

# CCP-TP-191

Revision 1

## CCP

# Box Neutron Assay System (BNAS) Operating Procedure

EFFECTIVE DATE: 10/20/2009

Larry Porter

PRINTED NAME

APPROVED FOR USE

RECORD OF REVISION

Revision Number	Date Approved	Description of Revision
0	04/30/2008	Initial issue.
1	10/20/2009	Revised to improve explicit procedural flow, correct editorial errors, and allow alternative assay times.

TABLE OF CONTENTS

1.0 PURPOSE..... 4  
1.1 Scope..... 4  
2.0 REQUIREMENTS..... 4  
2.1 References ..... 4  
2.2 Training Requirements..... 5  
2.3 Precautions and Limitations..... 5  
2.4 Prerequisite Actions..... 5  
2.5 Equipment List ..... 6  
3.0 RESPONSIBILITIES..... 7  
3.1 NDA Operator ..... 7  
3.2 NDA Lead Operator (LO) ..... 7  
3.3 NDA Expert Analyst (EA) ..... 7  
3.4 Vendor Project Manager (VPM)..... 7  
4.0 PROCEDURE..... 8  
4.1 BNAS Startup ..... 8  
4.2 QC Background Check ..... 9  
4.3 Environmental Background Check..... 12  
4.4 QC Calibration AAS Check..... 13  
4.5 Weekly Interfering Matrix Measurement ..... 16  
4.6 Routine Container Assaying ..... 18  
4.7 System Shutdown..... 22  
5.0 RECORDS..... 23

LIST OF ATTACHMENTS

Attachment 1 – QA Last Results Reports (Example) ..... 24  
Attachment 2 – BNAS Radioassay Data Sheet (Example)..... 26  
Attachment 3 – Weekly Interfering Matrix Control Chart (Example) ..... 27

## 1.0 PURPOSE

This procedure provides instructions for start-up, operations, and shutdown of the Box Neutron Assay System (BNAS) using Canberra Nondestructive Assay 2000 (NDA2000).

### 1.1 Scope

This procedure applies to personnel responsible for operating and/or supervising the operations of the BNAS.

## 2.0 REQUIREMENTS

### 2.1 References

#### Baseline Documents

- Canberra Industries, Inc., Publication No. 9231594, *NDA2000 Users Manual* (corresponding to current software version)
- Canberra Industries, Inc., Publication No. 9231595, *NDA2000 Technical Reference Manual* (corresponding to current software version)
- Document No. 38852, Box Neutron System, *Hardware Reference Manual*
- CCP-PO-002, *CCP Transuranic Waste Certification Plan*

#### Reference Documents

- CCP-PO-004, *CCP/SRS Interface Document*
- 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-QP-011, *CCP Notebooks and Logbooks*
- CCP-TP-192, *CCP Box Neutron Assay System Calibration Procedure*
- CCP-TP-193, *CCP Data Reviewing, Validating, and Reporting Procedure for the Nondestructive Assay Box Counters*

## 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 Precautions and Limitations

2.3.1 Personnel working around the BNAS conveyor, door closure, and moving equipment must observe all warning devices and postings.

2.3.2 Personnel working around the BNAS shall be aware of potential electrical hazards (e.g., high voltage power supplies, etc).

2.3.3 Personnel shall be aware of the precautions to be exercised when working with or around radioactive sources and waste materials. Such precautions shall be in accordance with Host site requirements.

2.3.4 Radioactive calibration sources/standards shall be treated and controlled as sealed radioactive sources in accordance with Host site requirements.

2.3.5 Quality control measurements involve the use of radioactive sealed sources. The physical position of the sources within the matrix container must be preserved to ensure repeatability.

## 2.4 Prerequisite Actions

---

### NOTE

The steps in section 2.4 may be performed in any order, as required.

---

### 2.4.1 Equipment Bay

- Ensure all personnel barriers are secure.
- Ensure NO Emergency Stops are activated.
- Ensure equipment and moving parts (e.g., the conveyor) are clear of personnel or obstructions.

2.4.2 Control Room

- Ensure the Light Stacks are operational.
- Ensure that the Programmable Logic Controller (PLC) Cabinet is turned ON and operational (e.g., supplies system power, provides troubleshooting capability, etc.).

| 2.5 Software

[A] NDA2000, Waste Assay

| [B] Genie 2000, Gamma Acquisition and Analysis

### 3.0 RESPONSIBILITIES

---

#### **NOTE**

The NDA Operator and the NDA Lead Operator (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 Performs routine startup, normal operations, and shutdown of the BNAS.

3.1.2 Notifies the NDA LO of abnormal or nonconforming conditions.

#### 3.2 NDA Lead Operator (LO)

3.2.1 Provides supervision of the overall operation of the BNAS.

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

3.2.3 Investigates and resolves non-routine occurrences.

#### 3.3 NDA Expert Analyst (EA)

3.3.1 Evaluates conditions detrimental to quality.

3.3.2 Provides technical supervision and data evaluation for radioassays.

3.3.3 Prepares and issues Six Month Weekly Interfering Matrix Report.

#### 3.4 Vendor Project Manager (VPM)

3.4.1 Oversees Central Characterization Project (CCP) Operations.

4.0 PROCEDURE

NDA Operator

---

**NOTE**

The NDA Operator, performing the daily operations below, has a level of proficiency such that routine instrument troubleshooting adjustments can be performed without need for intervention by the NDA LO. In all cases, when a simple instrument adjustment of this type becomes necessary, these actions, as well as the reasons why they were taken, are documented in the NDA Operational Logbook, in accordance with CCP-QP-011, *CCP Notebooks and Logbooks*. In the event that the BNAS requires a higher level of troubleshooting effort, the NDA LO is notified and collaborates with the NDA Operator so that any BNAS operational problems are resolved and the BNAS is restored to its correct operating condition. The NDA LO and VPM must be notified prior to any maintenance or troubleshooting that is not encompassed by procedure. These actions are documented in the NDA Operational Logbook, in accordance with CCP-QP-011.

---

4.1 BNAS Startup

---

**NOTE**

The Motion Warning Horn will sound for five seconds prior to any command mechanism movement. The yellow light will be ON during conveyor or door movement. The green light will be ON while an assay is in progress. The blue light will be ON when the Add-A-Source (AAS) is not in the Home position. If the system detects an error in the PLC operation, the yellow, blue, and green lights will flash ON and OFF repeatedly. If an Emergency Stop is activated, then the red light will stay ON while the yellow, blue, and green lights flash ON and OFF.

---

---

**NOTE**

BNAS Startup steps 4.1.1 through 4.1.10 may be performed as required and in any order.

---

4.1.1 Ensure there are NO obstructions in the BNAS sample chamber  
**OR** on the conveyors.

4.1.2 Ensure power is ON to UPS unit(s).

4.1.3 Ensure the Shift Register power is ON.

4.1.4 Ensure the surge protector power strip is ON.

- 4.1.5 Ensure the Main Power Rotary Switch on the PLC Cabinet is ON.
- 4.1.6 Ensure the Mechanism Control Switch (MCS) on the PLC Cabinet is turned to the Computer position.
- 4.1.7 Ensure the BNAS computer is turned ON.
- 4.1.8 Enter the operator user identification (ID) in the Logon window.
- 4.1.9 Enter the password.
- 4.1.10 Start NDA2000, as required.

[A] Select file.

[A.1] Select Counter.

[A.2] Select WSRS Neutron Box Counter.

[B] Select Hardware Setup.

[B.1] Select High Voltage Supplies.

[B.2] Select Turn ON.

[C] Select Hardware Setup.

[C.1] Select Initialize PLC.

[D] Inspect the conveyor system to ensure that the conveyor rollers have **NOT** shifted.

#### 4.2 QC Background Check

---

##### NOTE

A QC Background Check is performed at least once per operational day, usually at the beginning of the shift prior to assaying. It may be performed more frequently if a change in the background is suspected. The QC Background Check is used to identify changes in the background level that might affect the sample results. The QC Background Check of the BNAS is performed with the chamber empty of any containers including the container pallet.

---

- 4.2.1 Ensure there are NO obstructions or containers in the BNAS chamber **OR** on the conveyors.

4.2.2 Ensure the chamber door is CLOSED.

4.2.3 Perform the QC Background Check using NDA2000.

[A] Select Assay.

[B] Select Routine Assay.

[C] Select QC Background Check.

[D] Ensure the following information is displayed on the Assay – Routine screen:

- Container Type: None
- Geometry: All Banks On
- Disable Load/Unload: Checked
- Cycle Time: (e.g., 60 secs)
- Count Time: (e. g., 3600 secs, or as designated by the NDA LO)

[E] Select Start Assay.

[F] Enter the following information on the Item Information screen:

[F.1] Item ID: (e.g., Background)

[F.2] Description: (e.g., QC Check – Background)

[F.3] Comment: (e.g., SRS, E Area)

[G] Select Done.

4.2.4 **IF** any error conditions occur during the count, **THEN** select Stop, note the failure in the NDA Operational Logbook, in accordance with CCP-QP-011, **AND** notify the NDA LO.

**NOTE**

The report may contain two different types of flags: Above the boundary (Ab) or Below the boundary (Be). The boundary values are non-statistically determined.

- 4.2.5 **WHEN** the analysis is complete,  
**THEN** select View Last Assay Report button on the NDA2000 screen, **AND** review the QA Last Results Report for any flags (e.g., Above [Ab], or Below [Be]).
- 4.2.6 **IF** any of the values on the QA Last Results Report indicate an Ab or Be flag,  
**THEN** perform the following:
- [A] STOP WORK, **AND** notify the NDA LO and Vendor Project Manager (VPM).
  - [B] Note the problem in the NDA Operational Logbook, in accordance with CCP-QP-011.

**NDA LO**

- [C] Evaluate the nature of the failure consulting with the NDA EA as necessary, **AND** determine if an NCR is required.
- [D] **IF** an NCR is required,  
**THEN** initiate an NCR in accordance with CCP-QP-005, *CCP TRU Nonconforming Item Reporting and Control*, **AND** **DO NOT** resume operations until disposition of the NCR is approved.
- [E] **IF** an NCR is **NOT** required,  
**THEN** instruct the NDA Operator to mitigate the problem, note the resolution in the NDA Operational Logbook, in accordance with CCP-QP-011, **AND** repeat the QC Background Check.

**NDA Operator**

- 4.2.7 **IF** the values **DO NOT** indicate an Ab or Be flag,  
**THEN** print the QA Last Results Report for inclusion in the Batch Data Report (BDR).
- 4.2.8 Print name, sign, and date the QA Last Results Report(s).

---

4.3 Environmental Background Check

---

**NOTE**

The Environmental Background Check should be performed as directed by the NDA LO or NDA EA. The Environmental Background Check is **NOT** a QC Check and is performed for background subtraction purposes.

---

4.3.1 Ensure there are NO obstructions or containers in the BNAS chamber **OR** on the conveyor.

4.3.2 Ensure the chamber door is closed.

4.3.3 Perform the Environmental Background Check by using NDA2000:

[A] Select Assay.

[B] Select Routine Assay.

[C] Select Environmental Background.

[D] Ensure the following information is displayed on the Assay – Routine screen:

- Container Type: as appropriate
- Geometry: All Banks On
- Disable Load/Unload: Checked
- Cycle Time: (e.g., 60 secs)
- Count Time: (e.g., 900 secs, or as designated by the NDA LO)

[E] Select Start Assay.

[F] Enter the following information on the Item Information screen:

[F.1] Item ID: (e.g., Environmental Background)

[F.2] Description 1: (e.g., Environmental Background)

[F.3] Comment: (e.g., SRS, E Area)

4.3.4 Select Done.

4.3.5 **IF** any error conditions occur during the count,  
**THEN** select Stop, note the failure in the NDA Operational  
Logbook, in accordance with CCP-QP-011, **AND** notify the NDA  
LO.

4.4 QC Calibration AAS Check

4.4.1 Ensure the chamber is empty and the chamber door is closed.

4.4.2 Perform the QC Calibration Check AAS using NDA2000:

[A] Select Assay.

[B] Select Routine Assay.

[C] Select QC Calibration Check Cf-252.

[D] Ensure the following information is displayed on the  
Assay – Routine screen:

- Container Type: (e.g., None)
- Geometry: All Banks On
- Disable Load/Unload: Checked
- Cycle Time: (e.g., 60 secs)
- Count Time: (e.g., 60 secs)
- Mode: Normal Scan
- Automatic: Unselected
- Fixed: Selected (3)
- AAS Preset Time: (e.g., 900 secs)

[E] Select Start Assay.

4.4.3 Enter the following information on the Item Information screen:

- [A] Item ID: (e.g., QC Check – AAS)
- [B] Description 1: (e.g., Daily Neutron AAS Check)
- [C] Description 2: (e.g., N/A)
- [D] Location: (e.g., SRS E-Area)
- [E] Comment: (e.g., N/A)
- [F] Matrix Type: (as appropriate)
- [G] Percent Full: (e.g., 100)
- [H] Gross Weight: (e.g., 0.00)
- [I] Density: (automatically calculated by NDA2000)
  - [I.1] Sample Type: (as appropriate)
  - [I.2] Declaration: Box Counter AAS

4.4.4 Select Done.

4.4.5 **IF** the blue stack light fails to come ON, **OR** other error conditions occur during the count, **THEN** select Stop, note the failure in the NDA Operational Logbook, in accordance with CCP-QP-011, **AND** notify the NDA LO.

4.4.6 **WHEN** the analysis is complete, **THEN** review the QA Last Results Report for any flags (e.g., Investigate [In], Action [Ac]).

**NOTE**

A Calibration Verification will be performed for any of the following occurrences:

- Major system repairs and/or modifications
  - Replacement of the measurement system's components (e.g., detector or supporting electronic components that have the capacity to affect data)
  - Significant changes to the system's software
  - Relocation of the system
  - Failure of Quality Control Measurements
- 

4.4.7 **IF** any value on the QA Last Results Report indicates an In flag, **THEN** notify the NDA LO.

[A] Evaluate the cause of the In flag with the NDA LO and NDA EA, as necessary.

[A.1] **IF** this is the first or second In flag and a corrective action has been identified, **THEN** correct the condition and note the condition and corrective action in the NDA Operational Logbook, in accordance with CCP-QP-011, **AND** repeat steps 4.4.1 through 4.4.6.

4.4.8 **IF** this is the third In flag or **IF** any value on the QA Last Results Report indicates an Ac flag, **THEN** perform the following:

[A] STOP WORK **AND** notify the NDA LO and VPM.

[B] Complete an NCR in accordance with CCP-QP-005 and **DO NOT** resume operations until disposition of the nonconformance is complete, **AND** a Calibration Verification Report is prepared in accordance with CCP-TP-192, *CCP Box Neutron Assay System Counter Calibration Procedure*.

[C] Document the failure in the NDA Operational Logbook in accordance with CCP-QP-011.

4.4.9 Print the QA Last Results Report(s) for inclusion in the BDR.

4.4.10 Print name, sign, and date the QA Last Results Report(s).

#### 4.5 Weekly Interfering Matrix Measurement

---

##### NOTE

Matrices and radioactive standards are selected such that, over a six-month period, the operating range and matrix corrections of the assay system are verified and will be documented in a report (i.e., the Six-Month Weekly Interfering Matrix Report). This report summarizes the matrices and ranges that have been tested, notes any operational problems, and includes an evaluation of system performance during that period. These measurements are performed using surrogate waste containers which reflect the type of waste (e.g., debris, sludge) currently being assayed. A Weekly Interfering Matrix measurement will be performed each week that the system is in operation.

---

4.5.1 Obtain a surrogate matrix container with positioned sources as directed by the NDA LO.

4.5.2 Ensure the container is loaded on the conveyor.

4.5.3 Ensure Sections 4.2 and Section 4.4 have been completed during the operational day.

4.5.4 Ensure that there are NO obstructions in the BNAS sample chamber or on the conveyors.

4.5.5 Perform the Weekly Interfering Matrix Measurement using NDA2000.

[A] Select Assay.

[B] Select Routine Assay.

[C] Select Item Count.

[D] Verify the following information is displayed on the Assay Routine screen:

---

**NOTE**

The appropriate container, either a 55-gallon drum, a SWB, or a SLB-2, will be selected as Container Type. Each container will have a specific count time, as designated by the NDA LO.

---

- Container Type: (as appropriate)
- Geometry: All Banks ON (GEOM0001)
- Disable Load/Unload: Unchecked
- Cycle Time: (e.g. 60 secs)
- Count Time: (e.g., 3600 secs, or as designated by the NDA LO)
- Mode: Normal Scan
- Automatic: Selected
- Fixed: Unselected
- AAS Preset Time: (e.g., 180 secs, or as designated by the NDA LO)

4.5.6 Select Start Assay.

4.5.7 Verify the following information is displayed on the Item Information screen:

- [A] Item ID: (e.g., Weekly Interfering Matrix container ID)
- [B] Description 1: Date (e.g., week of 01-15-08)
- [C] Description 2: (as appropriate)
- [D] Location: (e.g., SRS, E Area)
- [E] Comment: (as appropriate)
- [F] Matrix Type: (as appropriate)

---

**NOTE**

The NDA LO will provide information on the Percent Full, Gross Weight, Sample Type, and Declaration.

---

- [G] Percent Full: (as appropriate)
- [H] Gross Weight: (as appropriate)
- [I] Density: (automatically calculated by NDA2000)
- [J] Iron Fraction: (as appropriate)
- [K] Lead Fraction: (as appropriate)
- [L] Sample Type: (as appropriate)
- [M] Declaration: (as appropriate)

4.5.8 Select Done.

4.5.9 **IF** any problems occur during the count,  
**THEN** click on Stop, note the failure in NDA Operational Logbook in  
accordance with CCP-QP-011, **AND** notify the NDA LO.

4.5.10 When the assay is complete, ensure the container is unloaded from  
the conveyor.

**NDA EA**

4.5.11 Plot the results of the Weekly Interfering Matrix measurement on  
the appropriate Control Chart (see Attachment 3, Weekly Interfering  
Matrix Control Chart, for an example) **AND** forward the Weekly  
Interfering Matrix Control Chart to the Operator for inclusion in the  
BDR.

4.6 Routine Container Assaying

4.6.1 Ensure Sections 4.2, 4.4, and 4.5 (if applicable) have been  
completed during the operational day.

4.6.2 Ensure that there are NO obstructions in the BNAS sample  
chamber or on the conveyors.

4.6.3 **IF** the waste container number to be assayed is **NOT** on the

Acceptable Knowledge Tracking Spreadsheet (AKTS),  
**THEN DO NOT** assay the container **AND** contact the NDA LO and  
VPM for direction to proceed.

4.6.4 Ensure the container is loaded on the conveyor.

4.6.5 Perform Routine Container Assay operations using NDA2000.

[A] Select Assay.

[B] Select Routine Assay.

[C] Select Item Count.

[D] Verify the following information is displayed on the Assay  
Routine screen:

- Container Type: (as appropriate)
- Geometry: All Banks ON (GEOM0001)
- Disable Load/Unload: Unchecked
- Cycle Time: (e.g., 60 secs)
- Count Time: (e.g., 3600 secs, or as designated by the  
NDA LO)
- Mode: Normal Scan
- Automatic: Selected
- Fixed: Unselected
- AAS Preset Time: (e.g., 180 secs, or as designated by  
the NDA LO)

4.6.6 Select Start Assay.

---

**NOTE**

The density is automatically calculated by NDA2000 for each assay.

---

**NOTE**

BDRs will be uniquely numbered using the following convention unless otherwise specified within the Batch Narrative Summary: SRLBCXXXX, where SR = Savannah River; LBC = Large Box Counter; XXXX = unique sequence number (e.g., SRLBC0001, SRLBC0002, etc.).

---

**NOTE**

The net weight may be substituted for the gross weight if the tare weight is set to 0.0 kg.

---

4.6.7 Verify the following information is displayed on the Item Information screen:

- [A] Item ID: Container ID (e.g., SWB511211)
- [B] Description 1: Batch Data Report Number (e.g., SRLBC0001)
- [C] Description 2: (e.g., N/A)
- [D] Location: (e.g., SRS, E Area)
- [E] Comment: (e.g., N/A)
- [F] Matrix Type: (as appropriate)
- [G] Percent Full: (provided by Host site or NDE)
- [H] Gross Weight: (provided by Host site or NDE)
- [I] Density: (automatically calculated by NDA2000)
- [J] Iron Fraction: (as appropriate)
- [K] Lead Fraction: (as appropriate)
- [L] Sample Type: (default)
- [M] Declaration: (appropriate to type of waste)

- 4.6.8 Select Done.
- 4.6.9 **IF** any errors occur during the count,  
**THEN** select Abort, note the failure in the NDA Operational Logbook, in accordance with CCP-QP-011, **AND** notify the NDA LO.
- 4.6.10 **WHEN** the analysis is complete,  
**THEN** select the View Last Assay Report button on the NDA2000 screen, as required **AND** review the results.
- [A] **IF** the Container ID numbers **DO NOT** match,  
**THEN** notify the NDA LO.

---

**NOTE**

Corrected total Pu-239 fissile gram equivalent (FGE) is used for criticality control and will be reported as the sum of the analyzed value plus two times the total measurement uncertainty (TMU) at one sigma. Corrected total Pu-239 equivalent activity (PE-Ci) will be reported as the analyzed value plus two times the TMU at one-sigma. The NDA results will be reviewed against Host site requirements as specified in the Host site interface document, and appropriate personnel notified as required.

---

- 4.6.11 **IF** the preliminary corrected total Pu-239 FGE or Pu-239 equivalent activity exceeds the Host site requirements as specified in the Host site interface document,  
**THEN** perform the following:
- [A] STOP WORK.
- [B] **DO NOT** move the container.
- [C] Notify appropriate personnel as specified in the Host site interface document.
- [D] Notify the NDA LO and VPM, **AND DO NOT** proceed without NDA LO and VPM concurrence.
- [E] Print a preliminary copy of the Radioassay Data Sheet to be provided to the Host site, as necessary.

**WARNING**

In order to prevent the risk of personnel exposure, the container must **NOT** be moved until proper disposition has been determined by the Host site.

4.6.12 **IF** the preliminary Radioassay Data Sheet indicates that the corrected Pu-239 equivalent activity, **AND** the corrected total Pu-239 FGE is less than the Host site requirements as specified in the Host site interface document, **THEN** mark the appropriate NDA system on the Container Traveler, **AND** initial and date.

4.6.13 Ensure the container is unloaded from the conveyor.

4.6.14 Repeat steps 4.6.2 through 4.6.13 for each production container.

4.6.15 Close the chamber door, as needed.

4.7 System Shutdown

4.7.1 Perform the following operations using NDA2000, if required:

[A] Select Hardware Setup.

[B] Select High Voltage Supplies.

[C] Select Turn OFF.

4.7.2 CLOSE NDA2000 and any supporting programs, **AND** shut down the computer, if required.

4.7.3 Shut down the conveyor by rotating the Main Power Rotary Switch to OFF, as required.

## 5.0 RECORDS

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

### 5.1.1 QA/Lifetime

- [A] QA Last Results Report(s) (flows into CCP-TP-193, *CCP Data Reviewing, Validating, and Reporting Procedure for the Nondestructive Assay Box Counters*)
  - [A.1] QC Background Check
  - [A.2] QC Calibration Check
- [B] Radioassay Data Sheet (flows into CCP-TP-193)
- [C] Weekly Interfering Matrix Control Chart (flows into CCP-TP-193)
- [D] Raw Data (CDs – Primary and Backup) (flows into CCP-TP-193)
- [E] Six-Month Weekly Interfering Matrix Report





Attachment 2 – BNAS Radioassay Data Sheet (Example)

Radioassay Data for WMAPSWB272      9/2/2009      9:00:47 AM      Page 4

-----  
Radioassay Data Sheet  
-----

Engine Version: MMRes. Cmb. V1.2

Count Sequence Number: 2591      Batch Number: SRLBC0059  
Assay Instrument: WSRS Box Counter      Location: SRS, E-area  
Analysis Method: CCP-TP-189 v 0      Software Version: NDA 2000 V.5.2  
Item ID: WMAPSWB272      Analysis Date: 8/19/2009

Net Weight      87200.0 g  
Pu mass      6.77E+000 +- 6.21E-001 g  
TRU Alpha Activity      7.25E-001 +- 6.25E-002 Ci  
TRU Activity Concentration      8.31E+003 +- 7.17E+002 nCi/g  
Pu-239 Equivalent Activity      7.49E-001 +- 6.25E-002 Ci  
Pu-239 FGE      6.35E+000 +- 6.19E-001 g  
Decay heat      2.31E-002 +- 2.03E-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	3.99E-008
U233	<LLD	<LLD	0.00E+000	4.20E-004
U234	<LLD	<LLD	0.00E+000	0.00E+000
U235	0.00E+000	0.00E+000	0.00E+000	7.24E-008
NP237	1.35E-003	9.65E-007	6.01E-008	1.22E-007
PU238	2.15E-003	3.71E-002	4.37E-003	1.25E-004
U238	<LLD	<LLD	0.00E+000	3.07E-006
PU239	6.31E+000	3.97E-001	3.90E-002	1.34E-003
PU240	4.45E-001	1.02E-001	1.05E-002	3.45E-004
AM241	5.43E-002	1.88E-001	4.75E-002	2.45E-003
PU241	1.33E-002	1.38E+000	1.38E-001	4.65E-003
PU242	2.69E-003	1.07E-005	1.50E-006	0.00E+000

Errors quoted at 1.000 sigma

Operator: \_\_\_\_\_ Date: \_\_\_\_\_

ITR: \_\_\_\_\_ Date: \_\_\_\_\_

Attachment 3 – Weekly Interfering Matrix Control Chart (Example)

BNAS - 25 Gm WG Pu Combustibles Matrix WIM Drum (NDA-301)  
Pu-240 Effective Mass (Grams)

