ENERGYSOLUTIONS

S20-AD-010

Barnwell Waste Management Facility Site Disposal Criteria Chem-Nuclear Systems Barnwell Office

Revisions to this procedure must be evaluated per the requirements of SC DES License No. 097, Condition 12.

Revision 28

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- ☒ Non-Proprietary
- ☐ Proprietary
- ☐ Restricted Information
- ☐ Safeguards Information
- ☐ Sensitive Security Information

- ☐ New
- ☐ Title Change
- ☒ Revision
- ☐ Rewrite
- ☐ Cancellation

Table of Contents

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1 PURPOSE AND SCOPE

1.1 Purpose

Chem-Nuclear Systems, LLC (CNS), as a subsidiary of Energy*Solutions*, accepts low-level radioactive waste (radwaste) material for disposal at the Barnwell Waste Management Facility (Barnwell Disposal Facility) based upon compliance with the requirements and references described in this document, "Barnwell Waste Management Facility Site Disposal Criteria" (Site Criteria). This document outlines the responsibilities of both the customer and CNS and describes what constitutes an acceptable shipment for disposal at the Barnwell Disposal Facility (BDF).

Any deviations from the requirements of the Site Criteria must be approved by the General Manager, Licensing, or designee to avoid refusal or additional surcharges.

1.2 Scope

This document applies to any individual shipping radioactive waste for disposal to the BDF and to CNS personnel involved with shipping and receiving radioactive material waste shipments for disposal at Barnwell. A copy of the Site Criteria should be retained by the customer's employees responsible for the packaging and shipping of radioactive waste to the BDF.

Any questions regarding the Site Criteria, CNS Licenses, Prior Notification Plan should be directed to the Barnwell Licensing Department (Telephone: 803-541-5017 or 541-5013) unless otherwise specified.

2 REFERENCES

All customers shipping radioactive waste to the BDF for disposal shall comply with the following applicable documents:

2.1 CNS's South Carolina Department of Environmental Services (SC DES) Radioactive Materials License, No. 097

2.2 U.S. Department of Transportation (DOT), Code of Federal Regulations, Title 49

2.3 U.S. NRC, Code of Federal Regulations, Title 10

2.4 SC DES Regulation 61-83, Transportation of Radioactive Waste into or Within South Carolina

2.5 U.S. NRC I.E. Information Notice No. 83-10

2.6 U. S. NRC Concentration Averaging and Encapsulation Branch Technical Position, Rev. 1, Dated: February 2015

2.7 SC DES Regulation 61-63, Radioactive Materials (Title A)

2.8 Additional Security Measurements (ASM) on the Transportation of Radioactive Material Quantities of Concerns issued by the U.S. NRC (EA-05-007, July 19,

2005), and associated NRC updates.

2.9 Federal Motor Carrier Safety Regulation, Part 393, Subpart I- Protection Against Shifting and Falling Cargo.

3 GENERAL

3.1 Abbreviations

Abbreviations used in this document are defined in Attachment 24.1.

3.2 CNS Telephone Numbers

The telephone numbers of CNS offices are listed in Attachment 24.2.

3.3 Holidays

CNS normally observes the following holidays and the BDF will be closed for business on the indicated dates or as specifically noted in separate correspondence:

New Year's Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day and the day before/or after
Christmas Day and the day before/or after (contact CNS for schedule)

3.4 Pre-Shipment Requirements

The BDF accepts waste by public highway only. The following requirements shall be met before shipping any radioactive waste to the BDF:

3.4.1 Shipments containing wastes with activities totaling 40,000 curies or more must have prior to shipment approval from the Barnwell Licensing Department. The allowable unburied activity level in accordance with Reference 2.1 is 50,000 Curies.

3.4.2 Before the receipt of any waste a contract and/or purchase order (if applicable) in form and substance acceptable to CNS certifying compliance with the Site Criteria, Reference 2.1, and any subsequent changes should be in the possession of CNS.

3.4.3 For Barnwell disposal contracts and Barnwell disposal pricing information contact the Energy*Solutions* (ES) General Manager (803) 450-2278.

3.4.4 For pre-paid shipments advance copies of all shipping documents must be on-hand with Energy*Solutions* State Agency Liaison prior to waste receipt.

3.4.5 Unless prior agreement has been made between CNS and the customer, "collect" freight shipments shall not be accepted at the BDF. Any demurrage charges shall be paid by the customer.

3.4.6 All waste generators, waste collectors, and waste processors unless otherwise exempted by the State of South Carolina, shall have a valid S.C. Radioactive Waste Transport Permit (See Reference 2.4).

3.4.6.1 Before any shipper/generator, waste collector, or waste processor transports or causes to be transported radioactive waste into the State of South Carolina, they shall purchase an annual Radioactive Waste Transport Permit, (RWTP), from South Carolina Department of Environmental Services, (SC DES).

3.4.6.2 Shippers/generators, waste collectors, and waste processors shall ensure that the RWTP is current and valid.

3.4.6.3 For each restricted RWTP, the Broker/Shipper shall ensure that they are **listed** as an authorized Broker of the RWTP.

3.4.6.4 All applications for RWTP's should be completed, signed, and received by SC DES 30 days before shipping date.

3.4.6.5 Permit Fees will be assessed by SC DES based on the following classifications:

3.4.6.5.1 Class X - More than an annual total of 75 cubic feet or more than 100 curies of radioactive waste for disposal, storage, or waste processing within the State.

3.4.6.5.2 Class Y - An annual total of no more than 75 cubic feet of radioactive waste for disposal, storage, or waste processing within the State.

Note: Y permits may be restricted to specific shippers or carriers. Refer to RWTP.

3.4.6.5.3 Class Z - Any shipment of radioactive waste which is not consigned for disposal, storage, or waste processing within the State, but is transported into or within the State.

Reference 2.4 and permit applications may be obtained from the following office:

S.C. Department of Environmental Services
Radioactive Waste Management Section
Division of Waste Management
Bureau of Land and Waste Management
2600 Bull Street
Columbia, S.C. 29201
Telephone: 803-898-0422 or 0239

Fax Number: 803-898-0391

3.4.7 All waste shippers shall obtain a Shipment Identification (ID) Number from the CNS Barnwell Licensing Department prior to shipping.

3.4.8 The Shipment ID Number shall be placed on the waste manifest to provide verification to carriers and others involved in radioactive waste transport and the BDF receiving personnel that the radioactive waste shipment has been authorized for receipt.

3.4.9 Radioactive waste shipments that arrive at the BDF without a Shipment ID Number shall NOT be accepted.

3.4.10 All shipments shall meet the requirements of Reference 2.1.

Note: Individual waste containers may be inspected to determine content and/or physical form.

3.4.11 Class C waste shipments must comply with Section 15.

3.4.12 Additional information for Class C waste shipments shall be provided in accordance with Form S20-AD-010-F1 and Attachment 24.4. Class C documentation must be received by the Barnwell Licensing Department prior to shipment departure and specific approval by SC DES is required prior to disposal.

3.4.13 Irradiated Hardware Liner Inventory Log, see Section 16.

3.4.14 Shipments with packages containing waste from more than one generator must comply with Section 21.

3.5 **Shipment Prior Notification**

3.5.1 Shippers shall comply with all notifications (written and telephone) in accordance with Step 5.3.

3.5.2 Shippers making waste shipments containing Radioactive Material containing Category 1 or Category 2 quantities to the Barnwell Site shall comply with the notification requirements of Reference 2.8 and Section 22.

3.5.3 Shippers making waste shipments containing Category 1 or Category 2 nationally tracked sources to the BDF shall comply with the requirements of References 2.3, 2.7, Step 13.4, and Section 23 of this criteria.

3.6 **Shipment Documentation**

The following documents shall accompany the shipment. Other documents may be required based on type of shipment being made.

3.6.1 The Barnwell Waste Management Facility Uniform Low-Level Waste Manifest, this includes Forms 540/540A, 541/541A, and 542/542A, as appropriate. Detailed instructions for completing these forms are provided in Attachment 24.3.

Note: At shipment departure, a copy of the waste manifest must be emailed or faxed to CNS.

3.6.2 SC DES Radioactive Waste Shipment Prior Notification and Manifest Form (SC 802 Form) if applicable.

Note: A SC 802 Form is required for all waste shipments greater than 75 cubic feet and/or greater than 1 curie and for radioactive waste required to be transported by exclusive-use conveyance per DOT regulations.

3.6.3 SC Radioactive Waste Shipment Certification Form (SC 803 Form) is required for all waste shipments.

3.6.4 Complete isotopic analysis printout or equivalent for aqueous filter media, filters, and resins (See Step 13.16).

3.6.5 Documentation required for Class "C" waste shipment (See Section 15. and Attachment 24.4).

3.6.6 Written statement of any unusual hazards and/or precautions that must be taken (Refer to Step 13.14).

3.6.7 High Integrity Container Certification (Refer to Step 13.15).

3.6.8 A DOE/NRC Form 741 for Special Nuclear Material (SNM), when required.

3.6.9 Irradiated Hardware Inventory Liner Log (See Section 16 and Form S20-AD-010-F3), when required.

3.6.10 Emergency Response Sheets.

3.6.11 Exclusive-Use Instruction, when required.

3.6.12 Typical Waste Package Data Summary (Example), Form S20-AD-010-F2 and Section 21.

3.6.13 Cask leak test documentation, when required.

3.7 **Off-Loading Schedule**

3.7.1 Arriving shipments should be off-loaded in order of arrival.

3.7.2 Special shipments should be off-loaded in accordance with contractual or other arrangements made in advance.

3.7.3 Special casks and other shipments that require non-routine operations for off-loading may be deferred in the off-loading routine to an appropriate time for commencement of handling.

3.7.4 License and criteria limitations, weather or site ground conditions, darkness, and crane availability are all key items that may cause delays or rearrangements of shipments in off-loading.

3.8 **Driver Check-In Procedure**

3.8.1 Present shipping documents to Security Officer at Main Gate Security.

3.8.2 Security Officer shall time stamp the Waste Manifest Forms.

3.8.3 Security Officer shall copy paperwork and notify Licensing Department of shipment arrival. Security Officer shall provide a copy of the paperwork to the Billing Department.

3.8.4 Licensing/Appropriate Personnel will obtain the shipment documents from Security.

Note: Shippers shall ensure that carriers are briefed on the importance of delivering the shipment to the correct facility.

3.9 **Delays**

3.9.1 BDF shall not be responsible for transport equipment detention or special equipment demurrage charges assessed by the carrier. Payment of detention/demurrage charges shall be the responsibility of the customer.

3.9.2 BDF assumes no responsibility for transport equipment delays or special detention charges assessed by the carrier due to weather delays, improper paperwork, special casks, non-routine off-loads, delays in Class C waste disposal approvals, decontaminating vehicles containers, violation of Federal and/or State requirements, or other shipment discrepancies.

3.10 **Retrievability of Disposed Material**

All materials disposed of at the BDF become the property of the State of South Carolina. No provision or authority exists for material retrieval following disposal.

3.11 **Equipment Storage**

Loading, storage, or exchange of pallets, liners, or containers for third parties will not be accommodated at the BDF unless prior approval has been obtained by the General Manager.

4 WASTE SCHEDULING

4.1 Shipment scheduling shall be performed by the waste generator or authorized Broker/Shipper.

4.2 All customers shall contact the Licensing Department (803-541-5017 or 5009) to schedule shipments. A CNS Shipment ID Number shall be assigned to each shipment.

4.3 At the time of initial shipment scheduling with the Licensing Department, the

customer will be required to provide the following information (or an estimate, which will be updated, as information becomes available):

4.3.1 Customer Name

4.3.2 Arrival Date

4.3.3 Activity (millicuries)

4.3.4 Package Dose Rate (Highest) (mR/hr)

4.3.5 Volume (Total)

4.3.6 Weight (Total)

4.3.7 Shipment Type (i.e., Van, Cask, Flatbed)

4.3.8 Waste Class

4.4 Customers must update Licensing of any changes to the information provided in accordance with Step 5.3, cancellations or other pertinent changes.

4.5 Generators should schedule monthly waste shipments under Shipment ID Numbers by the 10th of the month that the waste will be shipped to ensure appropriate availability of concrete vaults for immediate disposal.

5 PRIOR NOTIFICATION PLAN (PNP)

5.1 General

The Prior Notification Plan is required by Reference 2.4 and CNS. Questions concerning SC DES notifications shall be directed to SC DES. SC 802 Form and SC 803 Form must be obtained from SC DES.

5.2 Instructions

5.2.1 Complete forms as indicated by the instructions.

5.2.2 Shippers shall use the CNS Shipment ID Number in Item 4 (Shipment Identification Number) of the SC 802 Form.

5.2.3 Distribute the SC Form as follows:

5.2.3.1 One copy mailed, faxed, or emailed to the SC DES office in Columbia, South Carolina (Fax Number 803 898-0391).

5.2.3.2 One copy mailed, faxed, or emailed to CNS Licensing Department at Barnwell (Fax Number 803 259-1744).

5.2.3.3 One copy to accompany the shipment.

5.2.4 A completed copy of the SC 803 Form shall accompany the waste shipment.

5.3 PNP Notifications

5.3.1 CNS Licensing Department and SC DES must receive the SC 802 Form seventy-two (72) hours prior to shipment being transported into

or within the State of South Carolina.

5.3.2 Shippers shall keep the Licensing Department and SC DES informed of all data changes concerning the SC 802 Form and all shipment cancellations.

5.3.3 Shipment departure notification and updates shall be given to the Licensing Department when the shipment leaves the customer's facility.

5.3.4 The Licensing Department will update SC DES with the correct Shipment ID Number, if the Shipment ID Number is changed by CNS or if the shipment is delayed until the following month.

6 WASTE MANIFEST FORMS

6.1 General

6.1.1 Unless otherwise approved by the Barnwell Licensing Department, only approved Waste Manifest Forms shall be accepted (Attachment 24.5).

6.1.2 Waste Manifest Forms are available from the Licensing Department.

6.1.3 Waste Manifest Forms are inspected by CNS personnel and the on-site SC DES official prior to shipment acceptance. Other state and federal regulatory agency inspections may also be performed.

6.1.4 Improperly prepared Waste Manifest Forms will result in acceptance delays or refusal of the shipment and may result in additional charges.

6.1.5 A signed copy of the Waste Manifest Forms shall be returned to the shipper within seven days after the shipment has been accepted for disposal at the BDF.

6.1.6 A letter indicating that the shipment has been received will be sent to the shipper within seven days should acceptance be delayed (e.g., inclement weather, etc.,).

6.2 Instructions

Forms shall be completed in accordance with the detailed instructions for completing these forms (located in Attachment 24.3).

6.3 Special Considerations

6.3.1 All totals shown on the Waste Manifest Form should match all accompanying paperwork for a given shipment.

Note: SC 802 Form values must match waste manifest 541 Form values.

6.3.2 All disposal volumes, weights, radiation levels, activities, etc., shall be accurate when shipment is received for burial. The activities and weights on the continuation sheets must equal the totals listed on the manifest cover sheet. If any changes are to be made after waste has

been disposed of, the generator shall make a written justification for necessity of change and an additional fee may be charged.

6.3.3 The weight listed on the Waste Manifest Forms must be as accurate as possible. This information is used by CNS Personnel for billing purposes, and to select the proper off-loading equipment for the particular package. Failure to list correct weights could result in personnel injury and/or equipment damage and/or Regulatory investigation. Discrepancies of this type could result in a substantial penalty charge.

6.3.4 To determine the container volume or displacement volume of the package, reference Section 7 and Attachment 24.6.

6.3.5 The customer shall provide a written statement on or attached to the Waste Manifest Form listing any unusual hazards (See Step 13.14).

Note: Prior to shipment, notification of unusual hazards shall be made to the Barnwell Licensing Department.

7 VOLUME AND WEIGHT MEASUREMENT CRITERIA

7.1 Disposal charges shall be based on the contract rates set in the customer agreement.

7.2 Standard shaped packages (i.e., square, rectangular, cylinder) shall be sized using routine external measurements. Displacement volumes of steel drums up to 110 gallons and standard B-25 boxes are provided in Attachment 24.6.

7.3 The volume of any odd-shaped package (i.e., with protrusions, legs, flanges, etc.,) shall be agreed to by CNS Business Development Personnel, and the customer, prior to shipment. Odd-shaped packages received on Site without prior agreement of total displacement volume, shall be measured by CNS and disposal charges shall be assessed accordingly.

7.4 The maximum package size (including lifting lugs, skids, etc.) shall be 9' 4" L x 7' 6" W x 9' 2" H with a maximum package weight of 54,000 pounds.

Note: Any packages exceeding the dimensions or weight in Step 7.4 shall have CNS Licensing prior approval before shipment.

Bulging boxes must maintain complete compliance with Reference 2.2.

7.5 All weights shall be accurately reported.

7.6 External brace work is included in total gross box measurements. These pieces will hold one box away from another creating void space, which cannot be utilized. In the case of bulging boxes, the measurements are taken at the bulge. (The bulge will keep the box from being "snugged" up against another and may constitute the use of additional waste disposal vaults).

7.7 Skids or pallets are not included in the measurements.

7.8 The individual container volume is rounded off to the nearest tenth of a cubic foot. (128.64 cubic feet would be 128.6 cubic feet).

7.9 Cylindrical liner measurements are based on the outside maximum diameter and the maximum planar height.

8 WASTE CLASSIFICATION AND PACKAGING

8.1 All shipments received at the BDF shall be properly classified and marked in accordance with Reference 2.1. The waste class (A-U, A-S, B, or C) shall be durably and legibly marked on top of the disposal container.

Note: **Stable waste is waste that is inherently stable (i.e., metal reactor components), has been rendered stable by placement in a high integrity container, or has been rendered stable by processing with an approved solidification media. An approved media is one for which specific approval has been granted by SC DES. Any such processing with a media must eliminate void spaces in containers to the extent practicable. Unstable waste is all other waste that complies with all other license requirements except those listed for stable waste.**

The Waste Manifest Form shall indicate the waste class as: A-U, A-S, B, or C for each disposal package listed.

All waste containers shall be filled to no less than 85% except for waste packaged in approved high integrity containers or waste comprised of irradiated metal for disposal in the slit trench.

All waste must be disposed in concrete vaults unless specifically approved by SC DES.

8.2 For Class A Unstable wastes that are processed refer to Section 14 for waste classification methodology.

8.3 Additional information for Class C waste shipments shall be provided in accordance with Form S20-AD-010-F1. Class C documentation must be received by the Barnwell Licensing Department prior to shipment departure (See Section 15) and specific approval by SC DES is required prior to disposal.

Note: **Class C Documentation should be received by the Barnwell Licensing Department three (3) working days prior to shipment arrival at the Barnwell Site.**

8.4 For Irradiated Hardware wastes refer to Section 16 for waste classification and notifications.

8.5 Radwaste containing Special Nuclear Material (SNM) shall comply with Section 13.10.

8.6 The package identification and other required marking and labeling shall be clearly visible on the shipping package. Special emphasis should be directed to

this whenever wrapping materials are placed on the shipping package.

8.7 The waste classification for disposal packages that contain two or more inner packages shall be determined for each inner container. The most restrictive classification shall be indicated on the outer disposal container. (Example: A High Integrity Container Overpack containing one Class A Stable drum and one Class C drum shall be marked as Class C waste).

8.8 Cardboard boxes, corrugated paper drums, etc., are NOT acceptable containers for disposal.

8.9 Unless otherwise authorized by the Barnwell Licensing Department, waste shall be contained in wooden, plastic, or metal containers or SC DES approved high integrity containers.

Note: Disposal containers shall not be corroded to the point of container degradation. Containers having minor surface rust are acceptable, but shall meet as a minimum, the general design packaging requirements of the DOT.

8.10 All wooden boxes shall be banded with metal bands.

8.11 Boxes shall be of waterproof construction or properly covered during transit.

8.12 All boxes must be equipped with skids or non-returnable lifting devices.

8.13 Drums or other containers filled with non-radioactive materials shall NOT be used for shielding. New containers may be used as dunnage.

8.14 Any supplemental shielding, interior or exterior to the shipping container shall have approval from the Barnwell Licensing Department prior to shipping.

8.15 A van is not considered as a shipping container.

9 VAN SHIPMENTS

Note: Shipments arriving at the BDF must be properly blocked, braced, and secured. Shippers should verify that their shipments meet the applicable requirements sited in Reference 2.9

9.1 **Drums**

9.1.1 Open-top vans or flatbed trailers are the preferred method for shipment of drums.

Note: Vans with hydraulic lift gates are not acceptable without prior approval from the Barnwell Licensing Department.

9.1.2 Drums weighing 1,000 pounds or less shall not be shipped on pallets without prior approval.

9.1.3 Drums exceeding 1,000 pounds shall be palletized or equipped with appropriate lifting devices, which have been approved by the Barnwell Licensing Department before shipment.

9.1.4 Drums of different sizes shall be segregated within the same shipment.

9.1.5 Drums shall not be placed on their sides.

9.1.6 Drum rings and bolts shall be properly secured and be structurally strong enough to support the weight of the drum while off-loading.

9.1.7 Drums with lever-lock closure devices shall have prior approval from the Barnwell Licensing Department prior to shipment departure.

9.1.8 Drums shall comply with Reference 2.2. Bulging lids shall not exceed height of closure ring, bulging bottoms shall not extend below bottom ring of drums.

9.1.9 Drums may be double stacked with proper bracing, provided the heavier drums are on the bottom.

9.1.10 Class A Stable, Class B, and Class C waste shall be segregated from Class A Unstable waste in the same shipment.

9.1.11 Small drums should be stacked in reasonable quantities so that a Radwaste Technician may remove the highest container without need of a platform.

9.2 **Packages Weighing Less Than 8,000 Pounds**

9.2.1 package shall have a minimum clearance of three inches from the van walls.

9.2.2 Packages shall be elevated with skids from the van floor and accessible to a forklift. The use of two 2" X 4" boards nailed together is acceptable.

9.2.3 Each package shall have a top clearance of at least twelve inches in a closed van.

9.2.4 Steps 9.2.1 through 9.2.3 are not applicable to drums.

9.2.5 Dunnage used to establish spacing is considered sacrificial.

9.3 **Packages Weighing More Than 8,000 Pounds**

9.3.1 Packages shall be provided with properly attached lifting devices.

9.3.2 Lifting devices shall be secured to the top of packages and be readily available for easy access.

9.3.3 Packages shall not be shipped in closed, hardtop vehicles without prior approval from the Barnwell Licensing Department.

9.3.4 Each package shall have a minimum clearance of three inches from the van walls.

9.3.5 Shipments with boxes weighing more than 8,000 pounds and drums shall be segregated. Lifting devices shall have prior approval from the Barnwell Licensing Department prior to shipping.

9.4 **Mixed Shipments (Drums, Boxes, Liners, etc., Containing Class A, B, and C Waste)**

9.4.1 Mixed shipments shall comply with Steps 9.1 through 9.3 as applicable.

9.4.2 Only Class A Unstable waste shall be segregated from Class A Stable, Class B, and Class C waste when shipped together on the same shipment.

9.4.3 When Class A Unstable waste is on the same shipment with Class A Stable, Class B, and/or Class C waste, the shipping papers shall list the location of the waste in the shipment.

Example: "Class A Unstable Waste located in the front with the Class B in the rear." This is to be indicated on the bottom of the Waste Manifest Form (if using the Form 540, in the consignee use only section).

9.4.4 Do not stack drums on boxes or boxes on drums.

9.4.5 Drums or boxes may be loaded in the forward section of the van with definite segregation of the two types of containers. (Preferably drums loaded in forward section of van).

9.4.6 Improperly mixed shipments shall result in an additional off-loading charge or refusal of the shipment.

9.5 **Less Than Full Load Shipment**

Shippers shall ensure that carriers are briefed on the importance of delivering the shipment to the correct facility (i.e., Disposal Site versus the Barnwell Processing Facility).

10 FLATBED TRAILER SHIPMENTS

10.1.1 Flatbed trailer shipments shall comply with Section 9 as applicable.

10.1.2 Packages with attached lifting devices are not required to have bottom clearance.

10.1.3 Boxes less than 8,000 pounds and/or drums shipped on flatbed trailers must be loaded in such a manner that they may be off-loaded from the side using a forklift.

11 CASK SHIPMENTS

11.1 Customers using an NRC licensed cask not owned by Energy*Solutions* shall ensure that Energy*Solutions* is a "Registered User" of the licensed cask prior to shipment to the BDF. This applies to all shipments requiring licensed packages.

11.2 Third party cask documents (C of C, SAR, handling and maintenance procedures, and drawings) shall be made available prior to shipment of the cask to the BDF.

11.3 All shipments shall strictly comply with the applicable Certificate of Compliance and/or the cask handling procedures for the cask in use (lid torquing, sealing gaskets, weight restriction, shoring requirements, etc.).

Note: Empty casks returned to CNS shall be shipped in accordance with Reference 2.2.

11.4 to observe appropriate requirements shall result in the submission of noncompliance information to the appropriate regulatory agency.

11.5 Liners containing "Energy*Solutions* Grapple Bails" are to be identified on Waste Manifest Form 541/541A, Item 6.

Note: Liners containing non-Energy*Solutions* grapple bails must have appropriate lifting cables attached in accordance with Step 11.7.

11.6 All drums shall be palletized, and pallets shall have proper lifting devices attached. Boxes shall be equipped with appropriate lifting devices or palletized.

Note: Drums with dose rates greater than 1 R/hr shall be shipped in a cask on pallets and will be disposed with the pallet.

11.7 Disposal container and/or pallet shall have the lifting device secured at the top of the container(s). This is to prevent the cable from becoming caught under or between the container(s) or pallet.

Note: Lifting devices shall be of sufficient length to allow retrieval and crane hook-up without physically entering the cask. The Barnwell Licensing Department shall be notified prior to shipment of any lifting device supplied with the disposal container that has been altered, removed, or replaced.

11.8 For shipments consisting of high integrity container overpacks, the pallets on which the overpacks are placed are considered sacrificial since the pallets are used for proper placement in the concrete waste disposal vaults.

11.9 When using pallets, the containers shall be positioned to remain balanced and stable on the pallet when lifted clear of the cask.

11.10 Class A Unstable waste shall not be placed on the same pallet with Class A Stable, Class B, or C waste without prior approval from the Barnwell Licensing Department.

11.11 When tall, slender containers (i.e., demineralizers) are loaded on a pallet inside the cask, the containers shall be tied or secured together at the tops to prevent containers from falling off the pallets during off-loading.

Note: This is not required for a single tier of drums, i.e., 55-gallon, 83-gallon, etc., which are placed on a pallet.

11.12 Palletized drums inside a cask shall be loaded to prevent movement in such a manner that any shifted position of drums on the pallet will not increase radiation levels measured outside the cask (dunnage shall be removable with palletized

loads).

11.13 A shipment consisting of individual disposal containers not on pallets shall have attached to each container a lifting device that will allow off-loading by a single lift.

Example: Shipping 4 demineralizers without a pallet would require the use of a "D" ring with a 4-part spreader (spider). Each lifting leg of the spreader would be attached to one of the disposal containers lifting slings.

11.14 Lifting slings attached to disposal containers or pallets are considered sacrificial and are not returnable.

12 CONTAMINATION LIMITS OF PACKAGE/VEHICLE

12.1 General

12.1.1 All shipments received at the Barnwell Site shall comply with contamination control limits of Reference 2.2.

12.1.2 Loose contamination on and between packages that may be obscured by various barriers (i.e., impact limiters, base plates, etc.,) shall be considered. Contamination limits for the package, the barrier and the vehicle shall comply with References 2.2 and 2.5.

12.1.3 The receipt of excessive surface contamination on containers in casks or otherwise, is very undesirable from the standpoint of site cleanliness and contamination control. Customers should use all means at their disposal to ship containers with minimal surface contamination.

12.1.4 Notify the Barnwell Licensing Department prior to shipment of any smearable contamination on the disposal container and/or cask interior surface exceeding 50,000 dpm/100 cm^2 beta-gamma and/or 2200 dpm/100 cm^2 alpha.

12.1.5 Disposal containers that have been wrapped to prevent the spread of loose contamination shall have, prior to shipment, approval from the Barnwell Licensing Department.

Note: The customer shall notify the Barnwell Licensing Department prior to departure of any shipment, which has the potential for causing airborne contamination under normal handling circumstances and/or has contamination exceeding the limits stated in Step 12.1.4. Failure to provide timely information may result in substantial surcharges or refusal of the shipment.

12.1.6 Waste outside of their disposal containers and/or foreign objects found in shipping casks or other transport vehicles are not acceptable and are subject to the requirements specified in Section 20 of this criteria.

12.2 Floor Covering

Plywood or other materials that are placed over the transport vehicles flooring, for contamination control shall be considered sacrificial, but will not be considered part of the burial volume. Time and/or supplies for floor covering removal will be chargeable.

12.3 **Decontamination Prior to Release**

Vehicles exiting the BDF shall be decontaminated to release limits described in Step 12.4 prior to release. Charges for decontamination services to comply with these levels shall be assessed as necessary.

12.4 **Contamination Release Limits for Vehicles Exiting the Barnwell Site**

12.4.1 Enclosed vehicles used solely for the transport of radioactive materials (Exclusive Use) and properly marked "For Radioactive Materials Use Only", in accordance with Reference 2.2.

12.4.1.1 Fixed contamination shall not exceed 10 mrem/hr on contact with the interior surface or 2 mrem/hr at one meter from the interior surface.

12.4.1.2 Fixed contamination shall not exceed 0.5 mrem/hr at any exterior accessible surface.

12.4.1.3 Removable contamination shall not exceed 220 dpm/100 cm^2 alpha and 2200 dpm/100 cm^2 beta-gamma in the interior or on the exterior of the vehicle.

12.4.2 Enclosed vehicles used solely for transport of radioactive material (Exclusive Use) and NOT marked according to Step 12.4.1.

12.4.2.1 Fixed contamination shall not exceed 0.5 mrem/hr at any accessible surface.

12.4.2.2 Removable contamination for beta-gamma shall not exceed 500 dpm/100 cm^2.

12.4.2.3 Removable contamination for alpha shall not exceed 50 dpm/100 cm^2.

12.4.3 Empty Casks

12.4.3.1 Fixed contamination shall not exceed 0.5 mrem/hr at any accessible exterior surface unless cask is properly labeled, and a completed Radioactive Shipment Record (RSR) accompanies the cask.

12.4.3.2 Removable external contamination for beta-gamma shall not exceed 500 dpm/100 cm^2.

12.4.3.3 Removable external contamination for alpha shall not exceed 50 dpm/100 cm^2.

12.4.4 Vehicles or Items for Unconditional Release

12.4.4.1 Fixed contamination shall not exceed 0.1 mrem/hr at any accessible surface.

12.4.4.2 Removable beta-gamma contamination shall not exceed 220 dpm/100 cm^2.

12.4.4.3 Removable alpha contamination shall not exceed 22 dpm/100 cm^2.

13 SPECIAL CATEGORIES

13.1 Dry Active Waste

Dry Active Waste (DAW) consists of paper, plastics, contaminated metals, soil, building rubble, air filters, etc.

13.1.1 Dry Active Waste (DAW) must be packaged and classified for disposal in accordance with Reference 2.1 and Section 8.

13.1.2 All waste containing isotopes with greater than 5-year half-lives having a total specific activity greater than or equal to 1 µCi/cc requires stabilization. Also, if the sum of the fractions for the isotopes with a greater than 5-year half-life exceeds 1, the waste must be stabilized.

13.2 Biological Material

13.2.1 Plants, animals, and by-products are considered biological material. Glassware, etc., that at one time contained these materials may also be considered biological. All biological waste shall be packaged in accordance with this section.

Note: Biological waste containing isotopes with greater than 5-year half-lives having a specific activity of greater than or equal to 1 µCi/cc must be stabilized. Also, if the sum of fractions for the isotopes with a greater than 5-year half-life exceeds 1, the waste must be stabilized.

13.2.2 The inner container having a capacity of 55-gallons or less shall be in good condition and shall as a minimum comply with the DOT's general design requirements for radioactive material packaging.

13.2.3 The inner container shall have a watertight liner (i.e., polyethylene or equivalent) of at least 4 mils thickness.

13.2.4 The biological material shall be placed in the inner container and thoroughly layered with absorbent and slaked lime.

13.2.4.1 The lime used shall be commercially available slaked lime.

13.2.4.2 The absorbent used should be agricultural grade four vermiculite or medium grade diatomaceous earth.

Note: Other absorbent materials may be acceptable with SC DES approval. Other

absorbents currently approved are Chemsil 3030, Water Works Crystals SP-100, Water Works Crystals Long Grain, and Waste Lock 770.

13.2.4.3 The addition of lime and absorbent to biological material should be in a ratio of one part lime to ten parts absorbent to thirty parts biological material.

13.2.4.4 The addition of formaldehyde is strictly prohibited.

13.2.5 The watertight liner shall be hermetically (airtight) sealed by taping, tying, or heat-sealing.

13.2.6 The seal on the inner container is crucial to proper containment and made in the following manner:

13.2.6.1 The ring-and-bolt-equipped containers shall be closed with an appropriate wrench.

13.2.6.2 Lever locks are not acceptable.

13.2.7 The inner container shall be placed upright in an outer container.

13.2.8 The outer container shall meet the DOT's general design requirements for radioactive materials packaging.

13.2.9 The bottom of the outer container shall be covered with a minimum of four inches of absorbent material.

13.2.10 After the inner container(s) is/are placed in the outer container, the void space shall be filled with additional absorbent material.

13.2.11 Unless otherwise approved by SC DES, the volume of the outer container must be at least 1.5 times the volume of the inner container.

13.2.12 A refrigerated van shall be used to ship biological radwaste between April 1 and October 1 if transit time will exceed 48 hours from the time the biological radwaste is first removed from cold storage until arrival at the Site.

13.3 **Gaseous Waste**

13.3.1 Krypton 85 and Xenon 133 are acceptable in DOT specification cylinders or NRC approved sealed sources with internal pressures less than 1.5 atmospheres and less than 100 curies per container.

13.3.2 Sealed Tritium gas sources are acceptable provided:

13.3.2.1 The source is approved by the U.S. Nuclear Regulatory Commission, or an agreement state.

13.3.2.2 The maximum activity per disposal container must not exceed 1000 curies.

13.3.2.3 The sources/devices must be received intact to provide

additional physical protection to the primary tritium source containment.

13.3.2.4 Sources requiring stabilization as determined by waste classification, (using the volume of the sealed source only), are placed in high integrity containers or encapsulated with an appropriate stabilization media.

13.3.2.5 The internal pressure of each source does not exceed 1.5 atmospheres.

13.3.2.6 Methods used for stabilizing these sources shall be approved by the Barnwell Licensing Department prior to shipment.

13.4 Sealed Sources or Special Form Radioactive Materials

13.4.1 Sealed sources or special form radioactive material must have approval from the Barnwell Licensing Department and may require specific approval from SC DES prior to acceptance for disposal. An example request for approval is located in Attachment 24.7.

Note: See Section 23 regarding additional requirements for Nationally Tracked Sources.

13.4.2 The smallest allowable package will be a five-gallon container.

13.4.3 SC DES has placed the following container limits for source form radionuclides:

Radionuclide	Maximum Activity per Container
Ra-226	50 μCi
I-129	150 μCi
Am-241	500 μCi
Alpha > 5yrs	500 μCi
Tc-99	6 mCi
C-14	15 mCi
Pu-241	16 mCi
Cm-242	90 mCi

Note: If there are multiple radionuclides to be placed into an individual package, unity will be considered based upon these limits.

13.4.4 Cement encapsulation media used for the encapsulation of sealed sources to achieve stability may be acceptable provided the encapsulation method is approved by the Barnwell Licensing Department.

13.4.5 The encapsulation method must consist of a minimum of 4 inches of structural grade cement (2500 p.s.i. or greater) that surrounds the sources on all sides.

13.4.6 Waste classification for sealed sources is based on the actual source volume. Volumes for source housings or encapsulation media shall not be included.

13.4.7 Small quantity sources with radionuclides other than Radium and Transuranics with activities, which do not exceed Class A limits (determined using a source volume of 1 cubic centimeter), may be disposed as Class A waste packaged as DAW.

Note: Waste containing isotopes with greater than 5-year half-lives having a total specific activity greater than or equal to 1 μCi/cc requires stabilization. Also, if the sum of fractions for the isotopes with a greater than 5-year half-life exceeds 1, the waste must be stabilized.

13.5 **Liquid Radioactive Waste**

13.5.1 liquid waste or solid waste containing liquids shall be received at the BDF.

13.5.2 Solidified liquid waste may be accepted provided it is solidified with one of the following solidification media:

13.5.2.1 Vinyl Ester Styrene

13.5.2.2 Cement

13.5.2.3 Bitumen

13.5.2.4 Vinyl Chloride

13.5.2.5 Aquaset II-H (Class A-U waste only)

13.5.2.6 Petroset H (Class A-U waste only)

13.5.2.7 MetalPlex III (Class A-U waste only)

Note: Solidified oil is not acceptable for disposal. (See Step 13.8)

13.5.3 Liquid waste containing isotopes with greater than 5-year half-lives having a total specific activity greater than or equal to 1 μCi/cc requires stabilization. Also, if the sum of fractions for the isotopes with a greater than 5-year half-life exceeds 1, the waste must be stabilized.

13.5.4 Hazardous organic solutions, solidified or otherwise, are not acceptable for disposal at the BDF.

13.6 **Wastes Containing Free Standing Liquids**

13.6.1 Evaporator bottoms or concentrates, residues, sludges, or other waste which may contain free standing liquids must be solidified in accordance with Condition 33 of License 097, Reference 2.1, and meet the requirements as specified in Condition 32 of License 097, Reference 2.1.

13.6.2 Wastes that have been processed to contain no freestanding water and are not free flowing are acceptable for disposal when processed by a method specifically approved by SC DES prior to shipment.

13.7 **Scintillation Products and Containers**

13.7.1 Toluene, xylene, dioxane, scintillation liquids which exhibit hazardous properties or other organic liquids or solids with similar chemical properties are prohibited except as specified below:

13.7.1.1 Containers, which have contained any of the liquids mentioned above, are acceptable for disposal after treatment as specifically authorized by SC DES.

13.7.1.2 The ash and/or residue from the incineration of these wastes are acceptable in accordance with Condition 45 of License 097, Reference 2.1.

13.7.2 Solidified or processed waste containing non-hazardous scintillation products may be acceptable, provided the scintillation products have been approved by SC DES.

13.7.2.1 Scintillation products that have received SC DES approval shall be identified by product name on the shipment manifest.

13.7.2.2 The following scintillation products have been approved by SC DES for disposal: Ecoscint A, Ecoscint O, Opti-fluor, Ultima Gold, Ultima Gold LLT, Ready-Safe, Ready Cap, Ready Filter, Meltilex, and Beta Plate Scint XSC/9200. Additional products may be acceptable, provided they are approved by SC DES.

13.8 **Oil**

13.8.1 Petroleum based oils, regardless of waste form, are not acceptable for disposal at the BDF.

13.8.2 Waste containing incidental or trace amounts of absorbed oil are acceptable, provided they do not exceed one percent (1%) of the waste volume in a container. However, waste streams cannot be blended or mixed to obtain compliance.

13.8.3 Synthetic oils may be acceptable provided they have been approved by SC DES.

13.9 **Pyrophoric Materials or Flammable Solids**

13.9.1 Pyrophoric or flammable solid material contained in waste shall be made inert to prevent self-ignition during transport and disposal.

13.9.2 The inerting process shall be approved by the Barnwell Licensing Department prior to shipping.

13.9.3 No material that might react violently with water or moisture shall be accepted for disposal at the BDF.

13.10 **Special Nuclear Material (SNM)**

Note: Special Nuclear Material (SNM) means plutonium (Pu), U-233, or uranium enriched in U-233 or U-235.

13.10.1 All SNM waste shall be packaged and reported in accordance with Reference 2.1, 2.3, and Section 3.6 of this procedure.

13.10.2 Waste containing plutonium must meet the requirements of Condition 40 of Reference 2.1. Waste not meeting these requirements will require specific approval by SC DES.

13.10.3 The surface area on any side or projected plane of a package containing U-233, U-235, Pu shall be 2 ft^2 or greater. Only 55-gallon drums and larger packages are acceptable without prior approval from Barnwell Licensing Department.

13.10.4 Shippers having individual packages in excess of 100 grams of U-235 shall have on file with the Barnwell Licensing Department a statement indicating the percent confidence in their shipping values.

13.10.5 The Barnwell Licensing Department shall be notified prior to shipment of SNM packages exceeding 100 grams of U-235 in which the confidence in shipping value is less than 95 percent.

13.10.6 No single package/shipment shall contain more than 200 grams of U-233, 350 grams of U-235, or 200 grams of Pu. For packages containing a combination of U-233, U-235 or Pu, the sum of the ratios of the individual quantity of each SNM radionuclide to the quantity specified above for that radionuclide shall not exceed unity.

13.11 **Hazardous Chemicals**

13.11.1 Waste material containing hazardous chemicals/agents and radioactive materials shall be acceptable for disposal only when the radiological hazard clearly exceeds the toxic chemical/agent hazard.

Note: Mixed waste requirements are specified in Section 13.20.

13.11.2 All shipments shall comply with Reference 2.1 regarding the assessment of chemical versus radiological hazards.

13.11.3 When any determination has been made as to the classification of the hazard, an independent evaluation of the radiological, biological, and chemical hazards shall be performed, and the reports shall be submitted to the Barnwell Licensing Department for review prior to shipment.

13.11.4 CNS shall receive, review, and maintain on file all reports of evaluations for SC DES review.

13.11.5 Upon completion of review and comment, the reports, if necessary, will be submitted by CNS to SC DES for evaluation as to the acceptability of the waste material for disposal.

13.12 **Transuranics (Elements with Atomic Numbers greater than 92)**

13.12.1 Wastes containing transuranic nuclides are acceptable, provided the following conditions are met.

13.12.1.1 The concentration limits specified in Reference 2.1 are not exceeded.

13.12.1.2 The transuranic nuclides are evenly distributed within a homogeneous waste form.

13.12.1.3 The transuranic content is incidental to the total activity. Incidental is defined as up to one percent (1%) of the total activity.

Note: **Plutonium-241 is exempt from the one percent incidental transuranic activity criteria provided it is not the only transuranic in the waste. However, it must be considered when classifying the waste. Wastes containing only transuranics or plutonium-241 are not acceptable for disposal unless specifically approved by SC DES.**

13.12.1.4 If the limits of Reference 2.1 for transuranics are exceeded, SC DES prior approval is required.

13.12.2 Each transuranic nuclide must be identified on the Waste Manifest Form.

13.12.3 Packages containing transuranics, which are plutonium isotopes, must comply with Section 13.10.

13.12.4 Smoke or gas detectors containing Americium-241 foils, which exceed the limits specified in Reference 2.1 may be acceptable for disposal provided the entire detector is received for disposal.

13.12.5 In-core detectors or other such devices, which contain transuranics require approval by the Barnwell Licensing Department prior to shipping.

13.13 **Uranium Oxide**

Uranium oxide shipments are subject to heavy external contamination of containers. Precautions shall be taken to ensure that the shipping container contamination will be less than the limits specified in Reference 2.2.

13.14 **Unusual Hazards**

13.14.1 The shipper of radioactive material shall notify the Barnwell Licensing Department prior to departure of any shipment in which the possibility exists for unusual hazards.

13.14.2 Barnwell Licensing shall obtain approval of the General Manager or designee before authorizing the departure of any shipments with unusual hazards to the BDF.

13.14.3 The shipper shall provide a written statement on or attached to the Waste Manifest Form containing information as to unusual hazards.

13.14.4 Wind, weather, or other unusual circumstances may delay off-loading this type of shipment.

13.14.5 Unusual hazards include, but are not limited to, the presence of neutron sources or neutron emitters in the shipment, spills in or on shipping containers or vehicles, excessive external contamination levels on disposal containers (see Step 12.1.4), any non-routine waste processing event, any damage which has occurred to a disposable container or lifting device, etc.

13.15 **High Integrity Containers**

13.15.1 Only high integrity containers approved by SC DES are acceptable for burial at the BDF. Shippers shall ensure that a copy of the Certificate of Compliance (C of C) for the approved high integrity container as issued and amended by SC DES is on file with the Barnwell Licensing Department.

13.15.2 The Barnwell Licensing Department shall have signed documentation on file from the shipper or notification from SC DES that the shipper has received and will adhere to the requirements of the C of C.

13.15.3 A certification that the shipper has stored, handled and used the high integrity container in accordance with the C of C shall accompany the shipment to the BDF.

13.16 **Filter Media/Filters/Resins**

For each shipment containing resin or other aqueous filter media (including filters), a complete isotopic analysis shall be provided with the shipment. The analysis shall identify the following:

13.16.1 Disposal package number

13.16.2 Waste description

13.16.3 Radionuclides present

Note: Filters (i.e., fuel pool filters), which have the potential to contain activated metal in the form of shavings, must be classified with consideration given to concentrations of ^{59}Ni, ^{94}Nb, ^{14}C AND ^{63}Ni in activated metal.

13.16.4 Total curie content

13.16.5 Resin/filter media volume (cc or ft^3)

13.16.6 Indicate the number of filters in the container.

13.16.7 The specific activity of each radionuclide and the total radionuclide concentration shall be expressed in microcuries/cubic centimeter or curies/cubic meter and transuranic radionuclides in nanocuries/gram.

13.16.8 Waste classification for resin, filter media, and filters must comply with Reference 2.1 and Reference 2.6.

13.16.9 Resin, filter media, or filters that are classified as Class C waste must comply with Section 15.

Note: These requirements are not applicable to air filters. (See Section 13.1)

13.17 **Slit Trench Shipments**

13.17.1 Cask shipments which are required to be off-loaded using the horizontal off-load technique shall have approval of the General Manager or designee prior to shipping.

13.17.2 Horizontally off-loaded shipments shall have the liner removal device approved by the General Manager or designee, prior to shipping.

13.18 **Chelating Agents**

13.18.1 Waste containing chelating agents with concentrations in its final waste form greater than 0.1 percent, but less than 8 percent by weight is acceptable, provided it is stabilized with one of the solidification agents specified in Reference 2.1.

13.18.2 Waste containing chelating agents greater than 8 percent by weight is not acceptable.

13.18.3 The name and percent of chelating agents in the waste shall be listed on the Waste Manifest Form.

13.18.4 Dewatered waste containing chelating agents in concentrations ranging from 0.1 to 8.0 percent by weight will be accepted for disposal provided the following are met.

13.18.4.1 The waste is placed in a high integrity container (HIC).

13.18.4.2 The waste contains less than 1% free standing liquid by waste volume.

13.19 **Lead**

Non-radioactively contaminated lead specifically used for shielding purposes may be acceptable for disposal with prior approval by the Barnwell Licensing Department. Information requested on Attachment 24.8 shall be provided for evaluation.

13.20 **Mixed Waste**

13.20.1 No mixtures of radioactive waste and hazardous waste as defined by Title 40 Code of Federal Regulations (CFR) Part 261 and S.C. Hazardous Waste Management Regulation 61-79.261 will be accepted.

13.20.2 A mixture of radioactive waste and waste which was classified as hazardous solely because it exhibited one or more of the hazardous characteristics defined in 40 CFR 261 Subpart C, but has been treated in a manner such that it no longer exhibits any of the characteristics, will be reviewed for acceptance on a case-by-case basis. As required by 40 CFR 261.24, the Toxicity Characteristic Leaching Procedure shall be used.

13.20.3 A description of the treatment process and results of the analytical tests of the final waste shall be submitted to the Barnwell Licensing Department for evaluation prior to shipment.

13.21 **Polychlorinated Biphenyls (PCB's)**

13.21.1 In accordance w/ 40 CFR Part 761 – PCB's MANUFACTURING, PROCESSING, DISTRIBUTION IN COMMERCE, AND USE PROHIBITIONS, radioactively contaminated non-liquid waste containing < 50 ppm PCB's may be acceptable for disposal with prior approval from the Barnwell Licensing Department.

13.21.1.1 The Barnwell Licensing Department shall be provided, prior to shipment, documentation or analytical results from the shipper substantiating the level of PCB contamination is < 50 ppm.

13.21.2 Radioactively contaminated PCB bulk product waste as defined in Sections 13.21.2.1 & 13.21.2.2 may be acceptable for disposal with prior approval from the Barnwell Licensing Department.

13.21.2.1 Per 40 CFR 761.62(b)(1)(i), plastics (such as plastic insulation from wire or cable; radio, television and computer casings; vehicle parts; or furniture laminates); preformed or molded rubber parts and components; applied dried paints, varnishes, waxes or other similar coatings or sealants; caulking; Galbestos; non-liquid building demolition debris; or non-liquid PCB bulk product waste from the shredding of automobiles or household appliances from which PCB small capacitors have been removed (shredder fluff).

13.21.2.2 Per 40 CFR 761(b)(1)(ii), other PCB bulk product waste, sampled in accordance with the protocols set out in Subpart R of 40 CFR Part 761, that leaches PCB's at less than 10 μg/L (10 ppb) of water measured using a procedure used to

simulate leachate generation.

13.21.2.3 The Barnwell Licensing Department shall be provided written notice stating that the PCB bulk product waste may include components containing PCB's at > 50 ppm based on analysis of the waste in the shipment or application of a general knowledge of the waste stream (or similar material) which is known to contain PCB's at those levels, and that the PCB bulk product waste is known or presumed to leach < 10 µg/L PCB's.

13.21.3 No other PCB's or PCB items than those described above will be accepted for disposal. Questions regarding PCB's should be directed to the Barnwell Licensing Department.

13.22 **Asbestos**

13.22.1 Packages containing radioactively contaminated asbestos waste (0.1% or greater by weight) shall be identified as asbestos under the waste description of the Waste Manifest Form and continuation sheet.

13.22.2 OSHA Asbestos standard 29 CFR 1910.1001 requires affixment of warning labels on waste packages containing asbestos.

13.23 **Radium Wastes**

Waste containing Radium are prohibited except as specified below:

13.23.1 Radium contained in solid homogeneous waste forms in which the Radium activity is incidental (≤1.0%) to the total activity and the concentration of Radium has not been technologically enhanced. The classification of this waste shall be in accordance with Condition 31 of License 097, Reference 2.1.

13.23.2 Radium contained in self-luminous dials, hands of dials, timepieces, compasses, and electron tubes provided that the entire device is received and disposed.

13.23.3 Radium contained in biological research waste. The classification of this waste shall be in accordance with Condition 31 of License 097, Reference 2.1.

13.23.4 Radium sources which have been specifically approved by SC DES. Sealed source approvals and processing shall be accomplished in accordance with Step 13.4.

14 CLASS A UNSTABLE PROCESSED WASTE

Note: This section applies to generators and processors who process waste prior to shipment for disposal. This applies only to Class A Unstable Waste.

Note: Any waste received by a processor as Class A Stable, Class B, or Class

C must meet the stability requirements prior to disposal and the container must be classified using the highest waste classification in the container.

14.1 following methodology shall be used for Classification of Similar and Dissimilar Class A Unstable Waste Types for shipments to BDF.

14.2 "Similar or homogenous" wastes are defined as waste with the same physical characteristics (e.g., soil, ion exchange resins), contaminated trash waste (DAW), or incinerator ash. Other waste may be considered with the approval of the Barnwell Licensing Department and SC DES.

14.3 For waste that is not "similar or homogenous" the classification of the waste must be determined by calculating the activity concentration based on the "as processed" waste volume for each generator and waste stream. For "similar or homogenous" wastes averaging may be performed over each waste type under the following conditions.

14.4 The activity concentrations in each waste stream as received from the generator prior to processing must not exceed the Class A Unstable limits.

14.5 The activities may be averaged over the combined volume, after processing, of each similar or homogenous waste type. This activity must not exceed the Class A Unstable limit.

14.6 The following information must be provided by the waste processor on the Uniform Low-Level Radioactive Waste Manifest Form 542 (See Attachment 24.3). For each generator, a list of the radionuclides and their activities, and the waste volume prior to processing. For each "similar or homogenous" waste type in each container, the radionuclides and their activities, and volume after processing.

15 CLASS C WASTE SHIPMENTS

15.1 Class C waste shipments received at the BDF must have SC DES approval prior to disposal.

15.1.1 Documentation for each Class C shipment must be provided to the Barnwell Licensing Department in accordance with Attachment 24.4 prior to shipment departure.

15.1.2 Class C wastes shipments consisting of sealed sources or special form radioactive materials will be evaluated for approval under the provisions specified in Section 13.4.

15.2 A shipment may be released for transport to the disposal site prior to disposal approval but must have SC DES approval prior to disposal.

15.3 The Barnwell Licensing Department will review the Class C waste documentation for consistency with disposal license (Reference 2.1), Branch Technical Position on Concentration Averaging and Encapsulation (BTP), as applicable (Reference 2.6), and site disposal requirements.

15.4 CNS will fax or email a copy of the document and mail a copy to SC DES for

their review.

15.5 SC DES will fax or email a response letter and mail a copy to CNS indicating the acceptance/rejection of the shipment.

15.6 Once approval is obtained, the waste will be disposed of.

16 IRRADIATED HARDWARE

16.1 An Irradiated Hardware Liner Inventory Log (Form S20-AD-010-F3) for each shipment of waste containing irradiated hardware must be completed and provided with the waste shipment manifest.

16.2 A Class "C" Waste Classification Record (Form S20-AD-010-F1) for each shipment of waste containing Class C irradiated hardware must be completed and submitted to the Barnwell Licensing Department in accordance with Section 15.

Note: It is recommended that the Barnwell Licensing Department be contacted before processing and/or packaging of hardware begins.

16.3 Waste classification for hardware must be determined using the volume and weight of the waste only. No credit for the waste container volume or container weight can be used.

16.4 Wastes can be classified based on the activity concentration of the highest individual component or radionuclide concentration averaging using the Barnwell Rule of 10.

16.4.1 The Barnwell Rule of 10 is used to compare whole irradiated components for acceptability in blending waste within each package to meet the Class C concentration limits.

16.4.2 The activity of a component such as a control rod blade, which has varying activity levels, is averaged over the entire component volume.

16.4.3 Individual components exceeding Class C concentration limits can be averaged with components that are less than Class C concentration limits provided that their 10 CFR, Part 61, Table I and Table II sum of the fractions do not differ by more than a factor of 10.

16.4.4 All components of the same type (i.e., LPRMs) must have 10 CFR, Part 61, Table I and Table II sums of the fractions within a factor of 10 (Highest/Lowest $\leq$ 10).

16.4.5 Components of different types must have averaged batch Table I and Table II sums of the fractions within a factor of 10 (Highest Batch/Lowest Batch $\leq$ 10).

16.4.6 When concentration averaging is used, the concentration for each component or batch of components in the disposal package must be provided in Form S20-AD-010-F1, Class "C" Waste Classification Record - Example.

16.4.7 Other wastes placed in the disposal container, which does not affect the waste classification is excluded from the Rule of 10. However, these wastes and their activities must be identified in S20-AD-010-F1 and reported on the shipment manifest.

16.5 Waste classification, using the highest individual component, may be determined using the radionuclide concentrations averaged over the entire component volume and weight.

16.6 The final waste classification for each waste package cannot exceed Class C.

17 LARGE COMPONENTS

Large Components are waste items that will not fit into the standard disposal vaults at the BDF. One category of large components must be disposed in concrete disposal vaults and the other category of large components can meet structural stability requirements equivalent to the concrete disposal vaults and therefore are not disposed in concrete disposal vaults. The General Manager should be contacted at (803) 450-2278 regarding disposal contracts and disposal pricing for large components well in advance of the planned shipping date. CNS is responsible for all activities conducted at the BDF for the disposal of large components, including movement inside the fence, equipment for transfer to the disposal location, equipment used for stability in the disposal trench, etc. Coordination of all activities at the BDF must be done with CNS.

17.1 Large Components Disposed in Concrete Vaults

This Category of large components wastes may include oversize boxes, irregular shape packages, large pumps, etc. Case-by-case approval must be obtained from the Barnwell Licensing Department prior to shipping a large component or waste package that exceeds standard vault dimensions. Internal dimensions (ID) for standard vaults are:

Rectangular (ID)	114” (L) x 92” (W) x 112” (H)
Cylindrical (ID)	86” (H) x 84” (D)
Slit Trench (ID)	192” (L) x 48” (W) x 46” (H)

17.2 Concrete disposal vaults can be designed by CNS, approved by DES, fabricated, and used for the disposal of components requiring vaults that are too large for standard size vaults.

17.3 Shipment of large components to be disposed without vaults must be made in accordance with the requirements of Section 18.

18 LARGE COMPONENTS DISPOSED WITHOUT VAULTS

Disposal of components from commercial nuclear reactors are typically part of significant plant projects, which take several years from planning to completion. The General Manager should be contacted at (803) 450-2278 regarding disposal contracts and disposal pricing for very large components. Shortly after the transport and disposal methods for a very large component project are confirmed, customers should make arrangements with CNS to schedule a meeting with SC DES to discuss the project and

the preliminary plans made to date. The following documents and information must be provided to SC DES for review and approval.

18.1 The transportation plan including the transport method and conveyance, notifications to be made, the transportation routes, and estimated schedules.

18.2 The authorization from US DOT and/or US NRC for transportation of the component(s).

18.3 The waste characterization/classification methods and documentation, regardless of the resultant waste class.

18.4 The engineering evaluation demonstrating that the component(s) meet the structural stability requirements for the disposal site.

18.5 The dose assessment, which provides estimates of the personnel and fence line doses from the point of component acceptance through disposal.

18.6 The waste disposal trench modification plan outlining any changes from the existing trench design, access ramps, or site roadways.

18.7 The waste disposal plan describing how the component(s) will be accepted, handled, and disposed within the trench.

18.8 In additions to the requirements specified in Steps 18.1 through 18.7, the shipper must provide CNS with the following information.

18.8.1 The schedule for delivery.

18.8.2 Component and transporter specifications.

18.8.3 A listing of any special equipment that will be needed for movement or offload at the disposal site, and description of plans for procuring the needed equipment.

18.8.4 Description of any unusual requirements for on-site movement, or offload, that may entail cost issues that should be resolved prior to delivery.

18.8.5 Any other information required by SC DES or CNS that is needed for verification for compliance with regulatory requirements.

19 SHIPMENTS NOT AUTHORIZED BY CNS RADIOACTIVE MATERIAL LICENSES

19.1 If a proposed shipment does not conform to the requirements of References 2.1 or 2.2, the Barnwell Licensing Department shall be contacted by the customer and provided with detailed information on the packaging and contents of the shipment.

19.2 The Barnwell Licensing Department should be contacted for the procedures for obtaining a variance. Shipments requiring variances shall be subject to a special surcharge.

20 SHIPMENTS VIOLATING REGULATIONS OR CRITERIA

20.1 The customer shall be notified by telephone of any non-conformance shipment.

20.2 SC DES officials shall be notified of any waste shipments where a violation of applicable regulations or license conditions has been found.

20.3 The customer shall have twenty-four (24) hours to send a representative to inspect the shipment provided the violation is discovered during receipt inspection or early stages of off-loading.

20.4 Twenty-four (24) hours after customer notification, if customer inspection is waived, or if efforts to contact the customer are unsuccessful, the shipment may be off-loaded with SC DES approval.

20.5 If deemed necessary and with the approval of SC DES, the shipment may be returned to the customer.

20.6 The customer shall be billed for any special services/equipment, detention, and additional handling charges on shipments received with violations/discrepancies. The customer will also be billed for waste disposal of any waste generated resulting from a shipment violation/discrepancy.

21 MULTIPLE GENERATOR SHIPMENTS

21.1 In addition to the Barnwell Waste Management Facility Uniform Low-Level Waste Manifest Form 542, shippers with packages containing waste from more than one generator must complete the Typical Waste Package Data Summary - Example (see S20-AD-010-F2) or equivalent. Information required by this section may be provided in any convenient format provided the minimum required information is included.

21.2 The shipper of waste packages containing waste from more than one generator shall provide documentation of the following additional information for each package containing waste from more than one generator (see Reference 2.7):

21.3 The Shipment Identification Number and the Package Identification Number for each package containing waste from more than one generator.

21.4 The Generator Name/SC Transport Permit Number for each generator with waste in the package.

21.5 The radioactivity for each generator’s waste in the package.

21.6 The waste volume of each generator’s waste in the package.

21.7 The waste weight of each generator’s waste in the package.

21.8 The disposal volume of the container (external volume less waste volume).

21.9 The weight of the container (without waste).

21.10 The waste volume plus the allocated container volume proportioned to each generator with waste in the package.

21.11 The waste weight plus the allocated container weight proportioned to each generator’s waste in the container.

21.12 The total package volume and weight (including the container) to allow crosschecking with the Form 541 data.

22 RADIOACTIVE MATERIAL CATEGORY 1 AND CATEGORY 2 SHIPMENTS

22.1 Category 1 and Category 2 shipments are shipments that contain radionuclides and quantities that are listed in Table A of Reference 2.8, which pose a concern for potential malevolent use and potential risk or consequences.

22.2 Shippers preparing waste shipments containing Category 1 or Category 2 to the BDF should be familiar with the shipment requirements specified in Reference 2.8.

Note: Reference 2.8 contains sensitive information that cannot be included in this document.

22.3 The shipper of a Category 1 or Category 2 shipment shall notify the Barnwell Licensing Department in accordance with Reference 2.8 prior to making the shipment to the BDF.

23 NATIONALLY TRACKED SOURCES

23.1 A nationally tracked source, as defined in 10 CFR 20.1003, refers to a sealed source containing a quantity equal to or greater than Category 1 or Category 2 levels of any radioactive material listed in Appendix E to Part 20 – "Nationally Tracked Source Thresholds".

23.2 Effective January 31, 2009, shippers preparing waste shipments containing Category 1 and/or Category 2 nationally tracked sources to the Barnwell Disposal Site shall comply with the reporting requirements specified in Reference 2.3, Section 20.2207 and obtain prior to shipment approval from the Barnwell Licensing Department.

23.3 Prior to shipping, the shippers shall provide the Barnwell Licensing Department the following information for review and approval.

23.3.1 Shipper's name, shipping address, license number, SC Radioactive Waste Transport Permit number, and name of individual preparing the reported information.

Note: If the shipper is a Broker, waste processor, etc., and is not the waste generator, the shipper must also provide the name, shipping address, license number, and SC Radioactive Waste Transport Permit number for each waste generator.

23.3.2 The manufacturer, model, and serial number of the source or, if not available, other information to uniquely identify the source.

23.3.3 The radioactive material in the source and current activity in becquerels and curies. The activity reported must be the same as the activity that will be listed on the shipment manifest.

23.3.4 The date the source strength is reported.

23.3.5 The shipping date and estimated arrival date.

23.3.6 The waste manifest number and the waste disposal container number.

23.3.7 The Barnwell Licensing Department will notify the shipper of each source as being either approved or disapproved for shipment to the Barnwell Site.

23.3.8 Upon source shipment arrival, the Barnwell Licensing Department will complete the source tracking transaction report as required in Reference 2.3, Section 20.2207 by the close of the next business day.

23.3.9 Upon disposal of the sources, the Barnwell Licensing Department will complete the source tracking transaction report as required in Reference 2.3, Section 20.2207 by the close of the next business day.

24 ATTACHMENTS AND FORMS

S20-AD-010-F1, Rev0 Class "C" Waste Classification Record - Example

S20-AD-010-F2, Rev0 Typical Waste Package Data Summary - Example

S20-AD-010-F3, Rev0 Irradiated Hardware Liner Inventory Log - Example

Attachment 24.1, Abbreviations

Attachment 24.2, CNS Telephone Numbers

Attachment 24.3, Instruction for Completing the Barnwell Waste Management Facility Uniform Low-Level Radioactive Waste Manifest Forms

Attachment 24.4, Documentation Required for Class "C" Waste Shipment Acceptance at the Barnwell Site

Attachment 24.5, Barnwell Uniform Low-Level Radioactive Waste Manifest Forms - Example

Attachment 24.6, Displacement of Steel Drums and Standard B-25 Boxes – Drum Volumes

Attachment 24.7, Request Approval for Sealed Source/Special Form Radioactive Material - Example

Attachment 24.8, Lead Shielding Request - Example

S20-AD-010-F1, Rev0 -
CLASS "C" WASTE CLASSIFICATION RECORD - EXAMPLE

Generator Name _____ Shipment ID Number _____

1. Waste Description: _____

2. Volumes/Weight:

   (a) Container Volume (Ft^3): _____

   (b) Waste Volume (cm^3): _____

   (c) Waste Weight (lb): _____

3. Container Type: _____

4. Radiation Levels:

   (a) Maximum Dose Rate of Disposal Container on contact: _____

   (b) At One (1) Foot: _____

5. Total curie content : _____

6. Radionuclide concentrations:

Radionuclides	Each Radionuclide Concentration (microcuries/cc)	Total Activity of Each Radionuclide	Each Transuranic Concentration (nanocuries/gm)

Total Concentration of all Transuranics: _____

S20-AD-010-F1, Rev0 (Continued) -
CLASS "C" WASTE CLASSIFICATION RECORD - EXAMPLE

Generator Name Shipment ID Number

7. Waste Classification Methods:

(a) Describe method: _____

SIGNATURE: _____ DATE: _____

TITLE: _____

COMPANY: _____

S20-AD-010-F2, Rev0 -
Typical Waste Package Data Summary - Example

Shipment Identification Number: _____

Package Identification Number: _____

Generator Name/ SC Transport Permit #	Activity (mCi)	Waste Volume (cu.ft.)	Waste Weight (lbs)	Waste Volume Plus Allocated Container Volume (cu.ft.)	Waste Weight Plus Allocated Container Weight (lbs)
Gen #1		L	R	L + Q(L/P)	R + W(R/V)
Gen #2		M	S	M + Q(M/P)	S + W(S/V)
Gen #3		N	T	N + Q(N/P)	T + W(T/V)
Gen #4		O	U	O + Q(O/P)	U + W(U/V)
Waste Total		P	V	Total Vol (sum of 4 cells above)	Total Weight (sum of 4 cells above)
Disposal Volume of Container (external volume less waste volume)		Q			
Weight of Container (without waste)			W		
TOTAL		P + Q	V + W		

Note: In this example, letter designations are used in some cells and formulas shown in other cells for example purposes.

S20-AD-010-F3, Rev0 - Irradiated Hardware Liner Inventory Log - Example

A. RESPONSIBLE PERSONNEL: All persons entering data on this sheet must complete the following table.

Printed Name	Initials	Signature	Title	Organization

LINER # _____ LINER SER. # _____ Page _____ of _____

The following processed irradiated hardware has been loaded into this liner. Annotate any unused blocks below as N/A.

B. COMPONENT INVENTORY:

	Item Description	ID #	Processor Confirm	Plant Representative Verify
1.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				

C. MISCELLANEOUS COMPONENTS:

	Item Description	ID #	Processor Confirm	Plant Representative Verify
1.				
2.				
3.				
4.				
5.				

D. CERTIFICATION:

Certification is hereby made that this liner has been classified with a classification/characterization program accepted by Chem-Nuclear Barnwell Licensing, has been processed in accordance with procedures approved by the waste generator, contains only the inventory of items listed above, and does not include any spent fuel or fuel bearing components. Furthermore, the shipper certifies that all spent fuel has been physically accounted for at their facility.

_____ _____ _____

Cognizant Waste Generator Representative | Title | Date

Attachment 24.1 - Abbreviations

BTP.....U. S. NRC Concentration Averaging and Encapsulation Branch Technical Position, Rev. 1, Dated: February 2015

C of C .....Certificate of Compliance

CFR .....Code of Federal Regulations

CNS .....Chem-Nuclear Systems

DOE.....Department of Energy (U.S.)

DOT.....Department of Transportation (U.S.)

DPM .....Disintegrations Per Minute

HIC .....High Integrity Container

LPRM.....Low Power Range Monitor

LSA .....Low Specific Activity

NP.....Not Present

NRC.....Nuclear Regulatory Commission (U.S.)

OSHA.....Occupational Safety and Health Administration

PCB .....Polychlorinated Biphenyl

PKG.....Package

PNP.....Prior Notification Plan

RADWASTE .....Low-Level Radioactive Waste

RWTP.....Radioactive Waste Transport Permit

SC DES .....South Carolina Department of Environmental Services

SCO.....Surface Contaminated Object

SITE .....Barnwell Waste Management Facility

SITE CRITERIA.....Barnwell Waste Management Facility Site Disposal Criteria

SM .....Source Material

SNM .....Special Nuclear Material

TCLP .....Toxicity Characteristic Leaching Procedure

Attachment 24.2 - CNS Telephone Numbers

Barnwell Security ..... (803) 541-5004 .....Barnwell, SC

Barnwell Licensing..... (803) 541-5017, 5013, 5009 .....Barnwell, SC

24 Hour Security..... (803) 259-6069 .....Barnwell, SC

General Manager ..... (803) 450-2278 .....Barnwell, SC

BARNWELL FAX NUMBERS

Mail Room..... (803) 259-7230 ..... Barnwell, SC

Licensing..... (803) 259-1744 ..... Barnwell, SC

Attachment 24.3 -
Instructions for Completing the Barnwell Waste Management Facility Uniform Low-Level Radioactive Waste Manifest Forms

Note: Shipments may be refused if contents, supporting documentation, packaging, and all other aspects of the shipment are not in compliance with Chem-Nuclear Systems State and Federal Licenses, the Barnwell Site Criteria (S20-AD-010), 49 Code of Federal Regulations, and 10 Code of Federal Regulations.

I) General Instructions for Completing Forms

1. Computer generated versions of the Barnwell Waste Management Facility Uniform Low-Level Waste Manifest forms may be acceptable, but must be approved by the Licensing Department, Barnwell Waste Management Facility.

   Note: The Uniform Low-Level Radioactive Waste Manifest Forms authorized for shipments to the Barnwell Waste Management Facility have been modified and are not identical to the NRC's generic Uniform Low-Level Radioactive Waste Manifest Forms. The NRC'S generic Uniform Low-Level Radioactive Waste Manifest Forms may not be used for shipments of radioactive waste to the Barnwell Disposal Site.

2. These specific instructions for completing the Barnwell Waste Management Facility Uniform Low-Level Radioactive Waste Manifest must be strictly adhered to. Any deviations from these instructions must be approved by the Licensing Department, Barnwell Waste Management Facility. Additional pertinent information may be included if desired but must be presented in a manner fully compliant with applicable regulations, licenses, and the Barnwell Site Criteria (S20-AD-010).

3. Unless otherwise specified, all blanks must be filled. If a blank is not to be used, the abbreviation "NA" (not applicable) may be used. In some cases, the abbreviation NP (not present) may be used (if specified in these instructions).

4. Forms should be completed in permanent dark blue or black ink. Manual printing, typing, or electronic printer may be used.

5. Continuation lines may be used for redundant entries.

6. For any numerical entry that is < 1.0, use a 0 (zero) prior to the decimal place. For example: 0.8.

7. In general, SI units are the standard unit used on the manifest. Unless specifically instructed otherwise, SI units must be recorded followed by the conventional unit. Measurement units must be indicated for all values recorded. For example, the authorized SI unit for activity used in the manifest is the Megabequerel and the conventional unit is the millicurie. An activity of 1,000 millicuries would be recorded as: 37000 in the MBq column and 1000 in the mCi column.

   Note: Units of measurement are provided in column headings (or row headings) and need not be recorded after each numerical entry. Only those units specified on forms and in these instructions may be used. The use of parenthesis is reserved for certain key entries on these manifest forms. The use of parenthesis for the purpose of indicating a measure in conventional units is not authorized.

8. The use of scientific notation is authorized.

9. The instructions for completing continuation pages (540A, 541A, 542A) are identical to the corresponding items for the associated form.

10. The total nuclide activity (Form 541, Item 1) must be identical to the value recorded as the shipment total (Form 541/541A) and on SC 802 Form, Block Number 20.

11. The following table provides the standard SI units and the standard conventional units to be used in completing these forms. Approved conversion values are provided.

Measurement	**Conventional Unit**	**SI Unit**	**Conversion**
Activity	millicurie (mCi)	Megabecquerel (MBq)	1 mCi =37 MBq
Radiation Level	millirem/hour (mrem/hr)	millisieverts/hour (mSv/hr)	1 mrem/hr = 0.01 mSv/hr
Contamination Level	disintegration per minute per 100 square centimeters (dpm/100 cm^2)	Megabecquerels per 100 square centimeters (MBq/100 cm^2)	1 dpm/100 cm^2 = $1.67E^{-8}$ MBq/100 cm^2
Mass or weight	pound (lb)	Kilogram (kg)	1 lb = 0.4535924 kg
Source Material	pound (lb)	Kilogram (kg)	1 lb = 0.4535924 kg
SNM Grams	NA	grams (g)	NA
Volume	Cubic Foot (ft^3)	Cubic Meter (m^3)	1 ft^3 = 0.02831685 m^3

II) Form Instructions

A) Form 540: Shipping Paper

1) Form 540 must be completed for all shipments.

2) The purpose of this form is to meet the DOT's shipping paper requirements. In addition to the specific instructions listed below, the shipper must ensure full compliance with all applicable requirements of 49 Code of Federal Regulations (transportation).

Item Number	Detailed Instructions- Form 540
1	Record the emergency response telephone number or numbers for use in the event of an emergency. Record the name of the organization (or individual) providing the emergency response information as required by the DOT. **Note: When multiple numbers are applicable Reference NUREG/BR-0204.**
2	Mark the appropriate box "yes" or "no."
3	Record the total number of DOT packages in the shipment. **Note: In the case of waste packages shipped inside a larger package, (example 55-gallon drums contained in a shipping cask - with the cask acting as the "DOT" package), Item 3's entry is the total number of "DOT" packages. In the case of a cask used as the DOT shipping package - it would be "1".**
4	Mark the appropriate box "yes" or "no." Record the EPA Manifest number, if applicable, otherwise record N/A. **Note: The Barnwell Low-Level Waste Facility does not accept mixed or hazardous waste. For additional information, refer to the Barnwell Site Criteria (Section 13.20).**
5	Record the following information: Shipper's Company Name Facility Name Facility Address SC Transport Permit Number: Record the State of South Carolina Radioactive Waste Transport Permit Number. (For example: 0000-00-25-X) Shipment Number: Record a unique number assigned by the Shipper to this shipment for tracking purpose. Contact / Phone Number: The name/phone number of a responsible representative of the shipper's organization who can answer detailed questions concerning the shipment. Shipment ID Number: The Unique Shipment Identification Number assigned to this shipment by the Barnwell Low-Level Waste Facility Licensing Department. Collector/ Processor / Generator: Record an "X" in the appropriate box. Generators must record one of the following codes in the "Generator Type" item: A = University (academic)

Item Number	Detailed Instructions- Form 540
	FC= Fuel Cycle Industry G = Government I = Industrial M = Medical NP = Nuclear Power O = Other
6	Record the following: Carrier's Company Name Carrier's Company Address EPA ID No.: Record the carrier's EPA ID number if applicable, otherwise record N/A. Shipping Date: Record the date that the shipment is released to the carrier for transport. Contact / Phone Number: The name and phone number of a responsible representative of the carrier's organization who can answer detailed questions concerning the shipment. Signature / Date: The signature of an authorized representative of the carrier acknowledging receipt of the waste for the shipment. Record the date that the carrier's signature is affixed.
7	Record the number of pages of each set of forms (i.e., number of 540/540A's, 541/541A's, and 542/542A's). Also, record the number of other pages of additional information. If there are no pages of a given form record "None." If only NRC Form 540 (and 540A, if necessary) is intended to physically accompany the shipment (e.g., the shipper is electronically or otherwise providing NRC Forms 541 and 542 and any additional information separately to the consignee), indicate this by checking the box under "Electronic" for NRC Forms 541, 542, and additional information, as appropriate.
8	Record a unique traceable number comprised of at least four numbers, letters, characters assigned by the shipper. This number should be used on all continuation pages. The shipper may choose to use the same number recorded in Item 5 for "shipment number".
9	Record the following: Barnwell Waste Management Facility Operated by Chem-Nuclear Systems, LLC 740 Osborn Road, Barnwell, South Carolina 29812 Contact: Barnwell Security Telephone Number: (803) 541-5004 Signature / Date: Leave blank for the consignee to complete.
10	The signature of the shipper or authorized representative.

Item Number	Detailed Instructions- Form 540
11	Record the DOT's Basic Shipping Description (UN ID number, PSN, Hazard Class, and if applicable, packing group) for each package. Record any needed additional information as required by 49 Code of Federal Regulations. If the material is a reportable quantity - record RQ as appropriate. If the material is fissile excepted, record Fissile Excepted as appropriate. If the material is fissile record the CSI. Following all DOT information, record a brief waste description. For Example: dry activated waste, dewatered resin, etc. This description should not conflict with any codes recorded on Form 541/541A, Item 11. **Note: When shipping a licensed cask, record the Certificate of Compliance Number and the Model/Serial Number. For example: USA/9168/B(U) 8-120B-1**
12	Record the type of radioactive label that appears on the package. White I Yellow II Yellow III NA If no label is required Fissile If label required For other hazard class labels: Write out the Hazard Class Name, for example, Oxidizer. **Note: Do not record Radioactive-LSA or Radioactive-SCO in this blank**.
13	Record the package TI. If the TI is not required for the package, record "NA."
14	Record the physical form: "Solid," "Liquid," or "Gas" as appropriate Record the predominant chemical form: for example "Oxides." **Note: The Barnwell Waste Management Facility does not accept liquids for additional information; refer to the Barnwell Site Criteria Section 13.5.**
15	List nuclides in the shipping package in accordance with 49 CFR. Separate multiple nuclides with a semicolon. DOT approved abbreviations are authorized.
16	Record the maximum package activity in appropriate SI units followed by appropriate conventional units ( ). Use the SI unit Megabecquerel and the conventional unit Millicurie. For example, 10,000 mCi of activity would be recorded as: 370000 MBq; 10000 mCi (Scientific notation is authorized). **Note: Conventional units must be in parenthesis.**
17	Record the total package weight or volume with appropriate units. You may choose either of two options in completing this item: Use conventional units Use SI units followed by conventional units Example: 2.2 pounds of waste could either be recorded as 2.2 lbs, or if using SI units it would be recorded as 1.0 kg; 2.2 lbs.
18	Record the unique number for each package in the shipment assigned by the shipper. This number should be recorded on the manifest and also marked on the package exterior.
19	South Carolina Certification Statement: Record the date, signature of the shipper, or authorized representative, title and organization, and telephone number.

Item Number	**Detailed Instructions- Form 540**
Consignee Use Only Section	If applicable, enter the Illinois Transaction Reference Number.

B) Form 541, Container and Waste Description:

The Form 541 is required for all shipments.

The purpose of this form is to record the waste data that is required by 10 CFR 20, 10 CFR 61, State Licenses, and the Barnwell Site Criteria (S20-AD-010).

When recording the weight of SNM nuclides the unit of grams (g) is used and it is not necessary to record the number in conventional units.

Exercise caution when choosing the codes found in the notes on the bottom of Form 541. Consult the Barnwell Site License and Barnwell Site Criteria for further guidance or contact the Barnwell Waste Management Facility Licensing Department.

Record the waste form total for Item 15 by recording the word "Total" in Item 15 (radionuclide column) and then recording the total quantity of MBq, mCi, SNM grams and Source Kilograms.

Record the package total for Item 15 by recording the words "Package Total" Item 15 (radionuclide column) and then recording the total quantity of MBq, mCi, SNM grams and Source Kilograms.

Record the shipment total for Items 7, 8, and 15 by recording the words "Shipment Total" as the last row entry in Item 5 on the last 541/541A and then recording the total quantities for Items 7, 8, and 15 in the associated columns.

Item Number	Detailed Instructions - Form 541
1	Record the total number of Packages / Disposal Containers. This may be a different number than recorded on the Form 540, Item 3, when multiple disposal packages are contained within a single DOT package. For example, if multiple waste drums are shipped within an approved shipping cask (using the cask as the DOT package) the correct number for this item is the number of waste drums. Record the total net waste volume in cubic meters and cubic feet. For example, 7.5 ft^3 of waste would be recorded as: 0.2124 m^3 7.5 ft^3. Record the total net waste weight in kilograms and pounds. For example, 500 pounds of waste would be recorded as: 226.8 kg 500.0 lbs. **Special Nuclear Material Entries:** Record the weight in grams for U-233, U-235, and Pu. Record the total number of packages in parenthesis ( ) that contain each quantity of SNM in the same item with the SNM grams for that isotope. For example, a total of 1.0 gram of U-233 shipped in four different packages would be recorded as: 1.0 g (4 pkg.). Include the unit "g" in the entry. The abbreviation pkg. may be used for package. NP may be used for Not Present. Record the grand total of SNM (U-233, U-235, and Pu). Include the unit "g" in the entry.

Item Number	Detailed Instructions - Form 541
	All Nuclides Entry: Record the total activity of all nuclides in Megabecquerels and in millicuries. For example: 50,000 Curies would be recorded as: 1.85E9 MBq; $5E^{7}$ mCi. Radionuclides below LLD should not be included except for H3, C14, TC99, and I129 even if values are LLD or below. **Tritium, C^{14}, Tc^{99}, and I^{129} Entries:** Record the activity of Tritium, C^{14}, Tc^{99}, and I^{129} in Megabecquerels and in millicuries. For example: 5 millicuries of C14 would be recorded as: 185.0 MBq; 5.0 mCi. If the radionuclide is not present in the shipment record "NP" for not present. If the radionuclides are present in any of the containers within a shipment but are identified in Item 16 in quantities below the Lower Limit of Detection (LLD), the quantities of these nuclides must be recorded in parenthesis. For example: if one of the radionuclides was <LLD and had an LLD value of $1E^{-10}$ millicuries, this would be recorded as ($3.7E^{-9}$ MBq; $1E^{-10}$ mCi). The activities for the shipment reported in Item 1 should include the sum of the activity developed based on measurements, LLD values, and indirect methods, as applicable. If any portion of the reported activity was determined based on LLD values or indirect methods, mark the reported activity with an asterisk and provide additional details on the method used to determine the activity under Item 16. **Source Pound Entries**: Record the total source weight in kilograms (kg) and pounds (lbs). For example, if 100 pounds of source material was being shipped this entry would be: 45.36 kg; 100.0 lbs.
2	Transfer the manifest number from Form 540, Item 8.
3	Record the total number of Form 541 or 541A pages.
4	Transfer the shipper's name and Shipment ID Number from Form 540, Item 5.
5	Record a unique disposal container identification number. This entry is assigned by the shipper and may be alphanumeric. Record the unique State of South Carolina's Radioactive Waste Transport Permit number of the generator(s) contributing waste to a disposal container. **Note: Each container number on a shipment must be unique.** **Only one generator may be listed per row. Items 5-11 & 17 data represents the total disposal container, while Items 12-16 are on a per generator and per waste form basis.** **Generators with multiple facility locations utilizing the same SC Transport Permit Number must indicate the facility address in this block.** **For process/collected waste, identify the state of origin for all waste.**

Item Number	Detailed Instructions - Form 541
6	Using the codes found in Note 1 and Note 1A on the bottom of the Form 541, record the type of disposal container. Choose only one code from Note 1 and only one code from Note 1A. For example, a metal box would be assigned the code 2. If the container requires disposal in a structural overpack to provide structural stability, the suffix "-OP" should be recorded after the code. **Note: The "-OP" designator should be used when the structural overpack is required for the package to achieve structural stability as defined in 10 CFR 61. The "-OP" designator is always required for stable waste in a HIC (Code 13). Thus, the final code would by 13-A-OP.** **Information regarding acceptable stable waste forms/packages can be found in the Barnwell Site Criteria (S20-AD-010) or by contacting the Barnwell Waste Management Facility Licensing Department.** When CNS Grapple Bail Liners are used, "GRAPPLE" is required to be identified. Liners containing non-CNS Grapple Bails must have appropriate lifting Cables attached in accordance with Step 11.5. When any poly or metal liner, pressure vessel, or high integrity container is used, identify the manufacturer, the model number, the manufacturer's serial number, and the Certificate of Compliance number for the container, if applicable. When code 19 (other) is used, describe the container in Item 6. If necessary to adequately describe the container, the entry "see additional page" may be recorded in this item. The container should then be described on the additional page and that page count recorded on the Form 540, Item 7.
7	Record the waste container disposal volume using the SI unit cubic meter (m^3) and the conventional unit cubic feet (ft^3). For example, a 300 ft^3 waste container would be recorded as: 8.495 m^3; 300 ft^3. Standard container volumes for common containers and directions for determining non-standard container dimensions are specified in the Barnwell Site Criteria. (S20-AD-010) **Note: For processed and collected waste, the value recorded in Item 12 must include an allocation for the packages volume. The sum of the individual generator volumes (Item 12) must equal the package volume (Item 7).** Record the shipment total for Items 7, 8, and 16 by recording the words "Shipment Total" as the last row entry in Item 5 on the last 541/541A and then recording the total quantities for Items 7, 8, and 16 in the associated columns.
8	List the weight of the waste plus disposal container in the SI unit kilograms (kg) and the conventional unit pounds (lbs). For example, a 5,000 lbs package would be recorded as: 2270 kg; 5000 lbs. Record the shipment total for Items 7, 8, and 16 by recording the words "Shipment Total" as the last row entry in Item 5 on the last 541/541A and then recording the total quantities for Items 7, 8, and 16 in the associated columns.
9	List the weight of the waste in the SI unit kilograms (kg) and the conventional unit pounds (lbs). For example, a 5,000 lbs package would be recorded as: 2270 kg; 5000 lbs.

Item Number	Detailed Instructions - Form 541
	Record the shipment total for Items 7, 8, and 16 by recording the words "Shipment Total" as the last row entry in Item 5 on the last 541/541A and then recording the total quantities for Items 7, 8, and 16 in the associated columns.
10	Record the highest radiation level on contact with the disposal container in SI units of millisieverts (mSv/hr) and conventional units of millirem (mrem/hr). For example, a package that has a maximum radiation reading of 195 mrem/hr would be recorded as: 1.95 mSv/hr; 195 mrem/hr. **Note: "BKG" should not be used.**
11	Record the highest contamination levels anticipated on the exterior of the disposal container in the SI unit of Megabecquerel per 100 square centimeters (MBq/100 cm^2) and the conventional units of disintegration per minute per 100 square centimeters (dpm/100 cm^2). For example: Contamination levels of 100 dpm/100 cm^2 would be recorded as 1.67E-6 MBq/100 cm^2; 100 dpm/100 cm^2. Do not use BKG for background unless the level is recorded also. **Note: "BKG" should not be used.**
12	Using the codes found in Note 2 and Note 2A at the bottom of the Form 541, record the codes that most specifically describe the type of waste in the container. Choose up to three Note 2 codes, which predominate by volume. Choose all Note 2A codes that are applicable. For example, a dewatered mixed-resin waste might be assigned the codes 32, G, H, and I depending on the unique characteristics of the waste. For different waste forms contained in the same disposal container, the codes should be associated with the rest of the description required in items 12-16 for each listed waste form. Discrete waste forms, in significant quantities, must be individually identified and described in Items 11-15. Discrete waste forms that must be described individually are: Resin (Code 30, 31, 32); Dry Active Waste (Codes 35, 39, 40); Filter Media used in liquids (this does not include resins or aqueous filters): (Codes 26, 20); Cartridge/Mechanical Filters -Aqueous (Code 27); Solidified Liquids (Code 25 and Code 90 in Item 13; Code 38 and Code 90 in Item 13); Equipment/Components (Code 33, 43); Bulk Waste (Code 11 in Item 6); Biological Materials (Codes 41, 42); Ash (Code 21); Air Filtration Filters (Code K); Asbestos (Code L); Combustibles (Code I); Non-combustibles (Code J, 22, 29); Sources (Code 36). If code 59 (other) is used, a written explanation is required. This additional explanation may be recorded in item 12 or the entry "see additional page" may be recorded and an additional page attached. The additional page must be included in the Form 540 Item 7-page counts.
13	Record the volume in the SI unit of cubic meters and the conventional unit of cubic feet of the waste per generator and per waste form not to exceed three digits past the decimal. (Example 0.001)
14	Using the codes found in Note 3 and Note 3A on the bottom of Form 541, record the codes that apply. In addition, the media vendor and brand name must be recorded in this column as well.

Item Number	Detailed Instructions - Form 541
	If the media is intended to provide stability for the waste in accordance with 10CFR61, State, and Site requirements, the entry "-S" must be recorded following the appropriate code. For all solidification or stabilization media, also record the vendor (manufacturer) and brand name. If code 99 (other) is used a written explanation is required. This additional explanation may be recorded in Item 14 or the entry "see additional page" may be recorded and an additional page attached. The additional page must be included in the Form 540 Item 7-page counts.
15	List the most prevalent chemical form of the waste. Information in Item 15 should expand upon the entry on the Form 540, Item 14. Record significant chemicals like lime if used. Record the name of chelating agents that are present in amounts greater than 0.1% by weight of the waste. In the associated column, record the weight % of the chelating agent if >0.1%. If no chelating agents are present record "NP" for not present in both sub columns of Item 15. If large processes using chelating agents were used record the process name. Use additional sheets as needed. Record additional page counts on the Form 540, Item 7.
16	List all significant radionuclides (approved abbreviations are authorized) and the nuclide's activity in Megabecquerels followed by the millicurie value. For example: 1.0 mCi (millicuries) of Cs^{137} would be recorded as follows: Cs^{137} 37 MBq; 1.0 mCi. If the waste in the container is from multiple generators or is of multiple waste forms, the radionuclides must be broken down to the corresponding generator and waste form with totals for each waste stream, and for each generator specifically. When the radionuclides tritium (H-3), C-14, Tc-99, or I-129 are present, but the quantities are below the LLD, note the radionuclide and report the LLD value in parentheses ( ). If the activity is based on Indirect Methods, the activity should be marked by the use of a pound (#) sign. For an example see Table 1 from Reference 2.14. After listing the individual radionuclides as described above, enter the word "Total" on a new line and enter the total activity contained in the container. After listing all the package's radionuclides as described above, record the word "Total" on a new line and record the total activity in the package. **Note: The activity for uranium and thorium in source material and U-233, U-235, and plutonium in special nuclear material must be reported in Megabecquerels and millicuries. The quantity of these isotopes must be reported, in kilograms for source material -- including the abbreviation "kg," and in grams for special nuclear material -- including the abbreviation "g." The weight quantities must be reported in brackets [ ], either adjacent to the activity listing or below the radionuclide listing.** Record the shipment total for Items 7, 8, and 16 by recording the words "Shipment Total" as the last row entry in Item 5 on the last 541/541A and then recording the total quantities for Items 7, 8, and 16 in the associated columns.
17	Record the waste classification and the stability of the waste using the appropriate code provided in Item 17 for the most restrictive waste stream.

C) Form 542 - Manifest Index and Regional Compact Tabulation

Form 542 is required for all waste shipments that are processed or collected.

Note: Any shipment that requires a Form 542 must comply with Section 21.

Item Number	Detailed Instructions - Form 542
1	Record the collector or processor's name. Record the collector or processor's SC Radioactive Waste Transport Permit Number. Record the shipping date.
2	Transfer the manifest number from the Form 540, Item 8.
3	Record the total number of 542 and 542A pages.
4	In each row, record one generator's South Carolina Waste Transport Permit Number and one waste form. Use as many rows as is needed to uniquely record each waste form that the generator is shipping. For each waste form entry, record all entries as required in Form 542 columns 5-11F. Discrete waste forms that must be described individually are: Resin (Code 30, 31, 32); Dry Active Waste (Codes 35, 39, 40); Filter Media used in liquids (this does not include resins or aqueous filters): (Codes 26, 20); Cartridge/Mechanical Filters-Aqueous (Code 27); Solidified Liquids (Code 25 and Code 90 in Item 13; Code 38 and Code 90 in Item 13); Equipment/Components (Code 33, 43); Bulk Waste (Code 11 in Item 6); Biological Materials (Codes 41, 42); Ash (Code 21); Air Filtration Filters (Code K); Asbestos (Code L); Combustibles (Code I); Non-combustibles (Code J, 22, 29); Sources (Code 36). Ensure that all generators whose waste is being shipped are represented.
5	Record the generator name and telephone number.
6	Record the complete address of the generator's facility.
6A	Record the waste description nomenclature. For example, dewatered resin encapsulated, sources (unless placed in a HIC), dry activated waste, etc.
7	Record the approximate volume in cubic meters followed by the cubic feet (not including the container) of the preprocessed waste. For example, a waste that was 96 ft^3 prior to processing would be recorded as: 2.72 m^3; 96 ft^3.
8	List the previous manifest number(s) applicable to the waste that has been attributed to the generator listed in Item 5. Record the date(s) of waste receipt by the shipper identified on Form 540, item 5.
9	Record the proper waste code, "P" or "C" using the definitions of waste processor and waste collector in Appendix G of 10 CFR Part 20. Do not mix processed and collected waste on the same line - list separately.
10	Identify the originating State of the original generator of the waste. Standard state abbreviations may be used.

Item Number	Detailed Instructions - Form 542
11	For each original generator and waste form listed in Item 5, list the total source material in kilograms and in pounds. For each original generator and waste form listed in Item 5, list the total special nuclear material in grams. For each original generator and waste form listed in Item 5, list the total activity attributed to the generator in Megabecquerels and in millicuries. For each original generator and waste form listed in Item 5, list the volume attributed to the generator in cubic meters and in cubic feet. For each original generator and waste form listed in Item 5, list the weight attributed to the generator in pounds. (SI units are not required for this entry.) For each original generator and waste form listed in Item 5, list the maximum surface radiation level for the package that this waste is packaged in. Record in units of millirem per hour. (SI units are not required for this entry.) Record the totals for columns 11A-11E for each generator by drawing a horizontal line below the last entry for the generator and entering the generator column totals. Record the overall column totals at the bottom of the Form 542.

Attachment 24.4 - Documentation Required for Class "C" Waste Shipment Acceptance at the Barnwell Site

These instructions outline documentation required for Class C waste shipment acceptance. This documentation is required in addition to other applicable requirements of S.C. License 097, Barnwell Site Criteria and State and Federal regulations. Waste classification must be performed in accordance with SC License 097 (Reference 2.1). This additional information will be used to evaluate the shipment for acceptance. In order to have consistency, the information provided on the attached form, or equivalent, shall be completed and sent with each shipment.

Waste, other than irradiated hardware or sources, shall be classified in accordance with Section 15. A more detailed explanation is provided in the NRC Low Level Waste Licensing Branch Technical Position on Radioactive Waste Classification (Reference 2.6).

For irradiated hardware, classification must be performed in accordance with Section 16.

For Sources, classification must be performed in accordance with Section 13.4.

1. **Waste Description**

   The item, component, or medium in which the radioactivity is present, and the physical nature of the waste should be described. Example: 5 control rod blades, 25 dewatered filters, etc.

2. **Container Volume/Weight**

   The disposal volume (ft^3) is used to determine allocations, waste densities, and disposal fees. The volume and weight of waste materials only shall be used in determining radionuclide concentrations.

3. **Container Type**

   The disposal container should be clearly identified in terms of its size, composition, and construction.

4. **Radiation Levels**

   The maximum disposal container dose rate (1) on contact and (2) in air at one foot shall be clearly stated.

5. **Total Curie Content**

   Self-explanatory

6. **Radionuclide Concentrations**

A detailed list of the concentrations of contained radionuclides in microcuries per cubic centimeter and concentrations of each transuranic radionuclide in nanocuries per gram shall be provided. The total activity of each radionuclide in the waste material shall also be given.

7. **Waste Classification Method**

The methods used to calculate radionuclide concentrations in Class C waste shall be specified. Indicate if the waste was classified using the BTP, Barnwell Rule of 10, etc.

Attachment 24.5 –
Barnwell Uniform Low-Level Radioactive Waste Manifest Forms - Example

FORM 540 BARNWELL WASTE MANAGEMENT FACILITY

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST
SHIPPING PAPER

1. Emergency Telephone Number (Include area code)

Organization

2. Is this an "Exclusive Use" Shipment? ☐ Yes ☐ No

3. Total Number of packages identified on this manifest?

4. Does EPA regulated waste requiring a manifest accompany this shipment? (If "Yes," provide Manifest Number). ☐ Yes ☐ No

EPA Manifest Number

5. Shipper - Name and Facility

Shipment ID Number

☐ Collector ☐ Processor ☐ Generator Type (Specify)

S.C. Transport Permit Number | Shipment Number

Contact | Phone No (Include Area Code)

6. Carrier - Name and Address

EPA I.D. Number

Shipping Date

Contact | Phone No (Include Area Code)

Signature - Authorized carrier acknowledging waste receipt | Date

7. Form 540 and 540A Page 1 of ____Page(s) Reviewer ☐
Form 541 and 541A ____Page(s) ☐
Form 542 and 542A ____Page(s) ☐
Additional Information ____Page(s) ☐

8. Manifest Number

9. Consignee - Name and Facility Address
EnergySolutions/Chem-Nuclear Systems, LLC
Barnwell Waste Management Facility
740 Osborn Road
Barnwell, SC 29812

Contact: Barnwell Security
Phone No (Include Area Code): (803) 541-5004

Signature - Authorized consignee acknowledging waste receipt | Date

10. CERTIFICATION

"This is to certify that the herein-named materials are properly classified, described, packaged, marked and labeled, and are in proper condition for transportation according to the applicable regulations of the Department of Transportation, the Commission, and equivalent state regulations. For materials that are consigned to a land disposal facility or waste collector, this certifies that the materials are classified per the applicable requirements of 10 CFR Part 61, meet the land disposal facility's waste acceptance criteria, and are in proper condition for disposal as described in accordance with the applicable requirements of 10 CFR Parts 20 and 61, or equivalent state regulations. A collector in signing the certification is certifying that nothing has been done to the collected waste which would invalidate the waste generator's certification."

Authorized Signature and Title | Date

11. U.S. Department of Transportation Description (Including UN ID number, proper shipping name, hazard class, and any additional information)	12. DOT Labels	13. Transport Index	14. Physical and Chemical Form	15. Individual Radionuclides	16. Maximum Package Activity (MBq) (mCi)	17. Total Weight or Volume (Use appropriate units)	18. Identification Number of Package

For Consignee Use Only

19. "Certification is hereby made to the South Carolina Department of Health and Environmental Control that this shipment of low-level radioactive waste has been prepared in accordance with a radioactive waste management program which has been approved by the Nuclear Regulatory Commission or an Agreement State regulatory agency and has been inspected in accordance with the requirements of South Carolina Radioactive Materials License No. 097 as amended, and the effective Barnwell Site Disposal Criteria within 48 hours prior to shipment, and further certification is made that the inspection revealed no items of non-compliance with all applicable laws, rules and regulations."

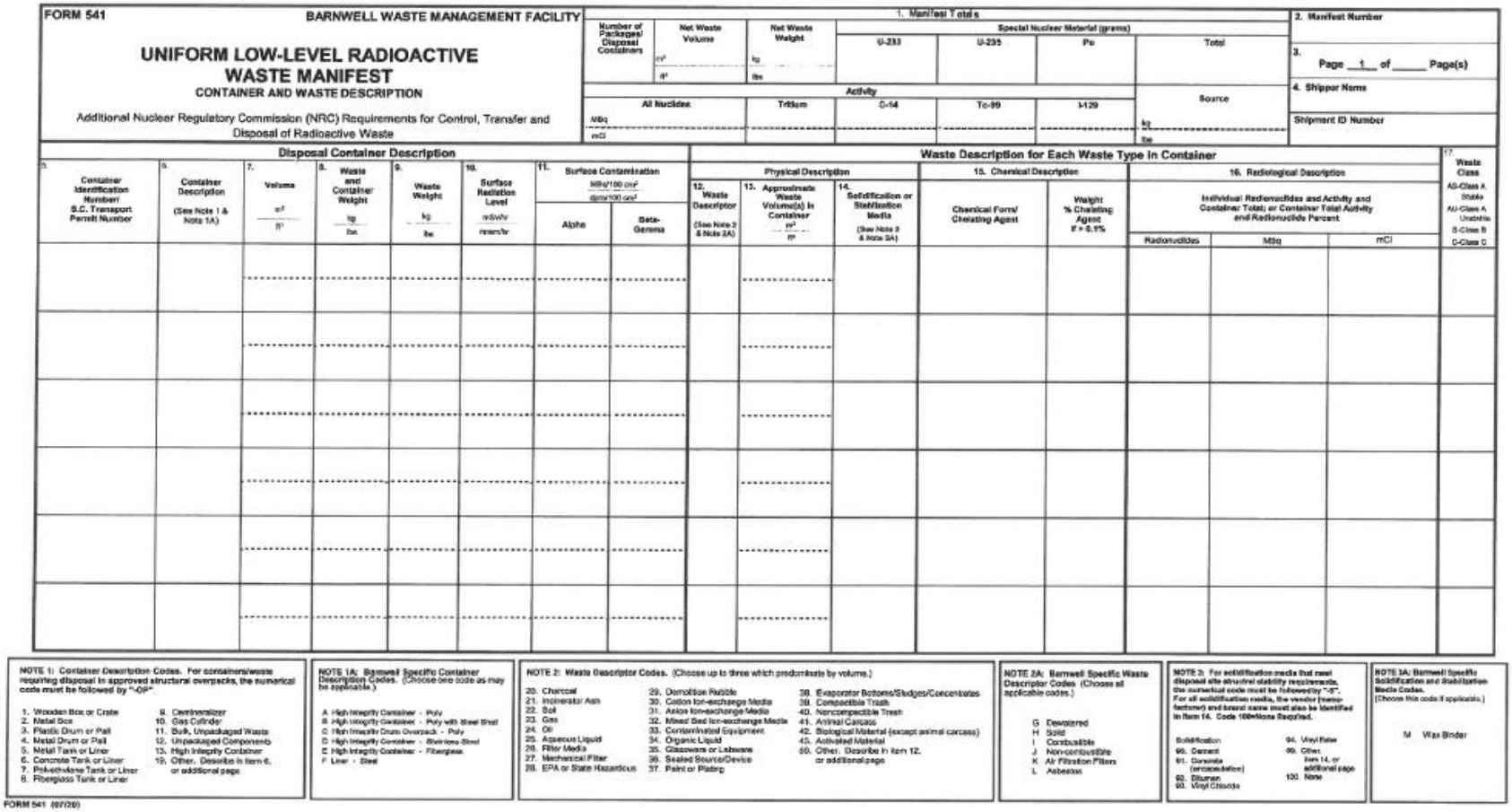
Date _____ Signature _____

Title and Organization _____

Telephone No. ( ) _____

FORM 540 (07/10)

Attachment 24.5 (continued)
Barnwell Uniform Low-Level Radioactive Waste Manifest Forms - Example



FORM 541 BARNWELL WAFACILITY

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST
CONTAINER AND WASTE DESCRIPTION

Additional Nuclear Regulatory Commission (NRC) Requirements for Control, Transfer and Disposal of Radioactive Waste

1. Manifest Totals — Number of Packages/ Disposal Containers; Net Waste Volume; Net Waste Weight; Special Nuclear Material (grams): U-233, U-235, Pu, Total; Activity: All Nuclides, Tritium, C-14, Tc-99, I-129, Source

2. Manifest Number

3. Page 1 of _____ Page(s)

4. Shipper Name

Shipment ID Number

Disposal Container Description

5. Container Identification Number/ S.C. Transport Permit Number	6. Container Description (See Note 1 & Note 1A)	7. Volume	8. Waste and Container Weight	9. Waste Weight	10. Surface Radiation Level	11. Surface Contamination Alpha	11. Surface Contamination Beta-Gamma

Waste Description for Each Waste Type In Container

12. Waste Descriptor (See Note 2 & Note 2A)	13. Approximate Waste Volume(s) in Container	14. Solidification or Stabilization Media (See Note 3 & Note 3A)	15. Chemical Description: Chemical Form/ Chelating Agent	15. Chemical Description: Weight % Chelating Agent If > 0.1%	16. Radiological Description: Individual Radionuclides and Activity and Container Total; or Container Total Activity and Radionuclide Percent: Radionuclides	MBq	mCi	17. Waste Class (A1-Class A Stable; A2-Class A Unstable; B-Class B; C-Class C)

NOTE 1: Container Description Codes. For containers/waste requiring disposal in approved structural overpacks, the numerical code must be followed by "-OP".

1. Wooden Box or Crate
2. Metal Box
3. Plastic Drum or Pail
4. Metal Drum or Pail
5. Metal Tank or Liner
6. Concrete Tank or Liner
7. Polyethylene Tank or Liner
8. Fiberglass Tank or Liner
9. Demineralizer
10. Gas Cylinder
11. Bulk, Unpackaged Waste
12. Unpackaged Components
13. High Integrity Container
19. Other. Describe in Item 6, or additional page

NOTE 1A: Barnwell Specific Container Description Codes. (Choose one code as may be applicable.)

A. High Integrity Container - Poly
B. High Integrity Container - Poly with Steel Shell
C. High Integrity Drum Overpack - Poly
D. High Integrity Container - Stainless Steel
E. High Integrity Container - Fiberglass
F. Liner - Steel

NOTE 2: Waste Descriptor Codes. (Choose up to three which predominate by volume.)

20. Charcoal
21. Incinerator Ash
22. Soil
23. Gas
24. Oil
25. Aqueous Liquid
26. Filter Media
27. Mechanical Filter
28. EPA or State Hazardous
29. Demolition Rubble
30. Cation Ion-exchange Media
31. Anion Ion-exchange Media
32. Mixed Bed Ion-exchange Media
33. Contaminated Equipment
34. Organic Liquid
35. Glassware or Labware
36. Sealed Source/Device
37. Paint or Plating
38. Evaporator Bottoms/Sludges/Concentrates
39. Compactible Trash
40. Noncompactible Trash
41. Animal Carcass
42. Biological Material (except animal carcass)
45. Activated Material
50. Other. Describe in Item 12, or additional page

NOTE 2A: Barnwell Specific Waste Descriptor Codes (Choose all applicable codes.)

G. Dewatered
H. Solid
I. Combustible
J. Non-combustible
K. Air Filtration Filters
L. Asbestos

NOTE 3: For solidification media that meet disposal site structural stability requirements, the numerical code must be followed by "-S". For all solidification media, the vendor (manufacturer) and brand name must also be identified in Item 14. Code 100=None Required.

Solidification
90. Cement
91. Concrete (encapsulation)
92. Bitumen
93. Vinyl Chloride
94. Vinyl Ester
99. Other. Item 14, or additional page
100. None

NOTE 3A: Barnwell Specific Solidification and Stabilization Media Codes. (Choose this code if applicable.)

M. Wax Binder

FORM 541 (07/20)

Attachment 24.5 (continued)
Barnwell Uniform Low-Level Radioactive Waste Manifest Forms - Example

FORM 542 BARNWELL WASTE MANAGEMENT FACILITY

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

MANIFEST INDEX AND REGIONAL COMPACT TABULATION

List all original "Processed Waste" generators (if any) before "Collected Waste" generators.

1. Waste Collector/Processor

Name

S.C. Transport Permit Number

Shipping Date

Shipper Use Only

2. Manifest Number

3. Page 1 of _____ Page(s)

4. S.C. Transport Permit Number	5. Generator Name and Telephone Number	6. Generator Facility Address	6A. Waste Description (Nomenclature)	7. Preprocessed Waste (or material) Volume (m^3)	7. Preprocessed Waste (or material) Volume (ft^3)	8. Manifest Number(s) Under Which Waste (or material) Received and Date of Receipt	9. Waste Code P=Processed C=Collected	10. Originating Compact Region or State	11. As Processed/Collected Total A. Source Material (kg)	A. Source Material (lbs)	B. SNM (g)	C. Activity (MBq)	C. Activity (mCi)	D. Volume (m^3)	D. Volume (ft^3)	E. Weight (lbs)	F. Maximum Package Surface Radiation Level (mrem/hr)
Totals of All Pages (542 and 542A)																	N/A

FORM 542 (07/20)

Attachment 24.6 -
Displacement of Steel Drums and Standard B-25 Boxes – Drum Volumes

4-GALLON DRUM0.55 CUBIC FEET
5-GALLON DRUM0.68 CUBIC FEET
16-GALLON DRUM2.00 CUBIC FEET
30-GALLON DRUM4.10 CUBIC FEET
52-GALLON DRUM7.10 CUBIC FEET
55-GALLON DRUM7.50 CUBIC FEET
60-GALLON DRUM8.20 CUBIC FEET
70-GALLON DRUM9.60 CUBIC FEET
79-GALLON DRUM10.80 CUBIC FEET
83-GALLON DRUM11.30 CUBIC FEET
85-GALLON DRUM11.60 CUBIC FEET
89-GALLON DRUM12.10 CUBIC FEET
96-GALLON DRUM13.10 CUBIC FEET
110-GALLON DRUM15.00 CUBIC FEET

Note: To obtain a volume for a drum other than listed above, contact the Barnwell Licensing Department.

BOX VOLUMES

* STANDARD B-25 BOX _____ 95 CUBIC FEET

* Volumes for other B-25 type boxes (i.e.: type A, drum overpacks, etc.) are to be obtained through the use of Section 7, Volume and Weight Measurement Criteria.

Attachment 24.7 -
Request Approval for Sealed Source/Special Form Radioactive Material - Example

Date:

Licensing Department
Chem-Nuclear Systems
740 Osborn Road
Barnwell, SC 29812

Dear Sir:

Customer Name requests approval for the source(s) described below. These items will be placed in a DOT certified shipping container and surrounded on all sides with cement encapsulation media, with a minimum compressive strength of at least 2500 psi. The minimum encapsulation will be four inches.

Waste Form and General Description:

Isotope (Per Source):

Activity (Per Source):

Generator (Atlantic Compact Generators Only) and Address:

If you have any additional questions, please feel free to contact me.

Sincerely,

Signature of Customer

Attachment 24.8 -
Lead Shielding Request - Example

Lead used for radiation shielding purposes may be acceptable for disposal at the Barnwell Disposal Facility. Requests for acceptance of non-radioactively contaminated lead, specifically used for shielding purposes, must be evaluated by CNS to ensure regulatory compliance. In order for Chem-Nuclear to evaluate your request, please provide the following information prior to making waste shipments containing lead shielding.

1. Type of lead used (sheet, shot, etc.,).

2. Amount of lead used (pounds/thickness): please provide a detailed sketch of the waste packaging specifically showing the location and thickness of the lead.

3. Container type and size (can be shown in sketch).

4. Location of lead in container, i.e.: top, bottom, sides (can be shown in sketch).

5. Description of waste requiring shielding (waste form, total activity, isotopic distribution, and total volume).

6. Waste classification (A, B, or C).

7. Approximate radiation dose rate prior to shielding.

8. Appropriate radiation dose after shielding.