OSL Personnel Monitoring Service

**USER WORK INSTRUCTIONS**

Radiation Protection Services
Philippine Nuclear Research Institute
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1. The Purpose of the Service Guide

The purpose of this booklet is to guide the clients of the Radiation Protection Services (RPS) to its Optically Stimulated Luminescence (OSL) Personnel Monitoring Services. Discussed in this guide are the a) steps in availing of the service, b) OSL dosimetry service processes, c) instructions in using & caring for the OSL dosimeters and d) overview of OSL dosimeter system & personnel monitoring programs.

2. OSL Personnel Monitoring Service Overview

The Philippine Nuclear Research Institute through the Radiation Protection Services has been providing technical services to licensed users of ionizing radiation to support them in their compliance to the radiation safety requirements of the national regulatory authorities.

Since the 1970s, the RPS has been providing radiation safety services such as a) occupational radiation protection services, b) area monitoring of licensed facilities, c) calibration & dosimetry services through its Secondary Standards Dosimetry Laboratory (SSDL), d) radiation control services, e) radioactive waste management and f) response to radiological & nuclear emergencies. Our clientele are composed of at least 5,000 government and private institutions.

Exposure to ionizing radiation could be a health hazard. Personnel working with ionizing radiation may be exposed to sources that are both inside and outside their bodies. Personal doses therefore need to be measured & assessed in order to demonstrate safety of personnel and readily identify overexposures to radiation.

RPS has been providing personnel monitoring services to occupationally exposed workers in the Philippines to enable workers to monitor their radiation exposures and ensure that their workplace is safe. It is part of PNRI’s commitment to strengthen the occupational radiation safety by providing sustainable & reliable personnel monitoring services.
Clients apply for subscription to the OSL personnel monitoring service

RPS prepares & issues the OSL dosimeters

Workers wear the OSL dosimeter while working with radiation

RPS gives the personal dose monitoring report to the client

Clients return the OSLs after the Monitoring Period

RPS processes & evaluates the doses received

Figure 1. OSL Personnel Monitoring Service Cycle
Currently, the RPS is providing the OSL Personnel Monitoring Service. This new Dosimeter system makes use of the Optically Stimulated Luminescence (OSL) Dosimeters. This new service is provided as an upgrade from and replacement to the Filmbadge dosimeter system. This OSL system, which was adopted to enhance the personnel monitoring services, is more technologically advanced in terms of accuracy, handling, and evaluation of exposures received by personnel.

Figure 1 shows the overview of the OSL Personnel Monitoring Service cycle. It illustrates the different processes in the service from application, issuance, evaluation and releasing of dose report. A detailed discussion of each process is found on Section 4.

**Contact Us**

Our office is available from Monday to Friday, from 8:30 to 17:00 by:

- **Phone:** 9296011 local 262 & 246
- **Fax:** 9201646
- **Email:** rps@pnri.dost.gov.ph
- **Post:**
  - Radiation Protection Services Unit
  - Philippine Nuclear Research Institute
  - Commonwealth Ave., Diliman
  - Quezon City 1101 PHILIPPINES
- **P.O. Box:**
  - 213 at UP Quezon City
  - 932 at Manila
  - 1314 at Central, Quezon City

3. Subscribing to the Service

3.1. Subscription Options

Clients can choose between two options for the OSL personnel monitoring service. In Option 1, the PNRI owns and provides the dosimeters. In Option 2, clients buy their own OSL dosimeters and sends it to PNRI for initial processing & evaluation.

**Option 1: PNRI provides the dosimeters**

In this option, the OSL Dosimeters issued to the clients are owned by PNRI. The dosimeters issued are to be used for an indicated monitoring period (MP). After each MP, the dosimeters have to be RETURNED to PNRI for processing & evaluation.

Note that before subscription, the client shall sign a Memorandum of Agreement (MOA) with PNRI on the terms & conditions of the Service.

**Option 2: Client buys or rents their own OSL Dosimeter**

In this option, the client may RENT or PURCHASE their own OSL dosimeters from authorized suppliers & use it for personnel monitoring. The Dosimeters are therefore owned by the client.

Note that for this option the client has to send the dosimeters to PNRI BEFORE each MP for initial processing and AFTER each MP for dose evaluation of exposures received.

The client can bring the dosimeter to PNRI & re-issued within 1-4 days.

3.2. Application for Subscription

The first step in the OSL personnel monitoring service, as illustrated in Figure 1, is the application for subscription to the service.
Figure 2. Application process for OPTION 1 (left) and OPTION 2 (right) of the service

The application process depends on the option chosen. Figure 2 describes these steps.

### 3.3. Selection of Individuals to be Monitored

It is not necessary to monitor the exposures received of all the workers in a radiation facility. Only those who are authorized in the use and/or handling of the radiation sources are to be monitored. In particular, these personnel to be monitored are:
a) Individuals working in Controlled Areas*
b) Workers who are regularly employed in a Supervised Area or who enters a Controlled Area occasionally
c) Declared pregnant workers who are likely to receive an equivalent dose from external sources to the embryo/fetus in excess of the public limit of 1 mSv in a year
d) Emergency workers responding to a radiological incident or emergency
e) Apprentices, students & trainees of age 16 years and above who are training for employment involving exposure to radiation and/or required to use sources of ionizing radiation in the course of their training/activities.

During application for subscription to the OSL service, supporting documents demonstrating that the person to be monitored is authorized and/or would be under supervision while using sources of ionizing radiation must be presented to the RPS.

*For more details on classification of areas, refer to Ref 6

3.4. Frequency of Monitoring Period

The OSL dosimeters are passive devices that measure cumulative radiation doses over a time period called the Monitoring Period (MP). The MP is therefore the duration for which the dosimeters will be used.

After each MP, the OSL dosimeters are returned by the client for evaluation. The used dosimeters are then replaced or re-issued for use on the next MP.

The frequency of this dosimeter exchange depends on the a) magnitude of the potential radiation doses that maybe received and b) possible fluctuations of exposure levels.

Typically, one MP is equivalent to two (2) months or 60 days. However for practices with high exposure risks such as Industrial Radiography and Radiation Therapy practices, one MP is equivalent to one (1) month.
4. OSL Personnel Monitoring Service Processes

The daily activities of the RPS OSL service, as illustrated in Figure 1, is directed towards OSL processing & issuance as well as evaluation of exposures results of the personnel.

In particular, the service has the following processes: 1. Client applies for subscription to the service (discussed in Section 3), 2. RPS prepares & issues the OSL dosimeters, 3. Workers wear the dosimeters while working with ionizing radiation, 4. Clients return the OSLs after the MP, 5. RPS processes & evaluates the doses received, 6. RPS provides the dose evaluation report to the client. The succeeding subsections discuss the processes in more detail.

4.1. Client applies for the OSL personnel monitoring service

The application process for the subscription to the OSL Personnel Monitoring Service was discussed in Section 3.

4.2. RPS prepares & issues the OSL dosimeters

After the application process is completed, the RPS starts the preparation of the OSL dosimeters for issuance to the client. Figure 3 shows the steps taken during the preparation & issuance of the dosimeters.
4.3. Workers wear the dosimeters while working with ionizing radiation

Upon receipt of the issued OSLs, the client shall give the dosimeters to the assigned individuals for them to wear while working with radiation. The proper use and wear practices of the dosimeters are detailed in Section 5.

4.4. Clients return the OSLs after the Monitoring Period

The monitoring period for which the OSL dosimeters are to be used is indicated in the Personal ID Sheet provided together with the dosimeters. After each MP, clients should RETURN to the RPS the used badges together with the ID sheet for dose evaluation & assessment.

OSL badges that are not returned or different from the one in the ID sheet are noted and shall be indicated in the dose evaluation report. Late return of dosimeters shall have corresponding penalties as indicated in the MOA (for Option 1 clients)

**Badge Exchange / Re-issuance**

Upon receipt of the used badges, the RPS will process the OSLs immediately. After processing, the OSL dosimeters will be Re-ISSUED to the client to be used again by the workers for the next MP.

Clients are expected to receive the re-issued badges within 1-4 days.
4.5. RPS processes & evaluates the doses received

Upon receipt, the used OSL badges are opened and removed from the badge holder. The dosimeters are then prepared for processing & evaluation. Figure 4 shows steps during the processing and evaluation of the OSL dosimeters.

After the dosimeters were processed and readout, the readings in terms of equivalent dose (in mSv) are transferred to an evaluation worksheet to calculate the total radiation doses received by the personnel during that monitoring period. The dose results are then reviewed, assessed and compared to the safe dose limits. After this step, the data is saved in preparation for the printing of the Personal Dose Monitoring Report.

4.6. RPS provides the dose evaluation report to the client

After the evaluation is completed and reviewed, a Personal Dose Monitoring Report is generated. A copy of this Report is given to the client through their Radiation Safety Officer for records keeping and assessment of the safety in the radiation facility.

Dose Reports will be available to the clients in 2-4 weeks following receipt of the used badges by the RPS. An electronic copy may be sent to the client upon request. High doses are notified to the client immediately.

“Dose Evaluation Reports are available in 2-4 weeks!”
One report is generated for each monitoring period and include the following information:

- The monitoring period
- the equivalent doses received by each personnel for that MP,
- Evaluation Remarks

A sample dose report and the description of its contents is shown in Appendix D.

After the effective doses have been evaluated, the results are compared to the regulatory safety limits. Each report contains several evaluation remarks as a means to guide Radiation Safety Officers (RSO) on the meaning of the results. It is important that the RSO takes note of these remarks and make necessary action.

Below are the types of evaluation remarks used and its description. Radiation safety offices (RSO) should take note of these remarks.

a. **Below MDL** – means that the evaluated radiation dose is below the minimum detection limit (MDL) of the dosimeter. Any evaluated dose below this level is not recordable and not considered as occupational exposure. The MDL depends on the dosimeter used and for the OSL system used by the RPS, the MDL = 0.06 mSv.

b. **Below or Above IL** – means that the evaluated dose is below or above the Investigation Level (IL). Investigation levels are radiation dose levels that are equivalent to one third (1/3) of the prescribed dose limit. As per regulations, the annual dose limit for workers is 20 mSv. Hence, the monthly limit is 1.67 mSv and the equivalent IL is 0.5 mSv.

“RSOs should take note of the remarks & take the necessary actions”
Evaluated dose levels **Below IL** are still within the prescribed safety limits. No immediate radiation controls & actions from the RSO are necessary.

If the evaluated dose level is **Above IL**, the RSO should initiate the review the facility’s radiation safety program and investigate why the personnel was exposed to such level. Additional radiation controls & safety measures may be introduced as necessary and as reasonable achievable to minimize the received doses. This is to ensure that the dose received by the personnel will not reach the annual dose limit.

c. **Above AL** – means that the evaluated dose has reached the Action Level (AL) and exceeded the dose limit for that monitoring period. Continued exposure to such levels may lead to overexposures of personnel.

For this situation, the RSO should take the necessary actions and radiation controls to avert the dose received by the personnel.

d. **Not Returned** – means that the particular dosimeter was not received by the RPS for evaluation

e. **Late Return** – means that the particular dosimeter was received for evaluation more than one month after the indicated monitoring period
5. Using your OSL dosimeters

5.1. OSL dosimeter main components

The OSL dosimeter used for the service is a Landauer Inlight XA dosimeter system. The main components are shown in Figure 5.

![Figure 5. OSL Dosimeter main components](image)

The dosimeter is composed of several components namely:

1. **OSL detector slide** – contains the four aluminum oxide (Al$_2$O$_3$) crystals which serves as detector elements

2. **Detector case with filters** – case where the detector slide is inserted. It contains the four types of filtration system: a) open window, b) plastic filter, c) aluminum filter and d) copper filter. The case also contains the serial number of the dosimeter.

3. Clip lock – the component that locks the badge, badge holder and badge clip and other dosimeter components together

4. Plastic badge holder – holds the badge

5. Badge clip

6. Badge – the component used to hold the detector case (containing the detector slide) in place before it is inserted into the plastic badge holder.
5.2. Your dosimeter package

The contents of the dosimeter package received by the client include the following:

1. OSL dosimeters to be used by the personnel
2. At least one CONTROL OSL dosimeter
3. Personal ID Sheet

The Personal ID sheet is a document that contains the following information:

a) The list of OSL dosimeters inside the package identified in terms serial number and to whom the dosimeter is assigned to.

b) The serial number of the Control dosimeter

c) Client information (name, address, client code)

d) Classification of practice such as industrial radiography, conventional radiology, nuclear medicine, radiotherapy, etc.

e) Monitoring Period or the duration of use

A sample Personal ID sheet and the description of its contents is detailed in Appendix C.

Note that the OSL dosimeters are NOT interchangeable and should be used only by the personnel to which it was assigned to. The RSO or authorized contact person should notify the RPS of any changes in personnel details.

5.3. Using your dosimeters

After the OSL dosimeters have been received and assigned to the respective personnel, the RSO should ensure that the personnel wears them properly while working with ionizing radiation.
Everytime a worker enters a radiation (or suspected) area, he/she should wear the OSL dosimeter to monitoring occupational doses received.

1. Pin or clip OSL dosimeter to your body with the front part of the badge facing away from the body.

2. Wear the OSL dosimeters around the chest area to best measure the doses received by the upper torso. If however, one part of the body is most likely to be exposed than the other parts, such as the waist, neck, or back, place the dosimeter on that area. Do not allow clothing, buttons, pens or buckles to shield the front of the badge.

3. If protective clothing is used, wear the dosimeter using the following guidelines

   a. When dealing primarily with penetrating radiation such as X-rays or gamma-rays, place the OSL dosimeter under the protective clothing

   b. When a non-penetrating radiation type is expected (e.g. beta radiation, or photon radiation < 20 keV average) and the eyes or substantial areas of skin are unprotected (e.g., the face and neck), then the dosimeter should be placed on the outside of the protective clothing to ensure proper measurement of shallow dose.

   However for areas with potential contamination, place the dosimeter in a thin plastic bag before wearing to avoid cross contamination.

   c. When a lead vest / apron is used, place the dosimeter underneath it in order to measure efficiency of the vest / apron in protecting the personnel.
4. At the end of each work in the radiation facility, remove the OSL dosimeter and store it together with the Control dosimeter.

**The Control dosimeter**

A CONTROL dosimeter is always sent with each dosimeter package in order to monitor a) the radiation received during transit and b) the background radiation during storage. It must not be used by any personnel or for any other purpose.

Control dosimeters should be placed in normal background radiation area and away from radiation facility as much as possible. It should never be placed near or on top of the radiation source.

Control dosimeters are typically stored together with the other dosimeters when not used or worn. It must be returned together with the used badges after each MP. The dose received by the Control will be subtracted from dose received by each personnel during the dose evaluation discussed in Section 4.5.

5.4. Storing & caring for your dosimeters

1. The OSL dosimeters provided to the client are locked inside the plastic badge holder. It must not be opened or removed from the holder in any way as it may damage the dosimeters or affect the accuracy of the dose evaluation.

2. When not in use, store the OSL dosimeters together with the Control badge in a radiation free area, preferably in a designated location such as the office, or locker area. This location should be out of direct sunlight and away from excessive heat or radioactive sources.
3. Avoid taking the dosimeters at home or during a medical procedure.

4. The dosimeters are not water tight. Take necessary precautions to prevent it from getting wet.

5. Always take the necessary precaution to prevent contamination of the dosimeters as it may significantly affect the dose evaluation.

6. NEVER deliberately expose the OSL dosimeters.

5.5. Records keeping

A Personal Dose Evaluation Report is provided to each client for each MP after the used dosimeters are returned. A copy of this Report is given to the client through their Radiation Safety Officer.

“Records keeping is very essential in

a) Providing analysis for dose distributions
b) Evaluating exposure trends
c) Optimizing effective of monitoring procedures and programs
 d) Provide data for epidemiological studies

“The management through the RSO shall therefore maintain exposure records for each worker by keeping the dose evaluation reports.

Dose records should be kept up date and procedures should be established to ensure that assessments of dose from any monitoring period reach the individual’s dose record promptly.

The management through the RSO shall

• provide workers with access to information on their own exposure records
• provide the regulatory authority, health surveillance agency and the relevant employer access to the exposure records
• facilitate provision of copies of workers exposure records to new employers when workers change employment

• give due care and attention to the maintenance of appropriate confidentiality of records

Exposure records for each worker shall be preserved during the worker’s working life and afterwards at least until the worker attains the age of 75 years and/or for not less than 30 years after the termination of the works involving occupational exposure.”

6. References


Appendix A: Application Form

SERVICE REQUEST FOR OSL PERSONNEL MONITORING SERVICE

I. CLIENT INFORMATION

1. Name of Institution: ________________________________
2. Address: ____________________________________________  □ Private  □ Gov.
3. PNRI License No: __________________ Date Issued: ____________
4. Radiological Health and Safety Office: ____________________
5. Tel/No/Fax: __________________ Email: __________________
6. Purpose or Use of OSL (please check)
   □ Medical X-Ray □ Industrial Radiography □ Research □ Nuclear Medicine
   □ Industrial Gauges □ Radiotherapy □ Industrial X-Ray

7. For Medical X-Ray and Industrial X-Ray machine (please supply data for the equipment)
   No. of units: __________________ Type/Brand: __________________ Date Acquired: ____________
   Use (please check): □ Diagnostic □ Therapy □ Others (specify): __________________
   Maximum kV: ______ Maximum mA: ______ Average mAs (imaging/day): ____________

8. For Nuclear Medicine/Radiotherapy/Industrial Radiography & Gauges/Research
   No. of Sources: ______ Activity: ______ Ref Date: ______
   Type of source: □ open □ sealed Source SN: __________________

3. Please indicate desired type of subscription (please check): □ Mail □ Pickup

II. TERMS & CONDITIONS

In addition to the terms and conditions detailed in the Memorandum of Agreement (MOA), the following shall also apply:
1. The Dose Evaluation Results shall be available 5-10 working days upon receipt of the used OSL Dosimeters. The results shall only be released to the person who applied for the service or their authorized representative.
2. The Institute is implementing a CASH PAYMENT POLICY. The services being requested will be provided only upon presentation of the official receipt.

I have read and agreed with all the terms and conditions stated upon and other supplementary provisions regarding special conditions and disagreement.

Signature of Applicant: __________________ Date: ______ Received by: __________________
Name of Institution

(Please give the necessary information concerning people involved in radiation work in your establishment. Use additional sheets if necessary)

<table>
<thead>
<tr>
<th>Name</th>
<th>ID No. <em>(OSIS, SSS)</em></th>
<th>Date of Birth</th>
<th>Sex</th>
<th>Civil Status</th>
<th>Title Position **</th>
<th>Place of work ***</th>
<th>Previous Work w/ Radiation *** (where and when)</th>
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* Please indicate a prefix G for GSIS No. or S for SSS No.

** Position/Title (Dr. Engineer, Nurse, Rad Tech, etc.)

*** Please indicate by appropriate letter

a) Office Work
b) Field Work e.g., Nuclear Medicine Laboratory, research Laboratory, RIA Laboratory, etc.
c) Facility Radiation Area e.g., Industrial Gages, Medical Radiography, Teletherapy, Brachytherapy

Name and Signature

Designation
Appendix B: Memorandum of Agreement

MEMORANDUM OF AGREEMENT

This AGREEMENT, made and entered into this ________ day in the month of _________ of the year 20__ in Quezon City, Metro Manila, between:

The PHILIPPINE NUCLEAR RESEARCH INSTITUTE, Department of Science and Technology under Republic Act 2067 as amended and organized under Executive Order 128 on January 30, 1987, represented by its Director, and referred to as the PNRI,

-and-

______________________________________, with address at _______________________
a government/private entity operating and doing business under Philippine law, and referred to as the CLIENT.

WITNESSETH

The PNRI is the owner of the OSL Dosimeters, each unit consisting of an OSL card and card holder, which are available for use in order to monitor the workers occupationally exposed to radiation for radiation protection purposes, the issuance of such units forming part of the personnel monitoring service rendered by PNRI

The CLIENT desires to avail of the personnel monitoring service and hence the use of the PNRI’s OSL Dosimeter unit described above in connection with the client’s use and/or handling of radioactive materials and/or radiation sources.

THE PNRI and the CLIENT agree to the following:

The PNRI shall allow the use of the OSL Dosimeter to the CLIENT, and the client shall accept and take possession of the said Dosimeter subject to the following terms and conditions:

a. The client shall use the OSL Dosimeter unit exclusively for the purpose indicated above within the monitoring period:

b. The CLIENT shall pay the PNRI for the personnel monitoring service including the use of the Dosimeter for P 160.00/unit/monitoring period which shall be for one or two months according to the prescribed usage period AND an advance payment equivalent to three monitoring periods. The CLIENT shall provide and be responsible for the delivery or collection of the Dosimeters, or a delivery fee shall be charged to them.

c. The CLIENT shall return for evaluation the dosimeter units to PNRI at the end of the stipulated monitoring period provided above without need of notice from the PNRI. Failure to return the unit one month after the prescribed period of use, shall make the client liable to pay PNRI the amount Php 250.00 for the late return of the Dosimeter.

d. The CLIENT shall be responsible for the loss or damage of the OSL Dosimeter while it is under its custody and shall REPLACE the lost or damaged Dosimeter with another Dosimeter of the same quality & specifications.
This agreement is effective for TWO YEARS and shall supersede and revoke any prior contract concerning the OSL Personnel Monitoring Services which PNRI has executed with the CLIENT, and may be amended, modified, or earlier terminated at the option of the PNRI.

Signed and sealed this _____ day of ___________________, 20___.

PHILIPPINE NUCLEAR RESEARCH INSTITUTE  CLIENT
by

ALUMANDA M. DELA ROSA, Ph. D  by
Director

Signature over printed name

WITNESS

ESTRELLA S. CASERIA
Signature over printed name

ACKNOWLEDGEMENT

Republic of the Philippines
Quezon City

BEFORE ME, Notary Public of

Personally appeared DR. ALUMANDA M. DELA ROSA with Passport No. OE0006886 issued at DFA MANILA on MAY 24, 2012.

and

___________________________ with Residence Certificate No. ________________________ issued at ___________ on ___________________, 201_ known to me to be the same persons who have executed the above Contract of lease and who acknowledged that the same is their voluntary act and deed. I further certify that this document consists of (2) pages, including this page upon which this acknowledgement is written, and that the parties together with their instrumental witnesses have signed their names on the left-hand margin of each page of this document.

WITNESS my hand and seal this _____ day of ________ 201_ at the________________________, Philippines.

NOTARY PUBLIC
Until December 31, 201_
PTR No. ___________
Doc. No. __________
Page No. __________
Book No. __________
Series of 200________
# Appendix C: Personal Identification Sheet

**OSL Service Identification Sheet**

**Client Name:** Radiation Protection Services  
**Reference Date:** 4/4/2014 10:46:01 AM

**Address:** PNRI, Commonwealth Avenue, Diliman, Quezon City  
**Monitoring Period:** 12 Dec-Jan 2013

**Phone Number:**  
**Class:** Service Facilities

**Client Code:** RADPH0094

<table>
<thead>
<tr>
<th>Dosimeter Number</th>
<th>Name of User</th>
<th>Remarks</th>
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<td>12 XA020068679</td>
<td>CONTROL BADGE</td>
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<td>12 XA02007019P</td>
<td>ROMALOSA, KRISTINE MARIE</td>
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<td>12 XA02007058N</td>
<td>SARMIENTO, REMIGIO JR.</td>
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</table>

**Total Number of Dosimeters:** 11

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**Prepared By:**   
**Verified By:**   
**Released By:**   
**Received By:**   
**Date:**

**NOTE:** Return OSL Badges after the indicated monitoring period together with the corresponding ID sheet.
**Appendix D: Personal Dose Monitoring Report**

<table>
<thead>
<tr>
<th>OSL No.</th>
<th>Name of User</th>
<th>Hp(10) in mSv</th>
<th>Remarks</th>
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<tr>
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<td>&lt;MDL</td>
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<td>XA01970810d CALAYCAY, JOSE</td>
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**REMARKS:**
- MDL - Minimum Detection Level
  - MDL = 0.05 mSv
- IL - Investigation Level
  - IL = 0.5 mSv/month or 1.0 mSv/2 months
- AL - Action Level
  - AL = 1.7 mSv/month or 3.4 mSv/2 months

**Monitoring Badges**
- Returned: 5/10/2013
- Processed: 5/10/2013
- Evaluated: 5/14/2013

**ANALYZED BY**
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**REVIEWED BY**
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**CERTIFIED CORRECT**
ESTRELLA S. CASERIA
Head, Radiation Protection Services