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DATE OF MEETING  
**05/04/2000**

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Docket Number(s) Project Number M-32

Plant/Facility Name West Valley Demonstration Project

TAC Number(s) (if available) \_\_\_\_\_

Reference Meeting Notice 2000-0365

Purpose of Meeting  
(copy from meeting notice) Discuss DOE-West Valley's  
preliminary safety evaluation  
report for the Remote Handled  
Waste Facility

NAME OF PERSON WHO ISSUED MEETING NOTICE  
**Jack D. Parrott**

TITLE  
**Project Scientist**

OFFICE  
**Office of Nuclear Material Safety and Safeguards**

DIVISION  
**Division of Waste Management**

BRANCH  
**Decommissioning Branch**

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*DF03*



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## Overview of the Remote-Handled Waste Facility (RHWF) Preliminary Safety Analysis Report (PSAR) for the Nuclear Regulatory Commission

May 4, 2000

James J. Prowse  
URS



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## *Purpose of this presentation*

- Inform NRC reviewers of the safety basis upon which DOE will authorize procurement, construction and pre-operational testing of the RHWF.
- Provide an opportunity to discuss initial NRC questions.



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## ***Overall Objectives of this Presentation***

- Review scope of existing WVDP SAR Modules
- Describe the Purpose and Scope of the RHWF PSAR (draft WVNS-SAR-023)
- Provide a brief overview of the RHWF PSAR contents by chapter
- Describe the key events and hazards identified in the Process Hazards Analysis
- Describe the sequences of analyzed accidents and associated preventive & mitigative features which ensure the safety of operations



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## *Documents that comprise the current Authorization Basis at the WVDP*

5480.23-Approved SARs:

<i>WVNS-SAR-001</i>	<i>WVNS-SAR-002</i>	<i>WVNS-SAR-003</i>	<i>WVNS-SAR-012</i>
<i>Project Overview and General Information</i>	<i>Low-Level Waste Processing and Support Activities</i>	<i>Vitrification Operations and HLW Interim Storage</i>	<i>Fuel Receiving and Storage Facility</i>

*DOE SERs and NRC SERs*

*Site Programs identified by DOE West Valley Area Office*



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## ***RHWF PSAR Purpose***

PSARs for new facilities are to serve as the principal safety basis for the DOE decision to authorize procurement, construction, or preoperational testing.

*[DOE Order 5480.23, 4f(8)(a)1]*

## ***RHWF PSAR Scope***

- Based upon the June 1999 conceptual design
- On-site movement to and from RHWF
- Waste handling and processing activities inside the RHWF.



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## ***Overview of the RHWF PSAR***

### Chapter 1. Introduction and General Description of the Remote-Handled Waste Facility

- *RHWF location, description, organization, schedule, process overview, etc.*

### Chapter 2. Summary Safety Analysis

- *overview of impacts of normal operations, abnormal operations, accidents*

### Chapter 3. Site Characteristics

- *a brief overview of the description provided in WVNS-SAR-001*

### Chapter 4. Principal Design Criteria

- *based on WVNS-DC-071, DC for the RHWF.*

### Chapter 5. Remote-Handled Waste Facility Design

- *descriptions of design features, including the conceptual design figures*



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## ***Overview of the RHWF PSAR (continued)***

### Chapter 6. Remote-Handled Waste Facility Process Systems

- *process flow description, including a discussion of items for safety concern*

### Chapter 7. Waste Confinement and Management

- *radioactive wastes, non-radioactive wastes, ventilation, liquid wastes, solid wastes*

### Chapter 8. Hazards Protection

- *ALARA (policy, design & operations), hazards protection design, occupational dose, off-site dose, criticality safety, fire protection*

### Chapter 9. Hazard and Accident Safety Analysis

- *process hazards analysis, accident selection and accident analysis*



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## ***Overview of the RHWF PSAR (completed)***

### Chapter 10. Conduct of Operations

- *a brief overview of the description provided in WVNS-SAR-001*

### Chapter 11. Derivation of Technical Safety Requirements

- *a discussion similar to what appears in all other WVDP SARs*
- *no TSRs are anticipated for the RHWF*

### Chapter 12. Quality Assurance

- *a brief overview of the description provided in WVNS-SAR-001*



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## ***Accident Sequence Development***

- Process Hazards Analysis prepared (qualitative)
- Risk factors prepared
- Highest risk accidents grouped by type
- Representative, bounding accident type quantitatively analyzed



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

HAZARD	EVENT	INITIATOR	PREVENTIVE SYSTEM(S) OR FEATURE(S)	MITIGATIVE SYSTEM(S) OR FEATURE(S)	CONSEQUENCES	FREQUENCY	RISK FACTOR
Work Cell							
Radioactive Material (Airborne or Otherwise Uncontrolled Release)	Container rupture or leak	1. Bridge crane or jib crane fails during lift, leading to spill of container's contents or breach of container	<ul style="list-style-type: none"> <li>• Cranes designed to conservative criteria and initially load tested</li> <li>• Administrative controls and procedures for crane operations, proper training, safety culture</li> <li>• Pre-planning of complex lifts</li> </ul>	<ul style="list-style-type: none"> <li>• HEPA filtration of airborne materials</li> <li>• Potential wall or floor impact will not violate integrity of thick concrete walls</li> </ul>	Low	Unlikely	2
		2. Mishap with powered conveyers, leading to spill of container's contents or breach of container	<ul style="list-style-type: none"> <li>• System care/maintenance to ensure proper operation</li> <li>• Administrative controls and procedures for conveyor operations, proper training, safety culture</li> </ul>	<ul style="list-style-type: none"> <li>• HEPA filtration of airborne materials</li> <li>• Potential wall or floor impact will not violate integrity of thick concrete walls</li> </ul>	Low	Unlikely	2



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## Container Rupture

forklift mishap

### >crane mishap

powered roller conveyor mishap

tool mishap

tornado

strong straight winds

### >seismic event

rupture of unspecified cause

shield door pinching

loss of Work Cell confinement

## Fire

### >spill ignites

combustible waste ignition

flammable gas ignition

pyrophoric materials ignition

electrical fire

vehicle fire

seismic event

## Fire (continued)

helicopter crash

airplane crash

nearby facility fire

## Explosion

### >natural gas

unspecified cause

## Water Inundation

fire suppression

## Direct Radiation Exposure

erroneous survey

## Inadvertent Criticality

configuration change

### >accumulation of fissile material

## Airborne Dispersal

decontamination system mishap

## Chemical Reaction

container lid cutting/opening

## HEPA Filter Failure

### >Various sources of damage

## Vehicle Accident

loss of control

dropped load

## Waste Transfer System Breach

mechanical failure

operator error

### > Analyzed Accidents



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## ***Design Basis Accidents: Work Cell Pre-filter Failure***

An operational upset results in damage to all 24 disposable pre-filters with an exposure rate of 15 R/hr at 6-inches.

### ***Conservatism***

- No credit taken for DF of 10,000 for ex-cell HEPA filters
- No credit taken for 100% redundancy in the filter trains
- No credit taken for monitored and alarmed differential pressure gauges across the filters, and stack emissions
- Exhaust fans are assumed to continue to operate



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## ***Design Basis Accidents: Waste Container Lift Failure***

The postulated bounding accident is one in which dissolver box 3C-1 is accidentally dropped during lifting on top of the second dissolver box, 3C-2.

### ***Conservatism***

- No credit taken for existing administrative controls for heavy lifts from hoisting and rigging manual
- Shielded transfer containers for some waste types
- No credit taken for contamination barriers (e.g., Herculite™ wrap, waste container)



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## ***Design Basis Accidents: Fire***

Spilled vehicle fuel pools under a loaded truck bed, ignites and the fire engulfs all of the packaged waste.

### ***Conservatism***

- No credit taken for fire detection and suppression systems
- No credit taken for building envelope
- No credit taken for plume rise
- No credit taken for operator actions
- Maximum inventory assumed to be involved in fire



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## ***Beyond Design Basis Accidents: Seismic Event***

The design basis earthquake involves an acceleration of 0.1 g at ground level. The beyond design basis earthquake is assumed to exceed this acceleration.

### ***Conservatism***

- Formidable structure is assumed to completely breach
- No credit taken for ventilation system
- Maximum inventory assumed to be at risk



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## ***Beyond Design Basis Accidents: Criticality in the Work Cell Washdown Receiving Tank***

Significant quantities of fissile material accumulate in the RHWF Work Cell Washdown Receiving Tank, resulting in an inadvertent criticality

### ***Conservatism***

- No credit taken for the physical and chemical form of fissionable materials or inherent poisons; assumes optimized system
- No credit taken for design features incorporated into the RHWF to prevent an inadvertent criticality, including: geometrically safe washdown trenches, floor drains, sumps and piping

***Criticality safety evaluations will be performed and will demonstrate that the double-contingency principle is met for the final design.***



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## ***Beyond Design Basis Accidents: Natural Gas Explosion***

Natural gas, which will be used to heat supply air for the RHWF to provide operator comfort, leaks from the supply system, accumulates within the facility and explodes

### ***Conservatism***

- No credit taken for preventive design features of heating units (e.g., pilot ignition fail safe, heating chamber isolation, etc.)
- Maximum inventory assumed to be at risk

***All natural gas lines and heating units will be exterior to the facility.***



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

## ***SUMMARY OF RHWF DESIGN BASIS ACCIDENT CONSEQUENCES***

ACCIDENT SCENARIO	MAX. ON-SITE DOSE	Evaluation Guideline	MAX. OFF-SITE DOSE	Evaluation Guideline
Work Cell Pre-filter Failure	0.93 rem	100 rem	0.56 rem	25 rem
RH Waste Container Lift Failure	0.15 rem	5 rem	0.088 rem	0.5 rem
Fire in RHWF	0.51 rem	100 rem	0.31 rem	25 rem



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

## **SUMMARY OF RHWF BEYOND DESIGN BASIS ACCIDENT CONSEQUENCES**

ACCIDENT SCENARIO	MAX. ON-SITE DOSE	MAX. OFF-SITE DOSE
Seismic Event >>0.1g	5.6 rem	3.4 rem
Criticality Accident	26 rem	16 rem
Natural Gas Explosion	8.6 rem	5.2 rem



# Remote-Handled Waste Facility Preliminary Safety Analysis Report

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## *Summary*

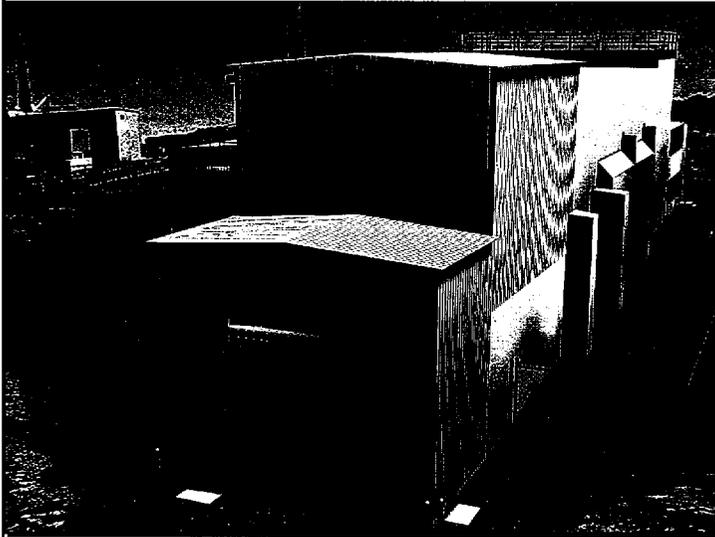
- Comprehensive identification of hazards
- Accident analyses are well within the evaluation guidelines with no credit taken for active mitigative systems, structures or components, and operator actions
- Facility design, construction, and operation will be protective of the workers, public, and environment



## Remote-Handled Waste Facility Preliminary Safety Analysis Report



### The Remote-Handled Waste Facility (RHWF) at the West Valley Demonstration Project (WVDP)



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RHWF Project Manager  
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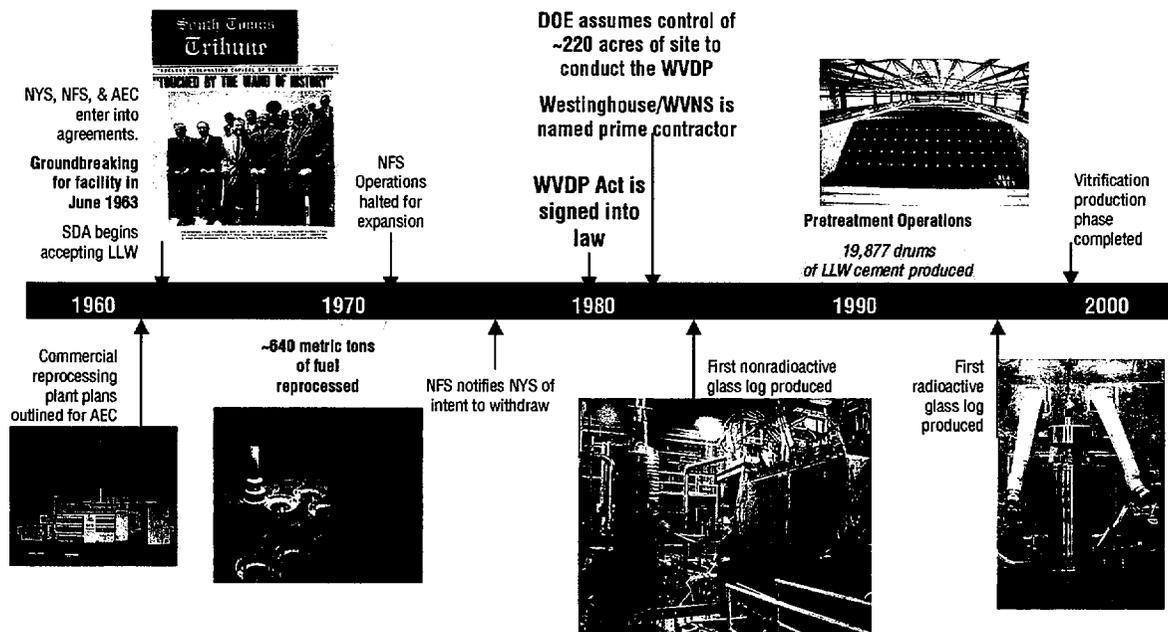
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## Remote-Handled Waste Facility Preliminary Safety Analysis Report



### Project History



# Remote-Handled Waste Facility Preliminary Safety Analysis Report



## Purpose of RHWF

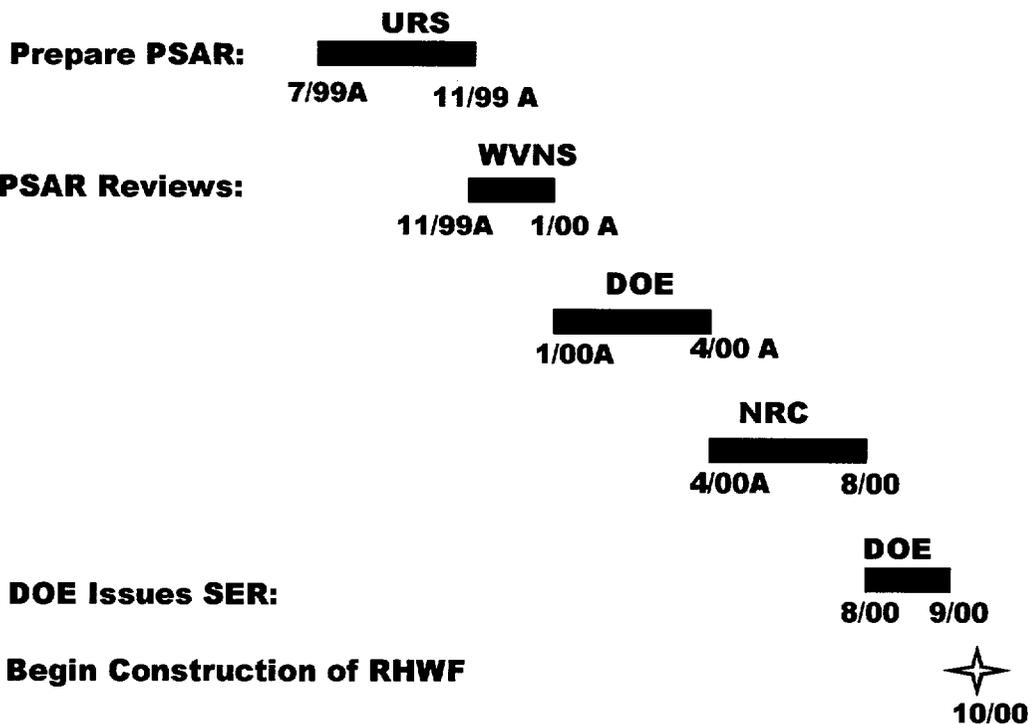
- ▣ To Process High Dose / Highly Contaminated Waste into Packages for Transportation and Disposal
- ▣ Existing Facilities are Not Equipped to Remotely Handle Large Waste Containers (e.g., waste tank farm pumps)
- ▣ New Facility Provides Efficient and Cost Effective Solution
- ▣ New Facility Reduces Radiation Exposures (ALARA)

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# Remote-Handled Waste Facility Preliminary Safety Analysis Report



## PSAR Schedule



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## Remote-Handled Waste Facility Preliminary Safety Analysis Report



PSARs ... serve as the principal safety basis for the DOE decision to authorize construction and preoperational testing.

[DOE Order 5480.23, 4f(8)(a)1]

### Proposed PSAR Schedule

- ❑ DOE Reviewed PSAR to NRC - April 17, 2000
- ❑ Receive NRC Request for Additional Information - June 29, 2000
- ❑ DOE Resolves NRC Comments - July 21, 2000
- ❑ NRC Issues Written Report - August 11, 2000
- ❑ DOE Issues DOE Safety Evaluation Report and Approves PSAR - September 25, 2000

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## Remote-Handled Waste Facility Preliminary Safety Analysis Report



### PSAR Facts

- ❑ The PSAR was Prepared by Experienced Safety Analysts Familiar with the WVDP
- ❑ Multiple, In-depth Reviews were Performed Prior to the PSAR being Submitted to NRC
- ❑ Analyzed Accidents are Within the WVDP Evaluation Guidelines
- ❑ The Analyses Demonstrate that the RHWF Poses a Low Risk
- ❑ There are No Safety-class or Safety-significant Systems, Structures, or Components
- ❑ DOE Approval Releases WVNS for Procurement, Fabrication and Construction. Separate Approval of the FSAR is Required Prior to the Start of Operations.

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## Remote-Handled Waste Facility Preliminary Safety Analysis Report



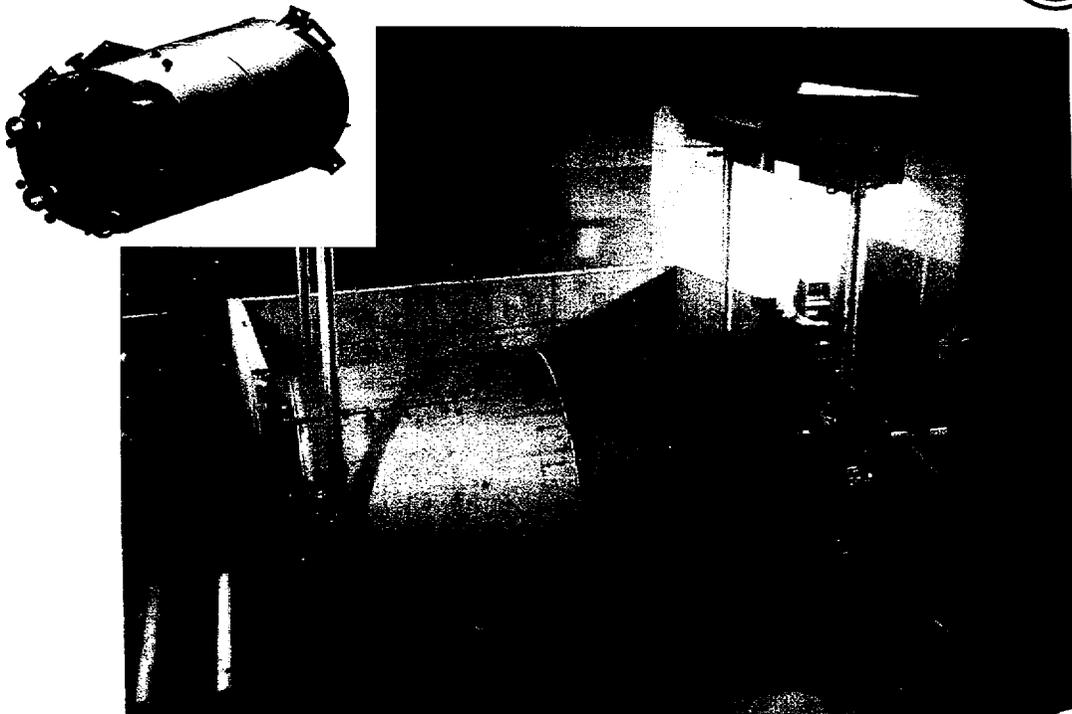
Solid Waste that will be processed in the RHWF includes equipment from past and future decontamination and decommissioning activities.



Chemical Process Cell (CPC) before and after decon and as it is presently configured for storing vitrified HLW.

7\_10195.ppt

## Remote-Handled Waste Facility Preliminary Safety Analysis Report



Dissolver Tank from the Chemical Process Cell

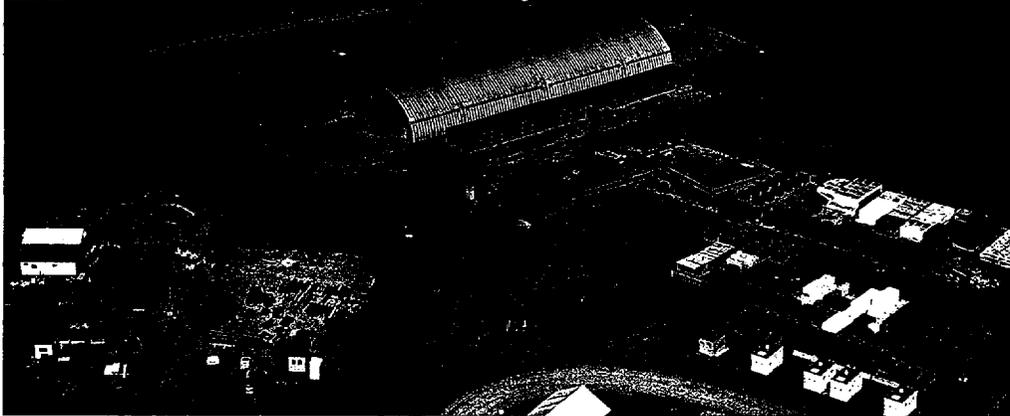
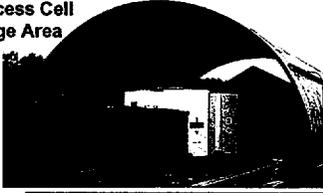
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# Remote-Handled Waste Facility Preliminary Safety Analysis Report



## Present Configuration of Chemical Process Cell-Waste Storage Area

Construction of  
Chemical Process Cell  
Waste Storage Area

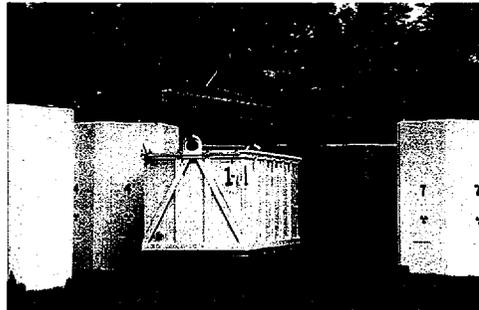


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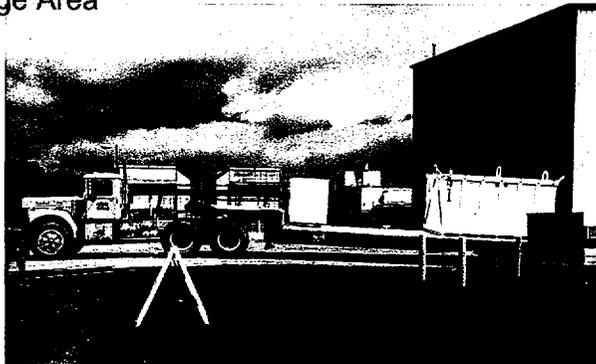
# Remote-Handled Waste Facility Preliminary Safety Analysis Report



Chemical Process Cell  
Waste Storage Area



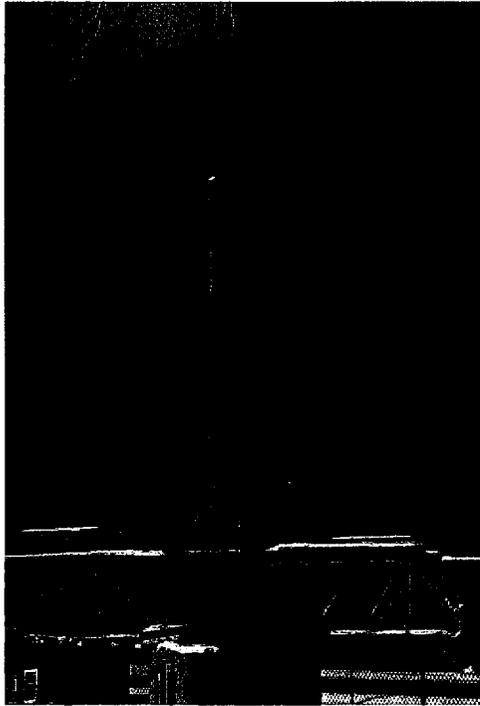
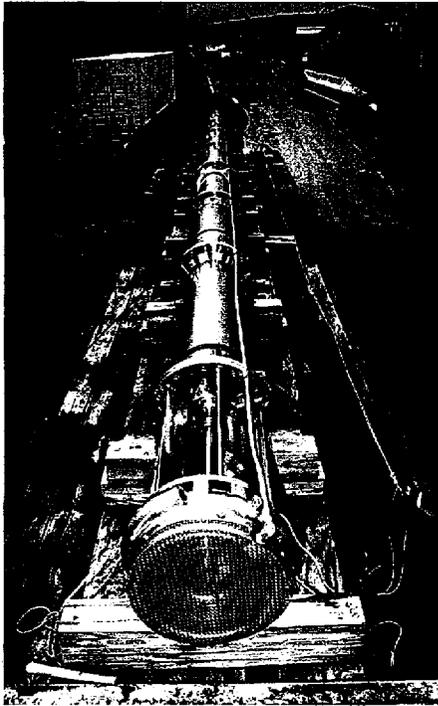
Lifting a Waste Container



On-site Waste Transport

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# Remote-Handled Waste Facility Preliminary Safety Analysis Report



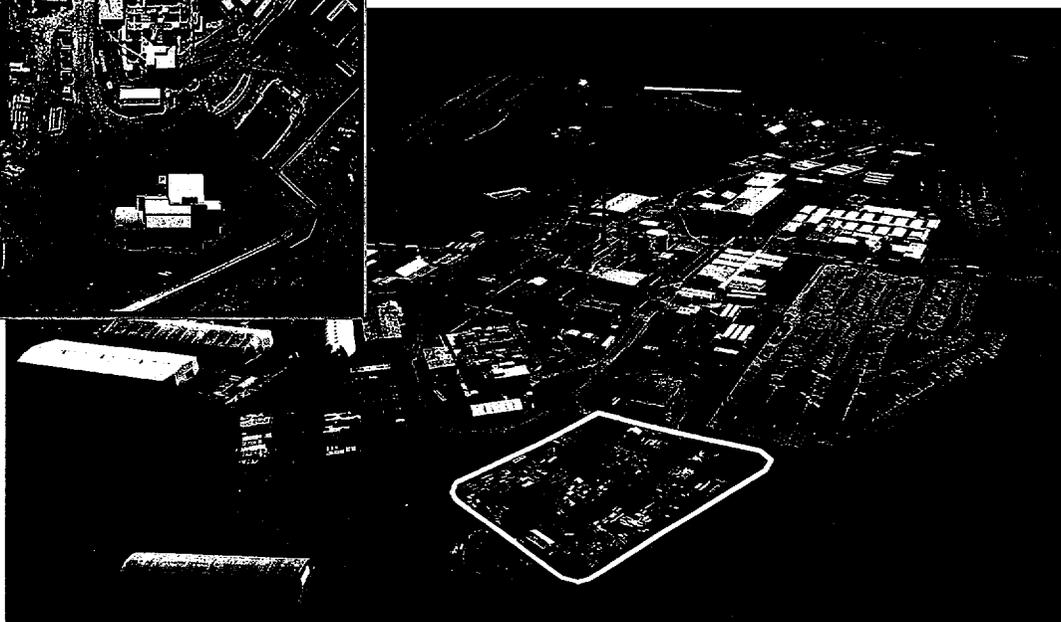
Waste Tank Farm Pump

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# Remote-Handled Waste Facility Preliminary Safety Analysis Report

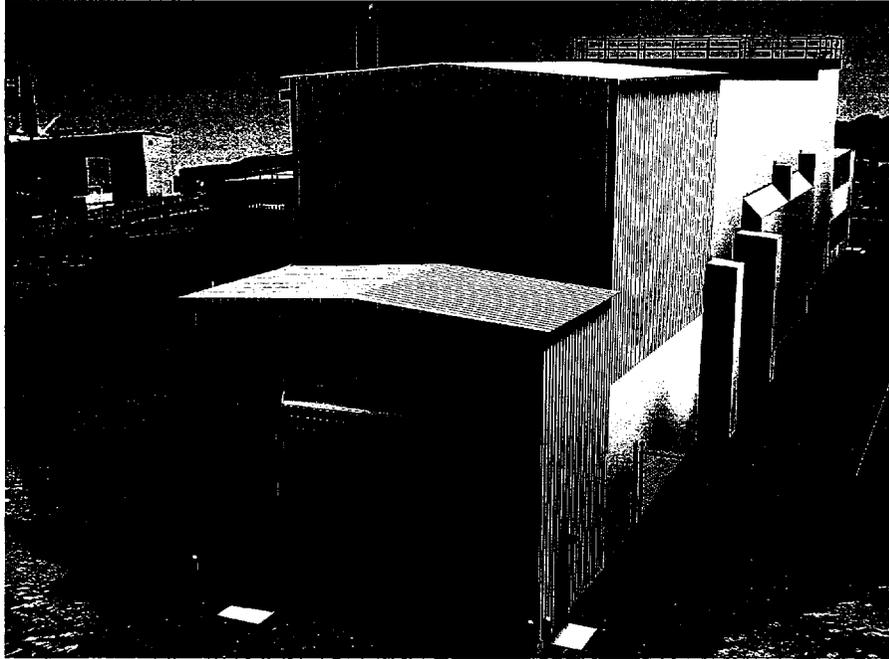


## Future Remote-Handled Waste Facility Construction Site at the WVDP



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# Remote-Handled Waste Facility Preliminary Safety Analysis Report



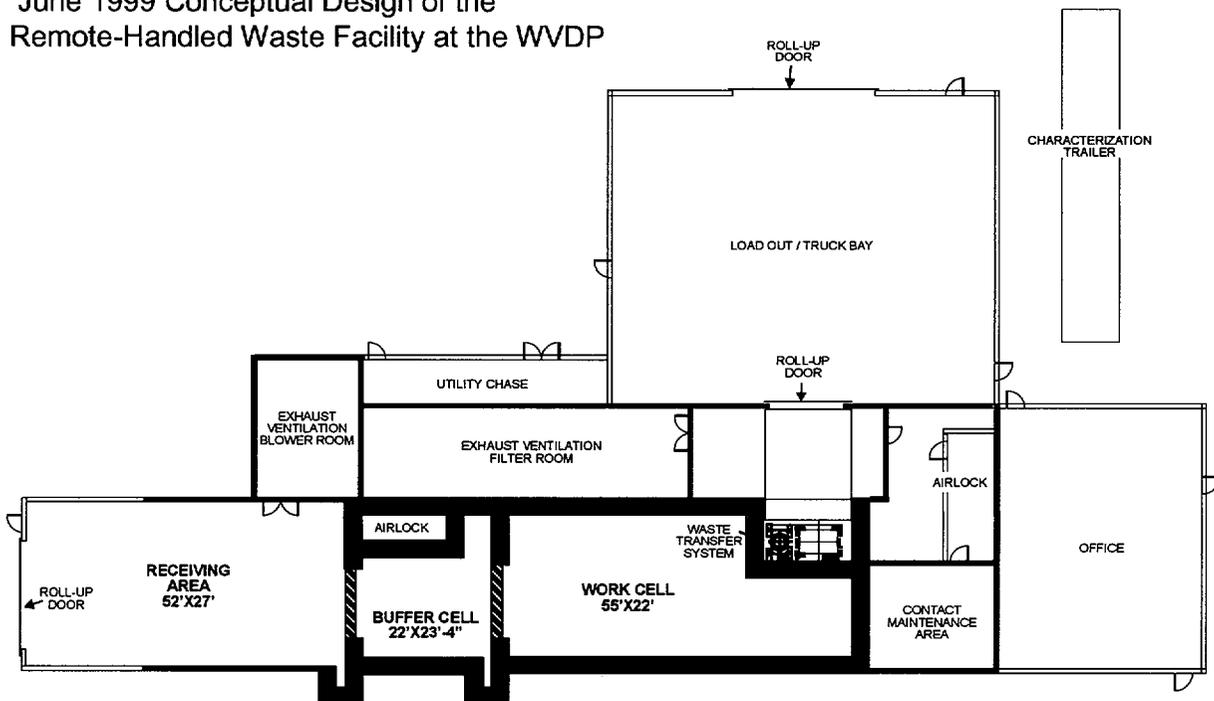
View of Future Remote-Handled  
Waste Facility Looking South-East  
(Artist's Rendering)

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# Remote-Handled Waste Facility Preliminary Safety Analysis Report



June 1999 Conceptual Design of the  
Remote-Handled Waste Facility at the WVDP



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**Remote-Handled Waste Facility  
Preliminary Safety Analysis Report**



**Animated video presentation showing  
processing dissolver tank in RHWF**



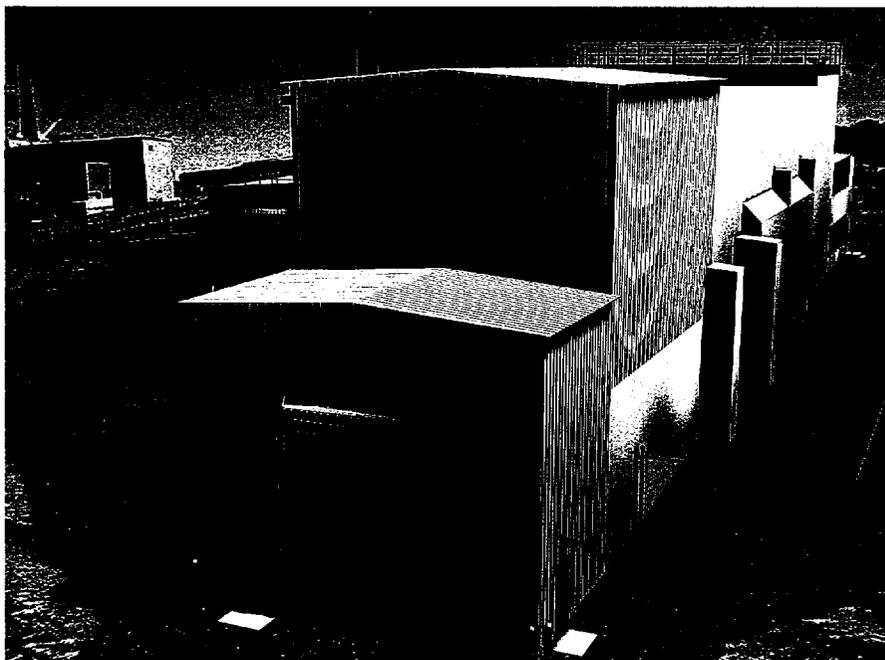
Dissolver tank being cut up  
(Artist's Rendering)

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**Remote-Handled Waste Facility  
Preliminary Safety Analysis Report**



**Remote-Handled Waste Facility**



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**Remote-Handled Waste Facility  
Preliminary Safety Analysis Report**



**Select Facility Design Features**

**Work Cell Structure:**

- ▣ Robust Construction [reinforced, 2 1/2 feet thick concrete-shield walls with stainless steel liner]
- ▣ Remotely-operated Mechanical Process
- ▣ Low-energy Sources in Work Cell
- ▣ Capability to Decontaminate the Work Cell and Associated Equipment

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**Remote-Handled Waste Facility  
Preliminary Safety Analysis Report**



**HEPA Filters in Work Cell**



18\_10195.ppt



**Remote-Handled Waste Facility  
Preliminary Safety Analysis Report**



**Select Facility Design Features**

**HEPA Filters:**

- ▣ One Set of Filters in the Work Cell act as Roughing Filters
- ▣ Two Sets of HEPA Filters in Series Outside of Work Cell
- ▣ Design Provides Retention of Particulate Matter, even if a Filter Set is Damaged (3 sets of filters in series)
- ▣ 100% Redundancy in the Filter Trains
- ▣ Backup Power Provided to HVAC System

19\_10195.ppt



**Remote-Handled Waste Facility  
Preliminary Safety Analysis Report**



**Select Facility Design Features**

**Fire Protection:**

- ▣ RHWF is of Non-combustible Construction
- ▣ Waste is Composed Primarily of Metallic Components
- ▣ Administrative Controls on Incidental Combustible Waste Components (e.g., wood, Herculite) in Work Cell
- ▣ Work Cell, Buffer Cell, and Contact Maintenance Area have Fire Detection and Manual Fire Suppression Systems
- ▣ Supply Fan Shut Off and Damper Closure

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## Remote-Handled Waste Facility Preliminary Safety Analysis Report



### Summary

- ❑ Robust Facility
- ❑ Remotely-operated Mechanical Process
- ❑ Waste Processed is Dry, Decontaminated Metal
- ❑ Redundant Safety Features (e.g., HVAC System)
- ❑ Industrial, Chemical, and Radiological Hazards are Defined, Controlled, and Mitigated
- ❑ ALARA
- ❑ Conservative Safety Analysis, Results well Within Evaluation Guidelines

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## Remote-Handled Waste Facility Preliminary Safety Analysis Report



### Schedule

#### DOE Approval of PSAR is Critical Path:

- |                                  |   |
|----------------------------------|---|
| ❑ RHWF PSAR to NRC               | <del>May 18, 2000</del> <i>April 17, 2000</i> |
| ❑ Proposed Date for NRC Response | June 29, 2000                                 |
| ❑ DOE Approves PSAR              | September 25, 2000                            |
| ❑ Start RHWF Construction        | October 2, 2000                               |

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