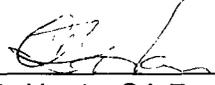
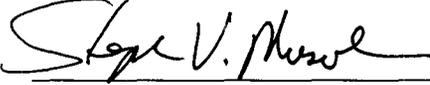
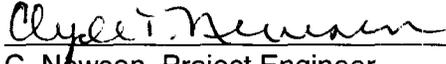
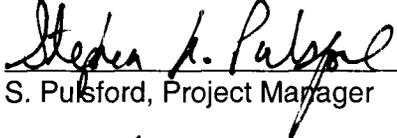


BROOKHAVEN GRAPHITE RESEARCH REACTOR (BGRR) DECOMMISSIONING PROJECT

ENVIRONMENT, HEALTH, AND SAFETY PLAN

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1.0 BGRR DECOMMISSIONING PROJECT ENVIRONMENT, HEALTH AND SAFETY PLAN

The BGRR Decommissioning Project (BGRR-D) will employ the Brookhaven National Laboratory (BNL) Standards Based Management System (SBMS) to provide a safe and healthy working environment for all staff; protecting the general public and the environment from unacceptable environmental, safety and health risks; operating in a manner that protects the environment by applying pollution prevention techniques to current activities; and remediating the environmental impacts of past operations.

The BGRR Decommission Project uses the BNL Integrated Safety Management System (ISMS) program to implement the guidance in DOE Standard 1120-98; Vols. 1 and 2, in integrating and enhancing the protection of workers, the public, and environment during the BGRR decommissioning activities. This Standard provides ES&H guidance to supplement the project management requirements and associated guidelines in DOE Order 430.1, *Life Cycle Asset Management*, and DOE-EM-STD-5503-94, *EM Health and Safety Plan Guidelines*. The Project shall perform work under BNL Work Control System including ES&H Standard 1.3.6, RadCon Manual, and CERCLA process to achieve ISMS at the BGRR-D.

This Project Environment, Health and Safety Plan (HASP) is the Management System Descriptions which forms the basis for the overall implementation of Environment, Safety and Health (ES&H) activities for this project. The BGRR-D expects to deploy and seek registration to the ISO 14001 Environmental Management and Systems Standard in FY00.

This is a guidance document for BGRR-D. A Task specific Environment, Health and Safety Plan (TEHASP) shall be developed for each major task. All task specific ES&H concerns shall be addressed in that TEHASP and references will be made to this HASP for completion of TEHASPs.

2.0 DESCRIPTION OF WORK AND GENERAL HAZARD EVALUATION

A Preliminary Hazard Analysis (PHA) was conducted for the entire BGRR facility. Based on a preliminary evaluation of the facility, no significant quantities of non-radiological hazardous material were identified, and as a result, the PHA focused on the radiological consequences of the identified events. The PHA team identified hazards and evaluated the possible causes and effects of potential scenarios involving these hazards. The preliminary hazard assessment and subsequent analyses show that the best estimate of the entire inventory for the BGRR facility is below the threshold for a Nuclear Hazard Category 3 Facility and is classified as a radiological facility.

The BGRR Decommissioning Project has divided the scope of activities under five Work Breakdown Structures (WBS); one WBS dealing with project administration. Each WBS defines the pertinent objective, background, and activity to be completed. All removal areas will be performed in a sequential progression of operations designed to initially eliminate the most hazardous conditions, followed by a logical course of operations for removal. These work activity WBSs are numbered from 1.0 to 5.0 and are listed as Removal Areas. The activity of each WBS is as follows:

- Removal Area #1
 - Water Disposal
 - Fan Removal and Decontaminate Fan House
 - Pile Fan Sump, Piping and Soils Removal
 - Above Ground Duct and Instrument House Removal

- Removal Area #2
 - Museum Walls and Materials Removal Building
 - Seal pile openings at bio-wall
 - Isolate Building 701 from 703

- Removal Area #3
 - Underground Air Plenum to Building 701 and Soils Removal
 - Underground Filter Removal
 - Underground Cooler Removal

- Removal Area #4
 - Above and Below Ground Canal and Water Treatment House and Soils Removal
 - Below Grade Piping Systems and Soils Removal
 - Remaining Soils

- Removal Area #5
 - Building 701 Disposition
 - Building 702 Disposition
 - Experimental Equipment Removal from Building 701
 - Equipment and Systems Removal

- **Project Administration:** While many significant accomplishments will be associated with each WBS, the completion of each WBS will be considered as a scheduled milestone that will trigger a redirection of work effort. In some cases, the completion of a WBS may serve as a hold point in the Project if higher priorities are identified or if funding must be diverted.

- **Radiological material removal:** Completion of the operations associated with this goal is paramount in eliminating the major source of radioactive contamination.

- **Facility equipment and systems removal:** Completion of these operations will prepare the facility for demolition/dismantlement and will eliminate additional sources of contamination.

- **Facility surface decontamination:** The total removal of surface contaminants will permit facility removal to be performed by conventional demolition practices, whereas the fixing of penetrated surface contaminants will lead to a more complex system of building dismantlement.

- **Facility characterization:** The conduct of radiation surveys and the analyses of select facility material samples will provide decisional information that will dictate the method of facility removal that can be used and the category of wastes that will be disposed.

- **Facility removal:** Removal of the building structures by conventional demolition or by selective dismantlement will determine the waste forms to be processed and will conclude the ultimate goal of this project.

- **Waste product disposal:** The characterization, packaging, storage, and transport of waste for disposal will be conducted throughout the duration of this project. Each waste type shall be processed and managed in accordance with appropriate regulations.

3.0 PERSONNEL

The following personnel have assigned functions toward various activities for this project in accordance with one's role, responsibility, accountability, and authority.

Project Manager	Environmental Compliance Representative
Deputy Project Manager	Project Controls Supervisor
Project Engineer	DOE Project Manager
Construction Manager	Lead Radiological Control Technician (RCT)
Lead Decommissioning Field Engineer	Quality Assurance (QA) Representative
Waste Management Representative	Building Facility Manager
Environment, Safety, and Health (ES&H) Manager	Field Superintendent
ES&H Coordinator	

4.0 HAZARD IDENTIFICATION

The following hazards are anticipated during the decommissioning activities. If some other hazards arise during the decommissioning work activities, they shall be addressed as addendum to the section.

Asbestos/Lead/Mercury/Cadmium	Overhead Hazards
Chemical	Polychlorinated Biphenyl Compounds (PCBs)
Confined Space	Radiological
Cuts/Abrasions	Temperature-Heat & Cold Stress
Cutting/Grinding/Welding	Transportation and Storage
Electrical	Trips, Slips, Falls
Equipment Sectioning	Unstable/Uneven Terrain
Fire/Explosion	Ventilation
Machinery/Mechanical Equipment	Other – See details in Section 5.0
Noise	

Note: Task-specific hazards shall be addressed in the applicable task-specific environment, health and safety plans.

5.0 HAZARD MITIGATION AND CONTROL

The following control measures have been incorporated to mitigate the anticipated hazards. If other administrative or engineering controls are necessary to mitigate a certain hazard, they shall be addressed in details in Task specific environmental, health and safety plan.

Asbestos/Lead/Mercury/Cadmium

- Trained and qualified workers shall perform abatement.
- Personnel shall be blood-lead baselined when working with lead materials, when and if applicable.
- Personnel performing asbestos abatement shall be in a medical surveillance program.

Chemical

- The ES&H Coordinator shall use only approved new chemicals required for routine and decontamination work. See BNL ES&H Standard 2.1.0, Hazard Communication Program, Chemical Management System.

Confined Space

- All entries into Class 2C and into permit-required confined spaces shall require a confined space entry permit, and adherence to the requirements of BNL ES&H Standard 2.2.4.

Cuts/Abrasions

- Protection against sharp edges: Preventative measures shall be incorporated into operations to prevent personnel puncture wounds and/or contamination during cutting operations. Protective gloves or techniques, such as taping cut edges or using protective foams, may be used.

Cutting/Grinding/Welding

- All welding, cutting and grinding activities shall follow BNL ES&H Standard 4.3.0. A hot work permit is required and guidance from this standard shall be followed.
- Welding, grinding, and cutting may be required to support the Project; however, these activities should not be allowed within the bioshield if safety radiological concerns have not been evaluated by the ES&H Coordinator and the Facility Support personnel.
- Personnel operating welding or cutting equipment shall wear welding/cutting goggles and/or a welding hood and the appropriate flame-retardant clothing for tasks being performed.
- Respiratory protection may be required during welding, grinding, cutting, or other activities producing respirable dusts, fumes, or vapors. The ES&H Coordinator and/or the Facility Support personnel shall make personal protective equipment (PPE) determination with concurrence from the construction manager.
- A photo ionization detector (PID) will be used to monitor for potential organic vapors. A combustible gas-detection meter, an oxygen-detection meter, and toxic-gas-detection meter may be used in certain situations to monitor for hazards of combustibility, oxygen deficiency or excess, and toxic gases. ES&H Coordinator shall evaluate the situation and implement the use of such equipment.
- Flash arrestors shall be in place on the oxy/acetylene regulators.
- Gas cylinders need to be chained and, if stored, in a secure and upright position (e.g., on racks).

Electrical

- Personnel are to treat all electrical systems as energized until a zero energy check has been performed or there is a de-energized sign.
- Ground fault circuit interrupters (GFCI): GFCIs shall be used with all extension cords and for all plugs and cord connected tools or appliances.
- Electrical heaters: These heaters must be mounted or secured so they are not subject to tipping over or being readily movable. A Fire Protection Engineer may periodically inspect the work area.

- Power cords: All power cords shall be protected during any work activity.
- Electrical equipment: Equipment shall be Underwriters' Laboratories-listed or equivalent.
- Temporary power upgrades: Must be compliant with BNL ES&H Standard 1.5.1, Electrical Safety, Rev. 3.

Equipment Sectioning

- Crimping/bagging equipment: Each cut section shall be prepared in accordance with applicable task instructions (e.g., crimped or otherwise plugged and bagged) before removal from the immediate work area.
- Crimping method: The system will be crimped at three parallel, closely spaced points to minimize the quantity of radioactive material involved, and an actual cut will be made through the center crimp.
- Non-ventilated areas: Dismantlement work (e.g., crimping, cutting, and bagging) in non-ventilated areas, e.g., canal, shall be performed with an approved confinement structure and an operating portable HEPA-filtered exhauster, as determined by Facility Support personnel/Plant Engineering and or ES&H Coordinator.
- Hoisting/rigging: Personnel shall be qualified to perform critical lifts, hoisting, and rigging. Critical lifts shall be performed in compliance with the BNL ES&H Standards, 1.3.1, Construction Safety; 1.6.0 and 1.6.1, Material Handling.

Fire/Explosion

Site activities and procedures shall focus on preventing fires and explosions through adherence to the following precautions and procedures provided in SBMS.

- Smoking: Not allowed within the controlled areas or inside any building.
- Monitoring for combustible gases: Required immediately before beginning any cutting operations if combustion potential exists and in confined spaces.
- Fire watch: A fire watch, who is trained in the use of fire extinguishers, is required during cutting, grinding, and welding. The fire watch person shall not perform any other task during the cutting, grinding, welding or any other burning operation.
- Periodic inspections: The Fire Protection Engineer or designee shall specify areas for storage of any combustible waste and shall complete random inspections of the Facility per BNL ES&H Standard 1.2.0, Department Safety Inspection.
- Temporary structures: Noncombustible or fire-retardant materials and engineered structures shall be used to mitigate the effects of fire.
- Combustibles: All combustibles shall be maintained as low as reasonably achievable (ALARA). Only smallest amount of combustibles for the daily activities should be taken in the work area. If there is any unused amount left at the end of the day, it shall be removed.

- Fire detection: All zones of the fire detection/alarm system, where present, shall be maintained throughout the decommissioning process. The BNL Fire Engineer will approve any system changes.
- Welding or cutting: Welding, flame-cutting operations, and storage of combustible liquids are prohibited in areas where there are highly radioactive material inventories unless evaluated by a Facility Support Personnel and the ES&H Coordinator.
- Hydraulic oils: It is recommended that only nonflammable hydraulic oils be used in the hydraulic shearing equipment.
- Combustible liquids: Storage of combustible liquids is prohibited in areas where there are highly radioactive material inventories or highly combustible material inventories. Combustible liquids will not be routinely used or stored within the facility, although small amounts may be required to support decontamination.

Machinery/Mechanical Equipment

All equipment that is to be brought onsite shall be in safe operating order. In order to ensure its safe operation, the operator shall pre-inspect for its safety operation. The construction manager/work control engineer shall notify the operator of the equipment about this requirement. Any defects, safety hazards, or problems shall be repaired or otherwise corrected before site entry. BNL Plant Engineering (PE) procedure dictates that PE personnel inspect all equipment before it can be brought to the work site.

Noise

Hearing protection will be required when working in environments where the noise exceeds 85 dBA. Proper hearing protection equipment will be available to all employees working in those areas (e.g., around heavy equipment). Areas where hearing protection is required shall be posted.

Radiological

See Sections 7.0 through 19.0 of this Environment, Health and Safety Plan (HASP) and the items listed below that apply to radiological. Engineering controls shall be used as applicable to keep exposures ALARA (such as the use of ventilation, capture velocity, containment and humidity control, etc.). For example:

- Contamination control measures: Before sectioning any process system, containment bagging may be adapted to the system at the location where sectioning is to occur or equally effective contamination control measures will be used. Each removed segment should be double-bagged to provide additional protection from tearing during the subsequent handling operations. Also, the cut point of the process system will be bagged to prevent contaminant migration following disassembly operations and a control area will be established during remediation. Frequent radiological surveys will be performed during dismantlement. Areas may be stabilized (sprayed or fogged with fixatives to reduce airborne levels before entry). Procedures will define the decontamination requirements in the event of contamination.
- Vacuum collection nozzle: The vacuum collection nozzle will be positioned in close proximity to the cut location, thereby controlling release of radioactive material particulate to the area.
- Radiation detection equipment: Equipment shall be provided to indicate contamination or external dose rate monitoring

- Sampling emissions: Continuous sampling of room emissions, as appropriate, during decommissioning activities will be conducted. This is performed to detect potential radioactive contaminants that may exceed the protection factor for respiratory protection and the airborne levels that require emergency notification.

Structural Dismantlement

- Services: Facility utility services shall be disconnected before initiating the dismantlement of the any facility structure as applicable.
- Demolition: Any demolition work, though none is anticipated, will be performed per the requirements of BNL ES&H Standard 1.3.1, Construction Safety.
- Dismantlement: All safety measures required for facility dismantlement will be provided, including postings, barriers, personnel directives, and fencing.

Temperature Extremes

To the extent practical, the work area will be heated or cooled to minimize the potential for heat stress or cold stress. Since much of the work will take place in Levels D, C, and B PPE, a potential for heat stress exists.

- Monitoring: Will be conducted for heat stress and cold stress per the requirements of BNL Standard BNL ES&H Standard 2.5.0, Heat Stress.
- Work/rest: Periods will be adjusted according to the guidance stated in BNL policy.
- Engineering controls (e.g., solar shielding, heating /cooling): Controls to reduce extreme temperature will be applied when and where appropriate. A climate-controlled area should be provided for cool-down/warm-up rest periods.
- Symptoms of cold and heat stress: Worker shall be briefed on the symptoms of cold and heat stress in the pre-job safety briefing and tailgate meetings. Medical assistance is extremely important if any of the cold or heat stress disorders are noticed.

Although there are other heat disorders, the following must be monitored carefully.

Heat Stress	Symptoms	First Aid*
Heat exhaustion	Pale, extreme sweating, headache, dizzy, shortness of breath, and nausea	Seek medical aid, give sips of water (if conscious), remove clothing, move to cool area, apply moist towels, lay down, and elevate legs
Heat stroke	Dry skin, drowsy or unconscious, red face, fatigue, incoherent, and hallucinations	Seek medical aid, give sips of water (if conscious), remove clothing, move to cool area, apply moist towels, lay down, and elevate legs

*When in doubt, ask for medical help, ext. 2222.

- Drinking water: Cool water and disposable drinking cups will be provided in a rest area.
- Work practices: Workers shall use safe work practices including drinking of cold water, taking rest breaks as necessary, and using the "buddy system" to keep an eye on each other and watch for heat stress symptoms.

Trips, Slips, and Falls

- General: Any situation that can cause tripping and slipping shall be attended to immediately.
- Accidental falls: Workers shall be protected in accordance with safety in accordance with BNL ES&H Standard 1.3.1, Construction Safety.
- Spacing and load limits: Personnel spacing and load limits exist and must be accounted for when preparing a work plan for on-roof operations.
- Work at elevated surfaces: Any work at levels of six feet or higher shall comply with BNL Standards on Fall Protection, Vehicle-mounted Elevating and Rotating Work Platforms, and Aerial Lifts. All equipment must be checked before use.

Transport and Storage

- Removal, transport, or storage of radiologically contaminated components shall be in currently site-approved packages, in accordance with the limits and restrictions of those packages per BNL RadCon Manual guidance.

Ventilation

- HVAC Recirculation system: Following BNL Field Support procedures, Plant Engineering monitors the building ventilation system periodically and implements corrective actions as necessary. Any malfunction shall be reported to the plant engineering.
- Engineered systems for dismantlement: During activities related to dismantlement, (e.g., crimping, cutting, and bagging) of piping system, additional need for portable HEPA like ventilation units shall be implemented as determined by the Radiological levels.
- HEPA filter (exhaust) integrity: If a HEPA filter is used, local differential pressure (dp) instrumentation readout (high dp alarms) and monitoring of gauges (which indicate dp) will be maintained until final dismantlement of ventilation system.
- Exhaust fans: Shut down exhaust fans, if any, in the event of a fire that could potentially threaten the HEPA filters.
- Backstreaming of contamination: Exhaust ducts will be sealed or temporary HEPA filters will be installed to prevent backstreaming of contamination into the other areas.

Other

- Lockout and tagout: Systems or components will comply with the provisions of BNL ES&H Standard 1.5.1, Lockout/Tagout Requirements.
- Material Handling: Any work activity related to material handling, rigging, hoisting, and other such activities shall follow BNL ES&H Standard 1.6.0 and 1.6.1.
- Exits: All personnel, working on this project, shall be familiar with location of exits and escape routes. Exits shall not be blocked.

- Pre-job briefings: The Construction Manager and Field Engineer shall ensure that the applicable requirements are discussed and understood during the pre-job briefings.
- Task packages: Packages shall be reviewed and approved as required by the appropriate organizations and the field procedures.
- Work plan adequacy: The Construction Manager or his designee shall verify daily that all work plans incorporate applicable safety and health requirements.
- Pipe trench: Lessons learned in other piping systems and precautionary commitments (including additional characterization, review, and worker protection) will be incorporated, as necessary, into the task planning/packages for the decommissioning of the pipe trench.
- Calibration and maintenance procedures: Appropriate calibration procedures for various equipment shall be implemented and followed.
- Section cutting: No section will be cut from the existing configuration until the arrangements have been made to transfer the preceding section to a staging area for waste packaging.
- Non-ventilated areas (such as canal): Airborne monitoring for chemical and radiological contamination shall be performed before opening or removing the cover blocks. Before any activity may be conducted within each area, covers must be removed to provide direct access to the internals. Direct non-destructive assay (NDA) measurements or other characterization will then be completed to estimate the inventory of radiological material and documented.

6.0 MAINTAINING THE DESIGN AND AUTHORIZATION BASIS

The following steps have been considered to maintain design and authorization basis for this project:

Unreviewed Safety Issue: Screenings will be prepared, consistent with the requirements BGRR Procedure BGRR-SOP-0902, "Safety Evaluations for Unreviewed Safety Issue (USI) Determinations", for proposed changes and/or discoveries that potentially could affect the design or authorization basis. The screening shall be reviewed and accepted by the project engineer or designee.

Dismantlement: Structural evaluations will be performed to ensure safe and stable structures.

Training: Personnel will receive training prior to handling material.

7.0 CHEMICAL OR RADIOLOGICAL HAZARD EVALUATION

Table 7.1 provides a list of the chemical and radiological hazards that were evaluated at the BGRR facility. Table 7.2 provides a list of substances present in the facility with respective characterization information for each substance.

Table 7.1 Chemical and Radiological Hazards

Waste Media	Hazardous Characteristics
Airborne Contamination	Ignitable (IGN)
Surface Contamination	Corrosive (COR)
Contaminated Soil	Reactive (RX)
Solid Waste	Explosive (EX)
Liquid Waste	Toxic (TX), (non-radiological)
Mixed Waste/Sludge	Carcinogen (CX)
	Radioactive (RAD)

Note: This task may or may not involve the possibility of exposure to the substances listed at concentrations in quantities that may be hazardous to the health of site personnel. The list of substances may be refined after sampling. If a radiological trigger level is exceeded, an ALARA review shall be performed. The need for Radiological Work Permits (RWPs) and/or formal ALARA reviews shall be conducted in accordance with the BNL institutional procedures triggered by RWPs.

Table 7.2 Hazard Evaluation Substances

Substance	INH	ING	Dermal Absorb of S or L	Skin Cont. by S or L	COR	IRR	IGN	RX/EX	Other
Americium *	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	TX,CX
Asbestos	Y	Y	N/A	N/A	N/A	N/A	N/A	NA	CX
Cesium *	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	
Cobalt*	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	
Iron*	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	
Lead	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	
Mercury, metallic	Y	N/A	Y	Y	N/A	N/A	N/A	N/A	
Cadmium	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	
Polychlorinated biphenyl (PCB)	Y	Y	Y	N/A	N/A	Y	N/A	N/A	CX
Strontium*	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	
Plutonium*	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	TX, CX
Tritium*	Y	Y	Y	N/A	N/A	N/A	N/A		
Silica, crystalline	Y	Y	N/A	N/A	N/A	N/A	N/A	N/A	CX
Uranium*	Y	Y	N/A	Y	N/A	Y	Y	Y	TX, CX

*Radionuclides

Abbreviations: INH = Inhalation, ING = Ingestion, IRR = Irritant, IGN = Ignitable, COR = Corrosive, RX = Reactive, EX = Explosive, TX = Toxic, CX = Carcinogenic, P = Poison, S = Solid, L = Liquid, Y = possible exposure route.

Substance: This task will involve describing the permissible exposure limits (PELs) for the substances expected to be present onsite. This also lists the PEL, provide an immediate dangerous to life and health (IDLH) value (if available), and describe any known health effects (see Table 7.3).

Table 7.3 Substances and IDLH Levels

Substance	Exposure Limit (Type)	IDLH Level	Health Effects
Asbestos, CAS No. 1332-21-4	0.1 f/cc (PEL/TWA) 1.0 f/cc STEL	Carcinogen	Causes chronic lung disease (asbestosis), inflammation of the pleura, and certain cancers of the lungs and digestive tracts.
Cadmium, CAS No; 7440-43-9	0.005 mg/m ³ (PEL/TWA)	Carcinogen	Causes pulmonary edema, dyspnea, cough, chest pain, substernal pain, chills, muscle ache, vomiting, emphysema, diarrhea
Lead, CAS No. 7439-92-1	0.05 mg/m ³ (PEL/TWA)	100 mg/m ³	Prolonged absorption of lead may result in weakness, tremors, abdominal pain, encephalopathy, and anemia.
Mercury, CAS No. 7439-97-6	0.05 mg/m ³ (PEL/TWA)	10 mg/m ³	Absorption may produce tremors, bronchitis and pneumonitis, chest pain, coughing, and may have other respiratory and central nervous system effects.
Cobalt*	BNL Rad Con Manual	Not available	Target organ: lungs
Cesium*	BNL Rad Con Manual	Not available	Target organ: lungs
Americium*	BNL Rad Con Manual	Not available	Targets bone surface.
PCBs, CAS Nos. 11097-69-1, 53469-21-9	0.5 mg/m ³ skin (PEL/TWA)	5 mg/m ³ carcinogen	Irritant of the eyes and mucous membranes, is toxic to the liver, and causes chloracne. It is a liver carcinogen in animals.
Plutonium*	BNL Rad Con Manual	Not available	Toxic and carcinogenic; targets gastro-intestinal tract, kidneys, and lungs.
Strontium*	BNL Rad Con Manual	Not available	Target organs: bone surface and lungs
Silica, crystalline, CA No. 14808-60-7	0.05 mg/m ³ (PEL/TWA)	25 mg/m ³ carcinogen	May cause impaired pulmonary function (coughing and wheezing).
Uranium*	0.05 mg/m ³ (PEL/TWA)	10 mg/m ³ carcinogen	Toxic and carcinogenic. May cause respiratory damage, vomiting, and skin burns.

*Radionuclides

Abbreviations: TWA = time weighted average; RWP = Radiation Work Permit; STEL = short-term exposure limit; PCB = polychlorinated biphenyl.

Note: A material safety data sheet for each of the above substances will be available onsite.

Onsite Injury or Illness

In the event of a work-related injury or an employee reporting any sign or symptom of exposure to hazardous substances, immediately call 2222 and refer to section 18.0 "Emergency Management" of this document. Use 344-2222 if using a cell phone.

In the event of life-threatening or traumatic injury, implement appropriate first aid and immediately call for emergency medical assistance at 911 or 2222 by plant telephone, or 344-2222 by cellular telephone.

8.0 MONITORING

The following monitoring procedures shall be implemented to monitor exposure levels of contaminants of concern:

8.1 ASBESTOS

Personnel: Lapel air samples will be taken during abatement activities. This will include 30-minute excursion samples and full shift/duration of task samples.

Area: Area sampling will be conducted to monitor airborne fiber concentrations and establish pre-abatement and post-abatement airborne fiber concentrations.

8.2 CHEMICAL

The preliminary hazards assessment does not indicate a need to conduct personnel monitoring, however, the need for monitoring will be constantly evaluated as on site conditions change. If monitoring is warranted, it will be conducted in accordance with a sampling strategy developed for the specific task as advised by the certified industrial hygienist.

8.3 LEAD

Personnel: Lapel air samples will be taken when a potential exists for worker exposure to exceed a TWA of 30 mg/m³. Periodic monitoring may be required if initial monitoring exceeds that level.

Area: Area samples may be taken as directed by Safety or Industrial Hygiene.

8.4 RADIOLOGICAL

Personnel: The use of lapel air samples may be required during certain work evolutions to monitor the radiological contamination level.

Area: Air sampling shall be conducted to trend and record air contaminant concentrations. Continuous air monitors (CAMs) shall be strategically placed inside the facility (such as Building 701). The alarm set points for CAMs will be set to alarm based on the respiratory protection factors, calculated airborne radioactivity levels, and estimated occupancy duration. The CAMs will alert personnel to increased levels of airborne radioactivity that may exceed the respiratory protection factors.

9.0 AMBIENT AIR AND SITE MONITORING PROCEDURES

Monitoring Instruments

The following instruments are anticipated to be used routinely to monitor the work environment and worker's breathing zones. The ES&H Coordinator will decide monitoring frequency continuous, 15 minutes, 30 minutes, hourly, or other. Facility Support Personnel will select proper monitoring devices and implement monitoring activities for radiological concerns.

1. Photo-ionization Detector (PID): The PID may be used to monitor the work area whenever a potential exposure exists. Both the 10.6 eV and 11.7 eV lamps will be used as determined appropriate by the ES&H Coordinator. FID (photoionization detector) may also be used.
2. Organic vapor analyzer (OVA): The OVA may be used as determined to be appropriate by the ES&H Coordinator.
3. Combustible gas indicator (CGI)/LEL meter/oxygen meter: Monitoring for these parameters will be conducted before beginning any activity that may produce a spark or flame.
4. Hydrogen sulfide detector: The presence of hydrogen sulfide gas will be detected with this monitor.
5. Carbon monoxide detector: The presence of carbon monoxide will be detected with this monitor.
6. Colorimetric detector tubes: Colorimetric detector tubes may be used for the detection and semiquantitative estimation of gases and vapors.
7. Portable heat stress monitor: If the dry bulb temperature reaches 20°C or 90°F, monitoring will be conducted, and personnel will follow guidance in BNL ES&H Standard 2.5.0, Heat Stress. This monitor will be used as determined appropriate by the ES&H Coordinator.
8. Sound level meters: Noise levels will be monitored periodically during the operation of heavy machinery or as advised by the industrial hygienist.
9. Radiological monitoring will be conducted in accordance with the BNL RadCon Manual and BGRR Surveillance and Maintenance Plan.

10.0 BIOLOGICAL MONITORING/MEDICAL SURVEILLANCE

This project requires medical surveillance or biological monitoring procedures beyond the provisions of the routine medical surveillance program:

- Bioassay: All working personnel wearing respiratory protection (for radiological purposes) shall be on a bioassay program.
- Whole-body count: All working personnel wearing respiratory protection for radiological purposes shall have a whole-body count. A chest count will be done only if advised by the Certified Health Physicist (CHP).
- Lead: Blood Lead Program (if necessary and when working with lead)
- Asbestos: Asbestos Worker Physical (if necessary and when working with asbestos).

11.0 ACTION LEVELS

Field team personnel shall observe the following action levels in Table 11.1:

Table 11.1 Action Levels

Instrument	Action Level	Specific Action
PID, both lamps or OVA/FID	<ol style="list-style-type: none"> 1. One ppm in breathing zone for three minutes or more. 2. 10 ppm peak (not necessarily sustained) in breathing zone. 	<ol style="list-style-type: none"> 1. Stop work, fall back upwind of area. Level B PPE will be used. 2. Possible upgrade to level of PPE; ES&H Coordinator/IH makes the determination. 3. Additional monitoring may be required if the PID or Draeger tubes show indication.
CGI (LEL)/O ₂	Monitor during activities when combustible gases, including hydrogen, could be present; monitoring during any activity that could produce sparks or ignition sources and when flammable gases may be present.	<ol style="list-style-type: none"> 1. If an alarm sounds, contact ES&H Coordinator immediately. 2. Stop work if O₂ reads <19.5% or >22.5%; LEL ≥ 20%. 3. Use non-sparking equipment or tools in area being monitored.
CO meter	35 ppm CO TWA	<ol style="list-style-type: none"> 1. Stop work. 2. Implement engineering controls. 3. Level B respiratory protection.
	200 ppm CO ceiling (instantaneous reading)	<ol style="list-style-type: none"> 1. Stop work. 2. Implement engineering controls. 3. Evacuate area.
H ₂ S meter	1-10 ppm H ₂ S	<ol style="list-style-type: none"> 1. Contact ES&H coordinator. 2. Perform continuous monitoring after evaluation by ES&H coordinator.
Colorimetric (Draeger tubes)	Will only be used for qualitative testing.	<ol style="list-style-type: none"> 1. Respiratory protection may be changed depending on compounds and levels detected. If levels are 50% of any published exposure levels, additional precautions, such as upgrading other PPE and changing work practices, will be taken. 2. Additional monitoring may be required if the PID or Draeger tubes show presence of any harmful airborne contaminant.
Continuous Air Monitoring	Derived air concentration values per PPE protection factors.	<ol style="list-style-type: none"> 1. Stop work. 2. Evaluate area. 3. Report to staging area/Facility Support personnel.

Note: If substances are identified that are different than those listed in Table 11.1, PPE levels will be adjusted according to toxicity.

Abbreviations: CGI = combustible gas monitor, FID = flame ionization detector, PID = photo ionization detector, O₂ = oxygen, PPE= personal protective equipment, OVA = organic vapor analyzer, CO = carbon monoxide, H₂S = hydrogen sulfide.

12.0 ONSITE CONTROL

All control boundaries shall be established in accordance with the BNL Rad Con Manual and 29 CFR 1910.120.

Support zone: This is an area outside of the controlled contamination and does not contain chemical contamination. This area is a clean zone.

Contamination Reduction Zone or Radiological Buffer Area: Area between the exclusion zone and the support zone used for controlling the spread of contamination. All step off pads located outside and adjacent to the Rad zones are considered the contamination reduction zones.

Exclusion zone or Contamination Area or High Contamination Area or Airborne Radioactivity Area: All these areas are consider exclusion zones including inner work area, known or highly probable contamination. These areas will not be posted as exclusion zones since the Rad zones clearly delineate the work area.

Other Safety measures: Measures required for facility dismantlement shall be provided, including posting, barriers, barricades, personnel directives, and fencing.

13.0 PERSONAL PROTECTIVE EQUIPMENT (PPE)

The following PPE is intended to be used during several activities at the BGRR project. PPE to be used at BGRR project shall be assigned by ES&H coordinator and/or Facility Support personnel in accordance with WP and RWP. Primarily disposable clothing will be utilized for all activities. Respirators, if necessary, are to be maintained by BNL procedures. An eye wash system shall be required on work area for irritants such as dust, paint aerosols, various fine debris, etc.

PPE - Industrial Safety

Basic PPE required in all work areas

- Substantial footwear
- Safety glasses with side shields
- Hard hat.

Optional PPE (used as required by work instructions or work permit or radiological work permit)

- Coveralls
- Booties
- Steel-toed boots
- Chemical gloves
- Work gloves
- Respirator.

PPE – Radiological

All PPE shall be provided in accordance with the RWP and/or RadCon Manual guidance.

14.0 DECONTAMINATION

Decontamination is the process of removing or neutralizing contaminants that have accumulated on the personnel, PPE, instruments, tools, or equipment. Serious personal injury takes precedence over decontamination procedures. Do not attempt personal decontamination if the injury will be aggravated. An injured person should first be removed from immediate danger (if possible to move without further injury). Then, if it is determined to be necessary by the ES&H and Facility Support personnel, decontamination can take place prior to leaving the site for medical treatment. If the extent of personal injury is unknown, emergency medical response personnel (i.e., Medical/Fire Department) will make the decision to move the injured person. The Facility Support personnel and ES&H Coordinator may have to escort the injured person to the hospital. In addition, follow other guidance in accordance with BSS-SOP-4010.

The following decontamination equipment is recommended;

- Personnel decontamination kit
- Potable water
- Various types and sizes of scrub brushes
- Spill absorbent
- Grate(s)
- Non-phosphate (biodegradable) detergent
- Wipes/towels
- Buckets/wash tubs.

15.0 RADIOLOGICAL

All radiological work procedures shall be conducted in accordance with BNL RadCon Manual and other institutionalized procedure.

Radiological conditions: Radiological work requirements are addressed in BNL Rad Con Manual and Institutionalized Procedures. Radiological control technician coverage will be from authorized RCT pool.

PPE for radiological hazards: The PPE for radiological work is addressed in BNL *Radiological Control Manual*, Rev. 3. The Facility Support personnel shall give task specific radiological requirements in the applicable RWP.

External Radiation Dosimetry shall be in accordance with applicable RWP.

Radiation monitoring: Radiological monitoring shall be performed in accordance with *BNL Radiological Control Manual* Rev. 3. The Facility Support personnel shall give task specific radiological monitoring requirements in the applicable RWP.

16.0 TRAINING/SPECIAL REQUIREMENTS

The BGRR training program requirements shall follow the criteria set forth in the BNL training policy. The BGRR Project shall establish a training matrix that meets federal, state, DOE, and site-specific requirements by job description. The matrix addresses all areas of training including worker's occupational health, safety, radiological training, equipment operation, and site and project emergency preparedness training items. The BNL Environmental Safety and Health Training Program provides workers with the knowledge and skills necessary to safely execute assigned duties. All employees receive BNL Employee General Training or Contractor/Vendor Orientation. The information in BNL Employee Safety Handbook must be thoroughly understood and followed at all times.

The training requirements identified provide each person working on the BGRR Decommissioning Project with the knowledge and skills necessary to perform their assigned duties safely, efficiently, and in compliance with the regulations.

Position Core Training:

The core training for each position is identified by the applicable functional department on a Training Position Description. The functional department is responsible for ensuring the training is maintained current.

- When craft is performing work, the Construction manager is responsible for ensuring the craft have the required qualifications and training.

Site workers:

- General Employee Training including Stop Work training for imminent danger and radiological activities, and thorough understanding of "Employee Safety Handbook."
- Forty-hour (40) hazardous waste worker plus 24-hour field experience (for work in the exclusion zone).
- Twenty-four- (24) hour hazardous waste worker plus 8-hour field experience (to work in the contamination reduction zones).
- Eight-hour (8) hazardous waste supervisor training (supervisors and ES&H Coordinator)
- Hazardous and Radioactive Waste Generator Training (as required by job assignment).
- Pre-entry briefing on Health and Safety Plan and applicable RWP.
- Respirator training (as required by job assignment).
- First aid trained personnel which may include 24 hour site Fire/Rescue Group, BNL Occupational Medical Clinic or BGRR Basic First Aid/CPR certified personnel.
- Certified asbestos worker and/or asbestos awareness (as required by job assignment).
- Lead worker (as required by job assignment).
- Radiation Worker II (as required by job assignment).
- Radiation Worker I (for access to contamination reduction zone).
- Transuranic-D&D (for removal of transuranic process system).

Visitors:

Visitors must report to the supervisor when they arrive onsite. Visitor (i.e. a non-team member) access will be limited to the support zone, unless the visitor meets full training requirements (the same requirements as field team members) and have a need to go into the contamination reduction and exclusion zones. The field construction supervisor or his designee shall control this access. This will also conform to ALARA principles at all times. All visitors (i.e., non-team members) will be escorted by a fully trained individual (i.e., an individual having completed 40-hour training and 24 hours of field experience and Rad Worker 11 training) when in these zones. Additional requirements for visitors entering contamination reduction and exclusion zones will be as follows:

- Visitors must give 24 hours prior notice of visit, if possible.

- Visitors who perform work must provide proof of training and medical surveillance to be allowed unescorted entry.
- Visitors must fill out the visitor log and sign in and out with the supervisor in accordance with the BGRR Access Control Procedure.
- Visitors must follow the same rules and wear the same PPE as any team member in the zones.

Medical requirements (for work in the exclusion zone and when applicable):

- Hazardous waste worker physical
- Whole body count
- Bioassay
- Respirator user examination

17.0 SANITATION REQUIREMENTS

The following table lists the minimum sanitation requirements:

Potable water supply available on work site?	Yes
Portable toilets available at work site?	No
Temporary washing/shower facilities required at work site?	No; location of nearest facility that can be used: Building 703 and Gymnasium (Building 478)

18.0 EMERGENCY MANAGEMENT

The following procedures should be followed if any of the situations exist.

18.1 STOP WORK FOR IMMINENT DANGER AND RADIOLOGICAL ACTIVITIES

Imminent Danger

Any employee or other person that has received training in this stop work procedure can issue a "Stop Work" order when an imminent danger situation exists. Line Management, such as ES&H professionals, will conduct a review of the work activities and conditions. Once the safety issue has been resolved, the department manager will authorize restart.

Radiological Work

Any employee, guest, or visitor that has received training in this stop work procedure can issue a "Radiological Stop Work" order. If any of the above personnel feel that his/her own work or the work of others in progress has a serious deviation from BNL radiological requirements, immediately issue a Radiological Stop Work order. Line management, supported Facility Support personnel, will conduct a review of the workplace activities and conditions. Once the radiological issue has been resolved, the department manager will authorize restart.

18.2 EMERGENCY PLAN

The following describes the emergency management measures taken at BGRR Decommissioning Project in accordance with BNL ES&H Standard 1.17.0, Local Emergency Plans:

- Emergency preparedness (training of personnel):

Prior to working within the BGRR facilities, personnel will review the applicable procedures, plans, demonstrate they are familiar with the emergency alarms, and attend pre-job safety meetings. The procedures and meetings will identify the facility specific hazards, and the appropriate emergency response, the evacuation routes, and notifications.

- Emergency planning:

An Emergency Plan (emergency action plan) has been written to meet the requirements and to ensure proper response(s) of employees if an emergency occurs. The elements required for an emergency action plan are described in the BGRR Local Emergency Plan.

Emergency notification: If an emergency or abnormal incident occurs within the BGRR facilities or an alarm annunciates that requires emergency egress, personnel will evacuate the facility and communicate the abnormal condition to the Facility Manager/local emergency coordinator (LEC) or BGRR ES&H services in this order.

Emergency Signals

Building Alarms: At the sound of any building alarm, evacuate the building and proceed to the Evacuation Area in the east parking lot and await further instructions.

Site Alarms: Continuous Alarms – Proceed to building assembly area and await further instructions
Intermittent Alarms – Evacuate the site immediately.

Project emergency notification: The project will be notified of an area emergency by telephone or area emergency sirens. Emergency notification communications will be communicated to project personnel by telephone, by radios, and by the use of runners.

Project Emergency Response Organization

Table 18.1 contains a list of emergency contacts and telephone numbers.

Evacuation:

- When workers observe a hazardous condition that they have not been prepared for, they will evacuate the area/building and call the LEC. The situation will be evaluated, and decisions will be made regarding mitigation and further response.

If notified to evacuate the building (i.e., by area emergency sirens, radio, or cellular telephone), personnel should:

- Exit through the normal means of egress, or if in imminent danger, through the nearest exit.
- Follow all radiological egress procedures unless in imminent danger.
- Help disabled, injured, or impaired persons to evacuate the area.
- Inform the person(s) performing personnel accountability of any personnel remaining in the evacuation area.

Note: Personnel should always stage upwind from the facility or location of event. Personnel who are dressed in PPE are to report to the PPE staging area (do not co-mingle with personnel who are not wearing PPE).

All workers entering the BGRR Facility and proceeding to work shall be aware of the appropriate evacuation routes to be used in an emergency.

Table 18.1 Emergency Response and Communication Telephone Numbers

Designation	Title	Work Location	Work Phone
Primary: Kevin Corbett	Facility Manager	Building 701	344-2431
Alternate: Manny Lilimpakis	Lead Decommissioning Field Engineer	Building 701	344-7628
Emergency:			
First Aid/Medical Assistance Line			2222 / 911/ Cellular 344-2222
Medical Assistance (during normal working hours)			3670
BNL Fire Department			2350
Spill Reporting			2222
BGRR Local Emergency Coordinator			2431
BNL Single Point of Contact			344-2222

Note: When it is suspected that there has been an inhalation, ingestion, or injection of radioactive material, the Lead RCT (with assistance of the Radiological Manager) shall notify BNL Internal Dosimetry Department and ask for assistance in providing the appropriate bioassay.

All affected personnel should assemble at the staging area and maintain a safe distance from response personnel and equipment unless requested to provide assistance by the LEC. If the LEC with assistance from ES&H coordinator and or Facility Support personnel determine that the exposures (from radiological or other hazardous materials) exceed the allowable background limits, personnel may be relocated to another area.

Assembly Areas

Building Assembly Area: By the mailboxes and the Plectron on elevation 143' of Building 701. Gather in this area for personnel accountability and await further instructions.

Indoor Shelter Area: The conference room on 143', for protection and await further instructions. Bring the Plectron to the conference room.

Evacuation Area: The east parking lot just outside the main entrance of Building 701 for personnel accountability and to await further instructions. In case of inclement weather, the Evacuation Area will be the lobby of Building 703.

Personnel Accountability

Personnel Accountability: The BGRR Decommissioning Project phone list will be used for project personnel. Work crew supervisors will be responsible for the accountability of their personnel and report the results to the LEC or alternate. The visitor Access Log Book will be used for accountability of all BGRR visitors.

Hearing-impaired Individuals: Hearing-impaired individuals must notify their immediate supervisor prior to working in this facility. The supervisor is responsible for notifying this individual in the event of an emergency. The supervisor should then notify the LEC or alternate in the event of an emergency that all individuals are or are not accounted for.

Re-entry

The Local Emergency Coordinator or his designee, in conjunction with the Incident Commander instructions, will authorize re-entry into the building.

Drills

Drills must be conducted at least annually.

Decontamination Procedures

As necessary, follow radiological decontamination procedures, which are addressed in Chapter 4 of BNL RadCon Manual, Rev 3, 4/99 and BNL-BSS-SOP-4010.

Emergency Preparedness Training

Training is one of the first steps of emergency preparedness. All members of the Local Emergency Response Team and employees shall complete the proper training. Initial and annual review of the BGRR project health and safety plan (HASP) is required and shall be documented. Review of the HASP initially and annually will suffice for the requirement that personnel have reviewed the building emergency plan.

Review of Health and Safety Plan

BGRR personnel shall review and familiarize with the HASP

- when hired ,
- when assigned to the project,
- when the employee's responsibilities or designated actions under the plan change,
- when the plan is revised, and at least annually thereafter.

Visitors shall be briefed on the emergency action plan when visiting the project site and shall review the BNL site emergency signals.

19.0 WASTE MANAGEMENT

The BGRR Project will generate wastes from two separate work scopes, surveillance and maintenance activities and decommissioning activities. All wastes generated during the project shall be managed, transported and disposed of in compliance with applicable state, federal and local regulatory requirements.

Surveillance and maintenance activities include routine operations such as housekeeping and equipment removal. Housekeeping waste can comprise of discarded personal protective equipment or other materials used during surveillance, cleanup and contamination control, and removal of waste caused by

animal intrusion. Waste generated from surveillance and maintenance activities shall be identified, segregated, managed, and processed through BNL's WMD via existing plans, policies and procedures.

The BGRR Decommissioning activities have been divided under five contaminant source removal actions as noted in Section 2.0 of this document. Each removal action defines a separate work scope that will result in the generation of waste. To ensure waste generated during the project is properly characterized, designated and managed a data quality objectives sessions will be conducted to validated existing characterization data and identify any additional sampling requirements. Additionally, detailed waste management guidance will be provided in the task specific environment, health and safety plans. This guidance will be prepared for each major waste generating activity to ensure wastes are properly segregated, managed, stored, and transported for disposal. These task specific plans will also ensure all waste planning activities are scrutinized for waste minimization opportunities. Each task specific plan will be based on assumptions generated in the BGRR Project Management Plan and project work breakdown structure. The assumptions specifically relate to the generation of waste are as follows:

1. Waste-disposal pathways exist for all wastes generated as a result of decommissioning the BGRR.
2. Wastes generated from the project will be low-level radioactive in nature. No Transuranic wastes will be generated and a minimal volume of radioactive mixed wastes will be generated.
3. Materials removed from the BGRR will either be released from radiological controls in accordance with approved and appropriate BNL procedures or processed and disposed of as radioactive waste. Hazardous wastes will be shipped to treatment, storage, or disposal facilities that are permitted to receive either mixed or hazardous waste.
4. Contaminated soils shall be removed as needed to meet the cleanup criteria.

The project will use, to the extent practical the existing site infrastructure including procedures, processes and disposal contracts to manage waste generated from BGRR decommissioning activities.

20.0 REFERENCES

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, 42 U.S.C. 9601, et seq.

10 CFR 835, Occupational Radiation Protection, Code of Regulations, as amended.

29 CFR 1910, Occupational Safety and Health Standards for General Industry, Code of Federal Regulations, as amended.

29 CFR 1926, Occupational Safety and Health Standards for Construction Industry, Code of Federal Regulations, as amended.

BNL Environmental, Safety and Health Standards Manual.

BNL ES&H Standard 1.17.0, Rev. 0, Local Emergency Plans.

BNL Radiological Control Manual, Revision 3, April 1999.

BNL Standards Based Management System

DOE, 1989, General Design Criteria, DOE Order 6430.1A, U.S. Department of Energy, Washington, D.C.

DOE, 1991, Unreviewed Safety Questions, DOE Order 5480.21, U.S. Department of Energy, Washington, D.C.

DOE, 1992, Technical Safety Requirements, DOE Order 5480.22, U.S. Department of Energy, Washington, D.C.

Superfund Amendments and Reauthorization Act of 1986, 42 U.S.C. 9601, et seq.

Computer Links:

BNL Standards Based Management System, <http://www.sbms.bnl.gov>
BNL ES&H Applicable Policies <https://sbms.bnl.gov/policies/cl00d011.htm>,
BNL Management System Descriptions <https://sbms.bnl.gov/mgtsys/ms00t011.htm>,
BNL RadCon Manual <https://sbms.bnl.gov/program/pd00t011.htm>
BNL Environmental Stewardship Policy <http://www.esh.bnl.gov/esd/envirnm.htm>;