Accelerated TRU Remediation Equipment Single-Point Failure

Jean Baladi & James Hendrix

Savannah River Nuclear Solutions

Presented By: Joseph F. Krupa

Background

- The Savannah River Site (SRS) received funding under the ARRA to accelerate Site cleanup and reduce risk. One key objective was the transportation and disposal of legacy transuranic (TRU) wastes in a safe and cost effective manner
- SRS made a commitment to dispose of about 5,000 cubic meters of this waste by end of fiscal year 2012 – a very ambitious objective

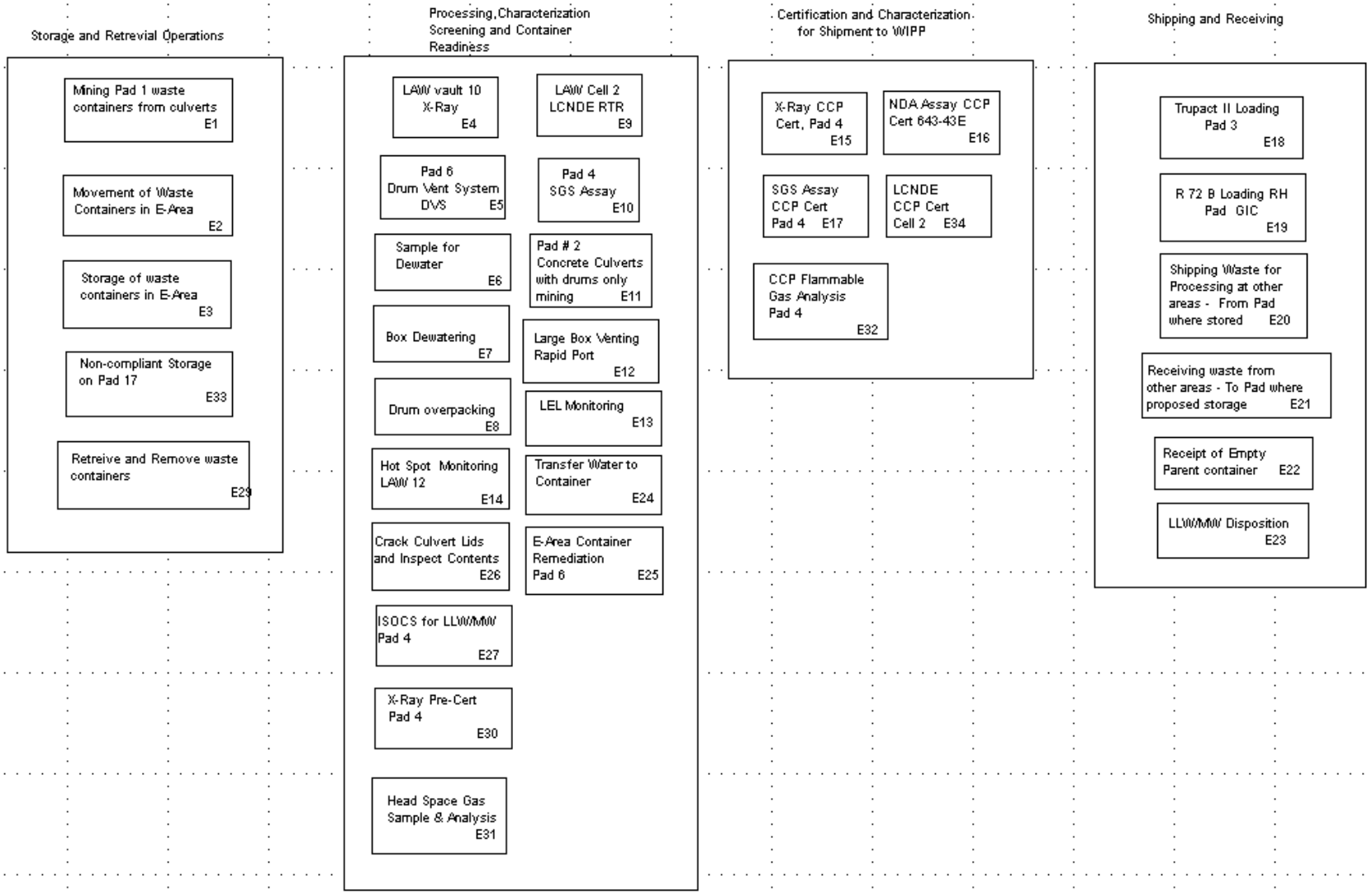
Why Repackaging and Remediation?

- The wastes have to be repackaged and remediated, to comply with transportation and disposal requirements, and be shipped to the Waste Isolation Pilot Plant (WIPP)
- Some of the waste is from other DOE sites (LANL) and former DOE Sites (Mound) and not well characterized.
- Some of the waste was generated in decontaminating highly contaminated facilities at SRS in preparation for a project in those facilities

The Four Facilities

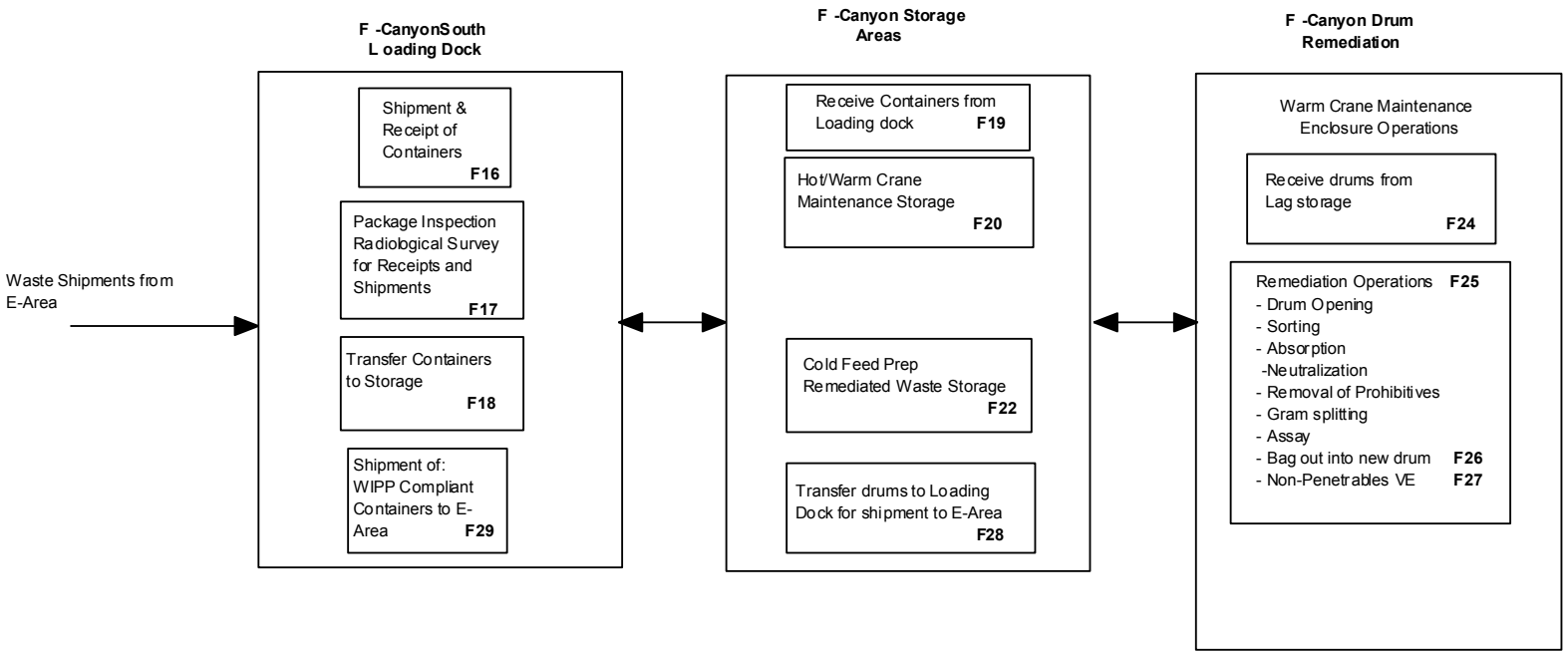
- The repackaging and remediation activities are performed in four facilities
  - E-Area facility
  - F-Canyon Drum Remediation, known as F-Drum,
  - F-Canyon Box Remediation, Known as F Box, and
  - H-Canyon Box Repackaging/Remediation, known as H-Box

E-Area Operations



F – Canyon Drum Remediation

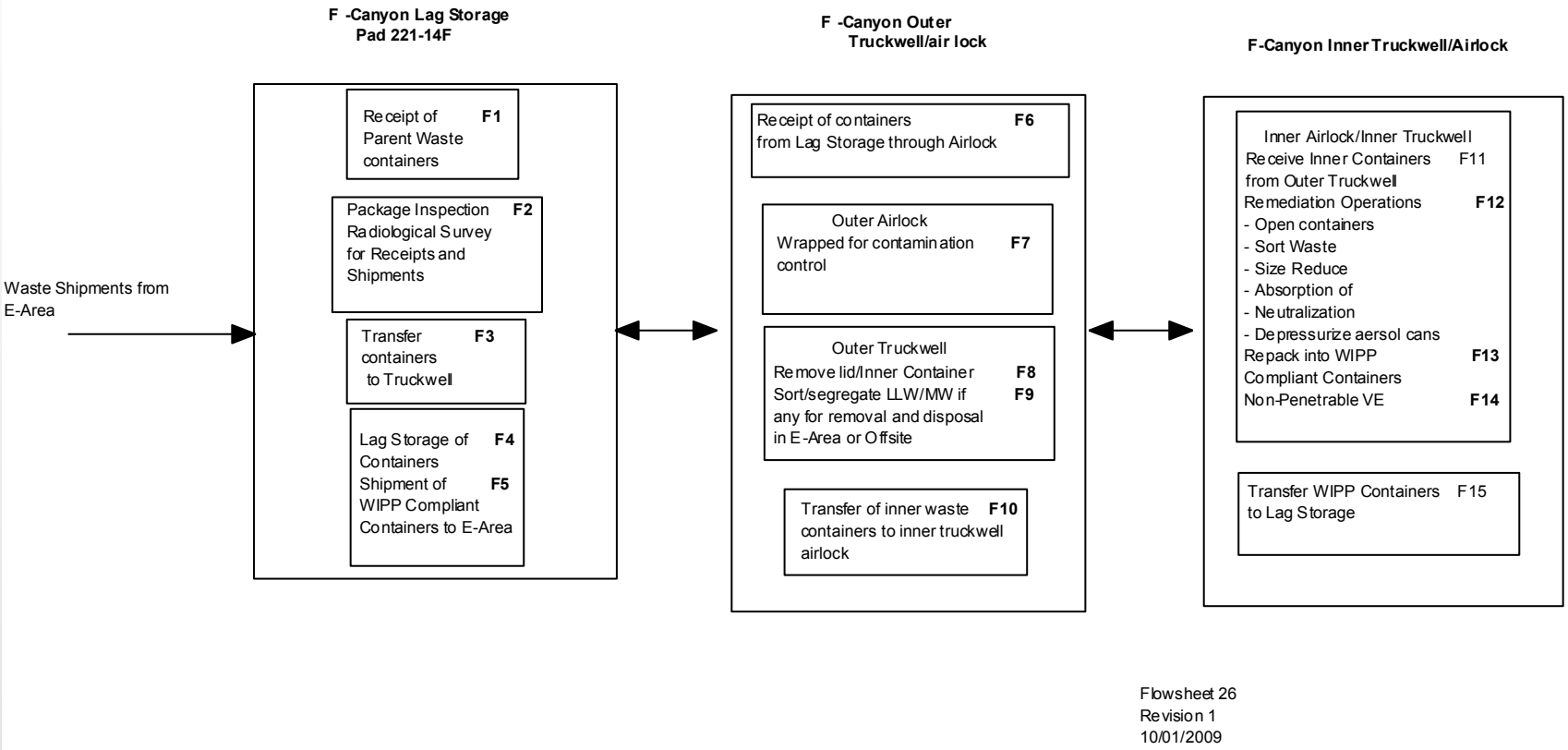
F-Canyon Drum Remediation Enclosure Equipment Flowsheet



Flowsheet 27
Revision 2
11/17/2009

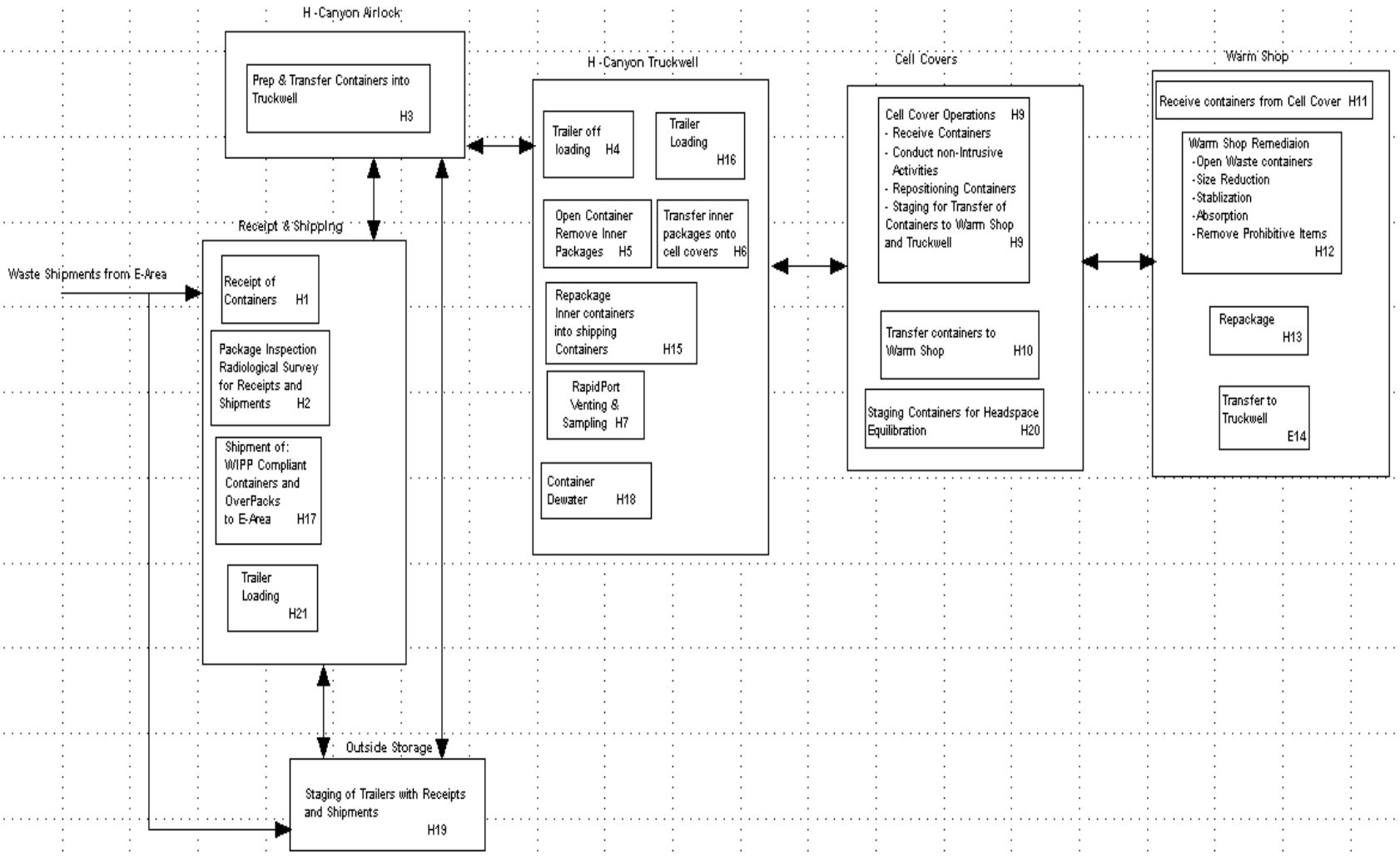
F – Canyon Box Remediation

F-Canyon Box Remediation Equipment Flowsheet



Flowsheet 26
Revision 1
10/01/2009

H-Canyon Remediation



Remediation & Repackaging Process

The process is organized into four activities;

- Retrieval & pre-characterization,
- Remediation and/or repackaging of waste,
- Characterization of repackaged containers,
- Certification of containers & shipment to WIPP

Objective of the Study

This study was chartered to

- Perform single point failure analysis on major equipment in the four facilities,
- Identify critical equipment whose failure can stop repackaging and remediation activities and result in unacceptable schedule delay and repair cost, and
- Recommend pre-emptive actions that can reduce or eliminate failure vulnerability and its impact on the project.

Scope of the Study

- The scope included equipment needed to install as well as operate the facilities
- A single point failure was defined as any failure that can stop process installation or operation in any of the four facilities and cause a schedule delay longer than four weeks or repair cost larger than $250K

Systematic Approach

- A systematic approach was implemented to ensure that
  - Major equipment is identified and
  - Cost effective recommendations are developed and prioritized
- Teams of subject matter experts (SME) were formed, and several team meetings and one-on-one discussions were held
- Walkdowns of the four facilities were conducted during these discussions

Major Equipment Lists

- Four lists of major equipment were generated for the four facilities for a total of 85 items
  - Diagrams of facilities unit operations were used as starting points
- Failure modes, causes, and frequency; failure impacts on cost and schedule; and recommendations to reduce these impacts were captured for each item on the four lists

Information Gathering

- A set of thirteen questions was used to focus discussions among the SME and gather information needed for the analysis
  - 1. What is the function of each equipment?
  - 2. Is the equipment function critical to the ATWR?
  - 3. What is the current conditions of the equipment?
  - 4. Should failure analysis be performed on the equipment as one unit, or should its components be analyzed?
  - 5. What is the likely operation mode when failure occurs?
  - 6. What are the likely causes of failure?
  - 7. Is the equipment failure highly unlikely during the lifetime of the ATWR (end of fiscal year 2012)?

Information Gathering

- 8. What are impacts on operations in each of the four facilities
  (complete stoppage, slight delay, etc.)?
- 9. What is the downtime to repair the failed equipment? What is the cost of repair?
- 10. What are impacts of failure on the ATWR schedule?
- 11. Is preventive maintenance (PM) performed regularly? Is there a regular inspection program for the equipment?
- 12. Do PM records have sufficient information to establish trends in equipment performance and predict failure?
- 13. Is the equipment vendor still in business and spare parts still available?

Necessary PM and Inspection Already in Place

- From the discussions and walkdowns, it was realized that
  - Major equipment in the four facilities has preventive maintenance (PM) and inspection program
  - Fork lifts and cranes are inspected before every use. PM is performed quarterly.
  - Monorail brake pivot pins are replaced annually to prevent sudden failure due to brittle fracture that had been observed over the years
  - Performance of equipment is monitored. When degradation is detected, the item is scheduled for repair
  - Some spare parts are available in stores. Major components will have to be ordered, which may take weeks

Results

- Each item on the four equipment lists was put through the five criteria of the systematic approach to identify critical equipment with single point failure
- Of the 85 items, only two were identified
  - Drum Vent System (DVS), E-Area
  - Law Activity Waste (LAW) Cell 2 Large Container Non-Destructive Examination (LCNDE) Real Time Radiography (RTR), E-Area

Three Vulnerable Components

The DVS as well as the LCNDE has three components each that can cause single point failure

The Teams' Recommendations

- Acquire replacement parts with appropriate software interface for the three components of each item
- Transfer method files and prepare components as backups
- Continue current PM and daily inspection and checkup

Conclusion

This study demonstrates the power of utilizing collective professional judgment of teams of subject matter experts in a systematic process to promptly identify failure vulnerability and reduce its impacts

Questions?