SILO 3 TECHNICAL ROUNDTABLE
September 10, 2002

Welcome and Introductions
Nina Akgunduz

Regulatory Background/Status
Terry Hagen

Design and Operations
Doris Edwards

Material Handling
Brian Pittenger, Jenike and Johanson

Worker Safety
LaVon Rutherford
  Fernald
  Envirocare
  Nevada Test Site

  Ken Alkema
  Jhon Carilli

Transportation
Terry Hagen

Comments
Critical Analysis Team (CAT)

Wrap up
Nina Akgunduz / Terry Hagen
SILO 3

Regulatory Background

• Wastes designated as 11e.(2) by-product material, statutorily exempt from RCRA

• Original remedy selection in 1994 called for on-site vitrification with disposal at Nevada Test Site (NTS)
  - NTS Waste Acceptance Criteria required immobilization of RCRA metals even if 11e.(2)
SILO 3

Regulatory Background

Remedy revised in 1998 through the Explanation of Significant Differences (ESD) process:

- 11e.(2) designation maintained
- Requirement to immobilize RCRA metals maintained
- Treatment changed to on-site or off-site chemical stabilization
- Disposal at NTS or permitted commercial disposal facility
SILO 3

What has changed?

- NTS Waste Acceptance Criteria has changed
  - Can now accept 11e.(2) material without immobilization of RCRA metals
- Envirocare can accept and place untreated Silo 3 material in bags
  - Pending Nuclear Regulatory Commission's final acceptance of 11e.(2) designation
SILO 3

What changes are we proposing?

- Treatment only as required to meet disposal facility Waste Acceptance Criteria

- Immobilization of RCRA metals not explicitly required
If you have any questions regarding this letter, please feel free to contact Jhon J. Grelle, or my
Assistant Manager, Carl H. Curtz.

The NTS waste approval process for disposal at the NTS at 11(e)(2) byproduct material following the successful completion of the
which is essentially exempt from the Resource Conservation and Recovery Act, may be accepted
This is to inform you that the Cermaid Silos materials, including the Silo 3 untreated material (all or

(SNTS)

DISPOSAL OF CERMAID SILOS WASTE MATERIALS AT THE NEVADA TEST SITE

Stephen H. Mootz, Director, PEM, Cincinnati, OH

Jun 20 2002

Las Vegas, NV 89193-6518
P.O. Box 98618
Nevada Operations Office
National Nuclear Security Administration

Department of Energy
SILO 3 PROJECT: AERIAL VIEW
SILO 3 PROJECT:
PNEUMATIC RETRIEVAL

Graphics #7704-07
SILO 3 PROJECT: MECHANICAL RETRIEVAL
SILO 3
GENERAL SEQUENCE OF PLANNED OPERATIONS

- Pre-operations system testing and commissioning
- Controlled radon reduction in Silo 3 headspace
- Pneumatic retrieval from silo dome
- Package material from pneumatic retrieval
- Partial initial opening in silo sidewall
- Pneumatic and mechanical retrieval through opening
- Enlarge opening, continue retrieval
- Complete material retrieval and packaging
- Safe shutdown
## SILO 3 SHIPPING

<table>
<thead>
<tr>
<th>Description</th>
<th>Cubic Yards</th>
<th>Bags</th>
<th>Cargo Containers</th>
<th>Railcars</th>
<th>Trucks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5,100 cy</td>
<td>3 cy bag</td>
<td>9 bags per cargo container - rail</td>
<td>4 cargo containers per railcar</td>
<td>1 cargo container per truck</td>
</tr>
<tr>
<td></td>
<td>Silo 3 material</td>
<td></td>
<td>8 bags per cargo container - truck</td>
<td>shipment every 2 weeks</td>
<td>2 shipments per day</td>
</tr>
<tr>
<td>Per hour</td>
<td>6 cy/hour</td>
<td>2 bags/hour</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per day (7.5 productive hours/day)</td>
<td>15 bags/day</td>
<td></td>
<td>1.5 cargo containers/day - rail</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.8 cargo containers/day - truck</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per week (4 days/week)</td>
<td></td>
<td></td>
<td>6 cargo containers/week - rail</td>
<td>1.5 railcars/week</td>
<td>8 truck shipments/week</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>7.2 cargo containers/week - truck</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Per 2 weeks</td>
<td></td>
<td></td>
<td></td>
<td>3 railcars/shipment</td>
<td></td>
</tr>
<tr>
<td>TOTAL</td>
<td>5,100 cy</td>
<td>1700 bags</td>
<td>189 cargo containers - rail</td>
<td>48 railcars*</td>
<td>213 trucks*</td>
</tr>
<tr>
<td></td>
<td>Silo 3 material</td>
<td></td>
<td>213 cargo containers - truck</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* Shipments over a 6 - 8 month period

Graphics #7704-010
SILO 3 - FACILITY DESIGN

- Fabric silo enclosure
  - Workers present during pneumatic retrieval

- Excavator building
  - Excavator room and excavator service room
  - Normally no workers present
SILO 3 - FACILITY DESIGN

Process building

♦ Corridor to packaging area and excavator building

♦ Excavator room viewing window

♦ Packaging area and equipment, ground floor

♦ Pneumatic retrieval and process dust collection, high bay

♦ Storage and wastewater tank area
SILO 3 FACILITY DESIGN

- Cargo container bay
- Electrical building
- Operations support and change room trailers
SILO 3 FACILITY DESIGN

Outside equipment pads

♦ Plant, instrument and breathing air systems
♦ Heating, ventilation, air conditioning (HVAC) units
♦ High efficiency particulate air (HEPA) filters
♦ Ultra low particulate air (ULPA) filters
♦ Fans and blowers
♦ Exhaust stack and emissions monitoring building
SILO 3
MECHANICAL EQUIPMENT

Pneumatic Retrieval System

- Vacuum wand management system
- Bag house and cartridge collectors
- Variable-speed screw feeder
- HEPA/ULPA filter
SILO 3
MECHANICAL EQUIPMENT

Mechanical Retrieval System

♦ Remote-controlled excavator
♦ Retrieval bin and variable-speed screw feeder
♦ Steep-inclined conveyor
♦ Screw feeder to packaging system
♦ Dust collection venting
SILO 3
MECHANICAL EQUIPMENT

Packaging System

♦ Bulk bag loading station and roller conveyors
♦ Airlocks between packaging area and cargo container bay
♦ Bridge crane in cargo container bay
♦ Dust collection venting
SILO 3
MECHANICAL EQUIPMENT

Process Vent System (Dust Collection)

- Hoods and enclosures in process areas and on equipment
- Bag house or cartridge collectors
- HEPA/ULPA filters
- Exhaust stack, also for pneumatic retrieval system and HVAC exhausts
- Exhaust emissions monitoring
SILO 3
MECHANICAL EQUIPMENT

Buildings HVAC Systems: cascading negative pressure

- Air conditioning and handling units
- HEPA / ULPA filters
- Exhaust fans
SILO 3
MECHANICAL EQUIPMENT

Utility and support systems

- Wastewater sumps and pumps
- Wastewater collection tanks and pumps
- Safety showers
- Water utility stations
- Plant and instrument air
- Breathing air
- Radon and radiological monitors
- Video cameras and monitors
APPLYING TECHNICAL FEEDBACK TO THE PROCESS

Reviewers

- Project and site subject matter experts
- Outside resources and consultants
- DOE and Critical Analysis Team (CAT)
- Defense Nuclear Facilities Safety Board (DNFSB)
- Safety Review Committee (SRC)
- Ohio Environmental Protection Agency (OEPA)
- U.S. Environmental Protection Agency (USEPA)
- Public
APPLYING TECHNICAL FEEDBACK TO THE PROCESS

- Design reviews
  - Conceptual
  - Preliminary/remedial
  - Final
- Review, comment, comment incorporation
- Studies and demonstrations
- Vendors and contractors
SILO 4 REINFORCING FRAME
SILO 4 REINFORCING FRAME
SILO 3 FACILITIES LAYOUT
MATERIAL HANDLING

- Geotechnical testing
- Equipment selection
- Modelling pneumatic and mechanical retrieval
- Vacuum wand engulfment loads
- Final design reviews
- Dispersibility testing
MATERIAL FLOW MODELLING
MATERIAL FLOW MODELLING
SILO 3 MATERIAL
SILO 3 MATERIAL
SILO 3 DISPERSIBILITY STUDY

P4 - Screw conveyor, manifolds, and chute

Graphics #7704-032
SILO 3 PROJECT OPERATIONS
HEALTH AND SAFETY PLAN (HASP)

Volume 1, Standard 29 CFR 1910.120
Health and Safety Plan with added sections

- Conduct of Operations
- Maintenance
- Nuclear and safety system requirements
SILO 3 PROJECT OPERATIONS
HEALTH AND SAFETY PLAN (HASP)

Volume 2, Supporting Analyses

♦ Integrated hazards analysis
♦ Fire hazards analysis
♦ Human factors evaluation
♦ Occupational and environmental ALARA
♦ Hazard category calculations
♦ Accident analysis
SILO 3 PROJECT WORKER PROTECTION

Radiological hazard

- Thorium 230
- Radon in Silo 3 headspace - modelling indicates levels are well below limits without treatment

Inhalation hazard

- Low external radiation exposure
SILO 3 PROJECT WORKER PROTECTION

- Chemical hazards
  - Heavy metals
  - Inhalation hazard

- Radiological vs. chemical hazards
  - Silo 3 airborne control limit calculation determined Thorium 230 greatest concern
SILO 3 PROJECT WORKER PROTECTION

Engineering controls - design focus on containment and ventilation

- Closed systems with process ventilation
- Room ventilation based on occupancy
- Building enclosure to reduce potential for release
- Remotely-operated equipment in high contamination areas
- Built-in breathing air stations for maintenance activities
SILO 3 PROJECT WORKER PROTECTION

Engineering controls - monitoring systems and
air samplers

- Stack monitor for particulates and radon
- Continuous air monitors in the work area for radon
  and thorium
- General area air samplers for particulates
- Breathing zone samplers
- Personnel whole body monitors
- Project and site boundary monitors
SILO 3 PROJECT WORKER PROTECTION

Administrative controls
- Training
- Workers involved in development of operating procedures
- Access control
- Postings
- Communication with off-site disposal facility health and safety personnel
SILO 3 PROJECT WORKER PROTECTION

Personal Protective Equipment (PPE)

- Engineers designed the facility with efficient controls so that routine respiratory protection would not be required

- Will require respiratory protection until sampling data supports the design objective and monitoring systems have been verified as meeting required detection limits
SILO 3
TRANSPORTATION

Material
- Low specific activity
- DOT designation Type II

Packaging
- IP-2 package required
- For IP-2 designation, package must pass a four-foot drop test and five-high stacking test
- Soft-sided container passed DOT tests using powdery material
- Project selected 3 cubic yard IP-2 soft-sided containers with liners
- Soft-sided containers placed inside cargo containers
- Cargo containers loaded onto flatbed railcars or trucks
SILO 3
TRANSPORTATION

Modes

• Train estimate
  - Nine bags per cargo container
  - Four containers per flatbed
  - 48 railcars - will use unit trains on existing route to Envirocare

• Truck estimate
  - Eight bags per cargo container
  - One container per truck
  - 213 trucks
SILO 3
TRANSPORTATION

Risk assessment

• Silo 3 ROD requires a transportation risk of less than $1 \times 10^{-6}$ for package and pre-treatment

• Performed RADTRAN 5 modelling using approved code

• Routine transportation risk:
  - Rail: $1.6 \times 10^{-8}$ ILRC
  - Truck: $1.5 \times 10^{-8}$

• Both rail and truck are compliant

• Probability of accident:
  - Rail: $9.5 \times 10^{-7}$
  - Truck: $2.1 \times 10^{-5}$
SILO 3
TRANSPORTATION

Bottom line:
Soft-sided containers filled with untreated Silo 3 material and shipped in cargo containers by rail or train comply with DOT regulations and the ROD.
SILO 3
TRANSPORTATION

Dispersibility issues:

- Fluor Fernald contracted Jenike & Johanson (J&J) to evaluate a cost-effective and implementable method for adding binder solution to material in soft-sided containers
- J&J concluded it is possible to add binder into material as it enters the bag
- Based on lab studies, could reach moisture content of 20 to 30 percent, which would reduce dusting and dispersibility but would add significant volume
- Needs design verification
- Would add $500,000 to total project cost
SOFT-SIDED CONTAINER STACKING TEST
## PRIMARY BALANCING CRITERIA

<table>
<thead>
<tr>
<th>CRITERION</th>
<th>CURRENT REMEDY - Treatment to meet Toxicity Characteristic Leachate Procedure</th>
<th>ALTERNATE REMEDY - Treatment not required</th>
</tr>
</thead>
</table>
| Long-Term Effectiveness and Permanence | - Provides long-term protectiveness from primary Contaminants of Concern (COC) through design and location of disposal facility  
  - Nominal advantage due to treatment to stabilize metals  
  - Advantage is not substantial since both alternatives are equivalent with respect to primary COCs identified in OU4 RI | - Provides long-term protectiveness from primary Contaminants of Concern through design and location of disposal facility |
| Short-term Effectiveness          | - Increased worker risk due to maintenance of additional equipment  
  - Increased risk of worker exposure due to additional material handling, blending and sampling  
  - Increased operational complexity increases schedule uncertainty | Favors alternate remedy due to lower worker risk and exposure and greater schedule certainty |
| Implementability                  | - Additional unit operations and equipment for material handling, blending of additives  
  - More complex process control to monitor formulation and feed characteristics  
  - Potential reprocessing of off-spec product  
  - Increased complexity of maintainence | Favors alternate remedy due to less complexity of operations and greater certainty of successful implementation |
| Reduction of Toxicity, Mobility, or Volume through treatment | - Nominal advantage due to treatment to reduce mobility of metals  
  - Advantage partially offset by increased disposal volume due to addition of stabilization additives. | - Does not require treatment  
  - Lower disposal volume |
| Cost                              | - Additional cost due to equipment, facilities, and operation to provide treatment for metals | Favors alternate remedy |

Graphics #7704-49
SILO 3 PROPOSED PLAN
ROD AMENDMENT

2002:
• August - EPA reviews draft Proposed Plan
• October/November - Fluor Fernald revisions
• November - EPA approves draft final of Proposed Plan
• December - public comment

2003:
• January - public comment
• February - EPA reviews/approves ROD Amendment

Milestone: Submit ROD Amendment 60 days after Proposed Plan approval
Employee Training

- **General** – 40 hr. HAZWOPER

- **Specific** – 3 hr. Silo 3 Job Specific
  - Specific training includes radiation protection requirements, and emergency response procedures in case of incidental spill

- **Specific Operations Work Permit and Radiation Work Permit will be developed**
  - Test runs will be performed prior to actual operation
Employee Monitoring

- Upgraded bioassay program
  - Bi-weekly fecal samples
  - Weekly WBC

- Air sampling
  - Area monitoring
  - Personnel monitoring
  - Air samplers affixed in cab of equipment

- Gamma exposure monitoring
  - Even though more of internal hazard, TLDs will be worn by all personnel. In addition, alarming dosimeters will be utilized.
Employee Radiation Protection

- **Necessary respiratory protection**
  - Primarily full-face
  - Supplied air will be readily available in case of spill or other emergency

- **Personnel Contamination Control**
  - Even though waste will remain in the container at all times, Hard hat, sealed double tyvek and nitrile gloves, booties will be worn by personnel managing waste
Controlled Management Activities

- Containers will only be managed inside the contaminated restricted area.
- Containers will be unloaded at facility near the middle of the site to maximize distance to fenceline.
- Only one container will be permitted for each haul truck.
- Truck speed will be limited to 15 m/hr (normally 25 m/hr).
- Even though waste will remain in containers at all times, waste management activities will be terminated if wind speeds exceed 20 m/hr (normally 35).
Controlled Management Activities

- Haul trucks will be radiologically inspected after each shift to ensure no silo material is present.
- All containers placed in cell will be covered with sand by the end of each shift.
  - Required container cover consists of 6 inches of clean sand, and then 1 foot of compactable clay.
- Dust suppression (water) will be immediately available at the unloading facility and the cell in case there is a breach in the containers.
  - Site Personnel will be on watch with dust suppression equipment during unloading and disposal.
Dose Assessment

- Envirocare utilized the Gaussian Plume Model to determine air concentrations at the site boundary and for the worker.
  - Assuming that an entire container was opened and all contents were spilled on the ground, using conservative resuspension and occupation factors and requiring adequate respiratory protection to the worker, the results indicated:
    - Air concentrations at the fenceline below the Effluent Concentration Limits listed in 10 CFR 20, Appendix B
    - Doses from radioactive effluents to individual members of the public less than the organ and whole body limits listed in 10 CFR 61.41
    - Internal doses to the worker would be below Envirocare’s annual ALARA limits.
Nevada Test Site
Low-Level Waste Management

Jhon Carilli, Project Manager
Low-Level Waste Project
Fernald Public Meeting
September 10, 2002
The Nevada Test Site

- Approximately 1,375 square miles of federally owned and controlled land – surrounded by approximately 5,000 square miles of federally owned and controlled land

- Located more than 60 miles northwest of Las Vegas
Waste Management Facilities
Waste Acceptance Criteria

- Audit the waste generator to verify that the low level waste stream meets Nevada's Waste Acceptance Criteria prior to the first shipment
- Re-audit the generator every two years thereafter
- Evaluate each waste stream to ensure that it can be safely disposed and managed at the Nevada Test Site
Upon Arrival ........

Driver and shipment information is verified at the badging office outside the main gate to the NTS.

LLW shipments are cleared through the main gate of the NTS once security has conducted a search.
Prior to Disposal.

Bulk packaged LLW shipments proceed to the Area 3 disposal site -- information is again verified and an exterior radiation survey is conducted prior to offloading.
Sealed containers are carefully unloaded and transported to the final storage area. Workers require no additional protection beyond normal industrial work practices. Containers are placed in a grid configuration to assure future tracking and retrieval ability.
Prior to leaving the site, the trailer is monitored to assure that no signs of contamination are present.
Questions. . . . . . .

Discussion. . . . . . .
Bottom Line

- Fernald has established a credible, responsible relationship with the Nevada Test Site

- The Nevada Test Site has provided safe, cost-effective waste management solutions for the entire DOE complex for the past 20 years

- The NTS works closely with its stakeholders and has their support for national waste management activities

- We will continue to maintain a safe, cost-effective program to ensure that generators throughout the DOE complex are served
FERNAILD CLEANUP STATUS

Fluor Fernald

AS OF AUGUST 31, 2002

1. Waste (E) Remediation, 102,764 tons, estimated 79,000 tons.

2. Sites I and 2, 2,890 cu. yds. of low-credible waste to be burned, temporarily stored in tanks, treated and stripped.

3. Site 5, 6,088 cu. yds. of solid metal oxides to be removed and disposed for disposal.


5. Waste at a Product Offloading.


9. Site 1, 1,000 cu. yds. of soil and debris disposal.

10. Site 7, 1,000 cu. yds. of soil and debris disposal.

Graphics #5955.12

AS OF AUGUST 31, 2002

100 of 233 structures removed

FORMER PRODUCTION AREA

EPA CERTIFIED CLEAN AREAS

LARGE STRUCTURES REMOVED