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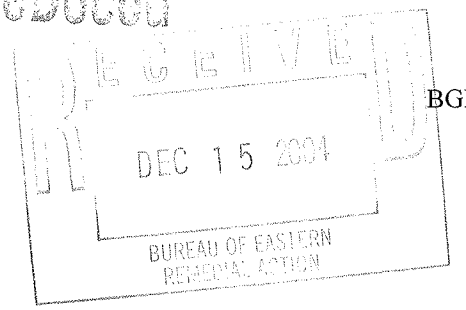

BGRR-062

FINAL ACTION MEMORANDUM BROOKHAVEN GRAPHITE RESEARCH REACTOR CANAL AND DEEP POCKETS OF SOIL CONTAMINATION REMOVAL ACTION

December 10, 2004

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Under Contract No. DE-AC0-2-98CH01886 with the
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ACRONYMS, ABBREVIATIONS, AND UNITS OF MEASURE

AOC	Area of Concern
ALARA	As Low As Reasonably Achievable
ARAR	Applicable or Relevant and Appropriate Requirement
BGRR	Brookhaven Graphite Research Reactor
BNL	Brookhaven National Laboratory
CERCLA	*Comprehensive Environmental Response, Compensation and Liability Act*
CFR	Code of Federal Regulations
Ci	Curies
Cs-137	cesium-137
DOE	U.S. Department of Energy
EPA	U.S. Environmental Protection Agency
Eu-152	europium-152
LLRW	low-level radiation waste
MDA	minimum detectable activity
mr/year	millirem per year
NYCRR	New York Codes, Rules and Regulations
NYSDEC	New York State Department of Environmental Conservation
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response
pCi/g	picoCuries per gram
Pu-239	plutonium-239
PRAP	Proposed Remedial Action Plan
RCRA	*Resource Conservation and Recovery Act*
ROD	Record of Decision
Sr-90	strontium-90
U-238	uranium-238
U.S.C.	United States Code

I. PURPOSE

The purpose of this Action Memorandum is to document the decision by the U.S. Department of Energy (DOE) to conduct a non-time-critical removal action to remove:

1. The Brookhaven Graphite Research Reactor (BGRR) canal (east of Building 701); and
2. Contaminated soils adjacent to and/or beneath
    a. The canal,
    b. South secondary air system bustle,
    c. Below ground duct expansion joint #4,
    d. Cooler drain sump, and
    e. Building 701 north trench.

Removal actions are to be taken in congested work areas immediately adjacent to buildings and structures that will remain in place. The extent of excavation and contaminated soil removal is constrained by the DOE's physical access to the work areas. The removal action described herein will result in the substantial removal of sub-surface contamination without undermining the foundations of the surrounding buildings and structures.

The DOE has determined that these removal actions are necessary to protect human health and the environment. Pursuant to this determination, the DOE has developed a Proposed Remedial Action Plan (PRAP) [1] for the cleanup of the BGRR that summarizes the evaluation of four remedial alternatives. The recommended alternative (Alternative C) in the PRAP includes the scope of this Action Memorandum.

The 30-day public comment period for the PRAP concluded on September 3, 2004. Only one comment was received that is directly related to the proposed work in this Action Memorandum. Specifically, a concern was expressed that to the extent practical, additional soil characterization be performed on inaccessible soils while excavating the accessible soil pockets. DOE addressed this comment in the responsiveness summary of the draft Record of Decision [2] that is under review by the Interagency Agreement (IAG) regulators. The responsiveness summary states that during the removal of accessible soils, samples will be obtained in the vicinity of the excavation to provide additional characterization data of the remaining soils.

As part of the final remedy documented in the Record of Decision, DOE will implement institutional controls, including land use restrictions, which will ensure that the remaining contaminated BGRR structures and soils are managed to prevent inadvertent direct exposure to and future migration of the soil.

With regulatory and community support of DOE's proposed Alternative C in the PRAP, the DOE has decided to accelerate the cleanup of the BGRR canal and deep pockets of contaminated soils. Accordingly, the decision to perform this work is being documented in this action memorandum.

II. SITE CONDITIONS AND BACKGROUND

This action is being undertaken as a non-time-critical removal action in accordance with the Interagency Agreement [3] among the DOE, the U.S. Environmental Protection Agency (EPA), and the New York State Department of Environmental Conservation (NYSDEC). This action will be documented in the BGRR Record of Decision (ROD). Work will be conducted in accordance with the National Contingency Plan [4].

A. Site Description

1. Removal Site Evaluation

Construction of the BGRR began in 1948 and the facility was operated from 1950 through 1968. The below ground duct (BGD) structures and canal were contaminated through a series of twenty-eight ruptured fuel assemblies and operations that sectioned spent fuel assemblies in the canal in preparation for off-site shipment. It is known through operational records and characterization data [5, 6] that these events and activities contaminated the below-ground duct structures and the canal. During and after reactor operations, soils adjacent to and beneath these structures were radiologically contaminated due to leakage of contaminated water from normally flooded structures (canal and drain sumps). Soil also became contaminated when rainwater entered into the normally dry below-ground ducts, became cross-contaminated, and then leaked into the soils. Also, a small area inside Building 701 — known as the north trench area — was contaminated during reactor operations.

These structures and their conditions have served as pathways for contamination to reach the environment in the past. Isolated areas (pockets) of contamination adjacent to and below these structures provide evidence of these historical releases. The DOE has taken several actions to address the release pathways and is confident that these contamination issues do not currently pose an immediate threat of continued migration to the environment. Nevertheless, in accordance with DOE's policy to minimize the potential and actual exposure to radiation and radioactivity as low as reasonably achievable (ALARA), this cleanup action is being taken to reduce future and long-term exposure risks associated with these contaminated structures and pockets of contaminated soils.

2. Physical Location

Brookhaven National Laboratory (BNL) is located near the geographic center of Suffolk County on Long Island, New York in the Town of Brookhaven (Figure 1). The BNL site, formerly Camp Upton, was occupied by the U.S. Army during World Wars I and II, and was subsequently transferred to the Atomic Energy Commission in 1947 for use as a national laboratory. Brookhaven National Laboratory carries out basic and applied research in the fields of high-energy nuclear and solid-state physics, fundamental material and structure properties and the interaction of matter, nuclear medicine, biomedical and environmental sciences, and selected energy technologies. Major operating facilities include the Relativistic Heavy Ion Collider, the

National Synchrotron Light Source and the Alternating Gradient Synchrotron. Brookhaven National Laboratory is a government-owned, contractor-operated facility of the DOE, and is operated and managed by Brookhaven Science Associates under contract to DOE.

The present site contains 5,321 acres, of which 75 percent are wooded. The remainder is developed and contains office buildings, various large research facilities, parking lots, and other facilities. The BGRR is located in the central section of the BNL property as shown in Figure 2. Figure 3 is an elevation view of the below-ground duct exhaust air-cooling system, where deep pockets of soil contamination are located (described later in this document). Figure 4 is an isometric view of the BGRR canal.

3. Site Characteristics

The Brookhaven Graphite Research Reactor (BGRR) was the first reactor built for the sole purpose of providing neutrons for research. During its years of operation, it was one of the principal research reactors in the United States. Construction on the BGRR was completed in August 1950, and initial criticality of the reactor was achieved the same month. The BGRR operated until June 10, 1968 when operation of the reactor was terminated and deactivation of the facility was initiated. In June of 1972, defueling and shipment of the fuel to the DOE Savannah River Site was completed. The BGRR complex was described as being in a safe shutdown condition by the U.S. Atomic Energy Commission and became a Surplus Facility within the DOE complex. From 1977 until 1997, portions of the facility were used as the BNL Science Museum.

Decommissioning of the BGRR began in 1997 and previous actions are described in section II B.

4. Release or Threat of Release into the Environment of a Hazardous Substance, or Pollutant, or Contaminant

To ascertain the locations and levels of radiological and hazardous materials contamination, characterization of the BGRR was performed and documented [5, 6]. Characterization of the following structures and associated soils confirmed:

- **Fuel canal east of Building 701** – The fuel canal east of Building 701 consists of the contaminated concrete on the inner surface of the fuel canal and walkway drain lines embedded in concrete that were not removed during prior decontamination efforts. This contaminated material contains approximately 0.022 Curies (Ci) of radioactive materials consisting primarily of strontium-90 (Sr-90) (0.003 Ci) and cesium-137 (Cs-137) (0.019 Ci). There are also trace amounts of residual surface contamination consisting of uranium, plutonium and americium (~0.0002 Ci).

- **Soils adjacent to canal outer walls** – The soil in some areas immediately adjacent to the canal structure is contaminated. This subsurface soil pocket begins approximately mid-height of the outer walls of the canal on the north, east and south walls and extends

outward one foot from the surface and below the canal to a depth of 18 feet below grade corresponding to 47 feet above groundwater. Soil is contaminated with Cs-137 at a peak level of 900 picocuries per gram (pCi/g) and Sr-90 at a peak level of 56 pCi/g. The estimated volume of contaminated soil is approximately 18 cubic yards.

Additionally, a pocket of contamination is located in the soil beneath the canal floor in the vicinity of the canal construction joint east of Building 701 foundation column 7 (east wall of Building 701). This subsurface soil pocket begins immediately below the canal structure (12.5 feet below grade) and extends below the canal to a depth of 29.5 feet below grade (corresponding to 37.5 feet above groundwater). Soil is contaminated primarily with Cs-137 at a peak level of 1,500 pCi/g and Sr-90 at a peak level of 572 pCi/g. Trace concentrations of uranium-238 (U-238) (6.2 pCi/g) and plutonium-239 (Pu-239) (5.2 pCi/g) were reported at their respective minimum detectable activity (MDA) limits for the sample.

- **Soil adjacent to the south secondary air system bustle -** The bustle area contamination consists of soils adjacent to the south secondary air bustle. The south secondary air bustle is located on the northeast side of the north below ground duct. This subsurface soil pocket begins approximately at the mid-height of the below ground duct (26 feet below grade) and extends to the soil below the duct to a depth of 40 feet below grade (corresponding to 27 feet above groundwater). The soil is contaminated with Cs-137 at a peak level of 89,000 pCi/g and Sr-90 at a peak level of 11,200 pCi/g.

- **Soils adjacent to expansion joint #4 and cooler drain sump** - Includes soils adjacent to and underneath the north and south ducts main expansion joint #4, near the cooler drain sumps. This subsurface soil pocket begins within soils immediately below the duct and cooler drain sump and extends to a depth of 30 feet below grade (corresponding to 38 feet above groundwater). The soil is contaminated primarily with Cs-137 at a peak level of 2,845 pCi/g and Sr-90 at a peak level of 37 pCi/g.

- **Soils in and around reactor building north trench area** – The reactor building trench area contains approximately two cubic yards of contaminated soils. The trench is constructed with concrete walls extending vertically approximately four feet below the reactor building main floor level with exposed soil at its base. The contamination is isolated to an area of approximately 60 square feet extending to a depth of approximately one foot within the soil. The soil is contaminated primarily with Cs-137 at a peak level of 17,726 pCi/g and Sr-90 at a peak level of 1,020 pCi/g. Trace concentrations of U-238 (0.3 pCi/g), Pu-239 (0.88 pCi/g), and europium-152 (Eu-152) (0.8 pCi/g) were reported at their respective MDA limits for the sample. Elevated levels of metals (cadmium and zinc) were also identified in the contaminated soil.

5. National Priorities List Status

Brookhaven National Laboratory was added to the National Priorities List in 1989. An Interagency Agreement under the *Comprehensive Environmental Response, Compensation and Liability Act* (CERCLA), and applicable New York State regulations was negotiated between the DOE, EPA, and NYSDEC. The Interagency Agreement became effective in May 1992 and governs the environmental restoration program at BNL.

6. Maps, Pictures, and Other Graphic Representations

- Figure 1 - Location of Brookhaven National Laboratory on Long Island, NY
- Figure 2 - Location of the Operable Units and the BGRR on the BNL site
- Figure 3 - Below-ground Exhaust Air-Cooling System (Elevation)
- Figure 4 - BGRR Canal (Isometric View)
- Figure 5 - Canal Structure Removal Excavation Plan
- Figure 6 - Below-Ground Duct Secondary Cooling Air Bustle Excavation Plan
- Figure 7 - Below-Ground Duct Cooler Drain and Exp. Joint #4 Excavation Plan

B. Other Actions

1. Previous Actions

- The canal was emptied of water in 1972.

- Water in the below-ground duct was removed in 1998. This activity was documented in BGRR Report-017 [7].

- Canal House and Water Treatment House were removed in 2001.

- Water level monitoring devices were installed at low-elevation points in the below ground duct and cooler drain sump to detect any new water in-leakage [7].

- The canal and surrounding soils were characterized for hazardous and radiological contaminants. Results were documented in BGRR Report 033 [5].

- The coolers and exhaust filters in the below ground duct have been removed. This activity was performed pursuant to BGRR Report 046 [8].

- The inner canal walls have been decontaminated to remove loose surface contamination and a temporary tent has been installed over the canal to protect the structure from the elements. All contaminated piping systems associated with the canal were removed except walkway floor drain piping associated with the canal walkway sump. All surface contaminated soils in the proximity of the canal were

removed and soil was restored in the area to levels that are at, or near, background. These activities were documented in BGRR Report 048 [9].

- The below-ground duct and surrounding soils were characterized for hazardous and radiological contaminants. Results were documented BGRR Report 049 [6].

2. Current Actions

- The below-ground ducts are monitored for water intrusion. Any water found is removed by pumping the water out at low points, such as at the deep drain sump.
- Removal of significant portions of the below-ground duct primary liner is in progress.
- Down-gradient groundwater is being monitored as part of the Operable Unit III, Sr-90 Groundwater Remediation Project.

C. State and Local Authorities' Roles

The BGRR Decommissioning Project is being performed in accordance with CERCLA under an Interagency Agreement (IAG) among the Environmental Protection Agency (EPA), New York State Department of Environmental Conservation (NYSDEC) and the Department of Energy (DOE). This BGRR removal action was developed through extensive discussions among the DOE, EPA, NYSDEC, the New York State Department of Health (NYSDOH) and the Suffolk County Department of Health Services (SCDHS).

III. THREATS TO PUBLIC HEALTH OR WELFARE AND THE ENVIRONMENT: STATUTORY AND REGULATORY AUTHORITIES

A. Threats to Public Health or Welfare

The threats posed by the BGRR canal and deep pockets of soil contaminations are based upon:

- The nature and extent of radiological contamination.
- The potential for further release of radiological contamination to soil and groundwater via rainwater intrusion, which has the potential to transport contamination from its current location.
- The BNL site is located above a sole-source aquifer, as designated by EPA under the *Safe Drinking Water Act,* and groundwater is the primary source of drinking water in the area. The groundwater also is classified by New York State as Class GA under

the New York Codes, Rules and Regulations (NYCRR), 6 NYCRR Part 703 [10], the best usage of which is a source of potable water.

- The appropriateness of the removal action is based on two of the eight factors listed in 40 Code of Federal Regulations (CFR) 300.415 (b) (2) [11] of the regulations implementing the National Contingency Plan.

    1. Actual or potential exposure to nearby human populations, animals or the food chain from hazardous substances, pollutants, or contaminants, and
    2. Actual or potential contamination of drinking-water supplies or sensitive ecosystems.

B. Threats to the Environment

A threat to the environment is the further migration of radiological contaminants into surrounding soils and subsequently to groundwater. There are no sensitive ecosystems threatened by these contaminants.

IV. IDENTIFICATION OF REMOVAL ACTION OBJECTIVES

The objectives for the removal of the BGRR canal (east of Building 701) as well as contaminated soils adjacent and/or beneath the canal, the south secondary air system bustle, the below-ground duct expansion joint #4, the cooler drain sump, and the Building 701 north trench are as follows:

- Remove substantial portions of the sub-surface contamination without undermining the surrounding buildings and structures.
- Substantially reduce the potential hazards posed by the radiological inventory.

V. PROPOSED ACTION AND ESTIMATED COSTS

A. Proposed Actions

1. Proposed Actions Descriptions

Fuel canal east of Building 701 – The canal east of Building 701 and contaminated soil adjacent to and below the canal structure will be removed to the extent practical. Surrounding structures cannot and will not be undermined as to create unsafe conditions, and all excavation work practices will be in compliance with OSHA requirements. Figure 5 illustrates the expected limits of this removal action imposed by these requirements. Specifically, it has been determined that a reasonable maximum excavation of the canal will be limited to four feet below the canal and approximately four feet east of the east air intake structure in order to not undermine

the east air intake of Building 701. Excavation in the areas is also limited by lay-back safety requirements for soil that will be removed at the BGRR Highlights of the canal removal and associated soils are illustrated in Figure 5 and summarized as follows:

- Approximately 1400 cubic yards of soil will be excavated.
- 840 cubic yards of the total soil volume to be excavated is from the first ten feet below grade and is considered as clean overburden. This soil will be sampled to ensure that it is clean and will be used as backfill after the canal is removed.
- 560 cubic yards of the total soil volume to be excavated is from ten feet below grade to four feet below the canal. This soil will be shipped to a LLRW facility for disposal.
- Approximately 200 cubic yards of contaminated concrete will be removed and shipped to a LLRW facility for disposal.
- Removal of approximately four cubic yards from the pocket of contamination located in the soil beneath the canal floor in the vicinity of the canal construction joint east of Building 701 foundation column 7 (east wall of Building 701). Access to this contaminated soil will be provided through a series of penetrations made across the width of the canal floor. Following contaminated soil removal, the excavation voids will be backfilled with clean soil and the removed portions of the canal concrete floor will be restored with poured concrete or structurally equivalent material.
- An as-left survey will be performed of the area exposed from removing the canal and the remaining accessible soil beneath the canal construction joint.
- The area east of Building 701 will be restored by backfilling, compacting, and grading. Under the BGRR Record of Decision [2], the excavated area will be covered by an approved engineered cap. If the final design of the cap is not engineered and approved when the canal is excavated, a temporary layer of blacktop will be installed to divert storm water from this area as an interim measure.

Soil adjacent to the south secondary air system bustle – Contaminated soil adjacent to the below ground duct bustle will be removed to the extent practical. An engineered shoring system will be used to excavate to the depth indicated in Figure 6. Surrounding structures cannot and will not be undermined as to create unsafe conditions. All excavation work practices will be in compliance with OSHA requirements. Figure 6 illustrates the expected limits of this removal action imposed by these requirements. Highlights are summarized as follows:

- Removal of clean overburden (approximately from grade to elevation 83 feet). This soil will be sampled to ensure that it is clean and will be used as backfill after the contaminated soil is removed.

- Relocation of utility interferences as necessary.

- Removal of approximately 40 cubic yards of contaminated soil adjacent to and below the north duct secondary air bustle approximately 6 to 18 feet south of Building 701 Column A-A. (Approximately from elevation 83'-0" to elevation 76'-9") As shown in Figure 6, this should result in the removal of the majority of the contaminated soil, including the areas of highest Cs-137 and Sr-90 contamination.

- An as-left survey will be performed of the area exposed from removing the soil adjacent to the below ground duct bustle.

- Restoration of the area south of Building 701 by backfilling, compacting, and grading. Under the BGRR Record of Decision [2], the excavated area will be covered by an approved engineered cap. If the final design of the cap is not engineered and approved when the area south of Building 701 is excavated, a temporary layer of blacktop will be installed to divert storm water from this area as an interim measure.

Soils adjacent to expansion joint #4 and cooler drain sump – Access to the contaminated soils beneath the north and south cooler drains sump will be provided by removing portions of the concrete floors in the sumps. Similarly, access to contaminated soils beneath expansion joint #4 will be provided through a series of penetrations made across the width of the below ground duct. As shown in Figure 7, approximately 10 cubic yards of contaminated soil will be removed from these areas. Following contaminated soil removal, the excavation voids will be backfilled with clean soil and the removed portions of the sumps will be restored with poured concrete or structurally equivalent material and the below ground ducts will be sealed. An as-left survey will be performed of the remaining accessible soil beneath the north and south cooler drain sumps and expansion joint #4.

Soils adjacent to Reactor Building trench area - Approximately two cubic yards of contaminated soil in the north trench area within Building 701 will be removed manually (hand digging and/or vacuum).

2. Contribution to the Remedial Performance

As already described, a PRAP was prepared by the DOE, reviewed by the IAG regulators, and issued for public comment. The removal actions described in this

Action Memorandum are included in the scope of the recommended alternative: Alterative C. Hence, this Action Memorandum has a direct contribution on overall remedial performance.

3. Engineering Evaluation/Cost Analysis (EE/CA)

A draft EE/CA [5] for the remediation of the canal and surrounding soils was submitted to EPA and NYDEC in August 2001. This EE/CA recommended limited soil and structures removal. The DOE has subsequently determined that is prudent to remove additional contaminated soil and the canal structure. These additional actions are described in this Action Memorandum and are included in the BGRR PRAP (Alternative C).

4. Applicable or Relevant and Appropriate Requirements

The National Contingency Plan, Section 300.430 (e)(9)(iii)(B), requires that removal attains the Federal and State Applicable and Relevant and Appropriate Requirements (ARARs) to the extent practicable. The following ARARs apply to this removal action.

Chemical and Radiation Specific ARARs

- 6 New York Code, Rules and Regulations (NYCRR) part 212, *General Process Emission Sources*: These State regulations will be followed to determine the need for air-emission control equipment. All remedial work will be performed in accordance with standards and procedures that will ensure compliance with these regulations.

- 6 NYCRR Part 380, *Rules and Regulations for Prevention and Control of Environmental Pollution by Radioactive Materials*: These regulations are the relevant and appropriate regulations for controlling radioactive emissions and liquid releases to the environment while completing the remedial action. Potential radioactive surface contamination releases, airborne radioactivity generation and release, and radioactive liquid releases will be controlled to eliminate emissions that would affect human health or the environment.

- Resource Conservation and Recovery Act (RCRA) (40CFR260-281): These Federal regulations define hazardous wastes.

- New York State Hazardous Waste Management System Regulations (6 NYCRR 370 – 376): These regulations define hazardous wastes in New York State. All wastes classified as hazardous will be handled, stored, and disposed of off-site at a permitted facility in accordance with these regulations.

- Safe Drinking Water Act (40CFR141.16): Establishes maximum contaminant levels (MCLs) that are used as groundwater standards for sole source aquifers. BNL site wide conformance with the ARAR is addressed in the Operable Unit (OU) III Record of Decision. U.S. Department of Transportation Requirements for the Transportation of Hazardous Materials (49CFR Parts 100 to 170) will be applicable for any wastes that are transported off-site.

Location-Specific ARARs

- National Historic Preservation Act (36CFR800), requires Federal agencies to take into account the effects of their actions on historic properties.

Action-Specific ARARs

- 10CFR835, *Occupational Radiation Protection*: These rules establish radiation protection standards for all DOE activities. Remedial action will be performed in accordance with the requirements of a DOE-approved radiation protection program and dosimetry program and appropriate procedures established to ensure compliance with this regulation.

- 10CFR830, *Nuclear Safety Management*: These rules establish the minimum acceptable quality assurance and controls for all applicable DOE activities. Remedial action will be performed in accordance with the requirements of a DOE-approved quality assurance and control program and appropriate procedures established to ensure compliance with this regulation.

- RCRA (40CFR260-268): As described above.

- New York State Hazardous Waste Regulations (6 NYCRR Parts 370 – 376): As described above.

- Clean Air Act (42 United States Code [U.S.C.] Section 7401, et seq.) and National Emissions Standards for Hazardous Air Pollutants (NESHAPs) (40CFR61): This Act regulates and limits the emissions of hazardous air pollutants, including radionuclides. All activities that have the potential for creating airborne emissions will require confinement or containment with confirmatory air sampling to verify compliance with these requirements and applicable standards.

To Be Considered Materials

- NYSDEC Technical and Administrative Guidance Memorandum *Remediation Guideline for Soils Contaminated with Radioactive Materials* (#4003), September 1993. This memorandum contains State guidance for remediating radiologically

contaminated soils. The State's value of 10 millirem/year (mrem/yr) above background serves as an additional goal for remediation that will be evaluated during remedial action planning and implementation.

- NYSDEC's Division of Air Guidelines for Control of Toxic Ambient Air Contaminants, Air Guide 1: This guide will be used to assess the impacts of air emissions for activities having the potential for creating airborne radioactivity. Contents of this guide will be used to aid in evaluating the need for having air-emissions control equipment.

- DOE Order 5400.5, *Radiation Protection of the Public and the Environment*: This DOE Order establishes the standards and requirements with respect to protection of members of the public and the environment against undue risk from radiation. As with 10CFR835, remedial action will be performed in accordance with appropriate procedures established to ensure continued protection of the public and the environment.

- DOE Order 435, Radioactive Waste Management: This order provides guidance and requirements for management and disposal of radioactive waste generated at DOE facilities.

- ALARA or As Low As Reasonably Achievable is the practical approach to radiation protection used to manage and control exposures (both individual and collective) to the work force and to the general public, to levels as low as is reasonable, taking into account social, technical, economic, practical, and public policy considerations. Technologies and techniques incorporated into this remedy will be such that radioactive waste is minimized and direct exposure to radiation sources is reduced to as low as reasonably achievable.

- 40CFR300.440, *The Off-Site Rule* – (52FR49200). The purpose of the rule is to avoid having CERCLA wastes from response actions authorized or funded under CERCLA contribute to present or future environmental problems by directing these wastes to management units determined to be environmentally sound. The rule establishes the criteria and procedures for determining whether facilities are acceptable for the receipt of CERCLA wastes from response actions authorized or funded under CERCLA. The rule establishes compliance criteria and release criteria, and establishes a process for determining whether facilities are acceptable based on those criteria. The rule also establishes procedures for notification of unacceptability, reconsideration of unacceptability determinations, and re-evaluation of unacceptability determinations.

- *Memorandum of Agreement Between Brookhaven Area Office and New York State Historic Preservation Office Concerning the BGRR Decommissioning Project.* DOE determined that the BGRR is eligible for inclusion in the National Register

of Historic Places in accordance with the National Historic Preservation Act of 1966. DOE also established a number of measures to mitigate the adverse impacts of decommissioning in consultation with the New York State Historic Preservation Officer (SHPO).

5. Project Schedule

Major tasks include preparing planning documentation, issuing subcontracts for procurement of equipment, waste processing, transportation, and disposal, carrying out the work, and issuing a closeout report. The current BGRR working schedule calls for the removal action (including shipment of all waste and completion reports written) to be completed by September 30, 2005.

B. Estimated Costs

The total project cost to remove and dispose of the BGRR canal and deep pockets of soil contamination is estimated to be $3,500,000.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

A substantially delayed action or no action will increase the potential for future releases of radioactive material to the environment.

VII. OUTSTANDING POLICY ISSUES

None

VIII. RECOMMENDATION

This decision document recommends a non-time-critical removal action to remove the BGRR canal (east of Building 701) as well as contaminated soils adjacent and/or beneath the canal, the south secondary air system bustle, the below-ground duct expansion joint #4, the cooler drain sump, and the Building 701 north trench. To the extent possible, contaminated soils in these areas will be removed. This decision document was developed in accordance with CERCLA as amended, and is consistent with the National Contingency Plan.

IX. REFERENCES

1. Proposed Remedial Action Plan for the Brookhaven Graphite Research Reactor, Brookhaven National Laboratory, Upton, New York, August 2004.

2. Brookhaven Graphite Research Reactor Draft Record of Decision, Brookhaven National Laboratory, Upton, New York, September 28, 2004.

3. Interagency Agreement between United States Environmental Protection Agency – Region II, United States Department of Energy, and New York Sate Department of Environmental Conservation. Federal Facility Agreement under CERCLA Section 120, Administrative Document Number II-CERCLA-FFA-00201, 1992.

4. Code of Federal Regulations, National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300) (U.S. Government Printing Office, Washington, D.C.).

5. BGRR Report 033, Lower Canal and Water Treatment House, Equipment, and Associated Soils Engineering Evaluation/Cost Analysis, August 2001.

6. BGRR Report 049, Draft Characterization Report for the Below-Ground Ducts and Associated Soils, January 2002.

7. BGRR Report 017, Activity Closure Report for Waste Water Shipping and Disposal, January 2000.

8. BGRR Report 046 Action Memorandum, Brookhaven Graphite Research Reactor Coolers and Filters Removal Action, December 2001.

9. Draft BGRR Report 048, Draft Canal and Water Treatment Houses, Equipment, and Associated Soils Completion Report, April 2002.

10. New York Code, Rules and Regulations (1967), Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations, (Title 6 NYCRR Part 703) (Amended August 1999) (New York State Department of Environmental Conservation, Albany, NY).

11. Code of Federal Regulations, National Oil & Hazardous Substance Pollution Contingency Plan, Hazardous Substance Response (40 CFR 300.415 (b) (2)) (U.S. Government Printing Office, Washington, D.C.).

12. New York Code of Rules and Regulations, General Process Emissions Sources (6 NYCRR Part 212) (New York State Hazardous Waste Management Program.

13. Code of Federal Regulations, Hazardous Waste Management System (RCRA) (40 CFR Parts 260-268) (U.S. Government Printing Office, Washington, D.C.).

14. New York Code of Rules and Regulations, New York State Hazardous Waste Management Program (6 NYCRR Part 370 - 373).

15. Code of Federal Regulations, Occupational Radiation Protection (10 CFR Part 835) (U.S. Government Printing Office, Washington, D.C.).

16. *Clear Air Act* (42 U.S.C Section 7401, et seq.).

17. National Emissions Standards for Hazardous Air Pollutants (40 CFR).

18. Code of Federal Regulations (49 CFR Part 173.4) (U.S. Government Printing Office, Washington, D.C.).

19. DOE Order 451.1 A, National Environmental Policy Act (NEPA), CERCLA actions address NEPA values.

20. New York State Department of Environmental Conservation, Division of Air Guidelines for Control of Toxic Ambient Air Contaminants, Air Guide 1.

21. Envirocare of Utah, Site Waste Acceptance Guidelines, Revision 3, and License (UT 2300249) Amendment 11.

22. United States Department of Energy, (DOE Order 435.1), Radioactive Waste Management.

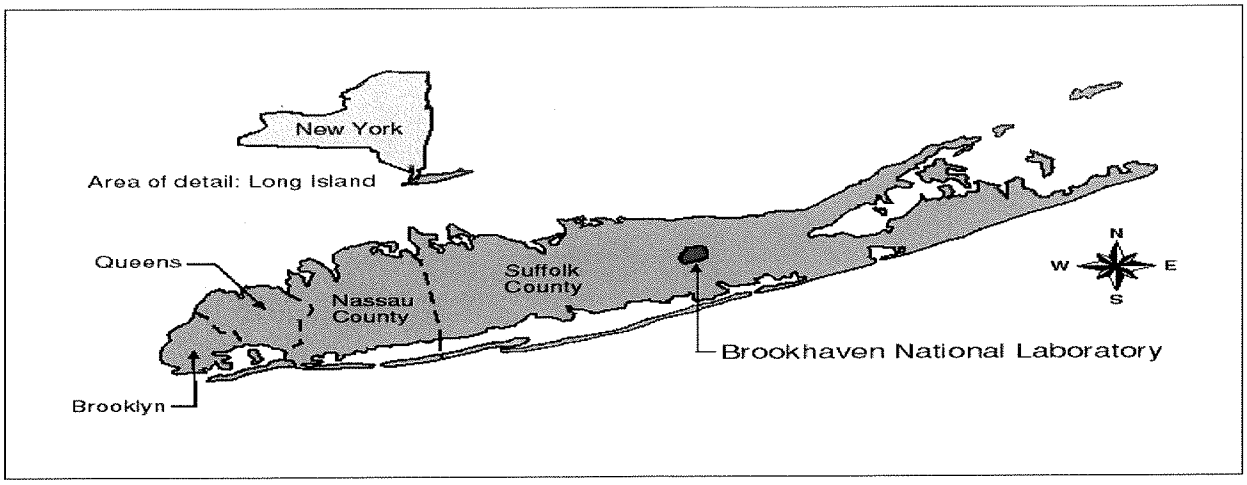


Figure 1. Location of Brookhaven National Laboratory

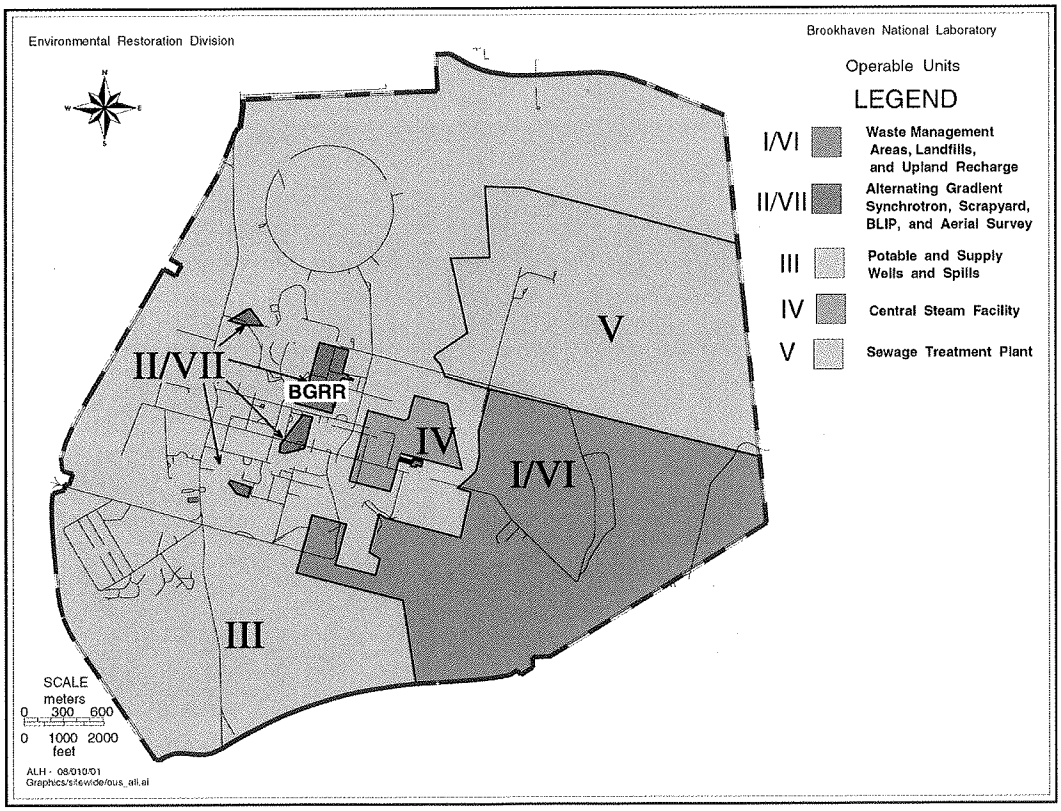


Figure 2. Location of BGRR on Brookhaven National Laboratory site

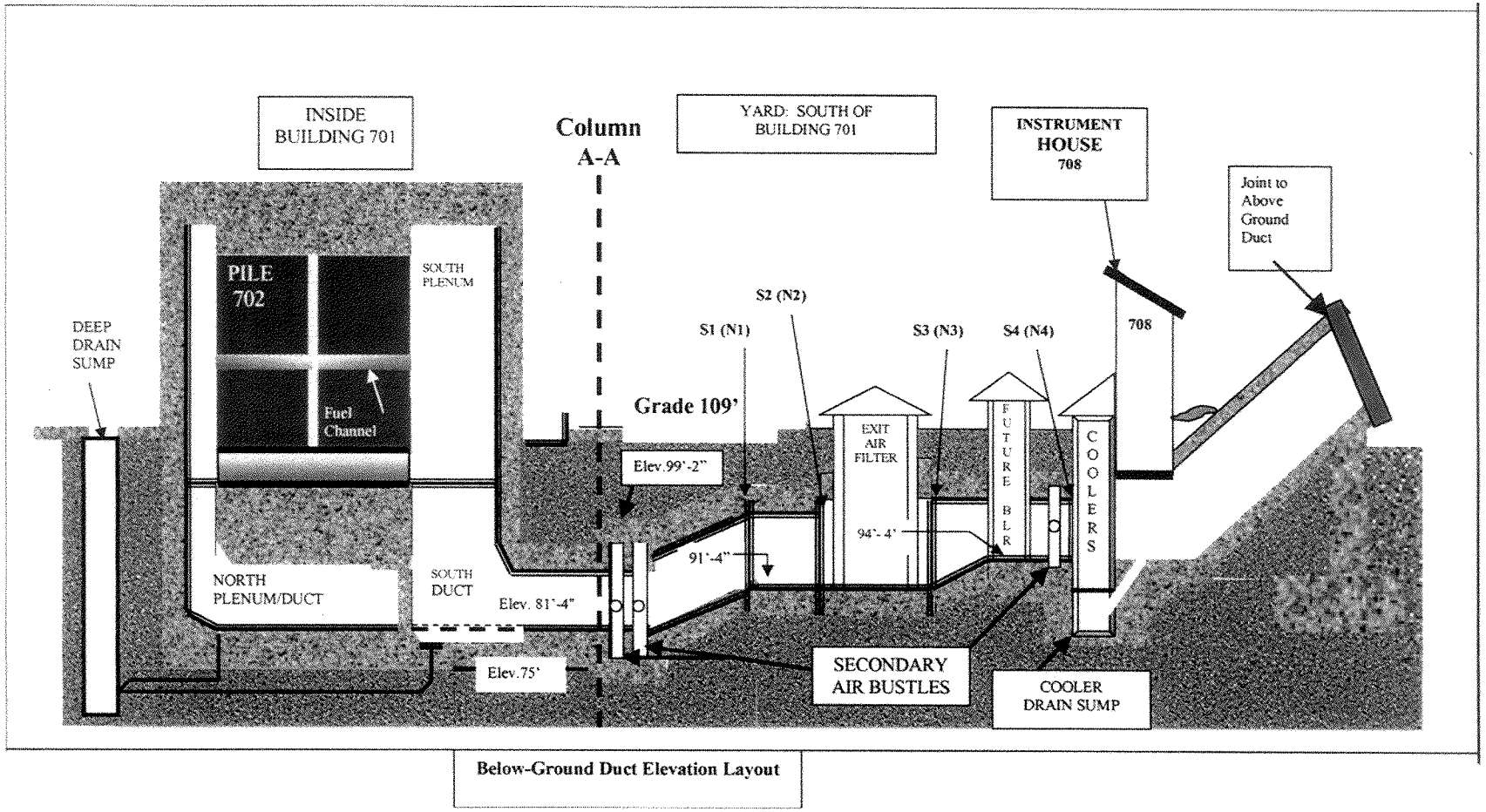


Figure 3. Below-ground Exhaust Air-cooling System (Elevation)

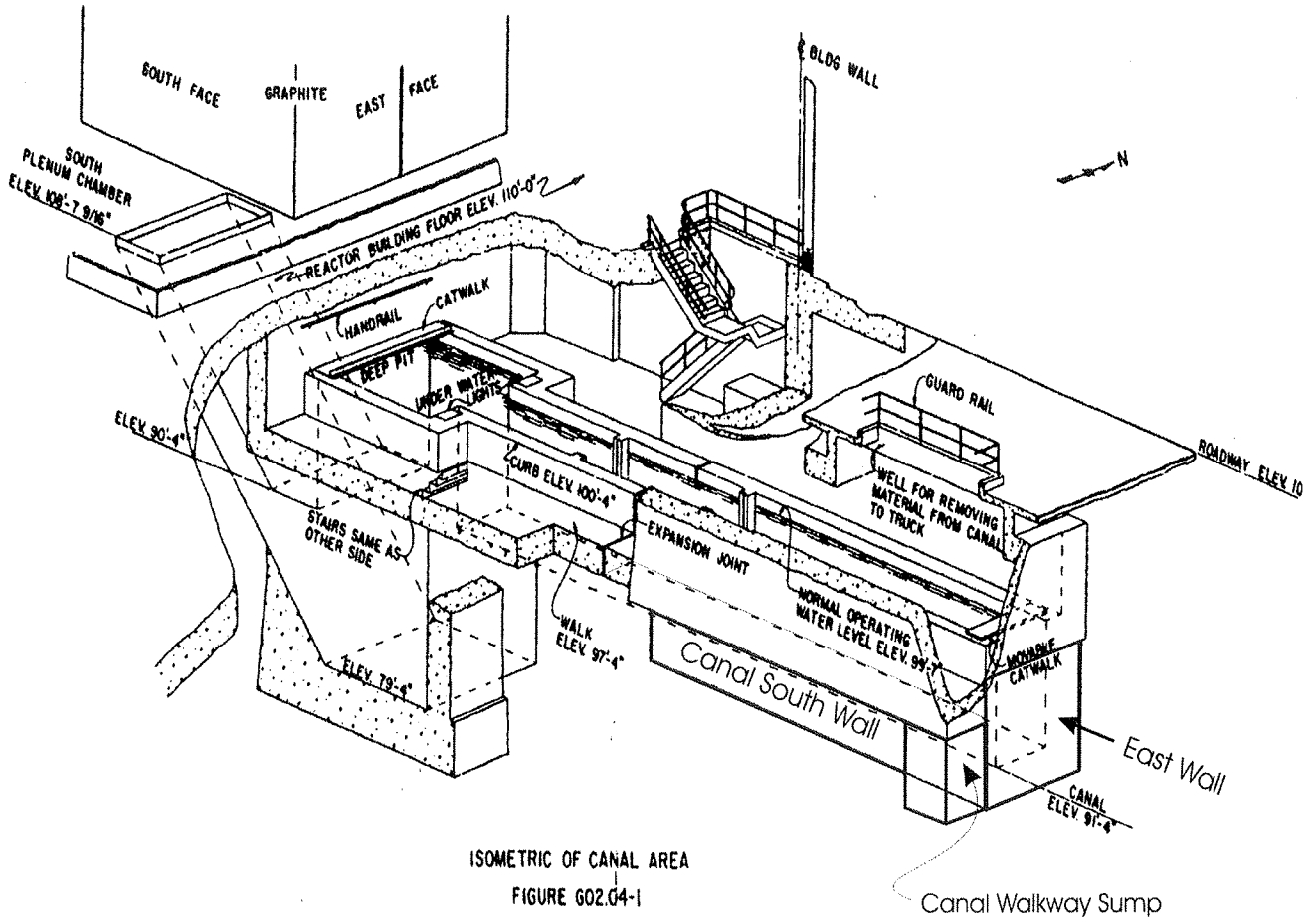
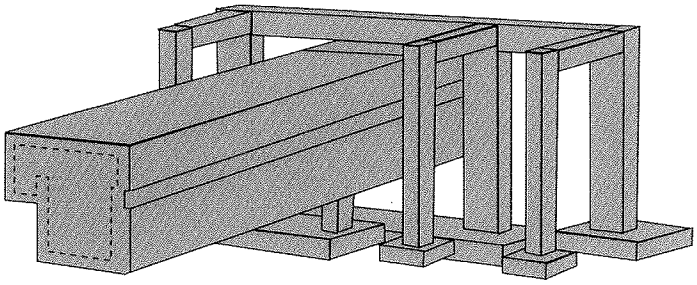


Figure 4. BGRR Canal (Isometric View)

Canal Structure Removal
Excavation Plan



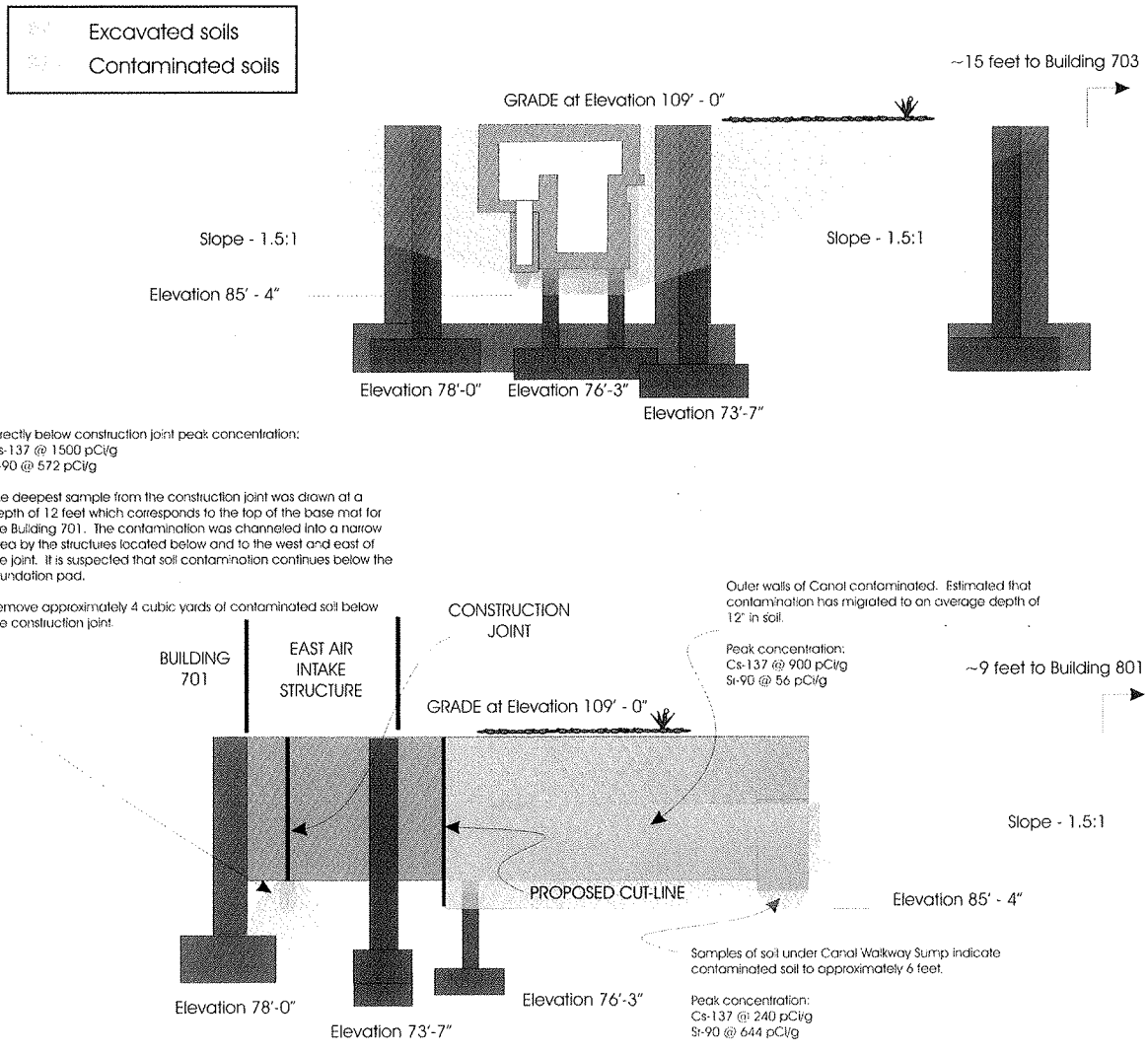


Figure 5

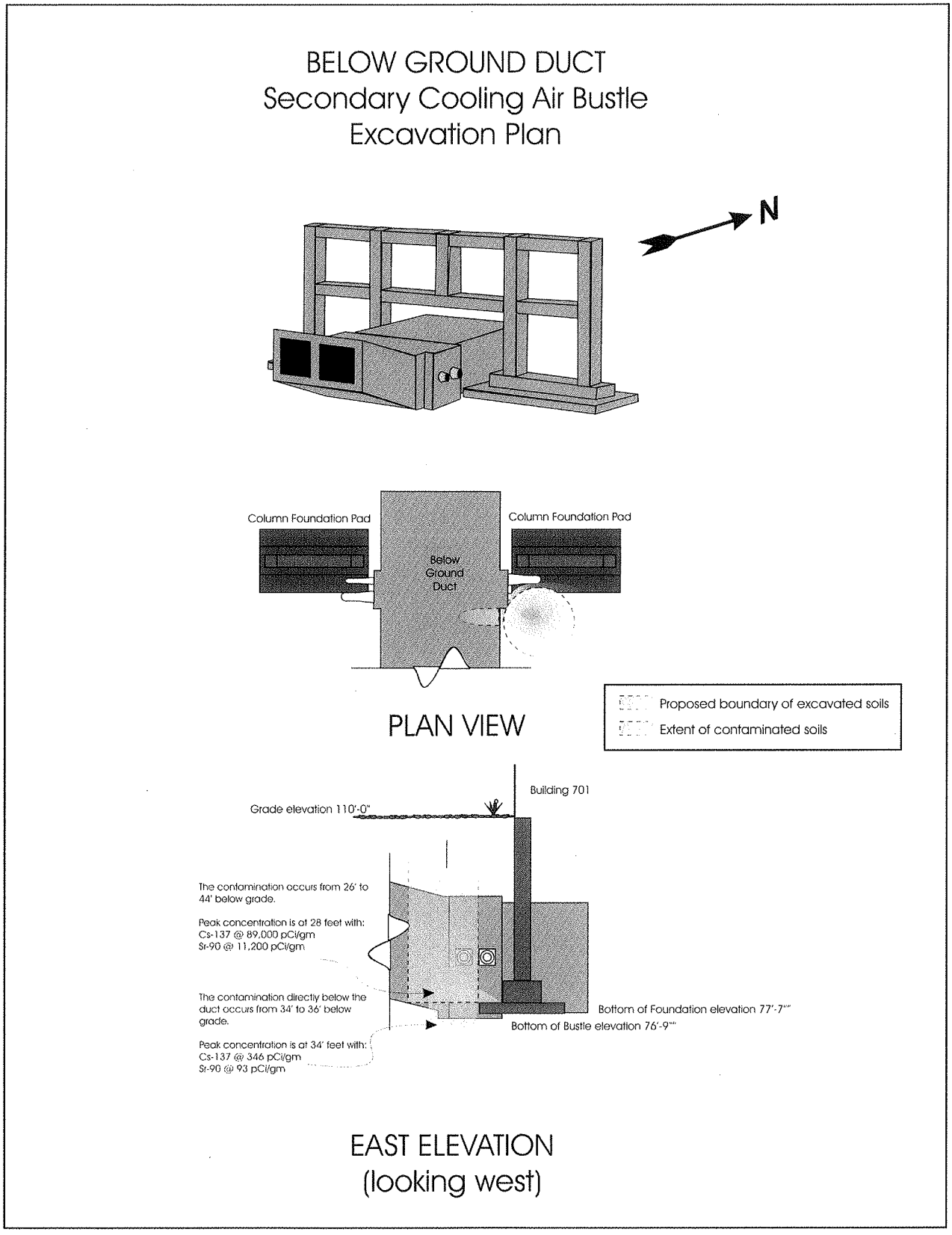
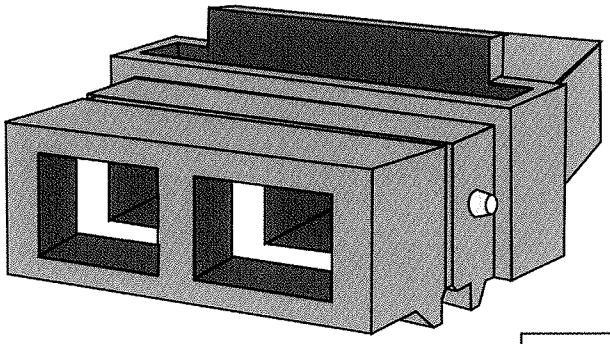

BELOW GROUND DUCT
Secondary Cooling Air Bustle
Excavation Plan
N
Column Foundation Pad
Column Foundation Pad
Below Ground Duct
PLAN VIEW
Proposed boundary of excavated soils
Extent of contaminated soils
Building 701
Grade elevation 110'-0"
The contamination occurs from 26' to 44' below grade.
Peak concentration is at 28 feet with:
Cs-137 @ 89,000 pCi/gm
Sr-90 @ 11,200 pCi/gm
The contamination directly below the duct occurs from 34' to 36' below grade.
Peak concentration is at 34' feet with:
Cs-137 @ 346 pCi/gm
Sr-90 @ 93 pCi/gm
Bottom of Foundation elevation 77'-7""
Bottom of Bustle elevation 76'-9""
EAST ELEVATION
(looking west)

Figure 6

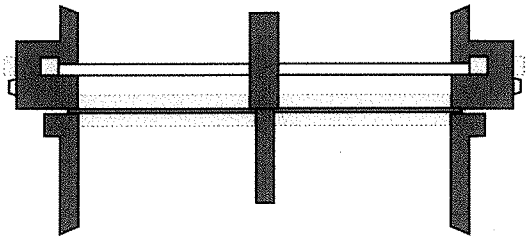
BELOW GROUND DUCT
Cooler Drain Sumps and Expansion Joint #4
Excavation Plan



Proposed boundary of excavated soils

Extent of contaminated soils

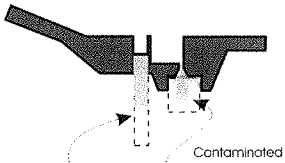
Excavate soil through bottom of sump



PLAN VIEW

North Elevation (looking south)

Elevation 112'-0"



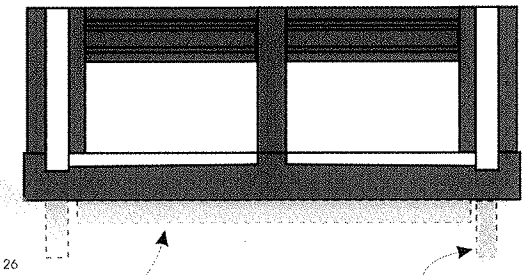
Contaminated from 20 - 26 feet below grade.

Peak concentration at 24 feet below grade: Cs-137 @ 66 pCi/gm

Contaminated from 14 - 26 feet below grade.

Peak concentration at 24 feet below grade: Cs-137 @ 66 pCi/gm

West Elevation (looking east)



ELEVATION VIEW

Excavate both drain sumps to 7 feet below foundation

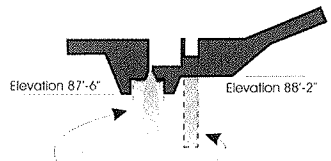
Although samples not taken, assumed that contamination leaked across entire length of expansion joint.

Excavate soil up to 4 feet below foundation across entire length of expansion joint

South Elevation (looking north)

Grade -- 111'-0" - 112'-0"

Elevation 112'-0"



Elevation 87'-6"

Elevation 86'-2"

Contaminated from 16 - 34 feet below grade.

Peak concentration at 22 feet below grade: Cs-137 @ 1,122 pCi/gm

Contaminated from 18 - 34 feet below grade.

Peak concentration at 20 feet below grade: Cs-137 @ 1,122 pCi/gm Sr-90 @ 37.3 pCi/gm

Figure 7

BROOKHAVEN NATIONAL LABORATORY
DRAFT Action Memorandum for Canal and Deep Pockets of Soil
NYSDEC COMMENT RESOLUTION

ITEM NO.	COMMENT	RESOLUTION
Bureau of Environmental Exposure Comments		
1.	This document should restate the DOE's commitment to conduct additional removal actions in the future if areas of contaminated soil that are now inaccessible become accessible.	The BGRR Record of Decision states DOE's commitment regarding controls and restrictions of the BGRR facility.
2.	Page 4 of the document lists three conditions that will limit the extent of the excavations (achievement of cleanup levels from the OUI ROD; sloughing of the soil; and risk to the structural integrity of nearby structures). As the excavation work proceeds and contaminant levels are determined at the limits of the excavations, decisions should be made as to whether it may be practical and appropriate to use engineering controls to allow some excavations to continue beyond these limits in order to remove additional contamination.	The Action memorandum was revised to reflect that the maximum practical excavation will be performed. References to cleanup levels and sloughing have been deleted.
3.	Figures 5, 6 and 7 do not clearly indicate the extent of proposed excavations, as stated in the text. At the least, a key should be added to explain the meaning of the various lines, colors and shading.	Legend has been added.
Bureau of Hazardous Waste and Radiation Management Comments		
4.	Section 11.2 details Federal and State ARARs that remedial efforts at the BGRR must comply with. However, the ARARs listed in this document do not include all of those ARARs listed in the draft Record of Decision, dated September 30, 2004. The Radiation Section considers explicit inclusion of the State's radioactive material regulation and remediation related ARARs to be requisite for all documents related to this remedial action; namely, 6 NYCRR Part 380, and NYSDEC Technical and Guidance Memorandum 4003. Please have these items included in the list of ARARs.	All ARARs have been revised and are the same as those stated in the BGRR Record of Decision.
5.	Page 7, first paragraph, line 3: change *picoCuries* to *picocuries* (the unit curies is always spelled with a lower case *"c"*, despite being named in honor of a living person).	Action memorandum has been revised.
6.	Page 8, Item B.1, fifth point: remove comma after 046 in Report 046.	Action memorandum has been revised.
7.	Page 9, last line: remove hyphen between *potable* and *water*; this is not a compound noun.	Action memorandum has been revised.
8.	Page 11, next to last paragraph, line 4: Words are missing after *"Figure 6,"* suggest adding "this action".	Action memorandum has been revised.
9.	Page 12, first paragraph, next-to-last line: the word *sealed* appears to be unnecessarily repeated.	Action memorandum has been revised.

BROOKHAVEN NATIONAL LABORATORY
DRAFT Action Memorandum for Canal and Deep Pockets of Soil
EPA COMMENT RESOLUTION

ITEM NO.	COMMENT	RESOLUTION
Section I – Purpose:		
1a.	Page 4 of this section discusses the cleanup levels to be reached for Cs-137 and Sr-90. Section 7.2 of the September 28, 2004 Draft Record of Decision (ROD) for the Brookhaven Graphite Research Reactor (BGRR) does not specify the cleanup goals but simply indicates that they are contained within the specific Action Memorandum (AM) authorizing the activity. While Alternative C in the Proposed Plan for the BGRR only indicates that approximately one and one-half Curies (predominantly cesium-137 and strontium-90) will remain in contaminated structures below Building 701, and within the below ground ducts. I understand that many of the items discussed in the draft AM have been discussed with the regulators and the community over the years as part of earlier AMs to conduct interim measures for the BGRR, however it is not clear where these cleanup goals were first proposed or finally formalized if they are not specified as the cleanup goals for Cs-137 and Sr-90, and these portions of the BGRR specified in the draft AM, in the final version of the ROD for the BGRR being circulated in draft form for review.	Clean-up goals have been eliminated.
1b.	Page 4 of this section indicates that the removal of soil will continue unless it threatens the structural integrity of adjacent structures and creates unsafe conditions. How is such a determination to be made? Will it be based on an engineering evaluation to determine at what depth and/or distance from a structure, foundation, piling, etc. you will jeopardize it, as is implied in the draft ROD for the BGRR? Additional information should be provided, for instance, will criteria be established for review, will work plans be developed, etc. Further discussions are needed.	Engineering evaluations have determined the physical limits of the proposed removals that will allow for a reasonable reduction of subsurface contamination while avoiding extraordinary efforts and risks with little reduction in radiological source terms. The specific limitations are delineated in the Action Memorandum.
1c.	Page 4 of this section indicates that excavation will continue until "sloughing" of the soil occurs. Since neither the Proposed Plan nor the draft ROD for the BGRR discusses this term, it is not clear what is meant by this term and, more importantly, who would make the determination that the soil is "sloughing". Further, the term seems arbitrary and open to interpretation. Recommend striking it from the AM since the decision to stop excavation should be based on the cleanup concentration levels to be achieved as part of this action and/or based on an engineering evaluation of the impact that soil excavation would have on the integrity of the structure(s)	All reference to "sloughing has been removed.
1d.	Page 4 of this section indicates that samples will be obtained in the vicinity of the excavation to provide additional characterization data on the inaccessible soil. However, it is not clear what this characterization and sampling will consist of. What will the soil samples be analyzed for, all Chemicals of Potential Concern (COPC) or a sub-set of the COPC list? For instance, the site characterization section of the draft AM indicates that elevated levels of metals (e.g., cadmium and zinc) were also identified in the contaminated soil in the north trench area in addition to Cs-137 and Sr-90. What will be the sampling frequency? Will work plans be developed specifying this information for review? Additional details should be provided.	The Action Memorandum has been revised to reflect that an "as left" survey will be performed in all areas that were excavated and remaining soils are accessible. The design of this sampling plan will be made available for regulatory review after it is developed. A list of COPC will be specified in this plan. The "as left" results will be documented in the Action Memorandum Completion Report.

BROOKHAVEN NATIONAL LABORATORY
DRAFT Action Memorandum for Canal and Deep Pockets of Soil
EPA COMMENT RESOLUTION

ITEM NO.	COMMENT	RESOLUTION
Section II – Site Conditions & Background, A. Site Description, 1. Removal Site Evaluation :		
2.	The second sentence under this section on page 5 uses the acronym, "BGD", however it was not referenced in the "Acronyms, Abbreviations, & Units of Measure" Section of the draft AM on page iii. Recommend adding "BGD" and what it is an abbreviation for in this section of the draft AM for the reader's clarity	The acronym BGD has been spelled out "below ground duct" the first time it is used.
Section II – Site Condition & Background, A Site Description, 2. Physical Location:		
3a.	Minor editorial – 3rd sentence of page 5 - please remove one word from the following, "... energy nuclear and solid-state physics, fundamental material and structure properties, ~~and~~ the interaction of matter, ..."	No change is considered necessary.
3b.	Very Minor – 2nd paragraph on page 6 - please clarify the estimated total acreage for the site. The draft ROD for the BGRR notes an estimated acreage of 5,321 acres and the draft AM notes a value of 5,265. Recommend revising either one of these documents so that the values are consistent.	Action Memorandum now reflects 5,321 acres.
Section II Site Conditions & Background, B. Other Actions, 2 Current Actions:		
4.	The first bullet item in this section on page 9 indicates that any water found within the below-ground ducts is pumped out. However, the draft AM does not discuss the final disposal destination for this water. Since the below-ground ducts are contaminated, and the water may have traveled through other portions of the BGRR that were contaminated prior to arriving at the ducts, does BNL typically need to sample the extracted water to verify that it is not contaminated and dispose of it accordingly? Please clarify.	Any water found in the below ground duct will be contaminated. Although very little water has been removed from the BGRR below ground duct since 1997, such water when found, has been analyzed for radiological constituents and processed as radioactive water.
Section IV – Identification of Removal Action Objectives:		
5.	Since this is an AM for a removal action as opposed to a remedial action, recommend changing the word "remedial" to "removal" in the second sentence of the first bullet item on page 10 so that it reads, "This *removal* action should ensure..."	Corrected.

BROOKHAVEN NATIONAL LABORATORY
DRAFT Action Memorandum for Canal and Deep Pockets of Soil
EPA COMMENT RESOLUTION

ITEM NO.	COMMENT	RESOLUTION
Section V – Proposed Action & Estimated Costs, A. Proposed Actions, 1. Proposed Actions Description		
6a.	The first and second bullet items on page 11 mention comparing field samples to the "OUI cleanup standards". I understand that many of the items discussed in the draft AM have been discussed with the regulators and the community over the years as part of earlier AMs to conduct interim measures for the BGRR, however it is not clear what these "OUI cleanup standards" are since no values are specified nor any reference to what document formalized them as standards for the BGRR removal and remedial actions. No reference to an "OUI cleanup standard" is noted in the September 28, 2004 Draft ROD nor the Proposed Plan for the BGRR	Reference to OUI standards has been deleted
6b.	The first bullet item on page 11 indicates that some of the overburden excavated soil will be used as clean backfill following field verification that the soil meets OUI cleanup standards. How and for what will this soil be sampled for to field verify that it is proper to be used for backfill? What will be the sampling frequency? Will work plans be developed specifying this information for review? Additional details should be provided.	The Action Memorandum has been revised to delete any reference to OUI standards. Furthermore, the Action Memorandum now states that the overburden soil will be sampled to ensure that it is clean and will be used as backfill after the canal and bustle area soil are removed. The design of this sampling plan will be made available for regulatory review after it is developed.
6c.	During previous characterization activities in the areas being specified in this draft AM, did BNL delineate horizontally and vertically the extent of soil contamination in such a way that a defined area of the overburden soil being excavated as part of this removal action can be defined as non-contaminated soil? If so, will such documentation be submitted as part of any plans related to the sampling activities discussed in earlier comments above in this letter since BNL plans to use portions of the soil as clean backfill? If not, how does BNL plan to segregate the known contaminated portions of the soil from the non-contaminated portions of the soil so that dilution of contaminated soil within the non-contaminated soil being field sampled and used for clean backfill does not occur. Additional details should be provided.	BNL plans to remove overburden soil that has been previously characterized as clean and is believed to be clean from process knowledge and operational history. Delineation for the canal and bustle area of clear overburden has been determined to be 10' and 27' below grade respectively. All soil beneath these elevations will be treated as radioactive waste.
6d.	The second bullet item on page 11 uses the acronym, "LLRW", however it was not referenced in the "Acronyms, Abbreviations, & Units of Measure" Section of the draft AM on page iii. Recommend adding "LLRW" and what it is an abbreviation for in this section of the draft AM for the reader's clarity.	LLRW added to list of acronyms.

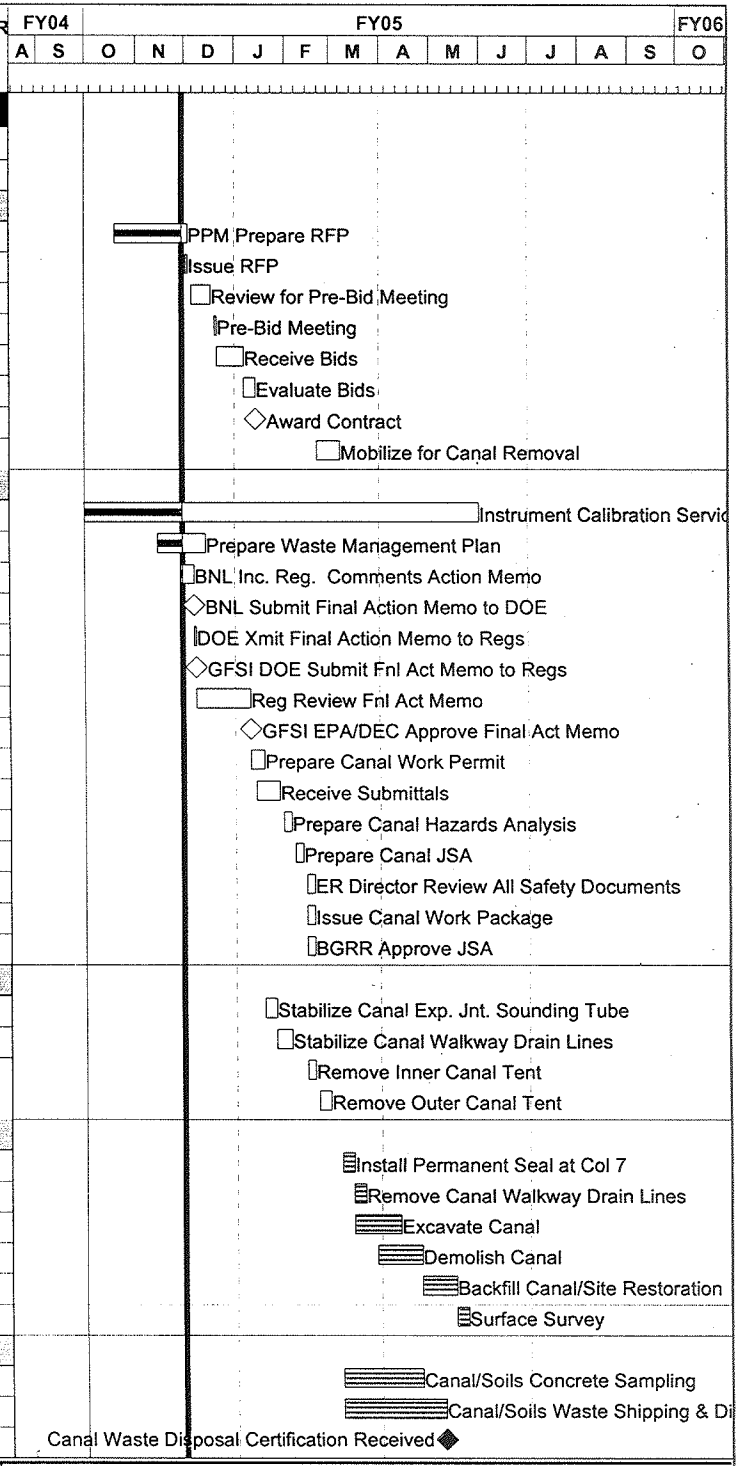
ITEM NO.	COMMENT	RESOLUTION
6e.	Relates to comment #1.b, above. The third, fifth, and seventh bullet items on page 11 and figures 5, 6, and 7 discuss the depths to which areas will be excavated. Are many of these depth intervals based on concerns about jeopardizing the structural integrity of adjacent structures? If so, was it based on an engineering evaluation on where excavation would need to stop based on a threat of impacting a structure as opposed to the actual level of contamination that exists in that specific area. Additional information should be provided.	Elevations stated in the Action Memorandum reflect elevations that engineering evaluations determined would not impact the structural integrity of adjacent structures.
6f.	The fourth and eighth bullet items on page 11 discuss either installing a final permanent cap as noted in the Draft BGRR ROD or a temporary cap consisting of blacktop. Once a decision is made, will the design specifications of either option be provided to the regulators for its information and review to ensure that either option is diverting water away from the below-ground duct(s) and Building 701?	A final design of a permanent cap will be submitted to the regulators for review and approval. If an interim measure is employed of installing blacktop, it will be sloped away from known contamination so that storm- water will be directed toward storm drains around the BGRR.
Section V – Proposed Actions & Estimated Costs, A. Proposed Actions, 4. Applicable or Relevant and Appropriate Requirements:		
7a.	Page 13 mentions the chemical-specific ARARs. Comparing the ARARs specified in this draft AM to the ARARs specified in the Draft BGRR ROD, it was noticed that the Draft BGRR ROD also specifies 6 NYCRR Part 380, Rules and Regulations for Prevention and Control of Environmental Pollution by Radioactive Materials, which the draft AM does not specify. Recommend adding this ARAR to the draft AM and specifying it in Section IX., References, unless there is some justification for why it is not needed in the draft AM.	Action Memorandum includes all ARARs as stated in ROD.
7b.	Page 13 mentions the chemical-specific ARARs. Comparing the ARARs specified in this draft AM to the ARARs specified in the Draft BGRR ROD, it was noticed that the Draft BGRR ROD also specifies U.S. Department of Transportation Requirements for the Transportation of Hazardous Materials (49 CFR 100 to 170), which the draft AM does not specify. Recommend adding this ARAR to the draft AM and specifying it in Section IX. References, unless there is some justification for why it is not needed in the draft AM.	Action Memorandum includes all ARARs as stated in ROD.
7c.	Page 13 mentions the location-specific ARARs. Comparing the ARARs specified in this draft AM to the ARARs specified in the Draft BGRR ROD, it was noticed that the Draft BGRR ROD also specifies a *Memorandum of Agreement Between Brookhaven Area Office and New York State Historic Preservation Office Concerning the BGRR Decommissioning Project,* which the draft AM does not specify. Recommend adding this ARAR to the draft AM and specifying it in Section IX, References, unless there is some justification for why it is not needed in the draft AM.	Action Memorandum includes all ARARs as stated in ROD.

BROOKHAVEN NATIONAL LABORATORY
DRAFT Action Memorandum for Canal and Deep Pockets of Soil
EPA COMMENT RESOLUTION

ITEM NO.	COMMENT	RESOLUTION
7d.	Page 13 mentions the action-specific ARARs. Comparing the ARARs specified in this draft AM to the ARARs specified in the Draft BGRR ROD, it was noticed that the Draft BGRR ROD also specifies DOE Order 5400.5, Radiation Protection of the Public and the Environment, which the draft AM does not specify. Recommend adding this ARAR to the draft AM and specifying it in Section IX, References, unless there is some justification for why it is not needed in the draft AM.	Action Memorandum includes all ARARs as stated in ROD.
7e.	The action-specific ARARs noted on page 13 of the draft AM also mentions 49 CFR Part 173.4 through 173.471, Packaging and Transportation of Radioactive Material. This ARAR was not identified in the Draft BGRR ROD, therefore recommend adding it to the list of action-specific ARARs in the Draft BGRR ROD for consistency unless there is some justification for why it is not needed in the draft BGRR ROD.	Action Memorandum includes all ARARs as stated in ROD.
7f.	The fifth bullet item, under the action-specific ARARs noted on page 13, mentions the National Emissions Standards for Hazardous Air Pollutants. However, the reference does not note what portion of 40 CFR it can be found under in the regulations. The Draft BGRR ROD notes it as being under Part 61. Recommend adding "Part 61" for this ARAR on page 13 and in its reference on page 17, under Section IX, References, of the draft AM.	Action Memorandum includes all ARARs as stated in ROD.
7g.	Page 14 mentions the To-be-considered (TBC) Guidance. Comparing the TBC items specified in this draft AM to the TBC items specified in the Draft BGRR ROD, it was noticed that the Draft BGRR ROD also specifies the following TBC items that are not specified in the draft AM: NYSDEC Technical and Administrative Guidance Memorandum, "Remediation Guideline for Soils Contaminated with Radioactive Materials" (#4003), September 1993; The Off-Site Rule, DOE Office of Environmental Guidance; and ALARA or As Low As Reasonably Achievable. Recommend adding these TBC items to the draft AM and specifying them in Section IX, References, unless there is some justification for why they are not needed in the draft AM.	Action Memorandum includes all ARARs as stated in ROD.
7h.	The first bullet item under the TBC Guidance Section on page 14 mentions DOE Order 451.1 A, *National Environmental Policy* Act (NEPA). This TBC item was not identified in the Draft BGRR ROD, therefore recommend adding it to the list of TBC items in the Draft BGRR ROD for consistency unless there is some justification for why it is not needed in the draft BGRR ROD	Action Memorandum includes all ARARs as stated in ROD.

ITEM NO.	COMMENT	RESOLUTION
Section V – Proposed Action & Estimated Costs, A. Proposed Actions, 5. Project Schedule:		
8.	If BNL has a more detailed schedule, which indicates the time frames for the various action items to be conducted under this removal action, it is recommended that it be submitted with any other subsequent documentation that may be submitted in response to the questions/comments specified in this letter.	Detailed schedule is attached.

Activity ID	Activity Description	Rem Dur	% Comp	Rev 6 Budget Cost	EV To Date	Forecast Sched Start	Forecast Sched Finish	Rev 6 EF Delta	1 Wk Delta	PMGR
FP Fred Petschauer										
TJ Tom Jernigan										
182 Canal and Deep Pocket Soil Removal (WP 182)										
17.7.02.B4.82.01.01.01 Procurement										
BGCR0003I	PPM Prepare RFP	4	20	0	0	19OCT04A	03DEC04	0	-5	FP
BGCR0005	Issue RFP	1	0	1,124	0	03DEC04	03DEC04	-61	-5	FP
BGCR0005A	Review for Pre-Bid Meeting	10	0	0	0	06DEC04	17DEC04	0	-5	FP
BGCR0005B	Pre-Bid Meeting	1	0	0	0	20DEC04	20DEC04	0	-5	FP
BGCR0006	Receive Bids	10	0	8,408	0	22DEC04	06JAN05	-68	-5	FP
BGCR0006A	Evaluate Bids	5	0	0	0	07JAN05	13JAN05	0	-5	FP
BGCR0007	Award Contract	0	0	1,149	0		13JAN05	-58	-5	FP
BGCR0008	Mobilize for Canal Removal	10	0	6,582	0	22FEB05	07MAR05	-83	-5	FP
17.7.02.B4.82.01.01.02 Documentation										
BGCR0012	Instrument Calibration Services	126*	24	53,100	6,903	01OCT04A	31MAY05	-4	0	FP
BGCR0040	Prepare Waste Management Plan	10	50	4,239	0	15NOV04A	13DEC04	-42	-6	FP
BGCR0011I	BNL Inc. Reg. Comments Action Memo	5	0	15,162	0	29NOV04A	06DEC04	-79	0	FP
BGCR0011J	BNL Submit Final Action Memo to DOE	0	0	0	0		06DEC04	-79	0	FP
BGCR0011K	DOE Xmit Final Action Memo to Regs	2	0	0	0	07DEC04	08DEC04	-76	0	FP
BGCR0011L	GFSI DOE Submit Fnl Act Memo to Regs	0	0	0	0		08DEC04	-76	0	FP
BGCR0011M	Reg Review Fnl Act Memo	21	0	0	0	09DEC04	10JAN05	-76	0	FP
BGCR0011N	GFSI EPA/DEC Approve Final Act Memo	0	0	0	0		10JAN05	-76	0	FP
BGCR0049A	Prepare Canal Work Permit	5	0	0	0	11JAN05	18JAN05	0	0	FP
BGCR0007A	Receive Submittals	10	0	0	0	14JAN05	28JAN05	0	-5	FP
BGCR0009	Prepare Canal Hazards Analysis	5	0	7,035	0	31JAN05	04FEB05	-113	-5	FP
BGCR0030	Prepare Canal JSA	5	0	8,331	0	07FEB05	11FEB05	-103	-5	FP
BGCR0031	ER Director Review All Safety Documents	5	0	0	0	14FEB05	18FEB05	0	-5	FP
BGCR0035	Issue Canal Work Package	5	0	7,385	0	14FEB05	18FEB05	-98	-5	FP
BGCR0045	BGRR Approve JSA	5	0	1,895	0	14FEB05	18FEB05	-103	-5	FP
17.7.02.B4.82.01.02.01 BSA Field Work										
BGCR0049	Stabilize Canal Exp. Jnt. Sounding Tube	5	0	29,489	0	19JAN05	25JAN05	-60	0	FP
BGCR0051	Stabilize Canal Walkway Drain Lines	8	0	51,405	0	26JAN05	04FEB05	-55	0	FP
BGCR0047	Remove Inner Canal Tent	5	0	41,348	0	14FEB05*	18FEB05	-68	0	FP
BGCR0048	Remove Outer Canal Tent	5	0	45,627	0	22FEB05	28FEB05	-68	0	FP
17.7.02.B4.82.01.02.02 Contractor Field Work										
BGCR0060	Install Permanent Seal at Col 7	5	0	36,577	0	08MAR05	14MAR05	-28	-5	FP
BGCR0052	Remove Canal Walkway Drain Lines	5	0	36,252	0	15MAR05	21MAR05	-78	-5	FP
BGCR0050	Excavate Canal	20	0	628,964	0	15MAR05	11APR05	-78	-5	FP
BGCR0055	Demolish Canal	20	0	367,055	0	29MAR05	25APR05	-63	-5	FP
BGCR0075	Backfill Canal/Site Restoration	15	0	133,780	0	26APR05	16MAY05	-58	-5	FP
BGCR0076	Surface Survey	5	0	0	0	17MAY05	23MAY05	0	-5	FP
17.7.02.B4.82.01.03 Canal Waste Shipping & Disposal										
BGCR0070	Canal/Soils Concrete Sampling	35	0	199,734	0	08MAR05	25APR05	-58	-5	FP
BGCR0065	Canal/Soils Waste Shipping & Disposal	45	0	439,777	0	08MAR05	09MAY05	-47	-5	FP
BGCR0071	Canal Waste Disposal Certification Received	0	0	0	0		09MAY05	-47	-5	FP



Data Date 30NOV04
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Forecast Schedule
Progress Bar
Critical Activity

Bar Pattern
DOE
Procurement
Regulatory & Other Agencies
Sub Contract
Waste Mgt & Disposal

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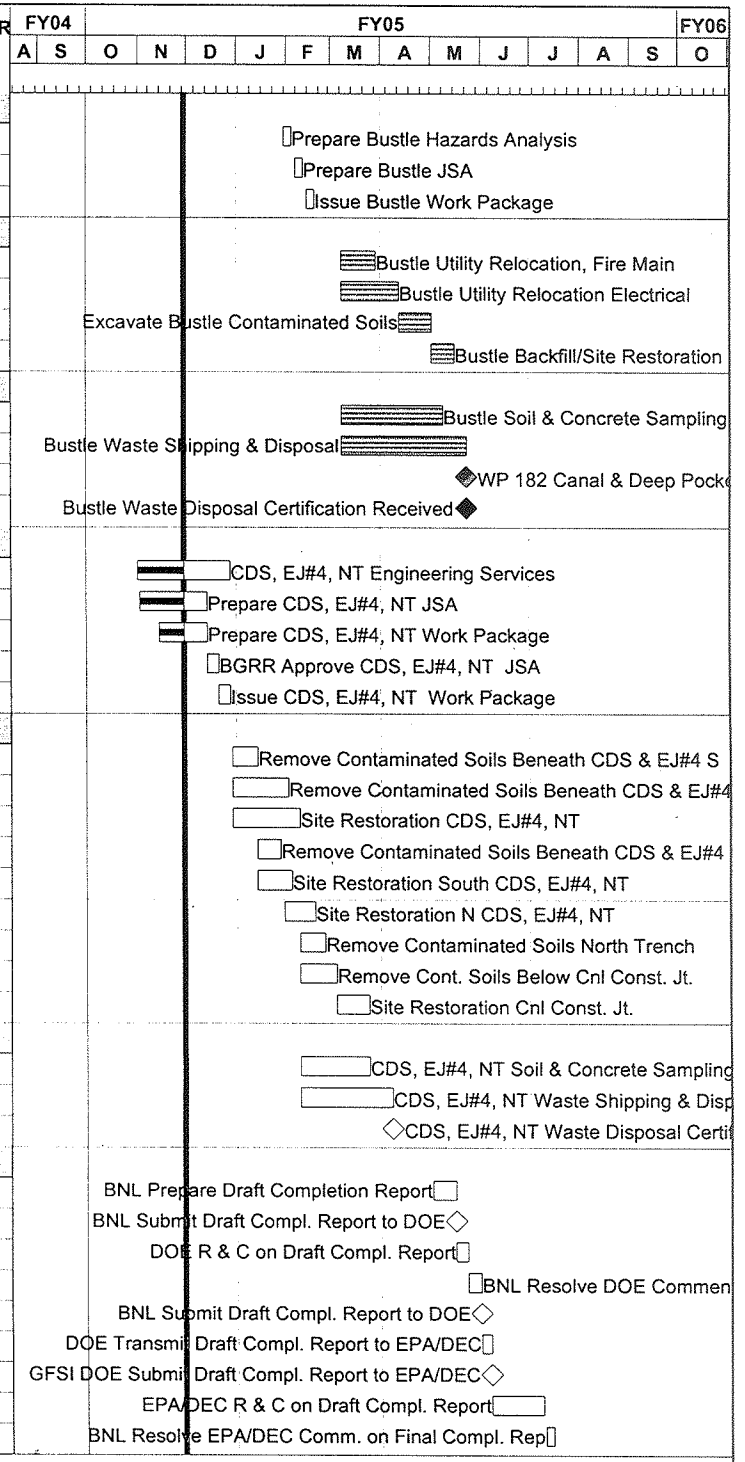
Activity ID	Activity Description	Rem Dur	% Comp	Rev 6 Budget Cost	EV To Date	Forecast Sched Start	Forecast Sched Finish	Rev 6 EF Delta	1 Wk Delta	PMGR
17.7.02.B4.82.02.01 Bustle Engineering & Planning										
BGBP0005	Prepare Bustle Hazards Analysis	5	0	10,067	0	31JAN05	04FEB05	-113	-5	FP
BGBP0030	Prepare Bustle JSA	5	0	10,226	0	07FEB05	11FEB05	-103	-5	FP
BGBP0035	Issue Bustle Work Package	5	0	7,450	0	14FEB05	18FEB05	-98	-5	FP
17.7.02.B4.82.02.02 Bustle Field Work										
BGBP0045	Bustle Utility Relocation, Fire Main	15	0	259,541	0	08MAR05*	28MAR05	-83	-5	FP
BGBP0050	Bustle Utility Relocation Electrical	25	0	203,653	0	08MAR05	11APR05	-83	-5	FP
BGBP0055	Excavate Bustle Contaminated Soils	15	0	116,574	0	12APR05	02MAY05	-83	-5	FP
BGBP0060	Bustle Backfill/Site Restoration	10	0	296,405	0	03MAY05	16MAY05	-84	-5	FP
17.7.02.B4.82.02.03 Bustle Waste Shipping & Disposal										
BGBP0065	Bustle Soil & Concrete Sampling	45	0	12,188	0	08MAR05	09MAY05	-81	-5	FP
BGBP0070	Bustle Waste Shipping & Disposal	55	0	41,958	0	08MAR05	23MAY05	-71	-5	FP
BG182FWC	WP 182 Canal & Deep Pocket Soil Removal	0	0	0	0		23MAY05	0	-5	FP
BGBP0075	Bustle Waste Disposal Certification Received	0	0	0	0		23MAY05	-71	-5	FP
17.7.02.B4.82.03.01 CS, EJ#4, NT Engineering & Planning										
BGDP0050	CDS, EJ#4, NT Engineering Services	20*	47	4,196	0	01NOV04A	28DEC04	2	0	FP
BGDP0010	Prepare CDS, EJ#4, NT JSA	10	50	8,514	1,703	03NOV04A	13DEC04	-12	-6	FP
BGDP0004	Prepare CDS, EJ#4, NT Work Package	10	50	7,588	0	15NOV04A	13DEC04	-32	-6	FP
BGDP0020	BGRR Approve CDS, EJ#4, NT JSA	5	0	1,926	0	14DEC04	20DEC04	-17	-6	FP
BGDP0015	Issue CDS, EJ#4, NT Work Package	5	0	7,588	0	21DEC04	28DEC04	-12	-6	FP
17.7.02.B4.82.03.02 CS, EJ#4, NT Field Work										
BGDP0025S	Remove Contaminated Soils Beneath CDS & EJ#4	10	0	0	0	30DEC04	13JAN05	0	-7	FP
BGDP0025	Remove Contaminated Soils Beneath CDS & EJ#4	23	0	264,245	0	30DEC04	02FEB05	-6	-7	FP
BGDP0035	Site Restoration CDS, EJ#4, NT	28	0	41,900	0	30DEC04	09FEB05	-1	-7	FP
BGDP0025N	Remove Contaminated Soils Beneath CDS & EJ#4	10	0	0	0	14JAN05	28JAN05	0	-7	FP
BGDP0035S	Site Restoration South CDS, EJ#4, NT	15	0	0	0	14JAN05	04FEB05	0	-7	FP
BGDP0035N	Site Restoration N CDS, EJ#4, NT	15	0	0	0	31JAN05	18FEB05	0	-7	FP
BGDP0030	Remove Contaminated Soils North Trench	10	0	48,491	0	10FEB05	24FEB05	-41	-7	FP
BGDP0031	Remove Cont. Soils Below Cnl Const. Jt.	15	0	0	0	10FEB05	03MAR05	0	-7	FP
BGDP0032	Site Restoration Cnl Const. Jt.	15	0	0	0	04MAR05	24MAR05	0	-7	FP
17.7.02.B4.82.03.03 CS, EJ#4, NT Waste Shipping & Disposal										
BGDP0040	CDS, EJ#4, NT Soil & Concrete Sampling	30	0	13,736	0	10FEB05	24MAR05	-28	-7	FP
BGDP0045	CDS, EJ#4, NT Waste Shipping & Disposal	40	0	29,318	0	10FEB05	07APR05	-21	-7	FP
BGDP0100	CDS, EJ#4, NT Waste Disposal Certificate Rcvd	0	0	0	0		07APR05	-21	-7	FP
17.7.02.B4.82.04 Removal Area 4 Completion Report										
BGCR0085	BNL Prepare Draft Completion Report	10	0	13,744	0	03MAY05	16MAY05	-63	-5	FP
BGCR0086	BNL Submit Draft Compl. Report to DOE	0	0	0	0		16MAY05	-63	-5	FP
BGCR0087	DOE R & C on Draft Compl. Report	5	0	0	0	17MAY05	23MAY05	-63	-5	FP
BGCR0088	BNL Resolve DOE Comments on Draft Compl.	5	0	9,125	0	24MAY05	31MAY05	-63	-5	FP
BGCR0089	BNL Submit Draft Compl. Report to DOE	0	0	0	0		31MAY05	-58	-5	FP
BGCR0090	DOE Transmit Draft Compl. Report to EPA/DEC	5	0	0	0	01JUN05	07JUN05	-58	-5	FP
BGCR0091	GFSI DOE Submit Draft Compl. Report to	0	0	0	0		07JUN05	-58	-5	FP
BGCR0092	EPA/DEC R & C on Draft Compl. Report	21	0	0	0	08JUN05	08JUL05	-58	-5	FP
BGCR0093	BNL Resolve EPA/DEC Comm. on Final Compl.	5	0	9,125	0	11JUL05	15JUL05	-58	-5	FP



Data Date 30NOV04
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Forecast Schedule
Progress Bar
Critical Activity

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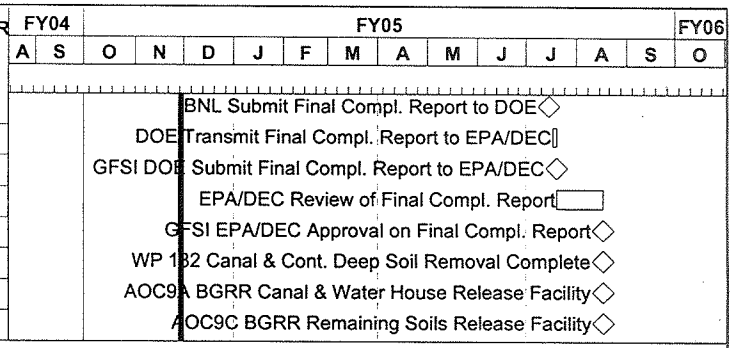
Activity ID	Activity Description	Rem Dur	% Comp	Rev 6 Budget Cost	EV To Date	Forecast Sched Start	Forecast Sched Finish	Rev 6 EF Delta	1 Wk Delta	PMGR
BGCR0094	BNL Submit Final Compl. Report to DOE	0	0	0	0		15JUL05	-58	-5	FP
BGCR0095	DOE Transmit Final Compl. Report to EPA/DEC	2	0	0	0	18JUL05	19JUL05	-58	-5	FP
BGCR0096	GFSI DOE Submit Final Compl. Report to	0	0	0	0		19JUL05	-58	-5	FP
BGCR0097	EPA/DEC Review of Final Compl. Report	21	0	0	0	20JUL05	17AUG05	-58	-5	FP
BGCR0098	GFSI EPA/DEC Approval on Final Compl. Report	0	0	0	0		17AUG05	-58	-5	FP
BGCR0100	WP 182 Canal & Cont. Deep Soil Removal	0	0	0	0		17AUG05	-58	-5	FP
BGRS0044C	AOC9A BGRR Canal & Water House Release	0	0	0	0		17AUG05	-58	-5	FP
BGRS0046C	AOC9C BGRR Remaining Soils Release Facility	0	0	0	0		17AUG05	-58	-5	FP



Data Date	30NOV04	Forecast Schedule	Bar Pattern: DOE, Procurement, Regulatory & Other Agencies, Sub Contract, Waste Mgt & Disposal
Run Date	30NOV04 13:22	Progress Bar	
		Critical Activity	

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