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Subject: Corrective Action Management Unit Updated Reference Document Cited in the Resource Conservation and Recovery Act Facility Operating Permit for Sandia National Laboratories/New Mexico, Environmental Protection Agency Identification Number NM5890110518

Dear Mr. Kieling:

The Department of Energy, National Nuclear Security Administration Sandia Field Office and National Technology and Engineering Solutions of Sandia, LLC are submitting the enclosed updated reference document to the New Mexico Environment Department. This submittal is required within 30 days of the effective date of the updated document, which is April 22, 2019.

This submittal is comprised of one procedure, FOP 08-20, Soil Moisture Monitoring Utilizing Neutron Logging, used by personnel to conduct soil moisture monitoring activities at the Corrective Action Management Unit. Minor revisions have been made as part of the routine three-year review cycle to keep the procedures current and incorporate improvements.

If you have questions contact David Rast of our staff at (505) 845-5349.

Sincerely,

Jeffrey P. Harrell  
Manager

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NNSA-2019-001710
Submittal of Updated Reference Documents Cited in the Resource Conservation and Recovery Act Facility Operating Permit

Sandia National Laboratories
Albuquerque, New Mexico
EPA ID No. NM5890110518

CERTIFICATION STATEMENT

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision according to a system designed to ensure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine or imprisonment for knowing violations.

Paul E. Shoemaker, Senior Manager
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Operator

Date signed

Jeffrey P. Harrell, Manager
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Sandia Field Office
Owner

Date signed
Enclosure A

Updated Reference Documents Cited in the
RCRA Facility Operating Permit

FOP 08-20  Soil Moisture Determination Utilizing Neutron Logging

May 2019

Sandia National Laboratories
EPA ID No. NM5890110518
Soil Moisture Determination Utilizing Neutron Logging

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Revision Number: Revision: 4
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Signatures

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Date: 4/18/2019

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Signature
Date: 4/15/19

Sue Collins
Program Lead/Approver
Signature
Date: 4/18/19

Next revision Date: 4/22/2022
Revision Cycle: 3 years

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<table>
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<td>New document.</td>
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<td>2</td>
<td>4/23/2013</td>
<td>Review cycle changed from 2 to 3 years. Updated to reflect the department’s current formatting requirements for a FOP. Removed all “correlation drum” information. Removed the following attachments: On-the-Job Training, Authorized Users List, and CPN 503 DR Hydroprobe® Moisture gauge Operating Manual. Updates were made to the following appendices: Radiological Hazardous Materials Summary and the Neutron Probe (Source) Checklist for Shipping &amp; Receiving.</td>
</tr>
<tr>
<td>3</td>
<td>4/22/2016</td>
<td>Updated department name. Added description of the CAMU. Removed field forms from the appendices. Created and hyperlinked forms located on the 4100 Controlled Documents website. To Section 3.0 and 12.0, added new permit reference. To Section 5.0, added reference to the safety case ALW 14-02 as well protocol for minor completing a change/deviation form. Added Section 7.5, Inspection of Monitoring Equipment and Locations. Removed Section 5.0, Data Quality Objectives and added Section 9.0, Quality Assurance. Added Section 11.0, Records. Updated Appendix D, Neutron Probe (Source) Checklist for Shipping &amp; Receiving.</td>
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<td>4</td>
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<td>Reviewer changes. Format changes. Updated all sections.</td>
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ACRONYMS AND ABBREVIATIONS

ALARA as low as reasonably achievable
ASRS accountable sealed radioactive source
CAMU Corrective Action Management Unit
cm centimeter
CPN 503 CPN 503 Elite HYDROPROBE™ or CPN 503 DR HYDROPROBE® moisture gauge
CSS Chemical Waste Landfill sanitary sewer
DARTS Device and Radiological Source Tracking System
EDMS Environmental Data Management System
ES&H Environment, Safety and Health
FOP field operating procedure
ft foot (feet)
in inch
m meter
mrem/hr millirem per hour
OJT on-the-job training
OSHA Occupational Safety and Health Administration
Permit Hazardous Waste Facility Operating Permit for Sandia National Laboratories
PHS primary hazard screening
PSL primary sub-liner
PVC polyvinylchloride
RCT Radiological Control Technician
SNL/NM Sandia National Laboratories/New Mexico
TA Technical Area
TWD technical work document
VCP vitrified clay pipe
1.0 PURPOSE, SCOPE, AND OWNERSHIP

The Corrective Action Management Unit (CAMU) consists of a containment cell and ancillary systems that occupies a 3.75-acre site located in the southeastern portion of Sandia National Laboratories/New Mexico (SNL/NM) Technical Area (TA) III. The containment cell was constructed with an engineered liner system used to permanently contain hazardous wastes remediated from the Chemical Waste Landfill. Monitoring requirements for the CAMU are specified in the Hazardous Waste Facility Operating Permit for SNL (referred to as the Permit) (New Mexico Environment Department [NMED] January 2015).

1.1 Purpose

Soil moisture monitoring requirements for the CAMU are defined in the Permit, Attachment H, Section H.5 (NMED January 2015). This field operating procedure (FOP) provides guidelines and procedures for use of the CPN 503 Elite HYDROPROBE™ or the CPN 503 DR HYDROPROBE® moisture gauge (CPN 503) at the CAMU. The CPN 503 counts neutrons used to determine soil moisture content under and adjacent to the CAMU containment cell. Neutron counts are correlated to moisture values by using a correlation formula.

1.2 Scope

This FOP is applicable to all SNL employees and contractors performing neutron logging activities at the TA-III CAMU containment cell, using a CPN 503. The work does not require a radiological work permit and will not affect other organizations.

1.3 Ownership

The Environmental Restoration and Stewardship Department is responsible for development, approval, distribution, revision, and control of this procedure.

2.0 TRAINING AND MONITORING QUALIFICATIONS

Personnel conducting field activities must complete Section 2.1.

2.1 Training

- On-the-job training (OJT) for new field personnel performing soil moisture monitoring activities or new processes and/or equipment. Document training by completing an OJT form, LTS-OJT.
- Field personnel must sign an Authorized Users List (AUL) form, LTS-AUL, to affirm they have read and understand this document and agree to operate within the stated constraints.
- Prejob briefing required by the “Radiation Protection” chapter of MN471022, Environment, Safety and Health (ES&H) Manual. (NOTE: Signing the AUL form suffices for the prejob briefing required by the ES&H Manual.)
- Read CPN 503 operating manuals.
• Read and sign PLA 04-01, *Health and Safety Plan for the Corrective Action Management Unit Containment Cell.*

• Be familiar with sections in the “Radiation Protection” chapter of the *ES&H Manual* pertaining to sealed and controlled radioactive sources.

• Training courses listed in Table 2-1.

**Table 2-1. Training Course List**

<table>
<thead>
<tr>
<th>COURSE CODE</th>
<th>COURSE TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHM100</td>
<td>Chemical Safety</td>
</tr>
<tr>
<td>CHM103</td>
<td>Site Specific Chemical Safety</td>
</tr>
<tr>
<td>ELC105</td>
<td>Basic Electrical Safety (&gt; 50 volts)</td>
</tr>
<tr>
<td>ENV100</td>
<td>Occupational Safety and Health Administration (OSHA) Health &amp; Safety Basic Training - General Worker (40 HR)</td>
</tr>
<tr>
<td>ENV103</td>
<td>OSHA Health &amp; Safety Training Refresher (8 HR)</td>
</tr>
<tr>
<td>ENV112</td>
<td>Hazardous Waste &amp; Environmental Management Training</td>
</tr>
<tr>
<td>ESH100</td>
<td>ES&amp;H Awareness</td>
</tr>
<tr>
<td>MCH200</td>
<td>Hand and Power Tool Safety</td>
</tr>
<tr>
<td>MED102</td>
<td>Standard First Aid</td>
</tr>
<tr>
<td>MED104</td>
<td>Heartsaver CPR</td>
</tr>
<tr>
<td>OTS101</td>
<td>Occupational Thermal Stress</td>
</tr>
<tr>
<td>PPE106</td>
<td>Personal Protective Equipment Training</td>
</tr>
<tr>
<td>RAD210</td>
<td>Radiological Worker I Training</td>
</tr>
<tr>
<td>RAD210R</td>
<td>Radiological Worker I Training Refresher</td>
</tr>
<tr>
<td>RAD218</td>
<td>Accountable Radioactive Source (ASRS) Control for Custodians (NOTE: Only required for the primary and the alternate ASRS Custodian.)</td>
</tr>
</tbody>
</table>

**3.0 HEALTH AND SAFETY**

A task hazard analysis has been performed on the activities described in this FOP, as well as a hazard assessment survey performed by an SNL/NM industrial hygienist. They are detailed in PLA 04-01.

**3.1 Radiation Hazard**

Field Technologists operating the CPN 503 are responsible for obtaining and wearing properly coded (neutron radiation) dosimeters during all operations. They are also responsible for returning the dosimeter to their department manager on the assigned dates.

The CPN 503 contains a 50.0 millicurie Am$^{241}$/Be neutron source. Radiation levels provided by the manufacturer are as follows:
Soil Moisture Determination Utilizing Neutron Logging

Table 3-1. Manufacturer Radiation Levels

<table>
<thead>
<tr>
<th>Distance</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 centimeters (cm)</td>
<td>0.1 millirem per hour (mrem/hr) gamma, 1.8 mrem/hr neutron</td>
</tr>
<tr>
<td>Contact</td>
<td>0.5 mrem/hr gamma</td>
</tr>
<tr>
<td></td>
<td>1.7 mrem/hr neutron</td>
</tr>
<tr>
<td>Other</td>
<td>Up to 30 mrem/hr neutron on contact, if unshielded.</td>
</tr>
</tbody>
</table>

Detailed ES&H Manual requirements for use and storage of the CPN 503 are listed in Table 3-2.

Table 3-2. ES&H Manual CPN 503 Storage Requirements

<table>
<thead>
<tr>
<th>Control Type</th>
<th>Requirement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Engineering</td>
<td>When not in use, the CPN 503 is locked in the storage shed labeled ERFO2 that is located at the CAMU.</td>
</tr>
<tr>
<td>Administrative</td>
<td>• Perform a prejob briefing.</td>
</tr>
<tr>
<td></td>
<td>• Complete technical work documents (TWDs; the FOP and primary hazard screening).</td>
</tr>
<tr>
<td>Hold Points</td>
<td>None</td>
</tr>
<tr>
<td>Void Points</td>
<td>Contamination greater than ES&amp;H Manual, “Radiation Protection” chapter, Radioactive contamination limits of 20 disintegrations per minute/100 cm2 and radiation levels greater than 5 mrem/hr at 30 cm (gamma + neutron).</td>
</tr>
<tr>
<td>Alarming Equipment (or other special equipment)</td>
<td>None</td>
</tr>
<tr>
<td>Radiological Control Technician (RCT) Coverage</td>
<td>Intermittent</td>
</tr>
<tr>
<td>RCT required surveys</td>
<td>• Semiannual leak test (cycle group, April and October)</td>
</tr>
<tr>
<td></td>
<td>• Monthly routine survey of storage area</td>
</tr>
<tr>
<td></td>
<td>• Transportation surveys when shipping CPN 503 to manufacturer</td>
</tr>
<tr>
<td></td>
<td>• Job coverage surveys, as needed.</td>
</tr>
<tr>
<td>ASRS Custodian Required Inventory</td>
<td>Semiannual (cycle group, April and October)</td>
</tr>
<tr>
<td>Radiological Posting</td>
<td>• Radioactive Materials Area</td>
</tr>
<tr>
<td></td>
<td>• Controlled Area</td>
</tr>
<tr>
<td>Frisking Requirements</td>
<td>None</td>
</tr>
<tr>
<td>TWD (this FOP) Sign-In Requirements</td>
<td>Initial</td>
</tr>
</tbody>
</table>
Care must be taken to keep radiation exposure as low as reasonably achievable (ALARA). If the probe becomes lodged in an access tube or sustains extensive damage, call Radiation Protection and they will dispatch an RCT to the site. Do not attempt to retrieve the probe. Maintain a safe distance from the probe; 10 meters (m) or 33 feet (ft). For more information on the CPN 503, see Appendix A.

4.0 DATA QUALITY OBJECTIVES

The data quality objective of this FOP is to ensure regulatory compliance and reduce the risks to human health and the environment.

5.0 EQUIPMENT AND MATERIALS

A CPN 503 is used to collect soil moisture data from the primary subliner (PSL) and Chemical Waste Landfill sanitary sewer (CSS) monitoring subsystems at the CAMU. The CPN 503 consists of the following (see Appendix B):

- Probe
- Shielded control box
- Interface cable (12-ft-length, used to connect probe to shielded control box for standard count)
- CPN 503 instrument suitcase (certified type 7A package)
- Battery charger

Additional equipment and materials include the following:

- Cable reel mounted in vehicle (spooled with interface cable).
- Key to unlock padlock on the ERFO2 storage shed (obtain key from the Project Lead).
- Key to unlock padlocks on PSL monitoring subsystem vitrified clay pipes (VCP) and the CSS monitoring subsystem protective casings (obtain key from the Project Lead).
- PSL monitoring subsystem-specific:
  - Aluminum centralizer
  - One Unistrut pulley fixture
  - One Unistrut cable guide
  - One cable pulling attachment
  - Two 2-way radios
- CSS monitoring subsystem-specific:
  - Ratchet and socket, 3/4-inch, (to remove polyvinylchloride [PVC] cap)
  - PVC support pulley fixture (tube and pulley cap)
6.0 FIELD PROCEDURES

6.1 CPN 503 Handling Requirements

The CPN 503 is stored in the locked ERFO2 storage shed. It can only be used with the permission of the ASRS Custodian, as follows:

- The probe must remain in the shielded control box unless in use.
- The operator must minimize time spent near the probe.
- Maintain a distance from the probe of at least 1 m (3.3 ft).
- Do not leave the probe unattended, except when it is locked in the ERFO2 storage shed.

The ERFO2 storage shed is marked with a magenta and yellow placard labeled “Controlled Area” and “Radioactive Materials.” The CPN 503 and the instrument suitcase are labeled with the appropriate radioactive material warnings.

Replace these labels immediately if damaged, obscured, or removed. Contact Radiation Protection to assist in the replacement of signs and/or labels.

Personnel not performing the monitoring, but in the immediate area, need to be notified of the radiation hazard.

The Field Technologist is only authorized to transport the CPN 503 within TA-III. Only a government vehicle may be used to transport the CPN 503. The CPN 503 must be stored in the instrument suitcase during transport. The instrument suitcase must be secured to the floor of the government vehicle during transport.

The Field Technologist must complete the following information on the Sign-Out/Sign-In Form, LTS 2015-004, when using the CPN 503:

- Field Technologist name
- ASRS Custodian contacted prior to use
- Reason for using CPN 503
- CPN 503 source identification
- Sign-out date and time
- Sign-in date and time

A leak test survey is performed on the probe by radiation protection personnel, semiannually (cycle group, April and October). A source inventory is performed by the ASRS Custodian semiannually (cycle group, April and October). Both are requirements listed in the “Radiation Protection” chapter of the ES&H Manual. Email notices are sent to the ASRS Custodian by the Device Source Registrar indicating when the surveys and inventories are due.
If the CPN 503 needs to be sent to the manufacturer for calibration and/or maintenance, follow the requirements listed in the “Radiation Protection” chapter of the ES&H Manual. Instructions for shipping the CPN 503 off site are provided in Attachment C.

6.2 CPN 503 Standard Count

Charge the CPN 503 battery prior to use. A standard count must be taken each day the CPN 503 is used. To take a standard count, follow directions in the appropriate CPN 503 operating manual.

6.3 CPN 503 Neutron Logging

Program the CPN 503 to count neutrons for 60 seconds. Program according to the appropriate CPN 503 operating manuals.

6.3.1 Neutron logging the PSL Monitoring Subsystem

The PSL monitoring subsystem consists of five horizontal VCP runs buried in the wicking layer, under the CAMU containment cell (Figure 6-1). The ends of the VCP runs are connected to 6-in nominal PVC access pipes, located on the north and south ends of the CAMU containment cell. These PVC pipes are used to access the PSL monitoring subsystem.

Prior to passing the aluminum centralizer with the CPN probe, each VCP must be checked for clear passage by passing the empty aluminum centralizer through the VCP.

Figure 6-1. Schematic of PSL and CSS Monitoring Subsystems
At the CAMU containment cell, south end:

1. Position the CPN cable reel in line with the VCP access tube to be measured.
2. Unlock cable reel restraint.
3. Pull some cable from the cable reel and thread it through the Unistrut pulley assembly with the pulley end towards the cable reel.
4. The end of the probe interface cable that feeds off the reel will be inserted into the aluminum centralizer as follows:
   i. Loosen the three Allen screws that hold the slotted end cap on the aluminum centralizer.
   ii. Insert the end of the probe interface cable through the slotted end cap.
   iii. Reattach the slotted end cap to the aluminum centralizer and secure the three Allen screws.
5. Unlock the protective steel casing cap and remove the 6-in PVC cap from the VCP access tube, with the resident pull cable attached to the carabiner and PVC cap.
6. Remove the resident pull cable from the carabiner and 6-in PVC cap and attach it to the locking swivel link located on the end of the aluminum centralizer.
7. Install the aluminum centralizer into the VCP access tube.
8. Install the Unistrut pulley assembly onto the access tube Unistrut support and secure it with the locking pin.
9. Notify the north end, by radio, that the assembly is ready to be pulled through to the north end of the access tube.

At the CAMU containment cell, north end:

1. Unload the CPN 503.
2. Unlock and remove the 6-in PVC cap from the VCP access tube.
3. Install the Unistrut cable guide onto the Unistrut support of the VCP access tube (see Appendix B).
4. Disconnect the resident pull cable from the 6-in PVC cap and carabiner.
5. Thread the cable through the Unistrut cable guide.
6. Reattach the cable to the carabiner and 6-in PVC cap.
7. Attach cable pulling attachment to resident pull cable.
8. Notify the south end and begin pulling the resident pull cable using the cable pulling attachment when south end is also ready.
At the CAMU containment cell, south end:

- Monitor/maintain tension on cable reel while the cable is being pulled through the access tube to prevent tangling of the cable.

At the CAMU containment cell, north end:

The interface cable is played out from the cable reel at the south end until the aluminum centralizer and interface cable emerge at the north end.

1. Notify the south end when the aluminum centralizer assembly arrives.
2. Remove the Unistrut cable guide and pull out the aluminum centralizer with about 3 ft of interface cable.
3. Loosen the three Allen screws that hold the slotted end cap on the aluminum centralizer and remove the interface cable.
4. Attach the interface cable to the probe.
5. Remove the probe from the shielded control box and insert it into the aluminum centralizer.
6. Reattach the slotted end cap to the aluminum centralizer and secure the three Allen screws.

With the aluminum centralizer and probe situated at the proper starting point, the cable reel footage counter must be initialized to zero. There is a mark on the outside of the aluminum centralizer indicating the end of the probe. This mark must be aligned with the end of the access tube.

1. North end - notify the south end to slowly reel in the centralizer/probe assembly until the mark aligns with the end of the access tube.
2. South end - sets the cable reel footage counter to zero.
3. North end - reinstall the Unistrut cable guide onto the access tube Unistrut support.
4. North end - return the shielded control box to the south end to be hooked up to the connector located on the hub of the cable reel.

At the CAMU containment cell, south end:

1. Reel the interface cable to place the probe/centralizer at the first location to be logged, as indicated on the PSL Neutron Count Log Form (LTS CAMU-2015-009).
2. Attach the cable connected to the cable reel hub to the shielded control box.
3. Operate the CPN 503, per the operating manual, to collect neutron count data. Write the value down on the PSL Neutron Count Log Form (LTS CAMU-2015-009).
4. Continue to reel the centralizer/probe assembly to each predetermined location indicated on the PSL Neutron Count Log Form (LTS CAMU-2015-009) and collect neutron count data until all locations have been monitored.

5. When finished, reel in the cable until the probe assembly is at the top of the south end of the access tube.

6. Remove the Unistrut pulley assembly and pull the centralizer/probe assembly from the access tube.

7. Disconnect the resident pull cable from the centralizer/probe assembly and connect it to the carabiner/6-in PVC cap.

8. Place the 6-in PVC cap on the access tube and secure.

9. Close and lock the protective steel casing cap.

10. Remove the probe from the aluminum centralizer and place it back in the shielded control box.

At the CAMU containment cell, north end:

1. Disconnect the resident pull cable from the 6-in PVC end cap and unthread from the Unistrut pulley assembly.

2. Remove the Unistrut pulley assembly from the access tube.

3. Reattach the resident pull cable to the 6-in PVC end cap.

4. Place the 6-in PVC cap on the access tube and secure.

5. Close and lock the protective steel casing cap.

Repeat this procedure for the remaining PSL monitoring subsystem access tubes (see Appendix B).

6.3.2 Neutron Logging the CSS Monitoring Subsystem

The CSS monitoring subsystem boreholes are 20-ft to 21-ft long, 2-in steel pipes with screens on the bottom of each pipe. The six CSS monitoring subsystem borehole pipes are sunk into the ground, vertically, near the CSS (see Appendix B). The top 2 ft, of each pipe that protrudes above the ground, is protected by a 12-in well casing with a locking lid.

At the CSS monitoring subsystem well:

1. Position the cable reel in line with the borehole monitoring location.

2. Unlock the protective steel casing cap.

3. Remove screw-on-PVC cap. Use the ¾-inch ratchet and socket if necessary.

4. Place the PVC support tube (with holes facing the cable reel) over the borehole 2-in pipe.
5. Connect the interface cable connector at the hub of the cable reel to the shielded control box.

6. Pull some cable from the cable reel, and thread it through the pulley cap.

7. Attach the interface cable to the probe.

8. Remove the probe from the shielded control box and insert it into the PVC support tube.

9. Place the pulley cap on the PVC support tube.

10. Feed the interface cable, off the reel, to lower the probe until it is at the bottom of the CSS monitoring subsystem borehole.

11. Take up the cable slack, with the probe just touching the bottom of the borehole. Set the cable footage counter on the cable reel to zero.

12. Use the cable reel to raise the probe to each of the two predetermined monitoring depths indicated on form LTS CAMU-2015-010. Take readings at each depth and record the neutron count values on the form.

13. Use the cable reel to raise the probe up into the PVC tube. View the probe entering the PVC tube through the holes in the PVC tube.

14. Remove the pulley cap from the PVC tube.

15. Remove the probe from the PVC tube, and place it in the shielded control box.

16. If another borehole is to be logged, the cables may be left connected while moving to the next location.

Repeat the procedures outlined above at the next borehole location (see Appendix B).

6.4 Inspection of Monitoring Equipment and Locations

Inspection of the monitoring equipment and locations must be performed at time of the monitoring event and are documented on the following forms:

- LTS CAMU-2015-001, CAMU Post-Closure Quarterly Inspection Form – VZMS CSS Soil Moisture/Soil Gas Monitoring Locations & Equipment
- LTS CAMU-2015-003, CAMU Post-Closure Quarterly Inspection Form – VZMS PSL Soil Moisture Monitoring Locations & Equipment

7.0 QUALITY ASSURANCE

Quality assurance objectives for soil moisture monitoring at the CAMU includes conforming to the sampling and analysis plans for the PSL and CSS monitoring subsystems detailed in Sections H.6 and H.8 of the Permit; and conforming to the activities outlined in this FOP.
8.0 DATA MANAGEMENT

8.1 Data Collection Locations and Frequency

CSS monitoring subsystem

The CSS monitoring subsystem is comprised of six borehole locations (CSS-1 through CSS-6). Data is collected from two monitoring depths at each of the six locations. See form LTS CAMU-2015-010 for details. Data is collected quarterly (every three months).

PSL monitoring subsystem

The PSL monitoring subsystem is comprised of five VCP locations with the number of monitoring points at each location in parentheses: West (34), West-Central (35), Central (35), East-Central (35), and East (34). See form LTS CAMU-2015-009 for details. Data is collected quarterly.

8.2 Data Submittal Process

The steps of the data flow process and the personnel associated with each step are defined as follows:

8.2.1 Field Technologist

1. As the neutron count data is collected and recorded on the field forms, it is compared to the previous quarter monitoring result values to see if there are any anomalies.
2. Anomalies are noted, and the field forms are submitted to the Project Lead.

8.2.2 Project Lead

1. The Project Lead enters the neutron count data into a Microsoft® Visual Fox Pro program and verifies the entries. The program performs the following functions:
   a. It converts neutron count data to soil moisture (percent mass) by using a previously determined correlation equation.
   b. It converts the data into an Environmental Data Management System (EDMS) file format. The file format allows the data to be readily downloaded into the EDMS database.
2. The EDMS formatted file is emailed to the Database Administrator.

8.2.3 Database Administrator

The Database Administrator imports the data file (received from the Project Lead) into EDMS.
9.0 RECORDS

Field documentation data records must be processed according to the Permit, which includes maintaining a facility operating record. Field documentation data records must also be maintained at the SNL/NM Records Center.

All LTS forms (Table 9-1) are in the Long-Term Stewardship ARAS Repository.

Table 9-1. List of Forms

<table>
<thead>
<tr>
<th>FORM NUMBER</th>
<th>FORM TITLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>LTS-AUL</td>
<td>Authorized Users List</td>
</tr>
<tr>
<td>LTS CAMU-2015-001</td>
<td>CAMU Post-Closure Quarterly Inspection Form – VZMS CSS Soil Moisture/Soil Gas Monitoring Locations &amp; Equipment</td>
</tr>
<tr>
<td>LTS CAMU-2015-003</td>
<td>CAMU Post-Closure Quarterly Inspection Form – VZMS PSL Soil Moisture/Soil Gas Monitoring Locations &amp; Equipment</td>
</tr>
<tr>
<td>LTS CAMU-2015-009</td>
<td>CAMU PSL – Neutron Count Log Form</td>
</tr>
<tr>
<td>LTS CAMU-2015-010</td>
<td>CAMU CSS – Neutron Count Log Form</td>
</tr>
<tr>
<td>LTS-OJT</td>
<td>On-the -Job Training (OJT) Form</td>
</tr>
<tr>
<td>LTS 2015-004</td>
<td>Sign-Out/Sign-In Form</td>
</tr>
<tr>
<td>SF 2001-RS</td>
<td>Radioactive Source Change Form</td>
</tr>
</tbody>
</table>

10.0 REFERENCES


APPENDIX A
Radiological Hazardous Materials Summary
A-1. GENERAL INFORMATION

Table A-1 presents general information pertaining to the neutron moisture probe stored at the TA-III ERFO2 storage shed.

Table A-1. CPN International, Inc. Neutron Moisture Probe

<table>
<thead>
<tr>
<th>GENERAL INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Type of device:</strong></td>
</tr>
<tr>
<td><strong>Manufacturer:</strong></td>
</tr>
<tr>
<td><strong>Model Number:</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Serial Number:</strong></td>
</tr>
<tr>
<td><strong>Operating Parameters:</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Type of Radiation:</strong></td>
</tr>
<tr>
<td><strong>Sandia Device and Source Registrar ID#:</strong></td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td><strong>Location of device:</strong></td>
</tr>
<tr>
<td><strong>Primary ASRS Custodian</strong></td>
</tr>
<tr>
<td><strong>Alternate ASRS Custodian</strong></td>
</tr>
</tbody>
</table>

A-2. RADIATION LEVELS (PROVIDED BY MANUFACTURER)

Table A-2. Manufacturer Radiation Levels

<table>
<thead>
<tr>
<th>Distance</th>
<th>Levels</th>
</tr>
</thead>
<tbody>
<tr>
<td>30 cm</td>
<td>0.1 mrem/hr gamma, 1.8 mrem/hr neutron</td>
</tr>
<tr>
<td>Contact</td>
<td>0.5 mrem/hr gamma, 1.7 mrem/hr neutron</td>
</tr>
<tr>
<td>Other</td>
<td>Up to 30 mrem/hr neutron on contact, if unshielded</td>
</tr>
</tbody>
</table>
A-3. DOSIMETRY

A thermoluminescence dosimeter (TLD) with a neutron code of 20 is required for personnel operating the CPN 503 probe.

A-4. TRAINING AND TECHNICAL WORK DOCUMENTS

CPN 503 Operators must complete the following training:

- Sign an LTS-AUL to affirm they have read and understand this document and agree to operate within the stated constraints.
- Complete OTJ, as necessary, for new personnel performing field activities. Document training by completing form LTS-OJT.
- Read CPN 503 operating manuals.
- Complete ENV100 OSHA 40-hour Hazardous Waste Operations Training.
- Complete ENV103 OSHA 8-hour Hazardous Waste Operations Training Refresher.
- Complete RAD210 Radiological Worker 1.
- Complete RAD210R Radiological Worker 1 Refresher
- Complete RAD218 ASRS Control for ASRS Custodians (NOTE: Only required for the primary and the alternate ASRS Custodian.)
- Ensure familiarity with sections in the “Radiation Protection” chapter of the ES&H Manual that pertain to sealed and controlled radioactive sources.
- Read and sign PLA 04-01.

ALARA protocol will be performed by the field personnel when using this instrument.

A-5. POSTINGS

Postings at the storage location and work area include, “Controlled Area” and “Radioactive Materials.”

Users of the instrument will be responsible for administrative controls while the probe is in transport.

A-6. SURVEYS AND INVENTORY

A leak survey must be performed on the CPN 503 semiannually (cycle group, April and October) by an RCT.

A leak test survey must be performed on the CPN 503 prior to transportation by the Packaging and Transportation group. This will occur only when the CPN 503 is sent to the manufacturer for calibration/maintenance. A leak test survey must also be performed when the CPN 503 is returned from the manufacturer.
NOTE: Prior to movement from the ERFO2 storage shed, when the CPN 503 is shipped to the manufacturer, the status of the source must be change from “Active” to “Loaned.” This is done by completing a radioactive source change form, SF 2001-RS, and providing it to the administrator of the Device and Radioactive Source Tracking System (DARTS) at devsrc@sandia.gov. Upon return from the manufacturer, and prior to use of the CPN 503 by a Field Technologist, the status of the source must be changed back to “Active” by completing another SF 2001-RS and providing it to the DARTS administrator.

Monthly routine surveys of the ERFO2 storage shed are performed by an RCT.

Inventory of the CPN 503 is performed semiannually (cycle group, April and October) by the ASRS Custodian.

A-7. TRANSPORT

- The CPN 503 will only be transported within TA-III by authorized field personnel. Any other transportation will be done by the Packaging and Transportation group.

- The CPN 503 will be transported in the manufacturer’s suitcase (certified type 7A package). The suitcase will be secured in the vehicle using tie-downs.

- A “Caution Radioactive Material” label must be affixed to the outside of the suitcase.

- If the CPN 503 is used in the field for more than five days (without daily storage in the ERFO2 storage shed) or is transferred off site, update the source location in the Radiation Protection Source Database.

A-8. OPERATIONAL AS LOW AS REASONABLY ACHIEVABLE (ALARA) SCREEN

The Operational ALARA Screen must be performed by evaluating the following conditions. If any of the conditions apply to the radiological work, an Operational ALARA Review must be performed. [10 Code of Federal Regulations 835.1003(b)].

An Operational ALARA Review is not required based on the answers to the following questions:

- Will the highest individual dose of >100 mrem total effective dose be expected to complete the work? No.

- Will the collective dose of >500 person-mrem total effective dose be expected to complete the work? No.

- Will airborne radioactivity in the accessible work area be expected to routinely meet or exceed the criteria for an airborne radioactivity area? No airborne radioactivity.
• Will removable contamination in the accessible work area be expected to routinely meet or exceed the criteria for a high contamination area? No removable contamination.

• Will hot particles be expected in the accessible work area? No hot particles.

• Will general area dose rates in the accessible work area be expected to routinely meet or exceed the criteria for a high or very high radiation area? No.

• Are dose rates of >50 µrem/hr expected in occupied areas for a period >1 week? No.
APPENDIX B
Equipment Setup Photos and Diagrams
PSL Setup

Figure B-1. Containment Cell, South End — Unistrut Pulley Assembly with Aluminum Centralizer.

Figure B-2. Containment Cell, North End — Unistrut Cable Guide with 6” PVC Cap.
CSS Setup

Figure B-3. Equipment Setup at CSS Monitoring Location.

Figure B-4. Cable reel used for PSL and CSS
Figure B-5. CPN 503 and Instrument Suitcase (probe contained in shielding).

Figure B-6. CPN 503 and Instrument Suitcase (probe removed from shielded control box).
APPENDIX C
Instructions for Shipping the CPN 503 Off Site
Instructions for Shipping the CPN503 Off Site

1) Request a “Movement” and “Shipping” survey from Radiation Protection.

2) Request a change of status from “Active” source to “Loaned,” prior to movement from the ERFO2 storage shed. This is done by completing a SF 2001-RS and providing it to the administrator of the DARTS at devsrc@sandia.gov.

3) Remove batteries from the instrument, prior to shipping.

4) Complete the shipping documentation (SHIPPER form) located at http://cfo.sandia.gov/logistics/Shipping/Page1WSF.htm.
   - Attach all relevant documents electronically to the SHIPPER form as instructed. This includes:
     - The “Information of Hazardous Material Shipments” form (provided on the SHIPPER website). Indicate on the appropriate line the material to be shipped is CLASS 7-RADIOACTIVE MATERIALS
     - The “Movement” and “Shipping” survey that was performed by the RCT.
     - Radioactive Material License Number 1100-07; and if still applicable, the Application Letter for Renewal of License
     - Copy of the U.S. Department of Transportation (Pipeline and Hazardous Materials Safety Administration) International Certificate of Competent Authority Special Form Radioactive Materials Certificate USA/0632/S-96
     - Type A certification test results
     - A statement in the form of an email from a nuclear criticality safety engineer that certifies the material remains below the DeMinimis requirements.

5) Submit the SHIPPER form and all attachments.

6) On-site movement of hazardous material must be requested after the Shipper is submitted at https://arsprod.sandia.gov/Logistics/LogisticsNM.jsp

The following must be completed upon return of the instrument to SNL, and prior to use:

1. The status of the source must be changed back to “Active,” by completing another SF 2001-RS form and submitting it to the DARTS administrator.
2. A leak test must be performed by an RCT.