actions are planned or underway. It is not comprehensive or with sufficient depth to form a basis for correcting the full range of ES&H problems.

6.4.4.2 Findings

MGMT/CF-3 Inadequate Environmental, Safety and Health Assessments

Performance Objective: Management systems should be in place that ensure ES&H requirements and policies are effectively implemented throughout the organization. The systems should provide management with objective, timely, and reliable information on ES&H performance, including significant achievements and deficiencies (DOE 5482.1B).

Finding: Not all ES&H assessments required by DOE Orders and other regulatory requirements are being performed adequately.

Multiple findings and concerns identified by the Subteam relate to either the lack of or the inadequacy of ES&H assessments at BNL. Examples of deficiencies discussed in this report, which are related to this finding include the following:

- Independent verifications, surveillance, and audits of quality attainment within the departments, divisions, and projects are too few to enable the BNL Director and his line managers to review and evaluate the implementation of their QA programs, as required by DOE 5700.6B. (See Concern QV.1-2, Appendix B.)
- QA audits at BNL conducted by both the QA Office and the Designated Quality Assurance Representatives do not cover all departments and divisions as required by Laboratory policy. (See Concern QV.1-4.)
- BNL has not routinely audited packaging and transportation functions as required by DOE 5480.3 and DOE 5482.1B. (See Concern PT.2-1, Appendix B.)
- BNL does not have safety oversight of Packaging and Transportation operations as required by DOE 5480.1A. (See Concern PT.4-1, Appendix B.)
- Periodic facility safety reviews do not include a safety review of all procedures and operational activities as required by DOE 5482.1B. (See Concern FR.4-1.)
- BNL does not perform a triennial appraisal of the safety review system as required by DOE 5482.1B. (See Concerns FR.5-1 and SR.7-1, Appendix B.)
- S&EP internal dosimetry program has not undergone an internal audit as required by DOE 5482.1B. (See Concern RP.7-1.)
- Policies, procedures, and practices of the Occupational Medical Clinic are not periodically reviewed and audited as required by good practices. (See Concern MS.4-1.)
- BNL has not identified all air emission sources that may require permits to construct or certificates to operate, and BNL does not have a rigorous procedure to identify such sources systematically (Finding A/CF-1).
- On-site soils and sediments have not been sufficiently characterized to determine the presence of contamination and, if present, the extent of the contamination and the controls necessary to prevent the spread of this contamination in accordance with DOE 5400.1 (Finding SSB/BMPF-1).
- Documentation of the radiological environmental monitoring program is inadequate with respect to DOE 5400.1, S&EP QA Manual, and BMPs (Finding RAD/CF-2).

- BNL has not adequately performed, has not maintained records of inspections, and has not collected data for and submitted an annual report for operations at the active solid waste landfill in accordance with 6 NYCRR 360.2 (Finding WM/CF-5).
- BHO has not conducted a complete search for information to assist in discovering and characterizing inactive waste sites as required by DOE 5400.4, 40 CFR 300.410, and 40 CFR 300.420 (Finding IWS/CF-5).
- The hydrologic regime at BNL has not been adequately characterized to define aquifer relationships, subsurface stratigraphy, extent of contamination, and local flow pathways in accordance with DOE 5400.4 and 40 CFR 300.430 (Finding GW/CF-1).
- Permitted RCRA monitoring wells WR and WS at the current landfill were not abandoned in accordance with 6 NYCRR, Part 360-211(a)(8)(vi) (Finding GW/CF-4).
- The DOE requirements for risk assessment and risk management are not uniformly implemented in accordance with DOE 5480.1B and 5000.3 (Finding MGMT/CF-6).
- The BNL ES&H program does not incorporate elements of QA in accordance with DOE 5480.1B and DOE 5482.1B (Finding MGMT/CF-5).

In addition, a number of the other findings and concerns in this assessment suggest that the BNL assessment programs are lacking the rigor, objectivity, and consistency expected by DOE policy. Specifically, more than 23 of the environmental findings, and 30 of the safety and health concerns have a causal factor relating to the less than adequate assessment and appraisal program.

BNL has initiated some actions that specifically respond to the above examples which are from the September 1989 TSA (Appendix B). However, BNL did not address the Laboratory-wide implications of those concerns.

The Subteam believes that BNL is lacking adequate self-assessment programs to ensure that ES&H deficiencies are identified, reported, and corrected. As a result of BNL not placing sufficient priority on ES&H issues, the assessments and inspections being performed have not been effective in providing a critical assessment of Laboratory ES&H performance.

Potential Conflict of Interest on Internal Appraisals

Performance Objective: Internal appraisals of ES&H activities shall be performed at the operating level by persons not directly responsible for performance of the activities being appraised (DOE 5482.1B).

Finding: The Laboratory Director does not have access to an independent internal appraisal process because conflicts of interest exist at the associate director level for reactor safety and QA oversight, and at the division head level for ES&H oversight.

The associate directors, who are responsible for providing the Laboratory Director with independent internal appraisals for reactor safety, QA and ES&H activities, also have line-management responsibilities.

The Associate Director for Management and Physical Plant has a potential conflict of interest in providing management oversight of the QA Office. In addition, the Associate Director for Management and Physical Plant has line-management responsibility within the Contracts & Procurement Division, Central Shops Division, and Plant Engineering Division; and is the Head of the Project Management Office. The QA Office is responsible for providing independent Laboratory-wide QA oversight, including the above mentioned divisions and office.

The Associate Director for Reactor, Safety and Security has a potential conflict of interest in providing oversight of the Laboratory reactor safety and ES&H programs. The Associate Director for Reactor, Safety and Security has line-management responsibilities within the Safeguards & Security Division, S&EP, and Reactor Division. BNL has taken action to have the Director approve the Reactor Safety Committee minutes; however, the approval is subsequent to the Associate Director for Reactor, Safety and Security review (Appendix I, M-159). The S&H Subteam also expressed concerns on this potential conflict of interest. (See Concerns OA.2-3 and CS.1-1.)

S&EP has been assigned responsibility for establishing the Laboratory-wide ES&H program and providing ES&H guidance, support, and oversight. In addition, S&EP has line-management responsibility within the Laboratory's hazardous waste management operations.

BNL has initiated an ES&H assessment program conducted by S&EP to review the performance of the Laboratory departments and divisions. A SOP has been developed to formalize this program (Appendix I, M-29). The procedure does not require that the team

members are qualified or independent of the activity being appraised. S&EP practice is to use staff members who are not directly involved with the activity (Appendix H, I-M-22).

More QA audits are needed, particularly of S&EP, which overall has had minimal exposure to internal QA audits. The S&EP division has requested additional staff for conducting such audits.

BNL has recognized the need to conduct independent appraisals of S&EP activities and is in the process of planning such reviews during FY 1991 (Appendix H, I-M-23).

The credibility and objectiveness of the BNL internal ES&H and QA oversight program is questionable. In some instances, the independence can be further questioned when supervisors and personnel with line-management responsibility are also involved in the appraisal.

MGMT/BMPF-8 Failure to Correct Known Deficiencies Promptly and Effectively

Performance Objective: Management systems shall be in place to ensure that deficiencies identified in appraisals, audits, surveys, and reviews are corrected promptly and effectively.

Finding: BNL has not promptly and effectively corrected deficiencies identified in appraisals, audits, surveys, and reviews.

BNL has some systems in place to track the correction of deficiencies identified through various types of audits and appraisals, both internal and external. Findings by the other subteams demonstrate that these systems are not fully effective:

- The S&H Subteam found that BNL tracking of remedial action in the Operational Safety area is inadequate (see Section 4.5.14.1 and Concern CS.4-3, Appendix B) and that the Occupational Medical Clinic had no formal program to systematically track the correction of identified deficiencies. (See Concern MS.2-1.)
- The Environmental Subteam found that the failure to respond fully to previous audits, surveys, and reviews was a cause for four of the findings in the Air portion of the Assessment (A/BMPF-2, A/BMPF-3, A/BMPF-5, and A/BMPF-6); one finding in the Waste Management portion (WM/CF-6); and three findings in the Toxic and Chemical Materials portion of the Assessment (TS/CF-1, TS/CF-2, and TS/BMPF-2).

Two of the findings in the Toxic and Chemical Materials portion of the environmental assessment (TS/CF-1 and TS/CF-2) concern BNL management of PCB Items. BNL response to appraisals in this area, as reflected in the June 1989 Environmental Protection Appraisal of BNL by CH as well as followup documentation to that appraisal, illustrate more specifically the inadequacy of existing systems:

- The 1989 Appraisal identified two deficiencies which had previously been identified in a similar appraisal in 1987 and were still uncorrected.
- Two of the recommendations made in the 1989 Appraisal were not acted on until February 14, 1990.
- The BNL monthly tracking report for February 1990 indicated that action on one of these recommendations (the development of an accurate inventory of PCB equipment) was closed before the action was completed. At the time of this TTA, an accurate inventory had still not been completed.

MGMT/BMPF-9 Inadequate Use of Management Tools

Performance Objective: Management systems are in place that provide timely, objective, and reliable indicators of ES&H performance to managers and supervisors at all levels.

Finding: BNL has not instituted a Laboratory-wide program for utilizing tracking, trending, or root cause analysis as management tools.

BNL currently has systems within S&EP to compile data obtained through Departmental and Divisional Self-Assessments, BNL Internal Assessments, Investigative Incident Reports, Unusual Occurrence Reports, and BNL External Assessments. However, BNL has failed to utilize these data to establish a proactive approach in solving ES&H concerns.

- BNL does not consistently identify root causes during the preparation of Unusual Occurrence Reports (Appendix H, I-M-51). This conclusion was supported through reviewing the 1988 and 1989 Unusual Occurrence Report files.
- The Assessment Coordinator, through his own initiative, performed a trend analysis on the data obtained during 1 year of internal assessments. This analysis showed that 19 facilities assessed had one common deficiency.

- Although BNL has staff trained in the proper identification of root causes, this expertise has not been consistently utilized in the past (Appendix H, I-M-58); hence, the accuracy of the prior determinations are in question.

In addition to the above, the following S&H Subteam concerns support the management finding:

- Interlock problems, including their use, misuse and nonreporting, have not been evaluated and the root cause of the problems determined. In addition, corrective actions have not been taken to upgrade and enforce this primary system of personnel protection. (See Concern OA.5-1, Appendix B.)
- Measurable goals and performance indicators are not used at many facilities to effectively improve performance and safe operations. (See Concern OP.1-2, Appendix B.)
- There is no comprehensive program for systemic evaluation of equipment performance. (See Concern TS.4-1, Appendix B.)
- A formal tracking program does not exist in the Occupational Medical Clinic. (See Concern MS.2-1.)
- BNL has not established a formal program to track the corrective actions identified during injury and illness recording, investigation, and reporting. (See Concern OS.4-3, Appendix B.)
- Methods for reporting, evaluating, and tracking safety performance data at BNL are not in keeping with accepted industry practice. (See Concern FAST.3-1, Appendix B.)

The information contained in Unusual Occurrence Reports, Investigative Incident Reports, and internal and external assessments is available and is a valuable resource for management to evaluate its ES&H program and establish goals for the future. However, most of the documents received by S&EP are filed without action.

The AGS and the NSLS have established committees to review equipment performance at their facilities. In addition, the committees are in the process of developing a data base for trending and root cause analysis on equipment performance.

BNL is in the process of preparing a procedure to be used for identifying root causes (by trained staff) when a Unusual Occurrence Report is prepared. This procedure is scheduled to be completed by June 30, 1990.

6.4.5 ES&H Criteria

6.4.5.1 Overview

The assessment of ES&H criteria evaluated the adequacy of the BNL QA program, the quality and enforcement of ES&H policies and standards, and the adequacy of risk assessment and management. The management controls to ensure that operations are within limits and permit requirements are met were reviewed as part of the risk management program as well as BNL's systems for conducting ES&H reviews on facility and site modifications, plant configurations, and research activities.

More QA audits are needed, particularly of S&EP, which as a whole has had minimal exposure to internal QA audits. The S&EP division has requested additional staff for the purpose of conducting such audits.

The BNL practice of establishing ES&H policy that is broad in scope and content and which allows the Department Chairpersons maximum independence in achieving safety and environmental goals and objectives has resulted in varying levels of formality and compliance with ES&H requirements and BMPs.

SARs are inadequate in that they are inconsistently prepared and often completed after the fact. Occupational Safety Requirements, for the most part, have not been established. Envelopes of safe operations in many cases have not been determined and documented, and these cannot be enforced.

BNL lacks the controls, procedures, and a strong quality verification program to ensure facility-wide implementation of ES&H criteria.

Seventy-five percent of the Environmental Subteam findings are attributed to one, or a combination of the following causal factors: lack of barriers and controls, lack of procedures, or inadequate policy implementation. Specifically, the Environmental Subteam concluded that the groundwater program deficiencies resulted primarily from inadequate controls placed on project review, design, changes, and oversight by the project manager, Plant Engineering, and by the S&EP Division.

Through internal and external assessments, BNL has been made aware of ESH and QA shortcomings and appears to be taking several positive steps toward resolution. A Laboratory-wide Safety Administrative Procedures and Policies Manual is in preparation

which may aid in standardizing and formalizing the ES&H program. A new guide concerning the safety analysis and review system is being prepared by S&EP that will address the problems with SARs, Operational Safety Requirements, and Occupancy Readiness Reviews. The new Safety Administrative Procedures and Policy Manual may bring uniformity to experiment reviews and finally, a Packaging and Transportation Manual, due to be completed in October 1990, will document written procedures for the packaging and transportation of hazardous and radioactive materials.

The Tiger Team did identify two programs warranting praise:

(1) the Reactor Division for its formality of operations and
(2) Plant Engineering for its safe and efficient approach during maintenance activities and consistent application of safety manual policies.

6.4.5.2 Findings

MGMT/CF-5 Inadequate Quality Assurance Program

Performance Objective: Management shall establish, implement, and maintain plans and actions to assure quality achievement in its ES&H program. (DOE 5480.1B and DOE 5482.1B)

Finding: A documented and approved QA program is not in place for all BNL ES&H activities.

The Management Subteam found that most of the 21 affected BNL department and divisions have submitted draft QA Manuals to the QA Office for review and approval, working against a scheduled submission date of March 31, 1990, and many of them have been approved and issued for use, including the manual for S&EP. However, four of the operating units have not yet submitted drafts, depriving their programs of integrated QA plans (Appendix H, I-M-57).

Both the Environmental Subteam and the S&H Subteam had multiple findings and concerns related to QA.

Deficiencies identified by the S&H Subteam include the following:

- Management is not ensuring control of vital safety and operating documents. (See Concern OA.7-1, Appendix B.)
- The BNL document control system does not ensure that documents important to the safe operation of a facility are available when needed and controlled. (See Concern OA.7-3.)

- Documented and approved QA plans are not all in place at BNL as required by the BNL QA Manual and DOE 5700.6B. (See Concern QV.1-1, Appendix B.)
- Audits conducted by both the QA Office and Designated QA Representatives do not cover all departments and divisions as required by Laboratory policy. (See Concern QV.1-4.)
- The BNL policy for calibration of measuring and testing equipment is not implemented by all departments and divisions. (See Concern QV.4-1, Appendix B.)
- BNL management is not enforcing its basic guidance for nonconformance issues. (See Concern QV.5-1, Appendix B.)
- Not all performance testing and monitoring files are readily auditable by a third party for verification of compliance with requirements. (See Concern TS.4-2, Appendix B.)
- Calibration of radiation protection instruments does not meet ANSI N323 as required by DOE 5480.4. (See Concern RP.8-1, Appendix B.)

Deficiencies identified by the Environmental Subteam include

- lack of consistency in airborne tritium concentrations (Finding A/BMPF-5),
- outdated sitewide EIS (Finding NEPA/CF-1),
- inadequate radiological environmental monitoring documentation (Finding RAD/CF-2),
- improper abandonment of monitoring wells at the current landfill (Finding GW/CF-4),
- inadequate chain-of-custody procedures (Finding QA/BMPF-1),
- inaccurate and inadequate information in the annual PCB reports (Finding TS/CF-1), and
- inadequate notification of PCB equipment (Finding TS/BMPF-3).

Other management findings also addressing the QA program are

- lack of defined responsibilities (Finding MGMT/BMPF-1),
- informality of operations (Finding MGMT/BMP-10), and

- lack of audits (Finding MGMT/CF-3).

In addition to these factors, there is a need for additional QA staff. The need exists in the QA Office and throughout the departments and divisions, particularly in S&EP. Staffing needs are discussed further in Finding MGMT/BMPF-5.

ANSI/ASME NQA-1 provides a basis for a formal management system. Although BNL is working toward a phased-in NQA-1 program, the advantages of the management system seem not to be recognized. Furthermore, the BNL self-assessment, April 1990, does not recognize QA as a part of the ES&H program.

MGMT/CF-6 Failure to Implement Requirements for Risk Assessment and Risk Management

Performance Objective: The ES&H program shall provide for an analysis of all existing and proposed operations, including unusual occurrences and shall require the identification of hazards, their elimination or control, the assessment of risk, and the documented management authorization of operation. (DOE 5481.1B and DOE 5000.3)

Finding: DOE requirements for risk assessment and risk management are not uniformly implemented.

Both the Environmental Subteam and the S&H Subteam had multiple findings and concerns dealing with the lack of risk assessment and risk management. The findings of the Environment Subteam deal with situations which have developed because of a failure to properly assess risk; these are

- inadequate contingency plan (Finding M/CF-8), and
- groundwater contamination (Finding GW/CF-2).

Also, two of the Environmental Subteam findings, NEPA/CF-1 and NEPA/CF-2, deal with an outdated EIS and an inappropriate NEPA determination. In both cases, the risk associated with BNL projects may not have been assessed properly.

Findings from the S&H Subteam include the following:

- The AGS and the 60-inch Cyclotron are not in compliance with DOE 5481.1B, which requires a SAR for each DOE facility. (See Concern OA.7-2, Appendix B.)
- BNL has not performed an analysis to verify that a credible fire loss could not impair an operation in a vital facility for a period greater than 6 months as required by DOE 5480.7. (See Concern FP.4-1, Appendix B.)

- BNL has not determined that a maximum credible fire may result in an unacceptable property loss as required by DOE 5480.7. (See Concern FP.5-1, Appendix B.)

Although the requirements for assessment and management of risk are stated in the BNL Safety Manual, BNL is preparing additional procedures to define risk control activities more directly. A new guide concerning the Safety Analysis and Review System is being prepared by S&EP that will address the problems with SARs, Operational Safety Requirements, and Occupancy Readiness Reviews (Appendix H, I-M-25). The new Safety Administrative Procedures and Policies Manual may bring uniformity to experiment reviews (Appendix I, M-22). An additional fire protection engineer has been employed who has a priority assignment to develop a risk analysis for all activities affected by the Life Safety Code for fire protection and OSHA (Appendix H, I-M-32).

Adequate evaluation of the risks associated with activities having potential adverse environmental impacts could be obtained through the NEPA process required by SEN-15-90.

MGMT/BMPF-10 Lack of Formality of Operations and Inadequate Procedures, Controls, and Documentation

Performance Objective: Management policy shall be committed to ES&H excellence and formality of operations, and management policy shall ensure that policy statements, practices, procedures, and priorities are aimed at establishing a culture that clearly reflects this commitment.

Finding: Management and administration of ES&H policy are not standardized or formalized and do not use thorough, orderly systems of procedures, controls, and documentation.

The Management Subteam found the prevailing practice at the Laboratory to be an informality of operations, with this practice extending to ES&H. Throughout the S&H and Environmental Subteam reports, finding after finding bears out this informality. At the top, there are no administrative policies and controls to ensure uniformity of ES&H practices encompassing all elements of a strong program. Many specific procedures such as those governing radiation protection, fire protection, hazardous material management, wastewater sampling, and emergency wastewater diversion are out-of-date, inadequate, or nonexistent.

BNL has acknowledged these problems in the report, Self-Assessment of Environment, Safety, & Health Issues, April 1990. Section B of the report addresses "ES&H Culture" and the "insufficient ES&H consciousness." Section C expressly deals with "Formality of Operations."

More than 80 of the Environmental Subteam and S&H Subteam findings and concerns pertain to the informality of operations, and cut across all activities. Examples of those from the S&H Subteam are include the following:

- The BNL process for procedure preparation, approval, modification, distribution, and safety impact determination is inconsistent, not formalized, and undocumented. (See Concern OP.3-1, Appendix B.)
- Controls and procedures are not in place to ensure that access to the NSLS Department experiment floor area is restricted to authorized and trained users and escorted visitors. (See Concern OP.5-2, Appendix B.)
- Management has not established standards and directives providing a clear, concise statement of acceptable operating states for facilities and experiments. (See Concern OP.6-1, Appendix B.)
- A uniform, BNL-wide maintenance program consistent with the requirements of DOE 4330.4, industry standards, and good practices is not provided by the current organizational structure. (See Concern MA.1-1, Appendix B.)
- Emergency assessment and notification practices and procedures are not based on current DOE emergency event classifications or protective action guides. (See Concern EP.6-1, Appendix B.)
- Many of the BNL organizations do not have written procedures controlling design and review of modifications. (See Concern TS.3-1, Appendix B.)
- BNL does not have policies and procedures for handling, packaging, and shipping hazardous materials required by DOE 5480.1A, DOE 5480.3, and DOE 5480.4. (See Concern PT.3-1, Appendix B.)
- BNL does not have a documented ALARA program. (See Concern RP.11-1, Appendix B.)
- BNL is not consistently enforcing the use of personnel protective equipment as required by DOE 5483.1A. (See Concern OS.5-1, Appendix B.)
- Not all of the fire protection functions required by DOE 5480.7 and BNL Safety Department operations, procedures, and safety directives are being performed. (See Concern FP.1-1, Appendix B.)

Failure to implement policies and procedures, or the lack of them, adversely affected many environmental protection activities. Some of the affected activities, or the results of them, found by the Environment Subteam are

- ambient air monitoring (Finding A/BMPF-1),
- air emissions inventory (Finding A/BMPF-3),
- asbestos disposal (Finding A/CF-4),
- NEPA approval and documentation process (Finding NEPA/BMPF-1),
- radiological environmental monitoring (Finding RAD/CF-2),
- disposal of hazardous solvent wastes (Finding WM/CF-7),
- landfill operating permit (Finding WM/CF-5),
- groundwater contamination (Finding GW/CF-1), and
- chain-of-custody procedures (Finding QA/BMPF-1).

The Laboratory is taking steps toward a standardized and formal ES&H program. A Laboratory-wide Safety Administrative Procedures and Policies Manual is under preparation (Appendix I, M-19). Additionally, Sections B and C of the BNL self-assessment report contain action plans to deal with many of the causal factors of these problems.

6.4.6 DOE

6.4.6.1 Overview

This review of DOE ES&H management activities was conducted on-site at BNL and through interviews at the CH and at HQDOE.

This TTA came while fundamental changes were in progress within DOE; thus, the Management Subteam was continually faced with the fact that the various DOE offices were not adequately meeting the expectations expressed in Secretary of Energy Notice No. 11 (SEN-11) "Setting The New Course," September 5, 1989. None of the DOE offices have sufficient staff to carry out its ES&H responsibilities to the extent envisioned in SEN-11. In fact, SEN-11 appears to recognize this lack of "sufficient numbers of skilled Federal employees", by stating that "When in place, primary accountability and responsibility will have been clearly fixed in the line management at all levels."

The three primary DOE line organizations that direct BNL (ER, CH, and BHO) were changing the way they implement their ES&H responsibilities. More responsibility was being assumed by ER and BHO (Appendix H, I-M-17).

The dominant DOE program represented at BNL was ER. The Subteam attempted to determine if ER has provided BNL the resources needed to comply with ES&H requirements. Although there are a number of long standing ES&H deficiencies at BNL that would take additional resources to correct, there was no readily available paper trail to determine who made the decision not to fund them and how those decisions were made.

Consistent with its approved SEN-6A implementation plan, ER was increasing its ES&H staff; it established an Office of Assessment and Support; and it was drafting a SEN-6A memorandum of understanding with CH. This agreement would cover not only nuclear safety, but also environmental protection, security and safeguards, transportation safety, etc. (The Team considers it to be especially important to document its relationship with CH in a manner that clearly establishes CH and BHO line management responsibilities.) ER was still early in the implementation stage of assuming an ES&H role commensurate with SEN-11 and SEN 6A expectations for HQDOE line organizations (Appendix H, I-M-60,62,63,64).

ER has largely relied on CH and NE for ensuring ES&H compliance. There is no question that ER, as well as the other HQDOE Program Offices, could not fulfill its ES&H responsibilities consistent with current expectations, since it was not allowed adequate ES&H staff. Even now, however, Team interviews with senior ER managers revealed a wide variance in knowledge and concern for past and present ES&H matters. (Appendix H, I-M-62,63,64) While recognizing the DOE change in ES&H emphasis, one of the recurring themes heard at BNL and HQDOE was the concern that ES&H requirements could only be met at the expense of research.

NE was in the process of developing a management agreement with CH that spells out the purpose, approach, and roles and responsibilities for the line management of operations, safety and health, environmental compliance, and safeguards and security for reactors at BNL. The Team was impressed with the draft agreement dated April 20, 1990, and believes that it would provide a sound working relationship between a HQDOE program organization and a field office.

Both CH and BHO management were emphasizing ES&H consistent with Departmental policy. CH was attempting to establish the best balance of ES&H resources and activities between its area offices and its matrix staff. (Appendix H, I-M-47) BHO was particularly hard pressed to fulfill its ES&H responsibilities due to the sparsity of ES&H staff and the inexperience of some of the staff

in line management. As a management tool, however, BHO was creating a number of data bases, which would allow BHO to track and trend some of the most important ES&H parameters (Appendix H, I-M-4,5,6).

While the Subteam learned of many initiatives that were under way to improve BNL ES&H situation, QA did not appear to play an adequate role. There was ready acknowledgment that operations must become more formal, consistent with NQA-1 and Institute of Nuclear Power Operations Conduct of Operations Guidelines, but the effort to implement NQA-1 has been too limited to date. A more aggressive CH QA audit program could have prompted more progress in this area.

6.4.6.2 Findings

MGMT/CF-7 Insufficient Environmental, Safety, and Health Oversight by the Office of Energy Research

Performance Objective: Primary accountability and responsibility for ES&H activities are to be fixed in line management at all levels (SEN-11-89)

Finding: The ER oversight of ES&H activities at BNL has not been sufficient.

ER has line responsibility for ES&H at BNL through their program offices and as landlord for the facility, with the exception of responsibility for the reactors which was recently transferred to NE. The primary ER programs at BNL are High-Energy Physics, Nuclear Physics, and Basic Energy Sciences.

ER does not currently perform many ES&H line management functions necessary to adequately oversee BNL operations, for example:

- ER has not participated in CH ES&H functional or management appraisals of BNL (DOE 5482.1B).
- ER does not track ES&H commitments or appraisal findings, concerns, or recommendations.
- ER evaluation of BNL safety analysis reports has been limited to reviews by a support services contractor (Appendix H, I-M-60,64).

The primary mechanisms used by ER to learn of BNL ES&H problems and to review proposed corrective actions are the annual institutional plan review meeting, annual program reviews, and discussions with CH and BNL managers. ES&H problem identification, resolution, and oversight are primarily left to BNL and CH (Appendix H, I-M-62,63,64).

Historically, ER has relied on CH and BHO for day-to-day ES&H oversight of BNL and NE. ER has relied on EH for ES&H oversight of the reactors. ER has also used special expertise such as the Advisory Panel on Accelerator Radiation Safety, reporting to the Director of Energy Research to supplement the CH oversight. As noted in the overview, ER has not had ES&H staff to adequately fulfill its line ES&H responsibilities, but that situation is being corrected (Appendix H, I-M-60,62,63,64) (Finding MGMT/BMPF-10).

MGMT/CF-8 Insufficient Environmental, Safety, and Health Oversight by the Chicago Operations Office

Performance Objective: The appraisal program is to provide management with objective, timely, and reliable information on ES&H performance, including significant achievements and deficiencies (DOE 5482.1B).

Finding: The CH oversight of ES&H activities at BNL has not been sufficient.

As evidenced by the findings and concerns of this TTA and recent TSAs, CH day-to-day walkthroughs, compliance inspections, and ES&H functional appraisals (particularly environmental), of BNL have not been sufficient to provide the oversight required by DOE 5482.1B, or to assist line management in assuring compliance with DOE and regulatory requirements.

Finding MGMT/CF-3 summarizes the findings and concerns of the Tiger Team that relate to inadequacies of the BNL internal audit program and to failures of that program to find ES&H problems. The CH ES&H oversight program shares the responsibility for the weaknesses noted.

The environmental appraisals are typically conducted by only two CH staff members. (Appendix H, I-M-47) A team of this size cannot meet the performance objective in view of the complexity of environmental regulations and technical issues confronted, and the variety of environmental activities and issues that the appraisal team must assess.

There has been only one DOE 5700.6B QA appraisal of BNL by CH. It was performed in 1985. (See Concern QV.1-5.) Neither the CH QA program nor the BNL QA program (Finding MGMT/CF-5) meets DOE expectations. In order to ensure quality achievement, CH 5700.6C was issued September 19, 1988, reassigning CH QA responsibilities and establishing overview responsibilities by the Environment, Safety, and Health Division, including an annual evaluation of CH-wide QA activities (Appendix H, I-M-48).

Failure of the Brookhaven Area Office to meet
Environmental, Safety, and Health Management
Responsibilities

Performance Objective: Primary accountability and responsibility for ES&H activities are to be fixed in the line management at all levels (SEN-11).

Finding: The BHO has not met a number of its ES&H program management responsibilities.

Since the BHO Manager is the Contracting Officer for the BNL management and operating contract with AUI, BHO clearly has primary accountability and responsibility for ES&H activities consistent with SEN-11. The numerous findings and concerns of this TTA and those of recent TSAs make it clear that BHO has not always succeeded in meeting this responsibility.

Although not noted as findings, the Environmental Subteam has identified occasions in which BHO has been unacceptably late in responding to environmental regulators and also in providing needed information to BNL. It also identified a number of occasions where BHO failed to document important oral agreements with regulators or did not require BNL to do so.

The groundwater management problems that are addressed in findings GW/CF-1 through GW/BMPF-3 further illustrate BHO's inadequate management and oversight of the ES&H program. Considering the sensitivity of the groundwater issue, BHO should have been assured that all of the needed management controls were in place, including peer review of proposed studies. Similarly, the inactive waste sites assessment, Section 3.4.9, identifies a large number of program deficiencies that the Environmental Subteam attributes, at least partially, to BHO's lack of aggressive implementation of DOE 5400.4 and CERCLA.

During the TTA an incident occurred at the AGS in which there were high radiation levels in uncontrolled areas. Neither BHO nor CH were allowed to provide the normal line-management role since, in this case, ER bypassed them and gave direction directly to the contractor. This was in contrast to an earlier radioactive contamination incident at the HFBR. CH and BHO directed the response to that incident in keeping with their responsibilities, in cooperation with NE.

Knowing the very large workload that the BHO staff is carrying, the Team considers BHO's ability to fully meet its ES&H program requirements limited by the lack of adequate staffing. (See Finding MGMT/BMPF-12.)

Implementation of Drug Free Federal Workplace Program

Performance Objective: DOE positions that meet at least one definition of "sensitive position" in Executive Order 12564 (Drug Free Federal Workplace) and the position directly affects the national security, public safety, or public health shall participate in the random drug testing program (DOE 3792.3).

Finding: "Sensitive" line-management positions at BHO have not been designated for participation in the random drug testing program.

The BHO primary mission is to manage and administer the DOE prime contract for the management and operation of BNL. This places line-management responsibility on certain positions at BHO to provide administrative, regulatory, and policy control over BNL operations.

The activities at BNL could affect the public health; the safety of local, state, and multi-state geographical areas; and national security. BNL programs, operations, and projects are of public concern and have the potential to affect the national nuclear program and the regional environment.

The level of sensitivity associated with some BNL programs requires that a high degree of public trust and confidence be placed on the individuals providing the management oversight and appraisal of the contractor activities.

CH nominated the BHO Manager position to be included in the drug testing pool. The Position Designation Board (PDB) agreed that the nomination met the definition of "sensitive position." However, the PDB recommended that the position be excluded from the random drug testing pool, as the position does not "directly affect" public health, public safety, or national security (Appendix I, M-21). CH has not initiated any action to appeal this decision (Appendix H, I-M-54).

The Management Subteam is concerned about this situation because the PDB decision is inconsistent with the philosophy that line organizations are fully responsible for their own activities (SEN 6A). It suggests that the line-management concept is not being applied to the Departmental Drug-Free Federal Workplace Testing Implementation Program.

Brookhaven Area Office Personnel Position Descriptions and Appraisals

Performance Objective: Responsibilities and authority for each management, supervisory, and professional position are well defined through position descriptions. Such employees are made

accountable for their responsibilities and authority through appropriate performance appraisal criteria.

Finding: Position descriptions for some key positions do not reflect the importance of ES&H objectives, and performance appraisal plans for some key positions do not require excellence.

Current, well-documented position descriptions and appraisal plans are an essential tool for communicating objectives and expectations and assuring accountability for performance. The position description and appraisal plan for the BHO Manager clearly reflect responsibility and accountability for ES&H matters. The position descriptions and appraisal plans for the Deputy Manager and the staff in the Environmental, Safety, and Engineering Branch raise concerns, however, as illustrated by the following examples:

- The appraisal plan for the Deputy Manager reflects no ES&H responsibility even though the Deputy Manager acts for the Manager in his absence and has direct supervisory authority over the Chief of the Environmental, Safety, and Engineering Branch.
- The performance standards set forth in the performance appraisal plans for the Branch Chief and staff do not require excellence for any of the elements included. For example, one of the critical elements in the Branch Chief's appraisal plan is "manages, implements and coordinates the Radiological Assistance Program for the Area Manager." The performance standard for an "Outstanding" rating (the highest rating) in this critical element is "Participates in RAP meetings and advises contractor of recent guidance from DOE." In other words, the criteria for outstanding is performance of the basic duties and responsibilities described in the position description.
- The position description for the position entitled "Program Coordinator" reflects no responsibility for ES&H issues even though this position is responsible for certain construction review. Equally as important, there is a wide variance in the duties described in the position description and the duties for which the incumbent is held accountable in the performance appraisal plan. This problem is apparent for other positions as well, especially where certain environmental duties have been added. The new duties are reflected in performance appraisal plans but not in job descriptions.

MGMT/BMPF-12 Inadequate Office of Energy Research, Chicago
Operations Office, and Brookhaven Area Office
Environmental, Safety, and Health Resources

Performance Objective: Management shall provide needed resources, including an adequate staff of qualified personnel to ensure effective and viable ES&H programs and shall afford professional development opportunities to staff personnel.

Finding: ER, CH, and BHO do not have sufficient ES&H resources to meet their ES&H responsibilities consistent with current expectations.

Findings MGMT/CF-7, MGMT/CF-8, and MGMT/CF-9 describe the inability of ER, CH, and BHO to meet many of their ES&H responsibilities noting inadequate resources as a primary cause.

Consistent with its approved SEN-6A implementation plan, ER was increasing its ES&H staff in the three ER offices having the majority of ES&H responsibility at BNL and in the newly established Office of Assessment and Support.

CH was in the process of strengthening BHO by adding staff and a new Nuclear Programs Branch to the area office. However, it is very difficult for BHO to hire and retain qualified staff, when positions are available, due to the Federal salary structure as compared to the high cost of living on Long Island (Appendix H, I-M-4,5,6).

CH has been active in increasing ES&H staff at CH for the past several years, partially from additional positions obtained from MA, but primarily through reassignment of positions as they have become available. With few exceptions, the CH ES&H DOE direct resources came through the Departmental Administration account rather than from the ER account. CH believes that the lack of a HQDOE program sponsor has made it difficult to obtain the resources it needs to meet DOE-direct ES&H requirements, including staffing levels and funding for training, travel, and adequate contractor support (Appendix H, I-M-17). The Team was not able to substantiate this belief through interviews with ER and elements of the former MA organization. For example, even ER was unable to obtain ES&H staff positions until the new emphasis on line responsibility (Appendix H, I-M-60,64).

The staffing situation is changing. Both CH and BHO have been allotted the positions requested by CH to implement SEN-6A. Also, the FY 1992 budget will reflect staffing allocations primarily from program accounts rather than from Departmental Administration.

Sufficient travel funds are not available to perform required duties and to obtain the management training needed to supplement BHO staff technical expertise (Appendix H, I-M-6). Requested levels of travel funding by CH have not been met despite appeals (Appendix I, M-174).

6.5 TABULATION OF MANAGEMENT FINDINGS

FINDING: The contract between DOE and AUI does not include
(MGMT/CF-1) an indemnification agreement under the Price-Anderson Act.

FINDING: The contract between DOE and AUI does not require
(MGMT/CF-2) AUI to comply with DOE Orders and directives on the environment.

FINDING: Not all ES&H assessments required by DOE Orders
(MGMT/CF-3) and other regulatory requirements are being performed adequately.

FINDING: The Laboratory Director does not have access to an
(MGMT/CF-4) independent internal appraisal process, because conflicts of interest exist at the associate director level for reactor safety and QA oversight, and at the division head level for ES&H oversight.

FINDING: A documented and approved QA program is not in
(MGMT/CF-5) place for all BNL ES&H activities.

FINDING: DOE requirements for risk assessment and risk
(MGMT/CF-6) management are not uniformly implemented.

FINDING: The ER oversight of ES&H activities at the
(MGMT/CF-7) BNL has not been sufficient.

FINDING: The CH oversight of ES&H activities at the
(MGMT/CF-8) BNL has not been sufficient.

FINDING: The BHO has not met a number of its ES&H
(MGMT/CF-9) program management responsibilities.

FINDING: "Sensitive" line-management positions at BHO have
(MGMT/CF-10) not been designated for participation in the random drug testing program.

FINDING: Some elements of the BNL organization do not have
(MGMT/BMPF-1) clearly defined responsibilities and reporting relationships concerning ES&H implementation.

FINDING: BNL does not have a formal lessons learned program
(MGMT/BMPF-2) in place to ensure deficiencies found during internal or external assessments, as well as experiences at other sites, are communicated to potential beneficiaries at BNL and to ensure that the lessons are utilized.

FINDING: Position descriptions for most key positions at
(MGMT/BMPF-3) BNL do not reflect the responsibility of ES&H objectives. There is no formal appraisal system for employees at the Department Chairperson and Division Manager level and above.

FINDING: BNL does not have a safety and health plan that
(MGMT/BMPF-4) identifies goals and objectives, identifies problems, and sets forth a plan to correct deficiencies.

FINDING: BNL does not have sufficient staff to meet
(MGMT/BMPF-5) existing ES&H requirements.

FINDING: Funding required to achieve full compliance with
(MGMT/BMPF-6) laws and regulations in the safety and health area has not been fully identified nor communicated to DOE.

FINDING: The current BNL training program is inadequate.
(MGMT/BMPF-7)

FINDING: BNL has not promptly and effectively corrected
(MGMT/BMPF-8) deficiencies identified in appraisals, audits, surveys, and reviews.

FINDING: BNL has not instituted a Laboratory-wide program
(MGMT/BMPF-9) for utilizing tracking, trending, or root cause analysis as management tools.

FINDING: Management and administration of ES&H policy are
(MGMT/BMPF-10) not standardized or formalized and do not use thorough, orderly systems of procedures, controls, and documentation.

FINDING: Position descriptions for some key positions do
(MGMT/BMPF-11) not reflect the importance of ES&H objectives, and performance appraisal plans for some key positions do not require excellence.

FINDING: ER, CH, and BHO do not have sufficient ES&H
(MGMT/BMPF-12) resources to meet their ES&H responsibilities consistent with current expectations.

7.0 Contributing Causes and Probable Route Causes

7.0

CONTRIBUTING CAUSES AND PROBABLE ROOT CAUSES

Many of the ES&H problems facing BNL have their roots in the past. For many years DOE and its predecessor agencies

- were reluctant to accept the applicability of certain environmental laws to Departmental activities;
- continued to support the exemption of DOE from OSHA;
- failed to adequately apply the lessons learned from Three Mile Island;
- had ES&H directives in place that were not followed and failed to hold the program offices, the field offices, and the contractors accountable; and
- were ignored by many in the outside world, often including the regulators.

As a result, in a number of aspects, DOE was years behind private industry in its ability to meet environmental and OSHA regulations and was behind many licensees in meeting Nuclear Regulator Commission equivalent safety and health requirements.

Beginning in the early to mid-1980s, DOE came under intense pressure from Congress, Federal, and State regulatory agencies and the public to comply with environmental laws and regulations. With the nuclear reactor accident at Chernobyl and the resultant National Academy of Sciences reviews and findings concerning operations of large DOE production and research reactors, the public started to focus on the safety of DOE reactor operations. In early 1989, the Secretary further intensified the growing pressure on Department safety and health programs for all nuclear operations in an effort to change the culture of DOE operations to achieve excellence in the ES&H areas concurrent with production and research missions.

Despite the pressure in the environmental area and enormous resource expenditures to date, compliance problems continue at most DOE sites. Reorienting the focus of environmental programs at DOE has been extremely difficult. Because DOE has been unable to meet all environmental requirements, it has had to enter into many compliance agreements.

Full compliance with DOE Orders and environmental regulations is a difficult task requiring changes in Departmental organization and culture. Fundamental operational and management approaches are being developed and implemented throughout the DOE management system.

The Team developed these probable root causes recognizing that changes are ongoing at the HQDOE Program Offices, CH, BHO, and BNL. It is the expectation of the Team that ER, CH, BHO, and BNL will work together in the process of preparing the corrective action plan, to better define the root causes for the Team findings and concerns.

7.1 Contributing Causes

Some of the more important causes contributing to the weaknesses in the BNL ES&H program are as follows:

- BNL management has not established comprehensive, sitewide safety and environmental policies, or an effective mechanism to promulgate these policies to all levels and to provide feedback to establish their effectiveness.
- Staff qualifications and training needs have not been defined in general or by position.
- Some ES&H oversight programs have not been as effective as they should be. This is true both for the "independent" oversight provided by CH and for the oversight of ES&H operations provided by BHO and BNL staff.
- Neither the DOE nor the BNL QA programs have been adequate in the ES&H areas. The basic precept of building quality into ES&H programs and projects is not being followed consistently at BNL, and there is not adequate QA auditing of the ES&H program.
- BNL does not have a formal lessons learned program. This failure to learn from others, and even one's own mistakes and successes, reduces the likelihood of success and contributes to inefficient and ineffective ES&H programs.
- The DOE risk assessment and backfitting requirements contained in DOE 5480.1B "Safety Analysis and Review System," allow too much flexibility and judgment. The formality and consistency requirements applied to the field organization and contractor operations is circumvented by directives such as this. The inadequacies of the BNL risk assessment programs, in part, are due to situations such as this one.

7.2 Probable Root Causes

It is important to note that the ever changing ES&H requirements that various Federal, State, and local governments impose on BNL

operations are outside the control of the HQDOE program Offices, CH, BHO, and BNL. This presents a major management challenge that must be factored into all aspects of the BNL ES&H program. During this TTA, DOE nuclear safety requirements, for example, were being rewritten, and the Clean Air Act was being amended. Federal, State, and local regulations change frequently.

Factors that were more within the control of these organizations were the following probable root causes:

DOE and BNL management have not uniformly accepted the need for high-level attention to the new ES&H expectations.

Senior management has typically come from production or research backgrounds. Production and research have traditionally taken precedence over ES&H, security, maintenance of facilities, training, housekeeping, and other resource demanding areas. Making the transition to equal emphasis on ES&H and research can be painful and possibly even impossible for some managers. While there are indications that senior DOE and BNL management recognize the need for a compliant ES&H program, it is not clear that they uniformly understand and accept the need for their personal involvement in all of its aspects.

DOE and BNL have underestimated the difficulty of meeting ES&H requirements.

BNL management, and to some extent DOE, does not seem to be aware of the difficult task it faces. For example, major problems in the BNL groundwater program indicate management and technical support deficiencies in the DOE and BNL organizations. These problems result from trying to handle a complex and sensitive area in a business-as-usual manner. The Team was left with the impression that this example of DOE and BNL underestimating the difficulty of meeting ES&H requirements is not unique. For example, in the safety and health area, BNL has no comprehensive plan for upgrading the SAR program and the associated requirements for Operational Safety Requirements, identification of safety systems, as built drawings, and configuration controls, or for instituting the Institute of Nuclear Power Operations Conduct of Operations Guidelines (INPO 85-017). The various departments and divisions appear to handle each new task in a piecemeal and reactive manner.

BNL management's lack of control of the ES&H program

BNL does not appear to recognize the consistency and formality needed to meet current DOE ES&H goals and expectations by requiring Laboratory-wide controls on safety- and environment-related activities through the promulgation of appropriate policies and enforcement of SOPs. BNL management appears to be approaching ES&H in a manner similar to the way it supports

research (i.e., it strives to create an environment in which the individual researcher can use his or her dedicated efforts and expertise to the fullest). Unfortunately, creating an environment for quality ES&H and then relying on the individual for ES&H compliance does not work. Incentives, education, and accountability must displace the lack of dedication to meeting ES&H requirements and the lack of knowledge of those requirements.

BNL lacks an adequate system of checks and balances in the ES&H area.

The Laboratory Director does not have an adequate system of checks and balances in the ES&H program. In order to use the talent of the BNL ES&H staff to its fullest potential, BNL primarily has concentrated this staff in one organization. This approach has created a number of organizational conflicts of interest. While safety committees, many of which are ad hoc, are extensively used to enhance the ES&H capability, they are not usually independent of the organization being appraised. This lack of independence is not offset by sufficient external oversight. The overall DOE and BNL oversight program is inadequate and cannot provide the quality of information needed for DOE and BNL management to ensure that BNL has the best possible ES&H program.

8.0 Alternating Gradient Synchrotron - Stepping Stone to the Future

The AGS, in operation since 1960, is one of the largest experimental tools at BNL. With the addition of the Booster Ring and the proposed Relativistic Heavy Ion Collider, the AGS holds the key to a large part of the future mission for BNL.

The lack of formality in the BNL operation as well as the decentralized management style raises questions as to whether the current AGS facilities and infrastructure are suitable to be the foundation for facility operations well into the Twenty-first Century. The beam line dispersion incident on April 16, 1990, and the initial actions by the operators exemplify the concerns identified by this Tiger Team.

As the Department begins to plan the modernization of its research and development facilities, it is important that a disciplined process be undertaken to ensure that the complex of the future is built upon a sound foundation. It is not a part of this Team's mission to evaluate the scientific aspect of current or proposed BNL operations. However, this TTA together with the findings from the September 1989 TSA provide a comprehensive evaluation concerning the ES&H and facility maintenance aspects of BNL operations. To assist BNL, BHO and CH, and ER in developing the modernization plan for the research complex, the Team compiled the following summary of findings and concerns that could directly affect the safe operation of the AGS.

There is no SAR that fully analyzes all safety aspects of the AGS (OA.7-1). The boundaries of safe operation of the facility have not been determined (TS.2-3), and the safe envelope of operation of the experiments has not been defined (EA.4-1). The adequacy of the lateral shielding of the AGS ring has not been assessed since 1967, and the system for review of AGS secondary beam lines does not follow written criteria (RP.4-1).

The independent safety review of the AGS activities lacks formality or is deficient in such areas as the following: (1) periodic facility safety reviews do not include a review of all procedures and operational activities as required by DOE Orders (FR.4-1); (2) charters for experiment safety review committees lack specificity (EA.4-1); (3) the annual Industrial Safety and Fire Protection Appraisal by CH has not been conducted since 1987 (FP.1-3); and (4) the Triennial Review of the internal safety review system as required by DOE Orders has never been performed (FR.5-1 and SR.7-1).

The lines of safety authority and responsibility are not well defined or understood by all management and staff (OA.1-1, OA.6-1, OP.1-1, OP.1-3, and OP.1-4). The shift

operators at the AGS report to one supervisor for programmatic direction and to another supervisor for line safety responsibility (OA.1-2). Not all first-line supervisors and working-level staff understand the line safety responsibility concept (OA.1-2). Operations personnel do not clearly understand their authorities and responsibilities (OP.1-3).

Fire protection at the AGS is less than adequate with regard to meeting the Life Safety Code as required by DOE Orders; e.g., dead-end corridors have inadequate warning signs, travel distance to exits is excessive, and implementation of previous recommendations is slow (FP.2-1). Some AGS facilities contain excess fire-loading material (FP.4-1), improperly stored material (FP.4-2), and inadequate or noneffective fire suppression systems (FP.4-1, FP.5-3, FP.5-6, FP.5-7). Roof-leaks at the AGS have not been repaired (FP.5-4). The AGS does not meet the "Improved Risk" level of protection in many areas; e.g., (1) there is a lack of penetration seals (FP.7-1, FP.7-6); (2) automatic sprinkler riser control valves are located in the center of the building and are accessible only from the inside (FP.7-11) or were obstructed by storage (FP.7-1); (3) portable electric cords are used extensively, and electrical directories in the circuit panel boxes are not up-to-date (FP.7-13), and evidence of smoking was observed around combustible material at AGS (FP.7-15).

Access to radiation areas on the BNL Site is not strictly controlled. Some users' families, with small children, live on the site for the duration of the experiment, and in most cases, have free access to the Laboratory. Unbadged people may also have unchecked access to the Laboratory. In most cases, only the driver of an automobile must show a badge to obtain access for all occupants of the vehicle. Even that process is suspect because the team found that anything resembling a badge will usually suffice for access through the main gate. Thus, the general public effectively has free access to this Laboratory.

A primary means of access control at the AGS, as well as at many other facilities at BNL, is through the use of interlocks. However, there are problems in the interlock system. Past problems with interlocks have not always been adequately evaluated (OA.5-1). The interlocks for high-hazard areas at the AGS are not redundant as required by the BNL Safety Manual (RP.3-4). The AGS does not have detailed checklists for most portions of the interlocks; sequence boxes in secondary areas are generally not placed to ensure a thorough search of the beamlines; access through interlock gates in the main ring does not necessarily require, via hardware, a search of the ring; and there is no requirement for the design and development of interlock systems to be independently reviewed (RP.3-4).

By June 1990, access to the AGS ring may be improved by permitting access only to personnel who have received AA256 Key

Training and Lockout/Tagout training. However, BNL is not currently planning to use examinations to assure certification of operators (TC.4-2).

The posting of radiation areas at BNL is not uniform (RP.3-2); and BNL does not have an effective program to control access to radiation areas (RP.3-8). Radiation safety procedures at AGS are generally in the form of memoranda that are not always readily available (RP.3-5).

There is a general lack of calibration for measuring and testing equipment (MA.5-1 April). The BNL policy for calibrating measuring and testing equipment is not being implemented (QV.4-1). A classification of operational control instrumentation that requires calibration does not exist at the AGS (MA.5-1).

A formal or uniform maintenance program is not consistently implemented at the AGS (MA.1-1, MA.1-3). Work orders and work requests are not uniformly prepared or used, and it is not clear who has specific authority to initiate maintenance activities (MA.2-2). Housekeeping in some parts of AGS is not good (MA.2-1). Documentation of maintenance requirements, procedures, and activities is incomplete and not sufficiently accurate to ensure safe and effective maintenance (MA.7-1). There is no systematic evaluation of equipment performance (TS.4-1, OA.5-1, MA.8-1, QV.1-2, and QV.5-1).

There is a lack of formality in the training of personnel at the AGS that includes the absence of any formal plan (TC.1-1), inadequate documentation (TC.3-3), a lack of formal examinations (TC.3-1), and informality with on-the-job training (TC.1-1, TC.5-1, and TC.1-2). Safety training and certification requirements for employees and visiting scientists are not in compliance with DOE 5480.11 (TC.4-2). Trainee evaluation techniques and methods vary throughout the Laboratory and do not exist in many cases. There is no assurance that employees will be adequately trained to safely carry out their assigned duties (Section III, D).

This compilation of concerns at the AGS reflects a snapshot in time. The Laboratory needs to review these concerns, perform a detailed assessment of this facility, and prepare a comprehensive plan to address these concerns, as well as to upgrade the AGS as a facility of the future.