

*If you are using a printed copy of this procedure, and not the on-screen version, then you **MUST** make sure the dates at the bottom of the printed copy and the on-screen version match. The on-screen version of the Collider-Accelerator Department Procedure is the Official Version. Hard copies of all signed, official, C-A Operating Procedures are available by contacting the ESSHQ Procedures Coordinator, Bldg. 911A*

C-A OPERATIONS PROCEDURES MANUAL

9.5.15 Sampling Activated Soil Areas Near Known Beam Loss Locations

Text Pages 2 through 5

Hand Processed Changes

<u>HPC No.</u>	<u>Date</u>	<u>Page Nos.</u>	<u>Initials</u>
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____
_____	_____	_____	_____

Approved: _____ *Signature on File* _____
Collider-Accelerator Department Chairman Date

M. Van Essendelft

9.5.15 Sampling Activated Soil Areas Near Known Beam Loss Locations

1. Purpose

- 1.1 This procedure provides guidance for obtaining and analyzing soil samples from soil activation areas, near known beam loss locations at the LINAC, AGS, Booster, and the RHIC. Its purpose is to evaluate the degree of soil activation through either direct soil samples or Removable Soil Samples (RSS).

2. Responsibilities

- 2.1 The C-A Environmental Compliance Representative (ECR) is responsible for maintaining records of activated soil samples, indicating location of sampling, date of sampling, and sample results.
- 2.2 The ECR, or a qualified representative will prepare the Chain of Custody Form and forward it along with the samples to the EWMS Field sampling Group for shipment to an analytical laboratory. A New York State certified analytical laboratory shall conduct analysis of soil samples.
- 2.3 The Environmental Compliance Representative will forward the analysis results to the C-A ESSHQ Division Head, and the BNL Groundwater Protection Subject Matter Expert. The Environmental Compliance Representative and C-A ESSHQ Division Head shall review results against the requirements of the Accelerator Safety Subject Area.
- 2.4 The Environmental Compliance Representative will consult with the C-A ESSHQ Division Head in evaluating sites requiring soil sampling.
- 2.5 The C-A Associate Chair for ESSHQ and the C-A ESSHQ Division Head shall review all operational areas for potential beam losses and identify those areas which require Removable Soil Samples.

3. Prerequisites

- 3.1 RSS – Material characteristics:

The soil used shall be native sand sized glacial outwash deposits, consisting predominately of quartz sand. The natural radioactivity levels of the soil shall be baselined and a stock of soil or pre-prepared RSS containers shall be maintained by the C-A ECR in a low radiation area until required for use.

3.2 RSS containers specifications:

The RSS containers shall be 1 liter pre-cleaned Nalgene containers with a wide-mouthed cap. Containers shall be filled to capacity.

3.3 RSS containers mounting:

RSS containers to be attached at approximate beam height in location as specified by the C-A Associate Chair for ESSHQ

4. Precautions

4.1 Access to the sampling locations may be controlled. Personnel obtaining the samples must comply with applicable Radiation Work Permits and Access Controls.

5. Procedures

5.1 Evaluate operations for potential beam losses. Determine if existing soil data or modeling indicate that if rainwater was to leach through the soils, the leachate concentrations would exceed 5% of the drinking water standard – reference the Accelerator Safety Subject Area.

5.2 Evaluate the need to obtain baseline or other verification soil activation samples from new areas and from the following known loss locations:

- Booster Beam dumps (old and new)
- RHIC Yellow line beam dump
- RHIC Blue line beam dump
- RHIC W line beam dump
- VQ12 Magnet
- RHIC Primary Collimators (2) at 8 o'clock position
- LINAC HEBT Water Stop
- LINAC/BLIP "Y" Chamber
- LINAC ND249 Magnet
- AGS J-10 Scraper
- L20 BtA Injection
- RHIC Injection Septum Lambertson magnets (X & Y Arc)
- 1006 Secondary Collimator – Vertical
- 1010 Secondary Collimator - Vertical
- 1008 Secondary Collimator – Blue Line Horizontal #1
- 1008 Secondary Collimator – Blue Line Horizontal #2
- 1008 Secondary Collimator – Yellow Line Horizontal #1
- 1008 Secondary Collimator – Yellow Line Horizontal #2
- 1008 Secondary Collimator – Blue Line Vertical #1
- 1008 Secondary Collimator – Yellow Line Vertical #1

5.3 Direct Sampling Method

- 5.3.1 If direct sampling is used, then determine the location of the potential maximum beam loss and evaluate the best means of drilling an access hole through the tunnel wall or floor.
- 5.3.2 Once access hole has been drilled, collect sufficient soil volume for gamma spectroscopy analysis Refer to EM-SOP-601, Collection of Soil Samples, for guidance on collecting the sample. Due to radiation drop off with distance, it is important to collect the sample as close to the tunnel wall as possible.
- 5.3.3 Determine unique sample ID. Ship the sample to the analytical laboratory under Chain of Custody as per EM-SOP-109, Chain of Custody Procedure.
- 5.3.4 Have the access hole repaired, plugged, or leave open until analytical results have been reviewed.

5.4 Removable Soil Sample Method

- 5.4.1 Review all operational areas for potential beam losses and identify those areas which require Removable Soil Samples. The need to obtain soil samples can also be based on a change in accelerator or experimental apparatus, change in location of apparatus, discrepancies noted on protective soil cap inspections, or large increases in beam energies or intensities.
- 5.4.2 Determine the location of the Removable Soil Samples placing them in areas of potential maximum beam loss. An appropriate means of securing the soil sample containers to the tunnel wall, approximately at beam height, shall be determined by the ECR and the C-A ESSHQ Division Head.
- 5.4.3 Soil samples placed in the area of planned beam loss locations shall be analyzed to establish a baseline to gauge future activation resulting from beam operation. The ECR shall maintain a stock of pre-analyzed samples as appropriate.
- 5.4.4 Soil sample containers and soil sample locations shall be identified with a unique RSS location ID.
- 5.4.5 Obtain and analyze soil samples in accordance with EM-SOP-601, Collection of Soil Samples. Samples shall be analyzed annually at the end of the physics run (or prior to the next running period) from areas as determined by the Environmental Compliance Representative and ESSHQ Division Head.

- 5.4.6 Removable Soil Samples located at the 1006 Secondary Collimator shall be analyzed two times during the physics run. In this location there shall be three removable Soil Samples at each of the determined sample locations. One sample to measure activation build-up over time and two additional samples that can be removed. During operations the first sample shall be removed during a maintenance period and replaced at the next available maintenance period, when returned from the analytical laboratory. During the second planned sampling period the second sample shall be sent for analysis. Prior to the next physics run only these two samples shall be replaced with samples containing fresh native sand.
- 5.4.7 Following analysis, the analytical laboratory returns the sample to BNL. The C-A ECR will return the samples to there appropriate locations within the complex.
- 5.4.8 The C-A ECR shall review results of the analysis with the C-A ESSHQ Division Head, and the C-A Associate Chair for ESSHQ as appropriate and shall forward the results to the BNL Groundwater Protection Subject Matter Expert.

6. Documentation

Monitoring records shall be maintained in accordance with the Records Management Subject Area.

7. References

- 7.1 EM-SOP-601, Collection of Soil Samples
7.2 EM-SOP-109, Chain of Custody Procedure
7.3 Accelerator Safety Subject Area

8. Attachments

None