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Reason for revision:

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1. **Introduction**

This Guideline applies when tank or separator sludge, sands, scales or equipment are suspected of being NORM contaminated and measure > 5 cps above background when monitored with the Mini 900 mini monitor with the 44A probe.

In order to quantify potential NORM risks and determine appropriate disposal options, samples for sludge, sands, and non fixed material will need to be collected and sent to the Sultan Qaboos University for Gamma Spectrum Analysis (GSA).

1.1 **Objective**

To define the requirements for sampling of material known or suspected to contain Naturally Occurring Radioactive Materials (NORM).

1.2 **Scope**

This procedure applies to sampling materials suspected or known to be NORM contaminated.

1.3 **Responsibilities**

1.3.1 **Radiation Protection Advisor (RPA)**

The RPA in conjunction with the Corporate Radiation Focal Point is responsible for the specific analysis requirements comprising the nuclides to be determined and the requisite detection limits.

1.3.2 **RPS/RPT**

The RPS/RPT is responsible for radiological support during sampling.

1.3.3 **The sampler**

The sampler is responsible for meeting the requirements of this guideline.

2. **Sampling execution**

2.1 **PPE and auxiliaries**

Prior to commencing work, the Sampler shall ensure the availability of sample bottles and labels from production chemistry, PPE and auxiliaries. The sampler shall be responsible for ensuring that he wears the PPE appropriate for situation which shall be outlined by the RPT on the NORM Radiological Survey.

2.2 **Safety measures and work instructions**

2.2.1 **General**

- Areas such as production water evaporation ponds, sand/soil around leaky production water piping/pumps, sludge/sands from tanks or separators which test > 5 cps above background using the Mini 900 meter with 44A prove shall be treated as NORM contaminated until quantified by Gamma Spectrum Analysis.
• All personnel involved with plant materials which store or convey production water/oil and gas shall attend a NORM awareness course and be familiar with the hazards and safeguards involved with NORM jobs.

2.2.2 Sampling of sludge, sands or contaminated plant for NORM

• Avoid contamination due to spillage. If no sampling point, use a scoop or similar to collect sample. Do not contaminate the outside of the container.

• RPT to assess if a supervised area is required and specify to what extent.

• RPT shall use the Mini 900 with 44A probe to check NORM contamination at the sampling point. Where the readings exceed 5 cps above background, the sampler shall wear the PPE outlined by the RPT. Measurements shall be recorded on the NORM Analysis Request Form attached in Appendix 2.

• Avoid touching or handling material. Use a scoop or similar to place at least 100 grams of sample or 1 Litre of liquid into the polyethylene containers from Production Chemistry.

• After sealing, label the sample container. Labels and sampling containers are available from the Interior Production Chemistry. The sample container shall be checked for external contamination before packing using the Mini 900 monitor with EP15 probe or it can be wipe tested and monitored with the Mini 900 with 44A probe.

• Sampler to be checked for contamination on exit from the supervised area.

• Equipment e.g. scoops, used inside the sampling area shall be checked for contamination prior to removal. Any equipment which can not be cleaned to background shall be bagged, sealed and marked externally as NORM contaminated and stored in Bahja.

• Any further waste generated should be checked for NORM contamination and if activity is found, placed in suitable containers and logged as above.

• NORM Contaminated waste should be transported to the nearest NORM yard.

3. Packing and labelling of samples

Samples shall be packaged in the following types of containers.

Solids: Well sealing, wide mouthed polythene jars shall be used (500 mL are provided).

Liquids: Well sealing polyethylene jars (>1 litre) shall be used for water, condensate and sludge. In case of low radiation levels being expected a sample of 10 litres is preferred.

Gas: Gas samples shall be collected in stainless steel pressure containers, fitted with needle valves at both ends, covered by a protective cap for safe transport. This shall be performed only by trained staff such as Production Chemistry.

All samples shall be labelled. The label shall contain the following information:

a) sampling date and time (to enable correction for decay of activity)

b) sample type (scale, other solids, water, condensate, sludge, pigging wax)
c) location of sampling point (installation, vessel, line, tank etc.)

d) radiological description of the material

e) name of sampler and reference indicator

f) Results and copies to if other than sampler

g) The statement “Radioactive sample, excepted package, Limited quantity of material, UN 2910” shall be on the pre-printed label (underlined).

Packing materials (jars, protective and transport boxes) and pre-printed labels shall be available from Production Chemistry in the respective assets.

4. Transport

Most samples taken in PDO and contractors will have a low radioactive content and may therefore be transported as excepted packages. Thus, no labelling external to the package is required other than the name of the recipient and sender together with the identifier “UN 2910”.

A box labelled radioactive (reference MSE.08) shall only be used in specific cases as advised by the CRFP. The sample shall be accompanied to its designation by a consignment note containing the information from the label.
<table>
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<tr>
<th>Abbreviation</th>
<th>Description</th>
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<tr>
<td>PPE</td>
<td>Personal Protective Equipment</td>
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<td>RPA</td>
<td>Radiation Protection Adviser</td>
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<tr>
<td>RPS</td>
<td>Radiation Protection Supervisor</td>
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<tr>
<td>RPT</td>
<td>Radiation Protection Technician</td>
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<tr>
<td>CRFP</td>
<td>Corporate Radiation Focal Point</td>
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1. **Location/Asset:**

   Contractor details (if applicable):
   
   Collected by (Name):  
   Requestor contact details:  Ph:  
   Email Address:  
   Ref. Ind.:  
   GSM:  

2. **Purpose of analysis:**

   SQU is requested to perform Gamma Spectrum Analysis on the following sample(s).

3. **Sample description:**

   Date collected: ___/___/___  
   Time collected:  

<table>
<thead>
<tr>
<th>Sample No.</th>
<th>Source of Sample</th>
<th>Liquid or Solid</th>
<th>Estimate amount of sample (grams/mL)</th>
<th>CPS (Mini 900/44A)</th>
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   Note: For statistical significance 80-100 grams of scale/sludge or 250 - 1000 mL for water is required.

4. **Result(s) distribution:**  

   Reports requested by: ___/___/___ (Date)
   
   1. UIK3C  -  nuzha.NH.Lawatiya@pdo.co.om  
   2. MSE 32 -  brett.young@pdo.co.om  
   3. MSE23 -  juma.handhali@pdo.co.om  
   4. Requestor Contact email – See Above

5. **Acknowledgement of Receipt:**

   Date received by Interior Laboratory: ___/___/___  
   Received by (Name):  
   Date sent to MAF: ___/___/___

   Date received by MAF Laboratory: ___/___/___  
   Received by (Name):  
   Date sent to SQU: ___/___/___

   SQU acknowledges receipt of the above sample(s) from (Name) _______________________ of Petroleum Development Oman on ___/___/___(Date)

   ____________________          ____________________            ____________________
   (Department)    (Print Name)            (Signature)
Section 1: Location/Asset

Fill out the location/asset and the personal details of the person requesting the analysis.

Section 2: Purpose of Analysis

No Further Action from requestor.

Section 3: Sample description

Label and number the sample. On the label of each sample, number it, describe it including location, date etc… enabling specific identification of individual sample(s).
Eg. Sample 1: Scale taken from tubulars from well SR-09 – Saih Rawl 12/09/2003
Sample 2: Sludge from the interior of Tank 109 – NIMR 21/03/2004

Please ensure samples are properly secure to prevent leaks or contamination of those handling them later on.

Section 4: Results distribution

Requestor to indicate when you require the samples to be analysed by SQU. If the analysis is urgent, please indicate a date and print urgent (if needed) after the date. Please note that there may be an additional charge for urgent work.

SQU to email the results to MAF Production Chemistry and MSE on the emails attached. MSE will assess the results and provide action items to the requestor electronically.

Requestor - If you do not include your contact details including your email address above, you will not receive the report and action items from MSE.

Section 5: Acknowledgement of Receipt

Interior Production Chemistry Laboratory fill in when they received the sample(s) and when they forwarded the sample(s). Send samples and NORM request form to MAF.

MAF laboratory to fill in when they receive the samples from the interior laboratory including the person who received the samples and the date when they were sent to SQU. This will allow us to track how long samples are taking to get from the interior to SQU for analysis.

The person delivering the sample(s) to SQU must ensure that a person from the Department of Clinical and Biomedical Physics (Radiation Protection Service) acknowledges and signs for the sample(s). A copy or the original signed analysis request form must be collected by delivery person and provided to Nuzha Lawatiya – UIK3C.

Alternatively a faxed copy can be sent to 24675462 marked attention Nuzha Lawatiya once completed and signed by SQU.

NOTE: If there is no documentation, there is no traceability and samples are likely to get lost or not get analysed in time.
Example of a polyethylene sample container (500 mL) and label for NORM sludge samples. Both the labels and sample containers are available from Production Chemistry.