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Nuclear Material Control and Accountability (NMC&A) for the Savannah River Site Tritium Facilities

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Categorization of the Tritium Facilities

The Tritium Facilities is a Category IV Material Balance Area (MBA) that consists of:

- Six (6) active production and research and development (R&D) facilities
- Two (2) Deactivated tritium processing facilities (i.e., Buildings 232-H, 236H)
- One (1) Reclamation and waste management preparation facility

Authorized accountable nuclear materials include five (5) active materials; one (1) former accountable nuclear material

- Special Nuclear Material (SNM): Americium-241 (active); Plutonium-238 (former)
- Source Material: Depleted Uranium (water-cracking catalyst for tritium recovery)
- Other Nuclear Material: Deuterium (commercial), lithium-6 (virgin tritium production), tritium (War Reserve (WR) and Non-War Reserve (NWR) applications)

Tritium Facilities MBA Account Structure and Reporting Methods

Tritium Facilities MBA is subdivided into thirteen (13) subaccount MBAs (subMBAs) to localize inventory differences and assist in loss detection evaluation.

- SubMBAs structured by function (receipt, shipment) and process status (loaded, unloaded) for WR/NWR processing
- SubMBAs for the Tritium Extraction Facility (TEF) are geographically structured
- Daily transactions are reported electronically using the Automated Reservoir Management System (ARMS) and reports are generated to identify relevant transactions
- Location changes (onsite movements, receipts, shipments) are updated in Savannah River Site Material Accounting System (SRSMAS) using ARMS data transfer files
- Daily and Monthly accounting reports are prepared to maintain the accuracy of the inventory transactions reported to SRSMAS
- Monthly reconciliations are performed electronically by comparing an ARMS data transfer file against the SRSMAS inventory
- Physical inventory reconciliation is performed once every 2 fiscal years using field walkdowns and bulk material measurements to verify the inventory balances

Comparison of NMC&A Program Requirements

NMC&A Program Element	Category III MBA Requirement(s)	Category IV MBA Requirement(s)
Reporting Requirements	Reportable Quantity: 0.01 grams Reporting Unit: 0.005 grams	Reportable Quantity: 0.01 grams Reporting Unit: 0.005 grams
Accounting Records System	Perform daily, monthly, and annual reporting; Two work day limit for transactions	Perform daily, monthly, and annual reporting; Two work day limit for transactions
Material Control Indicators	• Discards, Inventory Write-Offs • Physical Inventory • Dynamic LEIDs* • Cumulative ID Trends • Receipts/Shipments (> 2 g tritium) • Shipper/Receiver Differences • Performance Tests • Confirmation Measurements Analyses	• Discards, Inventory Write-Offs • Static LEIDs*
Material Controls – Detection/Assessment	Tamper-Indicating Devices • Storage Locations (HIVES, shelves) • Containers (receipts, shipments, storage)	Tamper-Indicating Devices • Storage Locations (HIVES, shelves) • Containers (receipts, shipments, storage)

Comparison of NMC&A Program Requirements (cont'd)

Measurement Control	• Prepare qualification documents for measurement methods (low range calorimeters, mass spectrometers, pressure transducers, process hydride beds, temperature devices, tank volumes) • Provide routine trending reports on qualified analytical systems (mass spectrometers, calorimeters for process hydrides)	• Maintain process instrumentation to site installed process instrumentation (IPI) program requirements • Maintain qualification of process hydride beds by in-bed accountability (IBA) measurements • Maintain analytical instrumentation to measuring systems & equipment (MSE)
Measurement Methods	• Calorimetric (Z-bed temperatures) • IBA (for process hydride beds) • PVTC (tankage)	• Calorimetric (Z-bed temperatures) • IBA (for process hydride beds) • PVTC (tankage)
Physical Inventories	Annual (items, bulk material)	Once every 2 fiscal years (item, bulk material)
Performance Tests	• Accounting Records – 1% error identity & location • LEIDs – 2% of the active inventory • TIDs – 1% error (accounting records); 5% error integrity (applied only)	• Accounting Records – 1% error identity & location • TIDs – 1% error (accounting records); 5% error integrity (applied only)

HIVES – Highly Invulnerable Encased Safes; LEIDs – Limits of error for inventory differences

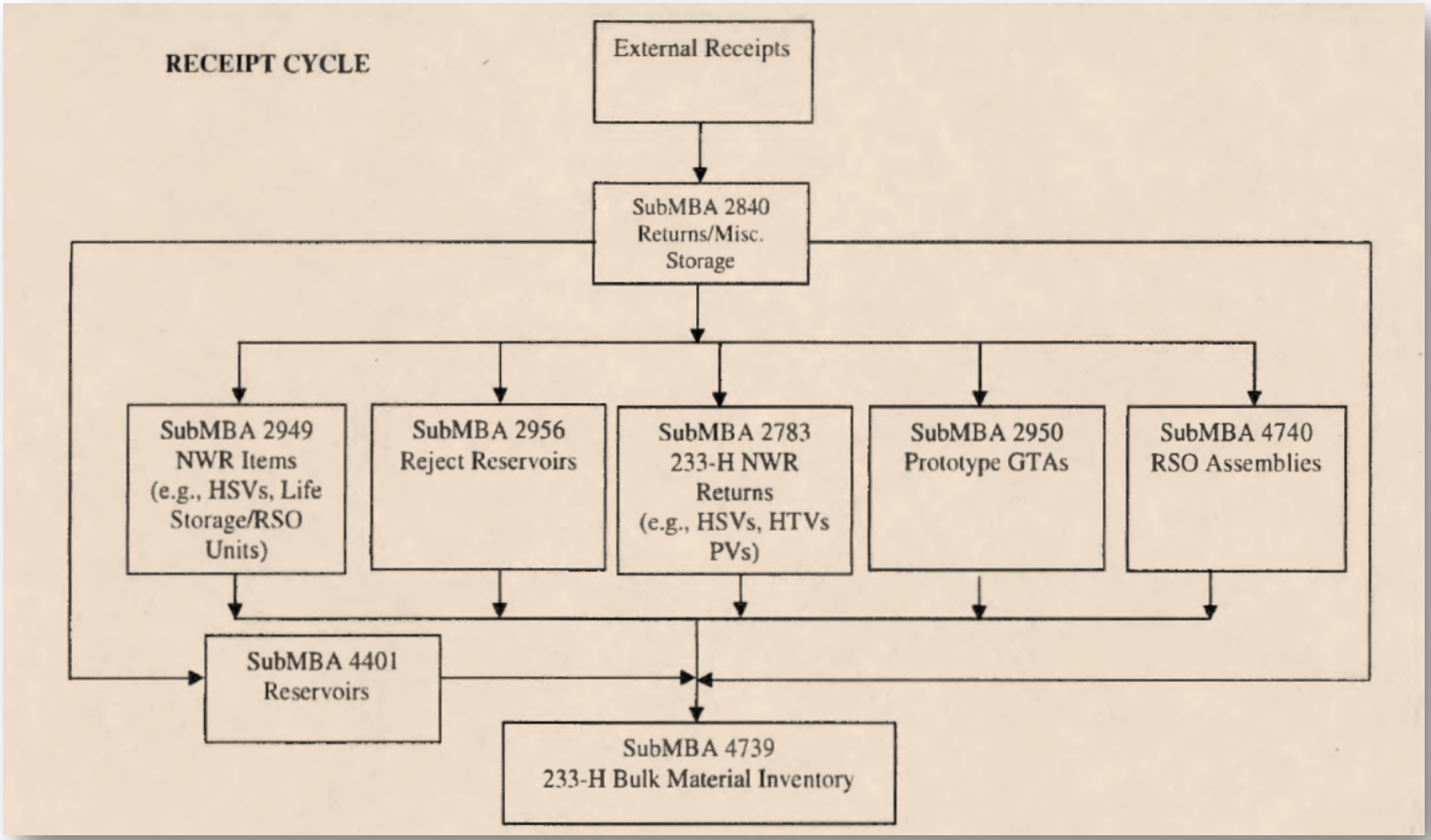
Programmatic Concerns

- Clear definition of the “Reportable Quantity” and “Reporting Unit” to ensure consistent practices are established for handling tritium at the NNSA sites.

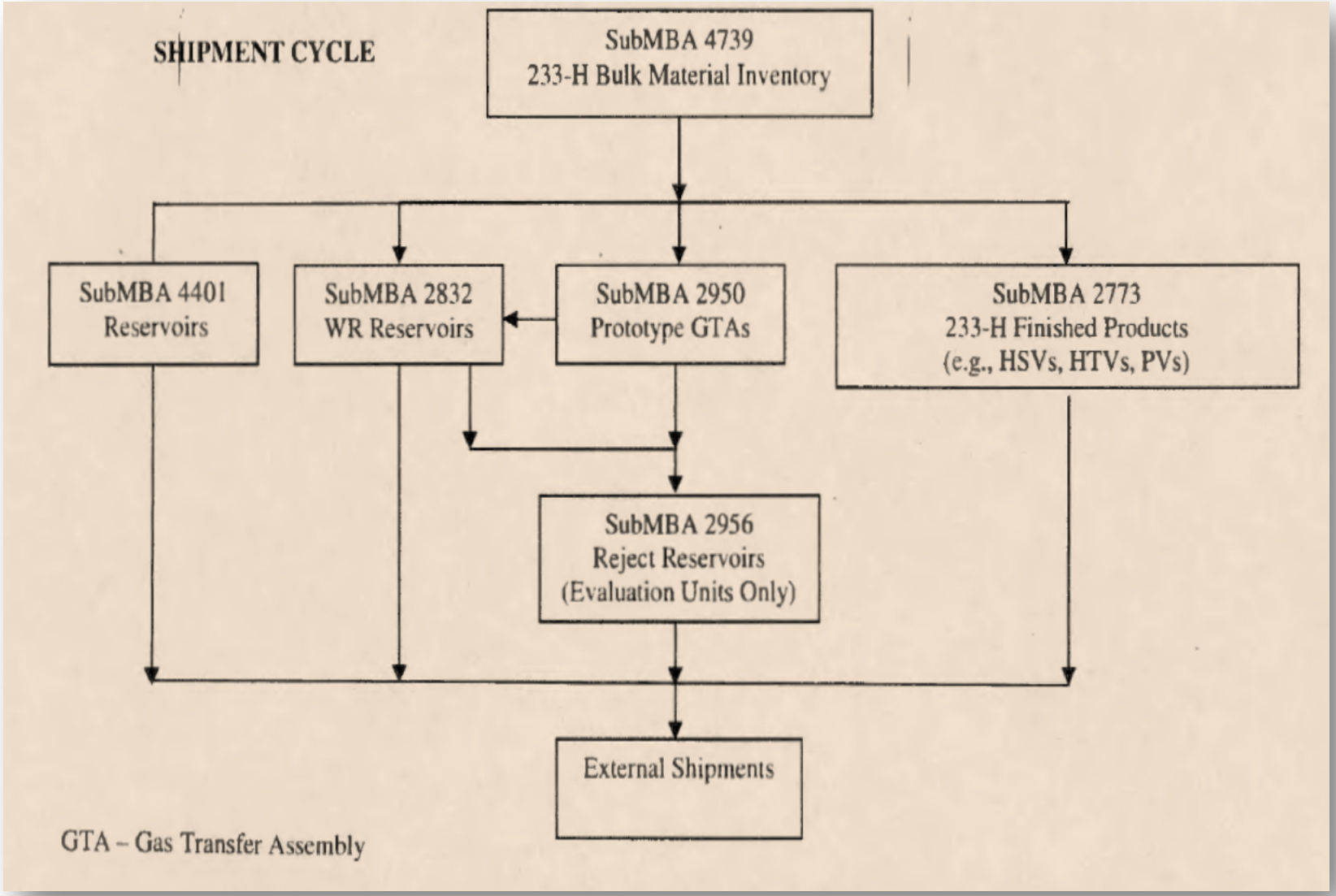
- Use of the 1g (0.5 g) as the “Reportable Quantity” does not impact SRS Tritium, because <5% of the items on inventory are <0.5 grams.

- Review the categorization of deuterium as an accountable nuclear material to reduce its significance, or exempt deuterium purchased from commercial vendors from the DOE O 474.2 rules.

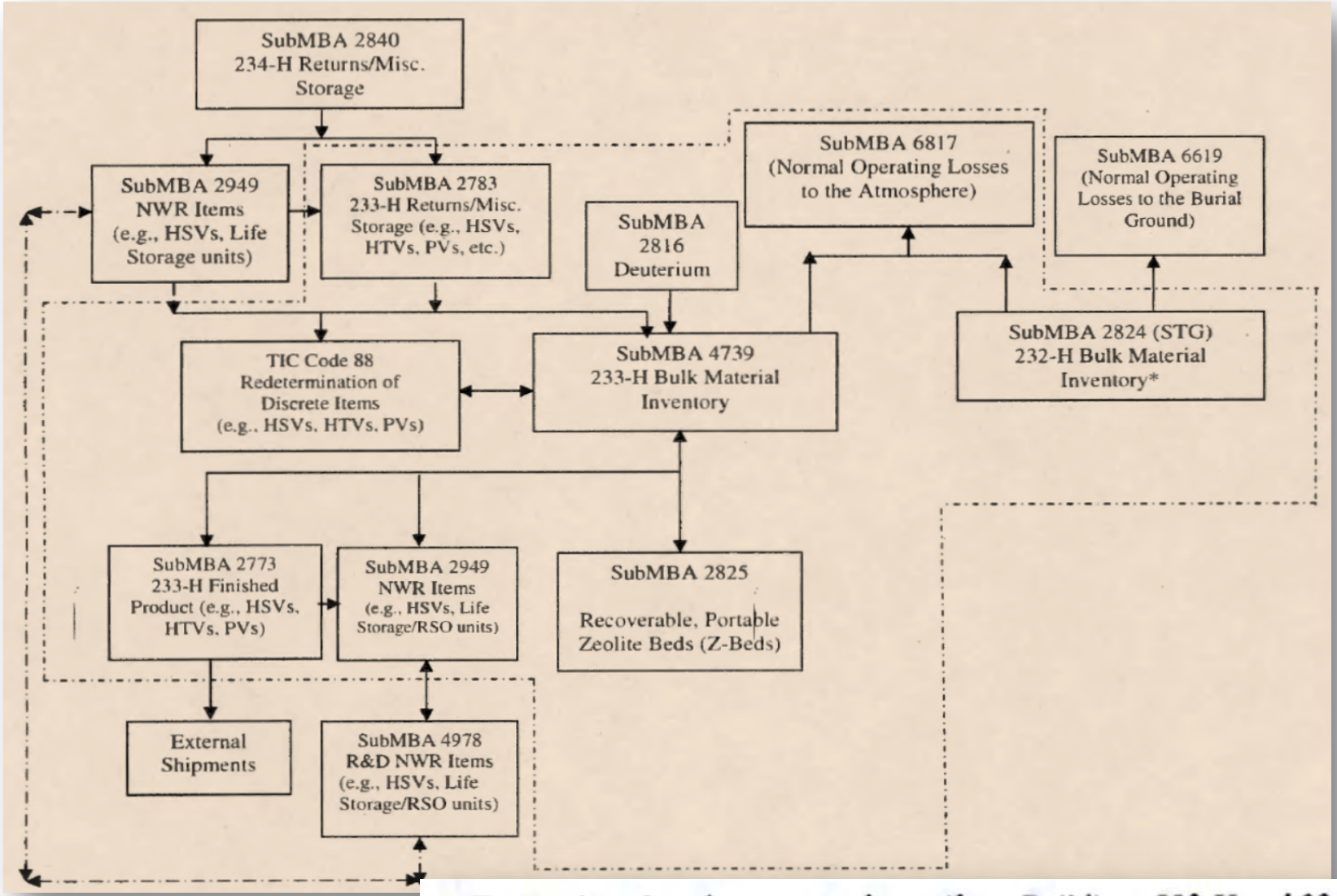
SubMBA Account Structure for WR/NWR Processing



SubMBA Account Structure for WR/NWR Processing (cont'd)

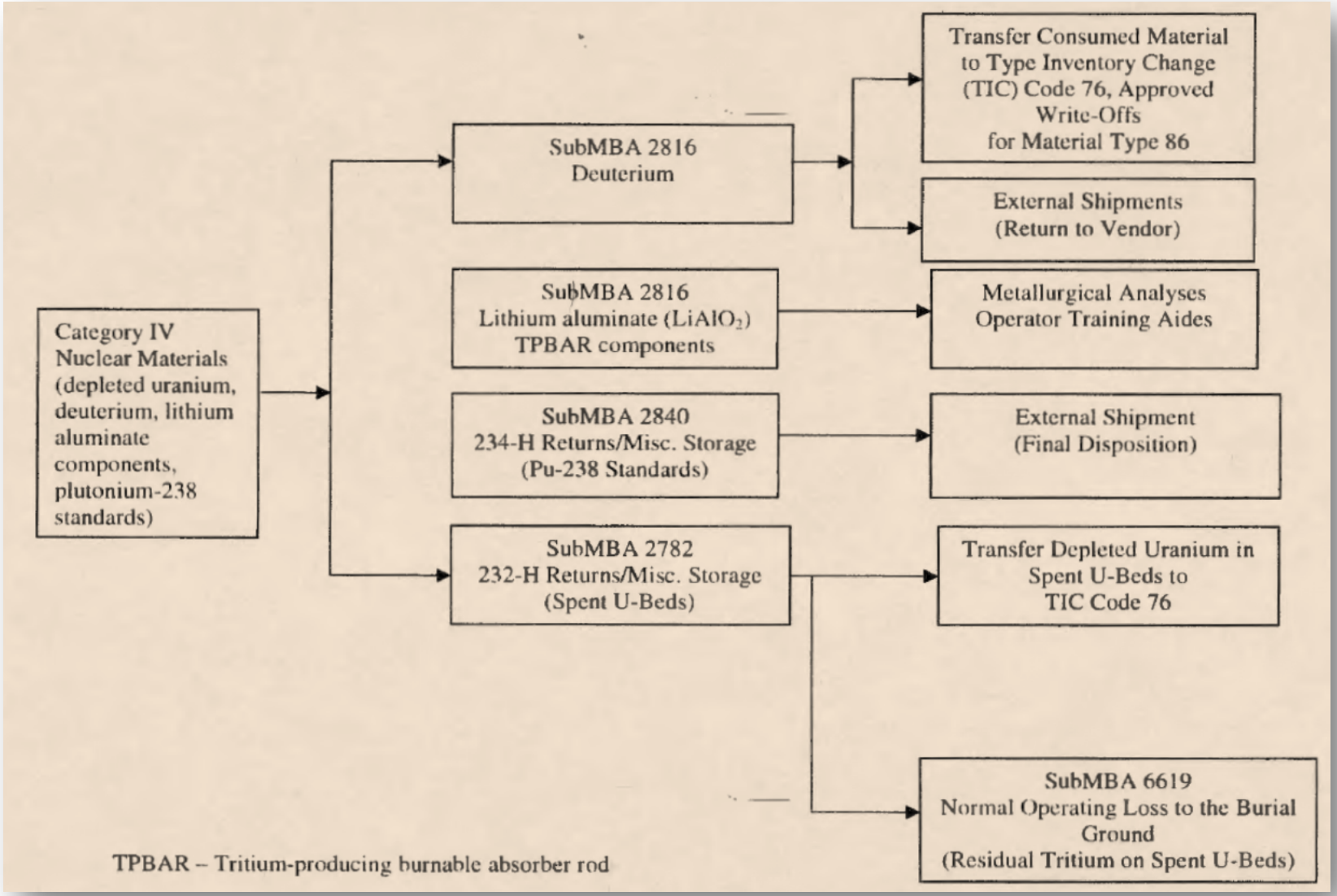


SubMBA Account Structure for WR/NWR Processing (cont'd)

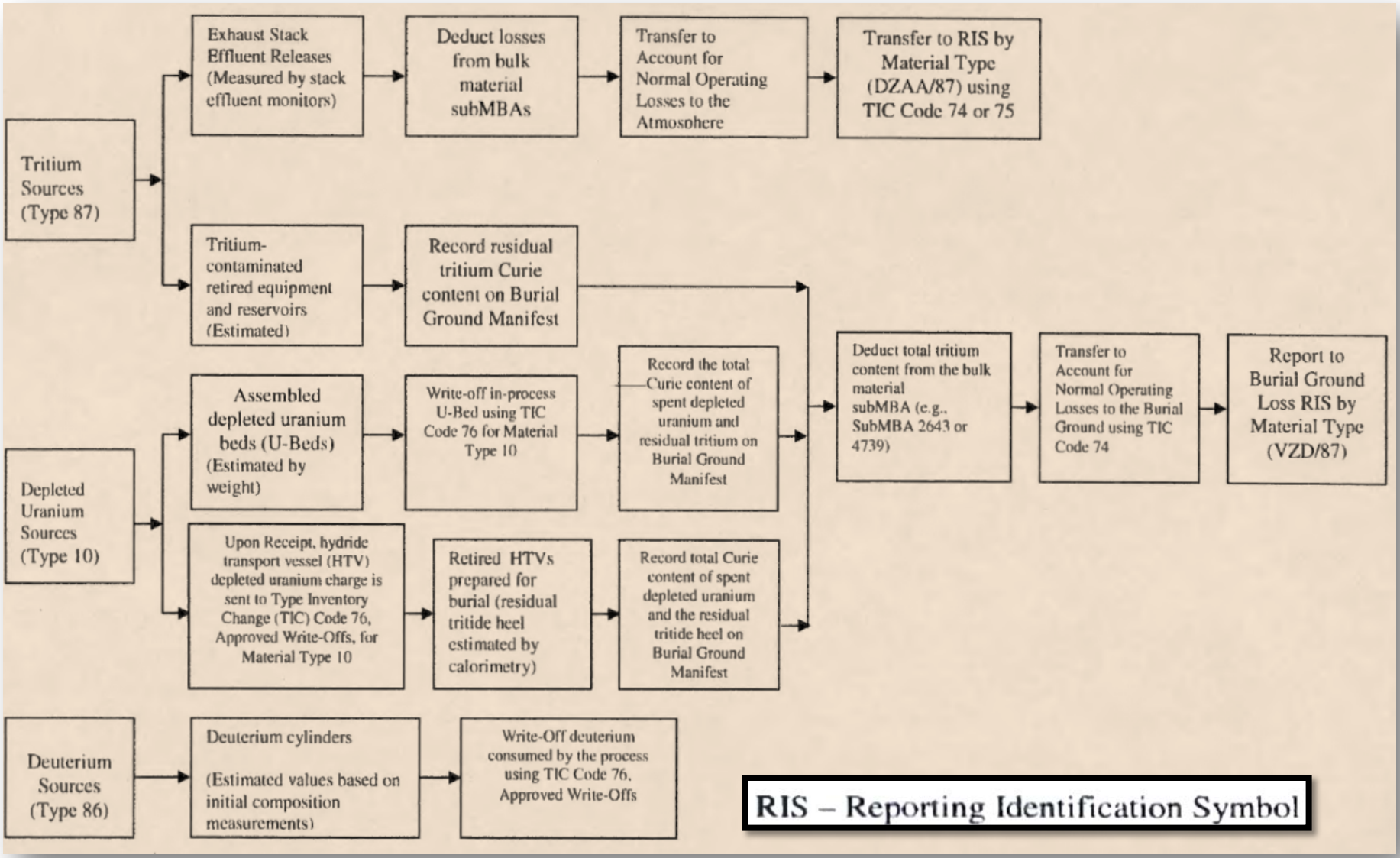


* - Former interface for gas transfers to/from Buildings 233-H and 234-H

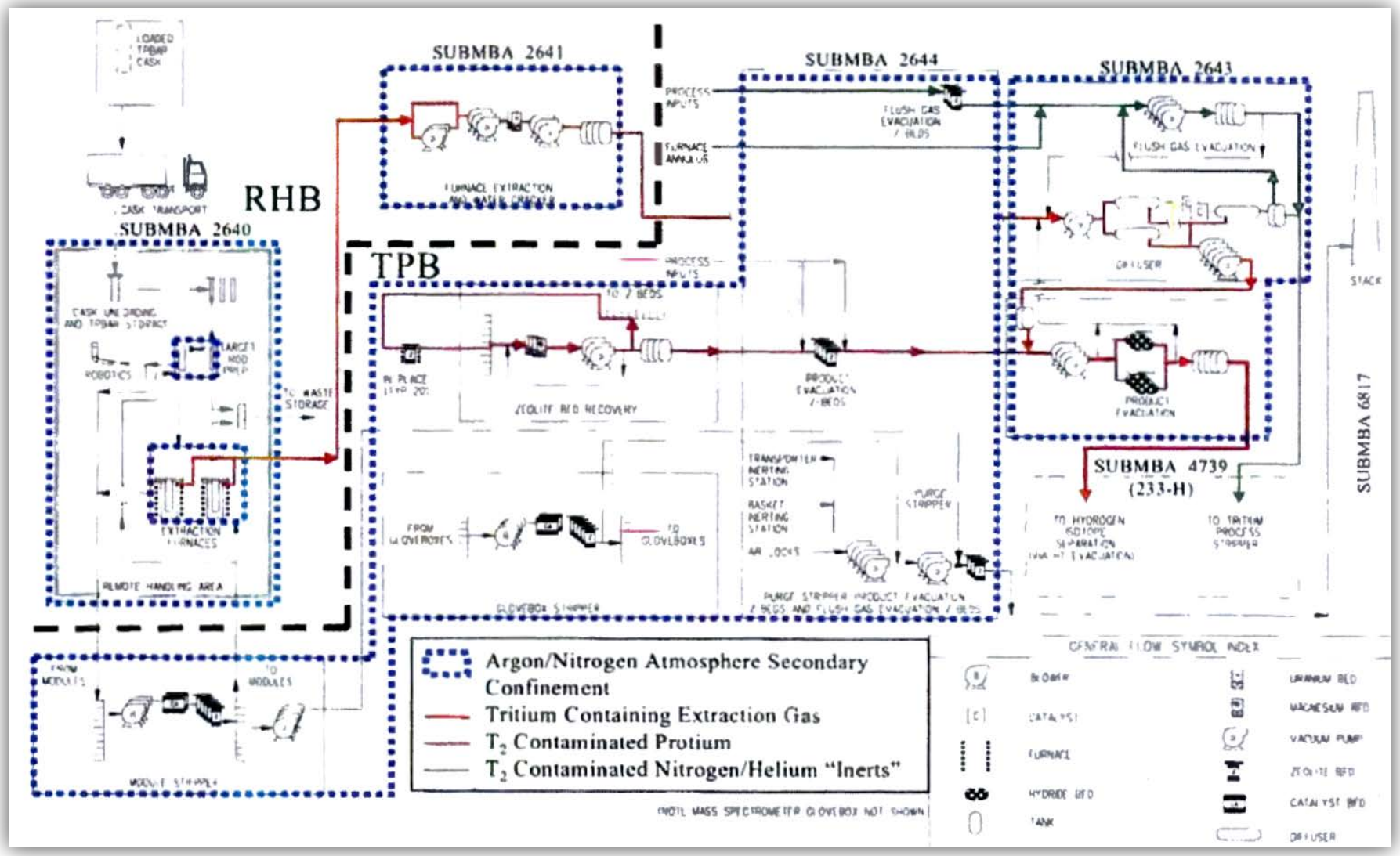
SubMBA Account Structure for WR/NWR Processing (cont'd)



Flowchart for Other Inventory Adjustments



SubMBA Account Structure for TEF



Process Flowchart for TPBAR Receipt and Extraction