

Brookhaven Graphite Research Reactor Decommissioning Project

FINAL Remedial Design/Remedial Action Work Plan For the Graphite Pile Removal



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**BROOKHAVEN NATIONAL LABORATORY
BROOKHAVEN SCIENCE ASSOCIATES
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APPENDIX D – ERP OPM 3.2 Work Planning and Control

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1.0 INTRODUCTION

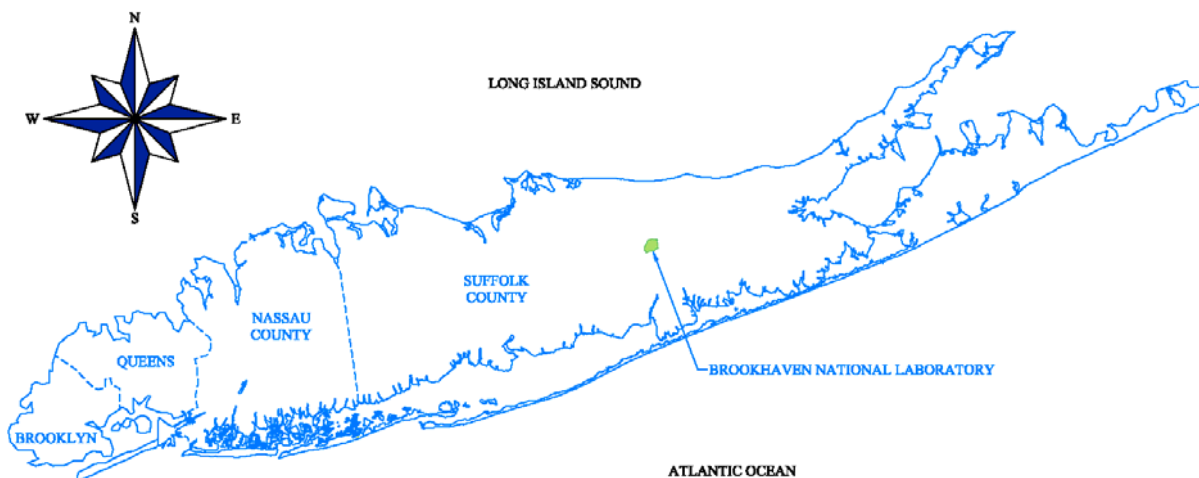
This Remedial Design/Remedial Action (RD/RA) work plan presents the approach that will be used for Graphite Pile Removal associated with Area of Concern (AOC) 9, Brookhaven Graphite Research Reactor (BGRR) Brookhaven National Laboratory (BNL).

The scope of this RD/RA work plan includes the removal of the concrete and steel plugs at the top of the biological shield, removal of the shroud surrounding the pile, and removal of the graphite blocks of the reactor pile. Graphite blocks will be removed to the steel plate at the base of the reactor. Loose debris will be removed and a fixative will be applied to the internal surfaces of the biological shield.

1.1 Site Background

BNL is a federal facility owned by U.S. Department of Energy (DOE). The DOE conducts research in physical, biomedical and environmental sciences and energy technologies. Brookhaven National Laboratory is located about 60 miles east of New York City, in Upton, Suffolk County, New York, near the geographic center of Long Island (Figure 1-1). Distances to neighboring communities from BNL are as follows: Patchogue ten miles west-southwest, Bellport eight miles southwest, Center Moriches seven miles southeast, Riverhead 13 miles east, Wading River seven miles north-northeast, and Port Jefferson eleven miles northwest.

Figure 1-1. Regional Site Location Map.



The BNL property, consisting of 5,321 acres, is an irregular polygon, and each side is approximately 2.5 miles long. The developed portion of the BNL Site includes the principal facilities, which are located near the center of the BNL Site on relatively high ground. The developed portion is approximately 900 acres, 500 acres of which were originally developed for

Army use. The remaining 400 acres are mostly occupied by various large research machine facilities. The outlying facilities occupy approximately 550 acres and include an apartment area, Biology Field, Former Hazardous Waste Management Area, Sewage Treatment Plant, firebreaks, and the Former Landfill Area. The terrain is gently rolling, with elevations varying between 40 to 120 feet above mean sea level. The land lies on the western rim of the shallow Peconic River watershed, with a tributary of the Peconic River rising in marshy areas in the northern section of the tract. The sole-source aquifer beneath BNL comprises three water-bearing units: the upper glacial deposits, the Magothy Formation, and the Lloyd Sand Member of the Raritan Formation. These units are hydraulically connected and make up a single zone of saturation with varying physical properties extending from a depth of five to 1,500 feet below the land surface. These three water-bearing units are designated as a "sole source aquifer" by the U.S. Environmental Protection Agency (EPA) and serve as the primary source of drinking water for Nassau and Suffolk Counties.

The BGRR is centrally located within the BNL Site (Figure 1-2, Location of the BGRR on BNL Site). The graphite pile and biological shield are contained within Building 701 and Figure 1-3 illustrates the BGRR complex and the location of the pile within the complex. Figure 1-4 is an illustration of the biological shield and experimental facilities.

The BGRR was an air-cooled, graphite-moderated reactor. It consists of a graphite cube, built in two halves separated by a vertical gap running east and west, 25 feet on each side and weighing about 700 metric tons. The cube is comprised of 75 horizontal layers of graphite blocks four inches wide and tall and of different lengths extending to more than 45 inches. The piles east, west, top, and bottom faces are covered with an airtight membrane to direct cooling air flow to the three inch air gap. This membrane was installed to prevent short circuiting of the cooling air. The north and south faces are covered with a three inch steel neutron shield. Figure 1-5 is a cutaway view of the biological shield and graphite pile and it shows the relationship between those two components, the layers of graphite, and the air gap separating the two halves of the pile.

1.2 Site History and Enforcement Activities

The U.S. Army occupied the BNL Site, formerly Camp Upton, during World Wars I and II. Between the wars, the Civilian Conservation Corps operated the BNL Site. It was transferred to the Atomic Energy Commission in 1947, to the Energy Research and Development Administration in 1975, and to DOE in 1977. Brookhaven Science Associates (BSA) operates BNL under a contract with DOE. In 1980, the BNL Site was placed on the New York State Department of Environmental Conservation's (NYSDEC) list of Inactive Hazardous Waste Sites. On November 21, 1989, the BNL Site was included on U.S. Environmental Protection Agency's (EPA's) National Priorities List because of soil and groundwater contamination that resulted from the Laboratory's past operations. Subsequently, the EPA, NYSDEC, and DOE entered into a Federal Facilities Agreement (CERCLA-FFA, 1992) (herein referred to as the Interagency Agreement; [IAG]) that became effective in May 1992 to coordinate the cleanup.

The BGRR at BNL 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 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.

Figure 1-2. Location of the BGRR on BNL Site.

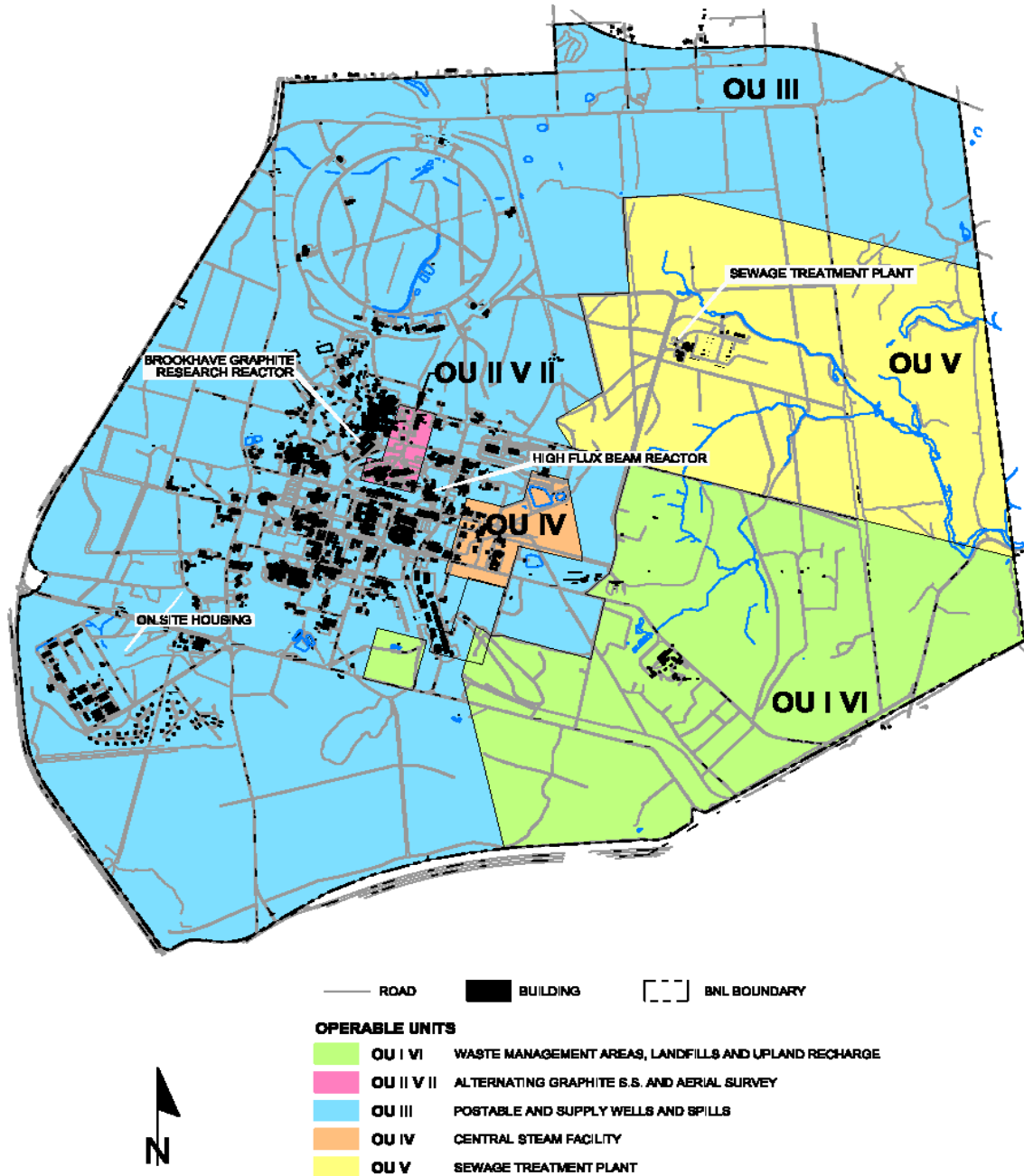


Figure 1-3. BGRR Complex

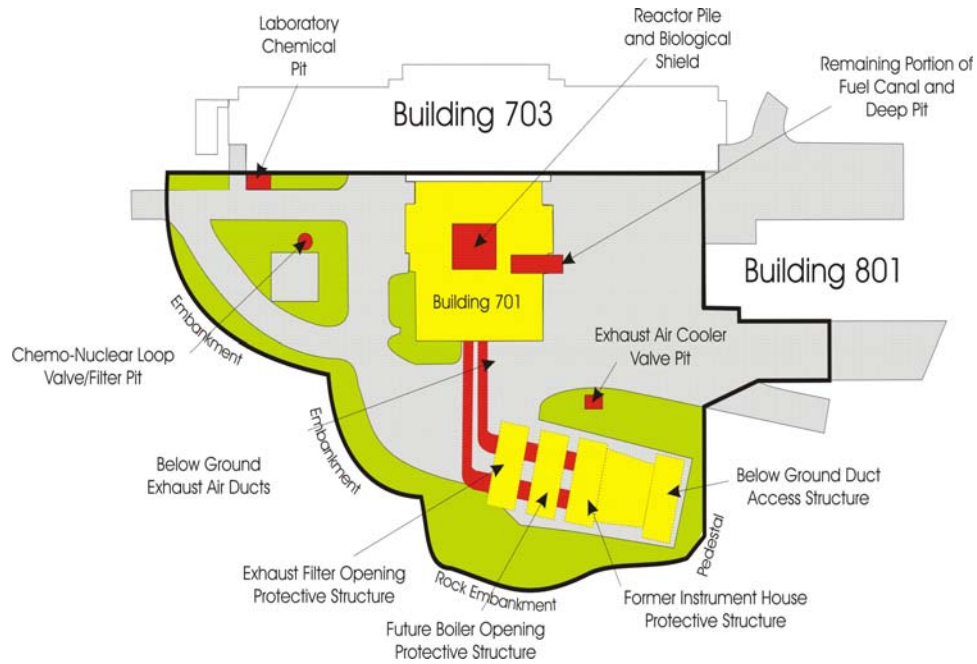


Figure 1-4. Biological Shield and Experimental Facilities

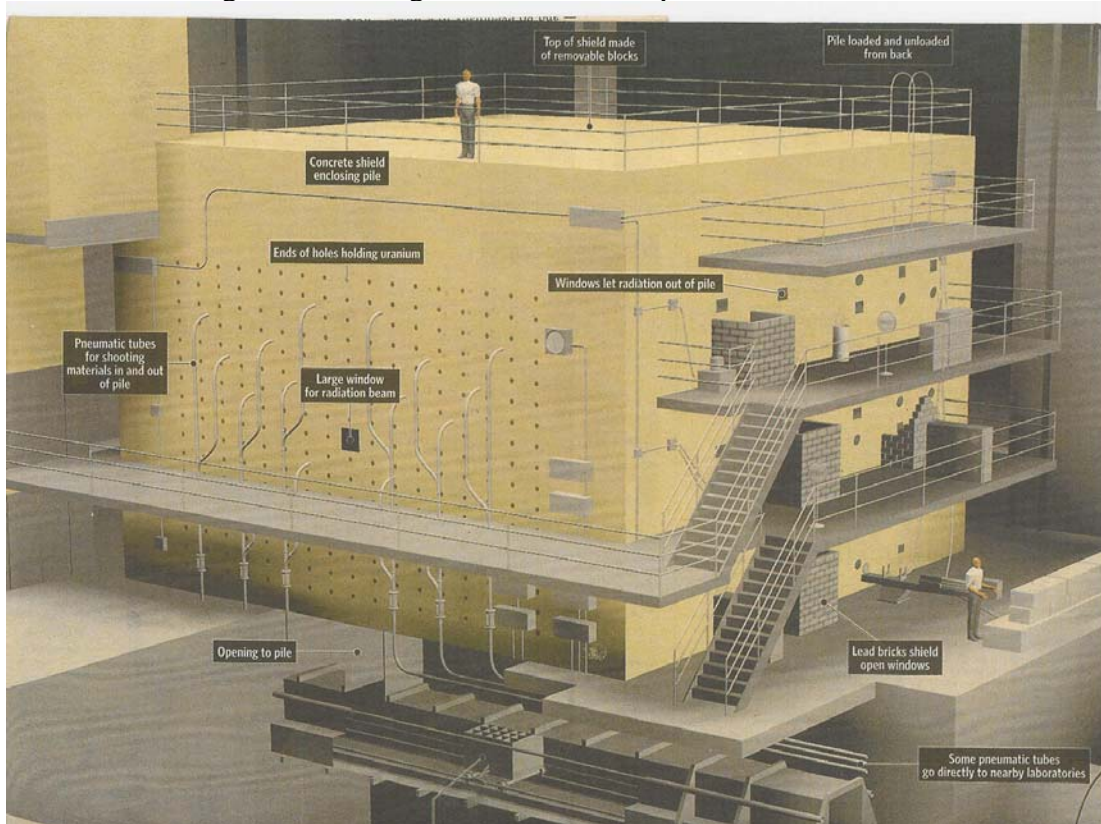
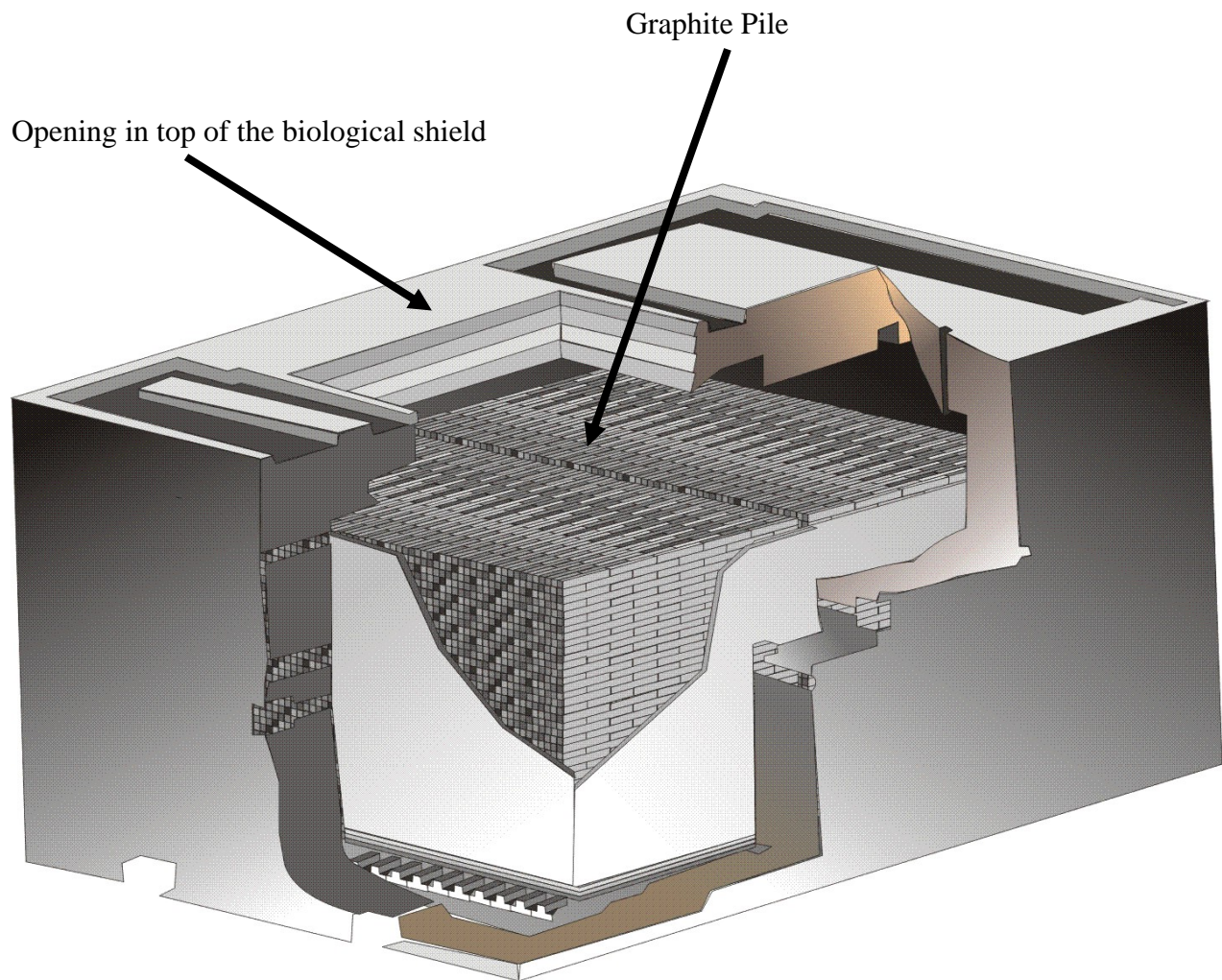


Figure 1-5. Cutaway View of Biological Shield and Graphite Pile



In June of 1972, de-fueling 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.

In 2005, the BGRR ROD was signed by the EPA, NYDEC and, the DOE. This agreement requires the removal of the graphite pile, biological shield, canal structure, reasonably accessible contaminated soils, and installation of water infiltration control and monitoring system for remaining structures and subsurface contaminated soils. This RD/RA Work Plan addresses the removal and disposal of the BGRR graphite pile.

1.3 Current Status of BGRR Remediation

Decommissioning of the BGRR began in 1997 with the discovery and subsequent removal of approximately 60,000 gallons of contaminated water that had infiltrated and accumulated in the below ground ducts. Additional decommissioning activities to date have included the disposition of:

- Experimental equipment and systems from the reactor building;
- Reactor exhaust fans, motors, valves and instruments;
- Pile fan sump, pipes and associated contaminated soil;
- Above-ground ducts, pipes and associated contaminated soil;
- Canal house and water treatment house, along with associated equipment, pipes, asphalt, concrete and accessible contaminated soils;
- Reactor exhaust cooling coils, filters and primary liner (partial);
- The fuel canal structure outside the footprint of the reactor building;
- Accessible subsurface contaminated soil in the vicinity of the fuel canal, below-ground duct expansion joint #4 and secondary cooling air bustle;
- Isolation of the below-ground duct and demolition of the instrument house;
- Verification that all nuclear instrumentation has been removed; and
- Inspection of all accessible fuel, non-fuel, and Newson channels.

Actions currently being performed include:

- Removal and characterization of all experimental components; and
- Characterization of the boron shot from within the emergency shutdown system.

Actions to be completed prior to the graphite pile removal include:

- Removal of the control rods and control rod sleeves; and
- Removal and characterization of the removable core.

Remaining actions to be completed include:

- Graphite pile removal including all remaining in-core components (e.g. thermocouples, aluminum shot wells, invar tie rods, etc.);
- Biological shield removal;
- Design and implementation of an engineered system to prevent water infiltration; and
- Establishment and implementation of land use and institutional controls.

1.4 Nature and Extent of Contamination

The BGRR pile has been extensively characterized and the results from these efforts are documented in the “*Determination of Radionuclide Inventory of the Graphite Pile for Waste Stream Characterization and Waste Acceptance Criteria Compliance, December 2005*”. The BGRR pile contains approximately 780 Curies with an average concentration of 1.76 Ci/ m³. The

dominant radionuclide in the pile is carbon-14 (571 Curies). Other significant (>1%) radionuclides identified included nickel-63, tritium (H-3), and europium-152. Dispersible contamination in the pile includes strontium-90, cesium-137, americium-241 and plutonium-238, 239, 240 and 241. The estimated in-situ volume of radioactive graphite is 580 cubic yards.

1.5 Objectives

The following remedial action objectives are included in the BGRR ROD and will be met through the implementation of this RD/RA work plan:

- Through prudent remedial action, ensure the protection of human health and the environment from the potential hazards posed by the radiological inventory that resides in the BGRR complex. The remedial action should ensure protection of human health and the environment without undue uncertainties.
- Use the As Low As Reasonably Achievable (ALARA) principle, while implementing the remedial action, to reduce further the potential hazard to human health and the environment posed by the considerable radiological inventory that resides in the BGRR complex.

The detailed operational objectives of this project include:

- Perform removal, transportation and disposal of contaminated materials using safe and efficient methods.
- Through the selection and use of appropriate packaging and transportation methods, prevent the spread of contamination.
- Comply with applicable regulations that govern the removal, packaging, transportation and disposal of the graphite pile.
- Complete the project with no Occupational, Safety and Health Association (OSHA) reportable injuries or DOE reportable incidents.

1.6 Site Cleanup Criteria

The completion criterion for this remedial action is the removal, shipment, and disposal of the graphite pile.

2.0 SUMMARY OF REMEDIAL DESIGN/REMEDIAL ACTION

2.1 Scope of Work

The scope of this RD/RA work plan includes the removal of the concrete and steel plugs at the top of the biological shield, removal of the membrane surrounding the pile, and removal of the graphite blocks of the reactor pile.

There are a total of 126 removable concrete and steel plugs which, when installed in the biological shield top opening, completely seal the 20-foot x 20-foot nominal opening. The plugs configured in two layers with 101 top layer blocks, and 25 blocks on the bottom layer. The individual blocks are irregularly shaped and range in weight from 1,100 pounds to 10,800 pounds.

The air tight membrane wraps the top, east and west sides of the graphite pile. The upper portion of the air tight membrane is constructed of a layer of one-eighth inch (1/8") thick aluminum. The east and west sides of the membrane are constructed of one-eighth inch (1/8") thick steel, covered with of corrugated aluminum insulating panels.

The neutron shield will be removed with the biological shield and is a steel structure that wraps the pile on the four vertical sides. The north and south neutron shields are three inch (3") thick steel and form the vertical walls of the north and south outlet air plenums. The graphite pile rests directly against the north and south neutron shields. The east and west neutron shields are six inch (6") thick steel and form the inner wall of the bioshield. The graphite pile is maintained approximately 15 inches (15") from the east and west neutron shields by the restraining springs.

Graphite blocks will be removed to the steel plate at the base of the reactor. Loose debris will be removed and a fixative will be applied to the internal surfaces of the biological shield.

The scope of the RD/RA is detailed in the *Brookhaven Graphite Research Reactor Graphite Removal Specifications*, June 8, 2006. A copy of the specifications is included in Appendix A.

2.1.1 Statement of Work

The work for the Graphite Pile Removal Project at the Brookhaven Graphite Research Reactor (BGRR) consists of the following:

- Detailed project plans and procedures will be prepared to perform the Graphite Pile Removal Project. Project plans will include an Environmental, Safety & Health (ES&H) Plan, Rigging Plan, Job Risk Assessment (JRA), Graphite Removal Work Plan and other Technical Work Procedures, ALARA/Contamination Control Plan, Qualification Plan for Special Tools, Waste Management Plan (WMP), Waste Packaging Procedure, and Quality Assurance Plan.

- Removal of the removable concrete plugs from the top of the BGRR biological shield to access the graphite pile. The concrete plugs will be packaged for disposal.
- Removal of the top of the membrane and the graphite pile down to the steel bedplates and packaging them for disposal. The pile is defined as all the graphite blocks and miscellaneous in-core components within the defined area. The defined area of removal shall be within the east and west sides of the membrane and within the north and south sides of the neutron shield.
- Removal of loose and visible debris within the biological shield cavity. Application of a fixative to the internal surfaces of the biological shield. The fixative shall meet the Waste Acceptance Criteria (WAC) for both the Nevada Test Site and Energy Solutions disposal sites.
- Following graphite removal, the Contractor shall install a temporary wood cover over the 21-foot 3-inch square opening in the top of the biological shield. The temporary wood cover shall be built to the residential live load requirement of 40 lb/ft².
- Packaging, transportation and disposal of graphite and associated debris, and project secondary wastes.
- Preparation of a Project Completion Report detailing the work performed and describing the “as-left” conditions. The Project Completion Report will be included in the Closeout Report. The Closeout Report for AOC 9 will be submitted for regulatory approval following all remedial actions including the removal of the biological shield and the installation of an engineered cap.

2.1.2 Contractor Selection

BSA plans to award the graphite pile removal subcontract to a DOE Indefinite Duration Indefinite Quantity (IDIQ) Contractor. The DOE has completed an extensive bid process to pre-qualify contractors for contaminated facility decontamination and decommissioning (D&D). In addition, BSA has prepared and is requiring the bidders to meet additional qualification criteria in the areas of corporate experience, key personnel experience, health and safety and quality assurance programs, ALARA, and contamination control. The qualification criteria are included as Appendix C.

To ensure that the contractors fully understood the qualification criteria requirements and the methods required per the Technical Specification, BSA conducted a three day workshop with the DOE IDIQ contractors in the fall of 2005. The workshop was a great success and BSA was able to clarify portions of the specification based on input received from the contractors.

2.1.3 BSA Activities and Project Oversight

Section 2.1.1 describes the scope of work that will be performed by BSA's Graphite Pile Removal Contractor. As stated in the technical specifications, BSA will supply the following services to the subcontractor:

- General employee training in accordance with BSA's specifications
- Sufficient quantity of waste packages and containers as summarized below:
 - 144 cu. ft. supersacks and B-25 boxes for graphite pile removal
 - 20-yard intermodal containers for concrete shield blocks and project secondary wastes
- Waste verification inspections during loading of waste containers
- Off-site waste transportation and disposal of project wastes and secondary wastes
- Radiological controls and health physics services to support the Work, including job coverage, instrumentation, transportation surveys and personnel and environmental air (radiological) sampling and analysis (detailed in Section 2.1.8)
- Thermo-luminescent dosimeters and bioassays required for personal monitoring
- Electrical power (460V, 30A, 3-phase and 120V, 30A, single phase)
- Potable water
- Approval and oversight of the Contractor's respiratory protection program.

In addition, BSA will also have a dedicated project oversight staff to ensure that the project is completed safely and in accordance with the technical specifications. The BSA oversight staff will include a Project Manager, Field Engineer, Radiation Protection Manager, Health and Safety Manager and Technicians, Waste Manager, and Quality Assurance Manager.

2.1.4 RD/RA End State

The "End State" at completion of the Graphite Pile Removal Project remedial action is described as follows:

- Completion of the removal of all graphite and associated equipment described above.
- Application of the fixative internal to the biological shield.
- Installation of a temporary wood cover built to the residential live load requirement of 40 lb/ft². The cover will remain in place until the commencement of biological shield removal activities.
- Transportation and disposal of all generated wastes.

2.1.5 Safety Requirements

An ES&H plan will be prepared which includes an analysis of the tasks to be performed to complete the graphite pile removal. The Job Safety Analysis will identify the potential hazards associated with each of the identified tasks. These hazards will be communicated daily to site workers. Graphite pile removal will be completed in accordance with all of the OSHA requirements in 29 CFR 1910/1926 and BSA Standards Based Management System (SBMS) requirements and applicable ES&H Standards.

All work will be performed within the envelope of the Authorization Based Documents (ABD). Specifically:

1. The detailed work plans and procedures including the ES&H Plan, Rigging Plan, Graphite Removal Work Plan and other Technical Work Procedures, ALARA/Contamination Control Plan, Qualification Plan for Special Tools, and the WMP will accurately incorporate the requirements of the ABD's.
2. The work will be performed in accordance with the limits, controls and requirements expressed in the ABD's at all times. Any work that is not in compliance with these requirements will be immediately halted.

All site workers performing or supervising D&D activities will be required to complete the 40-hr OSHA HAZWOPER course, BSA Radiological Worker Training, and other training detailed in Section 01 35 24 of the "*Brookhaven Graphite Research Reactor Graphite Removal Specifications*".

2.1.6 Work Controls and Work Management

All work will be performed with approved work permits which will be prepared, and issued following the requirements of the BSA SBMS "Work Planning and Control for Operations" subject area.

In addition, all Environmental Restoration Project (ERP) work is planned and performed in accordance with ERP Operations Procedure Manual 3.2, Work Planning and Control, Appendix E. The purpose of the ERP Work Planning and Control System procedure is to ensure all work performed within ERP is reviewed, planned and controlled in a manner that meets the Laboratory-wide Work Planning and Control for Experiments and Operations Subject Area and is compliant with applicable Authorization Basis Documents (ABDs) and Facility Use Agreements (FUA).

All work performed under the authority of ERP will undergo planning and control to the rigor set forth within this document. Authorized ERP work includes remediation, decommissioning, characterization, construction, maintenance, modification and all other related work performed by ERP staff as well as external Laboratory organizations and non-BNL personnel (including BNL subcontractors) working on ERP projects.

The ERP Work Planning and Control System also coordinates the preparation and approval of all ancillary BSA permits including concrete and masonry penetration, cutting and welding, confined space, and radiation work.

2.1.7 ALARA

The goal of the Graphite Pile Removal Project is to maintain personnel radiation exposure as low as reasonably achievable (ALARA) and well below the regulatory dose limits in 10 CFR 835.202. To accomplish this goal, numerical Administrative Control Levels (ACL) will be established below the regulatory limits to administratively control and help reduce individual and collective radiation dose. The Graphite Pile Removal Project has established a special ACL of 1,000 mrem/yr for each individual worker. Other requirements are as follows:

1. Radiation exposures to guests without training, visitors without training, or minors shall not exceed 25 mrem per year.
2. Minors under the age of 18 shall not be allowed to work in Controlled Areas or Radiological Areas.
3. No individual who arrives at the BNL Site with an estimated occupational exposure greater than 2,000 mrem for the calendar year will be allowed to work.

The ACL level chosen is a BSA internal control level that was considered practical for radiation workers performing the removal activities and also in keeping with ALARA principles. During planning for the pile removal, the ERP ALARA Committee will review measures that have been taken to ensure that this work will be done in a manner that will help to ensure that work will be accomplished ALARA.

During the actual performance of the work, radiological surveys will be taken, and radiological conditions will be communicated to workers as appropriate, TLDs will be utilized for personnel, as well as electronic dosimeters (if necessary), bioassays will be performed based upon the work, and workplace air monitoring will take place. If the airborne concentrations exceed levels prescribed in Appendix A, BSA will issue a radiological stop work order until corrective actions and controls are put in place to meet these requirements.

An ALARA/Contamination Control Plan will be developed prior to graphite removal operations. The plan will detail the ACL limits and compare the ACLs to detailed radiation exposure estimates for the tasks that comprise the removal of the graphite pile. Actual exposure will be monitored and compared to the estimates; corrective actions will be developed to remedy unfavorable radiation exposure trends.

No personnel entry into the biological shield will be allowed for routine graphite removal operations. Non-routine personnel entry into the biological shield will be considered on a

case-by-case basis and will conform to the ACLs established for the project and the ALARA goals.

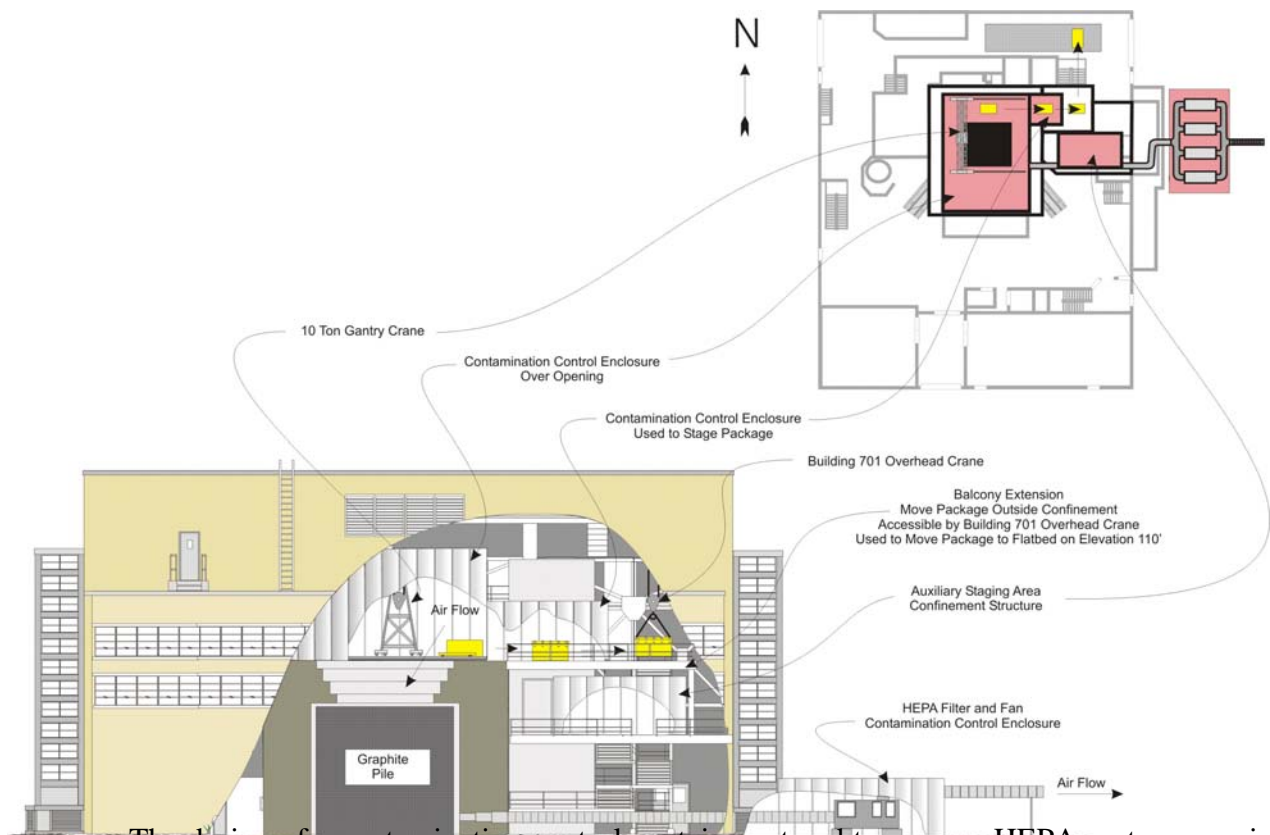
2.1.8 Contamination Control

The spread of radiological contamination associated with the graphite pile removal will be controlled through the implementation of engineered and administrative controls.

The contamination controls will include the design of a contamination control containment, including a temporary high efficiency particulate air (HEPA) ventilation system, special tools and graphite removal process design criteria. A contamination control containment similar to that illustrated in Figure 2-1 will be constructed over the bioshield opening to support handling and packaging of graphite waste as it is removed from within the bioshield.

This enclosure will be maintained at a negative pressure with respect to building 701 by the dedicated HEPA ventilation system. The objective will be to minimize the generation of dispersible contamination, and provide for its collection and control at the point of generation. Fixatives will be used throughout the dismantlement of the graphite pile to mitigate the generation of dust. This will increase visibility within the biological shield and minimize the potential for a release of contamination outside of the contamination control envelope.

Figure 2-1, Contamination Control Containment



The design of a contamination control containment and temporary HEPA system, special tools and graphite removal process controls shall meet the quantitative contamination control

performance requirements set forth in the *Brookhaven Graphite Research Reactor Graphite Removal Specifications*. These controls are summarized below:

- At all times during graphite pile removal, airborne radionuclide concentrations inside of the biological shield cavity will be continuously monitored. Airborne concentrations will not exceed 50 Derived Air Concentration (DAC) (10CFR835 Appendix A and C). In the event that airborne concentrations in excess of 50 DAC are detected within the biological shield, cavity work will cease until the causes have been evaluated and corrective actions implemented.
- Within the contamination control containment, monitoring of airborne radionuclide concentrations will be conducted continuously through the use of continuous air monitors (CAM) with pre-established warning level (10 DAC) and alarm level (50 DAC) set points. Surface contamination levels will be documented via the pre-shift radiological survey. At no time during graphite pile removal will the average loose contamination levels exceed the Table 1 values by a factor of more than 500 (i.e., the average permissible loose contamination levels are 500 times the Table 1 values). If average surface contamination levels in excess of these limits are detected within the contamination control containment work will cease until the causes have been evaluated and corrective actions implemented.

TABLE 1 – Removable and Fixed Contamination Levels

<i>Nuclide</i>	Removable (dpm/100 cm²)	Total (Fixed + Removable) (dpm/100cm²)
U-natural, U-235, U-238 and associated decay products	1,000 alpha	5,000 alpha
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	500
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.	1,000 beta-gamma	5,000 beta-gamma
Tritium organic compounds, surfaces contaminated by HT, HTO, and metal tritide aerosols	10,000	10,000

- Prior to entry into the contamination control containment, the BSA Radiation Protection Manager shall assess the surface and airborne radiological contamination levels to determine the minimum PPE requirements.
- During graphite pile removal, monitoring of airborne radionuclide concentrations within Building 701, but outside the contamination control containment, will be conducted continuously utilizing CAM's, general area air samples, and task specific air samples identified in the radiological work permit. Monitoring of surface

contamination levels and radiation levels in Building 701 areas adjacent to the contamination control containment will be performed shiftly. Airborne concentrations will not exceed background, and loose surface contamination levels will not exceed the values provided in Table 1. If airborne radionuclide concentrations are above background, or unplanned loose surface contamination levels in excess of the Table 1 values are detected, work will cease until the causes have been evaluated and corrective actions implemented.

- Analyses will include liquid scintillation for low energy emitters and open window gas flow proportional counters for beta/gamma and alpha emitters. For difficult to detect isotopes, scaling factors will be derived by the ERP Radiological Engineer from the data presented in “BGRR Determination of Radionuclide Inventory of the Graphite Pile for Waste Stream Characterization and Waste Acceptance Criteria Compliance”.

2.1.9 Post RD/RA Inspections and Site Restoration

Upon completion of the graphite removal, verification that all loose and visible debris within the biological shield cavity has been removed will be conducted. Once the inspection is completed, a fixative will be applied to the internal surfaces of the biological shield.

Site restoration activities will include the installation of a temporary cover over the 21-foot 3-inch square opening in the top of the biological shield and/or over any construction openings in the biological shield.

Prior to graphite pile removal, BSA will perform a comprehensive survey (contamination, background radiation and airborne concentrations) to establish the baseline radiological conditions and the survey will be provided to BSA’s pile removal contractor. The contractor shall be required to restore Building 701 to the established baseline radiological conditions.

3.0 WASTE MANAGEMENT AND DISPOSAL

A Draft Waste Management Plan (WMP) has been prepared for the project and is included in Appendix B. The Draft WMP will be finalized after Contractor selection is completed and all the plans for the project are finalized.

3.1 Planned Waste Generation

Planned waste streams resulting from graphite pile removal include:

TABLE 2 – Planned Waste Generation

Type of Material	Waste Type	Quantity	Planned Disposal Site
Graphite Blocks, Graphite Debris and Misc. In-core Components (Packaged in Disposal Container)	Low level radioactive waste (LLRW) (standard)	1,157 yd ³	Nevada Test Site (Note: Misc. In-core Components may be disposed of at Los Alamos National Laboratory)
Upper Airtight Membrane Removable Concrete Plugs (Packaged in Disposal Container)	LLRW (standard & oversized debris)	191 yd ³	Energy Solutions, Clive, UT
PPE/Filter Elements/Misc. Secondary Wastes (Packaged in Disposal Container)	LLRW (standard)	276 yd ³	Energy Solutions, Clive, UT
Radioactive Waste Oil	Radioactive Waste Oil	110 gal	Energy Solutions, Clive, UT

Graphite Blocks, Graphite Debris and In-Core Pile Metallic Components - The graphite pile consists of approximately 60,000 graphite blocks and in-core metallic components such as restraining rods and, metal sleeves from the boron shot wells. The graphite blocks are each 4” by 4” with varying lengths, assembled into a cube which measures 25’ - 0” on all sides. The total volume of the graphite pile and debris waste is 578 cubic yards in its constructed state. An estimated 1,157 cubic yards of as-packaged graphite waste will be disposed at NTS when accounting for a 50% packaging efficiency.

Metal / Metal Plate/Removable Concrete Plugs – Approximately 191 cubic yards of waste will be packaged including the bioshield removable concrete plugs and pile upper airtight membrane. This waste is low- level radioactive material that may be considered for disposal at the commercial disposal facility (Energy Solutions of Utah).

PPE/Filter Elements/Misc. Secondary Wastes – Dry Active Waste (DAW) generated from protective clothing (PPE), depleted filter elements from HEPA ventilation systems, and miscellaneous debris

such as contamination control containments, tooling etc. generated during pile removal will result in 276 cubic yards of packaged waste. This waste is low- level radioactive material that may be considered for disposal at the commercial disposal facility (Energy Solutions of Utah). The PPE volume is a derivative quantity based on the number of labor hours from the BSA estimate, then reduced by one-half on the assumption that bags of discarded PPE will be used as void fill in other waste containers.

Radioactive Waste Oil – The 110 gallons is based on BSA’s operating experience with this machine while performing the removal of the filters and liner from the BGRR below ground ducts.

3.2 Pollution Prevention and Waste Minimization

Several methods will be employed to minimize wastes generated during graphite pile removal:

- Construction of a contamination control containment to prevent the spread of contamination and the resulting cross contamination of clean areas and equipment and the unnecessary generation of the associated wastes;
- Segregating wastes in order to separate clean industrial waste from contaminated equipment and components;
- Using graphite pile removal methods that minimize volumes of debris;
- Minimize consumable materials brought into radiologically controlled areas;
- Through equipment design and process control, meeting the target packaging efficiency.
- Filtering of exhaust air from the contamination control containment;
- Minimizing the number of entries into the radiological areas in order to minimize the generation of secondary wastes; and
- Performing continuous radiological monitoring in order to promptly identify and correct sources of contamination outside of the designated work areas.

Segregation

All wastes generated will be segregated and stored in a manner that will facilitate their effective management and disposal. To the extent possible, non-hazardous/non-radioactive, hazardous, and radioactive wastes will be segregated and containerized based upon the waste’s classification.

Treatment On-site

On-site treatment operations will be limited to those actions that are required to meet the requirements of the designated waste disposal facilities. This will include the size-reduction of graphite pile components to conform to waste disposal site WAC’s for disposal as well as ensuring that the target packaging efficiency is achieved.

Additionally, proactive measures to prevent the presence of decontamination fluids in the final waste packages will be used. This will be accomplished by placing absorbents inside of waste packages that may contain moisture. All materials used will be approved by BSA to ensure compliance with the waste disposal facility WACs.

Reuse of Previously Contaminated Tools and Equipment

It is anticipated that some tools and equipment previously contaminated on other BGRR projects may be reused on the Graphite Removal Project. This equipment is already contaminated and reuse of this equipment during Graphite Pile Removal could minimize the generation of additional radioactive waste. Reuse of the following equipment is being considered:

- Bobcat with scarifier
- Two (2) 6,000 CFM HEPA fan units
- One (1) 10-ton Spanco trackless gantry crane
- Two (2) Brokk Model 330D remote manipulator and various attachments
- Propane powered Hi-Vac system

4.0 PROJECT MANAGEMENT

This section of the RD/RA Work Plan describes the project management and control procedures that will be used to ensure that the remedial action objectives are satisfied. Since the remedial action will involve several parties (EPA, NYSDEC, DOE, BSA, BSA subcontractors, etc.), coordination of activities between parties is essential to ensure satisfactory completion of the remedial action.

4.1 Project Management Organization

A summary level organization chart showing the lines of responsibility for the project is provided on Figure 4-1. Listed below are the representatives involved in management of the Graphite Pile Removal Project. A general description of the roles and responsibilities of each representative is given where applicable.

The DOE Site Federal Project Director has overall responsibility on the part of the DOE and will review and approve modification requests. The Site Federal Project Director is also responsible for providing reports to, and acting as a liaison with the NYSDEC and the EPA.

The DOE Federal Project Director reports to the DOE Site Federal Project Director and is responsible for the functions required to complete the project.

BSA's Director of the ERP organization has overall responsibility for the safe and cost effective completion of the project. The ERP Director is also the designated project manager.

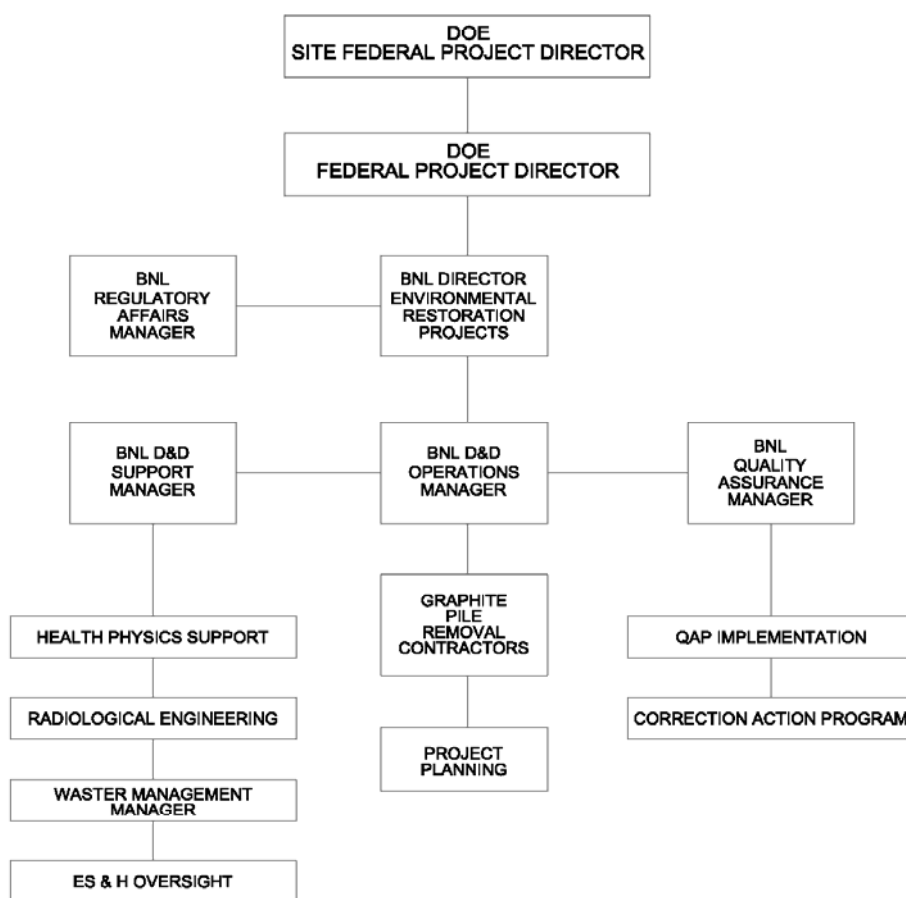
The ERP D&D Operations Manager will be responsible for safely completing the remedial action activities including coordination with DOE, other BSA divisions/departments, and BSA subcontractors. The D&D Operations Manager will also be responsible for ensuring that the completion of the Graphite Pile Removal is completed within the operational envelope described in the *Brookhaven Graphite Research Reactor Graphite Removal Specifications* and this work plan. The Operations Manager will monitor project schedule and costs, and prepare monthly reports to DOE.

The ERP D&D Support Manager will coordinate and deploy the project oversight and support personnel and services required to complete graphite pile removal. These oversight and support functions include health physics and radiological controls, radioactive waste management, work management and work controls, safety and industrial hygiene and environmental management.

The ERP Regulatory Affairs Manager is responsible for managing the interface with regulatory agencies: EPA, NYSDEC, New York State Department of Health (NYSDOH), Suffolk County Department of Health Services (SCDHS), and other federal State and local government agencies. Working with DOE, the ERP Regulatory Affairs Manager will be responsible for meeting regulatory commitments and for ensuring the effectiveness and timeliness of regulatory interactions (e.g., briefings on project progress, special focus meetings and weekly teleconferences).

The BSA Radiological Control Division will supply the necessary health physics support, through the ERP D&D Support Manager. BSA's qualified technicians will be responsible for providing operational health physics support for the project. These technicians will also be responsible for air effluent monitoring, performing radiological surveys in order to release materials, tools and equipment from controlled areas, and surveys of all radioactive waste shipments.

FIGURE 4-1
GRAPHITE PILE REMOVAL PROJECT
PROJECT ORGANIZATION



The BSA ERP Quality Systems Manager will ensure that the general BSA quality management and ERP project specific QAP are implemented.

The graphite pile removal subcontractors working for and under the oversight of BSA will be responsible for the safe completion of the work in accordance with the *Brookhaven Graphite Research Reactor Graphite Removal Specifications* and this RD/RA Work Plan.

4.2 Project Communication

To ensure effective project coordination and execution, the following actions will be performed:

- An Operational Readiness Review will be conducted prior to beginning graphite pile removal.
- Weekly meetings among BSA and DOE project personnel will be held to monitor the progress during field activities.
- Weekly teleconferences will be held with NYSDEC, NYSDOH, SCDHS, and the EPA to discuss project progress and issues. BSA will discuss all relevant project performance data during these teleconferences.

Weekly field status and formal monthly reports will be submitted to DOE describing ongoing graphite pile removal progress. These reports will include the status of the remedial action field activities, project cost and schedule performance analysis, and a discussion of any other issues relevant to the project.

4.3 Project Schedule

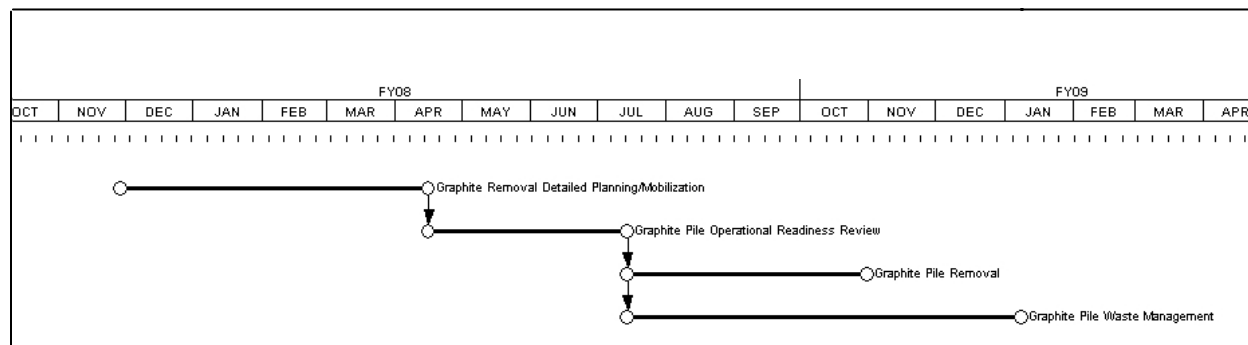
The preliminary schedule for field activities is presented in Figure 4-2. The project is anticipated to start in November 2007 and be completed by January 2009. NYSDEC and the EPA will be updated weekly on schedule changes during the IAG teleconferences.

4.4 Quality Assurance Plan

To ensure that the remedial action is completed in accordance with the *Brookhaven Graphite Research Reactor Graphite Removal Specifications*, a Quality Assurance Plan, *Environmental Restoration Projects Directorate Quality Assurance Plan, Rev 5*, January 2006, has been developed and will be implemented by BSA for the Graphite Pile Removal Project.

As described in Appendix A, BSA is flowing applicable quality management requirements to its subcontractors.

Figure 4-2. Project Schedule



4.5 Community Outreach and Involvement

The community will be informed of graphite pile removal developments by several methods described below. Complete information regarding community involvement activities can be found on BSA's website for the BGRR Project at <http://www.bnl.gov/erd/>.

Typical activities to inform the community include briefings to the Community Advisory Council, the Brookhaven Executive Roundtable, elected officials, and, as appropriate, the media.

The BGRR Project website will be updated with status of cleanup work, along with links to the following:

- BGRR Record of Decision
- Final Remedial Design/Remedial Action Work Plans
- Project schedule
- Completion Report

Communications through the Brookhaven Bulletin and the Monday Memo will caution onsite workers and residents about BGRR activities that may impact routine activities on the BNL Site.

5.0 PROJECT CLOSEOUT

The following sections describe the activities for documenting that the Graphite Pile Removal has been completed in accordance with the BGRR ROD.

5.1 Closeout Report

The successful completion of the Graphite Pile Removal Project will be documented in a Project Completion letter to DOE. The AOC 9 Closeout Report will be submitted to the NYSDEC and EPA upon completion of all BGRR remedial actions required to meet the requirements of the BGRR ROD. An outline for the Closeout Report is provided in Section 01 33 00 of Appendix A.

6.0 CONTINGENCY PLAN

The DOE and EPA require the implementation of a Contingency Plan to protect the local community that can be affected (both on-site and off-site), in the event of an accident or emergency. The Contingency Plan identifies the hazards that may arise during the completion of graphite pile removal, assigns responsibilities and authority in the event that an emergency occurs, and describes the emergency responses expected of BGRR project and BSA Emergency Forces personnel. The Contingency Plan for graphite pile removal is provided in Appendix E.

BSA will implement the Contingency Plan in accordance with BSA's SBMS Subject Area for Emergency Preparedness, and the BGRR Local Emergency Plan (ERP OPM 5.1 BGRR-DP Local Emergency Plan and Building Access requirements).

APPENDIX A

Brookhaven Graphite Research Reactor Graphite Pile Removal Specifications



BROOKHAVEN GRAPHITE RESEARCH REACTOR GRAPHITE PILE REMOVAL SPECIFICATIONS

June 8, 2006



Prepared by:

Brookhaven National Laboratory
Environmental Restoration Projects
Upton, New York 11973

DIVISION 00 – TECHNICAL SPECIFICATIONS
SECTION 00 01 01 – STATEMENT OF WORK

PART 1 - General

The Contractor's work for the Graphite Pile Removal Project at the Brookhaven Graphite Research Reactor (BGRR) consists of the following:

- A. The Contractor shall be responsible for the preparation of various project plans and procedures that are included in Brookhaven Science Associates (BSA) specifications. BSA will review these plans and procedures and provide comments to the Contractor for their incorporation. The Contractor shall be responsible for implementation and execution in compliance with BSA approved plans and procedures. In addition, the Contractor shall review and provide comments on the Waste Management Plan (WMP), which will be prepared by BSA. The Contractor shall be responsible for the implementation of designated elements of BSA's WMP.
- B. The Contractor shall design, fabricate, qualify and deliver all special tools required to complete the Work. These activities shall be conducted in accordance with the BSA-approved design and qualification plan for special tools. BSA will provide final approval of special tools for use upon satisfactory completion of qualification testing.
- C. The Contractor shall provide field oversight, monitoring equipment, consumables and sampling and analysis services required to implement its Environmental, Safety and Health (ES&H) Plan. The Contractor shall be responsible for providing all PPE including respiratory protection equipment required to perform the Work.
- D. The Contractor shall design, fabricate and install all ancillary equipment required to support graphite removal in accordance with BSA's specifications and the Contract. Such ancillary equipment includes but is not limited to contamination control containment, temporary HVAC system, temporary crane and other material handling apparatus, etc.
- E. Removal of the removable concrete plugs from the top of the BGRR biological shield to access the graphite pile. The concrete plugs will be packaged for disposal. A description of the concrete plugs is provided in the reference documents provided herein.
- F. Removal of the top of the membrane and the graphite pile down to steel bedplates and packaging of them for disposal. The pile is defined as all the graphite blocks and miscellaneous in-core components within the defined area. The defined area of removal shall be within the east and west sides of the membrane and within the north and south sides of the neutron shield. Any debris that falls outside of the defined area shall be removed by the Contractor. A description of the membrane, neutron shield, and graphite pile are provided in the reference documents provided herein.
- G. Removal of loose and visible debris within the biological shield cavity. (Note: The Contractor will be required to meet this visual cleanliness standard but will not be required to decontaminate the biological shield cavity.)
- H. Following graphite removal, the Contractor shall install a temporary cover over the 21-foot 3-inch square opening in the top of the biological shield and/or over any construction openings in the

biological shield made by the Contractor for the purpose of graphite pile removal. The cover shall be built to the residential live load requirement of 40 lb/ft².

- I. The Contractor shall remove all ancillary equipment (previously installed by the Contractor) upon completion of graphite removal.
- J. BSA will provide for the off site transportation and disposal of project secondary wastes to a limit of 20 20-yard intermodal containers. Secondary wastes include those wastes incidental to graphite removal, but not including graphite pile components for which the Contractor is responsible for removing. Secondary wastes include step off pad wastes, and systems, structures, components and equipment furnished by the Contractor that cannot be decontaminated for unrestricted use at the end of the project. BSA will back-charge the Contractor at a rate of \$50,000 per intermodal container for all intermodal containers containing secondary waste generated by the Contractor in excess of the 20 intermodal container allowance provided for herein.
- K. The Contractor shall perform a general cleanup and restoration of Building 701 and all areas outside of the biological shield used during the course of graphite removal to baseline conditions documented by BSA and the Contractor prior to the start of work. This will include the decontamination of these areas to baseline levels documented by BSA and the Contractor.
- L. BSA will be responsible for the off-site transportation and disposal of the removed graphite and associated debris, and project secondary wastes subject to the limitations set forth in Paragraph J, above. The Contractor shall be responsible for loading the removed graphite associated debris and secondary waste into BSA-furnished containers. The Contractor's graphite pile removal and waste loading procedures and activities shall accommodate BSA's waste sampling and inspection requirements and activities described in its WMP. The Contractor shall be responsible for conducting independent waste inspections concurrent with BSA's sampling and inspection activities. The Contractor shall be responsible for transporting these loaded waste containers to BSA's Waste Management Facility or another designated area on the Brookhaven National Laboratory (BNL) Site. BSA will have responsibility for off-site waste transportation and disposal.
- M. Project closeout activities and documentation including the preparation of a project completion report, all in accordance with BSA's specifications.
- N. BSA will provide the following services required to support the graphite removal project:
 - 1. General employee training in accordance with BSA's specifications
 - 2. Sufficient quantity of waste packages and containers as summarized below:
 - A. 96 cu. ft. supersacks and B-25 boxes for graphite pile removal
 - B. 145 cu. ft. supersacks and 145 cu. ft. DOT TYPE IP-1 containers for graphite pile removal
 - 3. Waste verification inspections during loading of waste containers
 - 4. Off-site waste transportation and disposal of project wastes and secondary wastes, subject to the limitations set forth in Paragraph J, above
 - 5. Radiological controls and health physics services to support the Work, including job coverage, instrumentation, transportation surveys and personnel and environmental air (radiological) sampling and analysis
 - 6. Thermo-luminescent dosimeters and bioassays required for personal monitoring

7. Electrical power (460V, 30A, 3-phase and 120V, 30A, single phase)
8. Potable water
9. Approval and oversight of the Contractor's respiratory protection program. (Note: The Contractor shall be responsible for training, medical screening, fit-testing, respirators, respirator cleaning and maintenance, and all other requirements in its respiratory protection program. The fit-testing must be quantitative.)

O. Prior to the Contractor's mobilization, BSA will remove the following in-core components:

1. All 16 control rod blades
2. Control rod lead, steel, and graphite control rod sleeve liners
3. Boron shot from the four emergency shot wells
4. In-core thermocouples and conductors
5. Removable core
6. Nuclear instrumentation
7. Abandoned experimental equipment

PART 2 - Products

Not used.

PART 3 - Execution

Not used.

END OF SECTION 00 01 01

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Attachments

- A. Reference Drawings (Compact Disk)
- B. Radiological Characterization Data
- C. Draft Hazard Classification and Auditable Safety Analysis For The Brookhaven Graphite Research Reactor Graphite Pile Removal Project
- D. Final Graphite Pile Waste Management Plan
- E. Draft Nevada Test Site Waste Profile
- F. Operational Readiness Evaluation Checklist (Provided at the Pre-Bid Conference)
- G. Draft ERP-OPM-3.2 Work Planning and Control
- H. Draft ERP-OPM-3.4 Field Activity Oversight

END OF SECTION 00 01 10

DIVISION 00 – TECHNICAL SPECIFICATIONS
SECTION 00 01 25 – ABBREVIATIONS AND ACRONYMS

PART 1 - General

1.00 Abbreviations and Acronyms:

AOC	Area of Concern
ASCE	American Society of Civil Engineers
ASME	American Society of Mechanical Engineers
ASA	Auditable Safety Analysis
ASTM	American Society of Testing and Materials
AWWA	American Water Works Association
BHSO	Brookhaven Site Office
BGRR	Brookhaven Graphite Research Reactor
BMP	Best Management Practice
BNL	Brookhaven National Laboratory
BSA	Brookhaven Science Associates
BOA	Basic Ordering Agreement
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CIH	Certified Industrial Hygienist
CSP	Certified Safety Professional
DART	Days Away, Restricted, or Transferred
DOE	U.S. Department of Energy
dpm	Disintegrations per minute
EMD	Environmental Management Directorate
EMS	Environmental Management System
ES&H	Environmental Safety & Health
ESHQR&T	Environment, Safety, Health, Quality, Radiological & Training
EWMSD	Environmental Services and Waste Management Division
FP	Fixed Price
FS	Feasibility Study
G&A	General and Administrative
GFI	Ground Fault Interrupter
HASP	Health and Safety Plan
HDPE	High Density Polyethylene
HP	Health Physics
IAG	Interagency Agreement
ISOCS	In-Situ Object Counting System
JSA	Job Safety Analysis
LCAM	Life Cycle Asset Management
LLW	Low-Level Radiological Waste
LOE	Level of Effort
LTES	Long Term Environmental Stewardship
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MLLW	Mixed Low Level Waste
MOA	Memorandum of Agreement
mR/hr	milli-Roentgen per hour
mrem/yr	milli-rem per year
MS&T	Materials, Supplies & Travel
MSDS	Material Safety Data Sheet

ncpm	Net counts per minute
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NESHAPS	National Emission Standards for Hazardous Air Pollutants
NFPA	National Fire Protection Association
NYSDEC	New York State Department of Environmental Conservation
OSHA	Occupational, Safety, and Health Association
OU	Operable Unit
ORE	Operational Readiness Evaluation
P-3	Primavera Project Planner
PA/SI	Preliminary Assessment/Site Inspection
PCBs	Polychlorinated Biphenyls
pCi/g	Picocuries per gram
PE	Plant Engineering
PM	Project Manager
PPE	Personal Protective Equipment
PPM	Procurement and Property Management
QA	Quality Assurance
QAP	Quality Assurance Plan
RA	Removal Action
RCD	Radiological Control Division
RCT	Radiological Control Technician
RCRA	Resource Conservation and Recovery Act
RD	Remedial Design
ROD	Record of Decision
SAP	Sampling and Analysis Plan
SBMS	Standards Based Management System (https://sbms.bnl.gov/)
SCDHS	Suffolk County Department of Health Services
SECON	BNL Security Condition
SOW	Scope of Work
SPDES	State Pollutant Discharge Elimination System
TCLP	Toxicity Characteristic Leaching Procedure
TLD	Thermoluminescent Dosimeter Badge
UL	Underwriters Laboratories
USEPA	U.S. Environmental Protection Agency
USID/SE	Unreviewed Safety Issue Determination/Safety Evaluation
USTs	Underground Storage Tanks
VOCs	Volatile Organic Compounds
WAC	Waste Acceptance Criteria
WBS	Work Breakdown Structure
WM	Waste Management
WMP	Waste Management Plan

PART 2 - Products

Not used.

PART 3 - Execution

Not used.

END OF SECTION 00 01 25

DIVISION 00 – TECHNICAL SPECIFICATIONS
SECTION 00 72 00 – GENERAL CONDITIONS

PART 1 - General

1.00 Definitions

A. As used in these specifications, the following have the meaning shown:

1. BSA - Brookhaven Science Associates, operator of Brookhaven National Laboratory, and its authorized representatives from various Divisions and Departments.
2. BNL – Brookhaven National Laboratory
3. BNL Site – Land occupied by Brookhaven National Laboratory, in Brookhaven Township, Suffolk County, New York.
4. Site – Immediate area of the BNL Site assigned to the Contractor to perform the Work.
5. Work or Project – Includes, but is not limited to, all labor, materials, tools, and equipment required and reasonably inferred by the Contract to complete all work described in the Statement of Work.
6. Contractor – Single person or entity identified in the Contract and responsible for completing the Work.
7. Subcontractor – Person or entity directly contracting with the Contractor, but not including one who merely furnishes materials not so worked.
8. OSHA Recordable Injury – An occupational injury or illness that requires more medical treatment than simple first aid and must therefore be reported to OSHA
9. Days Away, Restricted, or Transferred (DART) Case – A DART case is a type of OSHA Recordable Injury, whereby the injury or illness is severe enough that an individual loses time away from their job by being away from work, by being on restricted duty, or by being transferred to another job function.

B. Wherever the Specifications use the terms "shown on drawings", they shall mean "noted", "indicated", "scheduled", "detailed", or any other diagrammatic or written reference made on the drawings.

C. Wherever the terms "material" or "materials" are used in the Specifications, they shall mean any "product", "equipment", "device", "assembly" or "item" required under the contract, as indicated by trade or brand name, manufacturers' name, standard specification reference, or other description.

D. The term "approval" shall mean the written approval of BSA. (Approval by BSA does not relieve the Contractor from meeting its obligations, specification or Contract requirements.)

- E. The terms "directed", "required", "permitted", "ordered", "designated", "prescribed" and similar words shall mean BSA's direction, requirement, permission, order, designation or prescription. The terms "approved", "acceptable", "satisfactory" and similar words shall mean approved by, acceptable to, or satisfactory to BSA; and, the terms "necessary", "reasonable", "proper", "correct" and similar words shall mean necessary, reasonable, proper, or correct, in the judgment of BSA.
- F. "New" shall mean manufactured within the past twenty-four (24) months and never before used.

1.01 Review and Intent of Contract Documents

- A. The Contractor shall, during the bid period and prior to starting the work on any single portion and at frequent intervals during the progress of the work, carefully study and compare the General Documents, General Conditions, Drawings, Specifications, Amendments and other Contract documents and shall at once report to BSA any error, inconsistency or omission the Contractor may discover.

1.02 Reference Drawings

- A. Drawings generally are done to scale as noted. The Contractor shall not scale the drawings for establishing dimensions and/or layout. The dimensions shown on the documents or surveyed points (in feet) shall be used.
- B. The reference drawings are provided for the Contractor's information. BSA does not imply or warrant the accuracy of the information provided in reference drawings. Critical dimensions, other dimensions, as built and existing configurations, etc. that are important to the Contractor's development of designs, processes and procedures, etc. shall be field verified by the Contractor. BSA will not consider any requested changes or modifications to the Contract that are in any way related to the accuracy or inaccuracy of reference drawings.
- C. The Contractor shall give BSA timely notice of any additional design drawings, specifications, or instructions required to define the work in greater detail, or to permit its proper progress, and BSA will provide such information with reasonable promptness so as to not delay the Work.
- D. The following drawings are identified as reference drawings. The entire BGRR drawing set is being provided to the Contractor for reference:

M-702-3-1A through 75A	Graphite Layer Drawings
M-702-3-1B through 1938B	Individual Graphite Block Details (exclusive of 29 miscellaneous numbers; 1909 total "drawings") (Only one set exists and these will be made available for review)
M-702-33B	Graphite Blocks for Control Rods
M-702-ID	Bell Mouth Channel Opening - Exhaust
M-702-2D	Bell Mouth Channel Opening - Intake
A-701-3A	Upper Level Plan
A-701-15A	Stairway No. 2 and 5 Details
A-701-16A	Stairway No. 1 Details
A-701-19A	Balcony and Stair Railing Detail, Sheet No. 1
A-701-20A	Balcony and Stair Railing Detail, Sheet No. 2
A-701-21A	Balcony and Stair Railing Detail, Sheet No.3
A-701-27A	Stairs to Rod Structure Building 701

A-701-31A	Main Floor Plan Building 701
A-701-32A	Intermediate Floor Plan Building 701
A-701-39A	Ladder Connecting Balconies, West Side Structure
A-701-38B	Railings and Ladder at Balcony, Elevation 136' -4"
C-702-10A	Removable Roof Sections
C-702-11A	Removable Roof Sections, Sheet No.2
C-702-14A	Balcony, Floor Slab Elevations 114' - 4", 118' - 4" and 127' - 0"
C-702-15A	Balcony Floor Slab at Elevation 123' -0"
M-702-52A	Removable Plug Details
M-702-55A	Removable Plug Details
M-702-59A	General Arrangement - Shotwell
M-702-60A	Sections of Shotwell
M-702-66A	Details of Shotwell
M-702-67A	Shotwell Detail
M-702-105A	Steel Encasement Elevations
M-702-119A	Helium System - Sections and Details Through Top Barricade
M-702-154A	Helium System Trough Details
M-702-162A	General Arrangement Plugs for North, South and Type PE
M-702-164A	Roof Plugs - Graphite
M-702-181A	Sections of Shotwell Gap
M-702-182A	Sections and Details of Shotwell
M-702-7B	Liner Type C
M-702-10B	PE - Plug North
M-702-18B	Removable Core Plug Assembly
M-702-38B	Helium Purge Outlet to Plenum
M-702-39B	Shotwell Plug Assembly
M-702-40B	Graphite Details for Removable Plugs
M-702-45B	Periscope Plug Assembly and Details
M-702-48B	Concrete Plug for Shotwell at Gap
M-702-49B	Shotwell Funnel at Gap
M-702-13C	Liner Type PE
M-702-14C	Liner Type PE - Short
M-702-27C	Shotwell Charging Tube
M-702-42C	Liner - Shotwell at Gap
M-702-45C	Removable Shotwell Gap Plug Assembly
M-702-46C	Removable Shotwell Plug Detail at Gap
M-702-47C	Graphite Plug Shotwell at Gap
M-702-48C	Shotwell Charging Tube Details at Gap
M-702-2X	Helium System - Plan Layout and Details
S-702-1A	Steel Encasement - Elevations
S-702-2A	Steel Encasement - Plan and Section
S-702-3A	Balcony Framing Elevation 118' -4" and 114' -4" and 127' -0"
S-702-4A	Balcony Framing Elevation 123' -0"
S-702-8A	Steel Encasement - Opening in Roof
S-702-9A	Steel Encasement - 3" Plate Ceiling
FS-C 402-D	Schedule of Settlements
C-701-2A	Excavation Plan
C-701-3A	Foundation Plan and Sections
C-701-4A	Main Floor Plan Elevation 119 feet 0 inches
C-701-5A	Retaining Wall on "G" Line
C-701-6A	Section of Floor and Foundation Column Line No. 1
C-701-7A	Section of Floor and Foundation Column Line No. 2

C-701-8A	Section of Floor and Foundation Column Line No.6.
C-701-9A	Section of Floor and Foundation Column Line No. 7
C-701-10A	FDN Pedestals Plan and Elevation Part 1
C-701-12A	Column Pedestal B100-101-B1-B7
C-701-14A	FDN Pedestals Plan and Elevation Part 3
C-701-19A	Grade Beams B1 to B8 Inclusive
C-701-21A	Building 701 Interior Beams B9 to B-16 (Inclusive)
C-701-22A	Building 701 Interior Beams B17 to B23 (Inclusive)
C-702-1A	Buttress No. 4 Elevation and Detail
C-702-2A	Foundation Plan and Detail
C-702-3A	Buttress No. 1 Elevations and Details
C-702-4A	Buttress No. 2 Elevations and Details
C-702-5A	Buttress No. 3 Elevations and Details
C-708-1A	Section A Exhaust Ducts
C-708-2A	Section B Exhaust Ducts
M-702-3A	Details of Steel Enclosure
M-702-7A	Arrangement and Details of Grillage Beams
M-702-9A	Details of Grillage Assembly
M-702-12A	Details of Steel Enclosure
M-702-13A	Details of Bearing Rails
M-702-36A	Pushing Machine – General Assembly
M-702-37A	Pushing Machine – Assembly
M-702-38A	Pushing Machine – Details
M-702-39A	Pushing Machine – Details
M-702-43A	Pile Locking Device
M-702-26B	Pile Locking Device
M-702-19B	Details Pneumatic Tube Connection
42B	Pneumatic Tube System (Isometric)
44B	Pneumatic Tube Removable Plug
41C	Pneumatic System, Air and CO2 Accumulating Tank
M-801-4A	Pneumatic Tube System Arrangement and Details Hot Laboratory
M-702-55A	Removable Plug Details
7B	Liner Type "c"
16A	Door for Removable Core
18B	Removable Core Plug Assembly
M-702-14A	Large Chamber Duct
15A	Small Chamber Duct
18A	Small Chamber - General Assembly
19A	Small Chamber - Carriage Details
20A	Small Chamber - Carriage Assembly
21A	Small Chamber - Take Up Unit Assembly and Details
22A	Small Chamber - Sprocket Drive Housing Details
23A	Small Chamber - Sprocket Drive Assembly
25A	Small Chamber - Sprocket Drive Details
26A	Small Chamber - Carriage Details
27A	Large Chamber General Assembly
28A	Large and Small Chamber Gate Limit Switches
29A	Large Chamber Carriage Assembly
30A	Large Sprocket Drive Assembly
31A	Large Sprocket Drive Housing Details
32A	Large Sprocket Drive Details
33A	Large and Small Chamber Hand Drive Assembly
M-702-34A	Large Take-Up Unit Assembly and Details

35A	Large and Small Chamber Hand Drive Details
125A	Large Chamber Gate and Lifting Device Assembly and Details
126A	Large Chamber Carriage Details
127A	Large Chamber Carriage Details
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M-702-87A	Fission Pole Assembly
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BM-702-7A	Arrangement of Metal Temperature Thermocouples
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1.03 Work Permits

- A. The Work included in this Contract shall be performed in accordance with Work Permits prepared, approved and issued pursuant to the requirements provided in BSA's SBMS Subject Area: "Work Planning and Control for Operations," latest edition.
- B. A Work Permit, prepared by BSA, and signed and accepted by the Contractor, shall be posted or be on hand at the project Site. By signing and accepting the Work Permit, the Contractor indicates that it understands the job hazards and all of the requirements for performing the Work.
- C. A Tailgate Safety Meeting shall be held by the Contractor at the commencement of each work day, or new work shift if multiple daily shifts are worked, to discuss the activities for the day, specific hazards, and to solicit worker feedback on safety and work process. All workers shall attend this meeting or subsequently briefed as to its contents. If a change in field conditions occurs, or a new task is identified, a separate safety tailgate meeting will be held prior to the performance of the affected work. A BSA representative is required to attend all Tailgate Safety Meetings. The Contractor shall maintain a Daily Tailgate Safety Meeting Log and sign in sheet.

1.04 Notice to Proceed

- A. The Contractor shall not knowingly, without BSA's written formal notice, prematurely commence operations on the BNL Site. BSA shall not issue the Notice to Proceed before BSA receives all required bonds and insurance documents, and required submittals.
- B. Work may proceed, however, in preparing and submitting all required work plans and procedures and in ordering materials and equipment that do not require BSA's prior approval.

1.05 Use of Site

- A. The right of possession of the premises and the improvements made thereon by the Contractor shall remain at all times with BSA. The Contractor's right to entry and use thereof arises solely from the permission granted by BSA under the Contract.
- B. The Contractor shall confine the use of the premises for all purposes, to the areas identified by BSA.
- C. It shall be the responsibility of the Contractor to provide necessary and required security measures to safeguard the Site including all materials and equipment from theft, vandalism and intrusion of unauthorized persons during all working hours, non-working hours, weekends and holidays.

1.06 Work Hours

- A. The Contractor will not be limited to normal working hour shifts or the number of working days per week, except that no work shall be performed on BSA holidays or when BNL has been closed due to adverse weather conditions. The BSA holiday list can be found at www.bnl.gov/bnlweb/Admin/holidays.asp. The work hours and shift schedules shall be subject to BSA approval.

- B. The Contractor's personnel are to be made aware that extended or unusual work shifts may be more stressful physically, mentally, and emotionally on the work crews, leading to increased fatigue, stress, and lack of concentration. These effects lead to an increased risk of operator error, injuries, and/or accidents. The limits provided in Paragraph E, below, shall not be exceeded by the Contractor.
- C. The normal work hours at BNL are 8:30 am to 5:00 pm, Monday through Friday. The Contractor shall request BSA approval in advance of all planned activities and submit a list of all Contractor and Subcontractor employees who are expected to work on the BNL Site during off-hour periods. All employees working during off-hours must possess a valid BNL contractor employee photo identification badge.
- D. BSA will notify BSA Police Headquarters and the main gate of the days and hours outside of normal working hours that work is planned. Failure to notify BSA will be cause for BSA Police to deny access to the BNL Site.
- E. Limitation on Extended Work Hours

The Contractor's personnel shall be limited to the following work schedule restrictions with no exceptions:

- 1. A person shall not be permitted to work more than 16 consecutive hours, including shift turnover time;
 - 2. A person shall not be permitted to work more than 24 hours in any 48 hour period, including shift turnover time;
 - 3. A person shall not be permitted to work more than 72 hours in any 7 day period, including shift turnover time;
 - 4. A person shall not be permitted to work more than 14 consecutive days without having two (2) consecutive days off; and,
 - 5. If a person is required to work in excess of 12 continuous hours, his/her duties should be carefully selected. Moreover, this person shall not be assigned any task that could possibly endanger the safety of him/her and others due to fatigue.
- F. The Contractor shall compile all labor hours worked on a daily, weekly and monthly basis. This compilation shall include all OSHA Recordable and DART cases and is to be submitted to BSA by the first week of the following month.

1.07 Identification of Employees

- A. All Contractor employees must attend the Contractor/Vendor Orientation and be approved by BSA in order to work on the BNL Site. A contractor employee photo identification badge will then be issued in order to have access to the BNL Site.

- B. The Contractor shall assure that all employees promptly obtain a current BSA contractor employee photo identification badge. Badges shall be obtained in the lobby of the Brookhaven Center, Building 30, Monday through Friday, between 8:30 a.m. and 12:00 noon.
- C. Proper photo identification (e.g., driver's license, passport) and proof of social security number is required to obtain an identification badge. Access to the BNL Site by foreign nationals, including permanent resident aliens, is subject to BSA approval. Approval may take six or more weeks.
- D. Contractor employees shall wear the badge so as to be visible at all times while on-site.
- E. Contractor employee identification badges are valid for one (1) year after issuance. After one (1) year, contractors are required to attend the Contractor/Vendor Orientation and renew the photo identification badge. Badges will be provided at no cost to the Contractor. Immediately upon release of employees or project completion, the Contractor shall return badges to Building 30 lobby. (BSA will retain badges for re-issue for one year).
- F. Contractor employees shall report lost identification badges immediately to the BSA Badging Office, in the lobby of Building 30.

1.08 Kickoff Meeting

- A. BSA will set up a kickoff meeting to discuss and finalize any project plans or issues. The Contractor's non-manual staff is required to attend the kickoff meeting.

1.09 Work Schedule and Notification:

- A. The Contractor shall prepare a detailed, resource loaded (labor) schedule that accurately reflects the Contractor's work plan, and supports the schedule completion milestones included in the Contract. Individual activities in this schedule will normally be no longer than five (5) work days in duration. The intent of this requirement is to ensure that the Contractor provides a detailed schedule for managing the project. Where the five-day period is not practical, or is otherwise inconsequential to project management and control, longer durations will be accepted. The Contractor shall provide the schedule on a Primavera Project Planner (P-3) platform. BSA shall approve the schedule prior to BSA's issuance of a Notice to Proceed. The Contractor shall attend weekly schedule reviews with BSA, and the Contractor's schedule shall be updated on a weekly basis.
- B. Operational readiness and safety reviews and lessons learned hold points shall be built into the Contractor's schedule. The minimum durations to be included in the Contractor's schedule are provided below. Prior to scheduling the hold point, the Contractor is responsible to complete all activities required for review. (Note: The Contractor shall be required to resolve hold point issues and concern's to BSA's satisfaction regardless of the time duration required to do so. BSA shall not unreasonably withhold Contractor approval of a hold point and unnecessarily delay the Contractor's ability to proceed.) The following hold points shall be included in the schedule:
 - a. Operational readiness and safety review prior to the start of the physical graphite pile removal (5 work days).
 - b. Lessons learned following the first five days of graphite removal (3 work days).

- c. Lessons learned following removal of 25% of the graphite pile (3 work days).
- C. BSA must be notified and made aware of all work in progress. BSA will provide appropriate telephone extension numbers for notifications by the Contractor.
- D. Following removal of the graphite pile to the limits defined in the Statement of Work and removal of loose debris within the biological shield cavity, BSA shall perform radiological surveys to document the as-left radiological characteristics of the biological shield cavity.
- E. BSA expects all work to be performed in accordance with the P-3 schedule. When activities have not been previously scheduled, the Contractor shall request the authority to proceed with unplanned work no less than 24 hours in advance of the conduct of these unplanned activities. BSA encourages the Contractor to develop work-arounds and identify potential schedule accelerations and shall allow the Contractor to perform previously identified stand-by work without the 24-hr advance notification. BSA reserves the right to deny approval to proceed with work that is not on the P-3 schedule.
- F. BSA oversight is required for all work. For off-hour work not included in the Contract or P-3 schedule, the Contractor shall be backcharged on an hourly rate based on BSA's published schedule of rates for all resources required for BSA to support unscheduled work. The complete rate schedule is available through BSA's Contracting officer but listed below are the FY06 rates for the predominant BSA support personnel. This back-charge includes off-hour work directed by BSA due to the Contractor's failure to meet schedule completion dates.
 - a. Radiological Control Technician \$88.30
 - b. Waste Verifier \$81.48
 - c. Field Engineer \$104.10

1.10 Subcontractor Approval

- A. BSA shall approve the Contractor's selection and use of subcontractors.

1.11 Overall Project Coordination and the Flow Down of Contract Requirements

- A. The Contractor is responsible for the Work, including that performed by the Contractor's subcontractors, vendors, and service providers at all tiers and of any nature. The Contractor is responsible for the coordination, scheduling and performance of all subcontractors, vendors and service providers. The Contractor shall flow applicable requirements of the Contract to such subcontractors, vendors and service providers.
- B. BSA assumes no responsibility for contractual relations between the Contractor and other parties.

1.12 Transportation and Traffic

- A. The Contractor shall schedule, confine, and perform work so as not to interfere with BSA traffic on existing roads, walks, parking and other paved areas. The Contractor shall park all vehicles in designated parking areas, and load and unload vehicles where directed by BSA. All Contractor personnel shall comply with all New York State traffic regulations while on the BNL site. Violations will not be tolerated and chronic abusers will be removed from the BNL Site.

- B. The Contractor shall coordinate the delivery and removal of all materials and equipment with BSA. Major delivery and removal activities will be included in the P-3 schedule, and subject to the same requirements as all project activities. Unless otherwise approved by BSA in advance, the delivery and removal of materials and equipment shall be conducted during normal working hours. The firms providing transportation and logistics services to the Contractor are subcontractors subject to the Contractor's coordination and oversight and must comply with the Contractor's ES&H Plan.
- C. All Contractor vehicles (personal or otherwise), trucks, heavy equipment, equipment, material, trailers and any other conveyance or storage area are subject to inspection by BSA. All Contractor vehicles, trucks, heavy equipment, equipment, material, and trailers that are operated or staged within a radiological contaminated work zone must pass through the vehicle radiation monitor upon entry to the BNL Site and when leaving the BNL Site.
- D. All Contractor vehicles, trucks, heavy equipment, equipment, and/or material that will be used in a radiological contamination area will be subject to incoming radiation and contamination surveys performed by BSA. Incoming surveys will take approximately four (4) hours per vehicle.
- E. All Contractor vehicles, trucks, heavy equipment, equipment, and/or material that will be used in a radiological contamination area will be subject to outgoing radiological contamination and dose rate surveys performed by BSA. Any required decontamination required to meet BSA's radiological release criteria is the responsibility of the Contractor. Outgoing surveys will take approximately four (4) hours per vehicle.
- F. Transportation vehicles used by the Contractor in connection with on-site waste transportation shall be in compliance with applicable BSA SBMS requirements.

1.13 Protection of Property

- A. The Contractor shall be responsible for the safety and security of its property on the BNL Site.
- B. The Contractor shall protect materials equipment and other property from damage by and as a result of performing the Work, including disappearance.
- C. The Contractor shall repair, refinish, replace and otherwise correct all damage caused by the Contractor, and replace any missing materials, as required or otherwise directed by BSA.

1.14 Project Meetings:

- A. The Contractor shall participate in project meetings held weekly unless otherwise designated by BSA. The purpose of these meetings is to review the work planned for the week, previous week's accomplishments, safety issues, and project schedule. In addition, the Contractor shall provide weekly P-3 schedule updates and participate in weekly BSA schedule review meetings.
- B. The Contractor's key managers shall attend the weekly project meetings and arrangements will be made to ensure participation by the Contractor's corporate sponsor.
- C. Decisions, instructions and interpretations agreed upon at such meetings will be recorded in meeting minutes prepared by BSA and furnished to the Contractor and each attendee. The BSA contract technical representative and contractual representative will attend the meeting to ensure

that all work discussed is in accordance with the Contract. If BSA provides direction to the Contractor that is contrary to the Contract, a modification will be initiated prior to the performance of the Work.

- D. As the need arises, the Contractor shall attend non-routine meetings to discuss special matters with BSA.

PART 2 - Products

Not used.

PART 3 - Execution

Not used.

END OF SECTION 00 72 00

DIVISION 00 – TECHNICAL SPECIFICATIONS
SECTION 00 73 00 – SUPPLEMENTARY CONDITIONS

Part 1 - General

1.0 Definition

1.01 BNL Supplied Items

A. Items being supplied to the Contractor by BSA:

1. Training in accordance with Section 01 35 24 Training Requirements.
2. BSA will provide 145 cu. ft. supersacks used for loading graphite that will be placed into 145 cu. ft. DOT TYPE IP-1 containers that will also be provided by BSA. The Contractor may propose an alternate container for BSA consideration and approval.
3. BSA shall perform waste verification inspections during loading of the supersacks. The Contractors work plan and P-3 schedule will provide for BSA's waste inspection activities.
4. BSA shall be responsible for off-site waste transportation and disposal.
5. BSA shall provide radiological control and health physics services for the work, including job coverage, RWPs, transportation surveys, personnel and environmental radiological air samples. (Note: Non-radiological sampling and analysis to support the Contractor's ES&H Plan is the responsibility of the Contractor.)
6. Thermoluminescent dosimeters and bioassays.
7. Electrical power (460V, 30A, 3-phase and 120V, 30A, single phase).
8. Potable water.
9. Approval and oversight of the Contractor's respiratory protection program. (Note: The Contractor shall be responsible for training, medical screening, fit-testing, respirators, respirator cleaning and maintenance, and all other requirements in its respiratory protection program. Fit-testing must be quantitative.)
10. The following is a list of Government Owned Equipment that is available for the Contractor's use in the performance of the work. BSA makes no warranty as to the condition of the equipment, and it will be the Contractor's responsibility to perform all service and maintenance on this equipment should it be used:
 - a. Two (2) 6,000 CFM HEPA fan units with controls and (6) HEPA elements, (20) pre-filter elements, (8) large BI/BO bags and (8) small BI/BO bags. Each fan unit requires (8) HEPA elements and (4) pre-filter elements;
 - HEPA filters rated 99.97% efficiency at 0.3 microns.
 - Prefilters are 85% efficient.
 - Filter arrangement - 2 high x 2 wide, all filter elements are 24" x 24" x 6".

- Prefilter requires (4) filter elements; each of the two HEPA stages requires (4) elements.
 - Fan/motor assembly delivers 6000 CFM@ 9"SPWG, mounted with flex connection and vibration base.
 - Each filter stage (3) has 4 test sample ports as well as Static Pressure taps.
 - Photohelic gauges on each filter stage and across all stages (4) with local readout and remote indication capability. .
 - 208 Volt, 3 Phase, 60 Hertz
 - Control transformer provides 120VAC secondary at 2 amps minimum for 208 Volt input.
 - Local system controls are 120VAC with remote Start/Stop capability and include contacts on each motor starter.
 - Both Inlet and Outlet transition sections are flanged and have electric motor operation with Manual Override Low Leak Isolation dampers – damper sizes are 20" OD
 - Each unit has (4) lifting lugs located and sized appropriately for crane lifting.
 - All ductwork is 18-gauge galvanized steel. Common ductwork is 26" OD; individual fan unit connections are 20" OD.
 - Flex duct couplings are used to interconnect the (20") HEPA unit inlet and discharge connections and the Interconnecting Exhaust Duct
 - The exhaust stack has Isokinetic sampling probes sized for both flow rates, i.e. 6,000 and 12,000 CFM.
 - The exhaust stack is oriented horizontally with attachments for support stands (Unistrut or eq.)
- b. One (1) 10-ton Spanco trackless gantry crane;
- Spanco Model PF with 2-speed operation at 17/50 FPM. Overall span = 20'-0", 17'-0" clear span, 25'-0" height under beam.
 - Trackless power drive with two 2 HP drive motors driving polyurethane wheels.
 - Additional information on Spanco cranes available at <http://www.spanco.com/>
- c. Two (2) Brokk model 330D diesel-powered radio-remote operated manipulators;
- One (1) Brokk Model 330D remote manipulator (has loose contamination up to 210,000 dpm/100cm² and fixed radioactive contamination to 7mR/hr)
 - One (1) Brokk Model 330D remote manipulator (radiologically clean with low hours);
 - Caterpillar tracks, wheel gears
 - 63 HP, 3 liter diesel engine
 - Forward and rear facing halogen lights with compressed-air cleaning nozzles (1 unit)
 - One (1) short-arm, (1) long-arm manipulator
 - Both have Brokk "Quick Hitch" arms and central greasing system
 - (2) Forward facing and (1) rear-facing cameras (1 unit)
 - (2) Video control consoles with (3) flat-screen monitors each
 - Attachments (all "Quick Hitch")
 - 29 gallon clamshell bucket
 - Impact hammer

- Steel shear
- Lift magnet
- Steel plate sawing system
- Filter removal tool (base only)
- Additional information available at <http://www.brokk.com/>
- Special tools for Brokk 330D manipulators (e.g., clamshell bucket, impact hammer, steel shear, magnet)

Note: All work within the containment structure must be performed without introducing hazardous materials that are prohibited by the Draft Hazard Classification and Auditable Safety Analysis. These include the use of equipment powered by gasoline or diesel fuels.

- d. Bobcat Model No. 753G, S/N 515840476 with scarifier Model No. VOX ARx VA-30S. (The unit has 220 hours of use and has low levels of loose contamination)
- e. Hi-Vac system
 - Propane-powered Vacuum Unit
 - Hi-Vac model 840LP with 1 cubic yard capacity collection hopper
 - Skid-mounted for forklift handling
 - 6300 lbs empty
 - 16" Hg rated vacuum Roots blower @ 900 cfm
 - 183 CID, LP-fuel Ford Engine
 - 24' x 24" x 6" HEPA Filter on vacuum exhaust
 - 6" inlet connection
 - 6" outlet
 - Additional information available at <http://www.hi-vac.com/hihome.htm>
- f. 500 cubic feet of clean graphite blocks (1100 – 4"x 4"x 4') available for mock-up testing and qualification of special tools and equipment.
- g. Video inspection equipment includes two cameras with pan and tilt, console monitor, and camera control system

1.02 Safety

- A. The Contractor is responsible for preparing and complying with the Job Safety Analysis (JSA), ES&H Plan prepared in accordance with 29 CFR 1910.120 and 1926, and applicable BSA SBMS requirements
- B. The Contractor is responsible for performing the Work safely. In addition, the Contractor shall provide:
 - 1. Specific assignment of an individual, employed by the Contractor, as the Site Health & Safety Officer, who shall be responsible for Site construction safety. The Site Safety Officer shall complete a 30-hour OSHA construction safety course. The Contractor must demonstrate, with verification of completion of OSHA construction safety courses and other credentials, the ability of the Site Health & Safety Officer to supervise the type of work to be

- performed under the Contract. The qualification requirements for the Contractor's representative are specified in the Contractor Qualification Documentation Requirements.
2. A letter or certificate of compliance indicating that the Contractor is aware of, has reviewed, and shall comply with the safety regulations of both the OSHA Standards (29 CFR 1910/1926), and BSA SBMS requirements and applicable BSA ES&H Standards. The letter shall certify that all of these requirements are included in the ES&H Plan prepared by the Contractor.
- C. The Contractor shall provide field oversight, monitoring equipment, safety equipment, consumables, and sampling and analysis services required to implement its ES&H Plan. The Contractor shall be responsible for providing all PPE including respiratory protection equipment required to perform the Work.
- D. All Contractor personnel shall be able to comprehend the work and safety instructions required to perform the Work. All Contractor personnel shall acknowledge, in writing, that they have read and understood the ES&H Plan prior to the start of work.
- E. The Contractor shall be required to include the applicable safety requirements in contracts with all tiers of subcontractors of all kinds. The Contractor shall provide for the oversight of all of its subcontractors. These requirements apply to subcontractors of all kinds including transient, incidental and ancillary service providers.
- F. BSA demands that all work is performed safely and in accordance with the requirements of the Contract. BSA will not tolerate unsafe worker behavior and expects full compliance with all safety requirements. These requirements shall include, but not be limited to, all applicable OSHA regulations, BSA SBMS requirements, BSA ES&H standards, other codes and regulations, and the Contractor's BSA approved JSA and ES&H Plan. BSA has a zero tolerance policy and the Contractor will be directed to replace personnel who do not comply with safety requirements.
- G. All work associated with the project must be performed without introducing hazardous materials that are prohibited by the Draft Hazard Classification and Auditable Safety Analysis. These include the use of equipment powered by gasoline or diesel fuels within the biological shield.
- H. The following requirements have been established for electrical safety:
1. Zone 1 (Within the Biological Shield Cavity) is classified as a Class II, Division 1, Hazardous Location in accordance with NEC Article 500. Graphite dust in Zone 1 shall be considered to be Combustible Dust, Class II, Group F as defined in NFPA 499, Chapter 3.
 2. Zone 2 (Within the Contamination Control Containment) is classified as a Class II, Division 2, Hazardous Location in accordance with NEC Article 500.
 3. Zone 3 (Building 701 General Areas and Areas Adjacent to Pile, Biological Shield and Contamination Control Containment) is not classified as a Hazardous Location per NEC Article 500.
 4. The ventilation system inlet ductwork from the point of connection to Zone 1 to the first stage HEPA filter(s) shall be considered as part of Zone 1, and shall comply with recommended practices provided in NFPA 499. In designing this system, the Contractor shall take into

consideration the need to breach this system for repairs and service (e.g. filter change-out), and that all electrical tools and equipment used in these activities shall meet Zone 1 requirements.

5. All electrical equipment brought on-site shall have a label indicating that it has been tested and is in compliance with NFPA 70E, Standard for Electrical Safety Requirements for Employee Workplaces.
- I. All work associated with the project must be performed within the occupational exposure limits for Industrial Hygiene hazards set in OSHA 29CFR1926 and ACGIH *Threshold Limit Values*®. The contractor is required to provide qualified monitoring and hazard assessment personnel (per DOE G4401-3 *Occupational Exposure Assessment*), to conduct monitoring with calibrated equipment using NIOSH or OSHA approved methods, and to have analysis conducted by an AIHA Proficiency Analytical Testing certified laboratory. Copies of all field sampling sheets, laboratory analysis reports, and hazard assessment evaluation reports is to be provided to BSA for inclusion in the BNL Industrial Hygiene records management system.
- J. If a safety related event, accident, or a reportable condition occurs, the contractor shall immediately conduct a causal analysis, identify corrective actions, and prepare the applicable reporting documentation. The Contractor shall conduct a critique during the same work shift the safety event/accident/ condition occurred or was discovered. Similarly, statements from all involved parties must be prepared and submitted during the same work shift the safety event/accident/ condition occurred or was discovered.

1.03 BSA Administrative Radiological Control Levels

- A. A goal of BSA is to maintain personnel radiation exposure as low as reasonably achievable (ALARA) and well below the regulatory dose limits in 10 CFR 835.202. To accomplish this goal, numerical Administrative Control Levels (ACL) are established below the regulatory limits to administratively control and help reduce individual and collective radiation dose. BSA has established a special project ACL of 1,000 mrem/yr for all workers that shall not be waived under any circumstances. Other requirements are as follows:
 1. Radiation exposures to guests without training, visitors without training, or minors shall not exceed 25 mrem per year.
 2. Minors under the age of 18 shall not be allowed work in Controlled Areas or Radiological Areas.
 3. No individual who arrives at the BNL Site with an estimated occupational exposure greater than 2,000 mrem for the calendar year shall be allowed to work.
- B. Airborne radioactivity shall be monitored by BSA radiological control technicians. If the airborne levels exceed 0.5 DAC for non-respirator work and 100 DAC for respirator work, BSA shall issue a radiological stop work order until corrective actions and controls are put in place to meet these requirements.

PART 2 – Products

Not used.

PART 3 – Execution

Not used.

END OF SECTION 00 73 00

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 31 00 – PROJECT MANAGEMENT AND COORDINATION

PART 1 - General

1.00 Key Management Personnel

A. The following Contractor positions are designated as key personnel:

1. Corporate Sponsor
2. Project Manager
3. Field Superintendent
4. Radiological Engineer
5. Site Health and Safety Officer

B. The assignment of key management personnel by the Contractor shall be subject to BSA approval. All key personnel shall meet the qualification requirements provided in BSA's General Information for Bidders. Replacements for key management personnel departing the project shall meet these qualification requirements and are also subject to BSA approval.

1.01 Project Documentation

A. BSA shall have access to all Contractor project documentation, records, and data required to satisfy the requirements of the specifications.

PART 2 - Products

Not Used.

PART 3 - Execution

Not Used.

END OF SECTION 01 31 00

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 33 00 – SUBMITTALS

PART 1 - General

1.00 Related Sections

- A. Section 00 01 01 – Statement of Work
- B. Section 01 71 13 – Mobilization/Demobilization

1.01 General

- A. BSA will provide a draft copy of its Waste Management Plan (WMP) to the Contractor. The Contractor will review the WMP and propose changes to the WMP to ensure consistency with the Contractor's detailed work plans and procedures. The WMP along with proposed revisions will be submitted by the Contractor to BSA for final BSA approval.
- B. The Contractor shall be responsible for providing submissions for each of the following documents. Preparation, review, control, changes, and revisions to the following documents shall be in accordance with BSA procedure ER-OPM 1.2 *Procedure Development and Requirements*.
 - 1. Environmental, Safety & Health (ES&H) Plan – The ES&H Plan shall be prepared in accordance with 29 CFR 1910.120, 29 CFR 1926, and all applicable BSA SBMS requirements and ES&H standards. The Plan shall also address the risks, hazards and mitigative actions described in the JSA. At a minimum, the following elements shall be included in the Plan:
 - a. Certificate of Compliance
 - b. Accident prevention program
 - c. Contractor/subcontractor responsibilities
 - d. Training and communication
 - i. Drug-free workplace
 - ii. Hazard communication training
 - iii. Pre-shift safety briefings
 - iv. Shift turnover briefings
 - e. Emergencies
 - i. First aid and medical attention
 - ii. Fire protection and prevention
 - iii. Environmental protection
 - iv. BSA notification requirements
 - f. Concrete and masonry penetrations
 - g. Chemical safety
 - i. Hazard communication program
 - ii. List of hazardous chemicals known to be present
 - h. Electrical safety
 - i. Electrical safety program and safeguard checklist
 - ii. Lock-out/tag-out program
 - i. Mobile equipment program
 - i. Safe operation and maintenance
 - ii. Rigging plan worksheet

- j. Fall protection
 - k. Welding/cutting/open flame operations
 - l. Air Monitoring
 - i. Dust/particulates
 - ii. Airborne radioactivity
 - iii. Dust suppression
 - m. Confined spaces
 - n. General PPE
 - o. Other safety areas
2. Rigging Plan - The Rigging Plan shall describe the requirements for material and equipment handling. All material handling activities and lifts involving a load that is greater than those which can reasonably handled or lifted manually by a single worker (75 lbs.) are subject to the controls and requirements of the Rigging Plan. The Plan shall comply with applicable OSHA regulations and BSA SBMS requirements. At a minimum, the Rigging Plan shall include the following:
- a. Training and qualification requirements for Contractor personnel
 - b. Detailed rigging drawings for all material handling operations prepared by competent and qualified Contractor personnel and subject to BSA approval
 - c. Critical Lifts – All lifts of packages containing graphite or other reactor internals are designated as critical lifts and subject to the applicable BSA SBMS requirements.
 - d. Waste container handling and blocking/bracing instructions
 - e. Equipment/design limitations
 - f. Rigging safety and cross reference to ES&H Plan
 - g. Hold points/inspection points
 - h. Stop work expectations
 - i. Document and drawing control
3. Job Safety Analysis (JSA) – The Contractor shall perform a thorough and systematic safety analysis of the work. The analysis shall include the detailed identification of individual job tasks and an assessment of the hazards associated with each task. Following hazard identification, the Contractor shall establish controls and mitigating actions to manage the identified hazards and risks. The results of the JSA shall be reflected in the Contractor's ES&H Plan and Technical Work Procedures. The JSA shall include a cross reference that clearly demonstrates that all identified controls and measures are addressed. BSA approval of the JSA shall be a prerequisite to BSA's final approval of the Contractor's ES&H Plan and Technical Work Procedures. Upon full mobilization, the Contractor shall review with, and solicit the input of, its manual work force and make resulting revisions to the JSA subject to BSA approval. The JSA shall be periodically reviewed by the Contractor during the course of the work, and changes in the project scope, methodology and/or technical approach shall require the review and revision (if required) of the JSA by the Contractor.
4. Graphite Removal Work Plan and Technical Work Procedures – The Contractor shall prepare technical work procedures for performing the work. The Technical Work Procedures shall include the following:
- a. General description of technical work procedure scope
 - b. Prerequisites
 - c. General precautions and limitations

- d. Responsibilities of project personnel
- e. Detailed instructions for performing the work including specific precautions and limitations
- f. Identification of BSA hold points
- g. Reference documents

The Technical Work Procedures shall provide instructions of sufficient detail to ensure the safe and successful completion of the Work. Technical Work Procedures shall be prepared for all aspects of the work, including but not limited to the installation of temporary systems and equipment, the operation of special tools and all temporary systems and equipment, graphite removal operations, waste inspection, loading and packaging, on-site waste transportation, decontamination of equipment, and removal of temporary systems and equipment upon the completion of graphite removal.

The Contractor shall minimize its use of, or shall otherwise use extreme and measured care in relying on skill-of-the-craft while setting the level of detail in its Technical Work Procedures. To the extent that skill-of-the-craft is used, the Contractor shall have a formal training and qualification program that objectively demonstrates the skill of its workers commensurate with the level of detail included in the Technical Work Procedures.

5. ALARA/Contamination Control Plan – The Plan shall include project specific methodologies to be employed by the Contractor to maintain individual and cumulative project exposures ALARA and minimize the spread of radioactive contamination. At a minimum, the ALARA/Contamination Control Plan shall include the following:
 - a. Assignment of responsibilities
 - b. BSA project limits for radiation exposure and contamination control
 - c. Job planning
 - d. Radiological training
 - e. Personnel exposure control and use of ACL's
 - f. Detailed radiation exposure estimate for the project at the task level and the means to provide tracking against estimate
 - g. Detailed description of the work practices, precautions and procedures to be used by the Contractor to meet BSA's contamination control requirements
 - h. Work reviews, performance feedback and performance improvement
 - i. Records (e.g., training and exposure)
6. Qualification Plan for Special Tools– The Plan shall describe a systematic approach that will be developed and used by the Contractor to ensure that special tools used for graphite pile removal perform as intended. Among other things, the Plan shall describe the functional requirements of special tools including their design bases and requirements, Contractor quality assurance activities to ensure that the tools are fabricated to the Contractor's specifications, shop testing, mock-up designs and mock-up qualification testing to be performed at the BNL Site. The Plan shall include clear and rigorous shop testing and mock-up testing acceptance criteria for the special tools. BSA reserves the right to insert hold points during its review of the Plan. In addition, a final report documenting the performance testing and acceptance must be submitted to BSA for approval.

7. Waste Packaging Procedure – The procedure shall provide detailed instructions for packaging the waste components into the waste containers. The Waste Packaging Procedure shall be prepared in compliance with BSA's WMP.
8. Quality Assurance Plan-
 - A. The Quality Assurance Plan shall be prepared by the Contractor to address the criteria in 10 CFR 830.122, BNL SBMS requirements. At a minimum, the following sections shall be included in the Plan as applicable to the Work:
 - a. Program
 - b. Personnel Training and Qualifications
 - c. Quality Improvement
 - d. Documents and Records
 - e. Work Progress
 - f. Design
 - g. Procurement
 - h. Inspection and Acceptance Testing
 - i. Management Assessment
 - j. Independent Assessment
9. The Contractor shall also be responsible for providing each of the following:
 - A. List of proposed heavy equipment, hauling equipment, trucks, and temporary services/facilities, and date of mobilization of equipment.
 - B. Training records for all Contractor and subcontractor personnel.
 - C. OSHA 300 logs and Experience Modification Rates (EMR's) for the Contractor and all subcontractors. The EMR's must be less than 1.0.
 - D. Initial P-3 schedule and weekly schedule updates.
 - E. Pre-graphite removal photographs: Show existing conditions of adjoining structures, systems and components prior to graphite pile removal
 - F. Post-graphite removal photographs: Show the same or better conditions following graphite pile removal.
 - G. BSA shall provide the Contractor with a pre-graphite pile removal baseline radiological survey of Building 701 structures, systems and components in the vicinity of the graphite pile and biological shield. The Contractor shall be requested to concur with this survey, or perform a baseline survey to its satisfaction that will be provided to BSA prior to the start of work.
 - H. BSA shall provide the Contractor with a post-graphite pile removal radiological survey of Building 701 structures, systems and components in the vicinity of the pile and biological shield. The Contractor shall be requested to concur with this survey, or perform a survey to its satisfaction that will be provided to BSA prior to the start of work.

- I. Photographs (jpg file format), radiological surveys, radiological statistics, waste loading video recordings, and project documentation to be included with the Project Completion Report. Project documentation is further defined in Paragraph 1.02 of this Section.
- J. Project Completion Report - This Report shall contain a complete description of the Work performed by the Contractor, including:
 - a. Introduction – general description of the project
 - b. Summary of existing site conditions
 - c. Overview of Work Performed
 - i. Dates of significant activities (e.g. start, complete, duration)
 - ii. Noteworthy challenges and accomplishments
 - iii. Removal of the graphite pile
 1. Major tools & equipment used
 2. Removal of concrete plugs
 3. Removal of graphite pile blocks
 4. Removal of graphite restraints and membrane
 5. Final cleanup of the biological shield cavity
 6. Description of “as left” conditions
 - iv. Waste Management
 1. Waste packaging
 2. Onsite transportation
 3. Quantity and types of shipping containers utilized
 - v. Photographs showing before, during and after removal of the graphite pile
- K. The Contractor shall submit the above outlined documents in accordance with the following submittal schedule (all durations in provided work days):

Submittal Schedule

Submittal	Submittal Date
Technical Approach (Means & Methods)	With Bid
Experience Summary	With Bid
Project Management Capability and Experience Summary	With Bid
Corporate QA Program	With Bid
Contractors Safety Program	With Bid
Copy of Company Record of Injury, Accident, Fire and Property Damage for Past 2 Years, OSHA Form 300A and EMR	With Bid

Organizational Structure and Resumes of Key Personnel – Corporate Sponsor, Project Manager, Site Field Superintendent, Site Health & Safety Officer, , Radiological Engineer	With Bid
List of Subcontractors	With Bid
Insurance Certificate(s)	14 Days after Contract Signing
Payment and Performance Bond	14 Days after Contract Signing
Standard Form 1413	14 Days after Contract Signing
Letter of Compliance with Safety Requirements and SBMS	20 Days after Contract Signing
Waste Management Plan - comments	20 Days after Contract Signing
P-3 Schedule and Resource Loading Charts	20 Days before Mobilization
Environmental, Safety and Health Plan	40 Days after Contract Signing
Rigging Plan	40 Days after Contract Signing
Job Safety Analysis	40 Days after Contract Signing
Graphite Removal Technical Work Procedures	40 Days after Contract Signing
ALARA/Contamination Control Plan	40 Days after Contract Signing
Tooling Qualification Plan	20 Days after Contract Signing
Quality Assurance Plan	20 Days after Contract Signing
Waste Packaging Procedure	40 Days after Contract Signing
Proposed list of heavy equipment and mobilization dates	20 Days before Mobilization
Training Records	20 Days before Mobilization
Contractor Special Tools Operators Qualifications (See Section 01 35 24)	Prior to the ORE
Pre-graphite pile removal photographs	Prior to Start of Work
P-3 Schedule Updates	Weekly (Thursday's)
Industrial Hygiene Monitoring Results	5 days after the receipt of results from analytical laboratories or 5 days after analysis by direct reading instruments, meters, or monitors.
Post-graphite pile removal photographs	5 Days following restoration of Building 701
Project Completion Report including Project Records to BNL	10 Days following Completion of Work

K. Documents/Drawings Format

1. The Contractor shall prepare all documents for submittal using Microsoft Word 98 (or newer format). Schedules shall be prepared using P-3 software.

2. BSA shall provide copies of original construction drawings for mark up. The Contractor shall mark up the appropriate drawings to depict the as-left conditions.

L. Submittal Processing and Approval

1. Before submitting any documents for approval, the Contractor shall check them for accuracy, completeness, and compliance with the Contract requirements. The Contractor shall verify that all work contiguous with, and having bearing on, the Work indicated on documents is accurately described and distinctly illustrated, and that the work shown conforms to the requirements of the Contract.
2. The Contractor shall indicate approval on all submittals as evidence of the required reviews. Documents submitted to BSA without evidence of appropriate Contractor approval will be returned for resubmission.
3. The contractor shall submit the documents in their original electronic form (i.e., not converted to Adobe Portable Document Format (PDF)) including, but not limited to, project plans, P3 schedules, digital photographs, digital video records, recorded voice media, and progress reports.
4. BSA makes no representation of the number of review and rework cycles that will be required to approve submittals as final. BSA is committed to submittal approval using one review and comment cycle. However, this is a function of the quality of the submittals as initially submitted by the Contractor, and the Contractors ability to clearly and completely address BSA's comments and concerns.

NOTE: BSA shall not be liable for the costs associated with the resubmission of documents.

M. Submittal Preparation:

- a. The Contractor shall:
 - i. Place a permanent label or title on each submittal for its proper identification, including the identification of the Contractor's personnel responsible for submittal preparation and approval.
 - ii. Include the following information on the label:
 1. Project name: BGRR Graphite Pile Removal.
 2. Date.
 3. Name and address of the Contractor (and/or subcontractor).
 4. Reference project specification section number, if applicable.

N. Submittal Transmittal:

- a. The Contractor shall:
 - i. Package each submittal appropriately for transmittal and handling, and transmit each submittal using a transmittal form. BSA will not accept submittals received from sources other than the Contractor.
 - ii. On the transmittal, the Contractor shall record relevant information and requests for data. Attach the Contractor's Certification of Specification Compliance forms stating that the information complies with the requirements of the Contract.
- b. Address all submittals to:

Brookhaven National Laboratory
BGRR Manager of D&D Operations
Building 701, P.O. Box 5000
Upton, New York 11973-5000
- c. Mark all transmittal forms as follows:

Project Name: BGRR Graphite Pile Removal
- d. The Contractor shall transmit submittals via electronic mail upon request by BSA.

1.02 Project Record Keeping Documents

- A. The Contractor shall be responsible for keeping thorough, accurate and up-to-date project record documents. Copies of all project records shall be submitted to BSA within 10 business days of completing the project. The project records shall include, but are not limited to, the following:
 1. Daily progress reports. The Contractor shall prepare daily progress reports throughout the duration of the project. The daily progress reports are to be provided to BSA. The daily progress reports shall contain the following information:
 - a. Date
 - b. Time
 - c. Names of all employees in attendance, and their signatures
 - d. Topics discussed at the daily tailgate, including safety related items.
 - e. Lessons learned
 - f. Daily project progress including quantitative data describing the amount of graphite removed from the pile expressed in volume, mass and quantity of loaded waste containers.
 - g. Total hours worked, first aid treatments, OSHA Recordable and DART cases.
 2. Waste Documentation: The Contractor shall document and provide all waste container loading data.
 3. Video Documentation: The Contractor shall provide video documentation of all waste packaging operations. This shall include video documentation of the waste being loaded into

- supersacks and IP-1 containers. The video documentation shall include date and time imprinting.
4. Radiological Surveys: The Contractor shall provide to BSA copies of any radiological surveys that were not performed by BSA radiological control technicians. Note: Only BSA qualified radiological control technicians (RCTs) can perform surveys for radiological controls purposes. RCTs that do not possess BSA RCT certification are only permitted to perform surveys for Contractor information only. Any instrumentation used by the Contractor for surveys, radiological or informational shall be approved by BSA prior to use in the field.
 5. Photographs: The Contractor shall provide photo documentation (jpg file format) of the work activities.

PART 2 - Products

Not used.

PART 3 - Execution

Not used.

END OF SECTION 01 33 00

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 35 00 – SPECIAL PROCEDURES

Part 1 - General

1.00 Related Sections

- A. Section 00 72 00 – General Conditions
- B. Section 01 71 13 – Mobilization/Demobilization

1.01 General

A. The safety basis for performing graphite pile removal has been documented in the “Draft Hazard Classification and Auditable Safety Analysis For The Brookhaven Graphite Research Reactor Graphite Pile Removal Project”. The Work shall be performed by the Contractor in compliance with the requirements included in Draft Hazard Classification and Auditable Safety Analysis as further described below:

1. The Contractor’s document submissions shall accurately incorporate the requirements of Draft Hazard Classification and Auditable Safety Analysis. BSA shall not approve Contractor document submissions that do not include these requirements.
2. The Contractor shall work within the limits, controls and requirements expressed in Draft Hazard Classification and Auditable Safety Analysis. The Contractor shall stop any work that is not in compliance with these requirements and immediately notify BSA of the deficiency.
3. BSA shall not allow any work that is outside of the requirements of Draft Hazard Classification and Auditable Safety Analysis. BSA shall promptly issue a stop work order for any of the Contractor’s activities that are not in compliance with these requirements.

B. Applicable codes and standards for material furnished and work performed shall include all state laws, local ordinances, requirements of governmental agencies having jurisdiction, and applicable requirements of the latest editions of the following codes and standards including but not limited to:

ACGIH	American Conference of Governmental Industrial Hygienist
ANSI	American National Standards Institute
ASA	American Standards Association
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWWA	American Water Works Association
BNL ES&H	BNL Environment, Safety, and Health Standards
BNL RCM	BNL Radiological Control Manual
BNL SBMS	BNL Standards Based Management System
DOE	Department of Energy
EPA	Environmental Protection Agency
FM	Factory Mutual
NBS	National Bureau of Standards
NEC	National Electrical Code
NEMA	National Electric Manufacturers Association

NFPA	National Fire Protection Association NFPA-101
NYCRR	New York State Codes, Rules and Regulations
NYSBC	New York State Uniform Fire Prevention and Building Code
NYSDEC	New York State Department of Environmental Conservation
NYSDOL	New York State Department of Labor
NYSDOT	New York State Department of Transportation, Office of Engineering, Standard Specification, Construction and Materials
OSHA	Occupational Safety & Health Administration
SCDH	Suffolk County Department of Health
UL	Underwriter's Laboratories
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency

In case of conflict, the MOST STRINGENT requirements shall govern.

- C. Where specific performance requirements are listed herein, it is the intent of this Specification that all manufacturers, fabricators, suppliers, installers, contractors, subcontractors, specialty and sub-subcontractors shall provide services satisfying these requirements whether mentioned by trade or manufacturer's name or submitted for approval as a substitute.
- D. Where no explicit quality or standards for materials or workmanship are established for work, such work shall be of such quality consistent with industry standards and of the construction quality established for the Work generally. The Contractor shall conform to specified manufacturer's published specifications and installation instructions unless otherwise specified or indicated.
- E. Contractor shall perform all activities on the BNL Site in accordance with applicable BSA SBMS requirements, Environmental Management System (EMS), Operational Procedure Manual - Standard Operating Procedures, and all project specific documents, procedures, and specifications. If the Contractor identifies any discrepancies between procedures and project documents, the Contractor shall immediately notify BSA and the discrepancy will be resolved prior to performing any affected work. All BSA procedures, standards and other requirements are available on the BSA website (accessible only on site) or will be provided to the Contractor upon request.

The applicable BSA SBMS Subject Areas for the graphite pile removal project are as follows:

- 1. ALARA Program
- 2. Asbestos
- 3. Calibration
- 4. Chemicals, Working With
- 5. Compressed Gas Cylinders and Related Systems
- 6. Confined spaces
- 7. Construction Safety
- 8. Emergency Preparedness
- 9. Engineering Design
- 10. Entry/Exit for Rad Controlled Areas
- 11. ESH Policy Manual
- 12. ESH Standards

13. Exhaust Ventilation
14. Facility Use Agreements
15. Guests and Visitors
16. Hazardous Waste Management
17. Issuing Personnel Monitoring Device
18. Labeling and Handling Rad Materials
19. Lifting Safety
20. Liquid Effluents
21. Material Requiring Special Handling
22. Mixed Waste Management
23. Natural Hazards in the Environment
24. Noise and Hearing Conservation
25. Non-Radioactive Airborne Emissions
26. Occurrence Reporting and Processing System (ORPS)
27. Operational Readiness Evaluation (ORE)
28. Personal Protective Equipment
29. Pollution Prevention / Waste Minimization
30. BNL Radiological Control Manual
31. SBMS subject area (Radiological Control Procedures)
32. Rad Dose Limits & ACL's [we may use something more limiting]
33. Rad Training and Qualifications
34. Radioactive Airborne Emissions
35. Radioactive Waste Management
36. Radiological Stop Work Procedure
37. Radiological Work Permits
38. Releasing Materials from Rad Areas
39. Respiratory Protection
40. Spill Response
41. Stop Work – Imminent Danger
42. Storage & Transfer of Haz/Nonhaz Material
43. Traffic Safety
44. Transfer of Hazmat Onsite
45. Transfer of Rad Material Onsite
46. Transport of Hazmat Offsite
47. Transport of Rad Material Offsite
48. Underground Injection Control
49. Use of BNL Facilities & Grounds
50. Work Planning and Control for Experiments and Operations

The applicable requirements from the BSA ES&H Policy Manual include:

1. ESH Policy Manual: II- Nuclear Safety
2. ESH Policy Manual: Appendix E.1 – Fissionable Material Control Procedures
3. 1.3.2 Operational Readiness Review
4. 1.4.0 Compressed Gas Cylinder Safety
5. 1.5.0 Electrical Safety
6. 1.5.1 Lockout/Tagout Requirements
7. 2.6.0 Sanitation
8. 4.3.0 Cutting and Welding
9. 4.10.2 Flammable Liquids: Storage, Use, & Disposal

PART 2 - Products

Not Used.

PART 3 - Execution

Not Used.

END OF SECTION 01 35 00

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 35 24 – TRAINING REQUIREMENTS

PART 1 - General

1.00 Related Sections

- A. Section 00 72 00 – General Conditions
- B. Section 00 73 00 – Supplementary Conditions

1.01 General

- A. The Contractor shall be responsible for obtaining all necessary training, certifications, registrations, licenses, etc. for all personnel involved with the Work. Contractor personnel shall not be allowed to engage in work activities without first obtaining all proper and required training. Contractor personnel training shall be kept up to date throughout the duration of the project. Equivalent training may be acceptable if approved by BSA. For the training services provided by BSA at BNL, the Contractor is responsible for compensating their employees.

1.02 Required Training

- A. The Contractor and BSA shall perform a joint job training assessment for all personnel to determine the training requirements. The Environmental Restoration Projects Training Coordinator will assist the contractor with scheduling BSA provided training. As part of the ORE, BSA will verify that all required training has been completed. The following training shall be required as a minimum for the Contractor's employees:
 - 1. OSHA 40 Hr. HAZWOPER
 - 2. OSHA 8 Hr. HAZWOPER Supervisor (for Field Superintendent, Site Health and Safety Officer, and other Contractor supervisory personnel)
 - 3. BSA Contractor Vendor Orientation
 - 4. Medical Surveillance (i.e., whole body count, Bioassay, respirator clearance)
 - 5. BSA radiological worker training
 - Radiological Worker I
 - Contamination/Airborne radioactivity (RWT-300A)
 - 6. Four (4) hour Environmental Restoration Projects Operations Procedures Manual training for all subcontractor management and supervisory personnel.
- B. Upon award of the Contract, the Contractor should schedule the required training described herein. All required training shall be completed at least five (5) days prior to the Operational Readiness Evaluation.

- C. If the Contractor is unable to attend the courses at the regularly scheduled times, arrangements for special training classes can be made through BSA. BSA's costs of conducting non-scheduled training classes shall be back-charged to the Contractor.

1.03 BSA On-site Computer Based Training

- A. All Contractor personnel involved with waste packaging are required to complete the BSA Radioactive Waste Generator (HP-RADIGEN), BSA Hazardous Waste Generator (HP-RADIGEN3), BSA Transportation of Hazardous Material (TQ-HAZMAT-A), and BSA HAZMAT Transportation Awareness Training (TQ-HMT-SECURITY) courses. These are BSA web-based courses and will require approximately 60 minutes each to complete the program and quiz.
- B. The Contractor's Project Manager, Field Superintendent, and Site Health and Safety Officer are required to complete the BGRR Facility Environmental Training Course (ER-BENV1).
- C. Following completion of the Contractor/Vendor Orientation Training (CVO), the Contractor personnel will receive credit for the following BSA computer based training courses: Stop Work Procedure (GE-STOPWORK), Emergency Plan & Response (GE-EMERGPLAN), and Environmental Protection (GE-ENV-GET).
- D. All Contractor personnel requiring BNL network access are required to read and understand the computer based training course Cyber Security (GE-CYBERSEC).

1.04 Medical Surveillance

- A. Contractor shall provide medical surveillance of its personnel in accordance with OSHA regulations. In addition, Contractor personnel shall be required to complete a whole body count and bioassay provided by BSA in order to receive a thermo luminescent dosimeter (TLD) and work in radiological areas.

1.05 BSA Radiological Worker Training

- A. All Contractor personnel are required to complete the BSA Radiological Worker 1 Course (HP-RWT002) and the Contamination/Airborne Course and Practical (HP-RWT-300/A) and be approved by BSA to obtain and wear a TLD in order to work.
- B. The Radiological Worker 1 Course is a seven and one-half (7-1/2) hour course, given on the first and third Tuesday of every month between the hours of 9:00 am and 4:30 pm at Bldg. 703. The course is designed for personnel who need unescorted access to Controlled Areas, Radioactive Material Areas, Radiation Areas and High Radiation Areas.
- C. The Contamination/Airborne Course is a three (3) hour course, given on the first and third Wednesday of every month between the hours of 9:00 am and 12:00 pm. The Practical Course is a one and one-half (1-1/2) hour course, and follows the Contamination/Airborne Course on the first and third Wednesday of every month. The Contamination/Airborne Course and practical factors demonstration are required for employees who need unescorted access to the Radiological Buffer Areas, Contamination, High Contamination and/or Airborne Radioactivity Areas. Radiological Worker 1 is prerequisite. Note: The practical factors demonstration is a separate

session and must be taken in order for the trainee to receive qualification. The Contractor shall be responsible for providing respiratory protection training to its employees in accordance with the requirements of its program that shall be approved by BSA.

- D. All Contractor personnel shall submit radiological dose records to BSA prior to the issuance of a TLD by BSA and the start of work.
- E. All Contractor personnel required to work in contamination and or airborne radioactivity areas shall be required to have whole body counts prior to the start of work, then on an annual basis and prior to departing the BNL Site. BSA shall provide the whole body counts by appointment (two weeks notice is required).
- F. All Contractor personnel required to work in contamination and or airborne radioactivity areas shall have radiological bioassays prior to the start of work, then on an annual basis, and prior to departing the BNL Site. BSA will provide the bioassays analyses. Submittal of bioassay samples shall be coordinated with BSA in advance.
- G. It is the Contractor's responsibility to ensure that departing employees complete required termination whole body counts and bioassays. The Contractor shall be responsible for the cost to return the individuals to complete these requirements if they improperly depart the BNL Site.

1.06 Crane Operator Training

- A. All Contractor personnel involved with material handling and rigging shall be required to attend BSA's 8-hour Basic Rigging Course (TQ-RIG-C). In addition, all Contractor personnel operating the BGRR overhead crane or other hoists shall be required to the BSA web-based Overhead Crane Operator Course (HP-Q-010-W) and practical demonstration class. The Basic Rigging Course is an eight (8) hour course, given on the second Friday of each month between the hours of 8:30 am and 4:30 pm. Arrangements can be made through BSA if the Contractor personnel cannot attend the course at its regularly scheduled time.

1.07 Contractor's Industrial Hygiene/Safety Program

The Contractor is responsible for providing general safety and industrial hygiene training to all project personnel that includes the following:

- 1. Fall protection
 - 2. Back safety
 - 3. Hand and power tool safety
 - 4. Ladder safety
 - 5. Heat stress
 - 6. Electrical safety
 - 7. Noise and hearing conservation
 - 8. Hazard communication
 - 9. Fire extinguisher
- B. All Contractor personnel required to wear respirators shall complete the training and medical screening required by 29 CFR 1910.134. The Contractor shall provide for this training and medical screening. The Contractor is responsible for supplying and cleaning respirators. BSA shall approve the Contractor's respiratory protection program. Contractor personnel are required

to have an annual quantitative respirator fit test in order to work in areas where respirators are required. Fit test records shall be submitted to BSA.

1.08 Contractor Training and Qualification of Operators Using Special Tools

- A. The Contractor shall prepare a training and qualification plan to qualify its operators of special tools. The operators shall be trained in special tools design and operating limitations, safety, maintenance and inspection, and operating procedures. The Contractor's operators shall also receive hands-on training using mock-ups that accurately simulate conditions in the field. The Contractor shall establish clear and rigorous qualification criteria that shall be satisfied and documented prior to being authorizing operators of special tools to perform production work in the field.

1.09 Training Records

- A. The Contractor shall maintain current training records at the Site for all personnel.

PART 2 - Products

Not used.

PART 3 - Execution

Not used.

END OF SECTION 01 35 24

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 43 40 – SPECIAL TOOLS

PART 1 - General

1.00 Related Sections

- A. Section 02 00 00 – Existing Conditions
- B. Section 02 44 00 – Graphite Pile Removal

1.01 Definitions

- A. Special Tools – All tools which are of such a specialized nature that without substantial modification and alteration their use is limited to the performance of particular services. Special tools include but are not limited to:
 - a. Manipulators for remote removal of graphite and remote material handling
 - b. End effectors and/or other remote equipment for the segmentation and handling of miscellaneous components
 - c. Remote handling apparatus for waste containers
 - d. Remote manipulators for applying fixative coating systems
 - e. Remote manipulators for general cleanup, material removal and miscellaneous tasks
 - f. Remote manipulators to provide for real-time video surveillance of pile removal and waste container loading operations

1.02 Submittals

- A. The Contractor shall provide the design bases, functional requirements, drawings, descriptive sheets, or other written materials that fully describe and identify each special tool for BSA review and approval.
- B. The Contractor shall submit plans for constructing mock-ups and qualification testing to demonstrate the effectiveness of the special tools prior to use. The Plan shall include shop testing prior to delivery to the BNL Site, and final qualification testing prior to use. The Plan shall provide clear, conservative and objective acceptance criteria that must be satisfied prior to approval for use. The Plan shall be subject to BSA review and approval.

PART 2 – Products

Not Used.

PART 3 - Execution

3.00 Mock-Ups

- A. The Contractor shall provide all materials, labor, and equipment to construct representative mock-ups of the pile and work areas that accurately simulate the field conditions and test the functional adequacy of special tools. Mock-up materials of construction will be of a size and weight that duplicate relevant and actual conditions that will be encountered in the field that can impact the performance of special tools, or the performance of the Contractor's operators of special tools.

The Contractor shall consider mechanical properties of materials and environmental conditions in the mock-up designs. Mock-up designs are subject to BSA review and approval

3.01 Design and Fabrication of Special Tools

- A. The general design criteria and design bases of special tools are subject to BSA review and approval.
- B. The Contractor shall provide detailed design and fabrication schedules for special tools. BSA reserves the right to include shop inspections and hold points in the design and fabrication schedule.
- C. BSA shall be provided with access to all shops in which special tools are being fabricated. BSA may conduct a final inspection of special tools prior to their release from the shop and delivery to the BNL Site.
- D. Shop testing shall be performed to demonstrate that special tools have been fabricated in accordance with the Contractor's requirements. The scope and acceptance criteria of shop tests will be included in the Qualification Plan for Special Tools. BSA reserves the right to witness all shop tests.

3.02 Site Qualification Testing

- A. The Contractor shall perform qualification testing at the BNL Site against the acceptance criteria in the Qualification Plan for Special Tools using mock-ups as described herein. Other attributes to be evaluated by the Contractor include:
 - 1. The shake-down of operating procedures and equipment/operator interfaces, and identification and resolution of any potentially unsafe procedures and unacceptable workload demands.
 - 2. Evaluation of work methods and requirements for manual, hands-on work in high radiation exposure areas
 - 3. Evaluation of the non-mechanical aspects of the design, such as control dynamics, communications, information and electronic displays.
 - 4. Routine maintenance of and repairs to special tools.

3.03 Final Approval for Use

- A. The Contractor shall satisfy all special tool acceptance criteria prior to release for use subject to BSA approval. The Contractor shall provide the rework required for special tools to meet their acceptance requirements. Under no circumstances will BSA allow the use of special tools that have not been systematically designed, fabricated and qualified as described in these specifications. The Contractor shall prepare a final report documenting the testing and performance of the tools and submit the report to BSA for approval.

END OF SECTION 01 43 40

DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01 50 00 – TEMPORARY FACILITIES AND CONTROLS

PART 1 - General

1.00 Summary

- A. This section provides BSA's requirements for temporary services and facilities, including utilities, support facilities, miscellaneous services and protective barriers.
- B. The Contractor shall provide all field office facilities, break rooms, and temporary storage buildings, temporary utilities and services required to complete the work. The Contractor shall be responsible for the maintenance of such facilities and services in a safe condition for the duration required to support the work, and shall provide for their removal upon work completion. The location of all such facilities must be approved by BSA.
- C. Electric power may be made available to the Contractor upon request. BSA reserves the right to deny access to electric power other than that identified for a standard construction trailer.
- D. Utilities for a standard construction trailer will include electrical power (460V, 30A, 3-phase and 120V, 30A single phase).

1.01 Regulations

- A. The Contractor shall comply with applicable laws and regulations.

1.02 Standards

- A. The Contractor shall comply with NFPA Code 241, "Building Construction and Demolition Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and Demolition", and NECA Electrical Design Library "Temporary Electrical Facilities."
 - 1. Electrical Service: The Contractor shall comply with NEMA, NECA and UL standards and regulations for temporary electric service and shall install service in compliance with National Electric Code (NFPA 70).
 - 2. GFIs: Ground fault circuit interrupters are required for all electric services to and within the Site from other than permanent wiring of a building or structure.

1.03 Inspections

- A. The Contractor shall arrange for BSA personnel to inspect and test each temporary utility before its use. The Contractor shall remedy findings and deficiencies identified by BSA inspections within two (2) business days. The Contractor shall immediately remedy safety hazards identified during such inspections.

1.04 Conditions of Use

- A. The Contractor shall keep facilities clean and neat, and operate them in a safe and efficient manner. The Contractor shall take necessary fire prevention measures. The Contractor shall not overload facilities or allow hazardous, dangerous or unsanitary conditions. The

Contractor shall not allow public nuisances to develop or persist on the BNL Site. The Contractor shall perform housekeeping to the satisfaction of BSA.

- B. The Contractor shall maintain Material Data Safety Sheets (MSDSs) for all material on-site, provide an inventory and copy of each MSDS to BSA, and provide an updated inventory as material is brought on-site. The Contractor shall store all material properly in accordance with BNL SBMS requirements.

1.05 Field Offices

- A. The Contractor shall provide insulated, weather-tight field offices of sufficient size to accommodate its personnel. The field offices shall be prefabricated units or similar construction with lockable entrances, operable windows and serviceable finishes.

1.06 Sanitary Facilities

- A. The Contractor shall install self-contained single-occupant toilet units of the chemical type, properly vented and fully enclosed with a glass fiber reinforced polyester shell or similar nonabsorbent material. The Contractor shall install the facilities where needed and as approved by BSA. The Contractor shall comply with regulations and local health codes. Toilets must be serviced at least weekly, and more often if needed, as determined by BSA. The Contractor shall provide paper goods and similar disposable materials for each facility.

1.07 Drinking Water Facilities

- A. The Contractor shall provide containerized tap-dispenser bottled-water type drinking water units for its employees.

1.08 Fire Extinguishers

- A. The Contractor shall provide one (1) portable tank type fire extinguisher per work area containing fifteen pounds of liquid carbon dioxide, complete with seat type valve, three (3) feet of hose and non-shatterable discharge hose (as manufactured by Walter Kiddie & Co., Model 15KS, or equal).

1.09 Project Identification and Temporary Signs

- A. The Contractor shall install project identification signs where indicated, or as directed by BSA. The signs shall be supported on frames of preservative-treated wood or steel.
- B. BSA will prepare signs for pickup and installation by Contractor.

1.10 Protective Barrier Installation

- A. Barricades, Warning Signs, and Lights:
 - 1. The Contractor shall comply with standards and code requirements for erecting barricades. The Contractor shall install appropriate warning signs to inform personnel and the public of the hazard being protected against and where needed, install lighting including flashing lights, if required.

2. The Contractor shall provide precautions to prevent unauthorized entrance, vandalism and theft. The Contractor shall provide a secure, locked facility where materials and equipment are to be stored.

1.11 Environmental Protection

- A. The Contractor shall operate temporary facilities and equipment and conduct work by methods that comply with environmental regulations, and minimize the possibility that air, waterways and soil might be contaminated or polluted.
- B. When the work requires the Contractor to bring temporary fuel storage facilities on to the BNL Site, the Contractor shall be responsible for providing a temporary impermeable containment area for all fuel transfer operations in accordance with Suffolk County Department of Health Services, Article 12.
- C. The Contractor shall submit a spill prevention program that is proactive and effective in preventing spills on the BNL Site. The spill prevention program shall be reviewed and approved by BSA.
- D. If, during work activities, a release, discharge, or spill of petroleum products or chemicals occurs, the Contractor shall:
 1. Immediately notify Safeguards and Security and Fire Rescue at Ext. 2222 or 911 (from a BNL phone) or 631-344-2222 from a cell phone or pay phone, and the BSA Project Manager of the release, discharge, or spill.
 2. Immediately initiate cleanup and disposal operations by a BSA- approved hazardous waste management contractor, complete the operations, and be responsible for monitoring and/or sampling in the event of a spill, to the satisfaction of BSA.
 3. BSA will coordinate the disposal of contaminated material, with appropriate documentation and disposition forms. The Contractor is responsible for cleanup and disposal costs and all costs incurred as a result of the spill, plus penalties.
- E. The Contractor shall avoid use of tools and equipment that produce harmful noise, if possible.
- F. The Contractor shall make use of temporary enclosures in areas where work may generate airborne contaminants that cannot be controlled with engineering controls or the risk is high for a release to the environment, as determined by NESHAPs. The Contractor shall maintain enclosure contamination levels ALARA. The Contractor shall decontaminate the enclosure to minimize the potential spread of contamination. The enclosure shall be decontaminated at the completion of work or disposed of as waste. BSA shall perform NESHAPs evaluations to determine if an enclosure is required based on Contractor provided information.

1.12 Operation

- A. The Contractor shall enforce strict discipline in using temporary facilities, limit availability to intended use, minimize abuse, and maintain facilities in safe and good operating condition until their removal.
- B. Temporary structures shall be protected from damage by the elements.

1. The Contractor shall maintain operation of enclosures, cooling, heating, humidity control, ventilation and similar facilities on a 24-hour per day basis to achieve indicated results and to avoid damage.

1.13 Termination and Removal

A. The Contractor shall remove each facility when it is no longer needed, or during demobilization. All facilities shall be removed after the completion of the Work.

B. Temporary facilities are the property of the Contractor.

PART 2 – Products Not used.

PART 3 – Execution Not used.

END OF SECTION 01 50 00

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 71 13 – MOBILIZATION/DEMobilIZATION

PART 1 - General

1.00 Related sections

- A. Section 00 01 01 – Statement of Work
- B. Section 01 33 00 – Submittals
- C. Section 01 77 00 – Closeout Procedures

PART 2 - Products

Not used.

PART 3 - Execution

3.00 Mobilization

- A. Upon award of contract, the Contractor shall submit all the necessary plans and documents stipulated in Section 01 33 00 Submittals to BSA for review and approval.
- B. The Contractor shall obtain all required permits from BSA prior to initiating any work activities.
- C. The Contractor shall coordinate with BSA regarding equipment, materials, containers, deliveries and access to the BNL Site.
- D. The Contractor shall be responsible for obtaining the required training for all personnel prior to start of work. Contractor employees shall not be granted BNL Site access without required training certifications and documentation.
- E. The Contractor shall notify BSA prior to delivery of radioactive material, including calibration check sources for radiation detection equipment, to the BNL Site. BSA shall approve all deliveries in advance of delivery.
- F. All radiation monitoring equipment shall be inspected, calibration checked and approved by BSA prior to use at the BNL Site.
- G. All Industrial Hygiene monitoring equipment (including chemical, noise, confined space atmosphere testing and non-ionizing radiation) shall be inspected, checked for current calibration evidence, and approved by BSA prior to use on the BNL Site
- H. The Contractor shall identify and establish all work zones and material staging areas prior to beginning work, with approval by BSA.
- I. BSA will perform radiological surveys of incoming heavy equipment that will enter the radiological work area. Incoming radiological surveys of heavy equipment require four (4) hours to complete. The Contractor shall provide 48 hours notice to BSA prior to delivery of equipment. The Contractor shall make the heavy equipment available and accessible to BSA.

- J. BSA will perform quality control inspections of waste containers and any waste conveyance, not otherwise specified, prior to use. The Contractor shall provide 48 hours notice to BSA prior to delivery of waste container and waste conveyances. The Contractor shall make waste containers and waste conveyances available and accessible to BSA.

3.01 Demobilization

- A. The Contractor shall demobilize completely from the BNL Site within ten (10) business days after completion of the Work.
- B. The Contractor shall remove all equipment, temporary facilities, controls, materials, debris, waste, waste containers, used PPE, work zone delineation materials and any other job associated items prior to exiting the site.
- C. The Contractor shall coordinate with BSA prior to removing any equipment or materials that were used within the radiologically-posted work areas.
- D. The work areas will be left in neat, clean and accessible condition after work activities are complete.
- E. The Contractor shall not remove identified equipment or vehicles from the BNL Site until BSA has surveyed the equipment, and the vehicles/equipment passed through BSA's vehicle monitor on Princeton Avenue.

END OF SECTION 01 71 13

DIVISION 01 - GENERAL REQUIREMENTS
SECTION 01 77 00 – CLOSEOUT PROCEDURES

PART 1 - General

1.00 Related Sections

- A. Section 00 01 01 – Statement of Work
- B. Section 01 71 13 – Mobilization/Demobilization

1.01 General:

A. Project Closeout Inspection:

1. When the Work is complete, the Contractor shall notify BSA.
2. Before notifying BSA, the Contractor shall complete the following:
 - a. The Contractor shall assure that the Work is complete in accordance with BSA's requirements and is ready for inspection by BSA. This assurance shall include performing a post-graphite pile removal visual examination of the biological shield cavity to ensure that the goal of removing gross, loose debris and contamination from within the biological shield cavity has been satisfied.
 - b. Final cleanup has been completed as described in Section 01 71 13, step 3.01 Demobilization.
3. BSA reserves the right to set up a preliminary project closeout inspection prior to completion of the Work.
4. The Contractor shall provide to BSA a list of items remaining to be completed or corrected.
 - a. Within a reasonable time after receipt of the list, BSA will inspect the work areas to determine status of completion.
 - b. Should BSA determine that the Work is not complete:
 - i. BSA will so notify the Contractor, in writing, giving the reasons therefore.
 - ii. The Contractor shall remedy the deficiencies and notify BSA when ready for re-inspection.
 - iii. BSA will then re-inspect the Work.
 - iv. This procedure shall be repeated until all deficiencies have been corrected and Work is accepted by BSA as completed.
5. Results of the completed inspection will form the basis for final acceptance.

B. Final Acceptance:

1. Before requesting final acceptance of the Work and the last payment, the Contractor shall complete the following:
 - a. The Contractor shall close out all user accounts for goods and services purchased by the Contractor from BSA.
 - b. The Contractor shall submit a copy of the final inspection list stating that each item has been completed or otherwise resolved for BSA acceptance.
 - c. The Contractor shall submit a letter to BSA certifying that all subcontractors have been paid.

C. Record Document Submittals:

1. The Contractor shall submit Record Documents in accordance with Section 01 33 00 (Submittals).

D. Record Drawings:

1. The Contractor shall provide redlined revisions to BSA-provided drawings to depict "as-left" conditions

E. Record Specifications:

1. The Contractor shall provide a list of variations or changes in actual work performed in comparison with the specifications and addenda. The Contractor shall give particular attention to selection of options and similar information on elements that are concealed and cannot be readily discerned later by direct observation. Such deviations shall be clearly reflected by the Contractor on the Record Drawings.

F. Completion Report:

1. The Contractor shall prepare the Project Completion Report for BSA review and approval in accordance with Section 01 33 00 (Submittals).

G. Final Payment:

1. After compliance with all of the above requirements and approval in writing by BSA for project closeout, the Contractor shall submit a final payment requesting release of balance of 10% retainage and Contract closeout.

PART 2 - Products

Not used.

PART 3 - Execution

Not used.

END OF SECTION 01 77 00

DIVISION 02 – EXISTING CONDITIONS
SECTION 02 44 00 – GRAPHITE PILE REMOVAL

PART 1 - General

1.00 Related sections

- A. Section 00 01 01 – Statement of Work
- B. Section 02 81 00 – Waste Management & Transportation

1.01 General

- A. The Contractor shall furnish all labor, materials, and equipment necessary to remove the graphite pile, package and transport the resulting waste to BSA's Waste Management facility located on the BNL Site.
- B. The graphite pile removal means and methods shall be determined by the Contractor and described in detail in the Contractor's BSA-approved project submittals. (Section 01 33 00 Submittals). The Contractor's means and methods shall meet all of the performance requirements included in the Contract and are subject to BSA approval prior to their implementation.
- C. The Contractor shall use special tools to remotely remove the graphite pile. The Contractor's tools, processes and procedures will be devised so as to preclude the need for personnel entry and manual work inside of the biological shield cavity. If for some unforeseen reason an entry must be made approval shall be considered and approved by BSA on a case-by-case basis.
- D. The Contractor shall employ removal methods and procedures that minimize the generation of secondary wastes including liquids.
- E. BSA requires one-time handling and packaging of radioactive wastes. Wastes shall be packaged by the Contractor at the point of generation (including all BSA inspections and required sampling) in accordance with BSA's WMP. The Contractor is responsible for coordinating closely with BSA and ensuring that all waste inspection and packaging requirements are satisfied.
- F. The Contractor shall size-reduce the waste materials to debris standards set by BSA's WMP or as otherwise required to fit in the 145 cu. ft. supersacks and 145 cu. ft. DOT TYPE IP-1 containers furnished by BSA. Waste materials shall be placed in appropriate containers once they have been size-reduced. Waste handling and/or processing of bulk graphite and graphite pile debris outside of the contamination control boundary shall not be permitted.

1.02 Definitions

- A. Remove: Detach items from existing construction.
- B. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed.

1.03 Project Conditions

- A. BSA occupies Building 701, which houses the graphite pile and surrounding biological shield, and conducts routine project management activities from the offices located on the 133' and 143' levels. The Contractor shall conduct graphite pile removal without disruption to BSA's activities in Building 701.
- B. Building 701 is predominantly free of loose radiological contamination. The Contractor shall conduct graphite pile removal in a manner that preserves the present radiological conditions. The Contractor shall be responsible for decontaminating areas in and around Building 701 that become contaminated as a result of the Contractor's graphite pile removal activities at its expense. BSA will provide the Contractor with a baseline radiological survey and the Contractor is encouraged to verify the pre-graphite removal radiological conditions. Based on this baseline survey, BSA and the Contractor shall agree on the pre- and post- removal radiological conditions.
- C. The Contractor shall notify BSA of discrepancies between existing conditions and the specifications/drawings before award of the contract. Contract changes as a result of such discrepancies brought to BSA's attention by the Contractor after award of the contract will not be considered by BSA. For additional information, refer to section 00 72 00, General Conditions.
- D. The Contractor shall protect utilities, structures and services in the immediate and in the general vicinity of the work areas. The Contractor at the Contractor's expense shall repair damages to such utilities, structures and services caused by the Contractor.
- E. At the pre-bid conference, BSA will walk-down the work areas and identify all utilities available for the contractor's usage.

1.04 Work Area Preparation

- A. The Contractor shall be responsible for work area preparation as follows:
 - 1. Site preparation activities specified in this section and any other site preparation activities not otherwise specified, but deemed necessary by the Contractor, shall be included in the Technical Work Procedures.
 - 2. Coordination with BSA for removal of existing structures, systems and components that are interferences to graphite pile removal.
 - 3. Mobilization of all materials, equipment, and personnel to the BNL Site in accordance with the Contractor's P-3 schedule.
 - 4. Designation and establishment of all work zones. Work zones shall be delineated and created in accordance with the Contractor's Technical Work Procedures.
 - 5. Installation of temporary barricades, gates, postings, and other controls prior to the start of graphite pile removal including but not limited to:
 - i. Establishment of all controls (e.g., radiological), temporary facilities, and services prior to the start of work.
 - ii. Establishment of waste staging areas in accordance with the WMP.

1.05 Temporary Ventilation, Contamination Control Containment and Contamination Control

A. The Contractor shall design, deliver, install and operate a temporary contamination control containment as further described below.

1. The physical size of the containment will be as small as practical to limit the collateral contamination of Building 701 structures, systems and components.
2. A State of NY Registered Professional Engineer shall approve the structural design of the containment; installation/erection of the containment shall be in accordance with the Engineer's instructions.
3. BSA will perform a NESHAP's evaluation of the Contractors ventilation system and the Contractor shall be responsible for implementing all requirements from that evaluation.
4. The ventilation exhaust stack height shall be at least 60' higher than Building 701 or located where it will not be subjected to eddy currents or wake events.
5. A Professional Engineer shall approve the design and installation of the HEPA systems, exhaust stack, and the electrical and mechanical component selection. This includes an evaluation of the system for the acceptance test criteria in ASME N510-1995.
6. A Professional Engineer shall approve the surveillance testing of HEPA filters, at each installation/replacement of filters in the systems, for compliance with the surveillance test criteria in ASME N510-1995.
7. The Contractor shall prepare a Technical Work Procedure for the installation, testing and operation of the contamination control containment.
8. The physical size of the containment will be of sufficient size to allow for the safe and efficient conduct of graphite pile and waste handling operations.
9. The contamination control containment will be designed considering ease of dismantlement and disposal upon completion of the work.
10. The contamination control containment will be operated at a demonstrable negative pressure to preclude the spread of contamination outside of the biological shield and/or the contamination control containment.
11. Air effluent from the contamination control containment will be HEPA filtered and continuously monitored, and limits on air effluent quality are subject to BSA approval.
12. The Contractor shall not allow the introduction of hazardous material (gasoline, diesel fuel, etc.) into the contaminant control containment that might violate the Draft Hazard Classification and Auditable Safety Analysis or result in the generation of mixed waste.
13. The contamination control containment will allow for the safe and efficient ingress and egress of personnel, equipment and waste containers while precluding the spread of contamination.
14. All penetrations through the contamination control containment shall be hermetically sealed.
15. The Contractor shall perform daily inspections of the integrity of the containment. Inspections must be performed before use/entry of the work shift. Inspection records must be maintained at the work area.
16. The Contractor shall perform constant real-time visual observation of work from outside the containment by installing strategically placed windows/observation portals and/or use of video monitoring and surveillance.
17. The Contractor shall provide for constant radio communications between workers inside the containment, as well as between workers inside the containment, with

- supervisors/monitors outside the containment. In addition, the Contractor shall provide an additional visual and audible alert system in the event of an emergency stop work order or evacuation.
18. The contractor shall provide for lighting within the containment sufficient for work and independent observation.
 19. When respiratory protection is required within the contamination control containment, BSA strongly encourages the Contractor to use air purifying respirators or powered air purifying respirators. If the Contractor elects to utilize a manifold breathing air system, BSA will require strict adherence to contamination control procedures and the utilization of good health physics practices.
 20. The contamination control containment will be removed from Building 701 and disposed of at the completion of work unless otherwise directed by BSA.
- B. The Contractor shall develop and use engineered controls, procedures and safeguards that will preclude the spread on contamination during graphite pile removal. BSA expects a defense –in-depth approach to the Contractor’s contamination control strategy.
1. The Contractor shall use fixative coating systems in and around the graphite pile and employ methods to minimize the spread of loose contamination during graphite pile removal. Fixative coatings shall be in compliance with BSA’s WMP, BSA’s disposal site waste acceptance criteria and subject to BSA approval. Under no circumstances shall the application of fixative coatings create the generation of mixed wastes or potentially unsafe conditions during curing of the fixative.
 2. Special tools shall be designed with the objective of minimizing the generation of dispersible contamination and debris as a result of graphite pile removal operations.
 3. Special tools shall be designed with the objective of minimizing the generation of airborne graphite fines that could result in an explosive environment inside of the biological shield cavity and contamination control containment (Draft Hazard Classification and Auditable Safety Analysis).

1.06 Contamination Control Performance Requirements

The Contractor shall design the contamination control containment (including temporary HVAC system), special tools and the graphite removal process with the objective of minimizing the generation of dispersible contamination, and providing for its collection and control at the point of generation. The Contractor’s design of the contamination control containment and temporary HVAC system, special tools and graphite removal process controls shall meet the quantitative contamination control performance requirements set forth below:

A. Zone 1: Inside of the Biological Shield Cavity.

At all times during graphite pile removal, airborne radionuclide concentrations inside of the biological shield cavity shall be continuously monitored by BSA. Airborne concentrations shall not exceed 100 DAC (10CFR835 Appendix A and C). Airborne concentrations in excess of 100 DAC shall be considered as a failure by the Contractor to meet BSA’s performance requirements. The Contractor shall promptly cease graphite removal operations, evaluate the cause(s) of the excessive airborne concentrations, and take corrective actions required to remedy this non-conforming condition. The resumption of graphite removal operations shall require prior BSA approval. Under no circumstances shall such disruptions to graphite pile removal be considered by the Contractor or BSA as a basis for a modification to the Contract.

B. Zone 2: Inside of the Contamination Control Containment.

1. Airborne Contamination.

At all times during graphite pile removal, airborne radionuclide concentrations inside of the contamination control containment shall be continuously monitored by BSA. Airborne concentrations shall be less than 0.5 DAC for areas and operations that do not require respiratory protection, and less than 100 DAC for areas and operations requiring respiratory protection. Airborne concentrations in excess of these limits shall be considered as a failure by the Contractor to meet BSA's performance requirements. The Contractor shall promptly cease graphite pile removal operations, evaluate the cause(s) of the excessive airborne concentrations, and take corrective actions required to remedy this non-conforming condition. The resumption of graphite removal operations shall require prior BSA approval. Under no circumstances shall such disruptions to graphite pile removal be considered by the Contractor or BSA as a basis for a modification to the Contract.

2. Surface Contamination

BSA shall frequently monitor surface contamination levels inside of the contamination control containment. At no time during graphite pile removal shall the average, loose contamination levels exceed the Table 1 values in Section 02 51 26 by a factor of more than 100 (i.e., the average permissible loose contamination levels are 100 times the Table 1 values). Average surface contamination levels in excess of these limits shall be considered as a failure by the Contractor to meet BSA's performance requirements. The Contractor shall promptly cease graphite pile removal operations, evaluate the cause(s) of the excessive airborne concentrations, and take corrective actions required to remedy this non-conforming condition. The resumption of graphite removal operations shall require prior BSA approval. Under no circumstances shall such disruptions to graphite pile removal be considered by the Contractor or BSA as a basis for a modification to the Contract.

C. Zone 3: Building 701 General Areas and Areas Adjacent to Pile, Biological Shield and Contamination Control Containment

BSA shall continuously monitor airborne radionuclide concentrations and frequently monitor surface contamination levels in Zone 3 areas. Airborne concentrations shall not exceed background, and loose surface contamination levels shall not exceed the values provided in Table 1 of Section 02 51 26. Airborne radionuclide concentrations above background, or unplanned loose surface contamination levels in excess of the Table 1 values caused by the Contractor's graphite removal activities shall be considered as a failure by the Contractor to meet BSA's performance requirements. The Contractor shall promptly cease graphite pile removal operations, evaluate the cause(s) of the excessive airborne concentrations, and take corrective actions required to remedy this non-conforming condition. The resumption of graphite removal operations shall require prior BSA approval. Under no circumstances shall such disruptions to graphite pile removal be considered by the Contractor or BSA as a basis for a modification to the Contract if the disruption was caused by either a contractor personnel error or failure of the contamination control enclosure. (Note: The Zone 3 loose contamination limits do not include contaminated work areas, deliberately planned by the Contractor and approved by BSA that are required to support the work, or loose contamination that was otherwise present prior to the Contractor's mobilization in Building 701)

1.07 ALARA

- A. The Contractor shall perform graphite pile removal with the objective of minimizing occupational radiation exposure ALARA. As part of its ALARA plan, the Contractor shall provide BSA with detailed radiation exposure estimates for the tasks comprising the graphite removal project. The Contractor shall monitor actual exposure against these estimates, and the Contractor shall make corrective actions required to remedy unfavorable radiation exposure trends. The contractor shall comply with the requirements of 10CFR835, Occupational Radiation Protection.
- B. The area inside of the biological shield is a highly contaminated and dangerous environment. BSA shall not permit the entry of Contractor personnel into this area for routine operations. The Contractor's approach to graphite pile removal shall be developed accordingly. Contractor personnel entry into the biological shield shall be considered on a non-routine, case-by-case basis and subject to specific BSA approval.
- C. Loaded supersacks with radiation dose rates in excess of 5,000 mrem at one (1) foot shall not be removed from the biological shield cavity without BSA approval. The Contractor shall immediately notify BSA in the event that a supersack with this high radiation dose rate is encountered. The Contractor will be required to develop a contingency plan to remove and transport such supersacks in accordance with ALARA principles and BSA Subject Matter Experts will be made available to provide technical assistance to the Contractor. All other filled supersacks/metal boxes shall be transported to the Waste Management Facility (Building 865) or other designated location within BNL without additional constraints but in accordance with BSA standards and procedures.

PART 2 - Products

Not used.

PART 3 - Execution

3.00 Examination

- A. When unanticipated mechanical, electrical, or structural elements are encountered that conflict with intended function or design, the Contractor shall investigate and determine the nature and extent of the conflict. The Contractor shall promptly submit a written report to the BSA.

3.01 Graphite Pile Removal, General

- A. The Contractor shall remove all graphite pile components (graphite and miscellaneous in-core components) only to the extent designated in the Contract. The Contractor shall employ methods required to complete the work within limitations described in the Contract and in accordance with the Contractor's submittals described herein.
- B. The Contractors special tools and dismantlement process will not result in the transfer of sensible heat to the graphite blocks. The maximum acceptable graphite temperature during graphite pile removal shall be less than 100⁰ Celsius. Processes such as high speed graphite saw cutting, milling, etc., will not be acceptable.

- C. The Contractor shall exercise extreme caution with all aspects of graphite pile removal to prevent the spread of contamination to uncontaminated areas. Should a previously clean area become contaminated as result of graphite pile removal activities, it shall be the Contractor's responsibility to decontaminate the affected area(s) to pre-contaminated conditions at its expense.
- D. The Contractor shall maintain work areas in accordance with the ES&H Plan, and in accordance with BSA's RWP requirements and other direction provided by BSA.
- E. Uncontrolled dropping of materials is not allowed.
- F. Lifts involving graphite or any other graphite pile components shall be considered a Critical Lift and subject to BSA's Critical Lift requirements.
- G. While removing the graphite pile the Contractor shall segregate all components that have the potential of containing hazardous constituents. The Contractor shall obtain BSA approval prior to packaging any miscellaneous components with the graphite.

3.02 Cleaning/Housekeeping

- A. The Contractor shall maintain radiological contamination levels ALARA. Decontamination by the Contractor shall be required for contamination exceeding the following conditions:
 - 1. Contamination levels for clean areas exceeding the limits of Table 1 in section 02 51 26.
 - 2. Average contamination levels for contamination areas outside the contamination control containment exceeding 20 times the limits of Table 1 in section 02 51 26.
 - 3. Average contamination levels inside of the contamination control containment exceeding 100 times the limits of Table 1 in section 02 51 26.
 - 4. BSA shall not permit unfavorable trends. The Contractor shall promptly evaluate contamination events outside of the contamination control containment, and corrective actions implemented to preclude event reoccurrence.
 - 5. The Contractor shall employ good housekeeping practices including, but not limited to: (1) removal of job control waste at the completion of each daily work shift and/or work evolution, which ever is shortest; (2) minimizing storage of materials and equipment within the containment; and (3) maintaining audio and visual capabilities.
- B. The Contractor shall clean all structures within the bounds of building 701 and remove dust, dirt, and debris caused by graphite pile removal operations, and return these areas to the conditions existing prior to the start of work.

END OF SECTION 02 44 00

DIVISION 02 – EXISTING CONDITIONS

SECTION 02 51 26 – RADIOACTIVE DECONTAMINATION

PART 1 - General

1.00 Related sections

- A. 00 01 01 – Statement of Work
- B. 02 81 00 – Waste Management & Transportation

1.01 References

- A. BNL Radiological Control Manual

1.02 General

- A. The Contractor shall be required to perform radioactive decontamination of equipment, structures and components as described below:

1. The Contractor is responsible for the removal of the temporary systems and equipment that it installs and uses in connection with graphite pile removal. Systems and equipment that the Contractor removes from the BNL Site shall be decontaminated by the Contractor to levels below the limits provided in Table 1. The extent to which such systems and equipment can not be decontaminated below these levels, the contaminated systems and equipment will be disposed of as low level radioactive waste. (Note: If the Contractor's equipment is contaminated and the Contractor wishes to remove such equipment from the BNL site, a valid Radioactive Material License will be required indicating that Contractor is authorized to receive and possess the radioactive material). The Contractor is responsible for the packaging of this waste in BSA – furnished intermodal containers, and transporting these containers to a designated waste staging area on the BNL Site. BSA will be responsible for the off-loading, off-site transportation and disposal of this waste. Note: This waste will be considered as secondary waste and subject to the 20 intermodal allowance for which BSA is responsible. BSA's on-site staging, off-site transportation and disposal of secondary waste volumes in excess of 20 intermodal containers shall be back-charged to the Contractor at a rate of \$50,000 per intermodal container.
2. The Contractor is responsible for decontaminating the exterior surfaces of B-25 boxes exiting the contamination control containment. Table 1 provides the acceptance criteria that shall be satisfied by the Contractor before the boxes will be permitted to be loaded on the Contractor's conveyance for transportation out of Building 701.
3. The Contractor is responsible, at its expense, for decontaminating Building 701 structures, systems and components outside of the contamination control containment that are contaminated as a result of the Contractor's graphite pile removal activities. The Contractor shall be responsible for decontaminating such Building 701 structures, systems and components to the baseline conditions recorded by BSA and the Contractor prior to the start of work. Radioactive wastes resulting from these decontamination activities shall be considered as secondary wastes, and managed as described in Paragraph 1, above.

- B. Project Conditions and Requirements

1. All items are considered potentially contaminated if they have been used or stored in Contamination, High Contamination, Airborne Radioactivity or Radiological Buffer Areas.
2. The Contractor shall establish a holding/inspection area to allow BSA radiological control technicians to perform radiological surveys.
 - a. The holding/inspection area shall be arranged such that routine access is prevented by means of barrier rope with appropriate posting to identify that the items contained are being held for survey. The area shall be off-limits to individuals other than Contractor and BSA radiological survey personnel.
3. The Contractor should assume that an aggressive decontamination effort will be required to achieve unrestricted release of items that have come in contact with radioactive materials or were used in contamination areas. Based on past experience using the best available technologies, decontamination to meet the Table 1 release criteria may be difficult to achieve. As such, tools and equipment used in Contamination, High Contamination, Airborne Radioactivity or Radiological Buffer areas for performance of the work are to be considered expendable. BSA shall not reimburse the Contractor for any tools and equipment that cannot be released for unrestricted use from the BNL Site.

1.03 Submittals

- A. The Contractor shall prepare and submit decontamination procedures for BSA approval. The submission shall include any manufacturer's technical information for decontamination or contamination controlling agents planned to be used by the Contractor. Any such agents require BSA's approval prior to use.
- B. The Contractor shall provide BSA with a list of all tools, equipment, and material to be brought on the BNL Site which have been previously used in radiological environments, including the following information:
 1. Previous use of the equipment;
 2. Dates of use;
 3. Levels of contamination; and,
 4. Radioisotopes involved.

The list must be submitted as soon as known but no less than 30 days in advance of bringing such items on the BNL Site. BSA reserves the right to reject the Contractor's request to bring these items on site.

1.04 Decontamination Methods

- A. The Contractor shall employ decontamination methods that minimize generation of secondary waste.
- B. BSA shall approve decontamination methods and procedures prior to work.

1.05 Definition of Removable and Fixed Contamination Levels

- A. A surface shall be considered contaminated if the removable or total radioactivity is detected above the BNL Radiological Control Manual. A partial excerpt is provided in the table below.

TABLE 1 – Removable and Fixed Contamination Levels

Nuclide	Removable (dpm/100 cm²)	Total (Fixed + Removable) (dpm/100cm²)
U-natural, U-235, U-238 and associated decay products	1,000 alpha	5,000 alpha
Transuranics, Ra-226, Ra-228, Th-230, Th-228, Pa-231, Ac-227, I-125, I-129	20	500
Th-nat, Th-232, Sr-90, Ra-223, Ra-224, U-232, I-126, I-131, I-133	200	1,000
Beta-gamma emitters (nuclides with decay modes other than alpha emission or spontaneous fission) except Sr-90 and others noted above. Includes mixed fission products containing Sr-90.	1,000 beta-gamma	5,000 beta-gamma
Tritium organic compounds, surfaces contaminated by HT, HTO, and metal tritide aerosols	10,000	10,000

PART 2 – Products

2.00 Contractor's Equipment

- A. The Contractor shall supply all labor equipment, tools, and material required to decontaminate structures, systems and equipment in connection with performing the work.
- B. For the purposes of meeting BSA's ALARA objective it is expected that:
 1. Reasonable efforts are to be used by the Contractor to remove residual contamination to the extent that there is no detectable contamination on items that were free of contamination prior to use; or,
 2. There is no increase in the level of contamination on items that were previously contaminated.
- C. All Contractor furnished tools, equipment, and material shall be surveyed for radioactive contamination by BSA personnel upon removal from contamination controlled areas.

2.01 Materials

- A. Use of any decontamination agents and fixative coating materials shall be in compliance with the Waste Acceptance Criteria (WAC) of BSA's disposal facilities.
 1. The Contractor shall deliver coating materials in original, new and unopened containers bearing the manufacturer's name, label, and the following information:
 - a. Name or title of material;
 - b. Manufacturer's stock number and date of manufacture;
 - c. Manufacturer's name;
 - d. Application instructions; and,
 - e. Material Safety Data Sheets.

PART 3 - Execution

3.00 Prevention of or Minimizing Contamination

- A. The Contractor shall plan and coordinate all work to minimize exposure of equipment and tools to potential radioactive contamination. Where possible, equipment shall be located in areas with the least potential for contamination.
- B. It is the Contractor's responsibility to evaluate materials, equipment, and tools for ease of decontamination and disassembly that may be required for decontamination prior to use on site. Use of unrestricted release items (i.e., those other than expendable) should incorporate appropriate precautions to prevent contamination, which should be implemented prior to and during use. Examples of precautionary measures shall include HEPA filters, protective coverings or wrappings, strippable coatings, or protective caps. In addition, all openings on equipment or tools that may permit contamination of inaccessible or difficult to clean areas shall be covered and protected. All items with inaccessible areas for survey shall require release authorization from a BSA designated material evaluator.
- C. The Contractor shall provide precautionary measures, such as protective coverings or wrappings, to prevent contamination of the exterior surfaces of the waste containers.

3.01 Methods of Decontamination Activities

- A. When selecting a decontamination technique, consideration shall be given to those technologies that minimize radiological airborne emissions, secondary wastes, and tool or equipment damage.
- B. The Contractor shall include the decontamination methodologies in a Technical Work Procedure subject to BSA review and approval.
- C. The Contractor shall provide for personnel decontamination including decon showers/facilities and, if used, water collection.

3.02 Waste Management Activities

- A. The Contractor shall control, collect, and package all waste generated as a result of its decontamination activities.

3.03 Relocation, Reuse, and Release of Tools, Equipment, Materials, and Waste Containers

- A. The Contractor shall perform all decontamination activities required to meet the levels identified in Table 1. BSA will perform all release surveys.
- B. The Contractor shall provide a minimum of 24 hours prior notice to BSA of its intent to remove tools and equipment from the work area.
- C. BSA radiological control technicians will conduct radiological surveys to release tools, equipment, material, and waste containers from Contamination Areas in accordance with BSA's Standard Operating Procedures and Radiological Control Manual.
- D. BSA will not permit the use of encapsulation or wrapping as a means of releasing tools and equipment for unrestricted use.

3.04 Final Cleaning of Biological Shield Cavity

- A. Following complete removal of the graphite pile, the Contractor shall remove all visible debris. After all the debris has been removed, the Contractor shall apply a fixative coating to all accessible interior surfaces of the biological shield cavity and the neutron shields.

3.05 Unsuccessful/Impractical Contractor Decontamination

- A. Decontamination may be considered impractical for non-expendable items that are integral parts of equipment and not readily replaceable such as porous materials (e.g., wood and fiberglass), wire rope, chains, brushes, items with finned surfaces, and similar items where contamination may be embedded within the material configuration matrix. These items may not be released if detectable contamination is identified on the surface. Items considered for release shall require release authorization from BSA.
- B. Should the Contractor's equipment or tools become contaminated, they shall have to be decontaminated. The Contractor shall perform decontamination of its equipment or tools to the extent practical at its expense, before removal from the area. If decontamination proves impractical or impossible, contaminated tools and equipment shall be disposed of as secondary waste.
- C. It shall be assumed that small tools used for decontamination work, HEPA vacuum cleaners, wooden scaffold, wooden ladders, and miscellaneous fibrous materials cannot be decontaminated and shall be disposed of as secondary waste.

3.06 Rinsate/Effluent Handling

- A. The Contractor shall collect all waste and effluent generated while removing and/or fixing contamination.
- B. The Contractor shall collect and process decontamination wastes prior to packaging in BSA-furnished containers. The Contractor's decontamination waste shall meet BSA's debris waste profile for disposal at Envirocare. Under no circumstances shall the Contractor generate mixed waste. The Contractor shall be responsible for the treatment and disposal of any mixed waste resulting from its decontamination activities.

END OF SECTION 02 51 26

DIVISION 02 – EXISTING CONDITIONS

SECTION 02 81 00 – WASTE MANAGEMENT & TRANSPORTATION

PART 1 - General

1.00 References

- A. Environmental Management Directorate Waste Management Plan, January 28, 2002
- B. BSA SBMS Environmental Management System Description for Environmental Management and Hazardous Materials Transportation
- C. BSA SBMS Subject Area's for Radioactive Waste Management
- D. BSA SBMS Subject Area's for Radioactive Waste Transportation On- and Off-site
- E. FS-SOP-1050, Radiological Survey for Radioactive Material Shipments
- F. 10 CFR 835 Appendix E
- G. 40 CFR 264.314 and 265.314
- H. 49 CFR 173.425, Table of Activity Limits, Excepted Quantities, and Articles

1.01 Related Sections

- A. Section 01 33 00 – Submittals
- B. Section 02 44 00 – Graphite Pile Removal
- C. Section 02 51 26 – Radioactive Decontamination

1.02 General – Waste Management

- A. The Contractor shall meet all of the requirements included in BSA's WMP.
- B. The Contractor shall sort, segregate, inspect and package all waste in accordance with the applicable requirements of the Nevada Test Site or Envirocare (Energy Solutions) waste acceptance criteria.
- C. The contractor shall employ means and methods to prevent the generation of mixed and transuranic wastes.

1.03 General – Waste Packaging

- A. The Contractor shall be responsible for loading BSA-furnished waste containers with graphite resulting from the Contractor's removal of the graphite pile. BSA will provide 145 cu. ft. supersacks used for loading graphite segments that will be placed into 145 cu. ft. DOT TYPE IP-1 containers. BSA will provide separate DOT TYPE IP-1 96 cu. ft. containers as necessary for any anomalous materials found during the removal of the pile.

- B. The Contractor shall obtain a minimum of a 60% (**net graphite weight of 8700 lbs.**) packaging efficiency when loading IP-1 containers with graphite segments.
- C. The Contractor shall deliver the loaded waste containers to the BSA's Waste Management Facility or another designated staging area on the BNL Site.
- D. The Contractor shall be required to perform waste inspection and verification activities during the course of waste container loading. Waste inspection and verification shall include a method to witness and record via remote video to document the inventory of material placed into the waste containers (IP-1 containers). BSA will independently perform inspection and concurrent with the Contractor's waste inspection and verification.
- E. The Contractor shall be responsible for the collection and packaging of miscellaneous pile debris (shield plugs, membrane, etc.) in accordance with the BSA's WMP.
- F. Secondary waste packaged in BSA provided containers shall be delivered by the contractor to BSA's Waste Management Facility or a designated area on the BNL Site. Cost for the off-site transportation and disposal of secondary waste shall be the responsibility of BSA up to a maximum volume of 20 intermodal containers. Costs for disposal containers, transportation and disposal of any secondary waste generated in excess of 20 intermodal containers shall be back-charged to the Contractor at a rate of \$50,000 per intermodal container.
- G. The Contractor shall provide a method for accurately determining the weight of the loaded waste containers.
- H. The Contractor shall ensure that prohibited waste items are sorted and segregated from the wastes loaded in the containers by the Contractor. Rework, including unpacking and repacking of waste containers and all related costs shall be at the expense of the Contractor.
- I. The Contractor shall be responsible for all waste handling operations within Building 701.
- J. The Contractor shall protect waste containers from puncture, denting, scrapping or otherwise damaging the containers in any way.
- K. The Contractor shall seal each container according to the manufactures specification after BSA approves the waste container packaging and contents.
- L. The Contractor shall develop written procedures for the packaging and handling of waste.

1.04 General – Waste Transportation

- A. The Contractor shall load the waste containers onto trucks for transportation to BSA's Waste Management Facility or another designated staging area on the BNL Site. Packages will be off loaded and stored by BSA personnel. The Contractor shall schedule and coordinate these activities closely with BSA.
- B. The trucks and trailers supplied by the Contractor shall be in proper mechanical condition and will meet the requirements for over the road use. The Contractor shall ensure that the drivers of loads comply with BSA site speed limits, routing requirements, and PPE requirements in areas of loading and unloading materials.

- C. The Contractor shall decontaminate the waste containers in accordance with Section 02 51 26 (Radioactive Decontamination).
- D. The Contractor shall ensure that their operators of waste transportation vehicles are in possession of a BSA Waste Control Form at all times when transporting waste outside of the work area. BSA will complete the Waste Control Forms and provide the completed forms to the Contractor.
- E. The Contractor's vehicle operators shall have a valid commercial drivers license with a hazardous materials endorsement.
- F. Contractor personnel involved with waste transportation on the BNL Site shall be trained to transport radiological and hazardous waste on BNL property. This involves BSA training part A&B of "Transportation of Hazardous Material (TQ-HAZMAT-A/B)"
- G. The Contractor shall develop written procedures to control all work being performed to transport the waste to the Waste Management Facility or another designated area on the BNL Site.

PART 2 - Products

2.00 Equipment

- A. The Contractor shall supply all equipment required for sizing waste and loading waste into BSA-furnished containers, and the equipment for safely handling, loading and transporting loaded waste containers to BSA's Waste Management Facility or another designated area on the BNL Site.

PART 3 - Execution

3.00 Collection and Disposal of Office Waste

- A. Prohibited items that are suspected to be radiologically contaminated, or items not normally discarded into office area trash containers shall be segregated by the Contractor from typical office trash. Prohibited items include, but are not limited to:
 - Tools,
 - Equipment,
 - Mop heads,
 - Hose clamps,
 - Floor sweepings,
 - Aerosol cans,
 - High density material,
 - Personal protective clothing (PPE),
 - Yellow masslinn,
 - Yellow tape/Rad Con tape,
 - Herculite,
 - Yellow shoe covers,
 - Radiological smears,
 - Radiological safety signs,
 - Plastic sample bottles, and

- Survey instrument cords.
- B. If any prohibited or suspect materials are found, the Contractor shall notify BSA.
- C. If tools or equipment are found in office area trash containers, the Contractor shall contact BSA for radiological evaluation and the procedure for decontamination and/or disposition.
- D. The Contractor shall place office trash in a designated area agreed upon by BSA and the Contractor. BSA will collect office trash daily.

3.01 Waste Storage Areas

- A. The Contractor shall be responsible for maintenance and upkeep of the waste storage areas in accordance with the WMP.
- B. Signs shall be posted in storage areas identifying empty or full containers.
- C. It shall be the Contractor's responsibility to ensure that loading capacity of the waste storage area floors is not exceeded. Floor loadings within Building 701 are described in the BGRR Technical Manual.

3.02 Loading Containers

- A. The Contractor shall fill containers such that the interior volume is efficiently and compactly loaded as practical up to the maximum gross weight limit of the container. Contents shall be prepared for containerization so as to minimize load shifting or damage to the container during movement.

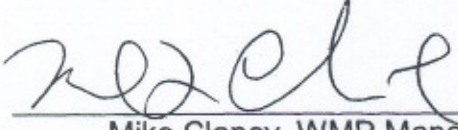
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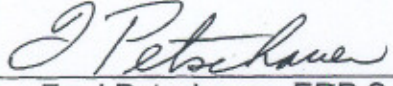
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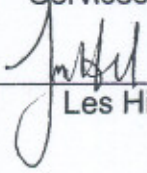
Waste Management Plan for the BGRR Graphite Pile Removal

WASTE MANAGEMENT PLAN
For the
BGRR Graphite Pile Removal

January 11, 2006

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Revision 0



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LIST OF ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
BGRR	Brookhaven Graphite Research Reactor
BNL	Brookhaven National Laboratory
BOA	Basic Ordering Agreement
BHSO	Brookhaven Site Office
BSA	Brookhaven Science Associates
BTMS	Brookhaven Training Management System
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
D&D	Decontamination and Decommissioning
DOE	Department of Energy
DOT	Department of Transportation
ECR	Environmental Compliance Representative
ERP	Environmental Restoration Projects
EPA	Environmental Protection Agency
ES&H	Environmental Safety & Health
EWMS	Environmental and Waste Management Services
FE	Field Engineer
FS	Facility Support
IH	Industrial Hygiene
IPABS/SDD	Integrated Planning, Accountability and Budgeting/Stream Disposition Data
IS	Information System
ISM	Isotopes and Special Materials
JSA	Job Safety Analysis
JTA	Job Training Analysis
LLRW	Low-Level Radiological Waste
NTS	Nevada Test Site
PE	Project Engineer
PM	Project Manager
PPE	Personal Protective Equipment
RCT	Radiological Control Technician
RWCF	Radioactive Waste Control Form
SBMS	Standards Based Management System
TBD	Technical Basis Document
TWD	Technical Work Document
WAC	Waste Acceptance Criteria
WCO	Waste Certification Official
WCPP	Waste Certification Program Plan
WM	Waste Manager
WMC	Waste Management Coordinator
WMP	Waste Management Plan

1.0 OBJECTIVE AND PROJECT SCOPE OF WORK

The purpose of this Waste Management Plan (WMP) is to specify the requirements for the management of wastes resulting from the removal of the Brookhaven National Laboratory's (BNL) Brookhaven Graphite Research Reactor (BGRR) graphite pile and includes the handling, packaging, and on-site transportation and storage of these wastes.

The scope covered under this WMP includes:

- Packaging of the bioshield top shield plugs, material associated with the aluminum upper air membrane, miscellaneous debris, and approximately 60,000 blocks of graphite into waste containers,
- Packaging of secondary waste including personnel protective clothing, depleted HEPA filters, graphite pile removal equipment and containment construction material, and other miscellaneous waste into waste containers,
- Inspection, verification, characterization and documentation of waste loading operations and loaded waste required to meet waste profile and burial site waste acceptance criteria and,
- Transporting the waste containers from Building 701 to the Waste Management Facility (Building 865) or another designated storage area on the BNL site.
- The establishing and maintenance of Waste Accumulation Areas

2.0 WASTE MANAGEMENT PLAN OVERVIEW

Brookhaven Science Associates (BSA) has overall responsibility for managing the graphite pile removed waste. BSA's subcontractor, responsible for graphite pile removal, will be assigned certain waste management tasks and responsibilities as described herein.

The BSA's graphite pile removal subcontractor is responsible to remove all graphite blocks and miscellaneous graphite pile components defined in BSA's technical specifications. Waste containers will be filled compliant with the waste acceptance criteria of the Nevada Test Site, Energy Solutions of Utah, or otherwise designated disposal facility and all applicable BSA procedures and standards. Additionally, the graphite pile removal subcontractor will install video monitoring equipment and record all waste loading operations. Provisions will be made for BSA to view all waste loading operations. The graphite pile removal subcontractor will provide written documentation of the inventory of each waste container.

Waste to be removed and handled by the graphite pile removal subcontractor includes the bioshield top shield plugs and the upper airtight membrane. These items will be packaged into BSA provided containers, such as intermodal containers and 144 cu. ft. DOT TYPE IP-1 steel containers. Graphite removed will be loaded directly into BSA provided soft-sided containers (supersacks). Filled soft-sided containers will be placed inside 144 cubic foot, DOT TYPE IP-1 steel containers by the graphite pile removal subcontractor.

The graphite pile removal subcontractor will be responsible to pick-up BSA provided containers from the BSA designated central storage area for use within Building 701. These containers will include the soft-sided containers (supersacks), DOT TYPE IP-1 steel containers,

as well as the intermodal or equivalent containers. The pile removal subcontractor will also provide the transportation of filled containers to Building 865 or other BSA designated lay down area. The pile removal subcontractor will ensure that the outside of the container is free of loose contamination (< 1000 dpm/100 sq. cm.) prior to transport to Building 865 or a designated BSA staging area. BSA Radiation Control Division personnel will perform the required contamination survey.

BSA is responsible to remove selected items from the pile prior to the mobilization of the pile removal contractor. These items will include the control rods, cadmium coated boron shot balls, thermocouples, removable core, and miscellaneous items in experimental ports. If during the project, the pile removal contractor identifies any miscellaneous items not previously removed by BSA, the pile removal contractor will remove such items and package into designated BSA supplied containers. The pile removal contractor is responsible for identifying non-conforming waste items (as defined by the waste site waste acceptance criteria and the approved waste profile) and for separating them from the graphite waste stream for BSA disposition.

BSA will provide all agreed upon waste disposal containers and packages to the pile removal contractor. Disposal containers and packages will be stored at a central location within the BNL property, ready for pick-up by the graphite pile removal subcontractor. The BSA Container Custodian or designee will be responsible for maintaining the central storage location and coordinating the pick-up of the containers. BSA will be responsible for characterizing all waste associated with removal of the pile and shall perform independent waste verification of all waste loading operations. BSA will complete Radioactive Waste Control Forms, which shall be approved by Environmental and Waste Management Services Division (EWMSD) staff prior to transporting waste from Building 701 to Building 865, or designated BSA staging area. BSA will complete all radiological surveys and shipping paperwork in order to meet all the Department of Transportation (DOT) and selected waste disposal site's waste acceptance criteria prior to shipment.

3.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

Applicable or Relevant and Appropriate Requirements (ARARs) are substantive environmental requirements, cleanup standards, and standards of control that must be adhered to during implementation of this project. ARARs applicable to the management of the graphite pile removal waste are as follows:

- BGRR Record of Decision, March 17, 2005
- 10 CFR 835, Occupational Radiation Protection
- 10 CFR 830.120, Quality Assurance Requirements
- 49 CFR 172 through 179, Transportation Requirements
- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)
- DOE Order 435.1, Radioactive Waste Management, U.S. Department of Energy (DOE), Office of Environmental Management
- DOE Manual 435.1, Radioactive Waste Management Manual, U.S. DOE, Office of Environmental Management, June 19, 2001
- DOE Orders 460.1 and 460.2, Transportation of Hazardous Material

- BNL SBMS Environmental Management System Description for Environmental Management and Hazardous Materials Transportation
- BNL SBMS Subject Areas for Radioactive Waste Management
- BNL SBMS Subject Areas for Hazardous Materials Transportation On- and Off site
- Nevada Test Site Waste Acceptance Criteria
- Energy Solutions of Utah Waste Acceptance Criteria

4.0 HISTORICAL DESCRIPTION

The BGRR at BNL 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 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, de-fueling 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 with the discovery and subsequent removal of approximately 60,000 gallons of contaminated water that had infiltrated and accumulated in the below ground ducts. Additional decommissioning activities to date have included the dispositioning of:

- Experimental equipment and systems from the reactor building;
- Reactor exhaust fans, motors, valves and instruments;
- Pile fan sump, pipes and associated contaminated soil;
- Above-ground ducts, pipes and associated contaminated soil;
- Canal house and water treatment house, along with associated equipment, pipes, asphalt, concrete and accessible contaminated soils;
- Reactor exhaust cooling coils, filters and primary liner (partial);
- Portion of the fuel canal outside the structural foundation footprint of the reactor building and accessible subsurface contaminated soil in the vicinity of the fuel canal, below-ground duct expansion joint #4 and secondary cooling air bustle; and
- Isolation of the below-ground duct and demolition of the instrument house;

In 2005, the BGRR Record Of Decision (ROD) was signed by the U.S. Environmental Protection Agency (EPA), New York Department of Environmental Conservation (NYDEC) and, the DOE. This agreement requires the removal and disposal of the BGRR graphite pile.

5.0 ROLES AND RESPONSIBILITIES

Roles and responsibilities for managing the graphite pile removal wastes are described herein.

Environmental Restoration Projects (ERP) Directorate Support Services General Manager (ERP SSGM): This individual reports to the ERP Director and is responsible to oversee the programmatic disposition of the pile waste stream. It is the SSGM's responsibility to:

- Ensure that all personnel working on the pile removal project follow the requirements, procedures, and restrictions outlined in this WMP.
- Ensure that the EWMS Division is staffed appropriately to support the pile removal and that sufficient waste management resources are available.
- Revise this WMP, as necessary, and process through an ERP review and approval cycle as described in ERP procedure ER-OPM-1.3.
- Review and approve all changes in procedures and work activities associated with this WMP.
- Authorize all WMP governed work to proceed.
- Review and approve any condition reports or occurrence reports related to this WMP.
- Inform the ERP Director and DOE of progress, issues and changes to the plan.

ERP Waste Manager (WM): The WM manages and coordinates the handling and disposal of all pile hazardous, radioactive, and mixed wastes packaged by the pile removal contractor. The WM is responsible for the integration of sound waste management practices into the pile removal project and to ensure that waste is properly planned for and budgeted, minimized, characterized, and disposed of in a manner that is cost-effective and in compliance with all applicable regulations and waste acceptance criteria. The WM ensures that all burial site criteria and Environmental and Waste Management Services (EWMS) Division requirements governing waste management are met. The BGRR WM responsibilities also include:

- Act as the Waste Generator and be responsible for Rad Waste Control Forms (RWCF).
- Review project waste profiles for selected waste disposal site.
- Review updates and changes to this plan.
- Review waste management audits and inspection results related to the project.
- Inform the Deputy Division Manager for Waste Programs of the EWMS Division of any issues and changes related to the management and disposal of project wastes.
- Maintain the waste inventory.
- Oversee day-to-day fieldwork related to the generation, transport and shipping of wastes.
- Assist the Field Engineers (FEs) in performing routine waste accumulation area compliance inspections.
- Act as the primary liaison between the EWMS Division and the project staff.
- Establish and authorize waste storage areas for the project in accordance with BNL requirements.
- Act as the "Accumulation Area" manager for the project for the accumulation of radioactive, hazardous and mixed wastes.
- Assist in identifying and implementing pollution prevention and waste minimization techniques.
- Assist in developing integrated contracting strategies for waste transport and disposal.
- Review pile removal project plans and documents related to the management of waste materials. Coordinate the technical reviews of such plans and documents.
- Ensure personnel from EWMS are available for independent verification of waste packages.
- Act in the capacity of Container Custodian. The Container Custodian is responsible for pre-use inspections and maintaining control over the waste containers from their arrival on-site to their departure off-site.

Waste Management Coordinator (WMC): The WMC for this project will be the EWMS Division Deputy Waste Programs Manager. The WMC will provide technical direction to the ERP WM and the pile removal contractor regarding requirements for managing hazardous, radioactive and mixed wastes generated from this project. The WMC provides guidance to this project on the proper implementation of the EWMS Division requirements governing waste management and ensures that waste management activities are in compliance with all applicable regulations and waste acceptance criteria. The WMC responsibilities also include:

- Provide oversight of graphite pile waste management activities.
- Provide technical direction of EWMS Division staff matrixed to graphite pile removal project.
- Review and approve project WMP's including updates and changes.
- Inform the Manager of EWMS Division of any issues and changes related to the management and disposal of project wastes.
- Act in the capacity of the NTS Waste Certification Official (WCO).
- Contract officer representative (COR) of the project's waste management Basic Ordering Agreement (BOA) contracts; interfacing with disposal site operators.
- Notify DOE prior to the shipment of any radioactive material and obtain approval as required.
- Review and approve all characterization plans.
- Review and countersign all shipping documents (e.g. manifest, bill of lading).

Environmental Compliance Representative (ECR): The ECR provides:

- Technical support guidance and coordination related to environmental compliance issues.
- Review of pollution prevention and waste minimization opportunities for waste materials generated by this project.

The Radiation Protection Manager (RPM): The RPM is responsible for implementation of the requirements of the BNL Radiological Control Manual and all Facility Support Radiological Control procedures. The RPM is responsible to:

- Oversee and coordinate radiation/contamination surveys of waste containers generated during the graphite pile removal project.
- Ensure that there is a sufficient quantity of qualified RCT's available to support the graphite pile removal waste management activities.
- Ensure waste shipments from Building 701 to Building 865, are properly monitored and performed in accordance with BSA standards and procedures.
- Coordinate and approve radiation work permits.
- Supervise radiation monitoring and surveillance activities.
- Conduct radiological assessments.

Radiological Control Technicians (RCTs): The RCTs implement radiation safety procedures and requirements of the BSA Radiological Control Manual. Specifically RCTs:

- Monitor radiation safety.

- Report non-conforming conditions.
- Assure that all work is conducted in accordance with the applicable RWP's and all other BSA radiological requirements.
- Conduct radiological surveys required to support waste management activities including surveys of personnel, equipment, containers and transport vehicles.
- Complete applicable sections of radioactive waste labels and RWCFs.
- Release items including equipment, instruments, trucks, and rail cars from radiologically controlled areas.

Waste Verifier (WV): The BSA waste verifier will be responsible for overseeing all waste loading operations and will be responsible to:

- Confirm that all waste containers are inspected prior to usage and document.
- Observe the loading of waste containers.
- Ensure that the loaded waste meets the disposal site WAC.
- Verify that no non-conforming wastes are inadvertently added to packages.
- Confirm package weights.
- Document the inventory of container contents.

Graphite Pile Removal Subcontractor Project Manager (PM):

- Ensure that all subcontractor personnel working on the pile removal project follow the applicable requirements, procedures, and restrictions outlined in this WMP.
- Responsible for the pick-up and loading of all waste disposal containers and packages generated from the pile removal project.
- Ensure waste verification (video and documentation) for all loading operations are performed.
- Transport and place loaded packages to Building 865 or a designated BSA storage location.
- Ensure that all waste containers are inspected, documented and approved prior to filling.
- Ensure that the driver for the loaded container vehicle holds a current CDL license stamped with a hazardous material endorsement.
- Ensure that all materials, equipment, and vehicles are BSA inspected and approved prior to usage.
- Ensure that on site transportation of waste is in accordance with the BSA provided Safety Assessment Methodology (SAM) form as described in section 11.1 of this document.
- Ensure that all vehicle pre-use and post loading inspections are performed and documented.

6.0 ERP DIVISION LEVEL PLANNING

6.1 Cost-savings Initiatives

Cost-saving strategies for the BGRR graphite pile removal project include the following:

- The potential reuse of tools and equipment contaminated on previous BNL cleanup projects. Such equipment includes Brokk manipulators, the Super Vac, and HEPA ventilation equipment.
- Evaluation of optimal transport modes from BNL to the NTS.

In addition, costs will be avoided by following programmatic infrastructure requirements, including the Standards Based Management System (SBMS), and this Waste Management Plan.

6.2 Exemption Process

Portions of the graphite pile removal waste stream are planned to be disposed of at a commercial disposal facility (Energy Solutions of Utah). BSA will submit a Commercial Disposal Exemption Request (DOE Order 435.1) for DOE approval. For mixed low-level wastes generated (though it is not anticipated), the DOE's complex-wide mixed waste exemption for its disposal will be used.

7.0 PLANNED WASTE GENERATION

Planned waste streams resulting from graphite pile removal include:

Type of Material	Waste Type	Quantity	Planned Disposal Site
Graphite Blocks, Graphite Debris and Misc In-core Components (Packaged in Disposal Container)	LLRW (standard)	964 yd ³	Nevada Test Site
Upper Airtight Membrane Removable Concrete Plugs (Packaged in Disposal Container)	LLRW (standard & o/s debris)	217 yd ³	Energy Solutions, Clive, UT
PPE/Filter Elements/Misc. Secondary Wastes (Packaged in Disposal Container)	LLRW (standard)	276 yd ³	Energy Solutions, Clive, UT
Radioactive Waste Oil (Brokk machine)	Radioactive Waste Oil	110 gallons	Energy Solutions, Clive, UT

Graphite Blocks, Graphite Debris and In-Core Pile Metallic Components - The graphite pile consists of approximately 60,000 graphite blocks and in-core metallic components such as: Restraining Rods and, metal sleeves from the boron shot wells. The graphite blocks are each 4" by 4" with varying lengths, assembled into a cube which measures 25' - 0" on all sides. The total volume of the graphite pile and debris waste is 578 cubic yards in its constructed state. An estimated 964 cubic yards of as-packaged graphite waste will be disposed at NTS when accounting for a 60% packaging efficiency.

Metal / Metal Plate/Removable Concrete Plugs - Approximately 217 cubic yards of low-level radioactive waste will be packaged including the bioshield removable concrete plugs and pile upper airtight membrane. This low-level radioactive waste is planned for disposal at the commercial disposal facility (Energy Solutions of Utah).

PPE/Filter Elements/Misc. Secondary Wastes – Dry Active Waste (DAW) generated from protective clothing (PPE), depleted filter elements from HEPA ventilation systems, and miscellaneous debris such as contamination control containments, tooling etc. generated during pile removal will result in 276 cubic yards of packaged low-level radioactive waste and be disposed as low-level radioactive waste at the commercial disposal facility (Energy Solutions of Utah). BSA estimates that 110 gallons of radioactive waste oil will be generated from oil changes of the Brokk. The waste oil will be packaged into DOT approved drums and disposed as low-level radioactive waste at the commercial disposal facility (Energy Solutions of Utah).

8.0 POLLUTION PREVENTION AND WASTE MINIMIZATION

Some methods that will be employed to minimize wastes generated during the pile removal project include the following:

- Construction of a pile containment to prevent the spread of contamination that will avoid cross contamination of clean areas and equipment and thereby minimize waste generation.
- Segregating wastes in order to separate clean industrial waste from contaminated equipment and components.
- Using graphite pile removal methods that minimize volumes of debris.
- Minimize consumable materials brought into radiologically controlled areas.
- Ensuring that BSA's graphite pile removal subcontractor meets the minimum required packaging efficiency.

8.1 Segregation

All wastes generated will be segregated and stored in a manner that will facilitate their effective management and disposal. To the extent possible, non-hazardous/non-radioactive, hazardous, and radioactive wastes will be segregated and containerized based upon the waste's classification.

8.2 Treatment On-site

On-site treatment operations will be limited to those actions that are required to meet the requirements of the selected waste disposal facility. This will include the size-reduction of graphite pile components to conform to waste disposal site's waste acceptance criteria (WAC) for its disposal as well as ensure a proper fit into designated waste containers. Additionally, the pile subcontractor will use proactive measures to prevent the presence of freestanding liquids in the final waste packages. This will be accomplished by employing the use of absorbents inside of waste packages that may contain moisture. All materials used will be approved by the BSA WCO to ensure compliance with the selected waste disposal facilities WAC.

8.3 Release of Waste and Property Contaminated with Residual Radioactivity

All property and equipment potentially contaminated with residual radioactivity will be surveyed and evaluated in accordance with BSA Radiological Control Division procedures to

ensure all standards are met prior to release.

8.4 Metals Recycling

Recyclable metals will not be generated during BGRR graphite pile removal project.

8.5 Property Transfer and Reuse of DOE Property and Waste in Lieu of Disposal

It is anticipated that some DOE property from the BGRR Canal and Deep Soil Pocket Excavation and Removal Project may be transferred and reused. Specifically, the following equipment will be made available to BSA's graphite pile removal subcontractor for reuse:

- Bobcat with scarifier
- Two (2) 6,000 CFM HEPA fan units
- One (1) 10-ton Spanco trackless gantry crane
- Two (2) Brokk Model 330D remote manipulator and various attachments
- Propane powered Hi-Vac system

Upon completion of the project the DOE equipment used by the subcontractor will be returned to the DOE in the same condition as before it was used. This includes contamination levels as well as operability.

8.6 Management of Excess Lead

Graphite pile removal activities under this WMP will not include the removal of structures, systems and components containing lead.

9.0 WASTE CHARACTERIZATION AND PROFILING

BSA personnel have completed the characterization of the graphite pile. Samples were selected and sent to an approved lab for both radiological and hazardous constituent analyses. Analytical procedures included:

- TCLP on graphite and selected components
- Gamma spectroscopy
- Alpha spectroscopy
- Gross Beta and Strontium-90, Tritium
- PCBs/Pesticides
- Physical parameters (pH, reactivity, flashpoint, etc. per waste site WAC)

The sampling methodologies and analytical results are documented in the "BGRR Determination of Radionuclide Inventory of the Graphite Pile for Waste Stream Characterization and Waste Acceptance Criteria Compliance" dated December 2005.

9.1 Waste Certification

To ensure that the requirements of the NTS waste acceptance criteria are met, RCRA Hazardous and Radiological Waste Characterization Technical Basis Documents (TBD) will be generated by BSA and all Low-Level Radioactive Waste (LLRW) that is generated will be

managed in accordance with BSA's Waste Certification Program Plan (WCPP). Included in the WCPP are requirements for waste characterization, analytical laboratories, on-site control and certification, waste package inventory and container selection, documentation and qualified waste certifiers. Confirmatory sampling of all waste streams will be performed at a frequency determined by BNL's EWMS Division and will be in compliance with BNL's approved waste profile for the specific disposal facility (NTS or Energy Solutions). Specifically, all loaded DOT TYPE IP-1 steel containers will have a gamma spectroscopy performed prior to transportation to NTS. Secondary waste destined for Energy Solutions will be compliant with the disposal site WAC for the specific container/package that is being used (for example, one composite sample for every 5 rail cars). Additionally, Scaling factors will be derived from the data presented in "BGRR Determination of Radionuclide Inventory of the Graphite Pile for Waste Stream Characterization and Waste Acceptance Criteria Compliance" and will include all significant isotopes (>1%) identified in the report. The scaling factors will be generated by the ERP Radiological Engineer and approved by the BNL NTS Waste Certification Official (WCO) prior to the commencement of graphite pile removal. It is anticipated that no further physical sampling of the graphite pile containers will be needed based on the prior characterization of the graphite pile as described above.

10.0 CONTROL OF DECONTAMINATION & DECOMMISSIONING (D&D) WASTES

The ERP Directorate is responsible to control all wastes generated from D&D projects at BNL. The ERP Directorate will ensure that all wastes are being managed under the appropriate BNL Standards Based Management System (SBMS) guideline as well as the BSA Waste Certification Program Plan (WCPP). Specific areas of D&D projects to be controlled by the ERP Directorate are:

10.1 BNL Waste Management Subject Areas

The BNL Standards Based Management System (SBMS) contains five Subject Areas applicable to managing wastes:

- Radioactive Waste Management
- Hazardous Waste Management
- Mixed Waste Management
- Industrial Waste Management
- Liquid Effluent Management

10.2 Interim Storage of Wastes

The environmental restoration program shall meet the requirements of the applicable SBMS documents for managing wastes:

- Meeting training requirements
- Segregating wastes
- Maintaining inventory
- Labeling wastes
- Completing Radioactive Waste Control Forms (RWCFs)

- Receive approval of the waste storage areas from the EWMS Division Deputy Waste Programs Manager
- Posting of storage and accumulation areas
- Providing spill containment
- Performing routine inspections

Radioactive waste staging will not be allowed to exceed 90 days at Building 701. All waste staging areas will be pre-approved by BNL's EWMS Division in accordance with the applicable SBMS requirements.

10.3 Container, Package and Conveyance Requirements

Containers

The container is considered the receptacle for the waste generated from the pile removal project. Anticipated waste containers for the pile removal project include soft-sided containers (supersacks) and, intermodals (or equivalent). The BSA Container Custodian or designee is responsible to visually inspect and document any findings of each container prior to use as well as maintain control over the waste containers from their arrival on-site to their departure off-site. This includes ensuring that containers are stored to prevent damage and secured to prevent the unauthorized addition of wastes.

All waste containers will meet the requirements of the Waste Certification Program Plan (WCPP). BSA EWMS Division personnel will inspect the new containers before use as well as observe the filling of each container and the final closure of each container.

Packages

The term package is used for shipping purposes and will be the final form of the waste prior to loading onto a waste conveyance. The "declared" package will be used to manifest each shipment. The waste container may be used as the "declared" package as well. The following waste packages are anticipated for the graphite pile removal wastes: Intermodals (or equivalent), DOT TYPE IP-1 steel containers and shielded containers. All packages will be QA/QC inspected by BSA's EWMS Division upon receipt on the BNL site and shall bear a green BNL QA Incoming Inspection Tag indicating acceptance for use. All waste will be placed into approved waste packages in accordance with the requirements specified in Title 49 of the Code of Federal Regulations (CFR). Packaged waste shall also be inspected in accordance with applicable SBMS requirements. The ERP Container Custodian or designee will be required to visually inspect each package prior to use as well as maintain control over the waste packages from their arrival on-site to their departure off-site. This includes ensuring that the packages are stored to prevent damage.

Conveyance

The conveyance is the mode of transportation used to deliver the package to the selected off-site disposal facility. BSA will be responsible for providing the conveyances for the graphite pile removal wastes. The anticipated conveyances for the graphite pile removal wastes are tractor-trailer, flatbed railcar, and shielded vans. The conveyance will be QA/QC inspected by BSA's EWMS Division upon receipt on the BNL site. BSA Radiological Control Division (RCD) will survey each conveyance prior to loading and upon completion of loading. BSA RCD will ensure that all DOT radiological requirements have been met prior to releasing the

conveyance off site. The conveyance will be loaded and shipped in accordance with the requirements specified in Title 49 of the Code of Federal Regulations (CFR). The conveyance shall also be QA/QC inspected by BSA's EWMS Division prior to leaving the BNL site.

10.4 Documentation and Record Keeping

The waste generator (ERP WM) or designee shall complete a Radioactive Waste Control Form (RWCF) for each container of low-level radioactive waste generated. If necessary, Hazardous and Mixed Waste Control forms also will be generated. All waste forms will be reviewed by the EWMS Division WCO for waste acceptance and compliance with the approved waste profile and the Waste Acceptance Criteria of the disposal facility. Additional documents that the waste generator shall maintain include the inspection records, characterization documents, and container video records and inventory sheets.

11.0 WASTE TRANSPORTATION REQUIREMENTS

11.1 Applicable Requirements

Transportation of materials and wastes will be conducted in accordance with the following BNL Standard Based Management System (SBMS) procedures:

- Transfer of Radioactive Material On-site
- Hazardous Material Transportation Manual
- Transfer of Hazardous and Radioactive Materials On-site

A Safety Assessment Methodology (SAM) form will be prepared by the ERP WM and approved by the BSA Transportation Safety Officer or Subject Matter Expert (SME) prior to transporting waste on the BNL site. This form will include various BSA requirements such as routing and any radiological or transport time restrictions. The BSA subcontractor will be responsible to provide the appropriate tractor and flatbed trailer as well as all blocking and bracing materials needed to secure loads. The operator of the vehicle must hold a current CDL license stamped with a hazardous material endorsement. All materials, vehicles, equipment and driver qualifications will be subject to BSA inspection and approval prior to use to ensure safe operability. Inspections to be performed and documented by the subcontractor will include vehicle maintenance schedules, daily pre-use inspection checklists as well as the inspection of the loaded trucks to ensure proper blocking and bracing prior to transporting to Building 865 or BSA designated lay down area.

11.2 Applicability to ERP Activities

On-site transportation refers to the movement of waste via a motorized means within the confines of the BNL property and roadways. Any waste that contains more than one (1) gram of fissile material (Pu-238, Pu-239, and U-235) must have the Safeguards and Securities Isotopes and Special Materials (IS&M) Group's permission to transport the waste (NOTE: The graphite pile removal is not expected to generate wastes exceeding this one gram threshold). Subcontractor-furnished vehicles will transport the wastes from Building 701 to Building 865 or BSA designated lay down area. The approved route to each of the designated

lay down areas is shown in Figure 1. An approved RWCF will accompany each shipment.

BSA's RCT's will perform release and transportation surveys for all on-site shipments of waste. The BSA RPM or designee will authorize the release of trucks, equipment and containers from radiologically controlled areas and remove postings as required.

11.3 Transportation Methods

This WMP only addresses on-site transportation as directed by the SAM referenced in 11.1. Graphite pile removal off-site transportation and disposal will be addressed in a separate WMP.

12.0 TREATMENT AND DISPOSAL OF ERP PROJECT WASTES

12.1 Compliance and Liability Assessments

The EWMS Division Deputy Waste Programs Manager will ensure that an assessment of the selected treatment, storage and disposal facility (TSDF) was performed within the last year.

12.2 EWMS Division Control of Waste at TSDFs

The EWMS Division Deputy Waste Programs Manager is responsible for ensuring that the wastes are monitored at the disposal facility. Destruction and Disposal certificates must be obtained from facilities that treat and dispose of waste.

12.3 Off-site Rule of CERCLA Wastes

All disposal facilities that provide waste management services shall meet the acceptability provisions of the EPA CERCLA off-site rule as specified in Title 40 of the Code of Federal Regulations (CFR) part 300.440. Should a new facility be identified for disposal, the EWMS Division Deputy Waste Programs Manager will evaluate it against the CERCLA rule to ensure compliance.

12.4 Waste Profiling for Disposal

Approved waste profiles are required for all radioactive waste shipments to disposal facilities. All waste to be sent to a disposal facility will be shipped under an approved profile. Prior to shipment, the BSA WCO will ensure that the waste complies with the Waste Acceptance Criteria of the disposal facility and meets the criteria of the Waste Profile.

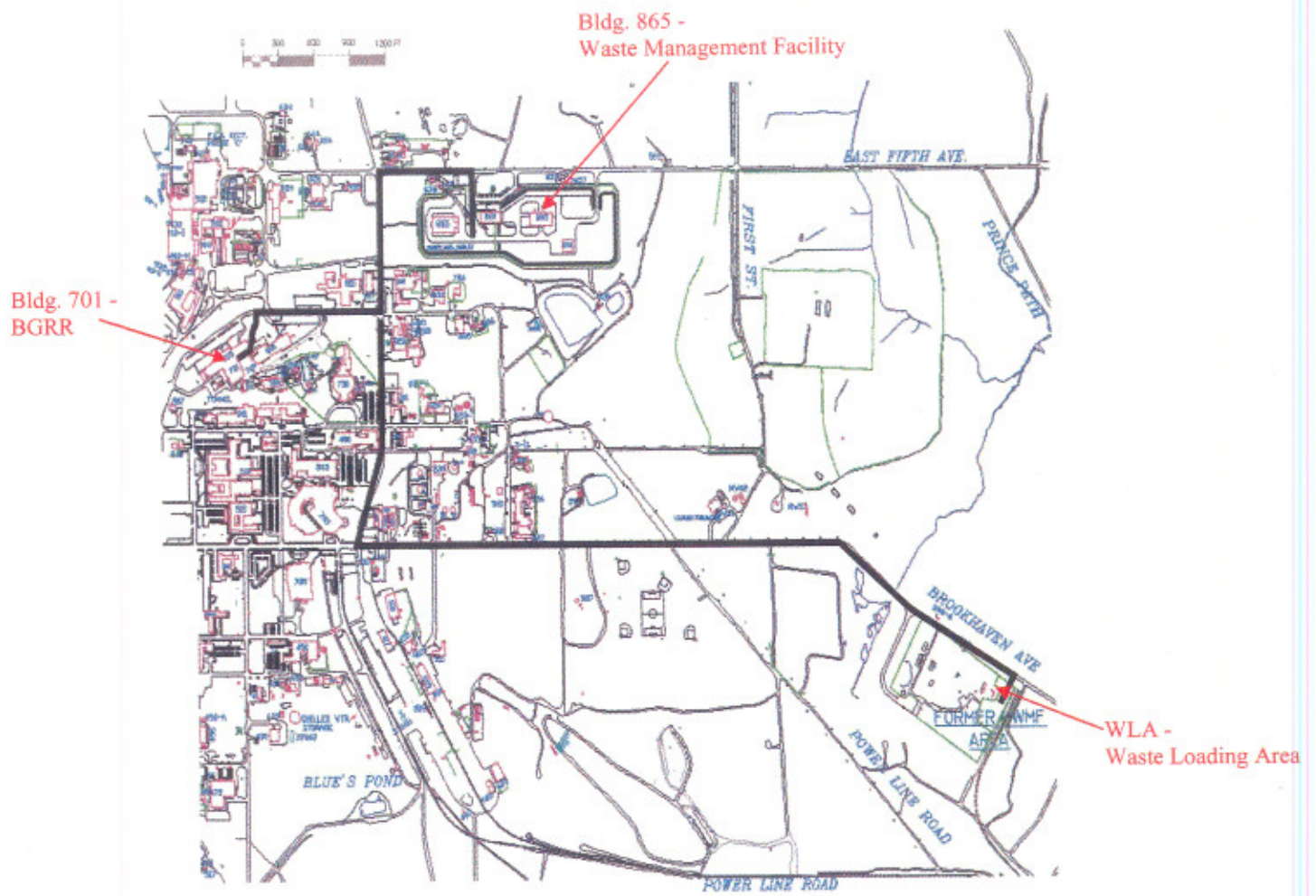
12.5 Funding and Contracting Requirements for the DOE's Wastes

Before planning for an off-site shipment, the ERP Division Support Services General Manager must ensure that there is funding available and contracts in place to cover the costs of treatment and disposal.

13.9 REFERENCES

1. Brookhaven Graphite Research Reactor Graphite Pile Removal Specifications
2. 10 CFR 835, Occupational Radiation Protection
3. 10 CFR 830.120, Quality Assurance Requirements
4. 49 CFR 172 through 179, Transportation Requirements
5. DOE Order 435.1, Radioactive Waste Management, US DOE, Office of Environmental Management
6. DOE Manual 435.1-1, Radioactive Waste Management Manual, US DOE, Office of Environmental Management, June 19, 2001
7. BNL SBMS Environmental Management System Description for Environmental Management and Hazardous Materials Transportation
8. BNL SBMS Subject Area's for Hazardous, Radioactive and Mixed Waste Management
9. ERD Operations Procedure Manual
10. BNL SBMS Subject Areas for Hazardous Materials Transportation On- and Off-site
11. WMD-003 Low Level Radioactive Waste Certification Program, BNL, September 2001
12. BGRR Record of Decision, March 17, 2005
13. Nevada Test Site & Energy Solutions of Utah Waste Acceptance Criteria
14. ERP Waste Management Plan
15. Radioactive Waste Management Basis Document
16. CERCLA
17. Integrated ERP Waste Management Plan
18. ER-OPM-1.3

Figure 1
On-site waste transportation routes



APPENDIX C

Contractor Qualification Requirements

Brookhaven Graphite Research Reactor (BGRR) Graphite Pile Removal Project

BGRR Job# PFHO7 Bidder Qualification Documentation Requirements, Technical Proposal Qualification Requirements And Bidder Qualification Checklist

Bidder: _____
Name of Firm

Signature

Date

A. General

The Bidder shall meet BSA's qualification requirements provided in Section B, below. The Bid shall include all of the required qualification documentation described in Section C to objectively demonstrate that the Bidder meets BSA's qualification requirements. The Bid shall describe the technical approach to completing the work, and shall clearly and thoroughly address the key performance attributes and expectations described in BSA's technical specifications and summarized in Section D. The Bidder shall complete the qualifications, documentation and proposal checklist provided in Section E.

B. Qualification Requirements

BSA will consider the Bids submitted by Bidders that meet all of the qualification requirements described herein. In meeting these qualification requirements, BSA will consider the consolidated qualifications of the Bidder's team including its proposed subcontractors. If proposed by the Bidder and used by the Bidder to meet BSA's qualification requirements, the Bidder will be obligated to use all subcontractors identified in its Bid unless otherwise approved by BSA.

1. Corporate Experience

The Bidder shall have extensive reactor decontamination and dismantlement (D&D) experience. This D&D experience shall include the demolition of radiologically activated and contaminated reactor components. The Bidder shall offer experience with all aspects of this work including work planning and tool design, remote reactor component segmentation and material

handling, remote waste packaging, contamination control and ALARA. The Bidder shall have extensive experience with all aspects of radioactive waste packaging and management.

2. Corporate Sponsor

The Bidder shall designate a home office Corporate Sponsor responsible for oversight of the project. The Bidder's Corporate Sponsor shall be thoroughly knowledgeable with all of the Bidder's corporate policies and procedures, and shall have the responsibility and authority for ensuring that the work is performed in accordance with the contract, Bidder's corporate policies and procedures. The Corporate Sponsor shall be extensively involved with and shall have approval authority for the Bidder's proposal. The Bidder's Corporate Sponsor shall have extensive reactor D&D and other nuclear D&D and cleanup experience.

3. Project Manager Qualifications and Experience

The Bidder's Project Manager Candidate shall have a BS degree (or equivalent training and/or work experience) in engineering, environmental sciences or a related field, and a minimum of fifteen (15) years of experience. (Note: The Project Manager is designated as a full-time member of the Bidder's site team, and if awarded the contract, the Project Manager will work full time on the BNL site.) The candidate shall have extensive reactor and nuclear facility D&D experience. This shall include experience with the disassembly of highly contaminated and activated reactor components. The candidate shall have experience with remote reactor component segmentation and material handling, design, installation and operation of ventilation systems, and waste packaging. The candidate shall be proficient in all facets of project management including scheduling, resource assignment, tracking and reporting, and problem solving. The candidate shall have participated extensively in the preparation of the Bid.

4. Field Superintendent Qualifications and Experience

The successful Bidder will be required to locate a full-time Field Superintendent on the BNL site. The Bidder's Field Superintendent candidate shall have a BS degree (or equivalent training and/or work experience) in engineering, environmental sciences or a related field and a minimum of ten (10) years of experience. The candidate shall have extensive field D&D experience including multi-shift operations, remote segmentation tooling design and qualification, remote reactor component segmentation and waste packaging, ventilation system operation, and contamination control. The candidate shall have participated extensively in the preparation of the Bid.

5. Site Health and Safety (H&S) Officer Qualifications and Experience

The Bidder's H&S Officer candidate shall have a minimum of ten (10) years of H&S experience in nuclear D&D, construction or environmental remediation work environments. The candidate shall have received formal training and offer credentials in the areas of safety and industrial hygiene, and shall have received HAZWOPER Supervisor training. The candidate shall have experience with developing and implementing site-specific ES&H plans, and if awarded the contract, the Bidder will be expected to relocate the proposed candidate to the BNL site on a full time basis.

6. Radiological Engineer

The Bidder's Radiological Engineer shall have a minimum education of BS in engineering/environmental Sciences or related field and a minimum of twelve (12) years experience in the radiation protection field. Experience shall include performance as radiological engineer on reactor and other nuclear D&D projects. The Bidder's candidate shall be registered in the National Registry of Radiation Protection Technologist (NRRPT) or shall be a Certified Health Physicist (CHP).

7. Safety Performance History

The Bidder's Recordable Incident Rate (RIR) shall be less than 4.0, and the Bidder's Insurance Experience Modification Rating (EMR) shall be less than 1.0.

8. Corporate Quality Assurance and Health & Safety Programs

The Bidder shall have comprehensive and written corporate quality assurance and health and safety programs. The Bid shall demonstrate that the Bidder has corporate programs covering Integrated Safety Management, ALARA and the complete range of safety and industrial hygiene topical areas encompassed by reactor D&D and the work described in BSA's specifications. The Bidder's corporate programs shall reflect a clear commitment to and provide for continuous improvement and worker involvement. The Bidder's programs shall address the flow-down of quality, and health and safety requirements to subcontractors of all kinds.

C. **Required Qualification Documentation**

The Bid shall include the required documentation and information described herein necessary to certify the Bidder's qualifications against the requirements described in Section B. In addition, BSA may conduct interviews with the key project personnel to ensure that their experience and qualifications meet the criteria set forth in Section B.

1. **Corporate Experience**

The Bidder shall submit a general statement as to how and why it meets BSA's Corporate Experience requirements described in Paragraph B.1, above. This statement shall be supported by a detailed description of at least three (3) similar projects completed by the Bidder during the previous ten (10) years. These project experience descriptions shall include the contract values and contact information of the owner and/ or contracting officer.

2. **Corporate Sponsor Qualifications and Experience**

The Bidder shall submit the resume of its proposed Corporate Sponsor. The resume shall address the specific requirements described in Paragraph B.2, above.

3. **Project Manager Qualifications and Experience**

The Bidder shall submit the resume of its proposed Project Manager. The resume shall address the specific requirements described in Paragraph B.3, above.

4. **Field Superintendent Qualifications and Experience**

The Bidder shall submit the resume of its proposed Field Superintendent. The resume shall address the specific requirements described in Paragraph B.4, above.

5. **Site H&S Officer Qualifications and Experience**

The Bidder shall submit the resume of its proposed Health and Safety Manager. The resume shall address the specific requirements described in Paragraph B.5, above.

6. *Radiological Engineer*

The Bidder shall submit the resume of its proposed Radiological Engineer. The resume shall address the specific requirements described in Paragraph B.6, above.

7. *Safety Performance History*

The Bidder shall provide its RIRs and EMRs as described in Paragraph B.7 for the following years: 2004, 2005 and 2006. The Bidder shall provide documentation from an independent source verifying these ratings and a copy of its OSHA 200/300 log(s) and total hours worked for these same years (i.e., 2004, 2005 and 2006).

8. *Corporate Quality Assurance and Health & Safety Programs*

The Bidder shall submit copies of its Corporate Quality Assurance and Health & Safety (H&S) Programs as described in Paragraph B.8, above. Its programs shall meet BSA's requirements described in BSA's specifications and contract.

D. Description of Bidder's Technical Approach

The Bid shall include a detailed and thorough description of the Bidder's technical approach to complete the work. In general, this technical description will demonstrate the understanding of the work and all of BSA's technical and contract requirements are satisfied. BSA will not rank or grade the Bidder's technical approach description. However, BSA will use the Bidder's technical description to qualify the Bid. BSA may reject any Bid that does not provide a technical description that meets BSA's requirements based on BSA's review and analysis of the Bid.

BSA's technical and performance requirements are described throughout its technical specifications. The Bidder shall thoroughly review these requirements in developing its proposal. Key BSA areas to be specifically addressed in the Bidder's technical description are described below.

1. *Compliance with BGRR Documented Safety Analysis, Technical Safety Requirements, and Fire Hazard Assessment*

The Bid shall clearly demonstrate that its graphite pile, biological shield, and duct service building removal approach methodology, etc. are in compliance with all of the requirements, conditions, controls and assumptions expressed in the Documented Safety Analysis, Technical Safety Requirements, and Fire Hazard Assessment.

2. *ALARA*

The Bidder shall provide a description of its technical approach to use time, distance and shielding to maintain personnel exposures ALARA. Technical concepts and innovations shall be described in detail along with the Bidder's administrative controls and reviews to reduce radiation exposure. BSA reminds the Bidder that it has established a zero entry policy for personnel entry into the biological shield and a 1000 mrem per year limit for personnel radiation exposure as set forth in its technical specifications included herein.

3. *Contamination Control*

The Bidder shall provide a detailed description of its contamination control plans to meet BSA's performance requirements. The Bidder shall provide a thorough description of the contamination control enclosures and other engineered safeguards, the use of tools and equipment that inherently minimize the generation of dispersible dismantlement fines, the use of fixative coating systems and all of its proposed innovations to preclude the spread of contamination from outside of the biological shield.

4. *Design, Fabrication and Qualification of Special Tools*

The Bidder shall provide a full and detailed description of its planned and systematic actions that will ensure that all special tools will perform safely, reliably and as designed and intended.

5. *Waste Packaging*

The Bidder shall provide a thorough description of its plan to package waste and meet BSA's performance requirements.

6. *Project Coordination*

The Bidder shall provide its overarching strategy for coordinating the work of its team. The Bidder's description shall include the identification of all proposed subcontractors and a detailed description of the division of responsibility, and the Bidder's plan to flow BSA's technical and contract requirements down to its subcontractors.

7. *Project Oversight*

The Bidder shall provide a description of its plan for providing home office oversight of the project.

E. Bidder Qualification Checklist

The Bidder shall complete the following checklist in its entirety and include it as part of the Bid. BSA reserves the right to reject any Bid in which the Bidder fails to provide all of the required submittals, and in which the Bid fails to meet all of the qualification requirements.

1. Corporate Experience (As described in Paragraph B.1)

- a. The Bidder has provided a general statement as to its experience that is supported by the description of three (3) projects completed by the Bidder during the previous ten (10) years.

_____Yes _____No

- b. As evidenced by the Bidder's submittal, the Bidder has extensive experience with the D&D of radiologically contaminated reactor structures.

_____Yes _____No

2. Corporate Sponsor (As described in Paragraph B.2)

- a. Resume of the proposed Corporate Point of Contact provided by the Bidder.

_____Yes _____No

- b. As evidenced by this resume, the qualification and experience of the proposed Corporate Point of Contact meet BSA's requirements.

_____Yes _____No

3. Project Manager (As described in Paragraph B.3)

- c. Resume of the proposed Project Manager provided by the Bidder.

_____Yes _____No

- d. As evidenced by this resume, the qualification and experience of the proposed Project Manager meet BSA's requirements.

_____Yes _____No

4. Field Superintendent (As described in Paragraph B.4)

- a. Resume of the proposed Field Superintendent provided by the Bidder.

_____Yes _____No

- b. As evidenced by this resume, the qualifications and experience of the proposed Field Superintendent meet BSA's requirements.

_____Yes _____No

5. Site H&S Officer (As described in Paragraph B.5)

- a. Resume of the proposed Site H&S Officer provided by the Bidder.

_____Yes _____No

- b. As evidenced by the resume, the qualifications and experience of the proposed Site H&S Officer meet BSA's requirements.

_____Yes _____No

6. Radiological Engineer (As described in Paragraph B.6)

- a. Resume of the proposed Radiological Engineer provided by the Bidder.

_____Yes _____No

- b. As evidenced by this resume, the qualifications and experience of the proposed Radiological meet BSA's requirements.

_____Yes _____No

7. Safety Performance History (As described in Paragraph B.7)

- a. Required RIR's and EMR's and supporting information provided by the Bidder.

_____Yes _____No

- b. Bidder's RIR is less than 4.0 and EMR is less than 1.0.

_____Yes _____No

8. Corporate QA and H&S Programs (As described in Paragraph B.8)

- a. Corporate QA and H&S Programs that meet BSA's requirements provided by the Bidder.

_____Yes _____No

9. Bidders Technical Approach (As described in Paragraph D)

- a. As evidenced by the Bid, the Bidders technical approach is in compliance with the Documented Safety Analysis, Technical Safety Requirements, and Fire Hazard Assessment.

_____Yes _____No

- b. As evidenced by the Bid, the Bidder has a detailed plan for ALARA that meets BSA's requirements?

_____Yes _____No

- c. As evidenced by the Bid, the Bidder has a detailed plan to provide for contamination control that meet BSA's requirements?

_____Yes _____No

- d. As evidenced by the Bid, the Bidder has a detailed plan to design and qualify special tools that meets BSA's requirements?

_____Yes _____No

- e. As evidenced by the Bid, the Bidder has a detailed plan to package the waste that meets BSA's requirements?

_____Yes _____No

- f. As evidenced by the Bid, the Bidder has a detailed strategy for coordinating the project (including the work performed by subcontractors) that meets BSA's requirements with clear scope definitions for subcontracted services.

_____Yes _____No

- g. As evidenced by the Bid, the Bidder has a detailed plan for home office oversight of the project that meets BSA's requirements?

_____Yes _____No

Note: Bidders are required to provide supporting documentation to ensure BSA that your Bid is in full compliance with the requirements detailed in the specification. Failure to either acknowledge "yes" to any of the qualification criteria or provide the required supporting documentation will result in your Bid being considered non-responsive and will therefore not be considered for award. BSA reserves the right to reject any Bid that does not meet BSA's requirements.

APPENDIX D

ERP OPM 3.2 Work Planning and Control

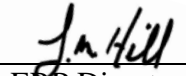
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ERP Operations Procedures Manual

3.2 WORK PLANNING AND CONTROL

Text Pages 1-15
Attachments: 7

Approved: _____


ERP Director
Les Hill

Date: 5/31/07

Preparer: B. Lein

ERP-OPM-3.2, Revision 0

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REVISION LOG

[illegible]

3.2 WORK PLANNING AND CONTROL

1.0 PURPOSE AND SCOPE

The purpose of the Environmental Restoration Projects (ERP) Work Planning and Control procedure is to ensure all work performed within ERP is reviewed, planned and controlled in a manner that meets the requirements of the Brookhaven National Laboratory (BNL) Standards Based Management System (SBMS) Subject Area, “Work Planning and Control for Experiments and Operations” (Reference 1) and is compliant with applicable Authorization Basis Documents (ABDs) and Facility Use Agreements (FUAs).

All work performed under the authority of ERP will undergo planning and control to the rigor set forth within this document. Authorized ERP work includes remediation, decommissioning, characterization, construction, maintenance, modification and all other related work performed by ERP staff as well as external BNL organizations and non-BNL personnel (including BNL subcontractors) working on ERP projects.

Activities associated with routine surveillance and maintenance within ERP facilities were considered during the development of the facility specific ABDs and the Department of Energy – Safety Evaluation Report (DOE-SER) approval process. ERP facility specific Surveillance and Maintenance (S&M) Manuals define the scope of routine activities. Because of their inherent repetitive nature, planning and control measures applicable to work involving routine maintenance, surveillance and operations activities do not require issuance of a Work Permit as defined in this procedure.

2.0 RESPONSIBILITIES

2.1 ERP Director

- 2.1.1 Shall appoint the ERP Work Control Manager
- 2.1.2 Shall provide leadership to ensure line management ownership of the work planning and control system.
- 2.1.3 Shall serve as chairperson of the Safety Review Committee (SRC) and have final approval authority for all Field Work Packages.

2.2 ERP Decontamination and Decommissioning (D&D) Operations Manager

- 2.2.1 Shall resolve technical issues regarding D&D project work activities (radiation protection, waste management, health and safety, etc.).
- 2.2.2 Shall review and approve Field Work Packages and forward them to the SRC for final approval.

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- 2.2.3 Shall provide oversight of work planning and control for project D&D work activities.
- 2.2.4 Shall assist project personnel in generating Work Permits and associated work documentation.
- 2.2.5 Shall remain cognizant of project work activities by inspecting work in progress and completed work as appropriate.
- 2.2.6 Shall determine whether work activities should be temporarily halted for review of work practices and/or a Lessons Learned session.

2.3 ERP D&D Support Manager

- 2.3.1 Shall resolve technical issues regarding facility maintenance and support services (radiation protection, waste management, health and safety, etc.).
- 2.3.2 Shall review and approve Field Work Packages and forward them to the SRC for final approval.
- 2.3.3 Shall provide oversight of work planning and control for facility maintenance work activities.
- 2.3.4 Shall assist project personnel in generating Work Permits and associated work documentation.
- 2.3.5 Shall remain cognizant of project work activities by inspecting work in progress and completed work as appropriate.
- 2.3.6 Shall determine whether work activities should be temporarily halted for review of work practices and/or a Lessons Learned session.

2.4 ERP Work Control Manager (WCM)

- 2.4.1 Shall appoint Work Control Coordinators (WCC) for each ERP facility.
- 2.4.2 Shall monitor the performance of the Work Planning and Control System by participating in the ERP Self-Assessment Program.
- 2.4.3 Shall upgrade and maintain the ERP Work Planning and Control System procedure.

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- 2.4.4 Shall ensure that personnel are trained on the requirements of this procedure.
- 2.4.5 Shall coordinate with other Laboratory WCMs through periodic meetings to promote consistency across the site in applying the graded approach to work control and hazard analysis.
- 2.4.6 Shall review all Work Permits and associated work documentation for completeness, job feedback and lessons learned.
- 2.4.7 Shall assist the WCC in the screening of work and determination of the work planning effort required.

2.5 ERP WCC

- 2.5.1 Shall initiate all Work Permits and maintain the Work Permit Logbook.
- 2.5.2 Shall assist Subject Matter Experts (SMEs) in the preparation of supporting work documentation (e.g., RWPs, JRAs, digging permits).
- 2.5.3 Shall designate the Primary Reviewer.
- 2.5.4 Shall notify the facility Building Manager of any activity that may impact the facility.
- 2.5.5 Shall notify the facility Building Manager of changes that would affect the Environment, Safety and Health (ES&H) concerns and the crosshatching of the facility's Key Plan.
- 2.5.6 Shall review Work Permits for completeness and verify that the work area has been returned to an acceptable condition.
- 2.5.7 Shall submit completed Field Work Packages to the WCM for filing.

2.6 ERP Safety and Industrial Hygiene (S&IH) Manager

- 2.6.1 Shall assist project personnel in generating Work Permits, Job Risk Assessments (JRA) and associated work documentation.
- 2.6.2 Shall serve as a member of the Work Permit Review Team.
- 2.6.3 Shall provide safety and industrial hygiene oversight throughout the planning and conduct of work.

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- 2.7 ERP Authorization Basis Engineer (ABE)
 - 2.7.1 Shall review all Field Work Packages and Work Permits for potential impact on facility ABD and compliance issues.
 - 2.7.2 Shall perform Unreviewed Safety Issue Determination (USID) screening on all Work Permits and develops associated Safety Evaluations as needed.
 - 2.7.3 Shall serve as a member of the Work Permit Review Team.
- 2.8 ERP Environmental Compliance Representative (ECR)
 - 2.8.1 Shall review all Work Procedures and Work Instructions for environmental management concerns and compliance issues.
 - 2.8.2 Shall serve as a member of the Work Permit Review Team if environmental compliance issues are identified.
- 2.9 ERP Radiation Protection Manager (RPM)
 - 2.9.1 Shall review all Work Procedures and Work Instructions and develops radiological control requirements.
 - 2.9.2 Shall prepare Radiological Work Permits (RWP) and support development of JRAs to address radiological controls.
 - 2.9.3 Shall serve as a member of the Work Permit Review Team if radiological issues are identified.
- 2.10 ERP Quality Management Services (QMS) Manager
 - 2.10.1 Shall perform assessments of the ERP Work Planning and Control to verify compliance with BNL SBMS and the ERP OPM requirements.
 - 2.10.2 Shall report to the ERP Director the results of assessments along with recommendations.
- 2.11 ERP Work Package Manager (WPM)
 - 2.11.1 Shall plan and develop Work Procedures and Work Instructions and serve as a member of the Work Permit Review Team.

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- 2.11.2 Shall assist Subject Matter Experts (SMEs) in the preparation of supporting work documentation (e.g., RWPs, JRAs, digging permits).
- 2.11.3 Shall coordinate the review, comment resolution, and approval process of the Field Work Packages.
- 2.11.4 Shall perform configuration control of the approved Field Work Packages.
- 2.11.5 Shall elicit worker feedback during work and at the completion of the job and incorporate improvements and/or Lessons Learned into the Work Permit and associated work documentation.
- 2.11.6 Shall review completed Field Work Packages prior to submittal to the WCC for closeout.
- 2.12 ERP Field Engineer (FE)
 - 2.12.1 Shall assist the WPM to plan and develop Work Procedures and Work Instructions.
 - 2.12.2 Shall assist Subject Matter Experts (SMEs) in the preparation of supporting work documentation (e.g., RWPs, JRAs, digging permits).
 - 2.12.3 Shall assist the WPM in the coordination, review, comment resolution, and approval process of the Field Work Packages.
 - 2.12.4 Shall perform configuration control of the approved Field Work Packages.
 - 2.12.5 Shall elicit worker feedback during work and at the completion of the job and incorporate improvements and/or Lessons Learned into the Work Permit and associated work documentation.
 - 2.12.6 Shall assist the WPM in the review of completed Field Work Packages prior to submittal to the WCC for closeout.
- 2.13 ERP Work Permit Primary Reviewer
 - 2.13.1 Shall establish the Work Permit Review Team.
 - 2.13.2 Shall ensure that the supporting documentation (e.g., JRA, RWP, digging permit) within the Field Work Package is complete.

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2.13.3 Shall obtain approval signatures from the Work Permit Review Team.

2.14 ERP Work Permit Review Team Members

2.14.1 Shall review and provide comments on Field Work Package materials relevant to their field of expertise.

2.14.2 Shall assist the primary reviewer in ensuring that the supporting documentation (e.g., JRA, RWP, digging permit) within the Field Work Package is complete.

2.15 Work Requesters (Non-ERP personnel)

2.15.1 Shall provide an accurate description of the Scope of Work and provide detailed plans, instructions, procedures, etc., commensurate with the complexity of the work.

2.16 Workers

2.16.1 Shall comply with the terms of the Work Permit and associated documentation.

2.16.2 Shall serve on the Work Permit Review Team when requested.

2.16.3 Shall promptly cease work and place the work area in a safe condition in the event that the work as prescribed in the Field Work Package cannot be followed as written.

2.16.4 Shall provide feedback during and at the completion of a job, for continuing improvement in the current job as well as future job planning.

3.0 PREREQUISITES

3.1 With the exception of activities identified within ERP facility specific S&M Manuals, all ERP work activities shall be controlled by a Work Permit.

3.2 Written guidance identifying the authorized scope of work and methodology to perform the work must be submitted with each Work Permit as part of the associated work documentation. Types of documents authorized for use include Work Procedures, Work Instructions, and operating manuals.

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- 3.2.1 Work Procedures shall be developed and maintained in accordance with ERP-OPM-1.3, “Work Procedure Development and Requirements” (Reference 2).
- 3.2.2 Work involving multiple, integrated tasks that result in an Occupational Health and Safety Assessment Series (OHSAS) 18001 (Reference 3) Net Risk Assessment ranking (after controls) of moderate or high (>40 points) require the use of Work Procedures.
- 3.2.3 Work involving discrete tasks with an OHSAS 18001 Net Risk Assessment ranking (after controls) of Low (40 points or less) may be performed utilizing Work Instructions in lieu of Work Procedures.
 - Work Instructions are developed to guide specific tasks within the defined work scope of a Work Permit.
 - Work Instructions shall be developed in accordance with Attachment 1 – Work Instruction (Sample).
 - Work Instructions are considered void upon completion of the job and filed as a part of the Work Permit.
- 3.2.4 Routine maintenance performed within the scope of the facility specific S&M Manuals may utilize pre-approved Departmental procedures in lieu of ERP Work Procedures and Work Instructions.
 - When utilized, a copy of Departmental procedures originating outside of ERP must be included as part of the work documentation.
- 3.2.5 Operating manuals provided by manufacturers and equipment suppliers may be used to supplement Work Procedures or Work Instructions.
 - When utilized, a copy of an operating manual with applicable sections highlighted must be included as part of the Field Work Package.
- 3.3 Work Permits shall be screened in accordance with ERP-OPM-3.3, “Unreviewed Safety Issue Determination” (Reference 4). Clarifications and/or answers to questions needed in regard to interpretations of the administrative controls and limits shall be formally documented.

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- 3.4 All work shall be reviewed for potential impact on the facility specific ABDs and FUA.
- 3.5 All work planning shall include reviewing DOE/BNL Lessons Learned for applicable events that relate to the work activity.

4.0 PRECAUTIONS AND LIMITATIONS

- 4.1 Personnel assigned to the various positions within this procedure are identified in Attachment 2 - Designation of Work Permit Primary Reviewers.
- 4.2 WPM/FEs shall ensure that personnel assigned to perform work governed by the Work Permit have completed all specified training, related to the hazards identified, prior to the start of work.
- 4.3 Field oversight of work shall be in accordance with ERP-OPM-3.4, “Field Activity Oversight” (Reference 5).
- 4.4 Original Work Permits shall be printed on green paper.

5.0 PROCEDURE

NOTE 1: *The process by which a Work Permit is developed is outlined in the Work Permit Development Flow Chart (Attachment 3).*

NOTE 2: *The Work Permit form is provided in the SBMS Subject Area, “Work Planning and Control for Experiments and Operations”.*

- 5.1 A Work Permit is initiated by the individual(s) requesting (Work Requestor) to perform work within a facility. The Work Requestor submits the work documentation to the WCC for Work Permit initiation. Work Permits are required for ALL activities with the exception of:
 - 5.1.1 General administrative type work.
 - 5.1.2 Routine surveillance and operation/maintenance of infrastructure system such as lighting, heating, air conditioning, treatment system sampling, etc., that is defined in the facility specific S&M Manuals.
- 5.2 The WCC will enter the task into the Work Permit Logbook. Once assigned a number, the WCC completes Section 1 of the Work Permit.

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- 5.3 The Field Work Package will be developed as follows:
- 5.3.1 The Work Requestor, with assistance from the WCC, shall create a new folder within the appropriate “Work Permits” folder, which is located on the BNL network at U:\Field Work Packages\Work Permits. Contained within the Work Permits folder are several sub-folders broken down by facility (BGRR or HFBR) and type. The Work Permit Logbooks are maintained within the Work Permit folder.
 - 5.3.2 The WCC shall complete the fields in the Work Permit Logbook and assign a Work Permit number. The new Work Permit shall be initiated and maintained electronically in the newly created folder.
 - 5.3.3 ERP-controlled support documentation such as JRAs, USID screening forms, and Work Instructions shall be initiated and maintained electronically in the newly created folder with the Work Permit. These documents shall be identified by their associated Work Permit number.
 - 5.3.4 ERP Work Procedures are maintained on the BNL network at U:\Field Work Packages\Work Procedures.
 - 5.3.5 Non-ERP controlled support documentation such as Digging Permits, RWPs and Hot Work Permits, shall be prepared in accordance with SBMS.
 - 5.3.6 The Work Requestor, with assistance from the WCC, shall initiate a Work Permit form.
- 5.4 The Work Permit with associated work documentation attached shall be submitted to the ERP ABE for USID screening as required by ERP-OPM-3.3, “Unreviewed Safety Issue Determination.”
- 5.4 The Work Permit with associated work documentation attached shall be submitted to the S&IH Manager for development of a JRA.
- 5.4.1 A JRA is required for all work performed within ERP. JRAs are maintained within the associated work permit folder.
 - 5.4.2 If a current JRA is not on file, the S&IH Manager notifies the Work Requestor to submit a step-by-step breakdown of the work identifying the hazards associated with each step of the job and control measures to mitigate the hazard(s).

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- 5.4.3 Using this information, the S&IH Manager, with assistance from SMEs, completes a JRA by performing a risk ranking of the work to verify adequate control measures are incorporated.
- 5.5 The Work Permit with the associated work documents attached is routed to the S&IH Manager, RPM, QMS Manager, ECR, Radioactive Waste Management Manager and the facility's Building Manager for preliminary review and screening.
 - 5.5.1 Each discipline will review the work documents and identify radiation, safety, environmental, waste management and facility concerns.
 - 5.5.2 Additionally, the review shall identify whether specific work control permit(s) (e.g., Confined Space Permit, Radiological Work Permit, Cutting/Welding Permit, etc.) are necessary.
 - 5.5.3 Upon completion of the preliminary review, the Work Permit and associated work documents shall be returned to the WCC for compilation.
- 5.6 Using the feedback received from the preliminary review, the WCC completes Section 2 of the permit, identifies the Work Permit Primary Reviewer.
 - 5.6.1 Using the guidance provided within SBMS Subject Area, "Work Planning and Control for Experiments and Operations" the WCC, with assistance from the WCM and S&IH Manager screens and categorizes the Work Permit (low, moderate or high hazard) based on the preliminary review feedback and their knowledge of S&IH issues, complexity of the task and work coordination.
 - 5.6.2 The Work Permit Primary Reviewer assigns the Work Permit Review Team members based on the impact the work has on their respective discipline. At a minimum, the Work Permit Review Team will consist of the Work Requestor, the WCC, and the S&IH Manager.
- 5.7 The Primary Reviewer communicates the feedback received from the preliminary review back to Work Requester for resolution.
- 5.8 Upon resolving comments from the Work Permit Review Team the Work Requester submits the associated work documents to the Primary Reviewer for final review.

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- 5.9 Upon receipt of the final Field Work Package the Primary Reviewer assembles the Work Permit Review Team for a final review. This may be accomplished as a team meeting or performed in series through independent reviews.
- 5.9.1 Each member of the Review Team must acknowledge the review by signing and dating the original copy of the Work Permit.
- 5.9.2 The signature of the Primary Reviewer on the Work Permit indicates that the hazards and risks that could impact ES&H have been adequately identified and will be controlled throughout the job in accordance with BNL requirements.
- 5.10 The Field Work Package must be reviewed and approved by the SRC.
- 5.11 Field Work Packages generated for routine maintenance performed within the scope of the facility specific S&M Manuals do not require SRC approval.
- 5.12 A Field Work Package pre-job briefing performed in accordance with ERP-OPM-3.4, “Field Activity Oversight” is required prior to the commencement of work. Annotate completion of this briefing by signing Section 4 of the Work Permit.
- 5.13 Following completion of the briefing, and when the resources and schedule allow, Section 5 is signed off by the FE (Job Supervisor) or WCC authorizing work to be performed.
- NOTE 1:** *The process by which a Work Permit is utilized and closed out is outlined in the Work Permit Use and Closeout Flow Chart (Attachment 5).*
- NOTE 2:** *When a change is made to a Field Work Package, the cognizant D&D Manager and/or the appropriate Work Package Manager shall review the change and determine whether the change is a Minor Change or Revision.*

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5.14 Minor Changes shall be incorporated into a Field Work Package in accordance with the following:

- Changes shall be made to the affected Field Work Package document (e.g. Work Permit, Work Instruction, Digging Permit).
- A vertical bar shall be placed in the right or left margin of the document adjacent to the change.
- Hand markings shall be made in pen directly on the Working Copy of the document.
- Changes may be made by the electronic generation of new page(s). If a new page is inserted, it shall be inserted into the procedure immediately following the original page(s) it revises. The original affected page shall be marked appropriately by “lining out” the portions that are superseded by the changed page.
- Both electronic and hand changes shall be initialed and dated by the Work Package Manager or cognizant D&D Manager.
- At a minimum, changes shall be reviewed by the individuals who performed the original Work Permit reviews (see 5.6.2) and the ABE. The review shall be documented on the Minor Change Review and Approval (Attachment 6).
- Upon completion of the review, the change shall be documented in the Minor Change and Revision Log (Attachment 7).
- Minor Changes to Field Work Packages can be approved and issued for use in the field without prior SRC approval. However, Minor Changes shall be provided to the SRC for review at the next scheduled meeting.
- The Minor Change and Revision Log shall be maintained in the original Field Work Package.

5.15 Field Work Package Revisions shall be issued when:

- Six or more Minor Changes are incorporated into the Work Permit, Work Instruction, or other controlled supporting documents in the Field Work Package; or
- The scope, intent, or purpose of a Field Work Package has changed.

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- 5.16 When a Field Work Package revision is required, the original Work Permit shall be closed in accordance Step 5.22, and a new Work Permit initiated.
- 5.17 If during the performance of the task(s), new work scope, work methods or hazards are identified that were not addressed in the original Work Permit or associated work documents, then stop the activity and inform the FE or WPM. The job will stop until the Work Permit and associated work documentation is replanned as outlined in 5.3 through 5.13.
- 5.18 FEs shall promote worker feedback throughout the performance of the work.
 - 5.18.1 Feedback received during the daily tailgate meeting or throughout the days work shall be recorded by the FE utilizing the Daily Field Report as required within ERP-OPM-3.4, “Field Activity Oversight.”
 - 5.18.2 A copy of all Field Reports containing feedback on the effectiveness of safety, health environmental protection measures, efficiency, and quality of work processes shall be forwarded to the WCC for review and incorporation into future work documents.
- 5.19 Following completion of all work activities the FE shall compile all associated work documentation and submit the completed Field Work Package to the WCC for review.
- 5.20 Based upon the feedback received throughout the job or pre-planned post-job review requirements contained within the Field Work Package, the WCC, working with the FE or WPM will determine the need for a post job review.
 - 5.20.1 If a post job review is deemed necessary, results of the review will be documented in report form and attached to the Work Permit prior to closeout.
 - 5.20.2 Personnel involved in the post job review shall sign Section 6 of the Work Permit.
- 5.21 The WCC, with assistance from the FE shall complete Section 7 by reviewing worker feedback and verifying all feedback received throughout the job has been reviewed and evaluated for incorporation into future work.

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- 5.21.1 If practical, each worker offering feedback throughout the job should be acknowledged and informed of the outcome of the feedback.
- 5.21.2 Documentation of feedback received and recourse shall be filed with the completed Field Work Package.
- 5.22 Upon final verification that all associated work documentation is present and complete and that the work area is returned to an acceptable condition Section 8 of the Work Permit is signed and the entire Field Work Package filed in accordance with ERP-OPM-2.6, “Records Management.” Completion of this step effectuates the closeout of the Field Work Package.

6.0 RECORDS

- 6.1 The WPM, FE, or WCC retains the original Work Permit and associated work documentation until the task is completed. After completion the entire Field Work Package is filed in accordance with ERP-OPM-2.6, “Records Management.”
- 6.2 Permanent Work Permit files shall be created and archived within 45 days of job completion. Work permit files not archived within 45 days of completion will require entry of an action item within the ERP Family Assessment Tracking System (FATS) until such time the file is archived.
- 6.3 All Work Permits must be maintained for 75 years in accordance with OHSAS 18001 - Health and Safety Record/Document Management Requirements.

7.0 REFERENCES

- 7.1 SBMS Subject Area, “Work Planning and Control for Experiments and Operations”
- 7.2 ERP-OPM-1.3, “Work Procedure Development and Requirements”
- 7.3 OHSAS 18001 – Occupational Health and Safety Assessment Series
- 7.4 ERP-OPM-2.6, “Records Management”
- 7.5 ERP-OPM-1.2, “Online Procedure Development and Requirements”
- 7.6 ERP-OPM-3.4, “Field Activity Oversight”
- 7.7 ERP-OPM-3.3, “Unreviewed Safety Issue Determination”

8.0 ATTACHMENTS

- 8.1 Attachment 1 – Work Instruction (Sample)
- 8.2 Attachment 2 – Designation of Work Permit Primary Reviewers and Review Team Members
- 8.3 Attachment 3 – Work Permit Development Flow Chart
- 8.4 Attachment 4 – Work Permit Additional Sign-on Sheet
- 8.5 Attachment 5 - Work Permit Use and Closeout Flow Chart
- 8.6 Attachment 6 – Minor Change Review and Approval
- 8.7 Attachment 7 – Minor Change and Revision Log

9.0 DEFINITIONS

- 9.1 Field Work Package – Work planning and implementation documents including but not limited to JRAs, approved USIDs and USID screening documents, primary work permits, adjunct work permits (e.g., RWPs, Hot Work Permits, Digging Permits, etc.), Work Procedures and Work Instructions.

Attachment 1
Work Instruction (Sample)

BGRR WORK INSTRUCTION	Work Permit No. # DD-WP-302-013	Date Effective 05/30/07
	Author: T. Doyle Reviewed/Date: T. Jernigan Approved/Date: T. Daniels	
Document Title: Inspection and Weighing of Bldg. 701 10-ton Overhead Crane		

1. PURPOSE

- 1.1 The purpose of this procedure is to provide directions to perform the prerequisite inspection to return the Bldg. 701 10-ton overhead crane to service for restricted use and to safely determine the weight of the Bldg. 701 10-ton overhead crane hoist.

2. SCOPE

- 2.1 The following activities will be performed:

- Inspection of the crane to return to service for restricted use.
- Positioning the hoist trolley to a position on the south end of the gantry beam.
- Lockout/Tagout (LOTO) of all power to the crane.
- Determining the weight of the hoist trolley using low-profile load cells.

- 2.2 This Work Instruction includes the following activities:

- Prerequisites
- Previous Lessons Learned
- References
- Safety Requirements
- Tools, Equipment and Special PPE
- Work Instructions
- Records

Work performed outside the scope of this Work Instruction must be pre-planned as outlined within ERP OPM 3.2, “Work Planning and Control”.

3. PREREQUISITES

3.1 Bldg. 701 10-ton Overhead Crane Inspection

NOTE: *The Bldg. 701 overhead crane has been placed “out of service” since 2005 due to lapse of the annual inspection requirements and several OSHA discrepancies. The following step prescribes the prerequisite inspection of the crane in order to return the crane to service to support its refurbishment in accordance with BSA Contract.*

3.1.1 Perform inspection of the Bldg. 701 overhead crane in accordance with SBMS requirements.

Plant Engineering (EP) Hoisting & Rigging Inspector:

Name (print): _____

Signature: _____ Date: _____

3.1.2 Upon completion of the crane inspection, post the following signs at the crane walkway entry and in the crane control cab:

<p style="text-align: center;">NOTICE – RESTRICTED USE THE BLDG. 701 OVERHEAD CRANE USE IS RESTRICTED TO OPERATION AND MATERIAL HANDLING ACTIVITIES ASSOCIATED WITH THE REFURBISHMENT OF THE CRANE</p>
--

3.1.3 Bldg. 701 10-ton overhead crane inspected and ready for restricted use.

EP Hoisting & Rigging Inspector - Initial: _____ Date: _____

ER Field Engineer - Initial: _____ Date: _____

3.2 A Radiological Work Permit (RWP) has been issued for this work.

ER Field Engineer - Initial: _____ Date: _____

NOTE: *This prerequisite SHALL be completed after trolley has been located to its southernmost location, step 8.1.1.*

3.3 Post an area not less than 50' x 50' in size on elevation 110' directly beneath the work location of the Bldg. 701 10-ton overhead crane hoist trolley.

ER Field Engineer - Initial: _____ Date: _____

4. PREVIOUS LESSONS LEARNED

See Attachment 1.

5. REFERENCES

- Attachment 2, Load Cell Placement
- ERP-OPM-2.6, “Records Management”
- ERP OPM-3.2, “Work Planning and Control”
- ERP-OPM-3.4, “Field Activity Oversight”
- KoneCranes, Inc. “Accident Prevention Plan and Workplace Safety & Health Program”, January 3, 2007.
- EP-ES&H-103, “Lockout/Tagout Requirements”
- ERP-OPM-2.8, “Lockout/Tagout”

6. SAFETY REQUIREMENTS

- Post area on elevation 110’ beneath the work area “Danger – Overhead Work in Progress”.
- EP personnel will perform all crane operation.
- CranePro personnel shall comply with KoneCranes, Inc. “Accident Prevention Plan and Workplace Safety & Health Program”.
- Personnel not involved in the work shall keep clear of the work areas.
- The Job Risk Assessment shall be attached to this Work Instruction.

7. TOOLS, EQUIPMENT, and SPECIAL PPE

- Gloves, Safety Glasses, Safety Shoes, and other PPE as prescribed by the JRA.
- Three (3) Load cells, Transducer Technologies, Inc., model LPD-CT, 25K lb rating with digital readout and cables.
- Two (2) Porta-Power® lifting devices with pump, hose, and cylinder rated for 5-ton minimum capacity.
- Long-handled tool for placing east load cell (Note: Load cell location is approximately three feet (3’) beyond the worker’s extended arm).

8. WORK INSTRUCTIONS

NOTE 1: *The Bldg. 701 overhead crane hoist trolley will be determined by the use of three (3) load cells placed between the trolley frame and the crane bridge beam. The trolley will be required to be lifted less than 1/4” from the rails to determine its weight.*

NOTE 2: *EP personnel will perform all crane operation.*

8.1 Weighing the Bldg. 701 10-ton Overhead Crane

8.1.1 Position the hoist trolley to its southernmost location on the crane bridge.

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NOTE: *Lockout/Tagout shall be performed in accordance with EP-ES&H-103, “Lockout/Tagout Requirements” until such time as ERP-OPM-2.8, “Lockout/Tagout” is approved. Any Lockout/Tagout after this approval shall be performed under the ERP-OPM-2.8.*

- 8.1.2 At Bldg. 703 440V MCC, OPEN breaker 4A, “701 Crane”, to isolate 440V power to building 701 overhead crane and apply LOTO to breaker.

LOTO applied – FE Initial: _____ Date: _____

- 8.1.3 Verify power to crane isolated by verifying zero voltage at the line side of crane disconnect located elev. 110’, adjacent to the east rollup door.

_____ Volts - PE Electrician Initial: _____ Date: _____

NOTE: *Refer to Attachment 2 for load cell locations.*

WARNING 1: **Personnel injury/fall hazard – All work shall be performed from the crane catwalks. Personnel shall not climb on the trolley or lean over catwalk handrail.**

WARNING 2: **Personnel injury/pinch hazard – Keep hands clear of trolley wheels when placing Porta-Power® cylinders and load cells.**

- 8.1.4 Using a permanent marker, mark the location for each of the load cells at the following locations:

8.1.4.1 Two (2) load cells (north and south), each located between the west trolley frame member and the bridge beam, adjacent to the trolley rail, with south load cell located 6” – 8” north from the centerline of the south trolley axle and the north load cell located 6” – 8” south from the centerline of the north trolley axle.

8.1.4.2 One (1) load cell positioned on the east crane beam, each located between the east trolley frame member and the bridge beam, adjacent to the trolley rail equidistant between the two trolley axles (4’-10.5” ref. from centerline of either axle).

8.1.5 Using two (2) Porta-Power® cylinders placed adjacent to the locations marked above, SLOWLY lift the west side of the trolley 1/4” to 3/8” and insert one (1) load cell at each of the marked locations.

8.1.6 Release the pressure on the Porta-Power® cylinders to lower the trolley until the full weight is bearing on the each of the west load cells and remove one (1) the Porta-Power® devices.

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- 8.1.7 Using (1) Porta-Power® cylinder placed adjacent to the location marked above, SLOWLY lift the east side of the trolley 1/4” to 3/8” and insert one (1) load cell at the marked location using the long-reach tool.
- 8.1.8 Release the pressure on the Porta-Power® cylinder to lower the trolley until the full weight is bearing on the east load cell; do not remove the Porta-Power® device.
- 8.1.9 Record the weight at each load cell and calculate total trolley weight.
- a. East Load Cell: _____ lbs
b. West Load Cell (north): _____ lbs
c. West Load Cell (south): _____ lbs
- Total Trolley Weight (a + b + c) = _____ lbs
ER Field Engineer - Initial: _____ Date: _____
- 8.1.10 Using (1) Porta-Power® device placed adjacent to the location marked above, SLOWLY lift the east side of the trolley until there is approx. 1/8” clearance between the load cell and the trolley frame.
- 8.1.11 Remove the load cell, lower the trolley to the track and remove the Porta-Power cylinder.
- 8.1.12 Repeat steps 8.1.10 and 8.1.11 above to remove the two (2) Porta-Power® cylinders from beneath the west side of the trolley frame.
- 8.1.13 Remove all tools and equipment from the work area and perform housekeeping to remove any debris and trash and remove all work area postings.
- 8.1.14 All work steps complete:
- ER Field Engineer - Initial: _____ Date: _____

9. RECORDS

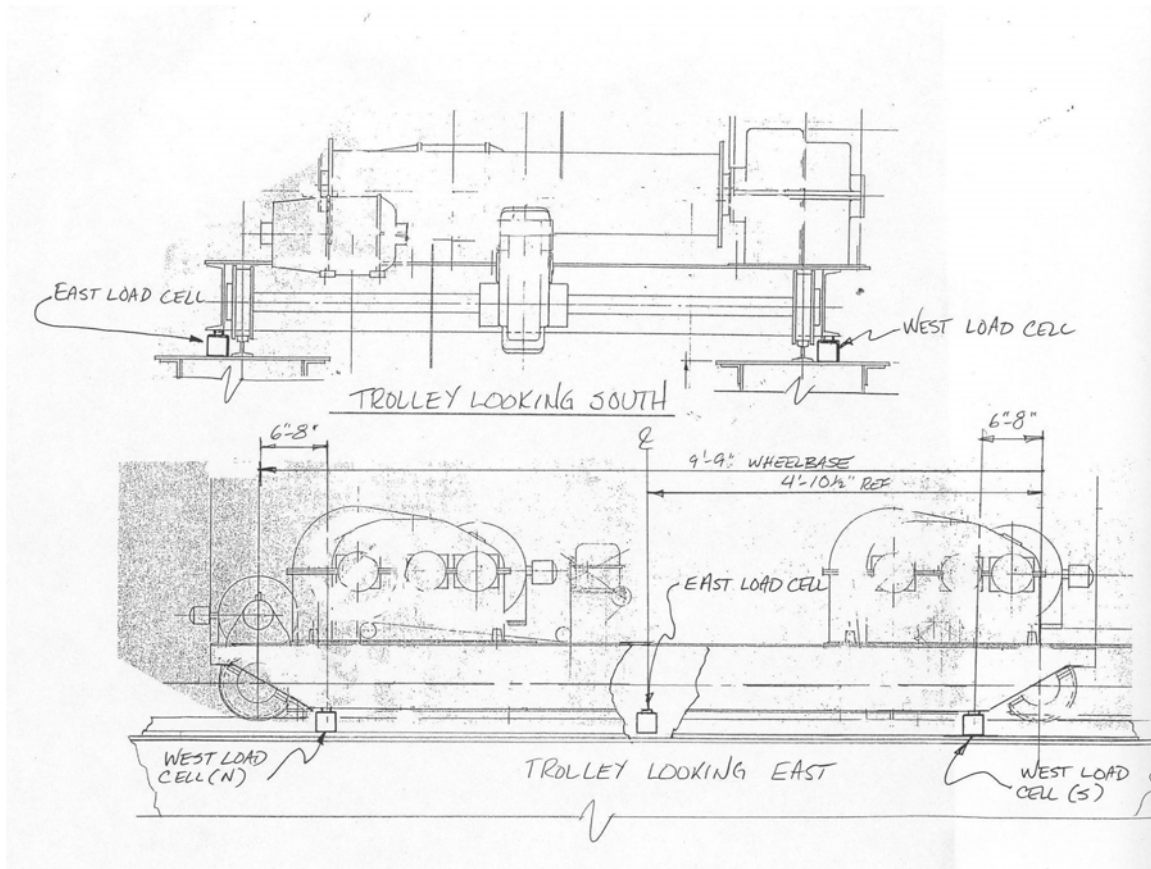
- Upon completion of this activity, the work supervisor shall complete Sections 6 and 7 of the Work Permit and submit the form to the BGRR Work Controls Coordinator (WCC) for close-out as outlined in ERP-OPM-3.2, “Work Planning and Control”.
- File the completed Field Work Package in accordance with ERP-OPM-2.6, “Records Management”.

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Attachment 1 **Lessons Learned**

(Insert appropriate Lessons Learned here – see SBMS Subject Area “Lessons Learned”)

Attachment 2
Load Cell Placement



Attachment 2

Designation of Work Permit Primary Reviewers and Review Team Members

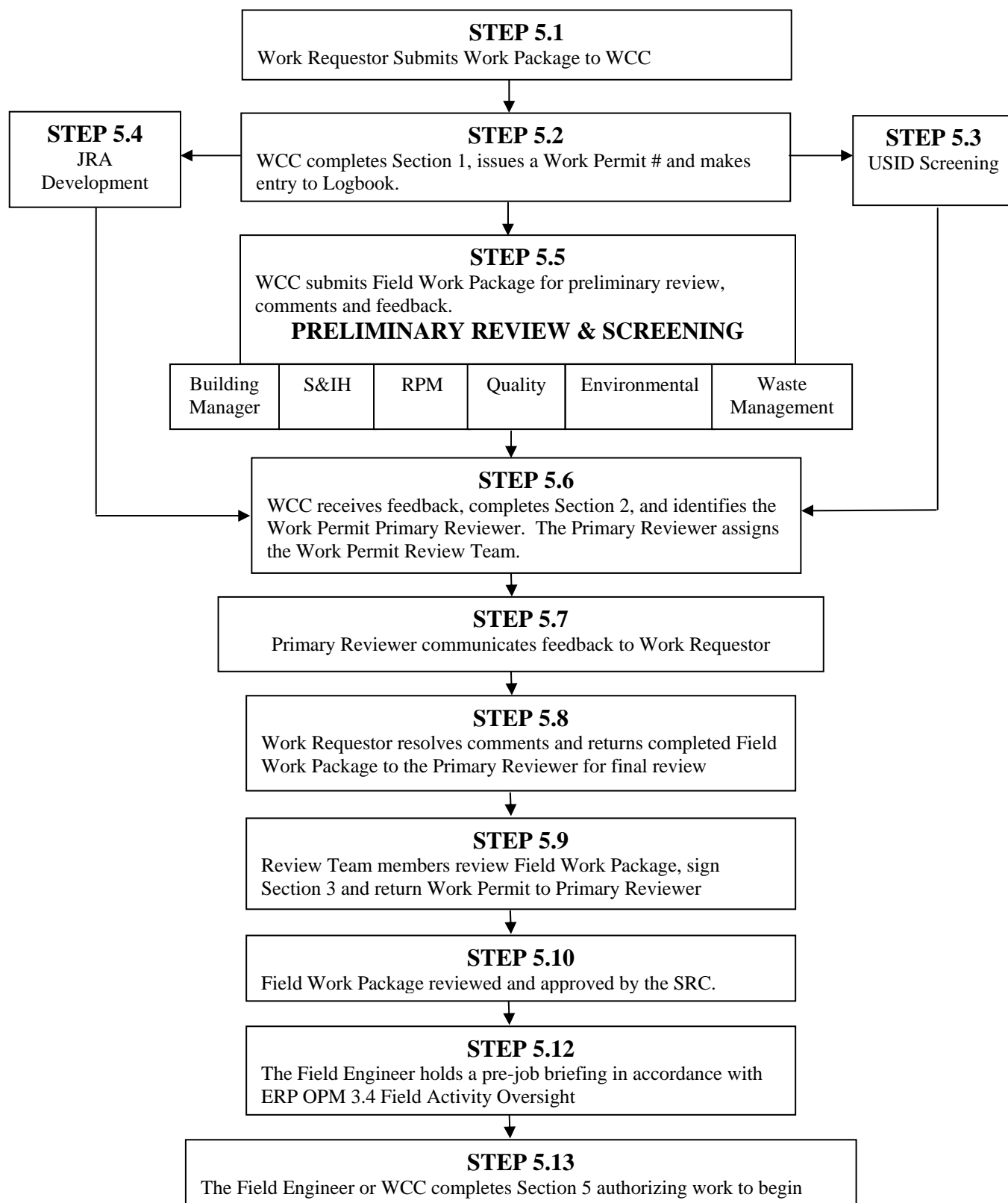
PRIMARY REVIEWERS

ERP Work Control Manager
ERP Work Control Coordinator
ERP D&D Operations, Manager
ERP D&D Support Manager
ERP Field Engineer
ERP Work Package Manager

WORK PERMIT REVIEW TEAM

*Work Permit Requestor
ERP Work Control Manager
ERP Work Control Coordinator
ERP S&IH Manager
ERP D&D Operations Manager
ERP D&D Support Manager
ERP Radiation Protection Manager
ERP Quality Management Services Manager
ERP Authorization Basis Engineer
ERP Environmental Compliance Representative
ERP Radioactive Waste Manager
*Must be part of team

Attachment 3
Work Permit Development Flow Chart



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Attachment 4 Work Permit Additional Sign on Sheet

Work Permit Number _____

This is an extension of Work Permit Form Section 4. Job Site Personnel fills out this section.

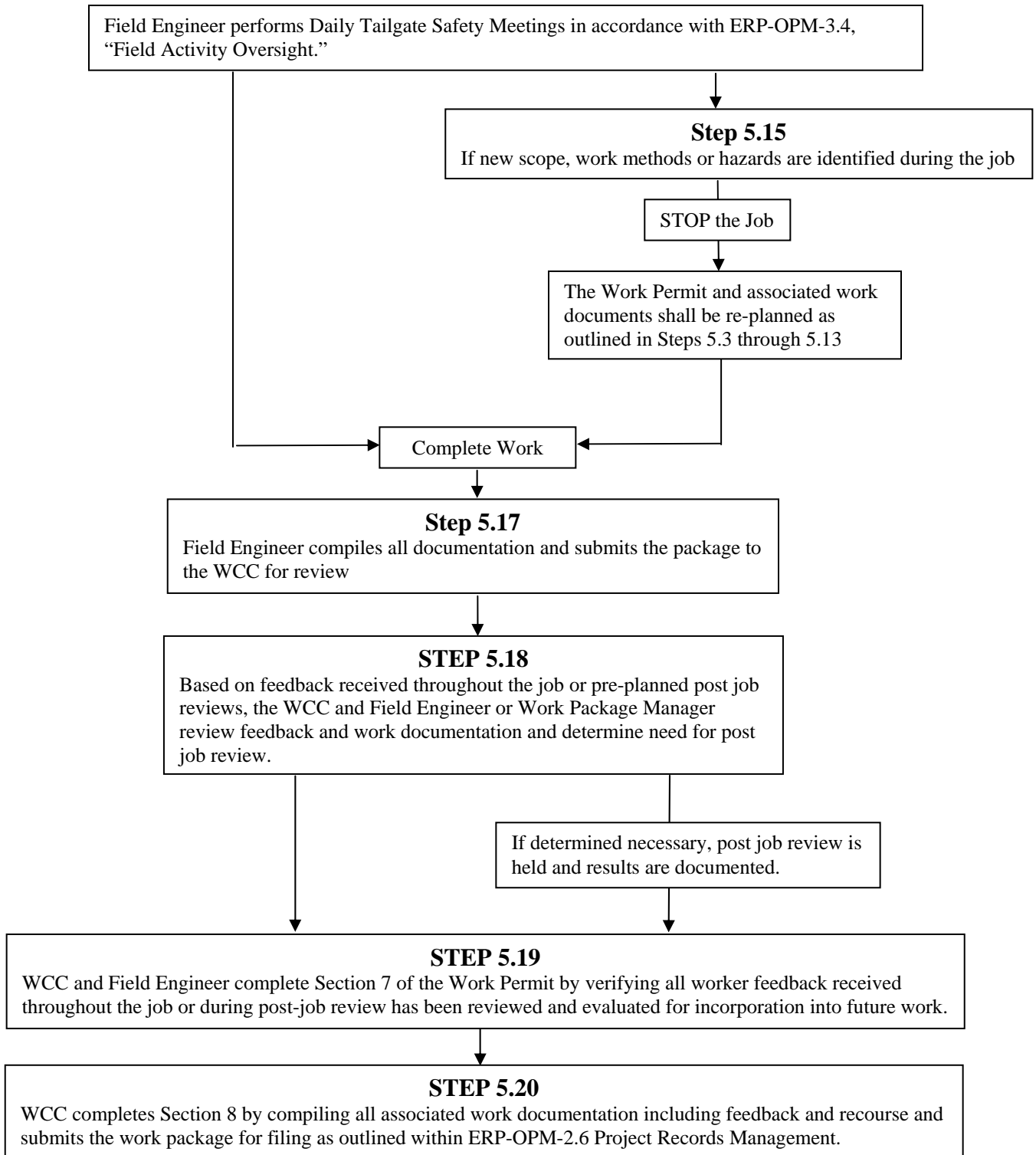
Note: Signature indicates personnel performing work have read and understand the hazards and permit requirements (including attached permits).

Workers

Life #

Workers are encouraged to provide feedback on ES&H concerns or on ideas for improved job work flow.

Attachment 5
Work Permit Use and Closeout Flow Chart



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Attachment 6

Minor Change Review and Approval

Minor Change Number: _____ Date: _____

Reason for Change: _____

Affected Documents (list):

Document	Affected Page(s)	Comments

Work Permit Review Team Review:

Title	Name (print)	Signature	Date
Primary Reviewer			
ES&H Professional			
Other			
Other			
ABE			
Work Control Coordinator			
Service Provider			
Work Package Manager			
D&D Manager			

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Attachment 7 Minor Change and Revision Log

SECTION	PAGE #	REV. #	DATE	REASON FOR MINOR CHANGE OR REVISION

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**[PLEASE CLICK HERE TO SEND READING
ACKNOWLEDGEMENT EMAIL](#)**

APPENDIX E

Contingency Plan for the BGRR Graphite Pile Removal

1.0 INTRODUCTION

The U.S. Department of Energy (DOE) and the U.S. Environmental Protection Agency (EPA) require the implementation of a Contingency Plan to protect the local community that can be affected (both on-site and off-site), in the event of an accident or emergency.

2.0 SCOPE

This Contingency Plan is intended to cover the responses to incidents, emergencies, and events at Area of Concern (AOC) 9, Brookhaven Graphite Research Reactor (BGRR) Decommissioning Project that require the implementation of the BGRR Local Emergency Plan and necessary emergency responses.

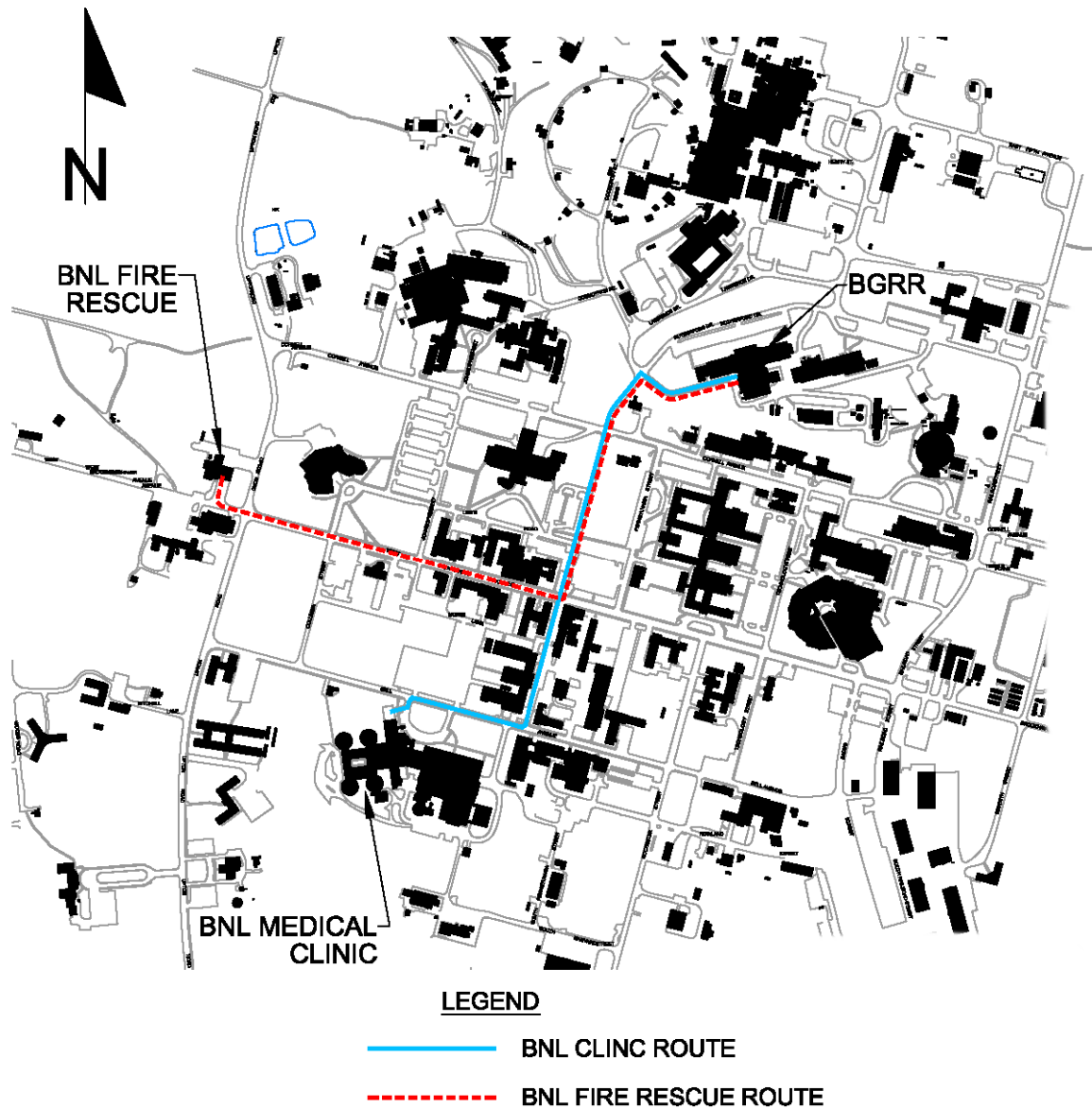
This Contingency Plan identifies the general hazards that may arise during graphite pile removal, assigns responsibilities and authority in the event that an accident or emergency occurs, and outlines generic emergency responses expected from BGRR project and BSA Emergency Services personnel. More detailed descriptions of identified project related hazards can be found in the Environmental, Safety & Health Plan (ES&H Plan) to be prepared for the project, associated task-specific Job Safety Analyses, and the BGRR-DP Local Emergency Plan.

3.0 DESCRIPTION OF THE PROJECT

The remedial actions for AOC 9 specified in the BGRR Record of Decision include the removal of the graphite pile, biological shield, canal structure, and reasonably accessible contaminated soils. The BGRR Decommissioning Project will be conducted as detailed in the appropriate Remedial Design/Remedial Action (RD/RA) Work Plans and contract specifications, and will be performed in accordance with the Interagency Agreement among the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the New York State Department of Environmental Conservation (NYSDEC).

The locations of the BNL emergency facilities and the route from the emergency facilities to the work site are shown on Figure 1.

Figure 1 – BNL Emergency Facilities



4.0 DESCRIPTION OF HAZARDS

The work associated with the BGRR Decommissioning Project requires a Contingency Plan because it involves radiological hazards associated with the handling, packaging and transportation of BGRR graphite and metal components.

The types of emergencies that may occur at the site during the remedial action are:

- **Fire** - Portable fire extinguishers will be placed onsite in the excavation areas during the excavation.

- **Explosions** – The project has placed limitations on the use of flammable materials while performing the pile removal thus reducing the risk of this type of emergency.
- **Heavy Equipment Operation** – Heavy equipment will be utilized during pile removal and waste loading activities.
- **Personnel Injury or Fatality** - The Environment, Health and Safety Plan (ES&H Plan) prepared for the Graphite Pile removal Project and the task-specific Job Safety Analysis (JSA) will address the hazards that may result in personnel injury or fatality.
- **Uncontrolled Release of Hazardous and/or Radiological Materials** - The possibility of an uncontrolled release of contaminated materials both on and off of BNL property.
- **Personnel Exposure** - The possibility of personnel exposure to radiological and hazardous materials.

5.0 EMERGENCY PERSONNEL RESPONSIBILITIES

The following personnel have responsibilities during an accident or emergency:

- **BSA Laboratory Emergency Supervisor (LES)** - Shall supervise and coordinate action during an emergency. The person arriving first in response to an emergency (usually the Fire or Police Captain) acts for the LES unless the characteristics of the emergency demand that the LES (manager of the Safety, Health Services Division) must be contacted. The LES is responsible for coordinating actions with New York State and Suffolk County Emergency Officials.
- **Incident Commander (IC)** - Shall act as the person in charge of the incident scene and the one who assumes overall responsibility for the emergency response until an Operational Emergency is declared and the LES takes responsibility. All personnel at the scene of the incident report to and are responsible to the IC.
- **Local Emergency Coordinator** - Shall ensure that building accountability is performed following a building evacuation and reports these results to the Incident Commander. Ensure that emergency forces have been summoned and building alarms are sounded as required. Maintain command and control of the scene until relieved by the Incident Commander. Shall ensure that the Plectron assigned to the building is operational and that it is brought to the assembly area, shelter-in-place area, or evacuation area as required.
- **D&D Support Manager** - Responsible to authorize unescorted access to the Building 701

once minimum training requirements have been completed and verified.

In an emergency, the Local Emergency Coordinator will ensure the following actions are taken:

- Initiate the necessary alarms and call the BNL emergency phone (Extension 2222 or 631-344-2222 if using a cellular phone) for on-site emergencies.
- Alert the assigned ERP Safety Representative and ERP Manager - Evacuate building personnel, as required.
- Account for and ensure the safety of personnel in the area - Activate the Local Emergency Plans.
- Report the results of personnel accountability to the IC and LES.
- Report to and assist the IC.

Individuals are responsible for activating alarms and the Local Emergency Plan if they are aware of an accident or emergency and for responding to alarms in a timely and orderly manner.

In accordance with the Local Emergency Plan, if a building or site occupant is aware of an accident or emergency at the BGRR they should:

- Pull the nearest fire alarm box, **Call 2222 or 911** from an on-site phone or **631-344-2222** from an off-site phone, and briefly describe the nature and extent of the emergency;
- Alert other personnel at the BGRR to the emergency.
- Make notifications in accordance with Section 6.

6.0 NOTIFICATIONS

The following personnel should be notified in the event of an accident or emergency:

- Local Emergency Coordinator: Bruce Lein
Work Phone: (631) 344-2188
Cell Phone: (631) 754-4043
- Alternate LEC: Dean Atchison
Work Phone: (631) 344-7854
Cell Phone: (631) 929-8398
- ERP Safety and Industrial Health Manager: Brian Heneveld
Work Phone: (631) 344-4721

Cell Phone: (631) 774-6615

- ERP Radiation Protection Manager: Tom Peterson
Work Phone: (631) 344-4839
Cell Phone: (631) 453-4536
- ERP Environmental Safety and Health Coordinator: Bruce Lein
Work Phone: (631) 344-2188
Cell Phone: (631) 754-4043
- ERP D&D Support Manager: Fred Petschauer
Work Phone: (631) 344-7498
Cell Phone: (631) 484-0190
- BGRR Building Manager: Dean Atchison
Work Phone: (631) 344-7854
Cell Phone: (631) 929-8398

Notification of an unexpected spill or release of oil, a hazardous substance, or radiological material to the environment will be conducted in accordance with the BNL Standards Based Management System (SBMS) Spill Response Subject Area, "Notification and Response Requirements for Unexpected Releases of Oil, Hazardous Substances, or Radioactive Materials".

7.0 EMERGENCY SIGNALS

BNL emergency sirens will sound if an on-site Operational Emergency exists as defined in the BNL Emergency Plan. The following signals exist at BNL:

- Warning Signal - This consists of the continuous sounding of the BNL site sirens for 5 minutes. Proceed immediately to the Indoor Assembly Area and await instructions.
- Evacuation Signal - This consists of the intermittent sounding of the BNL site sirens. Evacuate the BNL site as per instructions via the Plectron.
- Plectron Signal - This consists of a radio signal sent to the plectron unit from the BNL police headquarters.
 - Location of Plectron Unit: Building 701
Responsible Individual: Bruce Lein (Extension 2188)
 - Telephone Numbers for Emergency Communications: 631-344-2222

- Building Alarms - At the sound of any building alarm evacuate the building and proceed to the Outdoor Assembly Area to await further instructions. **(DO NOT USE THE ELEVATOR).**

The BNL emergency telephone extension is 2222 (631-344-2222 if using a cellular phone) for reporting spills, accidents, fires, or emergencies. Any individual may call the BNL emergency telephone (Extension 2222), and should provide the following information:

- State the nature and extent of the emergency.
- Give the location.

8.0 ASSEMBLY POINTS

Indoor Assembly Area – By the project staff mailboxes and the Plectron Radio on elevation 143 ft. of Building 701. Gather in this area for personnel accountability and to await further instructions.

Indoor Shelter Area – The Building 701 conference room on 143 ft. level for protection and to await further instructions. The LEC shall ensure that the Plectron Radio is brought to the conference room.

Outdoor Assembly Area – West Laydown Area just outside the entrance of Building 701. Personnel will meet there for accountability and to await further instructions. In case of inclement weather, the Outdoor Assembly Area will be the Main Lobby of 703.

9.0 ACCOUNTING FOR PERSONNEL

In the event of an evacuation, the Local Emergency Coordinator will account for all personnel. The accountability will include inquiries about operations and maintenance staff, contractors, and visitors. Personnel should remain in the assembly area until they have been released. Results of the accountability will be reported to the IC and LES.

10.0 REVIEW AND UPDATE OF CONTINGENCY PLAN

This Contingency Plan will be reviewed and updated, as necessary. This Contingency Plan and subsequent updates will be sent to the BNL Emergency Services Division for review.