ENERGYSOLUTIONS

DF-AD-009

Barnwell Processing Facility
Radioactive Material Acceptance Criteria

Revisions to this procedure must be evaluated per the requirements of SC DHEC License No. 287-04, Condition 25B.

Revision 18

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1. PURPOSE AND SCOPE

1.1 Purpose

Energy*Solutions*/Barnwell Processing Facility (BPF) accepts radioactive material and/or waste for processing and storage. This document outlines the responsibilities of the customer and the BPF and describes what constitutes an acceptable shipment for receipt at the BPF.

1.2 Scope

This document applies to any individual shipping radioactive material and/or waste to the BPF and to personnel involved with shipping and receiving shipments for processing at the BPF. A copy of the Acceptance Criteria should be retained by the customer's employees responsible for the packaging and shipping to the BPF.

Any questions regarding the facility acceptance criteria or processing capabilities, prior notification requirements, or shipment scheduling should be directed to the Licensing Department [Telephone: (803) 541-5017 or (803) 541-5013] unless otherwise specified.

2. REFERENCES

All customers shipping radioactive material to the BPF shall comply with the following applicable documents:

2.1 South Carolina Department of Health and Environmental Control (DHEC) Radioactive Material License, 287-04, as amended

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

2.3 Code of Federal Regulations, CFR Title 10

2.4 SC DHEC Regulation 61-83, Transportation of Radioactive Waste into or within South Carolina

2.5 SC DHEC Regulation 61-63, Title A, Radioactive Materials

2.6 Code of Federal Regulations, CFR Title 29

2.7 Code of Federal Regulation, CFR Title 40

2.8 DF-AD-010, Barnwell Processing Facility Radioactive Material Inventory and Control Procedure

2.9 S20-RP-036, Barnwell Processing Facility Radiation Safety Radioactive Material Receipt and Release Operations

2.10 SC DHEC Regulation 61-79, Hazardous Waste Management

2.11 S20-AD-015, Barnwell Processing Facility Waste Testing Laboratory Procedure

2.12 S20-RP-009, Radiation Work Permit

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

2.14 NUREG/BR-0204, Instructions for Completing the USNRC Uniform Low-Level Radioactive Waste Manifest

3. GENERAL

3.1 Definitions

3.1.1 *Enterprise Waste Tracking (EWT)* - Energy*Solutions* waste tracking database used to enter and track waste and radioactive material shipments from receipt to processing, storage, and disposal.

3.1.2 *BPF Shipment Number (SN)* - Unique number issued by EWT for each scheduled inbound radioactive waste/material shipment.

3.2 Responsibilities

None

3.3 Precautions and Limitations

None

3.4 Records

None

4. REQUIREMENTS AND GUIDANCE

4.1 General Information

4.1.1 BPF Address and Telephone Numbers

For questions regarding shipments or notification of shipping schedules, the following address and telephone numbers are provided:

Energy*Solutions*, LLC
Barnwell Processing Facility
16043 Dunbarton Boulevard
Barnwell, South Carolina 29812
General Manager (803) 450-2278 or (803) 541-5004
Fax 803-541-7302

4.1.2 **Normal Hours of Operation**

The normal hours of operation are Monday through Thursday, 6:00 a.m. to 4:30 p.m. (Eastern Time).

4.1.3 **Holidays**

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

New Year's Day
Presidents' Day
Memorial Day
Independence Day
Labor Day
Thanksgiving Day and the day after
Christmas Day and the day before or after

The facility will normally be closed all three days during a three-day weekend holiday.

4.1.4 **Pre-Shipment Requirements**

The BPF accepts radioactive waste/material by rail or highway in accordance with State and Federal regulations. The following requirements shall be met before shipping any radioactive material/waste to the BPF.

4.1.4.1 Before the receipt of any radioactive material, a contract, purchase order, or a written letter of authorization in a form and substance acceptable to Energy*Solutions* certifying compliance with this procedure, Reference 2.1, and any subsequent changes, should be in the possession of Energy*Solutions* Contracts Department and/or the BPF.

Note: The contract shall specify that the customer possesses a radioactive material license or other authorization allowing the return of material.

4.1.4.2 The generator shall ensure that all applicable export authorization documentation has been obtained in accordance with the requirements of the generator's compact commission.

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

4.1.4.4 All waste generators, waste collectors, and waste processors, unless otherwise exempted by the State of South Carolina, shall have a valid SC Radioactive Waste Transport Permit (Reference 2.4). The listing of effective permits shall be maintained at the Barnwell Complex and verified by the Licensing Department and/or General Manager before granting a BPF Shipment Number (SN).

4.1.4.4.1 Before any shipper/generator, waste collector, or processor transports or causes to be transported radioactive waste into the State of South Carolina, they shall obtain a Radioactive Waste Transport Permit (RWTP) from the South Carolina Department of Health and Environmental Control (SC DHEC). Shipper/generator, waste collectors, and processors shall ensure that the RWTP is current and valid.

4.1.4.4.2 For each restricted waste transport permit, the broker/shipper shall ensure that they are listed as an authorized Broker of the RWTP.

4.1.4.4.3 All applications for a RWTP should be completed, signed, and received by SC DHEC 30 days before shipping date.

4.1.4.4.4 Permit Fees will be annually determined and assessed by SC DHEC based on the following classifications.

4.1.4.4.4.1 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.

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

4.1.4.4.4.3 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.

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

S.C. Department of Health & Environmental Control
Infectious & Radioactive Waste Management Section
Division of Waste Management
Bureau of Land & Waste Management
2600 Bull Street
Columbia, South Carolina 29201

Telephone: (803) 898-0422 or 0239
Fax Number: (803) 898-0391

4.1.4.5 All shippers shall obtain a BPF SN from the Licensing Department [(803) 541-5017 or 5013] prior to shipping.

Note: The Licensing Department shall obtain approval from General Manager or designee prior to issuance of a BPF SN to a shipper.

4.1.4.6 The BPF SN shall be placed in the Shipment ID Number Section of the shipping papers to provide verification to the BPF receiving personnel that the radioactive material/waste shipment has been authorized.

4.1.4.7 Radioactive waste shipments or radioactive material shipments that arrive at the BPF without a BPF SN shall NOT be accepted.

4.1.4.8 All radioactive shipments shall be packaged, labeled, marked, and accompanied by proper shipping papers, in accordance with References 2.2, 2.3, 2.6, and 2.7, as applicable.

4.1.4.9 The waste class (A-U, A-Unstable, A-S, A-Stable, B, or C) shall be marked on top of the waste disposal container.

Note: Waste shipping to Thermex for processing does not require waste classification to be marked on top of the waste container or shipping container (tanker).

Note: Navy shipments being sent for Dewater processing do not require waste classification to be marked on top of the waste/shipping container. The inbound waste/shipping container will not be the final disposal container.

Note: If waste disposal containers cannot be marked with proper waste class due to ALARA concerns, contact the Licensing Department for variance from above requirement. Variance approval shall be noted in the "FOR CONSIGNEE USE ONLY" section of Form 540.

4.1.4.10 Shipments arriving at the BPF must be properly blocked, braced, and secured. Shippers should verify that their shipments meet the applicable requirements in accordance with Reference 2.13.

4.2 Shipment Prior Notification

4.2.1 Shippers shall comply with all notifications (written, email, and telephone) in accordance with Section 4.7 of this procedure.

4.2.2 Shippers making shipments containing Category 1 and/or Category 2 Quantities of Radioactive Material to the BPF shall comply with the notification requirements of References 2.5 (Part XII) and Section 4.14.

4.2.3 Shippers making shipments containing Category 1 and/or Category 2 Nationally Tracked Sources to the BPF shall comply with the requirements of Reference 2.3, 2.5, and Section 4.15.

4.3 Shipment Documentation

The following documents shall accompany radioactive shipments to the BPF. Steps 4.3.1, 4.3.3, 4.3.4, 4.3.5, and 4.3.6 provide the documentation requirements for radioactive waste shipments. Steps 4.3.2, 4.3.5, and 4.3.6 provide the documentation requirements for radioactive material shipments. Radioactive material shipments include equipment or any other items/materials not received at the BPF for ultimate disposal.

4.3.1 The BPF Uniform Low-Level Radioactive Waste Manifest Forms, Attachment 5.2. This includes Forms 540/540A, 541/541A, and 542/542A, as appropriate. Detailed instructions for completing these forms are provided in Attachment 5.3, Instructions for Completing the BPF Uniform Low-Level Radioactive Waste Manifest Forms.

4.3.2 A radioactive material shipment is documented on a Radioactive Material Shipment Record (RMSR) as shown in Attachment 5.1.

4.3.3 SC DHEC Radioactive Waste Shipment Prior Notification and Manifest Form (SC DHEC 802 Form).

Note: A SC DHEC 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. A SC DHEC 802 Form is <u>not</u> required for RMSR Shipments (i.e., non-waste shipment).

4.3.4 SC DHEC Radioactive Waste Shipment Certification Form (SC DHEC 803 Form).

Note: A SC DHEC 803 Form is <u>not</u> required for RMSR (Non-Waste) Shipments.

Note: Shipments transported via Federal Express do not require driver signature on the SC DHEC 803 Certification Form or the Energy*Solutions*/Barnwell Processing Facility Uniform Low-Level Radioactive Waste Manifest.

4.3.5 Complete isotopic analysis printout or equivalent for <u>aqueous</u> filter media, and resins.

4.3.6 Complete isotopic analysis printout or equivalent for worst case filter and the combined filters in package for mechanical filters for dewatering. The specific activity of each radionuclide and the total radionuclide concentration shall be expressed in uCi/cc or Ci/m3, and transuranic nuclides in nCi/gram.

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

4.4 **Driver Check-In Procedure**

Note: Shippers should ensure that carriers are informed of normal BPF working hours.

4.4.1 Present shipping papers to the Lobby Area at the Main Entrance of the BPF and follow the posted instructions.

4.4.2 General Manager or designee shall receipt shipment in accordance with Reference 2.9.

4.4.3 Radiation Safety Technician personnel shall receive the incoming shipment in accordance with Reference 2.9.

4.4.4 Drivers with shipments that are arriving at BPF during non-working hours shall report to the Energy*Solutions* Barnwell Complex, 740 Osborn Road, main Security Office for shipment receipt.

4.5 **Delays**

4.5.1 The BPF shall not be responsible for transport equipment detention or special equipment demurrage charges assessed by the carrier. Payment of detention charges shall be the responsibility of the customer.

4.5.2 The BPF 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 offloads, decontaminating vehicles or containers, violation of federal and/or state requirements, shipment discrepancies, or regulatory agency inspection.

4.6 **Returnability/Retrievability/Storage of Processed Material**

The BPF processes radioactive material and/or waste for subsequent shipment for disposal or return to the generator or other authorized recipient. Return of material, while at the BPF, must be authorized by the generator as stated in contract requirements (Step 4.1.4.1).

4.6.1 Retrieval of material during processing at the BPF must be authorized by the generator or stated in contract requirements.

4.6.2 No provision or authority exists for material retrieval following shipment by the BPF to a licensed disposal site.

4.6.3 Upon the determination that radioactive waste received for consolidation and repackaging cannot be shipped to a disposal facility under the terms and conditions of that facility's radioactive material license and acceptance criteria, that waste shall be returned to the original generator/shipper within two (2) weeks.

4.6.4 Waste received for processing or storage shall not be stored at the BPF greater than one year without prior approval from the Licensing Department and SC DHEC.

4.7 Prior Notification Requirements

4.7.1 General

The Prior Notification of radioactive waste and radioactive material shipments are required by Reference 2.4 and/or this procedure. Questions concerning SC DHEC notifications shall be directed to SC DHEC. SC DHEC and the BPF should receive the SC DHEC 802 Form at least 72 hours prior to the waste shipment being transported into or within the State of South Carolina or unless 72 hours notification has been waived by SC DHEC.

4.7.2 SC DHEC Prior Notification Instructions

4.7.2.1 Complete the SC DHEC 802 and 803 Forms as instructed on the reverse side of the form.

4.7.2.2 Shippers shall use the BPF Shipment Number (SN) in Block 4 (Shipment Identification Number) of the SC DHEC 802 Form.

4.7.2.3 Distribute the SC DHEC 802 Form as follows:

4.7.2.3.1 One copy mailed, emailed, or faxed (803) 898-0391 to the SC DHEC office in Columbia, South Carolina.

4.7.2.3.2 One copy faxed to the Licensing Department (803) 259-1744 or emailed.

4.7.2.3.3 Original to accompany the shipment.

4.7.3 **Facility Prior Notification Instructions**

4.7.3.1 The General Manager or designee shall notify the Licensing Department to issue a BPF SN. BPF SNs are required for all radioactive waste shipments and radioactive material shipments. A copy of the Uniform Low-Level Radioactive Waste Manifest or the RMSR may be requested prior to issuance of a BPF SN.

4.7.3.2 Shippers shall keep the BPF, Licensing Department, and SC DHEC informed of all data changes concerning the SC DHEC 802 Form and all shipment cancellations.

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

4.8 **Uniform Low-Level Radioactive Waste Manifest**

4.8.1 The BPF Uniform Low-Level Radioactive Waste Manifest including Forms 540/540A, 541/541A, and 542/542A, Attachment 5.2 as appropriate, shall be used to make waste shipments to the BPF. Detailed instructions for completing these forms are provided in Attachment 5.3, Instructions for Completing the BPF Uniform Low-Level Radioactive Waste Manifest Forms. Contact the Licensing Department to obtain approval of any other manifest forms before shipping.

4.8.2 Uniform Low-Level Radioactive Waste Manifest Forms are obtainable from the Licensing Department and/or the General Manager.

4.8.3 Uniform Low-Level Radioactive Waste Manifest Forms are reviewed by Energy*Solutions*/BPF personnel prior to shipment acceptance. State and federal regulatory agency inspections may also be performed, as required.

4.8.4 Improperly prepared Uniform Low-Level Radioactive Waste Manifest Forms will result in acceptance delays or refusal of the shipment.

4.8.5 A signed Acknowledgment of Receipt Letter and a copy of the Uniform Low-Level Radioactive Waste Manifest Form 540 shall be returned to the shipper within seven (7) days after the shipment has been accepted at the BPF.

4.8.6 The BPF copy of the Uniform Low-Level Radioactive Waste Manifest Form shall accompany the shipment.

4.8.7 All totals shown on the Uniform Low-Level Radioactive Waste Manifest Form shall match all accompanying paperwork for a given shipment.

4.8.8 All volumes, activity, etc., shall be accurate when shipment is received for processing.

4.8.9 The weight listed on the Uniform Low-Level Radioactive Waste Manifest Form must be as accurate as possible since it is used by Energy*Solutions* personnel to select the proper offloading technique for the particular package.

4.8.10 Shipments containing multiple generators must indicate on the 541 and 542 Forms the individual waste volume and activity by SC DHEC Radioactive Waste Transport Permit Number and Generator Name.

4.9 Van Shipments

4.9.1 Drums

BPF utilizes a mechanical lifter for offloading drums weighing 1000 pounds or less. Open-top vans or flatbed trailers are the preferred method of shipment for drums weighing greater than 1000 pounds.

Note: All drums above 1000 pounds shall be palletized.

4.9.1.1 Non-palletized drums greater than 1000 pounds shall have, prior to shipment, approval by the General Manager or designee.

4.9.1.2 Drums shall not be placed on their sides.

4.9.1.3 Drum rings and bolts shall be secured properly and be structurally strong enough to support the weight of the drum while offloading.

4.9.1.4 Lever-lock closure devices shall have prior approval from the General Manager or designee, prior to shipments departure from customer.

4.9.1.5 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.

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

4.9.1.7 Palletized drums may be double stacked.

4.9.1.8 Pallets shall be considered sacrificial. The recommended pallet for handling drums holds two parallel rows of two drums each (four drums total).

4.9.1.9 A three-drum pallet (singular row of three drums) may be used if weight is a limitation.

4.9.1.10 Drums shall be banded together and secured to the pallet to prevent sliding off during handling.

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

4.9.1.12 Heaviest containers shall be on the bottom.

4.9.2 **Packages Weighing Less Than 8,000 Pounds (BPF Forklift Capacity)**

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

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

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

4.9.2.4 Steps 4.9.2.1 through 4.9.2.3 are not applicable for non-palletized drums.

4.9.2.5 Dunnage used to establish spacing is considered sacrificial.

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

4.9.3.1 Packages shall be provided with properly attached lifting devices.

4.9.3.2 Lifting devices shall be secured to the top of package for easy access.

4.9.3.3 Lifting devices shall as a minimum be certified to twice the weight of the packages.

4.9.3.4 Packages shall not be shipped in a closed hardtop vehicle.

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

4.9.3.6 Shipments with boxes weighing more than 8,000 pounds and palletized drums shall be segregated.

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

4.9.3.8 Customer provided lifting slings may be returned upon request at the customer's expense, provided:

4.9.3.8.1 The slings are not contaminated.

4.9.3.8.2 Additional BPF personnel exposure will not be accumulated.

4.9.3.8.3 Excessive loading time will not be incurred.

4.9.3.8.4 Metal/steel braided/twisted cables/fabric slings are not generally released from the BPF due to difficulties in performing adequate radiological surveys.

Note: There may be an additional charge when a radiological survey and release of slings or equipment is requested.

4.9.4 **Shipments with Multiple Shipping Container Types**

4.9.4.1 Mixed container shipments shall comply with Steps 4.9.1 through 4.9.3 as applicable.

4.9.4.2 Do not stack non-palletized drums on boxes or boxes on non-palletized drums.

4.9.4.3 Palletized drums are considered as boxes. No segregation is necessary if boxes (less than 8,000 pounds) and palletized drums are on the same truck.

4.9.4.4 Non-palletized drums or boxes may be loaded in the forward section of the van with definite segregation of the two types of containers. (Preferably non-palletized drums loaded in forward section of van).

4.9.4.5 Shipments containing palletized drums and boxes weighing more than 8,000 pounds shall be segregated.

4.9.4.6 Step 4.9.3.8 is applicable.

4.9.4.7 Improperly mixed container shipments shall result in an additional offloading charge or refusal of the shipment.

4.10 Flatbed Trailer Shipments

4.10.1 Flatbed trailer shipments shall comply with Section 4.9 as applicable.

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

4.10.3 Lifting devices shall as a minimum be certified to twice the weight of the packages.

4.10.4 Boxes and/or palletized drums shipped on flatbed trailers must be loaded in such a manner that they may be offloaded from the side using a forklift.

4.11 Cask Shipments

4.11.1 Customers using a 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 BPF. This applies to all shipments requiring licensed packages.

4.11.2 All cask shipments shall strictly comply with the applicable Certificate of Compliance and cask handling procedures for the cask in use (lid torqueing, sealing gaskets, weight restrictions, shoring requirements, etc.).

4.11.3 All drums and/or boxes shall be palletized and pallets shall have proper lifting devices attached.

4.11.4 The waste 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 personnel physically entering the cask. The Radiation Safety Supervisor or designee, General Manager or designee, and the Licensing Department shall be notified prior to shipment of any lifting device supplied with the container that has been altered, removed, or replaced. Lifting devices shall as a minimum be certified to twice the rated load of the devices.

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

4.11.6 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).

4.11.7 A shipment consisting of individual waste containers not on pallets shall have attached to each container a lifting device that will allow offloading by a single lift.

4.11.8 Customer-provided lifting slings may be returned upon request at the customer's expense, provided:

4.11.8.1 The slings are not contaminated.

4.11.8.2 Additional Energy*Solutions* personnel exposure will not be accumulated.

4.11.8.3 Excessive loading time will not be incurred.

4.11.8.4 Metal/steel braided/twisted cables/fabric slings are not generally released from the BPF due to difficulties in performing adequate radiological surveys.

Note: There may be an additional charge when a radiological survey and release of slings or equipment is requested.

4.12 Contamination Limits of Package/Vehicle

4.12.1 General

4.12.1.1 All shipments received at the BPF shall comply with contamination control limits of Reference 2.2 and/or this procedure.

4.12.1.2 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 Reference 2.2.

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

4.12.1.4 Notify the Radiation Safety Supervisor or designee or Licensing Department prior to shipment of any smearable contamination on the container and/or cask interior surface exceeding 50,000 dpm/100 cm^2 beta-gamma and/or 2,200 dpm/100 cm^2 alpha.

4.12.1.5 Containers that have been wrapped to prevent the spread of loose contamination shall have, prior to shipment, approval from the General Manager or Radiation Safety Supervisor or designees.

Note: The customer shall notify the Radiation Safety Supervisor or Licensing Department prior to departure of any shipment in which the potential exists for airborne contamination and/or excessive smearable contamination is present.

4.12.2 Inner Packaging

Radioactive material/waste, which consists of small glass containers, shall be packaged in cardboard boxes or plastic bags to prevent breakage and facilitate the repackaging at a later date. These separate packages can be in larger packages (i.e., overpacks) for shipment to the BPF.

4.12.3 **Floor Covering**

Plywood or other materials that are placed over the transport vehicle's flooring for contamination control shall be considered sacrificial and may be considered as part of the disposal volume if they cannot be decontaminated and released. Time and/or supplies for floor covering removal will be chargeable.

4.12.4 **Decontamination Prior to Release**

Vehicles exiting the BPF shall be decontaminated to release limits described in Step 4.12.5 prior to release. Charges for decontamination services to comply with these levels shall be assessed as necessary.

4.12.5 **Contamination Release Limits for Vehicles Exiting the BPF**

4.12.5.1 Enclosed vehicles used solely for the transport of radioactive materials (Exclusive Use) and properly marked "For Radioactive Materials Use Only".

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

4.12.5.1.2 Fixed contamination shall not exceed 0.5 mR/hr at any exterior accessible surface.

4.12.5.1.3 Removable contamination shall not exceed 100 dpm/100 cm^2 alpha and 5000 dpm/100 cm^2 beta-gamma in the interior or on the exterior of the vehicle.

4.12.6 **Empty Casks**

4.12.6.1 Fixed contamination shall not exceed 0.5 mR/hr at any accessible surface unless cask is properly labeled and a completed Radioactive Material Shipment Record (RMSR) accompanies the cask.

4.12.6.2 Removable external contamination for beta-gamma shall not exceed 500 dpm/100 $cm^{2.}$

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

4.12.7 **All Vehicles for Unconditional Release**

4.12.7.1 Fixed contamination shall not exceed 0.1 mR/hr at any accessible surface.

4.12.7.2 Removable contamination for beta-gamma shall not exceed 500 dpm/100 $cm^{2.}$

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

4.13 **Special Categories**

4.13.1 **Dry Active Waste**

Dry Active Waste (DAW) comprised of paper, plastics, contaminated metals, soil, wood, building rubble, air filters, etc., shall be received under the following conditions:

4.13.1.1 Radioactive shipments shall be packaged, labeled, and placarded in accordance with References 2.2 and 2.3.

4.13.1.2 DAW must be included in the description in block (11) of the Uniform Low-Level Radioactive Waste Manifest Form 540. If material is compacted, or compactable, it should be noted in the description.

4.13.1.3 DAW packaging in bags, drums/boxes, or sealands is acceptable.

Note: All packages received at the BPF must not show signs of significant package deformation, loss or dispersal of the package contents, or an increase in the maximum radiation levels recorded or calculated at the external surface of the package. No chemical, galvanic, or other reaction among packaging components or between the packaging components and the package contents is allowed.

4.13.1.4 For biological, pyrophoric, hazardous chemicals, mixed or explosive wastes see Steps 4.13.2, 4.13.7, 4.13.9, 4.13.10, and 4.13.13. Contact the General Manager, the Licensing Department, or the Radiation Safety Officer (RSO) for additional information.

4.13.1.5 Liquid scintillation fluids, toluene, xylene, dioxane, or other organic liquids similar in chemical properties, and DAW with residues of these fluids are not acceptable.

Note: Containers, which contained these organic chemicals, are acceptable if they have been certified RCRA empty in accordance with Reference 2.7.

4.13.1.6 Sealed sources are accepted in accordance with Step 4.13.4 and Section 4.15. Contact the General Manager or Licensing Department for information on the acceptability of sealed sources.

4.13.1.7 Incidental liquids are only acceptable in DAW shipments.

4.13.1.8 In general, typical waste forms, which are acceptable for shallow land burial are acceptable for DAW processing. Contact the General Manager, if any waste acceptability issues are questionable.

4.13.1.9 No container shall have radiation levels greater than 200 mR/hr on the package exterior (contact) without prior approval from the General Manager. Packages that have supplemental shielding, internal, or external to the package, shall be approved by the General Manager prior to shipment.

4.13.1.10 Contamination limits on package exteriors and vehicles shall be in accordance with Section 4.12 of this procedure.

4.13.1.11 DAW containing transuranic (TRU) material must contain less than 10 nCi/g TRU waste and this quantity must be incidental (<1%) to the total shipment activity.

4.13.1.12 DAW containing Special Nuclear Material (SNM) shall be managed in accordance with Section 4.13.8 of this procedure.

4.13.1.13 All DAW shall meet Class A-Unstable classification as received at the BPF and shall maintain Class A-Unstable classification when radionuclide concentration is increased by a factor of 10.

4.13.2 **Biological Material**

Biological wastes and waste containing pathogenic agents are not acceptable at the BPF, unless properly sterilized. Plants, animals, and by-products thereof are considered biological material. Glassware, etc., that at one time contained these materials may also be considered biological. A signed certification documenting that the material has been sterilized shall be provided to the General Manager prior to shipment of waste.

4.13.3 **Gaseous Waste**

4.13.3.1 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.

4.13.3.2 Sealed Tritium gas sources are acceptable, provided:

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

4.13.3.2.2 The maximum activity per container must not exceed 1100 curies, with no individual source exceeding 1000 curies.

Note: The maximum activity for tritium gas sources disposed of at the Barnwell Disposal Site is 1000 curies per container.

4.13.3.2.3 All sources are disposed/recycled as entire devices to provide additional physical protection to the primary tritium source containment.

4.13.3.2.4 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.

4.13.3.2.5 The internal pressure of each source is less than 1.5 atmospheres.

4.13.3.2.6 Methods used for stabilizing these sources shall be approved by the General Manager and/or the Licensing Department prior to shipment.

4.13.3.3 Smoke or gas detectors/devices containing Am-241 shall be received as complete intact devices only unless specifically approved by the Licensing Department.

4.13.4 Sealed Sources or Special Form Radioactive Materials

Sealed sources used for radiography or high exposure gamma irradiation shall be in the original device or a comparable source holder with shutters or closures locked or otherwise secured. Sealed source capsules not contained in a manufactured device shall only be received inside a larger steel container for handling purposes with appropriate additional shielding. These devices shall not be received at the facility without prior approval by the General Manager and/or the Licensing Department. See section 4.15 for Nationally Tracked Sources.

Note: Package contact exposure rates shall not exceed 200 mR/hr, without prior approval.

Note: Approval from the Licensing Department is required prior to the receipt of sealed sources.

Note: Lead containers and/or lead packaging shall be received at the BPF only when used as radioactive material shielding. Contaminated lead is considered mixed waste and will not be accepted without prior approval.

4.13.5 Aqueous Radioactive Liquids

4.13.5.1 Shipments of aqueous radioactive liquids to the BPF shall be packaged in accordance with U.S. DOT Regulation 49 CFR Parts 100-185.

Note: The method used for packaging and shipping aqueous liquids to the BPF must be approved by the Licensing Department and the General Manager or designee prior to shipping.

4.13.5.2 Hazardous organic solutions solidified or otherwise, are not acceptable for processing at the BPF.

4.13.5.3 Non-hazardous scintillation products may be acceptable provided the scintillation products have been approved by the Licensing Department prior to shipment.

4.13.5.4 Acceptable wastes for processing include aqueous liquids, sludge, concentrates, resins, evaporator bottoms, diatomaceous earth, and filter media.

4.13.5.5 Aqueous radioactive materials/wastes shall be managed in accordance with approved Energy*Solutions* processing procedures and/or work instructions.

4.13.5.6 Dose assessments shall be performed and approved in accordance with Reference 2.12 for all shipment containers and new or revised processes.

4.13.5.7 Containers exhibiting dose rates over the top of the container greater than 10 R/hr require the approval of the General Manager or designee and ALARA Subcommittee, prior to acceptance.

4.13.5.8 Containers exhibiting a dose rate greater than 15 R/hr over the top of the container shall be processed with a top shield in place unless exempted by the ALARA Subcommittee. Casks with secondary lids may qualify as having a top shield.

4.13.5.9 For each shipment containing aqueous radioactive waste, a complete isotopic analysis shall be provided with the shipment. The analysis shall identify the following:

4.13.5.9.1 Waste description

4.13.5.9.2 Radionuclides identification and concentrations in μCi/cc and nCi/g (if applicable).

4.13.5.9.3 Total activity content

4.13.5.9.4 Waste volume within the container (cc or ft^3)

4.13.6 **Resin/Aqueous Filter Media (Including Mechanical Filters)**

4.13.6.1 Dewatered resin/aqueous filter media (including mechanical filters) packages, which contain liquid in excess of the waste disposal criteria of 0.5% by volume shall be transported in a shipping cask.

Note: Lids on liners are required to be closed/engaged (i.e., maintain its contents). HIC lid seal marks must be in compliance with C of C when appropriate prior to disposal.

4.13.6.2 Gross dewatered liners are acceptable for receipt at the BPF.

4.13.6.3 The waste must be contained in Energy*Solutions* High Integrity Containers (HICs), Energy*Solutions* poly liners, Energy*Solutions* steel liners, or Energy*Solutions* 24-Inch Diameter Pressure Vessels (PVs) constructed for dewatering purposes. Other containers may be acceptable on a case-by-case basis after review and approval by the General Manager or designee, RSO or designee, and the Licensing Department.

4.13.6.4 A dose assessment shall be performed and approved in accordance with Reference 2.12 for all containers.

4.13.6.5 Containers exhibiting a dose rate greater than 15 R/hr over the top of the container shall be processed with a top shield in place unless exempted by the ALARA Subcommittee. Casks with secondary lids may qualify as having a top shield.

4.13.6.6 For each shipment consigned for dewatering containing resin or other aqueous filter media (including mechanical filters), a complete isotopic analysis shall be provided with the shipment. For mechanical filters a complete isotopic for worst case filter and for combined filters per package shall be provided with the shipment. The analysis shall identify the following:

4.13.6.6.1 Waste description

4.13.6.6.2 Radionuclides identification and concentrations in μCi/cc and nCi/g (if applicable).

4.13.6.6.3 Total curie content

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

4.13.6.6.5 Indicate the total number of filters in the container.

4.13.7 **Pyrophoric Materials or Flammable Solids**

4.13.7.1 Pyrophoric or flammable solid material contained in waste shall be made inert to prevent self-ignition during transport, receipt, and processing.

4.13.7.2 Contact the General Manager for inerting process requirements prior to shipping.

4.13.7.3 No material that might react violently with water or moisture shall be accepted for processing at the BPF.

4.13.8 **Special Nuclear Material (SNM)**

Note: Special Nuclear Material (SNM) is defined as radioactive material containing any combination of the following isotopes: plutonium (Pu), U-233, or uranium enriched in U-233 or U-235.

4.13.8.1 All SNM waste shall be packaged and reported in accordance with References 2.1, 2.2, and Section 4.3 of this procedure.

4.13.8.2 No shipment shall contain more than 350 grams total of U-235 or 200 grams of U-233 or 200 grams of plutonium or any combination of these provided the sum of the ratios of the quantities does not exceed unity.

Note: The BPF radioactive material possession limits for SNM on site at any time shall not exceed the quantities indicated above.

4.13.9 **Hazardous Chemicals**

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

4.13.9.2 Radioactive waste, which contains or is capable of generating quantities of toxic gases, vapors, or fumes harmful to persons transporting, handing, or disposing of the waste is not acceptable.

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

4.13.10 **Mixed Waste**

4.13.10.1 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 for processing.

4.13.10.2 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.

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

4.13.11 **Polychlorinated Biphenyl Waste (PCB)**

4.13.11.1 No PCB's or PCB items as defined in 40 CFR 761 will be accepted for processing without prior approval from the Licensing Department.

4.13.11.2 Documentation or analytical results from the shipper substantiating the absence of PCB's for PCB suspect waste shall be provided prior to shipment.

4.13.12 **Asbestos**

4.13.12.1 Packages containing radioactively contaminated asbestos waste (0.1% or greater by weight) shall be packaged in double bags and shall be identified as asbestos under the waste description on the Uniform Waste Manifest and continuation sheet.

4.13.12.2 Acceptance of waste containing less than 0.1% asbestos by weight and is not double bagged requires BPF approval prior to shipment.

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

4.13.13 Detonation or Explosive Decomposition

Radioactive waste that is readily capable of detonation or of explosive decomposition or reaction, or of explosive or exothermic reaction with water is not acceptable.

4.13.14 Material and Equipment Decontamination

Materials and equipment for decontamination, segmentation, disassembly, survey, and re-use or release will be accepted, processed, and controlled in accordance with Reference 2.12.

4.13.15 Other Processes

The BPF performs radioactive material/waste processing on a project basis. Specific internal and/or SC DHEC approvals are required.

4.13.16 Laboratory Test Samples

This section provides instructions for the notification, shipment, and receipt of radioactive/hazardous material samples at the BPF for bench scale testing only.

4.13.16.1 All samples shall be packaged so that they will not leak, spill, or vaporize from the package during shipment and meets the requirements of References 2.1, 2.2, 2.7, 2.10, and 2.11.

4.13.16.2 Liquid samples shall be doubly packaged with absorbent material (i.e., vermiculite, speedi-dry, etc.). The outer container must have sufficient absorbent material necessary to absorb twice the volume of liquid. Glass inner containers are not acceptable without prior approval from the Licensing Department.

4.13.16.3 DOT Specification 5-gallon outer containers with bolted ring closures are recommended for limited quantity and LSA shipments. DOT 7A Type A packages must be used for Type A quantities in compliance with Reference 2.2. If the material is a mixed waste (hazardous and radioactive), the packaging must also meet the requirements for that particular waste as specified in Reference 2.10.

4.13.16.4 Shipments made to the BPF as excepted quantity, low specific activity (LSA) or Type A quantity shall be accompanied with an RMSR, Attachment 5.1, Radioactive Material Shipment Record (RMSR).

4.13.16.5 The maximum contact dose rate on any individual radioactive/hazardous sample shall not exceed 50 mR/hr without prior approval from the Licensing Department.

4.13.16.6 The total mass of hazardous or mixed waste possessed at the BPF at any one time shall not exceed 1000 kgs of non-acute waste, 1 kg of acute waste, or 250 kgs of soils, water or debris contaminated with acute waste in accordance with Reference 2.7. The Licensing Department shall verify quantities prior to shipment approval.

Note: The BPF is required to return all mixed waste products and residual samples to the generator/shipper.

4.13.16.7 All waste testing of samples shall be performed in accordance with References 2.10 and 2.11.

4.14 Category 1 and Category 2 Quantities of Radioactive Material Shipment

4.14.1 Category 1 and Category 2 shipments are shipments that contain radionuclides and quantities that are listed in References 2.3 and 2.5, which pose a concern for potential malevolent use and potential risk or consequences.

4.14.2 Shippers preparing waste shipments containing Category 1 and Category 2 Quantities of Radioactive Material to the BPF should be familiar with the shipment requirements specified in References 2.3 and 2.5.

4.14.3 The shipper of a Category 1 or Category 2 shipments, shall notify the General Manager and the Licensing Department in accordance with Step 4.2.2 prior to making the shipment to the BPF.

4.15 Nationally Tracked Sources

4.15.1 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".

4.15.2 Shippers preparing waste shipments containing Category 1 and/or Category 2 nationally tracked sources to the BPF shall comply with the reporting requirements specified in References 2.3 and 2.5 and obtain prior to shipment approval from the Barnwell Licensing Department.

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

4.15.3.1 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.

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

4.15.3.3 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.

4.15.3.4 The date the source strength is reported.

4.15.3.5 The shipping date and estimated arrival date.

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

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

4.15.5 Upon source shipment receipt, the Barnwell Licensing Department will complete the source tracking transaction report as required in References 2.3 and 2.5 by the close of the next business day.

4.16 Shipments Violating Regulations Or Criteria

4.16.1 Packaging, Labeling, Marking, and Manifest Non-Compliance

4.16.1.1 Any package not in compliance with this procedure that presents NO radiation or contamination hazard shall be conspicuously marked with a Hold Tag. Storage in a segregated storage area is required until disposition is determined by the Licensing Department.

4.16.1.2 Any package not in compliance with this procedure that PRESENTS a radiation or contamination hazard shall be managed under the guidance of the Radiation Safety Department.

4.16.1.3 The General Manager shall notify the Licensing Department prior to issuance of instructions for disposition of the shipment. The Licensing Department is required by license to notify SC DHEC of shipment discrepancies and obtain concurrence for disposition.

4.16.1.4 Notice shall be made and confirmed in writing to the waste generator as specified on the Uniform Low-Level Radioactive Waste Manifest Form.

4.16.1.5 Acceptance of the packages shall only occur upon verification of the package contents and receipt of proper paperwork. Radioactive materials or quantities not authorized by Reference 2.1 cannot be accepted at the BPF and will be returned to the shipper, in accordance with regulations of Reference 2.4.

4.16.2 Radiation or Contamination Limit Non-Compliance

4.16.2.1 Any package not in compliance with contamination limits specified in Section 4.12 of this procedure shall be isolated in a controlled area to minimize the spread of contamination.

4.16.2.2 When a package or vehicle in non-compliance has been safely isolated and access control has been established, the Radiation Safety Supervisor shall make notification to the Licensing Department. The Licensing Department will notify the waste generator and SC DHEC.

5. ATTACHMENTS AND FORMS

5.1 Radioactive Material Shipment Record (RMSR)

5.2 BPF Uniform Low-Level Radioactive Waste Manifest Forms

5.3 Instructions for Completing the BPF Uniform Low-Level Radioactive Waste Manifest Forms

Attachment 5.1
RADIOACTIVE MATERIAL SHIPMENT RECORD (RMSR)
(4 pages)

RADIOACTIVE MATERIAL SHIPMENT RECORD FORM

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 shipping paper?

4. Shipper Use Only

5. Shipper - Name and Facility

Shipper's Radioactive Materials License

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 receipt

Date

Shipment ID Number

7. Page 1 of _____ Page(s) ☐ Continuation

8. Shipping Paper Number

9. Consignee - Name and Facility Address

Contact

Phone No (Include Area Code)

Signature - Authorized consignee acknowledging 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."

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	16. Maximum Package Activity (mCi)	17. Total Weight or Volume (Use appropriate units)	18. Identification Number of Package

Maximum Package Non-Fixed Contamination Level (dpm/100cm^2): Beta/Gamma: _____ Alpha: _____ MBq/100 cm^2: Beta/Gamma: _____ Alpha: _____

Maximum Package Radiation Level (mrem/hour): On-Contact: _____ 1 meter: _____ mSv/hour: On-Contact: _____ 1 meter: _____

Additional Comments: _____

RADIOACTIVE MATERIAL SHIPMENT RECORD FORM

SHIPPING PAPER (Continuation)

8. Shipping Paper Number (Use this number on all continuation pages)	
Page _____ of _____ Page(s)	

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		17. Total Weight or Volume (Use appropriate units)	18. Identification Number of Package
					MBq	(mCi)		

RADIOACTIVE MATERIAL SHIPMENT RECORD (RMSR) FORM ADDENDUM

1. Name

S.C. Transport Permit Number

Shipping Date

Shipper Use Only

2. Shipping Paper 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 RMSR Addendum Pages																	N/A

RADIOACTIVE MATERIAL SHIPMENT RECORD (RMSR) FORM ADDENDUM (Continuation)

2. Shipping Paper Number

3. Page _____ 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)

Attachment 5.2
BPF UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST FORMS
(6 pages)

FORM 540 ENERGYSOLUTIONS BARNWELL PROCESSING 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) Electronic ☐
Form 541 and 541A ____Page(s) ☐
Form 542 and 542A ____Page(s) ☐
____Page(s)

8. Manifest Number

9. Consignee - Name and Facility Address

EnergySolutions, LLC
Barnwell Processing Facility
16043 Dunbarton Boulevard
Barnwell, SC 29812

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

Signature - Authorized consignee acknowledging waste reciept | 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. 287-04 as amended, and the effective Barnwell Processing Facility 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 (06/2021)

FORM 540A

ENERGYSOLUTIONS BARNWELL PROCESSING FACILITY

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST
SHIPPING PAPER (Continuation)

8. Manifest Number
(Use this number on all continuation pages)

Page _____ of _____ Page(s)

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		17. Total Weight or Volume (Use appropriate units)	18. Identification Number of Package
					MBq	(mCi)		

FORM 540A (06/2021)

FORM 541 ENERGYSOLUTIONS BARNWELL PROCESSING FACILITY

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

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 (m^3 / ft^3)	Net Waste Weight (kg / lbs)	Special Nuclear Material (grams) U-233	U-235	Pu	Total

Activity All Nuclides (MBq / mCi)	Tritium	C-14	Tc-99	I-129	Source (kg / lbs)

2. Manifest Number

3. Page __1__ of _____ Page(s)

4. Shipper Name

Shipment ID Number

Disposal Container Description								Waste Description for Each Waste Type in Container								
								Physical Description			15. Chemical Description		16. Radiological Description			17.
5. Container Identification Number/ S.C. Transport Permit Number	6. Container Description (See Note 1 & Note 1A)	7. Volume (m^3 / ft^3)	8. Waste and Container Weight (kg / lbs)	9. Waste Weight (kg / lbs)	10. Surface Radiation Level (mSv/hr / mrem/hr)	11. Surface Contamination (MBq/100 cm^2 / dpm/100 cm^2) Alpha	Beta-Gamma	12. Waste Descriptor (See Note 2 & Note 2A)	13. Approximate Waste Volume(s) in Container (m^3 / ft^3)	14. Solidification or Stabilization Media (See Note 3 & Note 3A)	Chemical Form/ Chelating Agent	Weight % Chelating Agent If > 0.1%	Individual Radionuclides and Activity and Container Total; or Container Total Activity and Radionuclide Percent: Radionuclides	MBq	mCi	Waste Class A/B-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)
43. Activated Material
59. 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 Styrene
99. Other. Describe in Item 14, or additional page
100. None Required

NOTE 3A: Barnwell Specific Solidification and Stabilization Media Codes.

M Wax Binder

FORM 541 (06/2021)

FORM 541A

ENERGYSOLUTIONS BARNWELL PROCESSING FACILITY

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

CONTAINER AND WASTE DESCRIPTION (Continuation)

2. Manifest Number

3. Page ____ of ____ Page(s)

Disposal Container Description								Waste Description for Each Waste Type in Container							
								Physical Description			15. Chemical Description		16. Radiological Description			17. Waste Class
5. Container Identification Number/ S.C. Transport Permit Number	6. Container Description (See Note 1 & Note 1A)	7. Volume m^3 / ft^3	8. Waste and Container Weight kg / lbs	9. Waste Weight kg / lbs	10. Surface Radiation Level mSv/hr / mrem/hr	11. Surface Contamination MBq/100 cm^2 / dpm/100 cm^2 Alpha	Beta-Gamma	12. Waste Descriptor (See Note 2 & Note 2A)	13. Approximate Waste Volume(s) in Container m^3 / ft^3	14. Solidification or Stabilization Media (See Note 3 & Note 3A)	Chemical Form/ Chelating Agent	Weight % Chelating Agent If > 0.1%	Individual Radionuclides and Activity and Container Total; or Container Total Activity and Radionuclide Percent: Radionuclides	MBq	mCi	A0-Class A Stable; AU-Class A Unstable; B-Class B; C-Class C

FORM 541A (08/2021)

FORM 542 ENERGYSOLUTIONS BARNWELL PROCESSING 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)	(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)	(lbs)	B. SNM (g)	C. Activity (MBq)	(mCi)	D. Volume (m^3)	(ft^3)	E. Weight (lbs)	F. Maximum Package Surface Radiation Level (mrem/hr)
Totals of All Pages (542 and 542A)																	N/A

FORM 542 (06/2021)

FORM 542A

ENERGYSOLUTIONS BARNWELL PROCESSING FACILITY

UNIFORM LOW-LEVEL RADIOACTIVE WASTE MANIFEST

MANIFEST INDEX AND REGIONAL COMPACT TABULATION (Continuation)

2. Manifest Number

3. Page _____ 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)	(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)	(lbs)	B. SNM (g)	C. Activity (MBq)	(mCi)	D. Volume (m^3)	(ft^3)	E. Weight (lbs)	F. Maximum Package Surface Radiation Level (mrem/hr)

FORM 542A (06/2021)

Attachment 5.3

INSTRUCTIONS FOR COMPLETING THE BPF 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 Energy*Solutions* state licenses, the BPF Radioactive Material Acceptance Criteria (DF-AD-009), 49 Code of Federal Regulations, and 10 Code of Federal Regulations.

I) General Instructions for Completing Forms

1. Copies of the BPF Uniform Low-Level Radioactive Waste Manifest forms are available from the Licensing Department or the General Manager. Computer generated versions of these forms may be acceptable, but must have approval prior to use.

   Note: The uniform low-level radioactive waste manifest forms authorized for shipments to the BPF have been modified and are not identical to the NRC generic uniform low-level radioactive waste manifest forms. The NRC's generic uniform low-level waste manifest forms may not be used for shipments of radioactive waste to the BPF.

2. These specific instructions for completing the Uniform Low-Level Radioactive Waste Manifest must be strictly adhered to. Any deviations from these instructions must be approved by the Licensing Department. Additional pertinent information may be included if desired, but must be presented in a manner fully compliant with applicable NUREG/BR-0204, regulations, licenses, and the BPF Radioactive Material Acceptance Criteria (DF-AD-009).

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

6. 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.

7. The use of scientific notation is authorized.

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

9. 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

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
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, (for 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. **Note: The BPF does not accept mixed or hazardous waste. For additional information, refer to the BPF Radioactive Material Acceptance Criteria (DF-AD-009)**
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. Shipment Number: Record a unique number assigned by the Shipper to this shipment for tracking purpose. Contact / Phone Number: The name and phone number of a responsible representative of the shipper's organization who can answer detailed questions concerning the shipment. Shipment ID Number (SN): The Unique BPF Shipment ID Number assigned to this shipment by the Licensing Department. Collector/ Processor / Generator: Record an "X" or "√" in the appropriate box. Generators must record one of the following codes in the "Generator Type" item: A = University (academic) 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 Number: Record the carrier's EPA ID number if applicable. 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. (Signature not required for non-exclusive use shipments)
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.
9	Record the following: Energy*Solutions* Barnwell Processing Facility 16043 Dunbarton Blvd. Hwy 64 (1 mile west of Snelling) Barnwell, South Carolina 29812 Barnwell, South Carolina 29812 is also approved 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.
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. When shipping a licensed cask, record the Certificate of Compliance Number. For example, USA/9168/B(U)-96
12	Record the type of radioactive label that appears on the package. "White I" = White One Label "Yellow II" = Yellow Two Label "Yellow III" = Yellow Three Label "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 BPF accepts liquids in accordance with the BPF Radioactive Material Acceptance Criteria (DF-AD-009).**
15	List nuclides in the shipping package in accordance with 49 CFR. Separate multiple nuclides with a space or 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).
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. For example, the model/serial number i.e. 8-120B-1.
19	South Carolina Certification Statement: Record the date, signature of the shipper or authorized representative, title and organization, and telephone number.
	The area labeled "for consignee use only" has been left blank intentionally to allow each consignee to record details such as discrepancies and burial information. The individual consignee should determine the information appropriate for this space. Use NRC Form 540A if additional space is needed to describe this shipment. Indicate the page number, total number of pages for Forms 540 and 540A, and the manifest number reported in Item 8.

B) Form 541, Container and Waste Description:

1. The Form 541 is required for all shipments.

2. 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 BPF Radioactive Material Acceptance Criteria (DF-AD-009).

3. 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.

4. Exercise caution when choosing the codes found in the notes on the bottom of Form 541. Consult the BPF License and BPF Acceptance Criteria for further guidance or contact the Licensing Department or General Manager.

Item Number	Detailed Instructions
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 that contain each quantity of SNM in the same item with the SNM grams for that isotope. For example, a total 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 the SNM (U-233, U-235, and Pu). Include the unit "g" in the entry.

Item Number	Detailed Instructions
1 (cont'd)	**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 H-3, C-14, Tc-99, and I-129 even if the 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 C-14 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 or # 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 shipper's name and Shipment ID Number from Form 540, Item 5.
5	Record a unique container identification number. This entry is assigned by the shipper and may be alpha-numeric. **Note: Each container number on a shipment must be unique.** Record the unique State of South Carolina's Radioactive Waste Transport Permit Number of the generator(s) contributing waste to a container. **Note: Only one generator and one waste form 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.** **Note: Generators with multiple facility locations utilizing the same SC transport permit number must indicate the facility address in this block also.**
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 Poly HIC would be assigned the code 13A. When Code 13 (High Integrity Container) is used, identify the manufacturer, the model number, serial number, and the Certificate of Compliance number for the container. 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

Item Number	Detailed Instructions
	the Form 540, Item 7.
7	Record the waste container 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
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 pound package would be recorded as 2270 kg; 5000 lbs.
9	List the weight of the waste in the SI unit kilograms (kg) and the conventional unit pounds (lbs). For example, 5,000 pounds of waste would be recorded as 2270 kg; 5000 lbs.
10	Record the highest radiation level on contact with the 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. **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 container, the codes should be associated with the rest of the description required in items 12-16 for each listed waste form. 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.
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. If the media is intended to provide stability for the waste in accordance with 10CFR61, State, and Facility requirements, the entry "-S" must be recorded following the appropriate code. 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.

Item Number	Detailed Instructions
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. If large processes using chelating agents were used record the process name. Use additional sheets as needed. Record the 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 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. 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 Megabecuerels and millicuries. The quantity of these isotopes must be reported, in pounds and kilograms for source material -- including the abbreviation "kg" and "lbs", 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.**
17	Record the waste classification and the stability of the waste using the appropriate code provided in Item 17. The waste class marking is not required to be recorded for waste for processing and the shipper should enter NA.
	Use NRC Form 541A if additional space is needed to describe this shipment. Indicate the page number, total number of pages for Forms 541 and 541A, and the manifest number from NRC Form 540, Item 8.

C) Form 542 - Manifest Index and Regional Compact Tabulation

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

Item Number	Detailed Instructions
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. 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, sources, 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 Compact Region or State of the original generator of the waste. Standard state abbreviations may be used. In addition, note the Compact Export Permit numbers, if applicable, in this block. Permit numbers issued by the receiving State (e.g., an out of State access number) may also be noted in this block.

11	A. For each original generator and waste form listed in Item 5, list the total source material in kilograms and in pounds. B. For each original generator and waste form listed in Item 5, list the total special nuclear material in grams. C. For each original generator and waste form listed in Item 5, list the total activity attributed to the generator in Megabecquerels and in millicuries. D. 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. E. 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.) F. 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 generators column totals. Record the overall column totals at the bottom of the Form 542.
	Use NRC Form 542A if additional space is needed to describe this shipment. Indicate the page number, total number of pages for Forms 542 and 542A, and the manifest number from NRC Form 540, Item 8.