

CCP-TP-047

Revision 11

CCP Mobile IQ3 Gamma Scanner Operation

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PRINTED NAME

APPROVED FOR USE

RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
0	02/05/2003	Initial Revision
1	03/21/2003	Changes in response to CBFO comments.
2	04/01/2003	Revised note above 4.6.1. This is a Minor Revision.
3	06/22/2004	Revision to clarify Note after section 4.7.6. Added Facility Records Custodian Responsibilities. Revised Sections 2.0-5.0 for clarifications and corrections.
4	03/11/2005	Supporting SRS authorization basis requirements.
5	04/28/2005	Revised to support SRS Authorization Basis (AB) requirements.
6	09/21/2005	Revised step 4.7.13 [H] and deleted Facility Records Custodian (Section 3.4).
7	11/16/2006	Revised to make the responsibilities of user consistent with those outlined by the Waste Isolation Pilot Plant Hazardous Waste Facility Permit requirements resulting from the Section 311/RH PMR and to incorporate procedure consistency changes.
8	09/22/2009	Revised in response to instrument relocation from Savannah River Site to Oak Ridge National Laboratory. Data field inputs amended and editorial changes made for procedural clarity. Procedural flow modified to match ORNL requirements.
9	01/22/2010	Revised to correct numbering sequence referenced in step 1.1.1, add calibration range to Section 1.1, and provide requirements regarding liquid nitrogen filling.
10	10/20/2010	Revised dead-time requirement from 60 percent (%) to 90%.
11	02/22/2011	Revised to account for changes in procedure to NDA2000 Software Upgrade.

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1.0 PURPOSE

This procedure contains the operating instructions to perform gamma assay on waste drums using the IQ3 Gamma Assay System.

1.1 Scope

This procedure provides specific instructions to operate the IQ3 system including start-up and use of NDA2000 Operations Software, (drum loading, assaying of transuranic (TRU) and TRU-mixed drums, and shutdown of equipment. Three coaxial Germanium (SeGe) detectors are used to quantify the activity of individual radionuclides present in the waste drum. The Multi-Group Analysis (MGA) software and three Low Energy Germanium (LEGe) detectors determine the isotopic analysis. The assays meet the requirements of CCP-PO-002, *CCP Transuranic Waste Certification Plan* for shipment of waste drums to the Waste Isolation Pilot Plant (WIPP). The calibration range for the IQ3 Gamma Assay System is 0 to 2.3g ²³⁸Pu; 0 to 35g ²³⁹Pu (no attenuators) and 0.1g to 7g ²³⁸Pu; 1g to 211g ²³⁹Pu (with attenuators).

2.0 REQUIREMENTS

2.1 References

Baseline Documents

- CCP-PO-003, *CCP Transuranic Authorized Methods for Payload Control (CCP CH-TRAMPAC)*
- *NDA2000 Software User's Manual*
- *MCS-IQ3-CALIB-2009 Calibration Report for the MCS IQ3*
- *MCS-IQ3-TMU-2009 Total Measurement Uncertainty for the MCS IQ3*

Referenced Documents

- Brown and Firestone, "Table of Radioactive Isotopes," 7th Edition, Wiley, 1986
- CCP-PO-002, *CCP Transuranic Waste Certification Plan*
- CCP-QP-002, *CCP Training and Qualification Plan*
- CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control*
- CCP-QP-008, *CCP Records Management*
- CCP-TP-048, *CCP Mobile IQ3 System Data, Reviewing, Validating, and Reporting Procedure*

2.2 Training Requirements

2.2.1 Personnel performing this procedure will be trained and qualified in accordance with CCP-QP-002, *CCP Training and Qualification Plan* prior to performing this procedure.

2.3 Equipment List

2.3.1 Nondestructive Assay (NDA) Operations Computer System and ancillary equipment

2.3.2 Three (3) SEGe detectors

2.3.3 Three (3) LEGe detectors

2.3.4 IQ3 mechanism including:

- Shield
- Sample rotator
- Three (3) Transmission sources (Barium [Ba]-133, nominally 10 millicuries [mCi])
- Transmission source shutter assembly
- Conveyor mechanism

2.3.5 A Nuclear Instrumentation Module (NIM) bin including:

- Three (3) Power Supplies
- Six (6) Analog to Digital Converters (ADCs)
- Six (6) Spectroscopy Amplifiers
- Six (6) High Voltage (HV) Bias Supplies
- Three (3) Acquisition Interface Modules (AIMs)
- Two (2) Dual Multi-Spectrum Storage (DMSS) Modules
- One (1) Reference Pulser Module

2.3.6 Light Stack

- Blue light indicates Liquid Nitrogen (LN) fill system is ON
- Amber light indicates system motion

- White light indicates data acquisition
- Red light indicates transmission shutter open
- Cycling through the lights indicates an EMERGENCY STOP

2.3.7 Attenuator Caps

- Three (3) for SEGe detectors
- Three (3) for LEGe detectors

2.4 Software

2.4.1 NDA2000 Operations

2.4.2 Operating System

2.4.3 Radionuclide Libraries

2.5 Precautions and Limitations

2.5.1 NDA Operator shall be aware of the following hazards:

- HV power
- LN
- Radioactive waste containers
- The IQ3 system will start without audible warning. Access to the Equipment Bay shall be controlled by the NDA Operator.
- Moving parts (e.g., shield door and conveyor)

2.5.2 The detection system includes an automatic LN fill system. The extremely cold temperature of LN can cause severe burns to human skin and mucous membranes.

2.5.3 The process of filling the detectors with LN shall be performed with the trailer doors open to prevent an asphyxiation hazard.

2.5.4 The LN supply shall be from a nominal 22 pounds per square inch (psig) DOT 4L cryogenic liquid cylinder to avoid over pressurizing the detector fill system.

2.6 Prerequisite Actions

NOTE

Prerequisite action steps may be performed in any order and may be repeated, as required.

2.6.1 Equipment Bay

- Verify power on the electrical cabinet, and all lamps are illuminated (24 Volts Alternating Current [VAC], 24 Volts Direct Current [VDC], 120 VAC, system ON).
- Verify that the two EMERGENCY STOP Buttons are operative.
- Verify the system interlocks operate properly.
- Ensure Central Processing Unit (CPU)/Manual switch is in CPU mode.
- Ensure that the attenuator caps are removed from the SEGe and LEGe detectors.

2.6.2 Control Room

- Ensure that power to NIM bin, computer, and ancillary equipment is ON.
- Verify that the EMERGENCY STOP Button is operative.
- Verify the stack light indicators operate (all the lights will cycle ON and OFF).
 - **IF** the lights fail to come ON during this process, **THEN STOP WORK**, notify the NDA Lead Operator (LO), **AND DO NOT** proceed without NDA LO concurrence.
- Verify that the HV inhibit indicators on the six detectors are OFF.

2.7 Definitions

2.7.1 None

3.0 RESPONSIBILITIES

NOTE

The NDA Operator and the NDA LO may be the same individual. The NDA LO may perform NDA Operator tasks and functions at any time.

3.1 NDA Operator

3.1.1 Operates the IQ3 system and manages data.

3.2 NDA Lead Operator (LO)

3.2.1 Provides supervision of the overall operation of the IQ3 system.

3.2.2 Ensures that operations are performed in a manner consistent with this procedure as well as site safety requirements.

3.2.3 Investigates and resolves non-routine occurrences.

3.3 NDA Expert Analyst (EA)

3.3.1 Reviews 100 percent of waste drum data.

3.3.2 Reviews the Weekly Interfering Matrix assay results, as required.

3.3.3 Identifies the appropriate surrogate drum(s) and radioactive standard(s) used for the Weekly Interfering Matrix measurement. Also generates the Weekly Interfering Matrix measurement schedule, as necessary.

3.3.4 Reviews Quality Control data to address trends, as necessary.

4.0 PROCEDURE

4.1 IQ3 System Startup

NOTE

Steps 4.1.1– 4.1.4 are to be performed only if required.

4.1.1 Turn computer power switch ON.

4.1.2 Start NDA2000 Operations Software.

4.1.3 Verify that the HV power is ON for each of the six HV bias supplies.

4.1.4 **IF** the HV power is **NOT** ON,
THEN perform the following:

[A] Select Hardware Setup from the NDA2000 menu bar.

[B] Select high-voltage power supplies.

[C] Select “TURN ON.”

4.2 Emergency Shutdown Operations

NOTE

Steps 4.2.1– 4.2.2 are to be performed only if required.

NOTE

There are five EMERGENCY STOP Buttons located on the IQ3 system: one in the control room, two in the equipment bay, and one on each conveyor.

4.2.1 **IF** a problem occurs while the system is in motion,
THEN press any one of the EMERGENCY STOP Buttons,
STOP WORK immediately, **AND** perform the following:

[A] Notify the NDA LO.

[B] Consult with the NDA LO and other personnel, as appropriate, **AND DO NOT** proceed until the equipment is operating in a safe and correct manner.

4.2.2 **IF** an electrical problem occurs,
THEN press any one of the EMERGENCY STOP Buttons, **AND**
turn OFF the power switch mounted on the door of the Electrical
Cabinet.

[A] Notify the NDA LO.

- [B] Consult with the NDA LO and other personnel, as appropriate, **AND DO NOT** proceed until the equipment is operating in a safe and correct manner.
- [C] Turn OFF the power switches for the following equipment, if necessary:
 - NIM bins
 - NDA operations computer system and ancillary equipment

4.3 Background/Transmission Check

NOTE

A background check is performed daily prior to waste measurement. The background check is used to identify changes in the background level that might affect the sample results. The background check is performed without a drum on the turntable.

NOTE

Reports generated during this procedure may be printed as needed. Reports will be retained for placement in the Batch Data Report (BDR), as appropriate.

- 4.3.1 Ensure that the attenuator caps are removed from the SEGe and LEGe detectors.
- 4.3.2 Select "MANUAL" from the NDA2000 Menu Bar.
- 4.3.3 Select "LOAD/UNLOAD/TRANSPORT."
- 4.3.4 Select "PREPARE FOR BACKGROUND."

NOTE

The system will automatically close the shield door.

- 4.3.5 Select "Background/Transmission" from the Routine Assay selection.
- 4.3.6 Verify that the following information is displayed on the "Start Assay" screen:
 - Count Type: (e.g., Background/Transmission)
 - Container Type: (e.g., None)
 - Geometry: (e.g., Ba-133 Non-Attenuated)

- Count Time:
 - Transmission: (e.g., 200 sec. real time)
 - Assay: (e.g. 300 sec. real time)

4.3.7 **IF** the information is not correct,
THEN press cancel and contact the NDA LO for further direction.

4.3.8 **WHEN** all the information on the Routine Assay screen is correct,
THEN select "Start Assay."

4.3.9 Enter the following information in the Background Information screen:

- Item I.D.: (e.g., Background)
- Description: (e.g., Quality Control [QC] Background Check)
- Comment: (e.g., ORNL)

4.3.10 **After** all the entries have been made,
THEN select "DONE."

4.3.11 Verify that acquisition has started, **AND** that there is a reference peak in the spectrum.

4.3.12 **IF** there is NO peak in the spectrum **OR** if the peak has shifted,
THEN ABORT the assay and contact the NDA LO for resolution.

NOTE

All operations are automatic. The acquisition will count for 500 seconds and will be analyzed and stored without NDA operator intervention.

4.3.13 **IF** the Assay Warning Log window is displayed,
THEN contact NDA LO for resolution.

NOTE

The Assay screen will present information about the status of the assay and how much time is remaining. A STOP option is available to allow the NDA Operator to stop the assay.

Assay operations are automatic. Data are acquired for 200 seconds with the transmission source exposed. Then data are acquired for 300 seconds without the transmission source exposed. The data are analyzed, compared to acceptance criteria, and stored without NDA Operator intervention.

The Assay Warning Log window is displayed if any errors or warnings have occurred during the assay.

Results of the assay may contain one of the two types of Flags (e.g., Above boundary "Ab" or Below boundary "Be").

4.3.14 To obtain the Quality Assurance (QA) Last Results Report for review, perform the following (see Attachment 1 for QC Background example):

- [A] Select the Magnifying Glass icon on the tool bar to go to the NDA2000 Data Review screen.
 - [B] Select QA on the tool bar, **AND** then select Plot/Reports on the menu.
 - [C] Select "QC Background," **AND** select Last Report at the bottom of the screen.
 - [D] Select "QC Transmission," **AND** select Last Report at the bottom of the screen.
-

NOTE

An external event not associated with performance of the system (e.g., high activity container placed in proximity to the system) may cause a background failure. The mitigation would be to remove the container from the vicinity of the system. This would not require a Nonconformance Report (NCR).

4.3.15 **IF** the values on either of the QA Last Results Report indicate an "Ab" or "Be" flag, **THEN** perform the following:

- [A] STOP WORK immediately, notify the NDA LO, **AND DO NOT** proceed without NDA LO concurrence.
- [B] Record the nonconforming background count in the NDA Operational Logbook.

- [C] Investigate the reason for the nonconforming background count, **AND** determine if an NCR is required.
- [D] **IF** an NCR is required, **THEN** initiate an NCR **AND DO NOT** resume operations until the approved NCR disposition instructions are complete.
- [E] **IF** an NCR is NOT required, **THEN** mitigate the problem as directed by the NDA LO, note the resolutions in the NDA Operational Logbook, **AND** repeat the Background/Transmission Check.

4.3.16 **IF** the values DO NOT exceed any boundaries and there are **NO** flags, **THEN** print the QA Last Results Reports.

4.3.17 Print name, sign, and date the reports.

4.3.18 Place reports in the Batch Data Report (BDR) holding file.

4.3.19 OPEN shield door.

4.4 Instrument Performance Measurement

NOTE

The Instrument Performance Measurement is performed daily prior to waste measurement. A QC drum is used for this assay.

The Assay screen will present information about the status of the assay and how much time is remaining. A "STOP" option is available to allow the NDA Operator to stop the assay. Notify the NDA LO if the assay is stopped.

4.4.1 Load the QC drum on the conveyor.

4.4.2 Select "Performance Check" from the Routine Assay Menu.

4.4.3 Verify that the following information is displayed on the "Start Assay" screen:

- Container Type set to 55 Gallon.
- Assay Count Time: 1200 Real Seconds.
- Transmission Count Time: 300 sec.
- Geometry: Non Attenuated.

- Transmission Sources: Ba-133 Non Attenuated.
- 4.4.4 **IF** the information is not correct,
THEN press cancel and contact the NDA LO for further direction.
- 4.4.5 **WHEN** all the information on the Routine Assay screen is correct,
THEN select “Start Assay.”
- 4.4.6 On the Item Information screen, enter the following data:
- ITEM I.D.: (e.g., “Performance Check”)
 - Gross Weight: (e.g., 2.3 kg)
 - Percent Full: (e.g., 100)
 - Matrix Type: (e.g., Combustible)
 - Container Type: (e.g., 55 Gallon)
 - Certificate File: (e.g., Calibration Drum)
- 4.4.7 **AFTER** all the entries have been made,
THEN select “Done.”

NOTE

The Assay Warning Log window will be displayed if any errors or warning have occurred. The data are analyzed, compared to acceptance criteria, and stored without NDA Operator intervention.

Results of the assay may contain one of two types of Flags (e.g., Investigate “In” or Action “Ac”). These limits are statistically derived with the “In” Flag being greater than ± 2 -sigma and less than or equal to ± 3 -sigma, and the “Ac” Flag being greater than ± 3 -sigma.

- 4.4.8 To obtain the QA Last Results Report for review, perform the following:
- [A] Select the Magnifying Glass icon on the tool bar to go to the NDA2000 Data Review screen.
 - [B] Select QA on tool bar, **AND** select Plot/Reports on the menu.
 - [C] Select “QC Performance Check,” **AND** select Last Report at the bottom of the screen.

4.4.9 **IF** the value on the QA Last Results Report indicates a ± 2 -sigma "In" Flag,
THEN perform the following:

- [A] Notify the NDA LO, **AND** note the problem in the NDA Operational Logbook.
- [B] **IF** possible, identify the cause of the failure and resolution, **THEN** correct the problem.
- [C] Repeat the Instrument Performance Measurement no more than two times.

NOTE

Calibration Verification shall be performed after any one of the following conditions has occurred:

- Major system repairs and/or modifications
- Replacement of the measurement system's components (e.g., detector, neutron generator, or supporting electronic components that have the capacity to affect data)
- Significant change to the system's software
- Relocation of the system
- Failure of QC Calibration Checks (a "Ac" Flag or 3 consecutive "In" Flags, respectively)

4.4.10 **IF** three successive ± 2 -sigma "In" QC failures **OR** one ± 3 -sigma "Ac" QC failure occurs,
THEN perform the following:

- [A] STOP WORK, **AND** notify the NDA LO and Vendor Project Manager (VPM).
- [B] Initiate an NCR **AND DO NOT** resume operations until the NCR disposition instructions have been approved and completed.
- [C] Perform Calibration Verification in accordance with CCP-TP-046, *CCP Mobile IQ3 System Calibration Procedure* and submit Calibration Verification Report to the Facility Records Custodian.

4.4.11 Print the QA Last Results Report.

4.4.12 Print name, sign, and date the QA Last Results Report.

4.4.13 Place the QA Last Results Report in the BDR holding file.

4.5 Weekly Interfering Matrix Measurement

NOTE

A Weekly Interfering Matrix measurement is performed on the operational system. Radioactive standards are selected such that, over a six-month period, the operating range of the assay system is checked and will be documented in a report. These measurements are performed using applicable surrogate waste matrices which reflect the site waste.

A Weekly Interfering Matrix measurement will be performed weekly when the system is in operation.

4.5.1 Contact the NDA LO for the appropriate surrogate drum and radioactive standard(s) to be used for the Weekly Interfering Matrix measurement.

4.5.2 Perform the measurement as described beginning in step 4.6.3.

4.6 Waste Drum Assay - Routine Sample Counting

CAUTION

Assay operations can continue only after the Background/Transmission Check, and Instrument Performance Measurement are successfully completed.

NOTE

The attenuator caps for the SEGe detectors were fabricated from 5-inch outside diameter (OD) aluminum pipe with 3/16-inch wall thickness. Sections 3.75-inches long were closed on one end with welded, 1/8-inch thick aluminum disks. The inside cap ends are lined with two layers of polymer-lead sheeting equivalent to a total of about 1.3 millimeters (mm) of lead, and the inside cylindrical surface is lined with a thicker polymer sheet (equivalent to about 1 mm of lead) plus 1/8-inch thick nickel sheet. The caps are engraved with the identifiers and with an arrow indicating the top of the cap. This procedure specifies that each cap is to be installed on the same detector (Cap A1 on the top detector, etc.). This ensures that the caps are placed in the same position on the same detector each time, and hence that attenuation effect of the caps will have negligible variability.

NOTE

Waste drums will typically be assayed with attenuator caps NOT installed. Only waste drums that have been identified as high activity due to excessive dead time will be assayed with attenuator caps installed.

- 4.6.1 **IF** assaying drums identified as high activity,
THEN ensure the attenuator caps are installed, **OTHERWISE** ensure caps are NOT installed.
- 4.6.2 **IF** the waste drum number to be assayed is **NOT** in the Acceptable Knowledge (AK) Tracking Spreadsheet,
THEN DO NOT assay the drum and contact the NDA LO for direction to proceed.
- 4.6.3 Ensure the drum to be assayed is on the load side of the conveyor.
- 4.6.4 Select "Non Attenuated Mode" or "Attenuated Mode" assay from the Routine Assay Menu.
- 4.6.5 Verify that the following information is displayed on the "Start Assay" screen:
 - Container Type: 55 Gallon

- Assay Count Time: 1200 Real sec
 - Disable Load/Unload: Not Checked
 - Transmission Count Time: 300 sec
 - Geometry: As required for count type
 - Transmission Source: As required for count type
- 4.6.6 **IF** the information is not correct,
THEN press cancel and contact NDA LO for further direction.
- 4.6.7 **WHEN** all the information is correct,
THEN select "Start Assay."
- 4.6.8 Select "Start Assay" at the bottom of the screen.

NOTE

All operations are now automatic.

- 4.6.9 On the Item Information screen enter the following data:
- Item I.D.: (e.g., Container I.D.)
 - Description 1: (e.g., BDR#)
 - Description 2: (e.g., N/A)
 - Location: (e.g., ORNL)
 - Comment: (e.g., N/A)
 - Matrix Type: (e.g., Combustible)
 - Percent Full: (e.g., As Required)
 - Gross Weight: (e.g., As Required [kg])
 - Density: Automatically Calculated
 - Declaration: (e.g., WG Pu)
- 4.6.10 **AFTER** all the entries have been made,
THEN select "Done" to start the Drum Assay.

4.6.11 **IF** a problem occurs during drum movement,
THEN proceed as follows:

- [A] Push an EMERGENCY STOP Button.
- [B] STOP WORK immediately, notify the NDA LO, **AND DO NOT** proceed without NDA LO concurrence.

NOTE

The WHITE light will be illuminated during data acquisition. The RED light is illuminated when the transmission source is exposed.

4.6.12 Verify that spectra are being collected

NOTE

For drums being re-assayed, the NDA LO may direct the NDA Operator to **NOT** perform step 4.6.13.

4.6.13 Perform the following:

- [A] **IF** assaying without the attenuators installed,
THEN monitor the dead time for each of the three SEGe detectors in the MCA view control window.
 - **IF** the dead time for any of the SEGe detectors exceeds 90 percent during the emission acquisition,
THEN abort the acquisition **AND** have the waste drum restaged with other high activity content drums.
- [B] **IF** the waste drums being assayed meets the appropriate dead time limits,
THEN let the assay finish.

NOTE

Upon completion of data acquisition, the spectra will be stored, analyzed, and results displayed without NDA Operator intervention.

4.6.14 After the assay completes, review the assay results, **AND** verify that the report is complete and the sample information is correct.

- [A] **IF** sample information is NOT correct the assay does not complete, OR any other abnormal event occurs,
THEN STOP WORK, contact the NDA LO and DO NOT proceed without NDA LO concurrence.
- [B] Initiate an NCR as necessary.

[C] Record the nonconformance in the NDA Operational Logbook.

4.6.15 Record the required information on the Container Traveler, **AND** initial and date, as required.

4.6.16 Repeat step 4.6.1 through 4.6.15 as needed.

WARNING

When filling the detectors with LN, safety glasses, face shield, cryogenic apron, cryogenic gloves, and safety shoes shall be worn. The filling process shall be performed with the trailer doors OPEN to prevent asphyxiation hazard.

NOTE

This is a stand-alone section and may be performed independently.

NOTE

In the event that the Automatic LN Fill system is not functional, the NDA Operator may perform the LN fill manually under the direction of the NDA LO.

4.7 Detector Automatic LN Fill System

4.7.1 Check that the following conditions are met for the LN supply cylinder.

- Relief valve is rated at 22 psig
- The pressure gauge does not exceed 30 psig

4.7.2 **IF** the conditions in 4.7.1 are NOT met, **THEN DO NOT** proceed with the LN fill **AND** notify NDA LO and VPM.

4.7.3 Connect the LN transfer hose to the LN supply tank, as required.

4.7.4 On the IQ3 system Electrical Cabinet located in the Equipment Bay, verify that the ENABLE switches for Detector 1 through Detector 6 are in the FILL position.

4.7.5 Turn the FILL MODE switch on the LN Control Panel to the MANUAL position.

4.7.6 OPEN the valve on the LN supply tank to allow the LN to flow to the fill system.

NOTE

The detectors will now begin the fill cycle. The BLUE light on the stack light in the Control Room will come on.

The fill sequence is as follows: Detectors 1 and 6 will be filled first, followed by Detector 2 alone, Detectors 3 and 4, and finally Detector 5 alone.

The detectors will take approximately 60 minutes to fill.

Lights on the Detector Fill Display Board will indicate which detectors are currently being filled and when the detector is full.

- 4.7.7 Monitor the fill process on the Detector Fill Display Board.
- 4.7.8 **AFTER** the fill cycle is complete,
THEN turn the valve on the LN supply tank OFF, and turn the FILL MODE switch to OFF.
- 4.7.9 To release the back pressure in the LN transfer hose, turn the FILL MODE Switch to the Manual position, **AND** then back to the OFF position.
- 4.7.10 Disconnect LN transfer hose from the LN supply tank, as required.

5.0 RECORDS

NOTE

Records identified in step 5.1.1 that are generated during the performance of this procedure are compiled in the BDR- in accordance with CCP-TP-048, *CCP Mobile IQ3 System Data Reviewing, Validating and Reporting*.

5.1 Records generated during the performance of this procedure are maintained as QA records in accordance with CCP-QP-008, *CCP Records Management*. The records are the following:

5.1.1 QA/Lifetime

[A] QC BACKGROUND – Last Results Report

[B] QC TRANSMISSION – Last Results Report

[C] QC PERFORMANCE – Last Results Report

5.1.2 QA/Nonpermanent

Six-month Summary of Weekly Interfering Matrix

Attachment 2 – QC TRANSMISSION (EXAMPLE)

Last Measurement Q.A. Report 11/22/10 9:54:20 AM Page 1

***** G E N I E Q U A L I T Y A S S U R A N C E *****

Last Results Report
11/22/10 9:54:20 AM

QA File: C:\CANBERRA\NDA2K\QA\CNTR0001_DC
Sample ID: Background
Sample Quantity: 1.0000E+000
Sample Date: 11/22/10 9:42:35 AM
Measurement Date: 11/22/10 9:42:43 AM
Elapsed Live Time: 96.7 seconds
Elapsed Real Time: 200.0 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
SS Peak Centroid 81 keV [0.00+/-0.00]	1.6208E+002	< 0.00 : : : >
SS Peak Centroid 356 keV [0.00+/-0.00]	7.1225E+002	< 0.00 : : : >
SS Peak FWHM 81 keV [0.00+/-0.00]	1.1848E+000	< 0.00 : : : >
SS Peak FWHM 356 keV [0.00+/-0.00]	1.3801E+000	< 0.00 : : : >
SS Peak cts/sec 356 keV [0.00+/-0.00]	1.3997E+004	< 0.00 : : : >

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
 SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
 UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
 BS = Measurement Bias Test (In = Investigate, Ac = Action)

Attachment 3 – QC PERFORMANCE (EXAMPLE)

Last Measurement Q.A. Report 11/22/10 10:31:32 AM Page 1

***** G E N I E Q U A L I T Y A S S U R A N C E *****

Last Results Report
11/22/10 10:31:32 AM

QA File: C:\CANBERRA\NDA2K\QA\CNTR0001_DC
Sample ID: PERFCHECK
Sample Quantity: 1.0000E+000
Sample Date: 7/1/05 12:00:00 PM
Measurement Date: 11/22/10 10:04:06 AM
Elapsed Live Time: 1095.6 seconds
Elapsed Real Time: 1200.0 seconds

Parameter Description [Mean +/- Std. Dev.]	Value	Deviation/Flags < LU : SD : UD : BS >
Co-60 DC Activity (uCi) [UD: 5.7000E+000+/- 0.100]	5.6971E+000	-2.8639E-002 < : : : >
1332 keV Centroid [0.00+/-0.00]	2.6663E+003	0.00 < : : : >
1332 keV FWHM [0.00+/-0.00]	2.3575E+000	0.00 < : : : >

Flags Key: LU = Lower/Upper Bounds Test (Ab = Above, Be = Below)
 SD = Sample Driven N-Sigma Test (In = Investigate, Ac = Action)
 UD = User Driven N-Sigma Test (In = Investigate, Ac = Action)
 BS = Measurement Bias Test (In = Investigate, Ac = Action)

Attachment 4 – Radioassay Data Sheet (EXAMPLE)

Radioassay Data for NFS0400G 11/23/2010 3:53:03 PM Page 12

***** Radioassay Data Sheet *****

Engine Version: TMU Gamma 1.5

Count Sequence Number: 128 Batch Number: N/A
Assay Instrument: MCS IQ3 Location: ORNL
Analysis Method: CCP-TP-047 v 11 Software Version: NDA 2000 V.4.0
Item ID: NFS0400G Analysis Date: 11/23/2010

NID identified fiducial nuclide PU-239
Source of isotopics: DECLARED

Net Weight 197800.0 g
Pu mass 3.90E+000 +- 1.50E+000 g
TRU Alpha Activity 2.98E-001 +- 9.65E-002 Ci
TRU Activity Concentration 1.51E+003 +- 4.88E+002 nCi/g
Pu-239 Equivalent Activity 3.06E-001 +- 9.66E-002 Ci
Pu-239 FGE 3.68E+000 +- 1.49E+000 g
Decay heat 9.30E-003 +- 2.99E-003 W

Nuclide	Mass g	Activity Ci	Activity Uncert. Ci	MDA Ci
SR90	<LLD	<LLD	0.00E+000	0.00E+000
CS137	<LLD	<LLD	0.00E+000	1.07E-008
U233	<LLD	<LLD	0.00E+000	4.19E-004
U234	<LLD	<LLD	0.00E+000	0.00E+000
U235	0.00E+000	0.00E+000	0.00E+000	2.30E-007
NP237	3.23E-003	2.31E-006	9.34E-007	1.38E-007
PU238	3.75E-004	6.49E-003	3.62E-003	4.58E-005
U238	4.56E+000	1.55E-006	6.62E-007	1.32E-006
PU239	3.67E+000	2.31E-001	9.40E-002	1.63E-003
PU240	2.23E-001	5.13E-002	2.13E-002	3.62E-004
AM241	2.79E-003	9.69E-003	4.33E-003	6.84E-005
PU241	3.93E-003	4.09E-001	1.83E-001	2.89E-003
PU242	1.68E-003	6.66E-006	4.35E-006	0.00E+000
AM243	0.00E+000	0.00E+000	0.00E+000	2.41E-007
CM243	0.00E+000	0.00E+000	0.00E+000	2.49E-007
CM244	0.00E+000	0.00E+000	0.00E+000	9.88E-003
CM245	0.00E+000	0.00E+000	0.00E+000	1.84E-006
CF249	0.00E+000	0.00E+000	0.00E+000	4.44E-008

Errors quoted at 1.000 sigma

Operator: _____ Date: _____

ITR: _____ Date: _____