LA-UR-8290

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Title: 33 SHAFTS PROJECT SUMMARY 12-17-07

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33 Shafts Remote Handled Transuranic Waste Retrieval Project Status
Executive Summary
11-15-2007

The 33 Shafts Remote Handled Transuranic (RH-TRU) Waste Retrieval Project (33S) was initiated to retrieve 32 pipes from below grade at Los Alamos National Laboratory (LANL) TA-54 as part of a compliance agreement with the New Mexico Environment Department to close the shaft field. In the first quarter of FY 2007 a team was assembled to determine the best way of accomplishing the retrieval, sending the waste to LANL CMR Building, certifying the waste, and finally sending it to WIPP. In the first Quarter of FY08 the project funding was redirected and progress on 33S was terminated. This report summarizes the progress to date. It is intended to be useful in carrying the project forward as funding and mission are restored.

No major equipment has been purchased, no design packages have been developed, and no waste has been retrieved. Personnel have been working on packaging characterization, process design, scheduling, safety basis, and documentation.

The waste configuration is assumed to be RH-TRU debris waste contained inside 11-foot long by 9.5-inch diameter carbon steel pipes with ¼-inch wall thickness. Pipe end treatments are unknown but are possibly welded plates. The pipes are probably centered inside 24-inch diameter smooth or corrugated metal pipes (culverts). The annular space of 24 of the assemblies is filled with concrete. The other 8 pipes are blocked and braced to stand (we assume) centered inside the culvert. All the culvert assemblies are stored in holes drilled vertically in the ground at TA-54. Based on what is known and assumed about the waste configuration the process is as follows:

1. Expose the tops of the culverts in situ at TA-54,
2. Create a void cylinder at the top of the pipes by coring the original concrete or casting the void into new concrete which would be poured to fill the annulus around 8 bare pipes,
3. Drill into the pipes, sample the gases, and render the pipe atmosphere non-flammable,
4. Extract the culverts from the ground and lay each one, in turn, on a shielded transporter,
5. Send the load to CMR,
6. Bag on the culvert to an Alpha Box in Wing 9, Hot Cell #2,
7. Drill out the end of the pipe inspect and withdraw the waste; clean the pipe interior,
8. Examine the waste and pack it into 1-gallon paint cans,
9. Gamma scan each can and stage for creating a drum payload,
10. Drum out the cans from an Alpha Box in Cell #8 into drums according to CCP guidance to assure not overloading a drum,
11. In the Corridor, gamma scan each drum to ensure compliance with WIPP WAC,
12. Remove the culvert from the Corridor, and send it to TA-54 as Low Level Waste,
13. Load the WIPP Removable Lid Canister (RLC) with three drums,
14. Receive 72-B transporter and load one of the staged RLCs,
15. Send 72-B to WIPP.

The following is a list of the key assignments:
Charlie LeNoie, Progect Manager, WDP-DO,
Bill Crooks, PMT-1, Project Leader,
Deborah Bennett, PMPP-DO, Project Liaison,
Robert Villarreal, Chief Scientist,
David Yeamans, PMT-1, Lead Process Designer for CMR,
Will Gonzales, WDP-TWPS, Operations Manager at TA-54,
Henry Nunes, WDP-TWPS, Operations Engineer at TA-54,
Danny Martinez, AET-1, Mechanical Engineering Team Lead,
Manny Tafoya, AET-1, Process Design Engineer,
Mike Miller, PE-DO, Engineering Management,
Joel Kohler, ES-DE, Project Design Consultant,
Russell Durrer, SB-PF, CMR Safety Basis,
Steve McKelvey, CS-PCS-1, Budget and Resource Loaded Schedule.

The waste is described in a spreadsheet (archived at TA-54 Records Management) where the data were collected from notebooks at CMR. The waste is RH-TRU generated from nuclear fuel examination conducted in the CMR Wing 9 Hot Cells in the late 20th century and then emplaced at TA-54. The process is described in the attached Functional and Operational Requirements (F&OR) document.

Throughout the project a continuously improved understanding of the waste configuration has led to updated proposed methods of handling the waste. A chart showing the evolution of the proposed methods is also attached. A draft Process Hazard Analysis (PrHA) and a resource loaded draft schedule are also attached.

External safety controls on the process have necessitated changes to the original plan. One control is documented in an e-mail (attached) from OS-PT indicating the need for headspace gas sampling and analysis prior to shipping containers from TA-54 to CMR.

Pertinent design and engineering information is archived by TA-54 records management. Attached to this document are pages with contact information and ideas that would be essential in continuing to develop the process. Also attached is an e-mail detailing data requests for TA-54 in their ongoing endeavor to characterize the waste configuration for retrieval. The e-mail header may be useful for reconstructing the list of project staff. A Draft Summary Schedule and Cost report is attached.

Attachments to the Executive Summary:

1. *Functional and Operational Requirements Process Design Tables, Revision F* November 5, 2007, (38 pages),
2. Evolution of the 33 Shafts Packaging Process, (5 pages),
3. *33 Shafts DRAFT Preliminary Hazards Analysis*, 11-05-07 (5 pages),
4. E-mail from Donald Thorp re: Gas Sampling, OS-PT, (1 page),
5. RH-TRU Contacts Possibly useful in the future (11-6-07), (2 pages), and
6. E-mail from David Yeamans re: Data Needs, PMT-1, (1 page).
7. Draft Summary Schedule and Cost report.

Attachment 1 Functional and Operational Requirements Process Design Tables, Revision F November 5, 2007

CMR 33 S Project

Functional and Operational Requirements Process Design Tables

Revision F
November 5, 2007

Attachment 1	Step 1 33 S Process Design Table Rev 0
Attachment 2	Step 2 33 S Process Design Table Rev 0
Attachment 3	Step 3 33 S Process Design Table Rev 0
Attachment 4	Step 4 33 S Process Design Table Rev 0
Attachment 5	Step 5 33 S Process Design Table Rev 0
Attachment 6	CMR 33 S Waste Acceptance Criteria– Rev 0

Approval Signatures			
Core Team	**33S Project Title**	**Signature**	**Date**
Bill Crooks	PMT-1 Lead		
David Yeamans	33 S Process Design Lead PMT-1		
Mike Miller	33 S Project Engineer PE-DO		
Concurrence Signatures			
Russ Durrer	Nuclear Safety Lead		
Thad Hahn	Facility Design Authority-CMR		
Danny Martinez	Design Construction Lead AET-1		

This document was reviewed to ensure proper classification:	☐ Unclassified ☐ UCNI ☐ Classified
Authorized Derivative Classifier Signature: Printed name:	Date
UCNI Reviewing Official Signature: Printed name:	Date

REVISION HISTORY

Rev. No.	Issue Date	Revision Description
A	June 18, 2007	
B	June 23, 2007	Includes dry revisions 6/17/07
C	June 30, 2007	Further refinements and definition of the Master Equipment List; process flow summary for each process step
C plus	July 2, 2007	Yeamans input from rev c plus
0	August 31, 2007	Issues Rev 0 F&OR Attaches Rev 0 33S Process Design Tables
E	September 15, 2007	Revision 0 was rescinded; Project to continue with alpha revs until PrHA complete. Includes improvements by Russ Durrer and David Yeamans
F	November 5, 2007	Process changed due to new knowledge about waste configuration at TA-54. Several "CDR" meetings have provided input to this Rev.

List of Attachments

TABLE OF CONTENTS

1. INTRODUCTION

This document is the Functional and Operational Requirements (F&OR) document for the CMR-33 Shafts Project (CMR-33S) at the Los Alamos National Laboratory (LANL), Los Alamos New Mexico. It was prepared and is maintained by the CMR-33S project team. This F&OR provides the requirements to design, engineer, and construct a self contained remotely handled transuranic (RH-TRU) waste handling facility within CMR.

This document and the following attachments comprise the F&OR for the CMR-33S Project.

Attachment A	Step 1 33 S Process Design Table
Attachment B	Step 2 33 S Process Design Table
Attachment C	Step 3 33 S Process Design Table
Attachment D	Step 4 33 S Process Design Table
Attachment E	Step 5 33 S Process Design Table
Attachment F	CMR 33 S Waste Acceptance Criteria

As the design progresses toward completion the revision number of this document and its attachments will be approved and revised as necessary. The current revision number is identified in the title block of the document title page.

1.1 CMR 33-S PROJECT MISSION OBJECTIVE

The objective of the CMR-33S project is to repackage Los Alamos National Laboratory's (LANL's) legacy of RH-TRU waste for final disposal at WIPP.

1.2 DOCUMENT PURPOSE AND SCOPE

The purpose of this document is to document the process design and the requirements to design, engineer, and construct a self contained RH-TRU waste handling facility within CMR. This RH-TRU facility will be used to characterize, certify, and repackage legacy waste that will be received from the "Remote-Handled TRU Waste Retrieval and Disposition Project", as described in its January 2006 mission need document.

The requirements specified in this document address only the facility design and construction requirements to install this facility into CMR. Start-up and operational requirements will be provided in a separate document.

1.3 CONFIGURATION CONTROL AND CHANGE CONTROL

This document and its attachments will be maintained by the CMR-33S core team in configuration with the nuclear safety design and any further changes to requirements that may be identified by the core team as the CMR design progresses to completion.

The detailed process design is provided in Attachment A through E. A complete modification package including scope schedule and budget will be completed for each step that includes a reference to a modification. The design information provided in the tables is at a summary level for information only and is a rollup of the detailed information provided by modification packages.

Attachment 6 provides the CMR-33S Waste Acceptance Criteria (WAC). This WAC is developed and owned by the CMR 33S process team. It specifies acceptance criteria that CMR will use to accept RH-TRU waste for processing.

1.4 APPROACH – REQUIREMENTS DEVELOPMENT

An expert panel of subject matter experts examined the detailed process flow against a series of functional, safety, and operating screens. The screens were designed to identify requirements to be incorporated into the process flow in order to maintain the process within the CMR authorization basis and to protect the worker.

Requirements resulting from the screens were rolled up and documented in the attached process design tables. The process design tables describe the detailed process flow, the equipment used in each step of the process, and the design requirements developed from the screens.

A complete modification package including scope, schedule, and budget will be completed for each step that includes a reference to a modification. The design information provided in the tables is at a summary level for information only and is a rollup of the detailed information provided by modification packages.

The process design tables have been subjected to a design review and revised to incorporate review comments.

1.5 DOCUMENT ORGANIZATION

This document is organized in 5 Sections:

- Section 1.0, Introduction, describes the purpose of the document
- Section 2.0, TA-54 33S Project Overview and CMR-33S Scope
- Section 3.0, CMR 33S Project Organization
- Section 4.0, Process Design Description
- Section 5.0, Process Design Tables

2. 33-S PROJECT OVERVIEW

The "Remote-Handled TRU Waste Retrieval and Disposition Project" (33-S project) is chartered to disposition remote handled transuranic waste that was generated between 1979 and 1998 and currently stored at Technical Area (TA) 54 Area G.

There are three contributors to the overall 33-S project scope: TA-54 33-S, CMR-33S, and WIPP 33-S. The CMR-33-S project is being managed as a subproject of the overall 33-S Project.

The disposition plan involves unearthing legacy waste bearing pipes one by one, moving them into a shielded cask (transport assembly), and transporting them to CMR for characterization and repackaging so that they can be shipped to WIPP for final disposition.

2.1 TA-54 SCOPE

The TA-54 33-S project team is serving as the 33-S project integrator across the overall project 33-S scope.

TA-54 scope covers exhumation, packaging in the transport assembly and shipment to CMR. The major equipment used in this phase consists of the transport assembly, mobile crane, and flat bed truck.

The waste contained in the TA-54 shipments to CMR is highly radioactive plutonium bearing experimental and decontamination material generated as part of the Post Irradiation Examination of nuclear fuels. The waste is contained in containers as described in Attachment 6 CMR 33S WAC. These containers were originally packaged in the Wing 9 hot cells using many of the same methods that are described in the process flow for CMR-33S as described on the attached process design tables.

Working with one container at a time, a container will be gas sampled and inerted prior to being exhumed from the vertical hole where it is buried. A crane will be used to lift the container into a shielded transport assembly. These transport assemblies are designed to protect the shafts during transport and also shield the general public and worker from the radiation. The pipes are to be the same configuration as much as possible, that is, any addition of concrete or boring of existing concrete is to be done at TA-54 rather than CMR.

2.2 CMR 33-S SCOPE

CMR will design, construct, and operate a characterization and packaging process by modifying CMR's existing hot cells to fit the CMR 33 S process design requirements. Containers that are accepted at CMR's 33S hot cell handling facility will be inserted into the hot cells and cut open so that the contents can be characterized and documented. After characterization, the pipe contents will be repackaged in accordance with WIPP WAC, and transported in a shielded 72-B cask to WIPP. The empty pipe will be returned to Area G as Low Level Waste.

2.3 WIPP SCOPE

WIPP will accept ownership of the characterized waste for disposition.

2.4 CMR PROJECT TIMELINE

LANL has been directed by the New Mexico Environmental Division (NMED) to close Area G by 2015. In order to meet this closure date, the CMR scope has to meet the following milestones:

Based on the following estimated throughput, and excluding time allocated for planning, construction and startup, the project could be completed in three years if the following throughput is implemented:

- One Cycle = 4 Weeks (one waste pipe in and one 72-B out)
- 33 Cycles = 132 Weeks (2.64 years @ 50 wks/yr)
- More Than 1 WIPP Shipment per waste pipe Means Longer
- Facility Delays Mean Longer
- Three Crews of 3 Persons – 1 Shift/Day

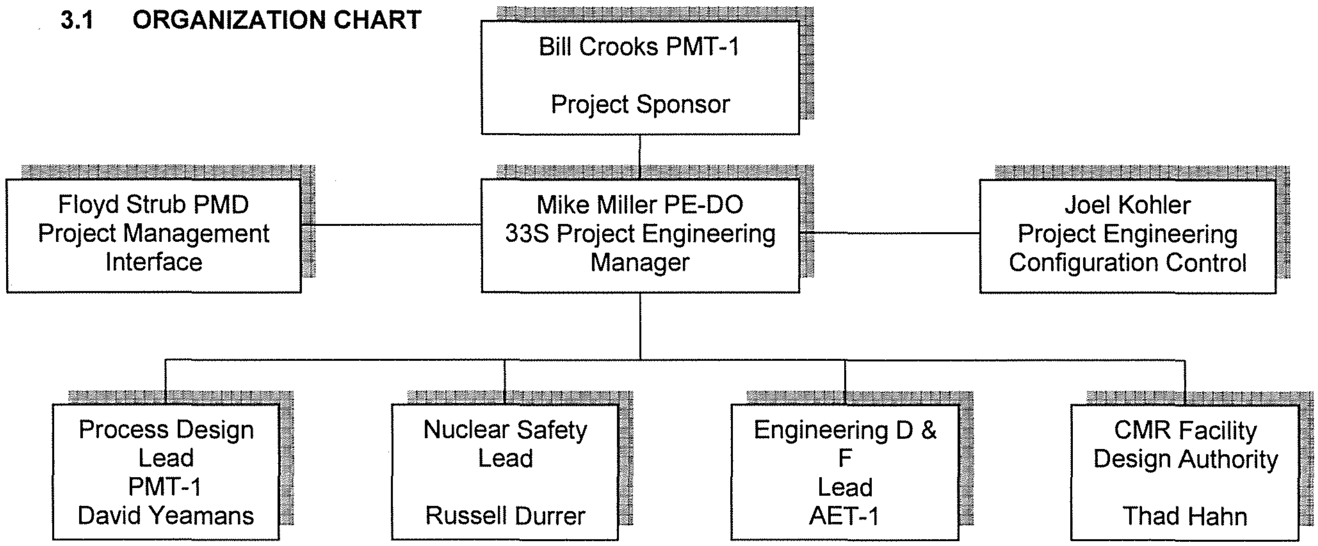
2.5 PROJECT STAKEHOLDERS

The CMR-33S project scope is owned by the Plutonium Manufacturing Technology Group 1 (PMT-1) of the Associate Director Stockpile Management and Support.

3. CMR-33S PROJECT CORE TEAM ROLES AND RESPONSIBILITES

This section documents the CMR-33S project design and engineering organization. It identifies the core team and lead assignments. It is understood that the core team leads will have SME's that provide input to the leads as necessary. As the project advances, the organization will be adjusted to fit the project needs.

3.1 ORGANIZATION CHART



3.2 CMR 33S RESPONSIBILITIES MATRIX

Name	Project Title	Roles and Responsibilities
Bill Crooks	PMT Customer and Project Sponsor	Provides project mission, budget, and priority. Provides project interface with LANS administrative and laboratory organization including the TA-54 project interface
Floyd Strub	Project Manager	Provide CMR-33S project interface with LANL PM division
Mike Miller	Project Engineering Manager	Provides project interface with LANS project management organization Leads the CMR-33S design effort and the Core Team
David Yeamans	33S Process Design Lead	Process design POC and the CMR-33S Process Design Authority Controls the process design, evolution, and documentation Formally or informally responds to process design inquiries and speaks for the process design. Controls the request for information process and maintains a log of queries and responses Manages the configuration control between process design and nuclear safety
Danny Martinez	Engineering Design and Fabrication Lead	Develops the list of engineered packages based on the documented process design Prepares the RFQ for 3rd party AE services Prepares design and procurement packages as necessary

Name	Project Title	Roles and Responsibilities
Russell Durrer	Nuclear Safety Lead	Develops the HA/PrHA based on the documented Process Design Master Equipment Tables maintained by the 33S Process Design Lead
Thad Hahn	CMR Facility Design Authority	CMR Facility Design Authority approves the installation of the design in CMR Speaks for the CMR facility design management process Provides the 33S project design interface with the CMR facility design management process
Joel Kohler	Configuration Control	Provides project engineering guidance and assistance to the Core Team Provides the focal point for project design documentation, development, configuration and design change control with the nuclear safety design.

4. CMR 33S PROCESS DESIGN DESCRIPTION

The CMR 33S process flow is divided into the following major functions.

F1	Receiving
F2	Setup
F3	Characterization
F4	Repackaging
F5	Output

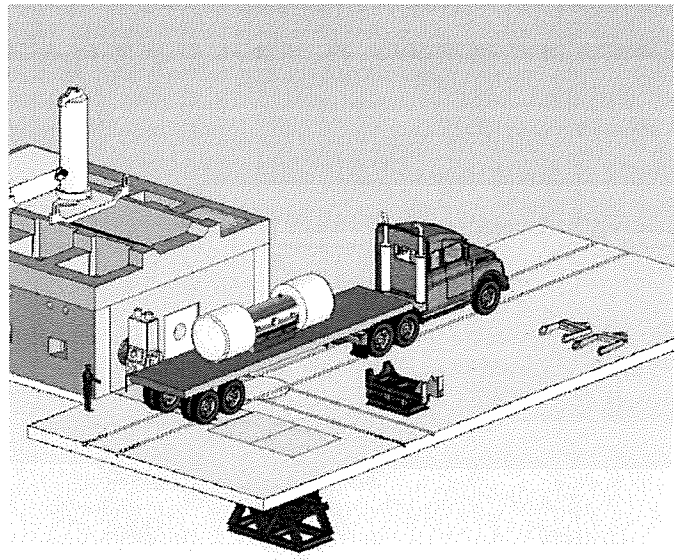
Process flow steps F1 through F5 are summarized in the following sections. The detailed process flow, the equipment used in each of the process flow steps, and requirements are provided in the attached process design tables.

The following table provides an overview of the major equipment incorporated into the process flow.

Major Equipment

Item-	Equipment Description
1.	Flat bed trailer, skid
2.	In bound cask (transport assembly)
3.	In bound waste pipe
4.	25 ton Crane
5.	Alpha Boxes
6.	Extraction equipment
7.	Outbound cask
8.	Cradle
9.	Hot cells
10	CMR Floor
11	CMR Facility

4.1 F1 SUMMARY OF RECEIVING STEP



1. The culvert/shielding assembly is delivered by truck and transporter from TA-54 to CMR;
   Transporter moved through the rollup doors and positioned inside CMR Wing 9 for unloading with the 25 ton crane
2. The culvert/shielding assembly is installed on a cradle and rail car;
   The cradle and transport assembly are moved into the hot cell corridor.
3. The culvert/shielding assembly is rotated to span the corridor between hot cells1 and 2; the culvert is bagged on to the alpha box in Cell 2.

4.2 F2 SUMMARY OF SETUP STEP

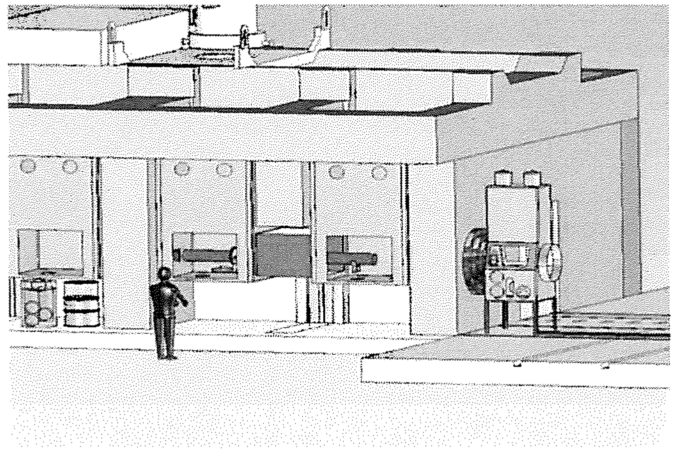
1. Inside the alpha box the waste pipe is drilled open in Alpha Box 2 and the waste removed by a combination of tools that pull, drill, and/or grapple the waste.
   The waste is moved into another hot cell for examination and characterization. Welded containers within the waste pipe are extracted and cut open at a station in Alpha Box 4 and the waste removed.
2. The waste is visually examined for WIPP compliance and placed in steel cans with lids.

4.3 F3 SUMMARY OF CHARACTERIZATION STEP

1. Cans containing waste are gamma counted for decay and confirmation of dose. Through calculation, nuclear material is quantified. Counting and characterization are documented for final WIPP disposition.

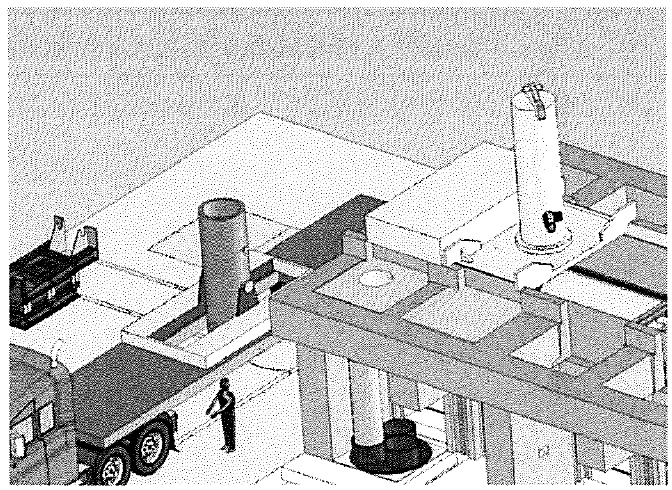
2. Cans are sent to hot cell 8 for drum out and repack.

3. The culvert is bagged off and disposed as Low Level Waste.



4.4 F4 SUMMARY OF REPACKAGING STEP

1. Documented cans are placed in WIPP WAC prepared drums in cell 8.
2. Head space gas sampling and gamma counting is performed on loaded drums.
3. Through a series of process steps, drums are loaded into WIPP certified RLC (Removable Lid Canister [RLC]) for shipment to WIPP in a 72-B cask.



4.5 F5 SUMMARY OF OUTPUT STEP

1. The 25 ton crane loads the RLC into the 72-B cask on the transporter.
2. The truck transporter and cask are shipped to WIPP.

5. CMR 33S PROCESS DESIGN TABLES

5.1 ATTACHMENT A: STEP 1 33 S PROCESS DESIGN TABLE

5.2 ATTACHMENT B: STEP 2 33 S PROCESS DESIGN TABLE

5.3 ATTACHMENT C: STEP 3 33 S PROCESS DESIGN TABLE

5.4 ATTACHMENT D: STEP 4 33 S PROCESS DESIGN TABLE

5.5 ATTACHMENT E: STEP 5 33 S PROCESS DESIGN TABL

5.6 ATTACHMENT F: CMR 33 S WASTE ACCEPTANCE CRITERIA

	F1 – RECEIVING	1. The culvert/transport assembly is delivered by truck and transporter from TA-54 to CMR; Transporter moved through the rollup doors and positioned inside CMR Wing 9 for unloading with the 25 ton crane	2. The culvert/transport assembly is installed on a handler. The culvert assembly/handler is advanced into the corridor. The culvert assembly is locked into position across the corridor and in line with alpha box 2.	3. The culvert is bagged on to Alpha Box 2.

Step 1 Rev E 91507				Sort Codes	Design Codes	Design References	CMR
	PROCESS STEP	**ITEM**	**FUNCTIONAL REQUIREMENTS**	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	**Acquisition Standards Acceptance Criteria**	**Qualitative Information to prepare design package** **Design Requirements** **Safety Requirements** **Facility Mod requirements** **Process Requirements**
1	After meeting the Wing 9 Waste Acceptance Criteria,	Waste Filled Pipe	Contains and confines waste. As described by TA-54 (nominal 11 feet long and 9.5-inch diameter)		N	CMR 33S WAC	Pipe must meet CMR 33-S Waste Acceptance Criteria (WAC) by the CMR 33S project in order to be processed in the CMR 33S RH-TRU facility
2	The Transport assembly and one pipe at a time will be transported from TA-54 aboard a 40-foot flatbed transporter trailer.	Transporter Trailer	Hold loaded transport assembly Transport load from TA-54 to inside CMR Wing 9 underneath the 25-ton crane.		M	LANL AET-1 to specify mod requirements	According to the Transportation Safety Document, P&T-SA-002
		Transport Skid (part of transporter trailer package)	Support and immobilize payload on trailer during transport. Can be removed or left in place as needed for Transport assembly handling.		M	LANL AET-1 to specify mod requirements	Design of transport skid is a function of final transport assembly dimensions, size, and weight Has to interface with 25 ton crane
		Transport assembly	Horizontal position with modular shielding that can be lifted off by crane with 5-ton or less capacity. Hold payload: waste pipe in accordance with CMR WAC. Containment to satisfy the LANL Packaging and Transportation Plan. Maximum weight < 50,000 pounds with		M	LANL AET-1 to specify mod requirements	Certifiable per 49 CFR. Desired dose rate ≤5mR/hr @30cm. Shielding calculations are required. Estimated weight of waste pipe

Step 1 Rev E 91507				Sort Codes	Design Codes	Design References	CMR
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	**Qualitative Information to prepare design package** **Design Requirements** **Safety Requirements** **Facility Mod requirements** **Process Requirements**
			payload, skid, and crane rigging. Culverts to remain sealable to Glovebox by bag-on bag.				Transport assembly dimensions have to accommodate waste pipe dimensions Transport assembly shielding has to accommodate estimated source term Transport assembly shielding has to accommodate Rad engineering assessment for transport on flat bed; Transport assembly shielding has to accommodate Rad Engineering ALARA Estimated transport assembly weight with impact limiters has to accommodate 25 ton crane Estimated transport assembly weight has to accommodate transport rigging structure Transport assembly weight and dimensions driven by waste pipe and dose rate.

Step 1 Rev E 91507				Sort Codes	Design Codes	Design References	CMR
	PROCESS STEP	**ITEM**	**FUNCTIONAL REQUIREMENTS**	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	**Qualitative Information to prepare design package** **Design Requirements** **Safety Requirements** **Facility Mod requirements** **Process Requirements**
3	Prepare Wing 9 for receipt Corridor clear of sources and equipment. Corridor openable 9149 clear except for (optionally) an empty culvert to return to TA-54. Culvert handler prepared and placed in 9149. Roll-up door functional and prepared per POD, Ops Center, RCTs, and security forces. 25-ton crane operational. Alpha box 2 contains drills and other waste extraction and management tools. Alpha box 2 prepared for new bag-on. Sufficient staging space for at least three additional drums in Cells 4 or 6,	Low Level Waste Box	Contains Culvert for return to TA-54 as LLW. Must withstand a one foot drop without leaking per LANL P&T Plan.		P		
4	Truck arrives at Door (prior coordination with SUP-5 and TA-54); conduct radiation surveys.						
5	Open roll-up door.						

Step 1 Rev E 91507				Sort Codes	Design Codes	Design References	CMR
	PROCESS STEP	**ITEM**	**FUNCTIONAL REQUIREMENTS**	**G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes**	**M=Mod P=Purchased O=Off the shelf N=No mod**	**Acquisition Standards Acceptance Criteria**	**Qualitative Information to prepare design package** **Design Requirements** **Safety Requirements** **Facility Mod requirements** **Process Requirements**
6	The trailer will back up to the Wing 9 door and radiation monitoring checks will be made. The door will be opened and the trailer backed in as far as needed to offload the Transport assembly which weighs approximately 15,000 pounds. The roll-up door will be closed with the tractor and trailer inside the Wing. The truck will be stopped and blocked.						To comply with existing approved PMT procedures for Wing 9 and CMR, e.g. PMT1-IWD-041, *Vehicle Operations in Wing 9 CMR.* Must meet requirements of P&T-SA-002.
7	Using the 25-ton crane, workers will unload the Transport assembly and shielding/skid from the trailer and set it on the handler which may be pre-mounted on the rail car.	Culvert handler	Supports Transport assembly at height sufficient to introduce culvert to alpha boxes. Pivots and translates to allow full rotation of culvert while remaining stable and secure. Minimum footprint while still providing stability.		M	LANL AET-1 to specify mod requirements	Has to interface with 25 ton crane
		25-ton Crane	Lift and position loads up to 25 tons within footprint and height of crane block travel in Wing 9.		N	Exists in Wing 9	
		Rail Car	Holds and remotely moves handler with transport assembly.		M		
8	Secure the load to the handler and release the rigging; conduct radiation surveys.						
9	The impact limiters (if any) will be removed from the Transport assembly and set aside for installation later.	Impact limiters (if any)	A feature of the Transport assembly that prevents damage to the transport assembly in case of dropping the transport assembly. Removable for access to Transport assembly interior.		N	(see Transport assembly)	

Step 1 Rev E 91507				Sort Codes	Design Codes	Design References	CMR
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
10		Impact Limiter Racks (if required)	Hold and immobilize two Transport assembly impact limiters. Available for 25-ton crane access.		Y	AET-1	Design is based on assumed impact accident, drop distance, Crane interface
11	Remove truck and LLW load from wing via door opening and closing.						
12	If rad safe to do so, remove the end shields from the culvert assembly.	Rigging for installing/removing shield components	Interfaces with 25-ton crane, 5-ton crane, PAR arm, and with shield components.				
13	Open Corridor door and move handler with load to the corridor with "up" ("cold") end of culvert leading.						
14	If necessary for making the rotation across the corridor, remove end shielding and/or body shielding from culvert; conduct rad surveys.						
15	Open Cell Doors 1, 2 and 4.						
16	If possible, considering radiological conditions and the physical dimensions of the culvert with and without shielding, leave the corridor door open; otherwise, close the door						
17	Rotate culvert to span the corridor between Cell 1 and Cell 2.						
18	Close Cell Door 4.						

Step 1 Rev E 91507				Sort Codes	Design Codes	Design References	CMR
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
19	If the end shields were not initially removed, remove the "up" end shield now.						
20	If removed in prior steps, replace the body shielding on the culvert assembly.						
21	Position the culvert assembly in front of Alpha Box 2 for bag-on.	Alpha Box 2	Incorporates seals, alignment, and support structures. Trolley for conveying waste between culvert and cells 2 and 4. Drum size conventional bagout port in rear floor. Culvert size conventional bagout port in rear wall. Glove ports and windows as a work station for bagout ports. Mounts for Severmaster-type pipe cutter. Attach and seal to the #2/4 tunnel Must control liquids that may be liberated from pipe during cutting. Mounts for push/pull/drill/grapple/camera equipment.	A	M	LANL AET-1 to specify mod requirements	Hot Cell Alpha Box Design Criteria and Analysis Document NMT-11-GEN-PUR-002 NMT-11-PUR-001/0
22	If rad safe to do so, bag on the culvert end to Cell 2 by hand; if not, keep the corridor door closed and bag on remotely using the inflatable bag-on collar.	Bag-on bag	Provide confinement of dispersible radioactive material. Mates to the Glovebox and the Transport assembly. Installable and removable by standard bag-on technique. Also installable by inflatable remote bag-on collar.		M	LANL AET-1 to specify mod requirements	
23	Insert the bagged on culvert assembly to Box 2 so that drilling and extraction may occur.						

Step 1 Rev E 91507				Sort Codes	Design Codes	Design References	CMR
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	**Qualitative Information to prepare design package** **Design Requirements** **Safety Requirements** **Facility Mod requirements** **Process Requirements**
24	Install the ventilation baffles on cells 1 and 2	Ventilation baffles	Maintains the ventilation function of hot cell doors (to maintain hot cell negative dp).				
25	Drilling and Extraction: Using a fiber-optic or other bore scope, examine the area to be drilled. Determine the proper tools (probably a hard faced or carbide, thin section hole saw about 3 to 4 inches long). Align the cutter and cut the top out of the pipe. Progressively or cyclically do the following: Vacuum out the easily extractable material. Grasp, attach, and/or impale material and drag it into the waste tray. Drill, hammer, and/or overdrill material to loosen it or provide a grip, then drag it out.	Bore Scope and Camera	Provides a full view inside the pipe at any position along the length of the pipe. Viewing screen in the personnel work space, not the alpha box. Sufficient lighting and resolution to allow tool selection and to verify pipe empty.				
		Push/pull device	Inserts and withdraws tools and waste. Rigid and powerful enough to pull a 5,000 pound load. Reacts the push/pull force to the culvert, not the alpha box.				

Step 1 Rev E 91507				Sort Codes	Design Codes	Design References	CMR
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
		Tool gripper	Interfaces with push/pull device and with tools to extract waste. Able to release stuck tools and be withdrawn.				
		Rotational head	Mates to push/pull device and with tool gripper. Must not transmit rotational force to push/pull device.				
		Drill tools such as core bits, twist bits, grapplers, magnets, brushes, swipes, smears, and radiological detection instruments.	Able to drill, core, and overbore waste if required. Able to grasp waste and withdraw it from the pipe into Cell 2. Mates to the push/pull device				
26	If the pipe cannot be emptied in this fashion, bag off and rotate the culvert assembly 180 degrees and bag it on again; core out the concrete end and repeat the drilling and extraction process.	Concrete coring tools.	See "Drill Tools" (above)				
27	Polish the inside of the pipe as required for reducing the culvert assembly to LLW.						
28	Move source material into Cells 6 and 8 or other shielded location so that corridor door can be opened for removal of clean culvert.	#2/4 tunnel	Mates/matches air tight and aligned with Alpha box #2 and with Alpha box #4.	GT	M	LANL AET-1 to specify mod requirements	Hot Cell Alpha Box Design Criteria and Analysis Document NMT-11-GEN-PUR-002 NMT-11 Procurement specification NMT-11-PUR-001/0

Step 1 Rev E 91507				Sort Codes	Design Codes	Design References	CMR
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
		Alpha Box 4	Attaches to and seals to #2/4 tunnel. Trolley for conveying pipe contents from transport assembly. Anchor points for withdrawing payload from pipe. Trolley for conveying welded can segments to and from Cells 2 and 6. Ten-inch conventional bagout port in rear floor. Glove ports and windows as a work station for bagout port. Double door transfer port in rear wall to accommodate replacement or new tools. Mounts for Severmaster-type pipe cutter. Attach and seal to the #4/6 tunnel	A	M	LANL AET-1 to specify mod requirements	
	All Process Steps inside Alpha Boxes.	All Alpha Boxes	Provide confinement of dispersible radioactive material per alpha box standard. Front window for viewing through hot cell face. Windows for viewing through Kollmorgen periscopes. Manipulator ports. Ceiling openings for lights Pick and place (limited travel acceptable) hoist capability for up to 500 pounds inside box. Grapplers for manipulating welded can pieces and other items up to 500 pounds.	A	M	LANL AET-1 to specify mod requirements	Hot Cell Alpha Box Design Criteria and Analysis Document NMT-11-GEN-PUR-002 NMT-11 Procurement specification NMT-11-PUR-001/0 Hot Cells to have * Manipulator Boot Seal Package * Door Enclosures Corridor to have access control interlocks
		Alpha Box Hoist	Capacity to handle loaded welded cans. Moves a items ±18 inches X and Y directions and ±48 inches in Z direction.	A	M	LANL AET-1 to specify mod requirements	

Step 1 Rev E 91507				Sort Codes	Design Codes	Design References	CMR
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
		Alpha Box 6	Attaches to and seals to #4/6 tunnel. Trolley for conveying welded can segments to and from Cells 4 and 8. Ten-inch conventional bagout port in rear floor. Glove ports and windows as a work station for bagout port. Sample positioner for gamma assay of canned waste. Thin window for gamma probes. Protector for thin window to provide physical protection and shielding when probes are not in use. Shielding to provide minimum background environment so gamma counting technique can be qualified. Mounts for Severmaster-type pipe cutter. Attach and seal to the #6/8 tunnel.	A	M	LANL AET-1 to specify mod requirements	Hot Cell Alpha Box Design Criteria and Analysis Document NMT-11-GEN-PUR-002 NMT-11 Procurement specification NMT-11-PUR-001/0
		Alpha Box 8	Attaches to and seals to #6/8 tunnel. Ten-inch conventional bagout port in rear floor. 8-inch double lid transfer port in rear floor. Drum size double lid transfer port in rear floor with remotely operable drum attachment/removal hardware. Glove ports and windows as two work stations for bagout ports.	A	M	LANL AET-1 to specify mod requirements	LaCalhene double door transfer system or equivalent. Rotation system capable of indexing a drum in 90-degree increments about the drum vertical axis.
		#4/6 tunnel	Doors with variable ventilation and seals to assure air flow. Mates/matches air tight and aligned with Alpha box #4 and with Alpha box #6. Houses transfer device for pipe segments, waste cans, and loose waste. Houses shielding plugs	GT	M	LANL AET-1 to specify mod requirements	
		Moveable shielding for #4/6 tunnel.	Provides dose protection to Cell 4 when sources are present in Cells 6 and 8.		P		

Step 1 Rev E 91507				Sort Codes	Design Codes	Design References	CMR
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
		#6/8 tunnel	Doors with variable ventilation and seals to assure air flow. Mates/matches air tight and aligned with Alpha box #6. Houses transfer device for pipe segments, waste cans, and loose waste.	GT	M	LANL AET-1 to specify mod requirements	
29	Brush, vacuum, and wipe the pipe interior and then measure it to ensure that TA-54 LLW waste criteria are met.	Rad monitor or swipe applier.	Provides real time gamma readings of entire pipe interior or ability to swipe any and all locations inside pipe.				
30	Bag off the LLW culvert assembly, remove it from the corridor and package it for removal to Area G for disposal.						
31	Remove the ventilation barrier and close hot cell 1 and 2 doors.						

	F2 – SETUP	3. Inside the alpha box the pipe is drilled and the waste extracted. The welded cans and other waste are moved into another hot cell for opening examination and characterization	4. Waste is placed in steel cans with lids.

Step 2 Rev E 91507				Sort Codes	Design Codes	Design References	
	PROCESS STEP	**ITEM**	**FUNCTIONAL REQUIREMENTS**	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	**Acquisition Standards** **Acceptance Criteria**	**Qualitative Information to prepare design package** **Design Requirements** **Safety Requirements** **Facility Mod requirements** **Process Requirements**
1	The goal is to package waste that can be passed through the alpha box train to cell 8 where it will be loaded into a LaCalhene double-door bagless transfer drum liner.	Conveyor for Waste (trolley).	Weight capacity to hold up to a 32 inch section of extracted waste. Conveys welded can segments within and between Cells 2, 4, and 6, and within tunnels 2/4, 4/6, and 6/8.		M	LANL AET-1 to specify mod requirements	Trolley in Cells 2/4 to transfer up to 500 lbs per load. Trolley in Cells 6/8 and in tunnels 4/6 and 6/8 to transfer up to 60 lbs per load.
2	After the waste and welded containers are extracted, they and the waste inside them will be moved to Cell 4 for further handling.				N		
3	Loose waste will be moved to Cell 4 in a catch pan.	Waste Box	Contains up to 3 welded cans with all waste. Fits through Tunnel 2/4. Easily usable on waste trolley.		M	LANL AET-1 to specify mod requirements	
4	Some loose waste may inadvertently be spilled in Cell 2. That waste can be visually examined there and placed into 1-gallon paint cans with filters or holes and sent to Cell 6 for gamma assay.	Standard 1-gallon paint with wire bail or similar steel can with a lid	Must be manipulator friendly. Bails help in this regard. Must fit through 4/6 tunnel. Must fit into trolleys and trays. Must be vented or have 3/8" diameter equivalent holes. Tin coated steel		N	Purchase from manufacturer or dealer. No QA required	

Step 2 Rev E 91507				Sort Codes	Design Codes	Design References	
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	**Acquisition Standards** **Acceptance Criteria**	**Qualitative Information to prepare design package** **Design Requirements** **Safety Requirements** **Facility Mod requirements** **Process Requirements**
5	Inside Cell 4, welded cans will be opened with a commercial grade Severmaster-type pipe cutter.	Welded Can Cutter	Accommodates welded can diameter. Cuts welded cans without cutting through waste within pipe. Manages, controls, or eliminates explosive atmospheres possibly present inside welded cans in case a non-vented can is discovered. Manages or controls liquids that may be present inside welded cans.		N	Severmaster from tri Tool	
6	That waste is visually examined in Cell 4 and placed into1-gallon paint cans with filters or holes and sent to Cell 6 for gamma assay.	Standard 1-gallon paint with wire bail or similar steel can with a lid			N		
7	The cutting, examination, and containerizing process is repeated until the entire pipe contents are examined. The examination process is conducted by a WIPP-certified contractor. Prohibited items will be remediated and managed as RH-TRU waste or segregated and managed separately.				N		
8	The cut pieces of welded waste cans will be sent via trolley to Cell 8 for drum out.				N		

ATTACHMENT C: Step 3 33S Process Design Table

1.	F3 – CHARACTERIZATION	1. Cans containing waste are gamma counted for decay and confirmation of dose. Through calculation, nuclear material is quantified. Counting and characterization are documented for final WIPP disposition.	2. Cans are sent to hot cell 8 for drum out and repack.

Step 3 Rev E 91507				Sort Codes	Design Codes	Design References	
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements

Step 3 Rev E 91507				Sort Codes	Design Codes	Design References	
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
1	During some of the F2 steps it is opportune and necessary to visually examine the waste and to assay the radioactive content. During visual examination (VE) the waste is viewed by the VE expert and described according to weight, volume, and waste matrix.	Certified Balance	Weighs waste for WIPP certification.		N	WIPP QAPD	
2	Any noncompliant conditions such as pressurized cans or free liquids are segregated or remediated at that time.		Remediate and/or bag out non-compliant items per WS-WA instructions. Send to TA-54 for final disposition. This waste is to be CH TRU or LLW.		N		
3	In order to control the geometry of the waste for gamma measurement, it is placed into thin steel cans with lids. The cans are positioned in front of the Alpha Box 6 thin window.	Positioner	Center and position a variety of probes that extend through the hot cell face and touch the alpha box wall. Provide shielding and probe connections during use and during idle periods.		M	LANL AET-1 to specify mod requirements	
4	In Cell 6 the newly created cans of waste will be measured for gamma decay by a collimated probe fed through the face of the hot cells. The probe will be positioned on the outside face of the alpha box in front of a thin window. The other end of the probe will be fed through a pass through port to the hot cell face for detection and analysis. The measurement confirms the dose rate and, by calculation, the nuclear material amount.	Gamma Counter	Detects Gamma field for Qualified dose to curie measurement.		M	WIPP QAPD PMT-1	
5	Once measured, the cans will be sent to Cell 8 for staging and drum out.						

Step 3 Rev E 91507				Sort Codes	Design Codes	Design References	
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
6	The location is chosen for its proximity to the thin window of Alpha Box 6 and its isolation from other gamma sources. The gamma dose rate of cans of waste is measured by any of several probes. When not in use, the probe feed through is shielded from radiation inside the alpha box. By calculation the measured field is converted to the Curie content of the can.	Window shielding	Protects thin window from physical damage. Protects workers from radiation exposure.		M	LANL AET-1 to specify mod requirements	
		Gamma background shielding	Provides low background for certifiable gamma measurements.		M	LANL AET-1 to specify mod requirements	
		Vertical Drum Lifter	Hangs from PAR arm hook or crane hook. Grips a 55-gallon drum for hoisting and positioning. Remotely operable.		N		Exists in Wing 9

F4 REPACKAGING	1. Documented cans placed in WIPP WAC prepared drums in cell 8	2. Head space gas sample and gamma measurement performed on loaded drums	3. Through a series of process steps, drums are loaded into WIPP certified RLC for shipment to WIPP in a 72-B cask

Step 4 Rev E 91507				Sort Codes	Design Codes	Design References	
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
1	In Cell 8 a specified set of cans identified by CCP and any amount of pipe segments and cut cans will be placed into a drum size bagless transfer port attached to the bottom of the alpha box.	Double lid drum-out port and can-out port	Mate to Alpha Box 8 rear floor. Provide contamination free removal and installation of waste drums and cans.		N		LaCalhene
		Double lid transfer cans and drums	Mate to double lid transfer ports. Provide contamination free removal and installation of waste drums and cans. Vented according to WIPP criteria for maximum hydrogen throughput. Drum size to provide exterior configuration compatible with vertical drum handler. Drum size to fit inside RLC and to be compatible with RLC handler and lid installation tools.		N		LaCalhene
2	Using remotely operated machinery each drum (with a custom liner) will be removed and swiped for contamination. If contamination is detected the drums will be overbagged. Alternatively, can-sized removable containers can be used and set inside 55-gallon drums.	Drumout Actuator	Positions the LaCalhene bagless transfer port hardware for double lid bagless transfers, drum and 8-inch size. Remotely operable. Moves to a position where drums and cans can be loaded onto it remotely.		N		LaCalhene
		Can Handling Equipment	Remotely picks and places small cans from the double lid bagless transfer system.		M	LANL AET-1 to specify mod requirements	
		Drum Sealing	Remotely installs lids on DOT Type 7A 55-gallon drums.		Mod	AET-1	

Step 4 Rev E 91507				Sort Codes	Design Codes	Design References	
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
		Equipment					
3	The drums will be placed on a turntable at the east end of the corridor and rotated to each of 4 positions for a gamma measurement that is used to calculate the dose rate at the surface of the 72-B cask.	Turntable	Positions a single drum at one time in front of a gamma probe. Rotates the drum to each of 4 quadrants.		M	LANL AET-1 to specify mod requirements	Wing 9 also provides design input
		Gamma measurement equipment	Measures gamma emission rate from near or at the surface of the loaded drums.		New Design	Wing 9 and CCP	
4	The drums will be staged.	Drum Staging Trays	Two each. Hold 55-gallon drums full of waste. Maximizes area on which drums can be stored. Remotely operable to enter and exit the cell from the corridor while holding a load. Receive or deliver drums to/from the corridor. In Cells 4 and 6 the trays will move the load in and out underneath the alpha box.		M	LANL AET-1 to specify mod requirements	
		Drum racks	To fit on Drum Staging Trays. Immobilize loaded and staged drums in vertical orientation. To be loaded/unloaded remotely using vertical drum handler. Not intended for stacking drums. Hold maximum number of drums possible in hot cell.		M	LANL AET-1 to specify mod requirements	
		RLC staging racks	Hold and immobilize 6 or more empty RLCs in 9165. RLCs accessible by fork lift and/or crane		M	LANL AET-1 to specify mod requirements	
		RLC lid rack	Capacity for one RLC lid. Accessible for receiving or releasing a lid for installation on RLC by remote means.		M	LANL AET-1 to specify mod requirements	
		RLC closure tooling	CCP qualified or acceptable. Seals and opens the RLCs, , RLC Handler and operating equipment. Powered (electrical, pneumatic, or hydraulic) Remotely operable.		M	LANL AET-1 to specify mod requirements	
5	Three gas sampled drums will be	Drum Rotator	Rotates a 55 gallon drum from vertical to horizontal and vice		N		Wing 9 owns

Step 4 Rev E 91507				Sort Codes	Design Codes	Design References	
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
	selected for loading into the RLC. Once the RLC is loaded it will be sealed by a twist locking lid and elevated to the vertical position.		versa. Remotely operable.				
		Horizontal Drum Lifter	Hangs from PAR arm hook or crane hook. Grips a 55-gallon drum for hoisting and positioning horizontally. Remotely operable.		N		Wing 9 owns
		Racks for RLC closure tooling	Fit in spaces in Corridor without causing interference with other required equipment. Hold lids in position for installation or removal on Removable Lid Canister. Remotely operable.		M	LANL AET-1 to specify mod requirements	Mod may not be required
		RLC leak test equipment	Reaches RLC canister leak detection ports. Provides WIPP compliant leak testing.		N	WIPP/CCP WIPP QAPD	WIPP Transportation AET-1 will review to determine if mod is required
		Removable Lid Canister Handler (RLC Handler)	Mobile in East-West direction Supports and manages RLC, lid, RLC closure tooling, and 3 waste drums at a time. Grasps and releases the RLC. Inserts and retrieves 3 55-gallon drums to/from interior of RLC. Accommodates remote installation and removal of RLC lid. Horizontal to vertical lift of RLC. Vertical clearance and alignment with roof plug hole. Adapted for use without counterweights. Attached to and mobile with rail car. Can be moved to 9149 to be fitted with an RLC.		M	LANL AET-1 to specify mod requirements	
6	In the vertical orientation the RLC is now, by design, located underneath a "window" in the roof of the hot cell corridor. The "window" cover will be removed and the Transport Shield (TS) will be positioned above the window opening using the 25-ton crane with the short hook	RH loading roof plug	Installed over RLC Handler in its most westward usable position. Supports and aligns Transport Shield. Hole to accommodate RLC removal from corridor. Provides shielding equivalent to original corridor roof plug specification or performance.		M	LANL AET-1 to specify mod requirements	CMR owns

Step 4 Rev E 91507				Sort Codes	Design Codes	Design References	
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
	replacement (adapter).						
		Transport Shield	Provide shielding for loaded RLC such that external dose rate ≤ 100 mR/hr at contact. Bottom entry and release for loaded RLC. Height such that it can be moved from above the corridor roof plug to a 72-B for discharge of payload. Gross Weight with payload < 50,000 pounds.		N		CMR owns AET-1 will review to determine if mod is required
		Transport Shield lift adapter	Replaces 25-ton crane hook. Rated to lift Transport Shield with loaded RLC. Fits Transport Shield Provides for clearance when handling the Transport Shield above the RH Roof Plug.		M	LANL AET-1 to specify mod requirements	AET adapts existing design
		Rack for hook changing	Accommodates change out and storage of 25-ton crane hook and for the Transport Shield lift adapter.		N		AET-1 will review to determine if mod is required
		Video Cameras, controls, cabling, and monitors	To view multiple angles of TS positioning with 25-ton Crane above Corridor Roof Plug, Cell #1 Roof Plug, and RH-TRU Uprighting Trailer. Pan, Tilt, Zoom capability		N	Specified by M-8	AET-1 will review to determine if mod is required
		ALARA Controls	Protects Crane operator(s) from radiation out of briefly opened hot cell ports and TS shield bottom during transfers.		M	LANL AET-1 to specify mod requirements	Analyze dose/time/distance/shielding array to determine best method. LANL Rad Protection Requirements
7	The cable and grappler of the TS will be lowered along the axis (inside the bore) of the TS until the grappler engages the RLC. Then the RLC will be released from the RLCH and pulled up into the TS.						
		Transport Shield Grappler	Grasps and holds/releases the loaded RLC from inside the Transport Shield		N		AET-1 will review to determine if mod is required
8	The assembly of TS with RLC inside will be moved over the top of Hot Cell #1.						
9	Movable shielding in the Cell #1 Roof Plug will be opened and the RLC will be lowered out of the TS	Hot Cell #1 RH-TRU Roof Plug	Admits one RLC vertically from Mezzanine through plug into hot cell.		M	LANL AET-1 to specify mod requirements	Shielding equivalent to original design and performance.

Step 4 Rev E 91507				Sort Codes	Design Codes	Design References	
	PROCESS STEP	**ITEM**	**FUNCTIONAL REQUIREMENTS**	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	**Acquisition Standards Acceptance Criteria**	**Qualitative Information to prepare design package** **Design Requirements** **Safety Requirements** **Facility Mod requirements** **Process Requirements**
	through a hole into Cell #1						LANL Rad Protection Requirements
		Personnel guard rails – 13-foot level	Prevent personnel falling from 13-foot level. Removable as needed to allow clearance for TS movements to and from Mezzanine.		M	LANL AET-1 to specify mod requirements	
		Shielding for Cell #1 Roof Plug	Provides Movable Shielding equivalent to original design or performance of the Cell #1 Roof Plug.		M	LANL AET-1 to specify mod requirements	
10	The RLC is set vertically on an RLC rack or turntable; the Cell #1 Roof Plug Shield is reinstalled.	RLC Staging Rack Turntable	Supports an array of up to 5 loaded vertical RLCs. Rotates with remotely controlled power to locate any of the RLCs under the Roof Plug Hole.		M	LANL AET-1 to specify mod requirements	Supports up to 5 RLCs of up to 8000 pounds each (RH-TRU 72-B Cask SAR). Aligns and supports canisters vertically. Positions canisters one at a time under hole in RH-TRU Hot Cell Roof Plug.

ATTACHMENT E: STEP 5 33S Process Design Table

F5 – OUTPUT	1. The 25 ton crane loads the RLC into the 72-B cask on the transporter.	2. The truck transporter and 72-B cask are shipped to WIPP.

Step 5 Rev E 91507				Sort Codes	Design Codes	Design References	
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	Qualitative Information to prepare design package Design Requirements Safety Requirements Facility Mod requirements Process Requirements
1	The 72-B Uprighting Transporter Trailer carrying an empty 72-B will be backed in to the Wing.	Uprighting Trailer	Transports 72-B. Fits in Wing 9. 72-B can be filled in place on trailer.		N	Per WIPP	
		72-B Cask	DOT Type-B container certified by WIPP		N	Per WIPP	
2	The tractor and trailer are stopped inside Wing 9 but will be jockeyed and blocked as necessary to remove impact limiters.	Impact Limiters	Part of DOT Type-B container certified by WIPP		N	Per WIPP	
3	A filled RLC will be removed from Cell #1 in the TS by 25-ton crane and moved to align with the empty 72-B.				N		
4	The RLC will be lowered into the 72-B fully and released. The TS will be returned to its position atop the Hot Cell Corridor.				N		
5	The 72-B will be sealed for WIPP shipment by WIPP contractor personnel.	Mobile Loading Equipment	Location for leak detectors, tools, supplies, and fixtures for 72-B loading and sealing.		N		On loan from WIPP for CCP use.
		Stands and platforms for filling 72-B	Accommodates and protects personnel walking/standing for work on 72-B cask in Uprighting Trailer in 9149.		N		On loan from WIPP for CCP use.
		72-B lid pick and place machinery	Handle the weight of 72-B lids. Move lids to/from rack and from/to 72-B for installation. For putting and placing 72-B lids.		N		On loan from WIPP for CCP use.
		72-B Leak test equipment	Provides Quality Assured testing for WIPP 72-B		N		On loan from WIPP for CCP use.

Step 5 Rev E 91507				Sort Codes	Design Codes	Design References	
	PROCESS STEP	ITEM	FUNCTIONAL REQUIREMENTS	G=Glovebox A=Alphabox GT=Glovebox Tunnel Other Codes	M=Mod P=Purchased O=Off the shelf N=No mod	Acquisition Standards Acceptance Criteria	**Qualitative Information to prepare design package** **Design Requirements** **Safety Requirements** **Facility Mod requirements** **Process Requirements**
		Racks for 72-B lids	Fit in spaces on 9149 floor or on Mezzanine. Hold lids in position for installation or removal on 72-B cask. Do not interfere with personnel working at 72-B cask seals. Do not interfere with Transport Shield movements or with 72-B movements.		N		On loan from WIPP for CCP use.
6	The loaded 72-B Transporter will be moved out of Wing 9 through the roll-up door opening. The roll-up door will be closed.				N		
7	Another pipe will be received into the hot cells as long as there is room for the transport trailer in the Wing, and there is room for the pipe in the alpha boxes. Waste characterization activities can occur simultaneously with 72-B Cask preparation activities.				N		

WAC

Waste Acceptance Criteria for "33 Shafts" Coming to CMR
Pipe # ___________

The completed document for each pipe is maintained as a record by the Project Records Office

- Headspace gas has been sampled and the pipe is devoid of flammable gases.
- RH-TRU waste container weighing up to 15,000 lb. total
- Pipe will be from TA-54 "33-shafts" project
- Pipe encased in a metal culvert, smooth or corrugated, (dimensions TBD as of 10-25-07), filled with concrete – pipe assumed to be centered axially and along the length of the culvert.
- One void cylinder in the concrete is present that exposes the entire top of the waste pipe. The void is plugged with a shield equivalent to the missing concrete.
- Delivered from TA-54 inside the project's shielded transport assembly
- < 100 mR/hr on contact with exterior of shielded transport assembly
- Exterior of culvert is free from dirt and radiological contamination.
- Volume and location of liquids inside pipe have been described.
- A description of package dimensions, material, assembly, and condition as retrieved is provided.
- A description of the pipe radiological conditions recently measured at TA-54 is provided.
- exterior of transport assembly free of contamination

On behalf of TA-54, I attest that the waste has met the above criteria.

(Signature) ___________________________________ (Date) _____________

On behalf of CMR, I receive the waste based on the above signature.

(Signature) ___________________________________ (Date) _____________

The above WAC document template has been reviewed and approved by TA-54 and CMR Facility and Programmatic Personnel. The completed WAC document for each pipe is maintained as a record by the Project Records Office

33S WAC Check Sheet Pipe # ____________

No.	Description	33 S WAC	Verification
	Description of pipe	Description of pipe dimensions, material, assembly, and condition as retrieved is provided	
1	Pipe will be from TA-54 "33-shafts" project		____________
2	Delivered from TA-54 inside the project's shielded transport assembly	< 100 mR/hr on contact with exterior of shielded transport assembly	____________mR/hr
	Pipe gases	Pipe gases have been made safe by an approved procedure that vents pressure and assures a non-flammable and non-toxic atmosphere in the pipes.	____________Pipe vented
	Exterior of culvert	Exterior of culvert has been cleaned of excessive dirt and rust. This may be additionally assured by using a designed and approved transport assembly liner	____________
	Weight and Center of Gravity	Total Culvert Assembly Weight Location of CG (inches from top)	____________ ____________
	Culvert size	Culvert length (< ? tbd), Diameter (< ? tbd)	____________
	Liquids	Volume and location of liquids inside pipe have been described	Description or "No Liquids" ____________
	Exterior of transport assembly free of contamination	Exterior of transport assembly is free of removable radioactive contamination.	

On behalf of TA-54, I attest that the waste has met the above criteria.

(Signature) ______________________________ (Date) ____________

On behalf of CMR, I receive the waste based on the above signature.

(Signature) ______________________________ (Date) ____________

The above WAC document template has been reviewed and approved by TA-54 and CMR Facility and Programmatic Personnel. The completed WAC document for each pipe is maintained as a record by the Project Records Office

Attachment 2 Evolution of the 33 Shafts Packaging Process

The table that follows is an attempt to portray the logic in choosing or rejecting a particular method or technique for sending the RH-TRU waste to WIPP. Risk to the budget, safety, safety basis, process, and schedule have all been considered but not necessarily elaborated in the cells of the table. Prior F&OR documents and notes from Conceptual Design Review Meetings were used to develop the best process to date. Not every process step, refinement, or deletion is annotated nor is a complete justification for decisions provided in this table. The careful reader will be given additional insights into the F&OR document for this project.

Process Steps: What process is being considered,
Superseded by (date): What improved step would be done instead of the process step in column 1; dates have not been determined,
Reason for Change: What assumptions failed, what related process or condition changed, or what new and better idea emerged,
Elements Carried Forward: What good ideas have come from this original suggestion that can be used in future suggestions,
Final Disposition of Original Method Element: What did we do with the original Process Step?

Process Steps	Superseded by (date)	Reason for Change	Elements Carried Forward	Final Disposition of Original Method Element
Pull Pipes into bottom entry cask at TA-54	Strip concrete from pipes.	24 pipes discovered to have concrete surrounding them	Pull existing pipes into bottom entry cask. Must clean pipes first.	Delete – lay pipes horizontally onto transporter and then add shielding.
Rotate FSV-1 or T3-L cask to horizontal and transport to CMR	Rotate pipe to horizontal first, then lay them onto custom-designed cask and install shielding.	Decision to leave concrete on pipes and to add concrete to nude pipes for shielding purposes.	Transport trailer and shielding cask	Delete – see above
At CMR, insert nude pipes through the Cell #2 wall and into Hot Cells 2 and 4.	Move at least some of the pipes into the corridor and then into the back of Alpha Box 2.	Second waste configuration discovered at TA-45. Also, unknown diameter of pipes means either drilling an impossibly large hole in Cell 2 wall (major mod?) or creating a second method for the second configuration.	Corridor entry plus side entry into Cell 2. (added a second capability)	Delete Cell 2 wall entry.
At CMR slice the pipes into segments.	Dump waste out of pipe and send pipe and culvert to TA-54 as LLW	Problematic to slice pipes in concrete. Searching for a single method. Less material handling.	Possible donut method. Equipment required for opening welded cans.	Delete except as needed for emergency in case of impacted waste.
At CMR, core out a concrete plug from each end of culvert.	Coring at TA-54	Difficulty of coring in a hot cell. Also, "need" identified by LANL P&T to assure a non-explosive pipe for shipping.	Coring a hollow for HGAS access	Delete – instead, create a void in only the "up" end of the concrete.

Process Steps	Superseded by (date)	Reason for Change	Elements Carried Forward	Final Disposition of Original Method Element
At TA-54, pour additional concrete around nude pipes to provide uniform product to CMR so a single method could be pursued rather than a multiplicity of methods.	Pour the concrete with hollow included in form. Also, core the existing pipes at TA-54.	Avoids having to drill 9 cores and avoids expense of hot cell coring. Provides a uniform and shielded product to CMR so that design time, cycle time, and equipment costs are minimized.	Pouring additional concrete including a hollow plug for the 9 nude pipes.	Keep this item.
At TA-54, create a cavity in the concrete at the top and bottom of the pipe. Allows for HGAS and eases the burden of hot cell work.	Create a cavity only at the "up" end of the pipes.	The waste can be extracted by pulling only. No need to have second cavity. If need arises, use alpha box 1 (if present. If not present, swap ends of pipe in cell 2 and drill out concrete.)	Cavity in one end of concrete.	Delete. Substitute with cavity at "up" end only.
Saw off dead concrete ends at CMR or TA-54	Leave ends in place	Ends provide shielding for operators during bag-on process.	Full Concrete and culvert size and shape.	Delete
Rubblize the concrete and remove it prior to introducing the entire pipe to hot cells	Leave Culvert intact.	Required an additional hot cell to be designed. Preserved the difficult Cell 2 wall penetration. Provides shielding. Eliminates handling industrial dirt and rock in hot cells.	Entire culvert length.	Delete
Introduce culverts to corridor and then to Alpha Box 2 for sawing off donuts that facilitate waste extraction.	Do not create donuts.	Difficulty of LLW management and lack of appropriate sawing equipment to cut an unconstrained welded can that could spin inside the waste pipe.	Introduce culvert to corridor and bag it on to the back of Alpha Box 2 for waste extraction.	Delete
Tip and Dump the waste out of the pipe at CMR	Introduce culvert to corridor, Cell 2, and then extract waste.	Needed entire new hot cell in 9149. Major Mod. Also, no backup plan for impacted waste.	Open both ends of pipe and push/pull waste out. Send culvert back to TA-54 as LLW.	Delete
Open both ends of concrete in Alpha Box 1 and Alpha Box 2	Open only one end of pipe in Alpha Box 2 and withdraw the waste – pull only.	Expense of second alpha box and extraction methods. Process time and dose exposure for bag-on/off.	Drilling the pipe diameter; introducing the culvert to Alpha Box 2. Bag-on/off.	Delete
Use a conventional Cask from General Atomics or another supplier	Create a custom cask	Casks to handle culverts are too heavy. Custom cask is lighter and can be made modular to be removed or installed remotely.	Shielding, handling, and transportation.	Delete

?

Process Steps	Superseded by (date)	Reason for Change	Elements Carried Forward	Final Disposition of Original Method Element
Stage multiple 72-B casks in CMR for filling.	Stage multiple payload canisters (RLCs) and load the single 72-B as it becomes available	WIPP changed and now supports only one 72-B on an uprighting trailer. More efficient use of materiel.	Multiple payload RLCs to be created.	Delete
Load one RLC and wait for a 72-B to show up.	Stage several loaded RLCs in Cell 1	Parallel processing efficiency	RLCs loaded in Corridor	Delete
Stage several loaded RLCs in Cell 1	Stage several loaded RLCs in Cell 3	Need floor space in Cell 1 to accommodate turn of culvert across the Corridor. Roof plug with shielded hole nonexistent.	Multiple RLCs to be staged.	Delete
Remote bagout of waste cans is done internal to Alpha Box 8	LaCalhene double door drum loading and transfer system	Contamination control and impracticality of handling, especially in light of 40 years of experience with suggested technology.	Clean transfer of cans out of alpha boxes and into drums for later handling.	Delete
Do not open Welded Steel Cans	Open all steel cans	WIPP requirement for visual examination of waste	None.	Delete

Summary of method 11-5-07

AT TA-54

1. Fill with concrete the annulus between the eight nude pipes and the culvert, preserving a hollow above the pipe for the purpose of gas sampling and inerting. Culvert/concrete dimensions to be ≤ 24-inch diameter X ≤ 16 feet long, with both ends (2 feet of each end) having a field in the low mRem region.
2. Core the 24 existing concreted culverts to expose the pipe and take gas samples; inert the pipe atmosphere.
3. Lift one culvert at a time out of the ground and lay it horizontally; add shielding and impact limiters for transport to CMR.

AT CMR

1. Receive truck with culvert and shielding in high bay.
2. Set shield and culvert on handler and introduce to Corridor.
3. Turn culvert across Corridor and bag it on to Alpha Box 2.
4. Drill out the end of the pipe inspect and withdraw the waste; clean the pipe interior.
5. Examine the waste and pack it into 1-gallon paint cans.
6. Gamma scan each can and stage for creating a drum payload.
7. Drum out the cans into drums according to CCP guidance to assure not overloading a drum.
8. In Corridor, gamma scan each drum to ensure compliance with WIPP WAC.
9. Stage drums in Cell 6 and 4.
10. Swipe the culvert to ensure LLW per TA-54 WAC; remove it from Corridor, and send it to TA-54.
11. Move at least one payload of three drums to Cell 6.

12. Move Removable Lid Canister (RLC) handler to corridor
13. Load RLC, install lid, and rotate to vertical.
14. Gamma scan RLC to ensure compliance with WIPP WAC.
15. Draw RLC up into facility transfer shield via hole in Corridor roof plug.
16. Move RLC to Cell 3 for staging; create and stage additional RLCs as space and waste supply allows.
17. Receive 72-B transporter and load one of the staged RLCs.
18. Send 72-B to WIP.

Attachment 3 33 Shafts DRAFT Preliminary Hazards Analysis

Remote Handled TRU Waste Shafts Safety Basis Status for Project Suspension (Russ Durrer, 11-7-07)
After several attempts, a draft hazard analysis results table was produced and incorporated into the F&OR (internal distribution). The project scope at the time that the table was produced was to handle, characterize and repackage TRU material in 9 ½" diameter steel pipes. This HA as become outdated with new information about the waste form (24" dia. concrete filled shafts) and corresponding variations on how the waste form will be characterized, handled, shipped, and processed in CMR W-9. If the waste does end up coming to CMR in the concrete filled shafts, the process description, hazard identification, hazard analysis, etc., would need to be significantly revised, or more likely started anew. Safety basis efforts in support of the project over the last year included attendance at weekly project meetings, conceptual and preliminary design input/review, input during process development, and initial development of the hazard analysis.

33 Shafts Preliminary Hazards Analysis

Hazard	What If Question	Unmitigated Consequences	Preventive Feature	Mitigative Feature	Comments or Action Items
	I. Operational Fires				
Radiological Materials (Pu and U isotopes)	1. Combustible materials in GB ignite	• Public exposure to radioactivity (C) • Worker exposure to radioactivity (A)	• Shipping cask design (noncombustible materials) • GB design (noncombustible materials)	• GB ventilation system w/ dual HEPA filtration	Only one pipe is processed at any given time (i.e., maximum of 900g Pu-239 equivalent material).
	2. Combustible materials in Alpha Box ignite	• Public exposure to radioactivity (C) • Worker exposure to radioactivity (A)	• Alpha Box design (noncombustible materials)	• Hot Cell structure (active confinement provided by DP) • Hoffman blower ventilation w/ single stage HEPA filtration • Hot Cell ventilation system w/single stage HEPA filtration	Dual HEPA filtration is provided by series line up of Alpha Box and Hot Cell ventilation systems.
	3. Combustible materials in Hot Cell corridor ignite	• Public exposure to radioactivity (C) • Worker exposure to radioactivity (A)	• RLC design (noncombustible materials) • Drum design (noncombustible materials)	• Hot Cell ventilation system w/single stage HEPA filtration	
	4. Combustible materials in Hot Cell ignite	• Public exposure to radioactivity (C) • Worker exposure to radioactivity (A)	• RLC design (noncombustible materials) • Drum design (noncombustible materials)	• Hot Cell ventilation system w/single stage HEPA filtration	
	II. Loss of Confinement (spills or leaks)				
	1. Shipping cask is breached in Wing 9	• Public exposure to radioactivity (C)	• Shipping cask design (containment)		

Hazard	What If Question	Unmitigated Consequences	Preventive Feature	Mitigative Feature	Comments or Action Items
	general area	• Worker exposure to radioactivity (A)	• 25-ton Crane design (lifting capacity) • Air pallet design (lifting capacity) • Wing 9 structure (floor loading capacity)		
	2. Connection between shipping container and GB is breached	• Public exposure to radioactivity (C) • Worker exposure to radioactivity (A)	• Bag sleeve design (confinement) • Cask bag ring design • GB design (loading capacity) • Hot Cell design (structural capacity of 10-in hole)	• GB ventilation system w/ dual HEPA filtration	
	3. Material is released inside an Alpha Box	• Public exposure to radioactivity (C) • Worker exposure to radioactivity (A)		• Alpha Box design (confinement) • Hoffman blower ventilation w/single stage HEPA filtration • Hot Cell ventilation w/single stage HEPA filtration	Dual HEPA filtration is provided by series line up of Alpha Box and Hot Cell ventilation systems
	4. Material is released inside a Hot Cell	• Public exposure to radioactivity (C) • Worker exposure to radioactivity (A)	• Steel can design (containment) • Drum design (containment) • RLC design (containment) • Drum turntable design (loading capacity) • RLC turntable	• Hot Cell ventilation w/single stage HEPA filtration	

Hazard	What If Question	Unmitigated Consequences	Preventive Feature	Mitigative Feature	Comments or Action Items
			design (loading capacity)		
	5. Loaded RLC is breached during transfers inside/outside the Hot Cells	• Public exposure to radioactivity (C) • Worker exposure to radioactivity (A)	• 25-ton Crane design (lifting capacity) • RLC design (containment) • RLCH design (loading capacity) • TS cable and grappler design (loading capacity)		
	6. Loaded 72-B is breached during transfer in Wing 9 general area	• Public exposure to radioactivity (C) • Worker exposure to radioactivity (A)	• 72-B design (containment) • Wing 9 structure (floor loading capacity)		
	III. Operational Transients				
	1. Loss of Hoffman Blower ventilation (mechanical or electrical failure)	• Public exposure to radioactivity (D) • Worker exposure to radioactivity (C)	• Hoffman blower design w/ backup blower?		
	2. Loss of Hot Cell ventilation system (mechanical or electrical failure)	• Public exposure to radioactivity (D) • Worker exposure to radioactivity (C)	• Hot Cell ventilation system design		
	1. Loss of compressed air for air pallet	• Public exposure to radioactivity (E) • Worker exposure to radioactivity (E)	• Compressed air system design		
	IV. External Events				
	1. Vehicle crashes into loading dock causing a container breach	• Public exposure to radioactivity (C) • Worker exposure to radioactivity (A)	• Shipping cask design (containment) • 72-B container design (containment)		

Hazard	What If Question	Unmitigated Consequences	Preventive Feature	Mitigative Feature	Comments or Action Items
	V. Natural Phenomena				
	1. Seismic Event	•	•		
	1.	•	•		
	1.	•	•		
	VI. Loss of Shielding				
Radioactive Materials (Sr-90, Cs-137)	1. Shipping container shielding is breached	• Worker external radiation exposure (A)	• Shipping cask and plug design (internal shielding)		Pipe contents are >1000 R/hr contact dose rate?
	1. Transport Shield (TS) shielding is breached	• Worker external radiation exposure (A)	• TS design (internal shielding)		
	1. RLC shielding is breached	• Worker external radiation exposure (A)	• RLC design (internal shielding)		
	1. 72-B shielding is breached	• Worker external radiation exposure (A)	• 72-B and end cap design (internal shielding)		
	1. Streaming occurs during transfer of shipping cask contents to Alpha Box	• Worker external radiation exposure (A)	• Hot Cell design (shielding)		
	1. Streaming occurs after transfer of RLC into a Hot Cell	• Worker external radiation exposure (A)	• Hot Cell design (shielding) • Hot Cell roof plug design (shielding)		

Attachment 4 E-mail from Donald Thorp re: Gas Sampling, OS-PT

Attachment 5 RH-TRU Contacts Possibly useful in the Future

RH-TRU Contacts Possibly useful in the future (11-6-07)

Nuclear Filter Technology, Patrick, (303) 384-9579. I asked him to investigate a sampling port that could drill into the RH pipes – ¼" carbon steel – without releasing contamination and to be of a big enough size to allow for pumping and purging the pipe.

NFT re: polyurethane bag-on bags. Need to develop an inflatable remote bag-on seal? (remote bag-on and manual bag-off)

Larry Porter, RH SPM for CCP (WIPP Certification)
Cell Phone 302-6547
Office Phone 234-7481

Anthony (Tony) Marlow tonyrmarlow@msn.com Nuclear & Military Business Manager
Brokk
Santa Fe, NM
505 466 3614 Office
505 699 8923 Cell
480 287 8709 Fax
Sent me photos of Brokk machines. Might be able to help with bore assay for LLW determination.

"Boing, Lawrence E." lboing@anl.gov (provided the contact to Tony – also, runs the D&D school at ANL)

Dennis Basile of LANL – he has experience in concrete sawing and coring at LANL from the D&D of TA-21

Tina Nguyen – PMT-1 archivist

AET-1 Design engineering:

Los Alamos

Jose "Manny" Tafoya
Technical Staff Member
Applied Engineering & Technology AET-1

PO Box 1663, MS J576
Los Alamos, NM 87545
(505) 665-5230 Work
jmtafoya@lanl.gov

documentation, contacts, drawings, part files, vendors and their status, simulations, calculations, etc. are on \\vernibt\ESA-AET\Thermal Engineering\RH-TRU and are also available in TA-54 records compressed (from 6 Gb) on a DV-R disk

La-Calhene Bagless removal from alpha boxes:
If you have any DPTE transfer port or AD glove port questions, please do the following;
Call Scot Lavalla in Rush City, MN. at 320-358-0570 or e-mail: ScotL@lacalhene.com
If Scot could not answer, E-mail Philippe Madelaine at PMadelaine@lacalhene.fr
If Philippe cannot answer, call me at the number below or E-mail me
Steve Chunglo
928-717-1842
SteveC@commspeed.net

TA-54 Records Management
Should be able to access e-mails, Solidworks designs, waste characterization spreadsheet, engineering and design notes, conceptual design review documents, and other items needed to reconstruct the history of the project.

Attachment 6 E-mail from David Yeamans re: Data Needs, PMT-1

X-Mailer: QUALCOMM Windows Eudora Version 7.1.0.9
Date: Mon, 15 Oct 2007 16:19:27 -0600
To: Danny Martintz <dmartinez@lanl.gov>,
"Charles O. Lenoie" <clenoie@lanl.gov>,Bill Crooks <crooks@lanl.gov>,
"Will Gonzales" <wgg@lanl.gov>,"Henry P. Nunes" <hpnunes1@lanl.gov>,
Bob Villarreal <bobv@lanl.gov>,"Russell E. Durrer" <russd@lanl.gov>,
Robert Gonzales <bgonzales@lanl.gov>,
Deborah Bennett <dbennett@lanl.gov>,Gregory Scott Long <glong@lanl.gov>,
David Yeamans <dryeamans@lanl.gov>,Toby Romero <tjromero@lanl.gov>,
"joel E. Kohler" <jkohler@lanl.gov>,"Manny Tafoya" <jmtafoya@lanl.gov>,
"Mike Miller" <zebra@lanl.gov>,smckelvey@lanl.gov
From: David Yeamans <dryeamans@lanl.gov>
Subject: Data needs for 33s project at TA-54
Cc: Floyd Strub <strub@lanl.gov>,"Donald T. Thorp" <dtthorp@lanl.gov>,
"George L. Peters" <glpeters@lanl.gov>

This is the list of data needs we've collected from everybody as of 10-15-07.

1. Length and diameter on all waste pipes,
2. Length and diameter on all culverts,
3. Weight of each culvert assembly
4. Weight distribution along culvert or pipe
5. Actual weight of each pipe,
6. Location of pipe within culvert (GPR?)
7. Concrete characteristics for the encasing monolith,
8. Contamination levels for each pipe
9. Proposed order of retrieval,
10. Activity profile of pipes with information on distance of detector from pipe and thickness of concrete or other shielding material
11. Culvert physical profile (smooth, corrugated, etc.)
12. What is structure of top and bottom of each pipe; extra plates lifting mechanism, etc.?
13. Gas composition inside pipe
14. Culvert/pipes that might have contamination on outside of culvert or top/bottom of culvert.

Two additional things the WAC (being revised) would have are:
clean outside of culvert (no dirt clods) and
one or both ends cored out to 10 inches down to pipe.
Dave
****

David Yeamans
Process Design Lead (at CMR) for RH-TRU Packaging
Group PMT-1, Los Alamos National Laboratory
ph.(505) 665-8832; pager 664-5670
dryeamans@lanl.gov
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Attachment 7 Draft Summary Schedule and Cost Report