ATTACHMENT 4

PILE FAN SUMP REMOVAL FIELD SAMPLING AND ANALYSES WORK PLAN

BGRR Decommissioning Project

Pile Fan Sump Removal Field Sampling and Analyses Work Plan

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1.0 INTRODUCTION

The purpose of this work plan is to provide radiological and chemical surveying and sampling direction to the field team. This work plan is only intended to be used in support of the Pile Fan Sump Removal Project. This document was developed using the "Brookhaven Graphite Research Reactor Sampling and Analysis Program for the Cleanup Verification of Soil and Disposal of Debris from the Removal of the Pile Fan Sump, Piping, and Aboveground Ducts." September 10, 1999, as a reference guide.

No work will be performed without an approved Technical Health and Safety Plan (THASP) and an approved Radiation Work Permit (RWP).

2.0 QUALITY ASSURANCE/QUALITY CONTROL

Field activities will be performed in accordance with the quality assurance/quality control (QA/QC) requirements described in the BGRR quality assurance project program. The BGRR Quality Assurance Officer shall monitor activities performed under this work plan.

3.0 FIELD DOCUMENTATION/LOG BOOK ENTIRIES

Field documentation of the sampling and analysis activities is an essential part of the project record. Actual conditions encountered in the field during prosecution of this project may require modification of the specifications described in this work plan. All modifications or change to sample locations, sample collection methods, or other aspects of this work plant will be recorded in the field logbook. Substantial changes will be reviewed by the project engineer for assessment of potential impacts on the project performance before implementation. Substantial changes include physical inability to collect specified samples and inability to collect required volumes of sample material. Changes which are not considered substantial, and which will be recorded in the field log at the time of the change, include small relocations of sample locations to avoid interference objects or structures, and selection of similar, but more appropriate sampling tools, based on actual conditions.

Documented information shall be legibly written in ink. Data shall not be obliterated by erasing or using white-out. Incorrect entries shall be corrected by striking a single line across the entry. The correction shall be entered, initialed, and dated. Logbook entries shall be reviewed for accuracy and completeness. Log book entries shall be dated and initialed by the author to be valid.

4.0 ASPHALT LOCATED ABOVE PFS PIPING

The following instructions apply only to asphalt located above the PFS piping. During asphalt excavation, the RCT will visually inspect the underside of the asphalt for stains and debris. Any stains or debris found will be recorded in the

field log and brought to the attention of the Field Superintendent. At intervals determined by the RCT, equipment and materials (i.e., hand shovels, etc.) used to support asphalt removal will be surveyed for loose surface contamination. Additionally, at intervals determined by the RCT, personnel working within the excavated area will be surveyed (i.e., frisk, loose surface, direct, etc.).

4.1 Under the direction of the Field Superintendent, Plant Engineering will remove the asphalt starting at the Fan House. The asphalt will be removed and placed approximately 4-feet from the trench. Plant Engineering will be instructed to place the asphalt with the under side up, if possible.

4.2 The RCT will perform a 100% gross surface gamma survey of the removed asphalt as per FS-SOP-1000. The results will be documented in Counts Per Minute (CPM) on a survey form.

4.3 The RCT will perform a 50% surface gross beta survey of the removed asphalt as per FS-SOP-1000. The results will be documented in CPM on a survey form.

4.4 Once the RCT has completed the surveys, an asphalt sample shall be collected every five-linear feet. At each sample location, a radiological and chemical sample will be collected.

4.5 The Field Samplers shall stage the area for collection of asphalt samples. A minimum of three (3) samples shall be collected. Completely fill a one-pint container with asphalt. The sampler containers shall be clearly marked with the appropriate information (location, time, date, media, etc.).

Note: Prior to placing the asphalt into a one-pint container, the top of the asphalt shall be clearly marked with a letter "T" (with paint or suitable marker). The Field Sampler will ensure that the asphalt is positioned in the container with the letter "T" face up to avoid attenuation in the analysis process.

4.6 RCT shall perform an external survey (loose and direct reading) of the sample containers. Containers found to exceed BNL loose surface contamination limits shall be decontaminated and brought the attention of the Field Superintendent. If the container can not be decontaminated, the sample shall be transferred to a new clean container under the direction of the Field Sampler.

4.7 RCT shall record sample information in the field log and shall place the containers into a secure controlled area, approved by the Field Superintendent.

4.8 Field Samplers shall be responsible for ensuring the sample(s) meet the chain of custody requirements for the Pile Fan Sump Removal Project.

4.9 When directed by the Field Superintendent, ASTD will analyze the one-pint containers using the ISOCS unit. The sample shall be under the visual control of

a Field Sampler. ASTD will analyze the samples for gamma emitters. At the completion of the analyses, ASTD will verbally provide activity concentrations, in units of pCi/g to the Field Superintendent. ASTD shall save each spectrum and, upon project completion, shall provide the Field Superintendent with a report of analytical results.

4.10 At the completion of the ISOCS analyses, the Field Sampler shall place the one-pint container(s) back into the designated storage location.

4.11 When directed by the Field Superintendent, the Field Sampler shall submit the one-pint container(s) analyzed by the ISOCS to the BNL laboratory for radiological analyses. The Field Sampler shall ensure that the samples are transmitted with a completed chain of custody form.

4.12 Areas of asphalt exceeding the DCGLs (Appendix 1) shall be placed under RCT control. The RCT will secure the area (i.e., rope, signs, etc.) appropriately and will notify the BGRR Waste Management Representative.

4.13 When directed by the Field Superintendent, any asphalt exceeding the DCGL shall be placed in approved waste containers.

4.14 The RCT shall perform a radiological survey on the outside of any waste containers generated. The RCT will notify the Field Superintendent if the survey results exceed BNL site radiological limits. RCT shall ensure that all containers are appropriately labeled and posted.

4.15 When directed by the Field Superintendent, asphalt identified to be below the DCGL should be segregated from radwaste materials.

5.0 SOILS ABOVE PIPING

The following instructions apply only to soils located above the PFS associated piping. During the excavation of the soil, RCT will visually inspect the excavated soils for stains and debris. Any stains or debris found will be recorded in the field log and brought to the attention of the Field Superintendent. At intervals determined by the RCT, equipment and materials (i.e., hand shovels, etc.) used to support soil removal will be surveyed for loose surface contamination. Additionally, at intervals determined by the RCT, personnel working within the excavated area will be surveyed (i.e., frisk, loose surface, direct, etc.).

5.1 Under the direction of the Field Superintendent, Plant Engineering will excavate soils located above the associated PFS pipes. The soil will be excavated either by hand digging or via use of mechanical excavation equipment. The excavated soil will be placed approximately 4 feet from the trench, away from the asphalt storage location.

5.2 The RCT will perform a 100% gross surface gamma survey of the excavated soils as per FS-SOP-1000. The results will be documented in CPM on a survey form.

5.3 The RCT will perform a 50% surface gross beta survey of the excavated soils as per FS-SOP-1000. The results will be documented in CPM on a survey form.

5.4 Once the RCT has completed the surveys, a soil sample shall be collected every forty-linear feet.

5.5 The Field Samplers shall stage the area for collection of soil samples. A minimum of five samples shall be collected and analyzed for radiological concerns using the ISOCS unit. The containers shall be clearly marked with the appropriate information (location, time, date, media, etc.).

5.6 RCT shall perform an external survey (loose and direct reading) of the sample containers. Containers found to exceed BNL loose surface contamination limits shall be decontaminated and brought the attention of the Field Superintendent. If the container can not be decontaminated, the sample shall be transferred to a new clean container under the direction of the Field Sampler.

5.7 RCT shall record sample information in the field log and shall place the containers into a secure controlled area, approved by the Field Superintendent.

5.8 Field Samplers shall be responsible for ensuring the sample(s) meet the chain of custody requirements for the Pile Fan Sump Removal Project.

5.9 When directed by the Field Superintendent, ASTD will analyze the one-pint containers using the ISOCS unit. The sample shall be under the visual control of a Field Sampler. ASTD will analyze the samples for gamma emitters. At the completion of the analyses, ASTD will verbally provide activity concentrations, in units of pCi/g to the Field Superintendent. ASTD shall save each spectrum and, upon project completion, shall provide the Field Superintendent with a report of analytical results.

5.10 At the completion of the ISOCS analyses, the Field Sampler shall place the one-pint container(s) back into the designated storage location.

5.11 When directed by the Field Superintendent, the Field Sampler shall submit the one-pint container(s) analyzed by the ISOCS to the BNL laboratory for radiological analyses. The Field Sampler shall ensure that the samples are transmitted with a completed chain of custody form.

5.12 Areas of soil exceeding the DCGLs (Appendix 1) shall be placed under RCT control. The RCT will secure the area (i.e., rope, signs, etc.) appropriately and will notify the BGRR Waste Management Representative.

5.13 When directed by the Field Superintendent, any soil exceeding the DCGL shall be placed in approved waste containers.

5.14 The RCT shall perform a radiological survey on the outside of any waste containers generated. The RCT will notify the Field Superintendent if the survey results exceed BNL site radiological limits. RCT shall ensure that all containers are appropriately labeled and posted.

5.15 When directed by the Field Superintendent, soil identified to be below the DCGL should be segregated from radwaste soil.

6.0 PIPING

The following instructions apply only to the PFS associated piping. After the soil surrounding the piping has been inspected, the pipe (by sections) will be removed. The RCT will provide radiological support to the Field Superintendent during the removal of piping. At intervals determined by the RCT, equipment and materials (i.e., rigging equipment) used to support pipe removal will be surveyed for loose surface contamination.

6.1 The RCT will support the Field Superintendent in setting up collection containers under pipe locations where cuts will be performed.

6.2 Under the direction of the Field Superintendent, Plant Engineering will cut the piping.

6.3 The RCT shall visually inspect the cut to identify possible liquids. If liquids are identified, samples will be collected.

6.4 Once the piping has been cut, a sample of the inside of the pipe shall be collected. At each sample location, a radiological and chemical sample should be collected, if sufficient sample material is available.

6.5 The Field Samplers shall stage the area for collection of samples. A minimum of four samples shall be collected (4 for radiological and 4 for chemical analyses) if sufficient sample material is available. For radiological analyses, completely fill a one-pint container with soil. For chemical analyses, completely fill containers as per the instructions in Appendix 2 of this document. Both the radiological and chemical sample containers shall be clearly marked with the appropriate information (location, time, date, media, etc.).

6.6 RCT shall perform an external survey (loose and direct reading) of the sample containers. Containers found to exceed BNL loose surface contamination limits shall be decontaminated and brought the attention of the Field Superintendent. If the container can not be decontaminated, the sample shall be transferred to a new clean container under the direction of the Field Sampler.

6.7 RCT shall record sample information in the field log and shall place the containers into a secure controlled area.

6.8 Field Samplers shall be responsible for ensuring the sample(s) meet the chain of custody requirements for the Pile Fan Sump Removal Project.

6.9 When directed by the Field Superintendent, ASTD will analyze the one-pint containers using the ISOCS unit. The sample shall be under the visual control of a Field Sampler. ASTD will analyze the samples for gamma emitters. At the completion of the analyses, ASTD will verbally provide activity concentrations, in units of pCi/g to the Field Superintendent. ASTD shall save each spectrum and, upon project completion, shall provide the Field Superintendent with a report of analytical results.

6.10 At the completion of the ISOCS analyses, the Field Sampler shall place the one-pint container(s) back into the designated storage location.

6.11 When directed by the Field Superintendent, the Field Sampler shall submit both the one-pint container(s) analyzed by the ISOCS and the containers used for the chemical samples to the BNL laboratory for radiological analyses. The Field Sampler shall ensure that the samples are transmitted with a completed chain of custody form.

Note: Once the BNL laboratory has completed screening analyses of the samples, the laboratory shall submit the samples to an independent outside laboratory for additional analyses. The Field Superintendent is responsible to ensure that the samples have been sent and received by the independent laboratory.

6.12 The RCT shall ensure the ends of the cut pipes have been securely covered.

6.13 Under the direction of the Field Superintendent, the piping will be removed and placed in approved waste containers.

6.14 The RCT shall perform a radiological survey on the outside of any waste containers generated. The RCT will notify the Field Superintendent if the survey results exceed BNL site radiological limits. The RCT shall ensure that all containers are appropriately labeled and posted.

7.0 SOILS BENEATH PIPING

The following instructions apply only to soils located beneath the PFS associated piping. Once piping has been removed, the RCT will visually inspect the soils for stains and debris. Once the piping has been removed, the remaining soils in the trench will be surveyed.

7.1 The RCT will perform a 100% gross surface gamma survey of the trench soil as per FS-SOP-1000. The results will be documented in CPM on a survey form.

7.2 The RCT will perform a 50% surface gross beta survey of the trench soil as per FS-SOP-1000. The results will be documented in CPM on a survey form.

7.3 Once the RCT has completed the surveys, soil samples shall be collected every 40-feet of trench run. At each sample location, three soil samples will be collected at depth intervals of 0 to 6 inches, 6 to 12 inches, and 12 to 18 inches below the exposed bottom of the trench.

7.4 The Field Samplers shall stage the area for collection of soil samples. A minimum of three samples shall be collected from each sample collection along the length of the trench. Each of the sample locations shall require samples collected at the depths noted in Step 7.3. The radiological sample containers shall be clearly marked with the appropriate information (location, time, date, media, etc.).

7.5 RCT shall perform an external survey (loose and direct reading) of the sample containers. Containers found to exceed the BNL loose surface contamination limits shall be decontaminated and brought the attention of the Field Superintendent. If the container can not be decontaminated, the sample shall be transferred to a new clean container under the direction of the Field Sampler.

7.6 RCT shall record sample information in the field log and shall place the containers into a secure controlled area.

7.7 Field Samplers shall be responsible for ensuring the sample(s) meet the chain of custody requirements for the Pile Fan Sump Removal Project.

7.8 When directed by the Field Superintendent, ASTD will analyze the one-pint containers using the ISOCS unit. The sample shall be under the visual control of a Field Sampler. ASTD will analyze the samples for gamma emitters. At the completion of the analyses, ASTD will verbally provide activity concentrations, in units of pCi/g to the Field Superintendent. ASTD shall save each spectrum and, upon project completion, shall provide the Field Superintendent with a report of analytical results.

Note: *The Field Superintendent shall be notified if the ISOCS results indicate soil concentrations equal to or greater than the DCGL's. The Field Superintendent shall instruct the Field Samplers to collect soil samples from the same location of the 5 previous samples and submit the new samples to an independent laboratory for chemical analyses. Follow steps 9.6 through 9.12,*

7.9 At the completion of the ISOCS analyses, the Field Sampler shall place the one-pint container(s) back into the designated storage location.

7.10 When directed by the Field Superintendent, the Field Sampler shall submit the one-pint container(s) analyzed by the ISOCS to the BNL laboratory for radiological analyses. The Field Superintendent shall ensure that the samples are transmitted with a completed chain of custody form.

7.11 Areas of soil exceeding the DCGLs (Appendix 1) shall be placed under RCT control. The RCT will secure the area (i.e., rope, signs, etc.) appropriately and will notify the Field Superintendent who may notify the BGRR Waste Management Representative.

7.12 When directed by the Field Superintendent, any soil exceeding the DCGL shall be placed in approved waste containers.

7.13 The RCT shall perform a radiological survey on the outside of any waste containers generated. The RCT will notify the Field Superintendent if the survey results exceed BNL site radiological limits. RCT shall ensure that all containers are appropriately labeled and posted.

7.14 When directed by the Field Superintendent, soil identified to be below the DCGL should be segregated from radwaste materials.

8.0 SUMP ASPHALT

The following instructions apply only to sump asphalt. During asphalt excavation, the RCT will visually inspect the underside of the asphalt for stains and debris. Any stains or debris identified will be recorded in the field log and brought to the attention of the Field Superintendent. At intervals determined by the RCT, equipment and materials (i.e., hand shovels, etc.) used to support asphalt removal will be surveyed for loose surface contamination. Additionally, at intervals determined by the RCT, personnel working within the excavated area will be surveyed (i.e., frisk, loose surface, direct, etc.).

8.1 Under the direction of the Field Superintendent, Plant Engineering will remove the sump asphalt. The sump asphalt will be removed and placed away from the sump. Plant Engineering will be instructed to place the sump asphalt with the under side up, if possible.

8.2 The RCT will perform a 100% gross surface gamma survey of the removed sump asphalt as per FS-SOP-1000. The results will be documented in CPM on a survey form.

8.3 The RCT will perform a 50% surface gross beta survey of the removed sump asphalt as per FS-SOP-1000. The results will be documented in CPM on a survey form.

8.4 Once the RCT has completed the surveys, an asphalt sample shall be collected every five-linear feet. At each sample location, a radiological sample will be collected.

8.5 The Field Samplers shall stage the area for collection of asphalt samples. A minimum of three samples shall be collected for radiological analyses. The sample containers shall be clearly marked with the appropriate information (location, time, date, media, etc.).

Note: Prior to placing the asphalt into a one-pint container, the top of the asphalt shall be clearly marked with a letter "T" (with paint or suitable marker). The Field Sampler will ensure that the asphalt is positioned in the container with the letter "T" face up to avoid attenuation in the analysis process.

8.6 RCT shall perform an external survey (loose and direct reading) of the sample containers. Containers found to exceed BNL loose surface contamination limits shall be decontaminated and brought the attention of the Field Superintendent. If the container can not be decontaminated, the sample shall be transferred to a new clean container under the direction of the Field Sampler.

8.7 RCT shall record sample information in the field log and shall place the containers into a secure controlled area.

8.8 Field Samplers shall be responsible for ensuring the sample(s) meet the chain of custody requirements for the Pile Fan Sump Removal Project.

8.9 When directed by the Field Superintendent, ASTD will analyze the one-pint containers using the ISOCS unit. The sample shall be under the visual control of a Field Sampler. ASTD will analyze the samples for gamma emitters. At the completion of the analyses, ASTD will verbally provide activity concentrations, in units of pCi/g to the Field Superintendent. ASTD shall save each spectrum and, upon project completion, shall provide the Field Superintendent with a report of analytical results.

8.10 At the completion of the ISOCS analyses, the Field Sampler shall place the one-pint container(s) back into the designated storage location.

8.11 When directed by the Field Superintendent, the Field Sampler shall submit the one-pint container(s) analyzed by the ISOCS to the BNL laboratory for radiological analyses. The Field Sampler shall ensure that the samples are transmitted with a completed chain of custody form.

8.12 Areas of asphalt exceeding the DCGLs (Appendix 1) shall be placed under RCT control. The RCT will secure the area (i.e., rope, signs, etc.) appropriately and will notify the Field Superintendent who may notify the BGRR Waste Management Representative.

8.13 When directed by the Field Superintendent, any asphalt exceeding the DCGL shall be placed in approved waste containers.

8.14 The RCT shall perform a radiological survey on the outside of any waste containers generated. The RCT will notify the Field Superintendent if the survey results exceed BNL site radiological limits. RCT shall ensure that all containers are appropriately labeled and posted.

8.15 When directed by the Field Superintendent, asphalt identified to be below the DCGL shall be segregated from radwaste asphalt.

9.0 SUMP SOILS

The following instructions apply only to soils surrounding and underneath the sump. During soil excavation, the RCT will visually inspect the excavated soils for stains and debris. Any stains or debris identified will be recorded in the field log and brought to the attention of the Field Superintendent. At intervals determined by the RCT, equipment and materials (i.e., hand shovels, etc.) used to support soil removal will be surveyed for loose surface contamination. Additionally, at intervals determined by the RCT, personnel working within the excavated soil will be surveyed (i.e., frisk, loose surface, direct, etc.).

9.1 Under the direction of the Field Superintendent, Plant Engineering will excavate soils surrounding the sump. The soil will be excavated either by hand digging or use of mechanical excavation equipment. The excavated soil will placed away from the trench, on the opposite side of the removed asphalt.

Note: Once the excavators have exposed the 14-inch stainless steel duct, the Field Superintendent shall stop the excavation. Field Samplers shall collect two soil samples from the area adjacent to the PFS immediately beneath the 14-inch duct penetrations outside the PFS.

9.2 The RCT will perform a 100% gross surface gamma survey of the excavated soils as per FS-SOP-1000. The results will be documented in CPM on a survey form.

9.3 The RCT will perform a 50% surface gross beta survey of the excavated soils as per FS-SOP-1000. The results will be documented in CPM on a survey form.

9.4 Once the RCT has completed the surveys, and in addition to the two samples already collected (14-inch pipe), a soil sample shall be collected every five-linear feet from the PFS to the point of pipe cutting and capping.

9.5 The Field Samplers shall stage the area for collection of soil samples. A minimum of two samples shall be collected which includes the two samples already collected (2 for radiological and 2 for chemical analyses). For radiological analyses, completely fill a one-pint container with soil. For chemical analyses, completely fill containers as per the instructions in Appendix 2 of this document. Both the radiological and chemical sample containers shall be clearly marked with the appropriate information (location, time, date, media, etc.).

9.6 RCT shall perform an external survey (loose and direct reading) of the sample containers. Containers found to exceed the BNL loose surface contamination limits shall be decontaminated and brought the attention of the Field Superintendent. If the container can not be decontaminated, the sample shall be transferred to a new clean container under the direction of the Field Sampler.

9.7 RCT shall record sample information in the field log and shall place the containers into a secure controlled area, approved by the Field Superintendent.

9.8 Field Samplers shall be responsible for ensuring the sample(s) meet the chain of custody requirements for the Pile Fan Sump Removal Project.

9.9 When directed by the Field Superintendent, ASTD will analyze the one-pint containers using the ISOCS unit. The sample shall be under the visual control of a Field Sampler. ASTD will analyze the samples for gamma emitters. At the completion of the analyses, ASTD will verbally provide activity concentrations, in units of pCi/g to the Field Superintendent. ASTD shall save each spectrum and, upon project completion, shall provide the Field Superintendent with a report of analytical results.

9.10 At the completion of the ISOCS analyses, the Field Sampler shall place the one-pint container(s) back into the designated storage location.

9.11 When directed by the Field Superintendent, the Field Sampler shall submit both the one-pint container(s) analyzed by the ISOCS and the containers used for the chemical samples to the BNL laboratory for radiological analyses. The Field Superintendent shall ensure that the samples are transmitted with a completed chain of custody form.

Note: Once the BNL laboratory has completed screening analyses of the samples, the laboratory shall submit the samples to an independent outside laboratory for additional analyses. The Field Superintendent is responsible to ensure that the samples have been sent and received by the independent laboratory.

9.12 Areas of soil exceeding the DCGLs (Appendix 1) shall be placed under RCT control. The RCT will secure the area (i.e., rope, signs, etc.) appropriately and

will notify the Field Superintendent who may notify the BGRR Waste Management Representative.

9.13 When directed by the Field Superintendent, any soil exceeding the DCGL shall be placed in approved waste containers.

9.14 The RCT shall perform a radiological survey on the outside of any waste containers generated. The RCT will notify the Field Superintendent if the survey results exceed BNL site radiological limits. RCT shall ensure that all containers are appropriately labeled and posted.

9.15 When directed by the Field Superintendent, soil found to be below the DCGL shall be segregated from radwaste soil.

10.0 SUMP REMOVAL

The following instructions apply only to the removal of the sump. The RCT shall support the Field Superintendent during the rigging and removing of the sump.

Note: At the discretion of the Field Superintendent, additional soil and/or concrete samples shall be collected.

10.1 Under the direction of the Field Superintendent, Plant Engineering will rig the Sump.

10.2 Under the direction of the Field Superintendent, Plant Engineering will remove and place the sump in a predetermined laydown area.

10.3 Once the Sump has been secured in the laydown area, and the Field Superintendent and Health & Safety Engineer has released the area for work, the RCT shall perform a preliminary survey of the sump. The results from the survey shall be used to assist the BGRR Waste Management Representative on disposal issues.

10.4 Once the survey has been completed (Step 10.3), the RCT will brief the Field Sampler's on the radiological conditions inside and outside the Sump.

10.5 The Field Samplers shall stage the area for collection of solid/concrete samples. A minimum of three samples, shall be collected (3 for radiological and 3 for chemical analyses). Samples will be collected from the three highest radiological activity locations based on the Step 10.3 survey. For radiological analyses, completely fill a one-pint container with concrete. For chemical analyses, completely fill containers as per the instructions in Appendix 2 of this document. Both the radiological and chemical sample containers shall be clearly marked with the appropriate information (location, time, date, media, etc.).

10.6 RCT shall perform an external survey (loose and direct reading) of the sample containers. Containers found to exceed the BNL loose surface contamination limits shall be decontaminated and brought the attention of the Field Superintendent. If the container can not be decontaminated, the sample shall be transferred to a new clean container under the direction of the Field Sampler.

10.7 Field Samplers shall be responsible for ensuring the sample(s) meet the chain of custody requirements for the Pile Fan Sump Removal Project.

10.8 Field Samplers shall record sample information in the field log and place the containers into a secure controlled area.

10.9 When directed by the Field Superintendent, ASTD will analyze the one-pint containers using the ISOCS unit. The sample shall be under the visual control of a Field Sampler. ASTD will analyze the samples for gamma emitters. At the completion of the analyses, ASTD will verbally provide activity concentrations, in units of pCi/g to the Field Superintendent. ASTD shall save each spectrum and, upon project completion, shall provide the Field Superintendent with a report of analytical results.

10.10 At the completion of the ISOCS analyses, the Field Sampler shall place the one-pint container(s) back into the designated storage location.

10.11 When directed by the Field Superintendent, the Field Sampler shall submit both the one-pint container(s) analyzed by the ISOCS and the containers used for the chemical samples to the BNL laboratory for radiological analyses. The Field Superintendent shall ensure that the samples are transmitted with a completed chain of custody form.

Note: Once the BNL laboratory has completed screening analyses of the samples, the laboratory shall submit the samples to an independent outside laboratory for additional analyses. The Field Superintendent is responsible to ensure that the samples have been sent and received by the independent laboratory.

11.0 SOILS BENEATH SUMP

The following instructions apply only to soils located below the PFS. Once the sump has been removed, the remaining soils in the trench will be surveyed. The survey will include radiological and chemical analyses.

11.1 Once the sump has been removed, RCT will visually inspect the soils for stains and debris.

11.2 The RCT will perform a 100% gross surface gamma survey of the trench soil as per FS-SOP-1000. The results will be documented in CPM on a survey form.

11.3 The RCT will perform a 50% surface gross beta survey of the trench soil as per FS-SOP-1000. The results will be documented in CPM on a survey form.

11.4 The Field Samplers shall stage the area for collection of soil samples. A minimum of one samples shall be collected (1 for radiological and 1 for chemical analyses). Each of the sample locations shall require samples collected at the depths noted in Step 12.3. For radiological analyses, completely fill a one-pint container with soil. For chemical analyses, completely fill containers as per the instructions in Appendix 2 of this document. Both the radiological and chemical sample containers shall be clearly marked with the appropriate information (location, time, date, media, etc.).

11.5 RCT shall perform an external survey (loose and direct reading) of the sample containers. Containers found to exceed the BNL loose surface contamination limits shall be decontaminated and brought the attention of the Field Superintendent. If the container can not be decontaminated, the sample shall be transferred to a new clean container under the direction of the Field Sampler.

11.6 RCT shall record sample information in the field log and shall place the containers into a secure controlled area, approved by the Field Superintendent.

11.7 Field Samplers shall be responsible for ensuring the sample(s) meet the chain of custody requirements for the Pile Fan Sump Removal Project.

11.8 When directed by the Field Superintendent, ASTD will analyze the one-pint containers using the ISOCS unit. The sample shall be under the visual control of a Field Sampler. ASTD will analyze the samples for gamma emitters. At the completion of the analyses, ASTD will verbally provide activity concentrations, in units of pCi/g to the Field Superintendent. ASTD shall save each spectrum and, upon project completion, shall provide the Field Superintendent with a report of analytical results.

11.9 At the completion of the ISOCS analyses, the Field Sampler shall place the one-pint container(s) back into the designated storage location.

11.10 When directed by the Field Superintendent, the Field Sampler shall submit both the one-pint container(s) analyzed by the ISOCS and the containers used for the chemical samples to the BNL laboratory for radiological analyses. The Field Superintendent shall ensure that the samples are transmitted with a completed chain of custody form.

Note: Once the BNL laboratory has completed screening analyses of the samples, the laboratory shall submit the samples to an independent outside laboratory for additional analyses. The Field Superintendent is responsible to ensure that the samples have been sent and received by the independent laboratory.

11.11 Areas of soil exceeding the DCGLs (Appendix 1) shall be placed under RCT control. The RCT will secure the area (i.e., rope, signs, etc.) appropriately and will notify the Field Superintendent who may notify the BGRR Waste Management Representative.

11.12 When directed by the Field Superintendent, any soil exceeding the DCGL shall be placed in approved waste containers.

11.13 The RCT shall perform a radiological survey on the outside of any waste containers generated. The RCT will notify the Field Superintendent if the survey results exceed BNL site radiological limits. RCT shall ensure that all containers are appropriately labeled and posted.

11.14 When directed by the Field Superintendent, soil found to be below the DCGL shall be segregated from radwaste materials.

12.0 CORE SAMPLES

Subsurface core samples may be collected if determined to be necessary, using BNL's Geoprobe sampling system and following the BNL procedure for Geoprobe sampling. The RCT will support the Field Superintendent with the collection of core samples.

APPENDIX 1

Derived Concentration Guideline Limits

Radionuclide	Industrial DCGL	Residential DCGL	Reference	Target DCGL For PFS[1] Removal Action (pCi/g)
Americium-241	160 (OU I/VI)	39 (OU I/VI)	CDM (1996), Table 6.2-10	39
Americium-241	160 (OU I)	40 (OU II/VII), 39 (OU IV)	CDM (1999), Table 1-3	
Carbon-14	no limit (NL)	NL		31 [2]
Cesium-137	67 (OU I/VI)	22 (OU I/VI)	CDM (1996), Table 6.2-10	23 [4]
Cesium-137	67 (OU I)	23 (OU II/VII, IV)	CDM (1999), Table 1-3	
Cobalt-60	3300 (OU I/VI)	1100 (OU I/VI)	CDM (1996), Table 6.2-10	1100
Cobalt-60	3356 (OU I)	NL	CDM (1997), page D-6	
Cobalt-60	3356 (OU I)	1300 (OU II/VII), 1160 (OU IV)	CDM (1999), Table 1-3	
Europium-152	NL	49 (OU IV)	CDM (1999), Table 1-8	49
Europium-154	NL	170 (OU IV)	CDM (1999), Table 1-8	170
Europium-155	NL	150,000 (OU IV)	CDM (1999), Table 1-8	1.50 E+05
Iodine-129	NL	NL		2.4 [2]
Nickel-63	NL	NL		2.9 E+05 [2]
Plutonium-238	270 (OU I/VI)	65 (OU I/VI)	CDM (1996), Table 6.2-10	65
Plutonium-238	274 (OU I)	66 (OU II/VII, IV)	CDM (1999), Table 1-3	
Plutonium-239	170 (OU I/VI)	40 (OU I/VI)	CDM (1996), Table 6.2-10	40
Plutonium-239	170 (OU I)	40 (OU II/VII, IV)	CDM (1999), Table 1-3	
Plutonium-240	170 (OU I/VI)	40 (OU I/VI)	CDM (1996), Table 6.2-10	40
Plutonium-240	170 (OU I)	40 (OU II/VII, IV)	CDM (1999), Table 1-3	
Radium-226	5 (OU I)	5 (OU II/VII, IV)	CDM (1999), page ES-5 and Table 1-3, per DOE Order 5400.5	5
Samarium-151	NL	NL		4.0 E+06 [2]
Strontium-90	NL	15 (OU I)	CDM (1997), page D-7 groundwater protection	15
Strontium-90	94 (OU I/VI)	33 (OU I/VI)	CDM (1996), Table 6.2-10	
Strontium-90	15 (OU I)	15 (OU II/VII, IV)	CDM (1999), Table 1-3	
Technetium-99	NL	NL		44 [2]
Thorium-232	5 (OU I)	5 (OU II/VII, IV)	CDM (1999), Appendix B page B-2, per DOE Order 5400.5	5
Tritium	9.6 E+15 (OU I/VI)	9.6 E+15 (OU I/VI)	CDM (1996), Table 6.2-10	1010 [2]
Tritium	9.6E+15	NA	CDM (1999), Table 1-3	
Uranium-234	NL	13	CDM (1999), Table 1-8	9 [3]
Uranium-235	29 (OU I/VI)	11 (OU I/VI)	CDM (1996)	9
Uranium-235	29 (OU I)	9 (OU II/VII), 10 (OU IV)	CDM (1999), Table 1-3	
Uranium-238		11	CDM (1997), page D-7 groundwater protection	9
Uranium-238	36 (OU I/VI)	14 (OU I/VI)	CDM (1996)	
Uranium-238	11 (OU I)	9 (OU II/VII),	CDM (1999), Table 1-3	

[1] The numbers in this column are generally chosen as the lowest that have been used in the other referenced OUs. For radionuclides that have not been considered in the other OUs, see footnote 2.

[2] The DCGLs for radionuclides that were not previously estimated for a residential scenario were estimated as the soil concentration which could cause a hypothetical onsite resident to receive no more than 15 mrem/yr using the regulator specified scenario.

[3] This DCGL was chosen to be consistent with the other uranium isotopes. The dose to source ratio (mrem/yr per pCi/g) for uranium-234 will be essentially identical to uranium-238 under the scenarios used in previous OUs.

[4] Target DCGL is provided for field screening. Final status verification concentration limits will be determined after RESRAD modeling is determined.

APPENDIX 2
TYPE AND LOCATION OF SAMPLES

Work Plan Section	Sample Location	Type of Sample	Amount of Sample Locations	Analyses per Location	Sample Container	Container Label/ Required Analyses	Minimum Volume	Number & Type of QA Samples
4.0 & 9.0	Asphalt	Asphalt	3	Rad	8-oz glass jar- No preservatives	Full Suite Radionuclides	50-grams	None
5.0	Soil Above Piping	Soil	5	Rad	8-oz glass jar- No preservatives	Full Suite Radionuclides	50-grams	None
6.0	Pipe Interior	Solids accumulated in pipe joint connections	4	Rad Chem Chem	8-oz glass jar – No preservatives 8-oz glass jar – No preservatives 8-oz glass jar – No preservatives	Full Suite radionuclides Lead Mercury	50-grams 50-grams 50-grams	1 Field Dup.
7.0	Soil Beneath Piping	Soil	5	Rad Chem[8] Chem[8] Chem[8] Chem[8]	8-oz HDPE jar – No preservatives 8-oz HDPE jar – Preserve on Ice 8-oz HDPE jar – No preservatives 4-oz glass jar w/Teflon lid – Ice 8-oz glass jar – Preserve on Ice	Full Suite Radionuclides PCBs & Pest. Total TAL Metals Total VOCs TAL SVOCs	50-grams 50-grams 50-grams Filled Filled	1 Field Duplicate for each method. 1 Extra Volume for Lab AQ for each method. 1 Field Rinsate Blank for each method 1 VOC Trip Blank

Chem[8] = Samples shall only be collected and analyzed for chemicals if soil concentration beneath the piping exceeds any of the DCGLs.

APPENDIX 2 (Cont.)
TYPE AND LOCATION OF SAMPLES

Work Plan Section	Sample Location	Type of Sample	Amount of Sample Locations	Analyses per Location	Sample Container	Container label/ Required Analyses	Minimum Volume	Number & Type of QA Samples
10.0	Pile Fan Sump Interior	Concrete	3	Rad Chem Chem	8-oz glass jar - No Preservatives 8-oz glass jar – No preservatives 8-oz glass jar – Preserve on Ice	Full Suite Radionuclides Metals PCB	50-grams 50-grams 50-grams	None
9.0	PFS Soils (at each of two 14-in. pipe penetratio ns and beneath PFS low pt.)	Soils	2	Rad Chem Chem Chem Chem	8-oz HDPE jar – No preservatives 8-oz HDPE jar – Preserve on Ice 8-oz HDPE jar – No preservatives 4-oz glass jar w/Teflon lid – Ice 8-oz glass jar – Preserve on Ice	Full Suite Radionuclides PCBs & Pest. Total TAL Metals Total VOCs TAL SVOCs	50-grams 50-grams 50-grams Filled Filled	1 Field Duplicate for each method. 1 Extra Volume for Lab AQ for each method. 1 Field Rinsate Blank for each method 1 VOC Trip Blank
11.0	Soil Beneath Sump	Soil	1	Rad Chem Chem Chem Chem Chem	8-ounce HDPE jar – No preservatives 8-ounce HDPE jar – Preserve on Ice 8-ounce HDPE jar – No preservatives 4-ounce glass jar w/Teflon lid – Ice 8-ounce glass jar – Preserve on Ice	Full Suite Radionuclides PCBs & Pest. Total TAL Metals Total VOCs TAL SVOCs	50-grams 50-grams 50-grams Filled Filled	None
12.0	Core Samples	Soil	1	Rad Chem Chem Chem Chem Chem	8-ounce HDPE jar – No preservatives 8-ounce HDPE jar – Preserve on Ice 8-ounce HDPE jar – No preservatives 4-ounce glass jar w/Teflon lid – Ice 8-ounce glass jar – Preserve on Ice	Full Suite Radionuclides PCBs & Pest. Total TAL Metals Total VOCs TAL SVOCs	50-grams 50-grams 50-grams Filled Filled	None

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March 1, 2000

Mr. Scott Mallette
Senior Environmental Advisor
U.S. Department of Energy
Brookhaven Group, Building 464
P.O. Box 5000
Upton, NY 11973-5000

SUBJECT: SUBMISSION OF BGRR SAMPLING AND ANALYSIS PROGRAM FOR THE CLEANUP VERIFICATION OF SOIL AND DISPOSAL OF DEBRIS FROM THE REMOVAL OF THE PILE FAN SUMP, PIPING, AND ABOVEGROUND DUCTS

Dear Mr. Mallette:

Enclosed for DOE approval is the final report, *BGRR Sampling and Analysis Program for the Cleanup Verification of Soil and Disposal of Debris from the Removal of the Pile Fan Sump, Piping, and Aboveground Ducts* (BGRR-008). The comments resulting from regulator review of the September 10, 1999 working draft of this report are summarized in a comment resolution matrix, which is also enclosed. The matrix explains the disposition of each comment from J. Pim (Suffolk County), J. Lister (NYS Department of Environmental Conservation), J. Crua (NYS Department of Health), and R. Rommel (NYS Division of Solid and Hazardous Materials).

If you have any questions or comments, please contact Stephen Pulsford, BGRR Decommissioning Project Manager, on ext. 2394.

Sincerely yours,

Michael Schlender

Michael Schlender
Assistant Laboratory Director
Environmental Management

Enclosures: 2

cc: M. Dikeakos, DOE/BHG (w/enc.)
J. Goodenough, DOE/CH (w/enc.)
E. Martinez, DOE/CH (w/enc.)
J. Meersman, ER (w/enc.)
S. Musolino, ER-BGRR (w/o enc.)
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S. Pulsford, ER-BGRR (w/o enc.)
File: WBS 1.3/1.4

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY J. PIM, SUFFOLK COUNTY	
COMMENT	**RESOLUTION**
1 Page 1-15. In the third paragraph in the discussion about radiological penetration of concrete, the assumption of less than ¼ " for solid surfaces may be correct, but the possibility of significant cracks and joints should be considered unless careful inspection has already proven that there are none.	The sentence will be changed to read as follows: "Contamination is expected to be confined to an approximate depth of ¼ inch into the surface of the concrete. However, special attention will be paid to cracks and joints where penetration may be substantially deeper."
2. In the fifth paragraph on the same page, the word "may" is inappropriately used. The soil around the sump has already been shown to be contaminated because of the leak around the duct. It is just not known what the extent of the contamination is.	The phrase "may have been" will be changed to read as follows: "The soil under and around the PFS has been exposed to the contents of the PFS and piping via leaks."
3. Page 1-18. Am I interpreting the plan correctly, that the 14" duct from 801 to the sump is to be removed, but the rest of the duct is to be capped and left in place? If this is the case, the last bullet on page 1-18 should refer to Building 802, not 801? If the duct is left in place, will the stack end also be plugged? Could condensation or drainage of any kind collect in the pipe once it is sealed off? If it is to be sealed and left in place, when will it be removed?	Yes, the 14" duct will be removed from Building 801 to the first elbow on the other side of the sump (approximately 6 to 8 feet from the sump). The open end of the duct on the other side of the sump will be capped and the open end of the line that exits Building 801 will be line capped. The outlet of the duct in the Stack has also been capped. The last bullet on page 1-18 is correct; however, an additional bullet is needed, which states that the open end of the duct exiting Building 801 will be capped. It is unlikely that drainage will enter the line since it will be capped where it is cut and is already capped at its exit into the stack. It is also unlikely that the line will corrode sufficiently to allow infiltration of water, because it is constructed of stainless steel. Plans are being reviewed and evaluated to remove this line in the near future.
4. Page 1-20. If the 14" duct is to be left in place, the removal of it should be added to the list of future activities.	Plans are being reviewed and evaluated to remove this line in the near future.

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY JAMES B. LISTER, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION	
COMMENT	**RESOLUTION**
1 It is essential that the initial samples obtained for each sub-area be analyzed for USEPA target compound/analyte list prior to determining what specific compounds only will be analyzed for in subsequent analyses.	Initial soil samples were analyzed for TAL VOCs, TAL SVOCs, Total TAL Metals, PCBs and Pesticides.
2. Page 1-15; Building 704 is mentioned twice in the discussion on the Pile Fan Sump.	Page 1-15 of the plan will be revised to correct this error.
3. Page B-2; No non-soil material will be permitted to be replaced in the excavation and this needs to be clearly stated in the plan.	Page B-2 of the plan will be revised to clearly state this requirement.
4. Page B-13; The TAGM number for heptachlor epoxide is 0.02 mg/kg, not NL.	Page B-13 of the plan will be revised to reflect the correct TAGM number.
5. Page B-20; When sampling interior walls of the PFS attempts should be made to sample the floor as well as interior walls.	Page B-20 will be revised to include this recommendation.
6. Page B-23; Samples should be obtained at every joint along the length of the pipe. In addition what criteria will be used to determine at what depth the three samples will be obtained? It is suggested that the same criteria stated to be used for picking additional sampling points be used such as visible staining and elevated gamma readings.	Remedial action support samples will be obtained at locations based on visual staining or the observation of elevated field measurements including pipe joints and analyzed by portable gamma spectroscopy. Remedial Action Support Surveys are described in Appendix G, which has been added to the SAP. Verification sample locations are selected based on a random location in each 40 foot segment, in accordance with MARSSIM guidance. Verification samples are taken at 0-6", 6-12", and 12-18" as specified in Table B2-2. They are not biased to pipe joint locations. However, additional verification sample locations may be selected based on visual staining or the observation of elevated field measurements. A description of the Final Status Survey and its comparison to MARSSIM guidance is included in Appendix H.
7. Page B-23; It is stated that one sample per container will be obtained for verification. No mention is made of the size of the container; please state the size.	This requirement relates to non-contaminated soil. Remedial Action Support Surveys are performed on soil that is removed from the excavation using beta and gamma field detectors, and sampling and analysis using portable gamma spectroscopy, as described in Appendix G. Contaminated will be separated from non-contaminated soil and placed into approximately 220 ft^3 containers. Non-contaminated soil will be placed to the side of the excavation. It will not be placed into containers because of the difficulty associated with replacing the non-contaminated soil from the containers back into the excavation. A 'container' of non-contaminated soil is assumed to consist of the soil excavated

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY JAMES B. LISTER, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION	
COMMENT	**RESOLUTION**
	from a 30 to 40 foot long segment of trench 5 to 10 feet deep. This will result in a volume of between 150 to 400 ft^3. This clarification will be made to Sections B2.0(3), B2.0(5c), and B2.0(6c).
8. Table B2-3; Mention is made of compositing samples and them immediately obtaining the volatile organic sample. Organic samples must not be composited.	Samples containers for analysis for Volatile Organic Compounds are collected prior to compositing. Other samples are collected from composites. Table B2-3 will be modified to clarify this requirement.
9. Page C-11; The interior of the PFS should be analyzed for VOCs and TAL metals as well as PCBs.	Sludge previously collected from the sump was analyzed for VOCs and TAL metals. This data will be used to characterize the sump for disposal as radioactive or mixed waste. The purpose of the samples described on page C-11 is to determine whether a coating exists on the interior of the sump, and if so, does it contain PCBs and lead. Analytical data for the coating will be used along with analytical data for the sludge to characterize the sump for disposal as radioactive or mixed waste. A change to the SAP is not considered necessary.

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY J. CRUA, NEW YORK STATE DEPARTMENT OF HEALTH	
COMMENT	**RESOLUTION**
1 Since there is uncertainty with respect to the types of chemicals used during the operation of the BGRR and other surrounding facilities (such as the "Hot Lab" housed in building 801) and uncertainty as to the chemicals discharged (most likely in the form of condensate to the pile fan sump, it is necessary to analyze the first round of samples for all of the contaminants on the United States Environmental Protection Agencies target compound/analyte list.	Initial soil samples were analyzed for TAL VOCs, TAL SVOCs, Total TAL Metals, PCBs and Pesticides.
2. The document should specifically state that post pipe excavation soil samples will be collected at each pipe union, and any other area along the excavated pipeline where leakage was evident (i.e. stained an/or radiologically contaminated soil.	Remedial action support samples will be obtained at locations based on visual staining or the observation of elevated field measurements including pipe joints and analyzed by portable gamma spectroscopy. Remedial Action Support Surveys are described in Appendix G, which has been added to the SAP. Verification sample locations are selected based on a random location in each 40 foot segment, in accordance with MARSSIM guidance. Verification samples are taken at 0-6", 6-12", and 12-18" as specified in Table B2-2. They are not biased to pipe joint locations. However, additional verification sample locations may be selected based on visual staining or the observation of elevated field measurements. A description of the Final Status Survey and its comparison to MARSSIM guidance is included in Appendix H.
3. Care should be exercised when sampling for polyaromatic hydrocarbons (PAHs) under the asphalt covering since the detection of PAHs in these areas may be attributed to the asphalt	The purpose of these samples is to determine whether these soils have become contaminated with PAHs that are attributable from the asphalt, which is the only suspected source of this contaminant. A change to the SAP is not considered necessary.

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY J. CRUA, NEW YORK STATE DEPARTMENT OF HEALTH	
COMMENT	**RESOLUTION**
4. During the excavation of contaminated soil, it is necessary to implement a dust monitoring/control plan as described in the New York State Department of Environmental Conservation's Technical and Administrative Guidance Manual 4031, regarding "Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites." Failure to monitor, and if necessary, control dust migration during excavation of contaminated soil may result in on-site exposure to contaminants, and/or the contamination of other on-site areas.	Anytime there is a possibility to generate dust from excavation of soil, a NESHAPS evaluation is prepared for the purpose of radiological control and regulatory compliance. In the case of the Pile Fan Sump, the hypothetical maximum exposure to the public was found to be 1.0×10^{-5} mrem. In conjunction, routine airborne radioactivity monitoring is defined in the Radiation Work Permit and conducted as the work proceeds. The monitoring results are independently reviewed by the NESHAPS Point-of-Contact. By complying with the NESHAPS constraints that keep the dose potential to the public below 0.1 mrem, the objectives to control the generation of particulates to NYS requirements is maintained. Therefore a parallel dust monitoring regime should not be required and credit for control and of airborne radioactivity should be taken to satisfy the NYSDEC.

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY R. ROMMEL, NEW YORK STATE DIVISION OF SOLID & HAZARDOUS MATERIALS	
COMMENT	**RESOLUTION**
1 The September 22, 1999 Action Memorandum only covers the PFS, also referred to as Area of Concern (AOC) 9D, and does not refer to the Above Ground Ducts. It was understood from the meeting held on June 2, 1999 between BNL and this department that the Aboveground Ducts would be administratively grouped with Building 708 and the Instrument House, and handled under a separate Engineering Evaluation / Cost Analysis (EECA). During a November 4, 1999 phone conference between the Department, Brookhaven National Laboratory (BNL), the New York State Department of Health (DOH), and the Suffolk County Department of Health Sciences (SCDHS), we discussed that the Above Ground Ducts removal be covered by its own Action Memorandum, separate from the EE/CA(s) for the remainder of the BGRR Decommissioning project. If any further details of organization of the Above Ground Duct project and the remainder of the BGRR project are available when the SAP is revised, then please include them in with the final SAP.	The SAP is not intended to include this type of information. Such information will be provided to the state, as it becomes available. A change to the SAP is not considered necessary.
2. The title of the document includes the term "cleanup verification of soil", yet this SAP does not utilize most of the guidance provided by the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) EPA 402-R-907-016, nor is MARSSIM referenced in the SAP. MARSSIM is particularly to radiological final status surveys. Include in this SAP a detailed explanation of why MARSSIM guidance is not being addressed.	Appendix H has been added to this document to explain how MARSSIM guidance is being incorporated into final status surveys for the PFS and associated piping.
3. No mention is made in the SAP of using an independent verification contractor (IVC) to substantiate reported results in areas where a final status survey will be performed as part of this removal action. The Department strongly recommends the use of an IVC for projects with such long operational and inactive periods, where large quantities of radionuclides were involved, and that are apparently the source of ground water contamination. Please address the use of an IVC in this SAP. It is anticipated that during the final status survey the Department will take some confirmatory soil samples to ensure remaining soils meet the established cleanup goal.	An independent contractor will be used to perform an independent verification of final status surveys for the PFS and associated piping. The state will be provided with the opportunity to collect confirmatory soil samples. These requirements will be added to Section 5.15, "Quality Assurance Project Plan, Assessment/Oversight.
4. The use of the ISOCS system for characterization purposes and for directing remediation for gamma-emitting nuclides is acceptable.	ISOCS is only being used for Remedial Action Support Surveys and to help ensure that cleanup standards have been attained prior to performing the final

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY R. ROMMEL, NEW YORK STATE DIVISION OF SOLID & HAZARDOUS MATERIALS	
COMMENT	**RESOLUTION**
However, use of the ISOCS for a final status survey, without developing a detailed correlation between actual soils samples and ISOCS readings, is not acceptable. Prior to ISOCS use in final status surveys, develop a correlation report that details acceptably accurate results, and provide this report to this Department prior to performing final status surveys using ISOCS. Pleas specific in this SAP if a separate "final status survey plan" will be prepared for submission to the regulatory agencies.	status survey (verification sampling). A description of the final status survey plan has been added to appendix H.
5. Further clarification needs to be provided concerning mixed wastes in this document. IF hazardous materials contamination is prevalent at the BGRR project, it is likely to be mixed with radionuclides. Include details on the handling, segregation, and disposal of mixed wastes discovered during this project.	The purpose of the SAP is to identify whether mixed wastes may be present. Handling, segregation, and disposal of mixed wastes that may be discovered during this project is not the subject of this Sampling and Analysis Plan. These activities will be performed in accordance with existing BNL policies and procedures that govern such activities. A change to the SAP is not considered necessary.
6. Section 1.1.1, Facility Description, on page 1-7 describes that the PFS was equipped with a float switch that caused an indicator light to come on in the Building 801 waste operations area when the PFS level reached an appropriate level. This description should also specify at what point in time (year) the sump's contents were no longer removed by the steam jet.	The time when routine pumping of the PFS ceased has not been firmly established. The problem was identified during a BNL Facility Review conducted in 9/97 and routine pumping was initiated in 12/97. Based on this information, routine pumping of the sump was not performed for an unknown period of time prior to 9/97. This level of detail is not considered appropriate for the SAP. A change to the SAP is not considered necessary.
7. In the description of the Belowground Piping, also on page 1-7, it refers to a 14" stainless steel air duct which carries exhaust from the laboratory fume hoods. Later, the SAP refers to a 14" acid off-gas line (first referred to on page 1-19 in Figure 1-8). If these two pipes are in fact the same, refer to it on page 1-7 as the "acid off-gas line"	These two 14" lines are the same. Page 1-7 will be changed to refer to it as the "acid off-gas line."
8. The 2" steel pipe that would drain the PFS, as mentioned on page 1-7, is not shown in Figure 1-3 on page 1-9. Please include the approximate location of this drain line in Figure 1-3.	Figure 1-2 was intended to show major features in the vicinity of the PFS and the 4" line. Figure 1-8, page 1-19 clearly shows the location of the 2" steel pipe. A change to the SAP is not considered necessary.
9. A description on page 1-12 of the January 1991 survey work in the Above Ground Duct specified that a survey instrument read 50,000 dpm on the inner surface of a core sample. Without specifying the instrument, active probe window area, or other details such as whether this contamination was removable or fixed, this information is of extremely limited utility. If there are any other details that can be mentioned in this section concerning	The instrument was a Ludlum GM pancake detector with a 15 cm^2 window. Limited information is available regarding this survey. However, additional available details will be added to this section

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY R. ROMMEL, NEW YORK STATE DIVISION OF SOLID & HAZARDOUS MATERIALS	
COMMENT	**RESOLUTION**
the January 1991 Survey the please include it here.	
10. Further down on page 1-12 is the following statement, "the memo reporting the 1991 survey (BNL 1991) refers to some radiological analyses (e.g., gamma spectroscopy, gross alpha/beta, and alpha spectroscopy) that were in process, but not complete, at the time that the report was produced. (These data were not included in the document and planning effort)." Although this is understood to mean that that data has not been located and is therefore not considered in this SAP, it is unspecified what the words "the document" refers to (the SAP or the 1991 report). Please clarify the wording here. It is disappointing that the radiological analyses results were not later attached to the 1991 report.	Unfortunately, this data has not been located. The SAP will be revised to clarify the wording.
11. Section 1.1.3 on page 1-14 discusses the contaminants of potential concern (COPCs). The following radionuclides are specified as COPCs: Cs-137, Sr-90, Pu-238, Pu-239/240, Sm-151, U-234, U-235, U-238, Ni-63, Am-241, Ra-226, Th-232, H-3, I-129 (from radioiodine recovery operations in Building 801), and C-14. This section also states that gamma emitters, such as Co-60, Eu-152, Eu-154, and Eu-155 will be detected using gamma spectroscopy. With the exception of I-129, this paragraph focuses on those isotopes related to BGRR operations. Since I-129 is included on this list of COPCs based on its use in Building 801, please also include any other radionuclides that were used in Building 801 which have a credible pathway to the PFS area.	We do not have any additional information regarding COPCs for the Building 801vent line. However, the radiological analytical requirements for the PFS cover long-lived fission and neutron activation products, including I-129. A change to the SAP is not considered necessary.
12. Section 1.1.3 on page 1-14 specifies, "large quantities of carbon –14 emitted from stack during operations." It is uncertain what is meant by large quantities. In the paper titled *A Comparison of Computed and Measured Ground-Level Dose Rates from Radioargon Emitted by the Brookhaven Reactor Stack* dated May 1954, the author, Irving A. Singer, states, "in terms of significant air pollution, the only constituent of importance which becomes partially radioactive is argon, which constitutes approximately 0.9 percent by volume of the earth's atmosphere." It now appears that this statement is incorrect. The BGRR Characterization Plan, describing activation of the BGRR pile, lists four modes for C-14 creation: N-14(n,p)C-14, C-13 (n,γ)C-14, O-17(n,α)C-14, and ternary fission. On the page detailing contamination in	Historical radionuclide air emissions at Brookhaven are currently being evaluated. However, that effort is independent of the BGRR decommissioning project. This report will be provided to the state when it is issued. This paper was written in 1954 and the term "significant air pollution" must be considered in light of standards and routine practices during that era. Carbon-14 releases were likely on the order of 1,000 to 10,000 times less than Argon-41 releases. The purpose of the SAP is to identify contaminants of potential radiological concern from fission and activation processes that may have occurred in the reactor, to support establishing analytical requirements for samples. It is not intended that it provide a detailed description of the production processes or

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY R. ROMMEL, NEW YORK STATE DIVISION OF SOLID & HAZARDOUS MATERIALS	
COMMENT	**RESOLUTION**
the Reactor Air Cooling System on page 3-16, carbon-14 is again missing. Specific details that are not currently available to us include the form of carbon-14 emitted that would have resulted in contamination of the PFS, the total activity of carbon-14 discharged, and the generation modes of carbon-14 in the stack emissions. As we were informed during the November 4, 1999 phone conference, BNL is finalizing a site environmental report covering the period from 1948-1961, which includes data on carbon-14. It is anticipated that this document will provide the Department the information required. We eagerly await the receipt of this environmental report.	estimate the source term from these processes. The SAP will be changed to remove the phrase "large quantities". Information regarding source terms and stack emissions are the subject of other documents.
13. Section 1.2 under the sub-heading "Air-Ducts" on page 1-15, notes that, "water did not stand in the air duct..." Please specify that this section refers to the above ground ducts, since water did accumulate in the belowground duct.	This refers to the above ground duct. Accumulation of leakage and infiltration water occurred in the below ground ducts, where it remained until pumped out. There is no evidence indicating that standing accumulations of water occurred in the above ground duct. However, they may have been subject to small amounts of rainwater in leakage. The SAP will be revised to provide these clarifications.
14. Figures 1-6 and 1-7 on pages 1-16 and 1-17, respectively, show that the secondary source of radionuclides in both figures are contaminated soils, which are partially shaded in both figures. The notes at the bottom of both figures indicate that, "shaded components will be eliminated during the removal action." These diagrams indicate that only a portion of the contaminated soils will be removed. Please explain why the contaminated soils boxes are not fully shaded in these figures. It is anticipated that soils greater than the DCGLs will be removed and disposed of.	The incomplete shading indicates our limited knowledge regarding soil contamination. Soil contamination in excess of the DCGLs may be limited to small isolated areas or be more widespread. All soils contaminated in excess of the DCGLs will be removed during the remediation process and verification surveys will be performed to demonstrate that this goal has been achieved. These requirements are specified in Appendix B, which presents the Data Quality Objectives, including decision statements that will be used to implement the remediation. A change to the SAP is not considered necessary.
15. Figure 1-8 on page 1-19 is difficult to reconcile with Section 1.3 of page 1-18 which refers to this figure. Specifically, the fourth bullet in Section 1.3 refers to a 14"stainless steel pipe between the PFS and Building 801, which is shown (as a 14" stainless steel duct) leading from the PFS but it does not connect to the building. Please correct Figure 1-8 if this line actually extends to Building 801. In addition, the last bullet point states, "stub-off and cap the 14-in	The 14" stainless steel pipe is synonymous with the 14" stainless steel duct. The line does connect with Building 801. The fourth bullet will be changed to refer to this line as a stainless steel duct. Figure 1-8 will be revised to show that the stainless steel duct connects with Building 801. The 14" line will be cut and capped at Building 801 and at the elbow just south

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY R. ROMMEL, NEW YORK STATE DIVISION OF SOLID & HAZARDOUS MATERIALS	
COMMENT	**RESOLUTION**
stainless-steel line from Building 801 to the PFS, as shown in Figure 1-8." If this refers to the same 14" stainless steel pipe mentioned in the fourth bullet, then this action is impossible since this pipe is being removed. It is assumed that this bullet meant to refer to the 14" stainless steel duct (as shown on Figure 1-8) leading from Building 802 to the PFS, which shows an isolation point in the figure. Please clarify the wording in the last bullet on page 1-18. If possible please use consistent terms to refer to various lines, pipes, ducts, caps, and isolations mentioned here. The use of different terms in each bullet and the diagram is confusing.	of the Pile Fan Sump. The intervening piece of 14" line that runs through the sump will be removed. The wording in Bullets 4 and 6 will be revised to clarify these actions. The terminology in the bullet list will be revised to be consistent with the terminology on the drawing.
16. Please change the word "reoved" to "removed" in the legend of Figure 1-8 on page 1-19, referring to the drain line.	The wording will be corrected in the Figure 1-8
17. Section A1.2, Decision Statements, in the middle of page A-2 refers to Technical Administrative Guidance Memoranda (TAGM) criteria, as does Figure A1-1 on page A-5. Please specify which TAGMs are being included in these general references. This comment also applies to Section B1.2 on page B-2.	Section B1.5.2 specifies the source of the TAGM limits as a memo from the New York State Department of Environmental conservation dated January 24, 1994 (HWR-94-4046). This reference will be added to the reference lists at the end of both Appendices A and B.
18. Figure A1-2, Waste Disposal Decision Logic, on page A-6 is difficult to follow and may lead to erroneous conclusions. Waste material that <u>must</u> be treated as radioactive or RCRA hazardous wastes re-enter the decision tree, where the possible outcomes are that it can be treated as a TSCA waste or simply a solid waste. Can a single waste form be considered a RCRA, and a TSCA waste (or RCRA, and solid waste) at the same time? Additionally, this figure does not consider the case where a waste material contains added radioactivity as well as hazardous components, and therefore should be disposed of a mixed waste. Please correct this diagram.	The yes statements are intended to be cumulative in this diagram. For each yes answer, the applicable regulations must be followed for treatment and disposal. This would allow for combination of waste forms (e.g., mixed wastes). A footnote will be added to this diagram to clarify this point
19. The third paragraph in Section A1.7, Waste Designation Sampling Design, specifies that samarium-151 concentrations will be estimated based on a samarium-151 to Cs-137 ration from a uranium-fueled graphite reactor at Hanford, since Sm-151 is a low-energy beta-emitter. This approach is acceptable. This also applies to Section B1.5 on page B-6.	Because this agrees with the approach taken in the SAP, a change to the SAP is not considered necessary.
20. In the discussion of Derived Concentration Guide Levels in Section B1.5.1	This paragraph will be reworded to address this comment.

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY R. ROMMEL, NEW YORK STATE DIVISION OF SOLID & HAZARDOUS MATERIALS	
COMMENT	**RESOLUTION**
on page B-14, the third paragraph compares the size of the PFS removal action to the size of the areas modeled in the *OU I/VI Radiological Risk Assessment, the OU I Final Feasibility Report*, and the *Chemical/Animal Pits and Glass Holes Final Evaluation of Alternatives Report*. It states that, "the actual size of the PFS and surrounding areas that are expected to be involved in this removal action are <400 m^2; therefore, this assumption is extremely conservative." However, this claim does not address the fact that AOC 9D, the PFS, is only a small part of Area of Concern 9, the BGRR. Assuming that any risk assessment should only address any particular sub-AOC and not the entire project is inappropriate and should not be used to extol the conservative nature of this project. Please reword this paragraph.	
21. The first paragraph of Section B4.0, Final Dose Assessment, on page B-35 states, "the final status surveys will be those done just prior to beginning the sample collection for laboratory analysis in support of final verification." No other details are provided concerning the final status surveys and it is unspecified when the final status surveys will be performed, nor is it specified what action swill occur following the final status survey. Please note that the general comments made concerning IVS's and the use of ISOCS without defining a correlation to soil samples are particularly relevant here. If a "final status survey plan" is under development and will be submitted for review as a separate document, please state so here.	Appendix H has been added to this document to explain how MARSSIM guidance is being incorporated into final status surveys for the PFS and associated piping.

Department of Energy
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Upton, New York 11973

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MAR 16 2000
BGRR PROJECT

Mr. James Lister, P.E.
New York State Department of Environmental Conservation
Division of Hazardous Waste Remediation
50 Wolf Road - Suite 210
Albany, New York 12233-7010

Ms. Mary Logan
Federal Facilities Section
Emergency and Remedial Response Division
U.S.EPA - Region II
290 Broadway - 18th Floor
New York, N.Y. 10007-1866

Dear Mr. Lister and Ms. Logan:

SUBJECT: BROOKHAVEN NATIONAL LABORATORY (BNL) INTERAGENCY AGREEMENT (IAG): BROOKHAVEN GRAPHITE RESEARCH REACTOR DECOMMISSIONING PROJECT (BGRR-DP) - SAMPLING AND ANALYSIS PROGRAM FOR THE CLEANUP VERIFICATION OF SOIL AND DISPOSAL OF DEBRIS FROM THE REMOVAL OF THE PILE FAN SUMP, PIPING AND ABOVE GROUND DUCTS

Enclosed are the final subject report and a comment resolution matrix that explains the disposition of comments received from New York State Department of Environmental Conservation (NYSDEC), New York State Department of Health (NYSDOH) and Suffolk County Department of Health Services (SCDHS).

This document will be posted to the BGRR-DP Web Site in the near future. The URL for the Web Site is: http://www.bgrr.bnl.gov.

DOE acknowledges receipt of NYSDEC's letter, dated February 7th, concerning the use of an Independent Verification Contractor. DOE has selected the Oak Ridge Institute for Science and Education (ORISE) to conduct independent verification of the Pile Fan Sump Removal Action and the Above Grade Ducts Removal Action contaminated soils remediation. The ORISE Verification Survey Report will be included as an appendix in the Pile Fan Sump Completion Report.

If you have any questions regarding these reports, please contact either Mr. James D. Goodenough of the BGRR Project Office on (631) 344-2423 or Mr. Scott Mallette of my staff on (631) 344-5345.

Sincerely,

George J. Malosh
Brookhaven Group Manager

Enclosures:
As stated

cc: J. Pim, SCDHS, w/encls.
J. Crua, NYSDOH, w/o encls.
A. Salame-Alfie, NYSDOH, w/encls.
R. Rommel, NYSDEC, w/encls.
W. Parrish, NYSDEC, w/encls.
M. Stahr, EM-34, GTN, w/o encls.
J. Roberts, EPG, CH, w/o encls.
J. Goodenough, EPG, CH, w/o encl.
S. Mallette, BHG, w/o encl.
E. Martinez, BHG, w/o encl.
M. Schlender, BNL, w/o encl.
J. Meersman, BNL, w/o encl.
S. Pulsford, BNL, w/o encl.

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN
COMMENTS BY J. PIM, SUFFOLK COUNTY

COMMENT	RESOLUTION
1 Page 1-15. In the third paragraph in the discussion about radiological penetration of concrete, the assumption of less than ¼ " for solid surfaces may be correct, but the possibility of significant cracks and joints should be considered unless careful inspection has already proven that there are none.	The sentence will be changed to read as follows: "Contamination is expected to be confined to an approximate depth of ¼ inch into the surface of the concrete. However, special attention will be paid to cracks and joints where penetration may be substantially deeper."
2. In the fifth paragraph on the same page, the word "may" is inappropriately used. The soil around the sump has already been shown to be contaminated because of the leak around the duct. It is just not known what the extent of the contamination is.	The phrase "may have been" will be changed to read as follows: "The soil under and around the PFS has been exposed to the contents of the PFS and piping via leaks."
3. Page 1-18. Am I interpreting the plan correctly, that the 14" duct from 801 to the sump is to be removed, but the rest of the duct is to be capped and left in place? If this is the case, the last bullet on page 1-18 should refer to Building 802, not 801? If the duct is left in place, will the stack end also be plugged? Could condensation or drainage of any kind collect in the pipe once it is sealed off? If it is to be sealed and left in place, when will it be removed?	Yes, the 14" duct will be removed from Building 801 to the first elbow on the other side of the sump (approximately 6 to 8 feet from the sump). The open end of the duct on the other side of the sump will be capped and the open end of the line that exits Building 801 will be line capped. The outlet of the duct in the Stack has also been capped. The last bullet on page 1-18 is correct; however, an additional bullet is needed, which states that the open end of the duct exiting Building 801 will be capped. It is unlikely that drainage will enter the line since it will be capped where it is cut and is already capped at its exit into the stack. It is also unlikely that the line will corrode sufficiently to allow infiltration of water, because it is constructed of stainless steel. Plans are being reviewed and evaluated to remove this line in the near future.
4. Page 1-20. If the 14" duct is to be left in place, the removal of it should be added to the list of future activities.	Plans are being reviewed and evaluated to remove this line in the near future.

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY JAMES B. LISTER, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION	
COMMENT	**RESOLUTION**
1 It is essential that the initial samples obtained for each sub-area be analyzed for USEPA target compound/analyte list prior to determining what specific compounds only will be analyzed for in subsequent analyses.	Initial soil samples were analyzed for TAL VOCs, TAL SVOCs, Total TAL Metals, PCBs and Pesticides.
2. Page 1-15; Building 704 is mentioned twice in the discussion on the Pile Fan Sump.	Page 1-15 of the plan will be revised to correct this error.
3. Page B-2; No non-soil material will be permitted to be replaced in the excavation and this needs to be clearly stated in the plan.	Page B-2 of the plan will be revised to clearly state this requirement.
4. Page B-13; The TAGM number for heptachlor epoxide is 0.02 mg/kg, not NL.	Page B-13 of the plan will be revised to reflect the correct TAGM number.
5. Page B-20; When sampling interior walls of the PFS attempts should be made to sample the floor as well as interior walls.	Page B-20 will be revised to include this recommendation.
6. Page B-23; Samples should be obtained at every joint along the length of the pipe. In addition what criteria will be used to determine at what depth the three samples will be obtained? It is suggested that the same criteria stated to be used for picking additional sampling points be used such as visible staining and elevated gamma readings.	Remedial action support samples will be obtained at locations based on visual staining or the observation of elevated field measurements including pipe joints and analyzed by portable gamma spectroscopy. Remedial Action Support Surveys are described in Appendix G, which has been added to the SAP. Verification sample locations are selected based on a random location in each 40 foot segment, in accordance with MARSSIM guidance. Verification samples are taken at 0-6", 6-12", and 12-18" as specified in Table B2-2. They are not biased to pipe joint locations. However, additional verification sample locations may be selected based on visual staining or the observation of elevated field measurements. A description of the Final Status Survey and its comparison to MARSSIM guidance is included in Appendix H.
7. Page B-23; It is stated that one sample per container will be obtained for verification. No mention is made of the size of the container; please state the size.	This requirement relates to non-contaminated soil. Remedial Action Support Surveys are performed on soil that is removed from the excavation using beta and gamma field detectors, and sampling and analysis using portable gamma spectroscopy, as described in Appendix G. Contaminated will be separated from non-contaminated soil and placed into approximately 220 ft^3 containers. Non-contaminated soil will be placed to the side of the excavation. It will not be placed into containers because of the difficulty associated with replacing the non-contaminated soil from the containers back into the excavation. A 'container' of non-contaminated soil is assumed to consist of the soil excavated

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY JAMES B. LISTER, NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION	
COMMENT	**RESOLUTION**
	from a 30 to 40 foot long segment of trench 5 to 10 feet deep. This will result in a volume of between 150 to 400 ft^3. This clarification will be made to Sections B2.0(3), B2.0(5c), and B2.0(6c).
8. Table B2-3; Mention is made of compositing samples and them immediately obtaining the volatile organic sample. Organic samples must not be composited.	Samples containers for analysis for Volatile Organic Compounds are collected prior to compositing. Other samples are collected from composites. Table B2-3 will be modified to clarify this requirement.
9. Page C-11; The interior of the PFS should be analyzed for VOCs and TAL metals as well as PCBs.	Sludge previously collected from the sump was analyzed for VOCs and TAL metals. This data will be used to characterize the sump for disposal as radioactive or mixed waste. The purpose of the samples described on page C-11 is to determine whether a coating exists on the interior of the sump, and if so, does it contain PCBs and lead. Analytical data for the coating will be used along with analytical data for the sludge to characterize the sump for disposal as radioactive or mixed waste. A change to the SAP is not considered necessary.

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY J. CRUA, NEW YORK STATE DEPARTMENT OF HEALTH	
COMMENT	**RESOLUTION**
1 Since there is uncertainty with respect to the types of chemicals used during the operation of the BGRR and other surrounding facilities (such as the "Hot Lab" housed in building 801) and uncertainty as to the chemicals discharged (most likely in the form of condensate to the pile fan sump, it is necessary to analyze the first round of samples for all of the contaminants on the United States Environmental Protection Agencies target compound/analyte list.	Initial soil samples were analyzed for TAL VOCs, TAL SVOCs, Total TAL Metals, PCBs and Pesticides.
2. The document should specifically state that post pipe excavation soil samples will be collected at each pipe union, and any other area along the excavated pipeline where leakage was evident (i.e. stained an/or radiologically contaminated soil.	Remedial action support samples will be obtained at locations based on visual staining or the observation of elevated field measurements including pipe joints and analyzed by portable gamma spectroscopy. Remedial Action Support Surveys are described in Appendix G, which has been added to the SAP. Verification sample locations are selected based on a random location in each 40 foot segment, in accordance with MARSSIM guidance. Verification samples are taken at 0-6", 6-12", and 12-18" as specified in Table B2-2. They are not biased to pipe joint locations. However, additional verification sample locations may be selected based on visual staining or the observation of elevated field measurements. A description of the Final Status Survey and its comparison to MARSSIM guidance is included in Appendix H.
3. Care should be exercised when sampling for polyaromatic hydrocarbons (PAHs) under the asphalt covering since the detection of PAHs in these areas may be attributed to the asphalt	The purpose of these samples is to determine whether these soils have become contaminated with PAHs that are attributable from the asphalt, which is the only suspected source of this contaminant. A change to the SAP is not considered necessary.

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY J. CRUA, NEW YORK STATE DEPARTMENT OF HEALTH	
COMMENT	**RESOLUTION**
4. During the excavation of contaminated soil, it is necessary to implement a dust monitoring/control plan as described in the New York State Department of Environmental Conservation's Technical and Administrative Guidance Manual 4031, regarding "Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites." Failure to monitor, and if necessary, control dust migration during excavation of contaminated soil may result in on-site exposure to contaminants, and/or the contamination of other on-site areas.	Anytime there is a possibility to generate dust from excavation of soil, a NESHAPS evaluation is prepared for the purpose of radiological control and regulatory compliance. In the case of the Pile Fan Sump, the hypothetical maximum exposure to the public was found to be 1.0×10^{-5} mrem. In conjunction, routine airborne radioactivity monitoring is defined in the Radiation Work Permit and conducted as the work proceeds. The monitoring results are independently reviewed by the NESHAPS Point-of-Contact. By complying with the NESHAPS constraints that keep the dose potential to the public below 0.1 mrem, the objectives to control the generation of particulates to NYS requirements is maintained. Therefore a parallel dust monitoring regime should not be required and credit for control and of airborne radioactivity should be taken to satisfy the NYSDEC.

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY R. ROMMEL, NEW YORK STATE DIVISION OF SOLID & HAZARDOUS MATERIALS	
COMMENT	**RESOLUTION**
1 The September 22, 1999 Action Memorandum only covers the PFS, also referred to as Area of Concern (AOC) 9D, and does not refer to the Above Ground Ducts. It was understood from the meeting held on June 2, 1999 between BNL and this department that the Aboveground Ducts would be administratively grouped with Building 708 and the Instrument House, and handled under a separate Engineering Evaluation / Cost Analysis (EECA). During a November 4, 1999 phone conference between the Department, Brookhaven National Laboratory (BNL), the New York State Department of Health (DOH), and the Suffolk County Department of Health Sciences (SCDHS), we discussed that the Above Ground Ducts removal be covered by its own Action Memorandum, separate from the EE/CA(s) for the remainder of the BGRR Decommissioning project. If any further details of organization of the Above Ground Duct project and the remainder of the BGRR project are available when the SAP is revised, then please include them in with the final SAP.	The SAP is not intended to include this type of information. Such information will be provided to the state, as it becomes available. A change to the SAP is not considered necessary.
2. The title of the document includes the term "cleanup verification of soil", yet this SAP does not utilize most of the guidance provided by the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) EPA 402-R-907-016, nor is MARSSIM referenced in the SAP. MARSSIM is particularly to radiological final status surveys. Include in this SAP a detailed explanation of why MARSSIM guidance is not being addressed.	Appendix H has been added to this document to explain how MARSSIM guidance is being incorporated into final status surveys for the PFS and associated piping.
3. No mention is made in the SAP of using an independent verification contractor (IVC) to substantiate reported results in areas where a final status survey will be performed as part of this removal action. The Department strongly recommends the use of an IVC for projects with such long operational and inactive periods, where large quantities of radionuclides were involved, and that are apparently the source of ground water contamination. Please address the use of an IVC in this SAP. It is anticipated that during the final status survey the Department will take some confirmatory soil samples to ensure remaining soils meet the established cleanup goal.	An independent contractor will be used to perform an independent verification of final status surveys for the PFS and associated piping. The state will be provided with the opportunity to collect confirmatory soil samples. These requirements will be added to Section 5.15, "Quality Assurance Project Plan, Assessment/Oversight.
4. The use of the ISOCS system for characterization purposes and for directing remediation for gamma-emitting nuclides is acceptable.	ISOCS is only being used for Remedial Action Support Surveys and to help ensure that cleanup standards have been attained prior to performing the final

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY R. ROMMEL, NEW YORK STATE DIVISION OF SOLID & HAZARDOUS MATERIALS		
	COMMENT	**RESOLUTION**
	However, use of the ISOCS for a final status survey, without developing a detailed correlation between actual soils samples and ISOCS readings, is not acceptable. Prior to ISOCS use in final status surveys, develop a correlation report that details acceptably accurate results, and provide this report to this Department prior to performing final status surveys using ISOCS. Pleas specific in this SAP if a separate "final status survey plan" will be prepared for submission to the regulatory agencies.	status survey (verification sampling). A description of the final status survey plan has been added to appendix H.
5	Further clarification needs to be provided concerning mixed wastes in this document. IF hazardous materials contamination is prevalent at the BGRR project, it is likely to be mixed with radionuclides. Include details on the handling, segregation, and disposal of mixed wastes discovered during this project.	The purpose of the SAP is to identify whether mixed wastes may be present. Handling, segregation, and disposal of mixed wastes that may be discovered during this project is not the subject of this Sampling and Analysis Plan. These activities will be performed in accordance with existing BNL policies and procedures that govern such activities. A change to the SAP is not considered necessary.
6	Section 1.1.1, Facility Description, on page 1-7 describes that the PFS was equipped with a float switch that caused an indicator light to come on in the Building 801 waste operations area when the PFS level reached an appropriate level. This description should also specify at what point in time (year) the sump's contents were no longer removed by the steam jet.	The time when routine pumping of the PFS ceased has not been firmly established. The problem was identified during a BNL Facility Review conducted in 9/97 and routine pumping was initiated in 12/97. Based on this information, routine pumping of the sump was not performed for an unknown period of time prior to 9/97. This level of detail is not considered appropriate for the SAP. A change to the SAP is not considered necessary.
7	In the description of the Belowground Piping, also on page 1-7, it refers to a 14" stainless steel air duct which carries exhaust from the laboratory fume hoods. Later, the SAP refers to a 14" acid off-gas line (first referred to on page 1-19 in Figure 1-8). If these two pipes are in fact the same, refer to it on page 1-7 as the "acid off-gas line"	These two 14" lines are the same. Page 1-7 will be changed to refer to it as the "acid off-gas line."
8.	The 2" steel pipe that would drain the PFS, as mentioned on page 1-7, is not shown in Figure 1-3 on page 1-9. Please include the approximate location of this drain line in Figure 1-3.	Figure 1-2 was intended to show major features in the vicinity of the PFS and the 4" line. Figure 1-8, page 1-19 clearly shows the location of the 2" steel pipe. A change to the SAP is not considered necessary.
9.	A description on page 1-12 of the January 1991 survey work in the Above Ground Duct specified that a survey instrument read 50,000 dpm on the inner surface of a core sample. Without specifying the instrument, active probe window area, or other details such as whether this contamination was removable or fixed, this information is of extremely limited utility. If there are any other details that can be mentioned in this section concerning	The instrument was a Ludlum GM pancake detector with a 15 cm^2 window. Limited information is available regarding this survey. However, additional available details will be added to this section

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY R. ROMMEL, NEW YORK STATE DIVISION OF SOLID & HAZARDOUS MATERIALS	
COMMENT	**RESOLUTION**
the January 1991 Survey the please include it here.	
10. Further down on page 1-12 is the following statement, "the memo reporting the 1991 survey (BNL 1991) refers to some radiological analyses (e.g., gamma spectroscopy, gross alpha/beta, and alpha spectroscopy) that were in process, but not complete, at the time that the report was produced. (These data were not included in the document and planning effort)." Although this is understood to mean that that data has not been located and is therefore not considered in this SAP, it is unspecified what the words "the document" refers to (the SAP or the 1991 report). Please clarify the wording here. It is disappointing that the radiological analyses results were not later attached to the 1991 report.	Unfortunately, this data has not been located. The SAP will be revised to clarify the wording.
11. Section 1.1.3 on page 1-14 discusses the contaminants of potential concern (COPCs). The following radionuclides are specified as COPCs: Cs-137, Sr-90, Pu-238, Pu-239/240, Sm-151, U-234, U-235, U-238, Ni-63, Am-241, Ra-226, Th-232, H-3, I-129 (from radioiodine recovery operations in Building 801), and C-14. This section also states that gamma emitters, such as Co-60, Eu-152, Eu-154, and Eu-155 will be detected using gamma spectroscopy. With the exception of I-129, this paragraph focuses on those isotopes related to BGRR operations. Since I-129 is included on this list of COPCs based on its use in Building 801, please also include any other radionuclides that were used in Building 801 which have a credible pathway to the PFS area.	We do not have any additional information regarding COPCs for the Building 801vent line. However, the radiological analytical requirements for the PFS cover long-lived fission and neutron activation products, including I-129. A change to the SAP is not considered necessary.
12. Section 1.1.3 on page 1-14 specifies, "large quantities of carbon –14 emitted from stack during operations." It is uncertain what is meant by large quantities. In the paper titled *A Comparison of Computed and Measured Ground-Level Dose Rates from Radioargon Emitted by the Brookhaven Reactor Stack* dated May 1954, the author, Irving A. Singer, states, "in terms of significant air pollution, the only constituent of importance which becomes partially radioactive is argon, which constitutes approximately 0.9 percent by volume of the earth's atmosphere." It now appears that this statement is incorrect. The BGRR Characterization Plan, describing activation of the BGRR pile, lists four modes for C-14 creation: N-14(n,p)C-14, C-13 (n,γ)C-14, O-17(n,α)C-14, and ternary fission. On the page detailing contamination in	Historical radionuclide air emissions at Brookhaven are currently being evaluated. However, that effort is independent of the BGRR decommissioning project. This report will be provided to the state when it is issued. This paper was written in 1954 and the term "significant air pollution" must be considered in light of standards and routine practices during that era. Carbon-14 releases were likely on the order of 1,000 to 10,000 times less than Argon-41 releases. The purpose of the SAP is to identify contaminants of potential radiological concern from fission and activation processes that may have occurred in the reactor, to support establishing analytical requirements for samples. It is not intended that it provide a detailed description of the production processes or

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY R. ROMMEL, NEW YORK STATE DIVISION OF SOLID & HAZARDOUS MATERIALS	
COMMENT	**RESOLUTION**
the Reactor Air Cooling System on page 3-16, carbon-14 is again missing. Specific details that are not currently available to us include the form of carbon-14 emitted that would have resulted in contamination of the PFS, the total activity of carbon-14 discharged, and the generation modes of carbon-14 in the stack emissions. As we were informed during the November 4, 1999 phone conference, BNL is finalizing a site environmental report covering the period from 1948-1961, which includes data on carbon-14. It is anticipated that this document will provide the Department the information required. We eagerly await the receipt of this environmental report.	estimate the source term from these processes. The SAP will be changed to remove the phrase "large quantities". Information regarding source terms and stack emissions are the subject of other documents.
13. Section 1.2 under the sub-heading "Air-Ducts" on page 1-15, notes that, "water did not stand in the air duct..." Please specify that this section refers to the above ground ducts, since water did accumulate in the belowground duct.	This refers to the above ground duct Accumulation of leakage and infiltration water occurred in the below ground ducts, where it remained until pumped out. There is no evidence indicating that standing accumulations of water occurred in the above ground duct. However, they may have been subject to small amounts of rainwater in leakage The SAP will be revised to provide these clarifications.
14 Figures 1-6 and 1-7 on pages 1-16 and 1-17, respectively, show that the secondary source of radionuclides in both figures are contaminated soils, which are partially shaded in both figures. The notes at the bottom of both figures indicate that, "shaded components will be eliminated during the removal action." These diagrams indicate that only a portion of the contaminated soils will be removed. Please explain why the contaminated soils boxes are not fully shaded in these figures. It is anticipated that soils greater than the DCGLs will be removed and disposed of.	The incomplete shading indicates our limited knowledge regarding soil contamination. Soil contamination in excess of the DCGLs may be limited to small isolated areas or be more widespread. All soils contaminated in excess of the DCGLs will be removed during the remediation process and verification surveys will be performed to demonstrate that this goal has been achieved. These requirements are specified in Appendix B, which presents the Data Quality Objectives, including decision statements that will be used to implement the remediation. A change to the SAP is not considered necessary.
15 Figure 1-8 on page 1-19 is difficult to reconcile with Section 1.3 of page 1-18 which refers to this figure Specifically, the fourth bullet in Section 1.3 refers to a 14"stainless steel pipe between the PFS and Building 801, which is shown (as a 14" stainless steel duct) leading from the PFS but it does not connect to the building. Please correct Figure 1-8 if this line actually extends to Building 801. In addition, the last bullet point states, "stub-off and cap the 14-in	The 14" stainless steel pipe is synonymous with the 14" stainless steel duct The line does connect with Building 801. The fourth bullet will be changed to refer to this line as a stainless steel duct. Figure 1-8 will be revised to show that the stainless steel duct connects with Building 801. The 14" line will be cut and capped at Building 801 and at the elbow just south

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY R. ROMMEL, NEW YORK STATE DIVISION OF SOLID & HAZARDOUS MATERIALS	
COMMENT	**RESOLUTION**
stainless-steel line from Building 801 to the PFS, as shown in Figure 1-8." If this refers to the same 14" stainless steel pipe mentioned in the fourth bullet, then this action is impossible since this pipe is being removed. It is assumed that this bullet meant to refer to the 14" stainless steel duct (as shown on Figure 1-8) leading from Building 802 to the PFS, which shows an isolation point in the figure. Please clarify the wording in the last bullet on page 1-18. If possible please use consistent terms to refer to various lines, pipes, ducts, caps, and isolations mentioned here. The use of different terms in each bullet and the diagram is confusing.	of the Pile Fan Sump. The intervening piece of 14" line that runs through the sump will be removed. The wording in Bullets 4 and 6 will be revised to clarify these actions. The terminology in the bullet list will be revised to be consistent with the terminology on the drawing.
16. Please change the word "reoved" to "removed" in the legend of Figure 1-8 on page 1-19, referring to the drain line.	The wording will be corrected in the Figure 1-8
17. Section A1.2, Decision Statements, in the middle of page A-2 refers to Technical Administrative Guidance Memoranda (TAGM) criteria, as does Figure A1-1 on page A-5. Please specify which TAGMs are being included in these general references. This comment also applies to Section B1.2 on page B-2.	Section B1.5.2 specifies the source of the TAGM limits as a memo from the New York State Department of Environmental conservation dated January 24, 1994 (HWR-94-4046). This reference will be added to the reference lists at the end of both Appendices A and B.
18. Figure A1-2, Waste Disposal Decision Logic, on page A-6 is difficult to follow and may lead to erroneous conclusions. Waste material that <u>must</u> be treated as radioactive or RCRA hazardous wastes re-enter the decision tree, where the possible outcomes are that it can be treated as a TSCA waste or simply a solid waste. Can a single waste form be considered a RCRA, and a TSCA waste (or RCRA, and solid waste) at the same time? Additionally, this figure does not consider the case where a waste material contains added radioactivity as well as hazardous components, and therefore should be disposed of a mixed waste. Please correct this diagram.	The yes statements are intended to be cumulative in this diagram. For each yes answer, the applicable regulations must be followed for treatment and disposal. This would allow for combination of waste forms (e.g., mixed wastes). A footnote will be added to this diagram to clarify this point
19. The third paragraph in Section A1.7, Waste Designation Sampling Design, specifies that samarium-151 concentrations will be estimated based on a samarium-151 to Cs-137 ration from a uranium-fueled graphite reactor at Hanford, since Sm-151 is a low-energy beta-emitter. This approach is acceptable. This also applies to Section B1.5 on page B-6.	Because this agrees with the approach taken in the SAP, a change to the SAP is not considered necessary.
20. In the discussion of Derived Concentration Guide Levels in Section B1.5.1	This paragraph will be reworded to address this comment.

PILE FAN SUM AND ABOVE GROUND DUCTS SAMPLING AND ANALYSIS PLAN COMMENTS BY R. ROMMEL, NEW YORK STATE DIVISION OF SOLID & HAZARDOUS MATERIALS	
COMMENT	**RESOLUTION**
on page B-14, the third paragraph compares the size of the PFS removal action to the size of the areas modeled in the *OU I/VI Radiological Risk Assessment, the OU I Final Feasibility Report*, and the *Chemical/Animal Pits and Glass Holes Final Evaluation of Alternatives Report*. It states that, "the actual size of the PFS and surrounding areas that are expected to be involved in this removal action are <400 m^2; therefore, this assumption is extremely conservative." However, this claim does not address the fact that AOC 9D, the PFS, is only a small part of Area of Concern 9, the BGRR. Assuming that any risk assessment should only address any particular sub-AOC and not the entire project is inappropriate and should not be used to extol the conservative nature of this project. Please reword this paragraph.	
21. The first paragraph of Section B4.0, Final Dose Assessment, on page B-35 states, "the final status surveys will be those done just prior to beginning the sample collection for laboratory analysis in support of final verification." No other details are provided concerning the final status surveys and it is unspecified when the final status surveys will be performed, nor is it specified what action swill occur following the final status survey. Please note that the general comments made concerning IVS's and the use of ISOCS without defining a correlation to soil samples are particularly relevant here. If a "final status survey plan" is under development and will be submitted for review as a separate document, please state so here.	Appendix H has been added to this document to explain how MARSSIM guidance is being incorporated into final status surveys for the PFS and associated piping.

New York State Department of Environmental Conservation
Division of Environmental Remediation
Bureau of Eastern Remedial Action, Room 242
50 Wolf Road, Albany, New York 12233-7010
Phone: (518) 457-4349 • **FAX:** (518) 457-4198
Website: www.dec.state.ny.us

John P. Cahill
Commissioner

December 6, 1999

Mr. George J. Malosh
Brookhaven Group Manager
U.S. Department of Energy
Brookhaven Group
Building 464
P.O. Box 5000
Upton, New York 11973

Re: Draft Sampling and Analysis Plan
BGRR - Pile Fan Sump and
Above Ground Ducts
Brookhaven National Laboratory
ID# 152009

Dear Mr. Malosh:

New York State has received and reviewed the draft Sampling and Analysis Plan for the BGRR Pile Fan Sump and Above Ground Ducts at Brookhaven National Laboratory. Our comments are as follows:

General Comments:

It is essential that the initial samples obtained for each sub-area be analyzed for USEPA target compound/analyze list prior to determining what specific compounds only will be analyzed for in subsequent samples.

Detailed Comments:

1. Page 1-15; Building 704 is mentioned twice in the discussion of the Pile Fan Sump.

2. Page 1-18; We feel that the entire length of the 14 inch stainless steel pipe should be removed.

3. Page B-2; No non-soil material will be permitted to be replaced in the excavation and this needs to be clearly stated in the plan.

4. Page B-13; The TAGM number for heptachlor epoxide is 0.02 mg/kg, not NL.

5. Page B-20; When sampling interior walls of the PFS attempts should be made to sample the floor as well as interior walls.

6. Page B-23; Samples should be obtained at every joint along the length of the pipe. In addition what criteria will be used to determine at what depth the three samples will be obtained? It is suggested that the same criteria stated to be used for picking additional sampling points be used such as visible staining and elevated gamma readings.

7. Page B-23; It is stated that one sample per container will be obtained for verification. No mention is made of the size of the container, please state the size.

8. Table B2-3; Mention is made of compositing samples and then immediately obtain the volatile organic sample. Organic samples must not be composited.

9. Page C-11; The interior of the PFS should be analyzed for VOCs and TAL metals as well as PCBs.

I have included comments from of our Bureau of Radiation and Hazardous Site Management and from the Bureau of Environmental Exposure Investigation of the New York State Department of Health. We are still awaiting the submittal of comments from the Bureau of Environmental Radiation Protection of the New York State Department of Health and will transmit them as soon as we receive them.

If you have any questions, please feel free to call me at (518) 457-3976.

Sincerely,

James B. Lister, PE
Project Manager

Enc

cc: M. Logan

STATE OF NEW YORK
DEPARTMENT OF HEALTH

Flanigan Square, 547 River Street, Troy, New York 12180-2216

Antonia C. Novello, M.D., M.P.H.
Commissioner

Dennis P. Whalen
Executive Deputy Commissioner

December 1, 1999

James B. Lister, P.E.
Federal Projects Section
NYS Department of Environmental Conservation
50 Wolf Road
Albany, NY 12233

RE: BGRR – Draft Sampling Plan
Brookhaven National Laboratories
Site # 152009
Brookhaven, Suffolk County

Dear Mr. Lister:

I have reviewed the September 10, 1999 "Working Draft" Brookhaven Graphite Research Reactor (BGRR) sampling and analysis plan and have the following comments:

General Comments

Since there is uncertainty with respect to the types of chemicals used during the operation of the BGRR and other surrounding facilities (such as the "Hot Lab" housed in building 801) and uncertainty as to the chemicals discharged (most likely in the form of condensate) to the pile fan sump, it is necessary to analyze the first round of samples for all of the contaminants on the United States Environmental Protection Agencies target compound/analyte list.

Specific Comments

- The document should specifically state that post pipe excavation soil samples will be collected at each pipe union, and any other area along the excavated pipeline where leakage was evident (i.e. stained and/or radiologically contaminated soil).

- Care should be exercised when sampling for polyaromatic hydrocarbons (PAHs) under the asphalt covering since the detection of PAHs in these areas may be attributed to the asphalt.

- During the excavation of contaminated soil, it is necessary to implement a dust monitoring/control plan as described in the New York State Department of Environmental Conservation's Technical and Administrative Guidance Manual 4031, regarding "Fugitive Dust Suppression and Particulate Monitoring Program at Inactive Hazardous Waste Sites". Failure to monitor, and if necessary, control dust migration during excavation of contaminated soil may result in on-site exposure to contaminants, and/or the contamination of other on-site areas.

Should you have any questions please call me at (518) 402-7860.

Sincerely,

Joseph P. Crua
Environmental Health Specialist III
Bureau of Environmental Exposure Investigation

cc: Dr. A. Carlson
Mr. M. VanValkenburg/Mr. S. Bates
Dr. A. Salame-Alfie/Mr. R. Alibozek - BERP
Mr. J. Pim – SCDHS
Mr. M. Chen/Mr. S. Ervolina – DEC
Mr. R. Cowen – DEC Region 1

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New York State Department of Environmental Conservation
Division of Solid and Hazardous Materials
Bureau of Radiation & Hazardous Site Management
50 Wolf Road, Albany, New York 12233-7255
Phone: (518) 457-9253 FAX: (518) 457-9240
Website: www.dec.state.ny.us

John P. Cahill
Commissioner

MEMORANDUM

TO: Jim Lister, P.E., Division of Environmental Remediation

FROM: Robert Rommel, Division of Solid & Hazardous Materials

SUBJECT: Comments on working draft BGRR PFS SAP

DATE: NOV 0 5 1999

This memorandum details my comments on the "Working Draft Brookhaven Graphite Research Reactor (BGRR) Sampling and Analysis Program (SAP) for the Cleanup Verification of Soil and Disposal of Debris from the Removal of the Pile Fan Sump (PFS), Piping, and Aboveground Ducts" dated September 10, 1999.

General Comments

1. The September 22, 1999 Action Memorandum only covers the PFS, also referred to as Area of Concern (AOC) 9D, and does not refer to the Aboveground Ducts. It was understood from the meeting held on June 2, 1999 between BNL and this Department that the Aboveground Ducts would be administratively grouped with Building 708 and the Instrument House, and handled under a separate Engineering Evaluation / Cost Analysis (EE/CA). During a November 4, 1999 phone conference between the Department, Brookhaven National Laboratory (BNL), the New York State Department of Health (DOH), and the Suffolk County Department of Health Sciences (SCDHS), we discussed that the Aboveground Ducts removal may be covered by its own Action Memorandum, separate from the EE/CA(s) for the remainder of the BGRR Decommissioning project. If any further details of the organization of the Aboveground Duct project and the remainder of the BGRR project are available when the SAP is revised, then please include them with the final SAP.

2. The title of the document includes the term "cleanup verification of soil", yet this SAP does not utilize most of the guidance provided by the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) EPA 402-R-97-016, nor is MARSSIM referenced in the SAP. MARSSIM is particularly applicable to radiological final status surveys. Include in this SAP a detailed explanation why MARSSIM guidance is not being addressed.

3. No mention is made in the SAP of using an independent verification contractor (IVC) to substantiate reported results in areas where a final status survey will be performed as part of this removal action. The Department strongly recommends the use of an IVC for projects with such long operational and inactive periods, where large quantities of radionuclides were involved, and that are apparently the source of groundwater contamination. Please address the use of an IVC in this SAP. It is anticipated that during the final status survey the Department will take some confirmatory soil samples to ensure remaining soils meet the established cleanup goals.

4. The use of the ISOCs system for characterization purposes and for directing remediation actions for gamma-emitting radionuclides is acceptable. However, the use of the ISOCs system for a final status survey, without developing a detailed correlation between actual soil samples and ISOCs readings, is not acceptable. Prior to ISOCs use in final status surveys, develop a correlation report that details acceptably accurate results, and provide this report to this Department prior to performing final status surveys using ISOCs. Please specify in this SAP if a separate "final status survey plan" will be prepared for submission to the regulatory agencies.

5. Further clarification needs to be provided concerning mixed wastes in this document. If hazardous materials contamination is prevalent at the BGRR project, it is likely to be mixed with radionuclides. Include details on the handling, segregation, and disposal of mixed wastes discovered during this project in the SAP.

Specific Comments

1. Section 1.1.1, Facility Description, on page 1-7 describes that the PFS was equipped with a float switch that caused an indicator light to come on in the Building 801 waste operations area when the PFS level reached an appropriate level. This description should also specify at what point in time (year) the sump's contents were no longer removed by the steam jet.

2. In the description of the Belowground Piping, also on page 1-7, it refers to a 14" stainless steel air duct which carries exhaust from the laboratory fume hoods. Later, the SAP refers to a 14" acid off-gas line (first referred to on page 1-19 in Figure 1-8). If these two pipes are in fact the same, refer to it on page 1-7 as the "acid off-gas line."

3. The 2" steel pipe that would drain the PFS, as mentioned on page 1-7, is not shown in Figure 1-3 on page 1-9. Please include the approximate location of this drain line in Figure 1-3.

4. A description on page 1-12 of the January 1991 survey work in the Aboveground Duct specified that a survey instrument read 50,000 dpm on the inner surface of a core collected from the duct wall. Without specifying the instrument, the active probe window area, or other details such as whether this contamination was removable or fixed, this

information is of extremely limited utility. If there are any other details that can be mentioned in this section concerning the January 1991 survey then please include it here.

5. Further down on page 1-12 is the following statement, "the memo reporting the 1991 survey (BNL 1991) refers to some radiological analyses (e.g., gamma spectroscopy, gross alpha/beta, and alpha spectroscopy) that were in process, but not complete, at the time that the report was produced. (These data were not included in the document and planning effort)." Although this is understood to mean that this data has not been located and is therefore not considered in this SAP, it is unspecified what the words "the document" refers to (the SAP or the 1991 report). Please clarify the wording here. It is disappointing that the radiological analyses results were not later attached to the 1991 report.

6. Section 1.1.3 on page 1-14 discusses the contaminants of potential concern (COPCs). The following radionuclides are specified as COPCs: Cs-137, Sr-90, Pu-238, Pu-239/240, Sm-151, U-234, U-235, U-238, Ni-63, Am-241, Ra-226, Th-232, H-3, I-129 (from radioiodine recovery operations in Building 801), and C-14. This section also states that gamma emitters, such as Co-60, Eu-152, Eu-154, and Eu-155 will be detected using gamma spectroscopy. With the exception of I-129, this paragraph focuses on those isotopes related to BGRR operations. Since I-129 is included on this list of COPCs based on its use in Building 801, please also include any other radionuclides that were used in Building 801 which have a credible pathway to the PFS area.

7. A statement in parenthesis next to the mention of carbon-14 as a COPC on page 1-14 specifies, "large quantities carbon-14 emitted from stack during operations." It is uncertain what is meant by *large quantities*. In the paper titled *A Comparison of Computed and Measured Ground-level Dose Rates from Radioargon Emitted by the Brookhaven Reactor Stack* dated May 1954, the author, Irving A. Singer, states, "in terms of significant air pollution, the only constituent of importance which becomes partially radioactive is argon, which constitutes approximately 0.9 percent by volume of the earth's atmosphere." It now appears that this statement is incorrect.

The *BGRR Characterization Plan*, describing activation of the BGRR graphite pile, lists four modes for C-14 creation: N-14(n,p)C-14, C-13(n,γ)C-14, O-17(n,α)C-14, and ternary fission. On the page detailing contamination in the Reactor Air Cooling System on page 3-16, carbon-14 is again missing. Specific details that are not currently available to us include the form of carbon-14 emitted that could have resulted in contamination of the PFS, the total activity of carbon-14 discharged, and the generation modes of carbon-14 in the stack emissions. As we were informed during the November 4, 1999 phone conference, BNL is finalizing a site environmental report covering the period from 1948-1961, which includes data on carbon-14. It is anticipated that this document will provide the Department the information required. We eagerly await the receipt of this environmental report.

8. Section 1.2, under the sub-heading "Air Ducts" on page 1-15, notes that, "water did not stand in the air duct..." Please specify that this section refers to the aboveground ducts, since water did accumulate in the belowground duct.

9. Figures 1-6 and 1-7 on pages 1-16 and 1-17, respectively, show that the secondary source of radionuclides in both figures are contaminated soils, which are partially shaded in both figures. The notes at the bottom of both figures indicate that, "shaded components will be eliminated during the removal action." These diagrams indicate that only a portion of the contaminated soils will be removed. Please explain why the contaminated soils boxes are not fully shaded in these figures. It is anticipated that soils greater than the DCGLs will be removed and disposed of.

10. Figure 1-8 on page 1-19 is difficult to reconcile with Section 1.3 of page 1-18 which refers to this figure. Specifically, the fourth bullet point in Section 1.3 refers to a 14" stainless steel pipe between the PFS and Building 801, which is shown (as a 14" stainless steel duct) leading from the PFS but it does not connect to the building. Please correct Figure 1-8 if this line actually extends to Building 801.

    In addition, the last bullet point states, "stub-off and cap the 14-in stainless-steel line from Building 801 to the PFS, as shown in Figure 1-8." If this refers to the same 14" stainless steel pipe mentioned in the fourth bullet, then this action is impossible since this pipe is being removed. It is assumed that this bullet meant to refer to the 14" stainless steel duct (as shown on Figure 1-8) leading from **Building 802** to the PFS, which shows an isolation point in the figure. Please clarify the wording in the last bullet on page 1-18.

    If possible, please use consistent terms to refer to the various lines, pipes, ducts, caps, and isolations mentioned here. The use of different terms in each bullet and the diagram is confusing.

11. Please change the word "reoved" to "removed" in the legend of Figure 1-8 on page 1-19, referring to the drain line.

12. Section A1.2, Decision Statements, in the middle of page A-2 refers to Technical and Administrative Guidance Memoranda [TAGM] criteria, as does Figure A1-1 on page A-5. Please specify which TAGMs are being included in these general references. This comment also applies to Section B1.2 on page B-2.

13. Figure A1-2, Waste Disposal Decision Logic, on page A-6 is difficult to follow and may lead to erroneous conclusions. Waste material that must be treated as radioactive or RCRA hazardous wastes re-enter the decision tree, where the possible outcomes are that it can be treated as a TSCA waste or simply a solid waste. Can a single waste form be considered a RCRA, and a TSCA waste (or RCRA, and solid waste) at the same time? Additionally, this figure does not consider the case where a waste material contains added

radioactivity as well as hazardous components, and therefore should be disposed of or treated as a **mixed waste**. Please correct this diagram.

14. The third paragraph in Section A1.7, Waste Designation Sampling Design, specifies that samarium-151 concentrations will be estimated based on a samarium-151 to cesium-137 ratio from a uranium-fueled graphite reactor at Hanford, since Sm-151 is a low-energy beta-emitter. This approach is acceptable. This also applies to Section B1.5 on page B-6.

15. In the discussion of Derived Concentration Guide Levels in Section B1.5.1 on page B-14, the third paragraph compares the size of the PFS removal action to the size of the areas modeled for the *OU I/VI Radiological Risk Assessment*, the *OU I Final Feasibility Report*, and the *Chemical/Animal Pits and Glass Holes Final Evaluation of Alternatives Report*. It then states that, "the actual size of the PFS and surrounding areas that are expected to be involved in this removal action are <400 m^2; therefore, this assumption is extremely conservative." However, this claim does not address the fact that AOC 9D, the PFS, is only a small part of Area of Concern 9, the BGRR. Assuming that any risk assessment should only address any particular sub-AOC and not the entire project is inappropriate and should not be used to extoll the conservative nature of this project. Please reword this paragraph.

16. The first paragraph of Section B4.0, Final Dose Assessment, on page B-35 states, "the final status surveys will be those done just prior to beginning the sample collection for laboratory analysis in support of final verification." No other details are provided concerning final status surveys and it is unspecified when the final status surveys will be performed, nor is it specified what actions will occur following the final status survey. Please note that the general comments made concerning IVC's and the use of ISOCs without defining a correlation to soil samples are particularly relevant here. If a "final status survey plan" is under development and will be submitted for review as a separate document, please state so here.

COUNTY OF SUFFOLK

ROBERT J. GAFFNEY
SUFFOLK COUNTY EXECUTIVE

DEPARTMENT OF HEALTH SERVICES

CLARE B. BRADLEY, M.D., M.P.H.
COMMISSIONER

October 18, 1999

Mr. George J. Malosh
Brookhaven Group Manager
Department of Energy
Brookhaven Group
Building 464
P.O. Box 5000
Upton, New York 12233-7010

Re: BGRR DECOMMISSIONING PROJECT: PILE FAN SUMP AND ABOVE GRADE DUCTS SAMPLING AND ANALYSIS PLAN

Dear Mr. Malosh:

I have reviewed the referenced report and have a few small comments.

- Page 1-15. In the third paragraph in the discussion about radiological penetration of concrete, the assumption of less than ¼ " for solid surfaces may be correct, but the possibility of significant cracks and joints should be considered unless careful inspection has already proven that there are none.
- In the fifth paragraph of the same page, the word "may" is inappropriately used. The soil around the sump has already been shown to be contaminated because of the leak around the duct. It is just not known yet what the extent of the contamination is.
- Page 1-18. Am I interpreting the plan correctly, that the 14" duct from 801 to the sump is to be removed, but the rest of the duct is to be capped and left in place? If this is the case, the last bullet on page 1-18 should refer to building 802, not 801. If the duct is left in place, will the stack end also be plugged? Could condensation or drainage of any kind collect in the pipe once it is sealed off? If it is to be sealed and left in place, when will it be removed?
- Page 1-20. If the 14" duct is to be left in place, the removal of it should be added to the list of future activities.

Very truly yours,

James H. Pim, Chief
Office of Water Resources

cc: M. Logan, USEPA
J. Lister, NYSDEC

Environmental Management Directorate

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for the U.S. Department of Energy

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October 1, 1999

Mr. George J. Malosh
Brookhaven Group Manager
U.S. Department of Energy
Building 464
Upton, NY 11973

SUBJECT: BGRR Sampling and Analysis Program and Plans for the Pile Fan Sump and Above-Grade Duct Removals

Dear Mr. Malosh:

The attached document contains both the Sampling Program and Plans for the Pile Fan Sump and Above-Grade Duct Removal Actions. It is provided for your subsequent transmittal to respective regulators at the Environmental Protection Agency (EPA) Regions 2, 8, and 10 and the New York State Department of Environmental Conservation (NYSDEC). The EPA Region 8 and 10 Toxic Substance Control Act representatives will review it only for compliance to PCB regulations at the disposal sites under consideration for the waste material (DOE Hanford and Envirocare of Utah). The BGRR staff and James Goodenough have been working with Scott Mallette to draft transmittal letters to the various regulators involved in this effort. The letters will explain the contents of the document and lead the regulators to the specific areas that require review, while providing the entire document to ensure that the project description and planned actions are adequately explained.

The document covers the data needs for Unreviewed Safety Issue development, Environment, Safety, and Health planning, waste designation and disposal requirements, and the final status survey for the Pile Fan Sump and Above-Grade Duct removal. It implements the agreements reached in the Data Quality Objectives meeting which was held at the BGRR on July 27, 1999 with EPA and NYSDEC.

Please contact me if you have any questions or comments.

Sincerely yours,

Michael Schlender

Michael Schlender
Assistant Laboratory Director
Environmental Management

Attachment: as stated
cc (w attachment):
J. Goodenough, DOE/CH
S. Mallette, DOE/BHG