Fermilab	ESH Section Procedures	
Procedure Number/Name ESH-RPO-007 – ROUTINE SUMP, LCW & RAW SAMPLE PROGRAM		**Original Date:** 9/26/00
Written by: Dale White	**Reviewed and Updated By:** Dale White	**Date:** 3/17/2020

Approvals

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Revision History

Author	Description of Change	Revision Date
Dale White	• Transferred to ESH procedure • Updated personnel titles after ESH reorganization	8/16/2019
Dale White	Initial release (RSG-101-1)	9/26/00

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1.0 PERSON(S) AUTHORIZED TO PERFORM THIS PROCEDURE

Environment, Safety, Health (ESH) Section Radiation Physics Operations (RPO) Department Radiation Safety Officers (RSO)/Radiological Control Technicians (RCT)

2.0 PURPOSE OF THIS PROCEDURE

Sump systems, LCW (Low Conductivity Water) systems, and Radioactive Water (RAW) systems are required to be surveyed (i.e., sampled) on a routine frequency as determined by the assigned RSO. This procedure details the specific aspects of the sampling program.

2.1 Objectives:

To monitor the radiochemical concentrations in discharges to surface waters resulting from facility operations to verify compliance with applicable Federal, State and local effluent regulations.

To provide information to estimate annual on-site and off-site releases of radioactive effluents.

To detect, characterize, and report any unplanned releases.

2.2 Discussion:

Water samples are taken routinely from sumps, retention pits and monitoring holes located within the accelerator rings and fixed target tunnel enclosures. The sample type[1] in accordance with the sample schedule[2] determines which accelerator-produced nuclides (H-3, Be-7, Na-22, Mn-54, Co-60…) will be analyzed. The sample type will determine the amount of sample needed, necessary preservation [3], and whether on-site or off-site analysis will be used. Submit all samples to the Radionuclide Analysis Facility (RAF)[4] for analysis.

The Environmental Protection Group, in consultation with Radiation Physics Operations Department, develops a yearly sampling plan. Sample sites are chosen by their proximity to target areas, closed loop (recirculating) cooling systems, and areas of soil radioactivation resulting from accelerator operations. The number of samples per year is dependent on the anticipated concentration of nuclides detected in the water.

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[1] Environmental Protection Procedures Manual, Water Analysis Sample Types.

[2] Environmental Protection Procedures Manual, Routine Sampling Schedule.

[3] Environmental protection Procedures Manual, Preservation Methods and Required Volumes of Samples for Radiochemical Analysis by Sample Type.

[4] FRCM Chapter 5 Appendix 5E.C, Sample Receiving.

Sumps located closest to maximum soil activation are sampled more frequently than ones further away. Other sumps are sampled less often based on low tritium concentrations. Typically retention pits are sampled 1 - 4 times per year depending on historic activation levels and storage capacities. A discharge from these does not occur automatically. If the concentration of any radionuclide exceeds the Derived Concentration Standards found in the Fermilab Radiological Control Manual, it is disposed of as radioactive waste. If the concentrations are less than Derived Concentration Standards the sample is disposed of by RAF group per their current non-radwaste disposal procedures[5].

The Environmental Protection Group is currently responsible for collecting samples from the outdoor waterways from on-site locations i.e. lakes, ponds, creeks, ditches etc. The Radiation Physics Operations Department is responsible for collecting samples in the Beam Line Enclosures. The Radiation Physics Operations Department relinquishes these samples to RAF. The samples are stored at RAF pending analysis.

3.0 RPO SAMPLE PROCEDURE DESCRIPTION

3.1 Special Precautions:

Call Main Control Room (MCR) before planning any sampling to coordinate access to beam enclosures. While getting keys from MCR ask about any hazards or special circumstances that may call for added precautionary measures in the areas you will be working.

Wear a Dosimetry Badge and Personal Pocket Dosimeter at all times while in beam enclosures. Take any additional precautions necessary depending on the current access status. Report any unexpected exposures to your supervisor. Refer to the current revision of the following publications for general and specific guidelines you must follow when dealing with radioactive material or when working in radiation areas:

1) Fermilab ES&H Manual
2) Fermilab Radiological Control Manual

Any Confined Space area requiring entry into it to collect a sample will require filling out Confined Space permit and its associated steps to gain access.

Sump lids that are marked as Confined Space: Because a person is not entering with any part of their body it is ok to place dipstick into water and collect sample without performing normal confined space access entry procedure and permit.

Avoid spilling water in the area around the sample site.

Wipe off any water on the outside of the tubing when removing it from the sample site.

[5] RAF Disposal Procedure

Dispose of all radioactive waste generated in the tunnel enclosures per current Fermilab radwaste disposal procedures.

Upon exiting of enclosure check equipment and personnel for contamination. Contact your supervisor or area safety personnel if contamination is detected.

Be sure to return keys to MCR Room immediately after all sampling is complete.

3.2 Equipment & Materials:

* Dipstick

  Note: Most locations can easily be sampled with the use of a dipstick. This method is the preferred method. Use a pump for locations with grates or that are too deep and that will not allow for use of a dipstick

* AC/Battery-operated peristaltic pump with required tubing w/weight for sample end (~20ft intake and 2ft discharge), pump adapter, and extension cord if necessary

* Necessary survey meter i.e. LSM if under controlled access

* Personal monitoring devices (dosimetry badge and pocket dosimeter)

* keys (for access to enclosures & service buildings)

* Polyethylene sample containers as required for sample type with blank labels attached

* Chain-of-Custody, labels, and pen/marker

* Kimwipes or similar disposable absorbent material

* Required PPC to make access into areas. i.e. gloves & shoe covers for any controlled access. At a minimum it is recommended to wear gloves

* Maps, (If unfamiliar with areas to be visited)

3.3 Procedures:

Contact MCR phone extension 3721, to coordinate access.

Obtain required access keys from MCR.

Sumps and Retention Pits:

Dipstick Method:
As noted above this is the easiest and most convenient method. The use of the dipstick is self evident when gathering samples.
Precauation: When handling/carrying dipstick, cup end should be down towards ground as to avoid and prevent placing it near another individuals face or body. Having cup end low to the ground also prevents water from running down the handle while it is being carried

Pump Method:

1) Plug AC adapter into pump to power the pump from an electrical outlet. The AC method will provide the greatest pumping power and speed over the battery method. If intending to use battery power place the peristaltic pump on charge the day before sampling to ensure a full charge is available.

2) Attach hosing: Connect both long pump section of hose and discharge end to appropriate head connection of pump. Ensure suction and discharge ends are performing proper function by turning on pump temporarily. If the discharge end is sucking rather than pushing air you can either switch hose end connections or reverse direction of pump operation. The pump may be run in a Clockwise (CW) or Counterclockwise(CCW) direction allowing for thorough purging of lines before collecting the sample.

3) At the sample site lower the weighted intake tube into the sump/retention pit/hole until the weight is just below the surface of the water.

4) Turn on the pump: Once sufficient flow has begun purge the lines by allowing the pump to run for about 30 seconds with the discharge running back into the sump/retention pit/hole. Repeat this step at the next location for each sample, thoroughly purging lines before collecting the sample.

5) Fill the required sample bottles to a point just below the neck seam line.

6) Turn the pump off, switch the flow direction knob to the opposite setting (CW or CCW) and turn the pump back on allowing water in the tubing to completely run back into the sump/retention pit/hole. Wipe off the outside of the tubing with absorbent material while removing hose.

LCW Samples:

1) Fill sample bottle from sample nozzle by opening control valve.

2) Close valve when desired level is reached.

RAW Samples:

1) Locate sample valve with associated discharge hose/nozzle

2) Fill bottle to desired level by gently opening control valve and closing when fill is complete.

Note: NuMi RAW systems have a sample manifold located in the Power Supply room which allows for sampling remotely so that entry into RAW room is not necessary. This requires an M-13 key to unlock.

3.4 Sample Submission Process:

1) If you have not already done so attach label to container. Mark bottle with Sample Identification number (SID), location description, and time sample taken. Use info recorded on bottle label to record/fill out analysis information on form RP 33 known as Chain-of-Custody[6]

2) Take samples to RAF. Depending on analysis type, samples will either be analyzed on-site or shipped to an off-site vendor.

3) Submission/Analysis Request:

   Submit the sample(s) by signing off "Relinquished By" signature area of the Chain-of-Custody to RAF personnel. They in turn will sign accepting possession of sample(s) in "Received By" portion. This process thereby establishes a change in custody of sample(s) and also establishes a request to have them analyzed. The original Chain-of-Custody is to remain with the sample(s). RAF will provide submitter with either a paper or electronic version copy.

4.0 REFERENCES

Fermilab Radiological Control Manual (FRCM)
Fermilab ES&H Manual
Environmental Protection Procedures Manual

[6] Environmental Protection Procedures Manual, Document 050, Procedures for Chain-of-Custody.

SOP Signature Page

This table indicates all qualified personnel, and documents that they have read and understand this procedure and completed necessary On-the-Job Training (OJT). By signing below, the qualified individual agrees to follow this procedure along with any applicable RWP & ALARA plan for each sample collected. ESH RPO Group Leader and Department Head approvals authorize the qualified individuals to perform this procedure.

Name	OJT Completion Date	Signature	ID #	Date	Approvals & Date	
					Group Leader	Dept. Head
Joel Fulgham	5/27/20		9634	5/26/20		
Tony Busch	5/27/20		10068	5/26/20	✓	
Paul Sedory	5/27/20		12630	5/27/20	✓	
Dale White	5/27/20		10017	5/26/20	✓	
Jose DeLaO	5/27/20		#4175	5/24/20	✓	