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	
• Fernald	LaVon Rutherford
• Envirocare	Ken Alkema
• Nevada Test Site	Jhon Carilli
Transportation	Terry Hagen
Comments	Critical Analysis Team (CAT)
Wrap up	Nina Akgunduz / Terry Hagen

Graphics #7704-01

SILO 3

Regulatory Background

- Wastes designated as 11e.(2) by-product material, statutorially 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)

Graphics #7704-02

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

Graphics #7704-03

SILO 3

What has changed?

- NTS Waste Aceptance 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

Graphics #7704-04

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

Graphics #7704-05

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Department of Energy
National Nuclear Security Administration
Nevada Operations Office
P.O. Box 98518
Las Vegas, NV 89193-8518

FERNALD
LOG C-1436
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JUN 20 2002

Stephen H. McCracken, Director, FEMP, Cincinnati, OH

DISPOSAL OF FERNALD SILOS WASTE MATERIALS AT THE NEVADA TEST SITE (NTS)

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

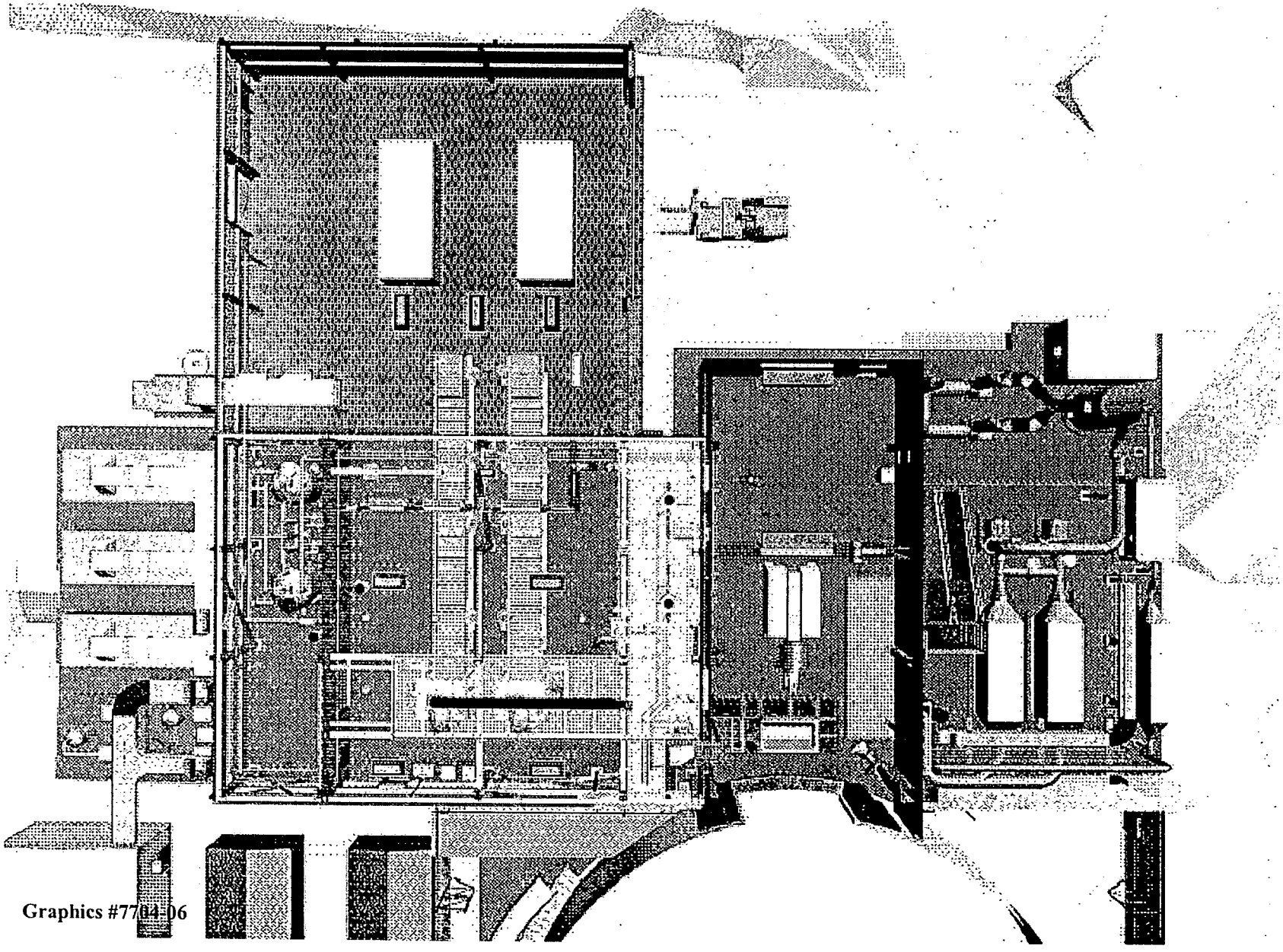
If you have any questions regarding this letter, please feel free to contact Jhon T Carilli, of my staff, at (702) 295-0672.

Carl P. Gertz
Assistant Manager
for Environmental Management

WMD:JTC-240

cc:
S. A. Robison, DOE/HQ (EM-31)
Cloverleaf
J. M. Sattler, DOE/Fernald,
Cincinnati, OH
N. K. Akgunduz, DOE/Fernald,
Cincinnati, OH

SILO 3 PROJECT: AERIAL VIEW



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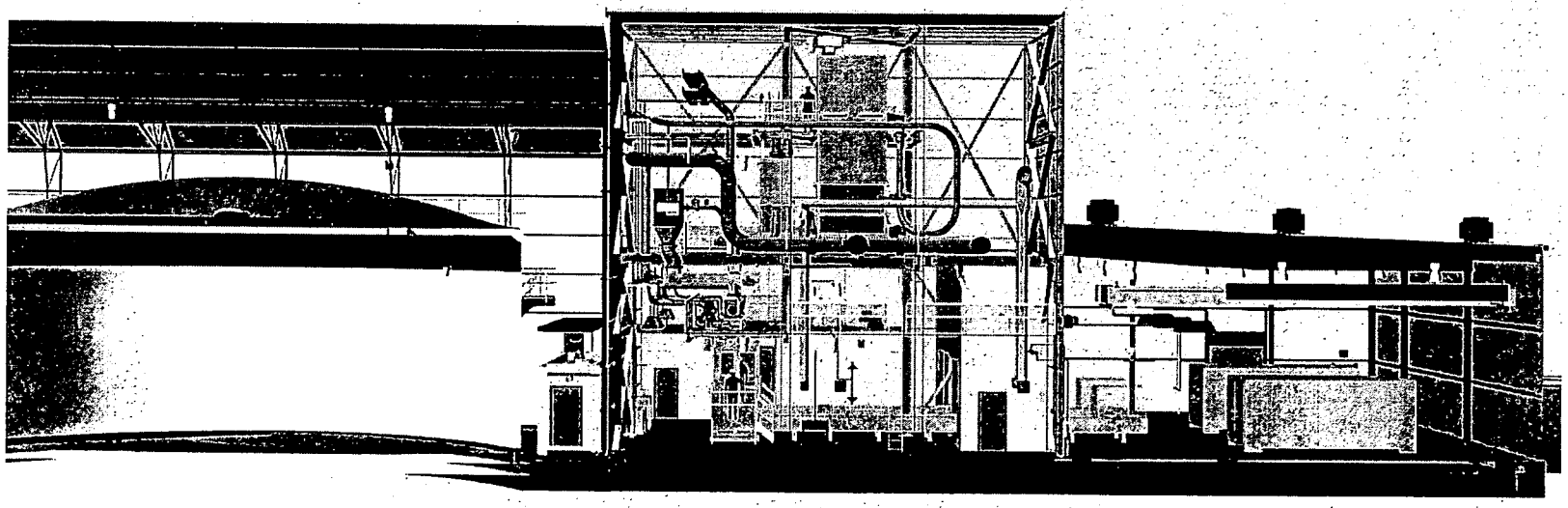
SILO 3 PROJECT: PNEUMATIC RETRIEVAL



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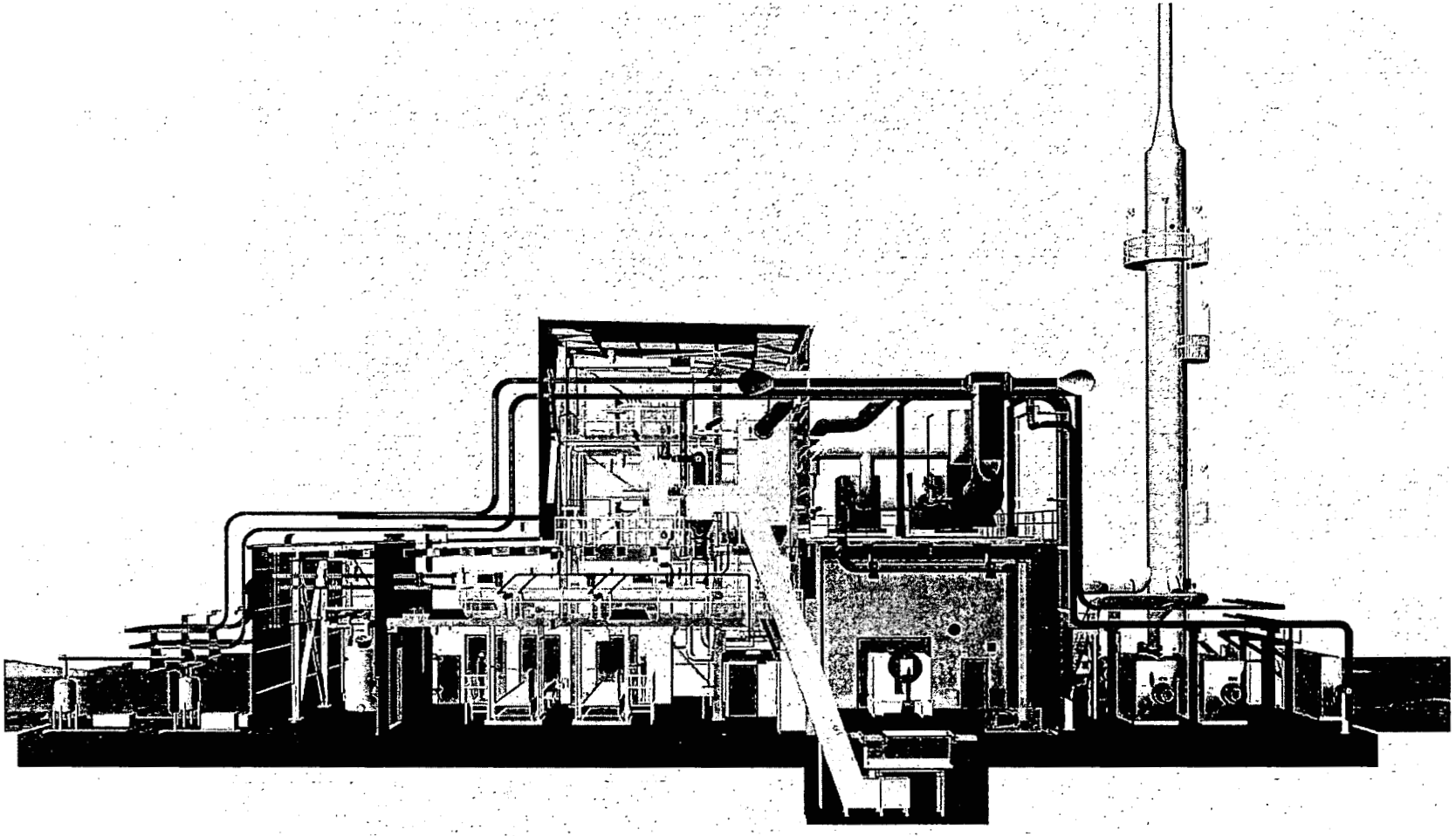
SILO 3 PROJECT: MECHANICAL RETRIEVAL



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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

Graphics #7704-09

SILO 3 SHIPPING

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

* 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

Graphics #7704-011

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

Graphics #7704-012

SILO 3 FACILITY DESIGN

- Cargo container bay
- Electrical building
- Operations support and change room trailers

Graphics #7704-013

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

Graphics #7704-014

SILO 3
MECHANICAL EQUIPMENT

Pneumatic Retrieval System

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

Graphics #7704-015

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

Graphics #7704-017

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

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Graphics #7704-018

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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

Graphics #7704-019

SILO 3
MECHANICAL EQUIPMENT

Buildings HVAC Systems: cascading negative pressure

- Air conditioning and handling units
- HEPA / ULPA filters
- Exhaust fans

Graphics #7704-020

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

Graphics #7704-021

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

Graphics #7704-022

APPLYING TECHNICAL FEEDBACK TO THE PROCESS

- Design reviews
  - Conceptual
  - Preliminary/remedial
  - Final
- Review, comment, comment incorporation
- Studies and demonstrations
- Vendors and contractors

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SILO 4 REINFORCING FRAME

Graphics #7704-024
Photo #7815-D088

SILO 4 REINFORCING FRAME

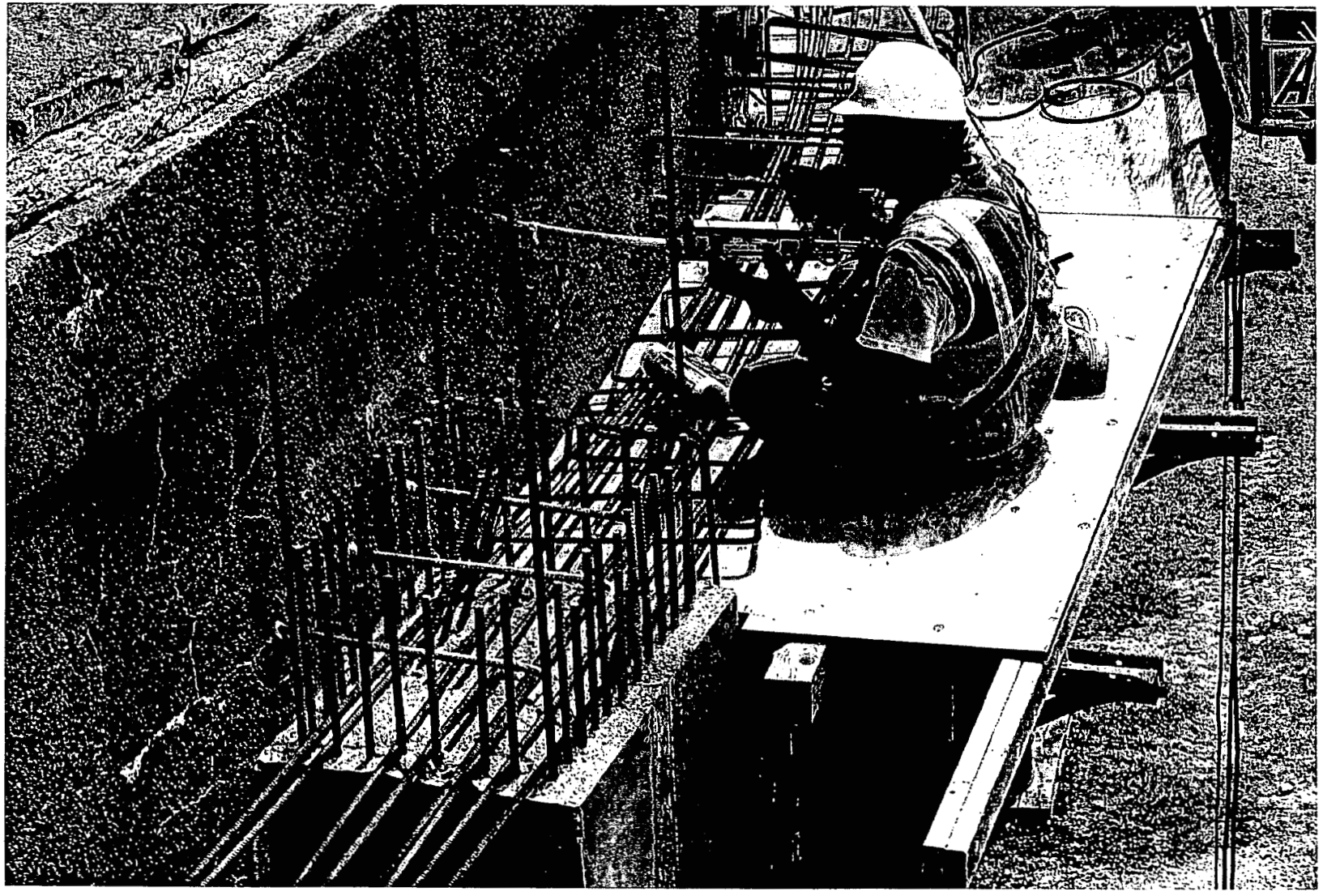

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Photo #7815-D091

SILO 3 FACILITIES LAYOUT

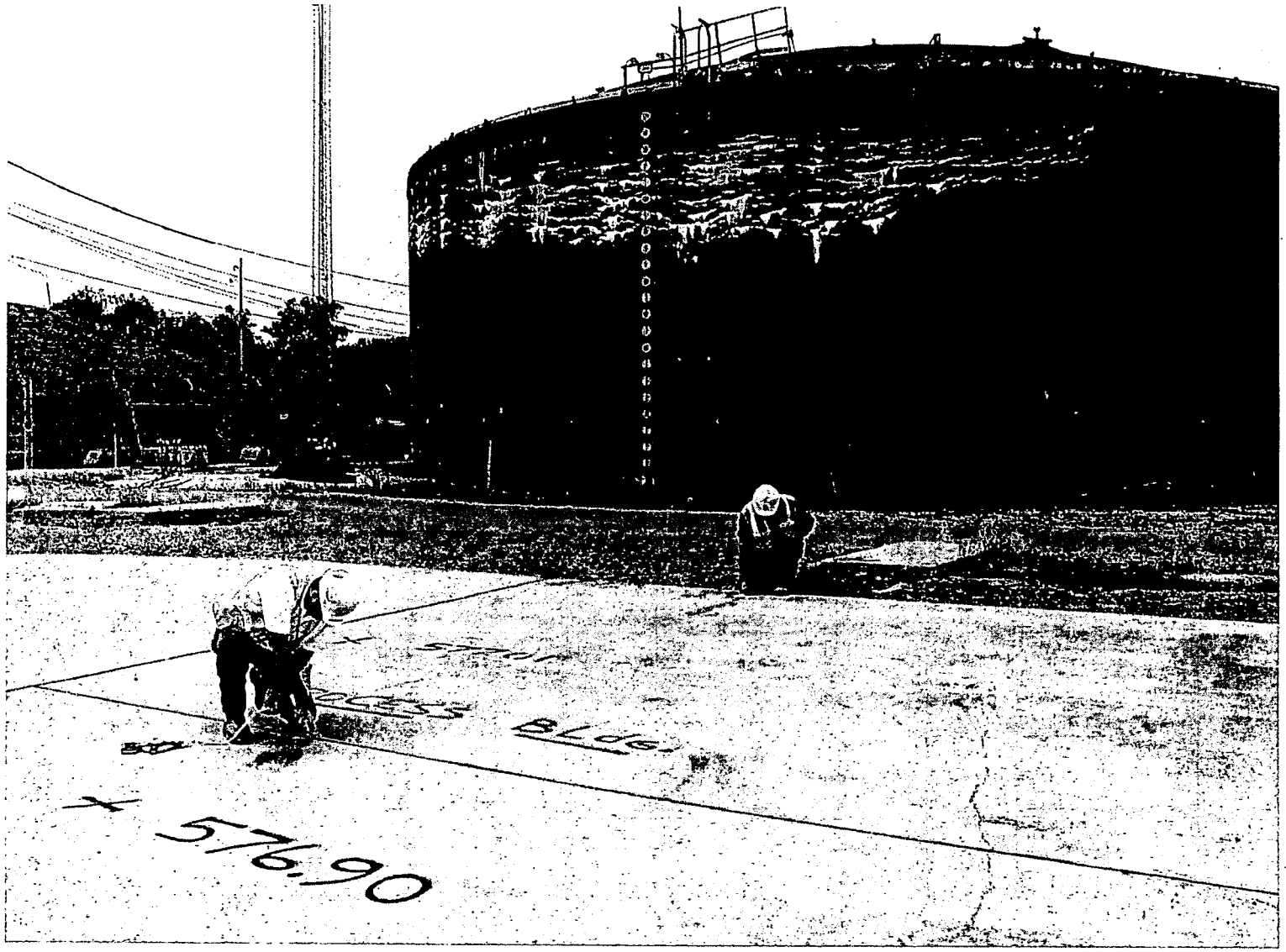

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Photo #7325-D0860

MATERIAL HANDLING

- Geotechnical testing
- Equipment selection
- Modelling pneumatic and mechanical retrieval
- Vacuum wand engulfment loads
- Final design reviews
- Dispersibility testing

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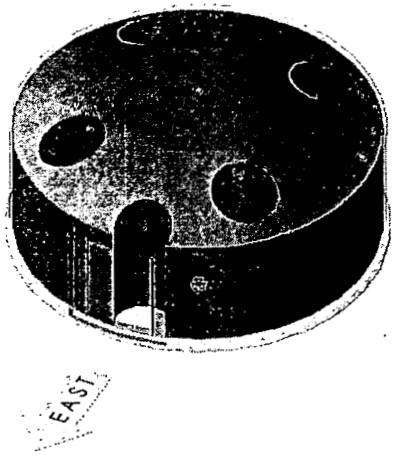
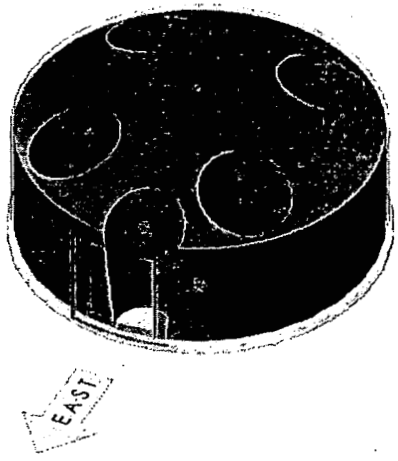
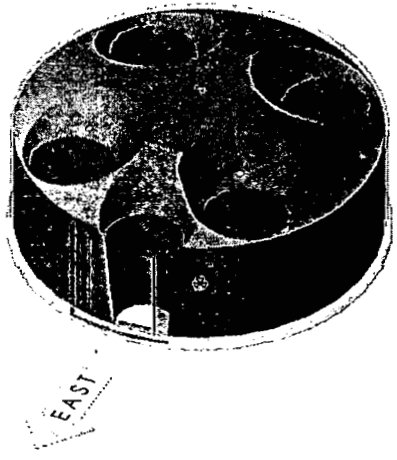
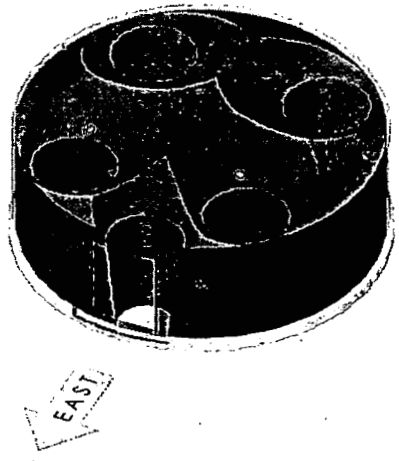
MATERIAL FLOW MODELLING









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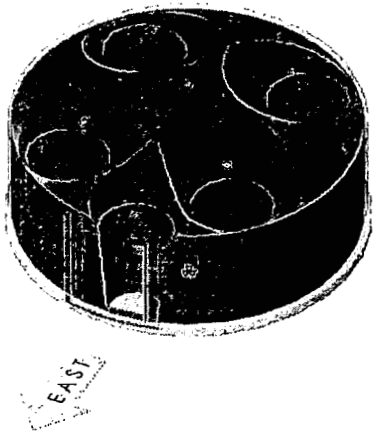
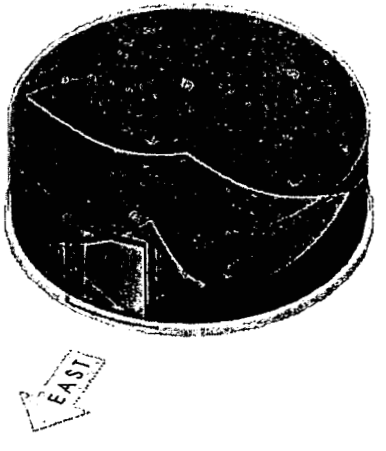
MATERIAL FLOW MODELLING





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SILO 3 MATERIAL

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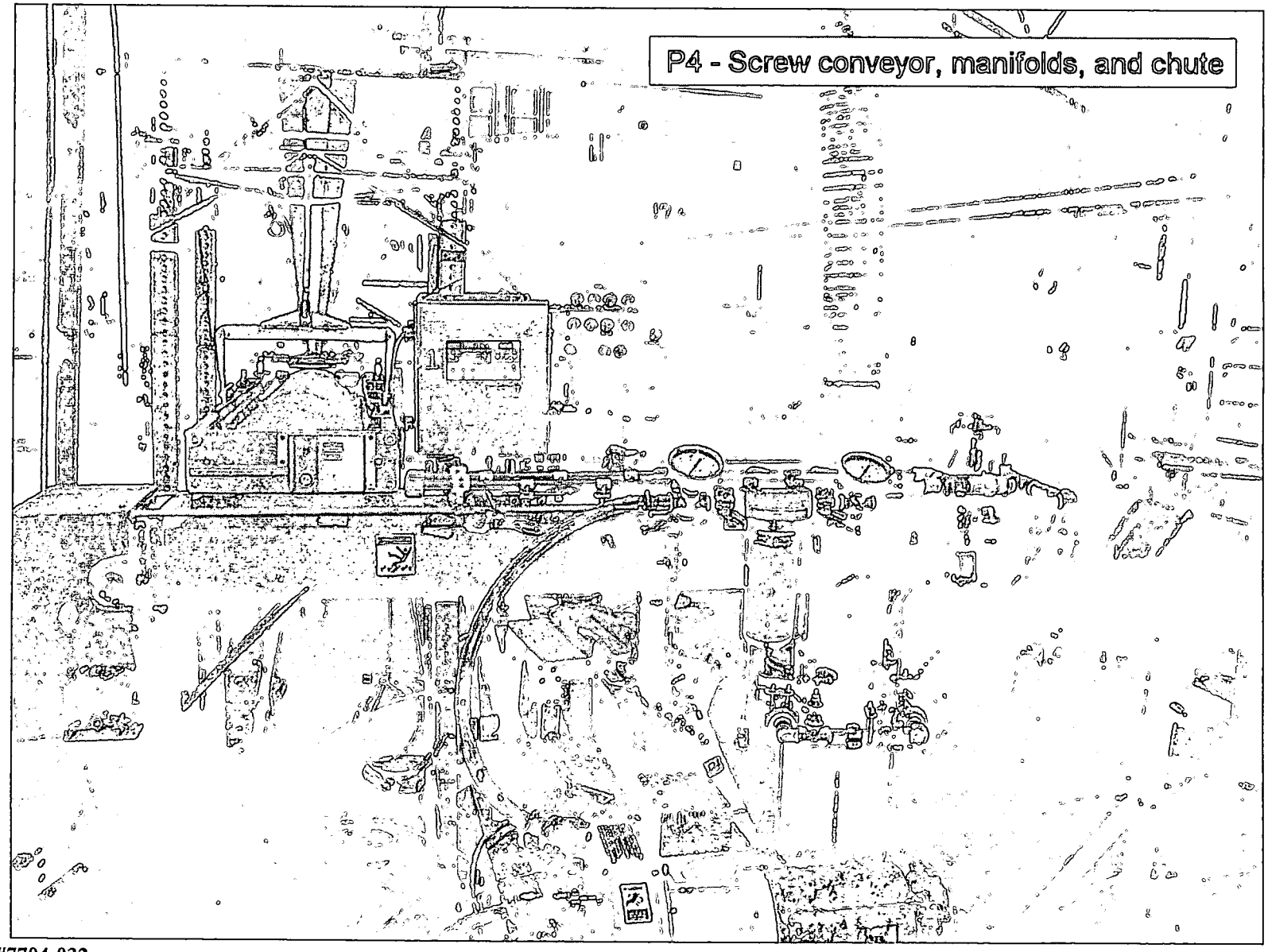
SILO 3 MATERIAL

Graphics #7704-031
Photo #7665-D02

SILO 3 DISPERSIBILITY STUDY



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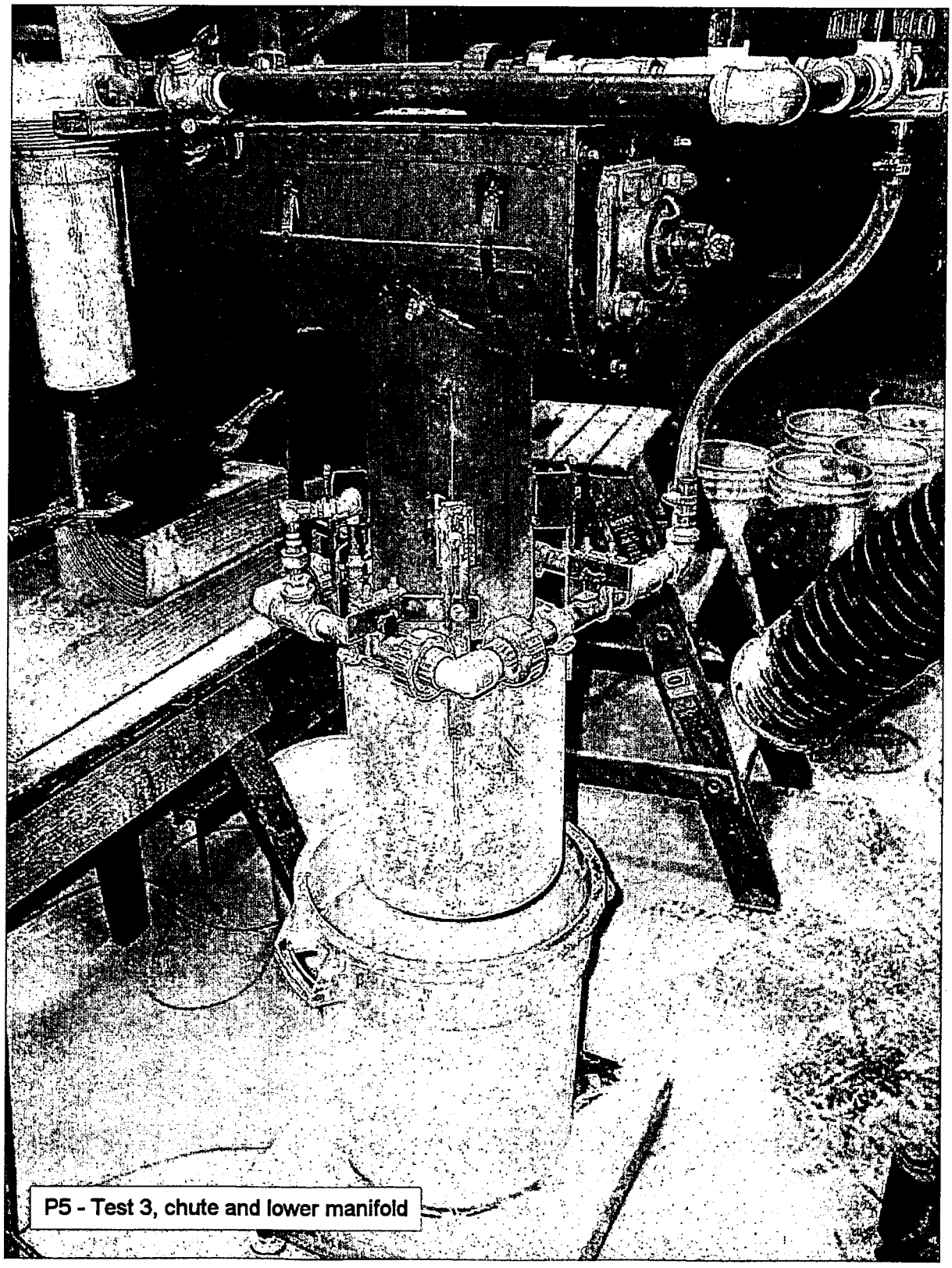
SILO 3 DISPERSIBILITY STUDY



P5 - Test 3, chute and lower manifold

Graphics #7704-033

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

Graphics #7704-034

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

Graphics #7704-035

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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

Graphics #7704-036

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

Graphics #7704-037

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

Graphics #7704-038

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

Graphics #7704-039

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

Graphics #7704-040

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

Graphics #7704-041

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

Graphics #7704-42

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

Graphics #7704-43

SILO 3
TRANSPORTATION

Risk assessment

- Silo 3 ROD requires a transportation risk of less than $1x10^{-6}$ for package and pre-treatment
- Performed RADTRAN 5 modelling using approved code
- Routine transportation risk:
  - Rail: $1.6x10^{-8}$ ILRC
  - Truck: $1.5x10^{-8}$
- Both rail and truck are compliant
- Probability of accident:
  - Rail: $9.5x10^{-7}$
  - Truck: $2.1x10^{-5}$

Graphics #7704-44

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

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SILO 3
TRANSPORTATION

Dispersibility issues:

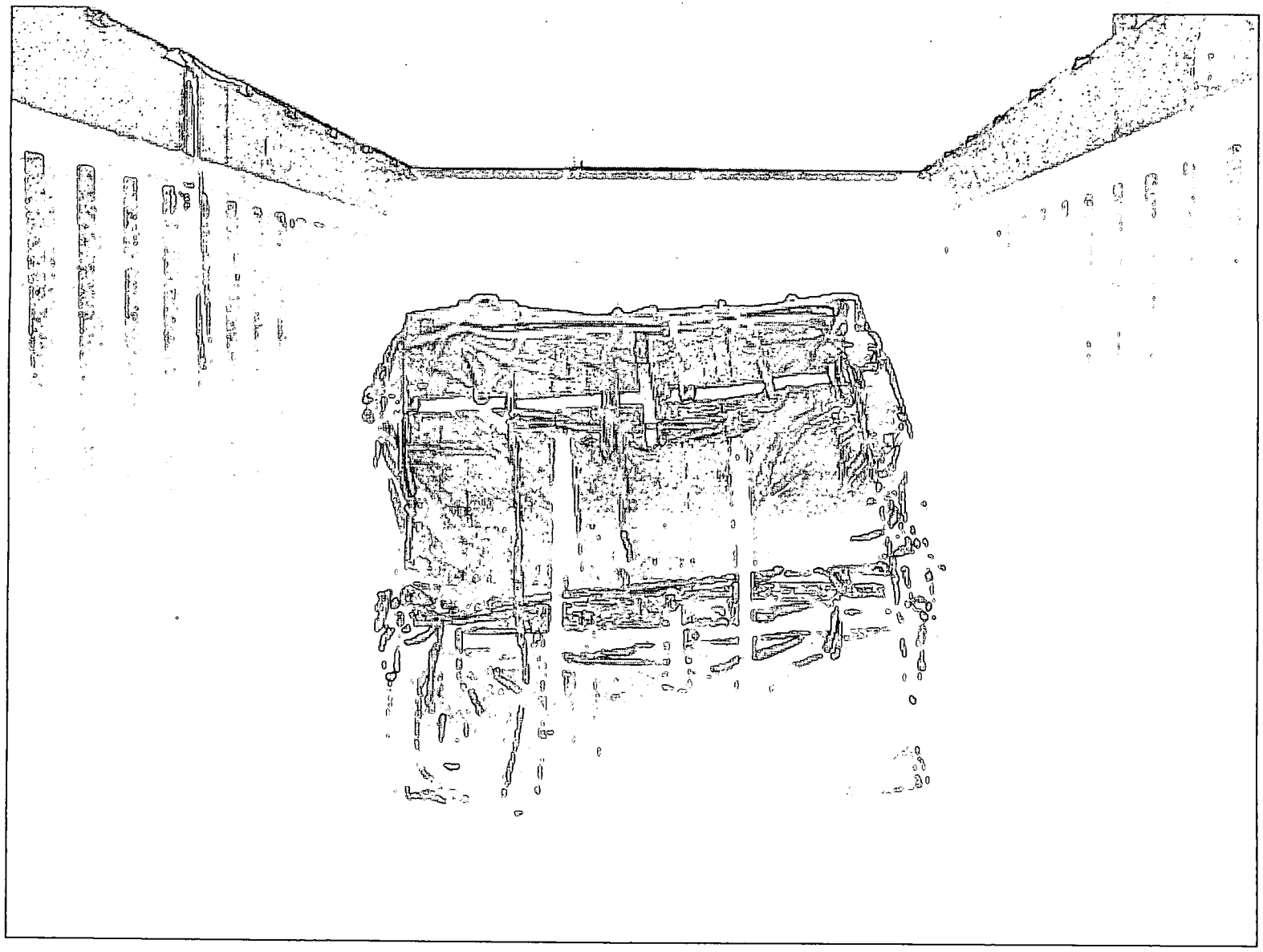
- Fluor Fernald contracted Jenike & Johanson (J&J) to evaluate a cost-effective and implementable method for adding binder solution to material in soft-sided containers
- J&J concluded it is possible to add binder into material as it enters the bag
- Based on lab studies, could reach moisture content 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

Graphics #7704-46

SOFT-SIDED CONTAINER STACKING TEST

Graphics #7704-047

SOFT-SIDED CONTAINER STACKING TEST



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PRIMARY BALANCING CRITERIA

CRITERION	CURRENT REMEDY - Treatment to meet Toxicity Characteristic Leachate Procedure	ALTERNATE REMEDY - Treatment not required
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***

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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

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FERNALD

ENVIROCARE OF UTAH, INC.

THE SAFE ALTERNATIVE

September 10, 2002

Silo 3

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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.

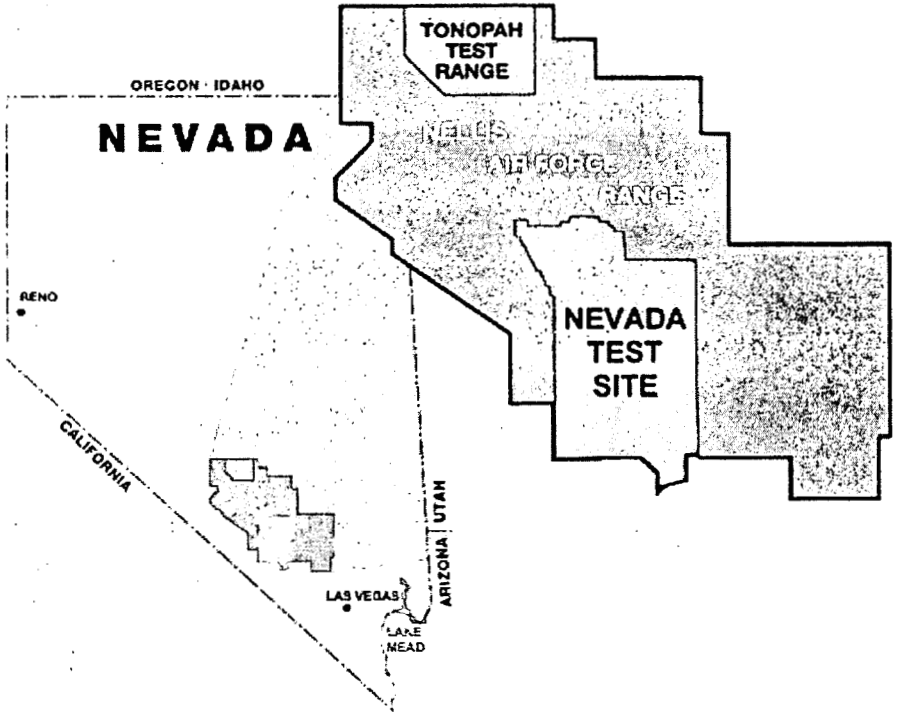
Nevada Test Site
Low-Level Waste Management

Jhon Carilli, Project Manager
Low-Level Waste Project
Fernald Public Meeting
September 10, 2002

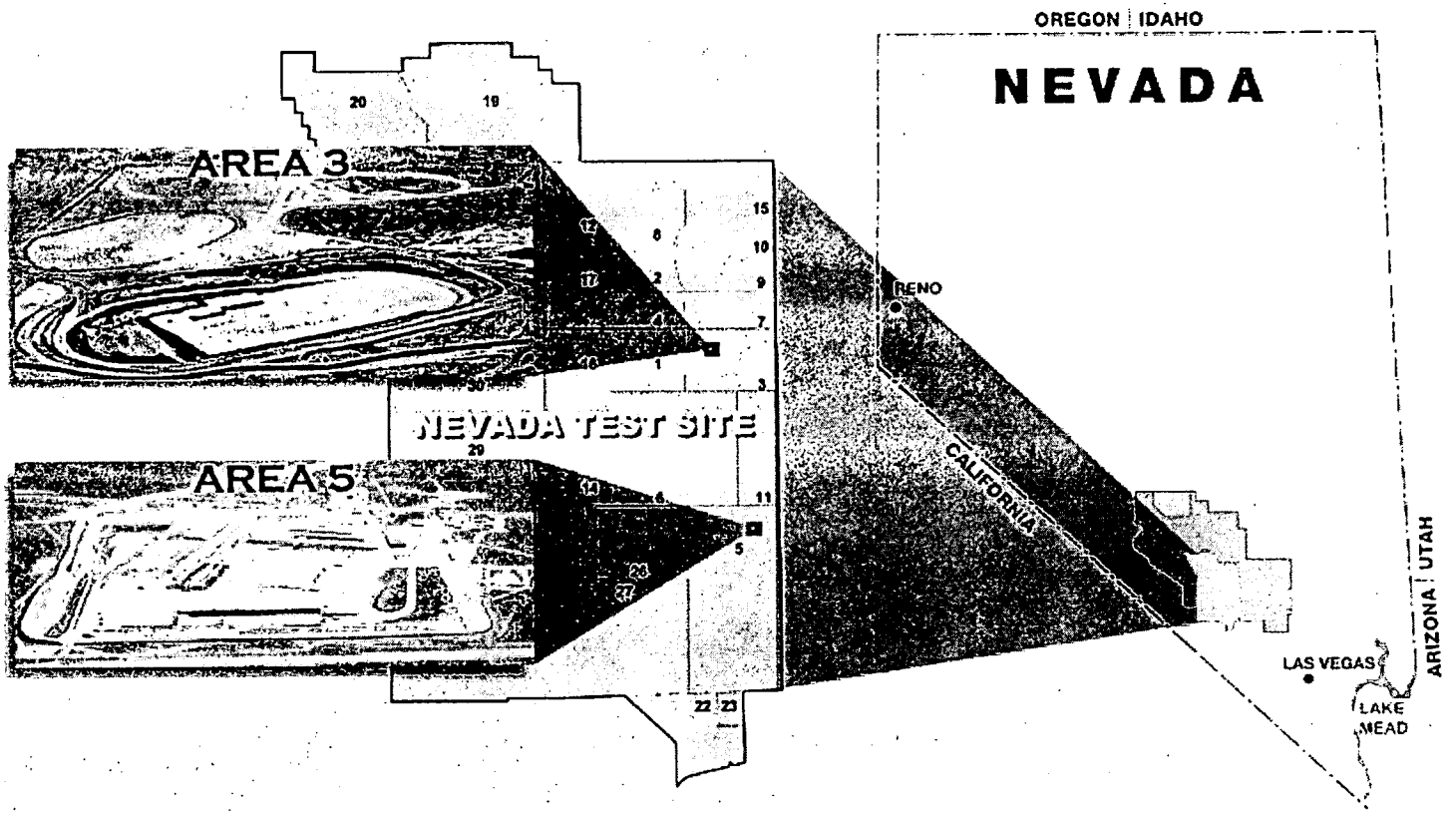
U.S. Department of Energy, National Nuclear Security Administration
Nevada Operations Office

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



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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

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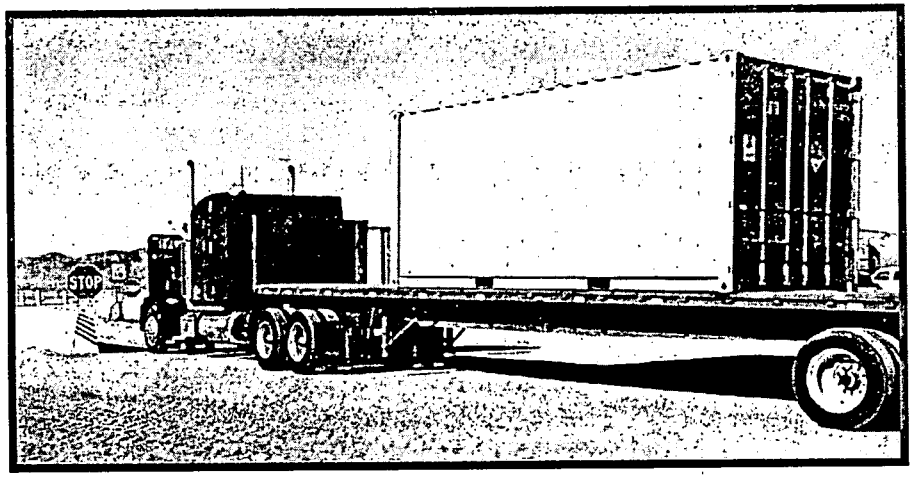
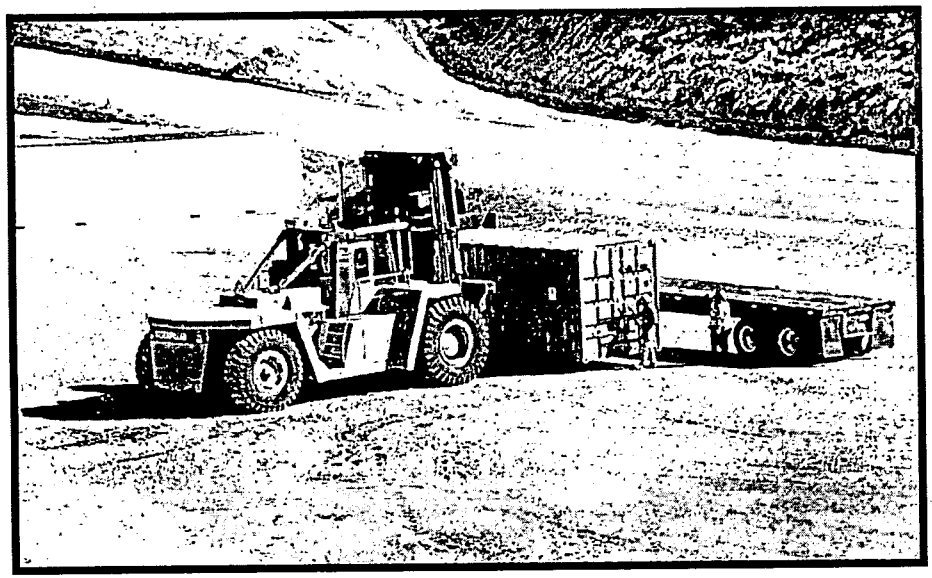
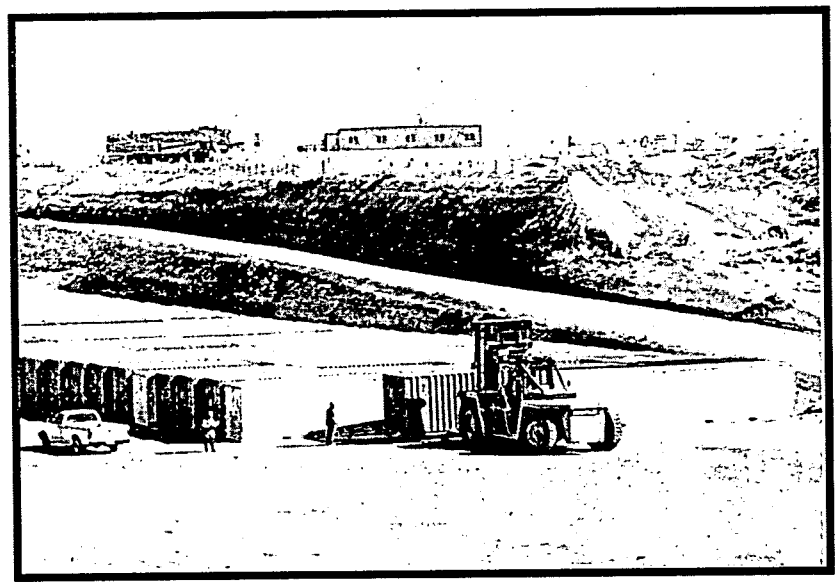
Prior to Disposal. . . . . .



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.

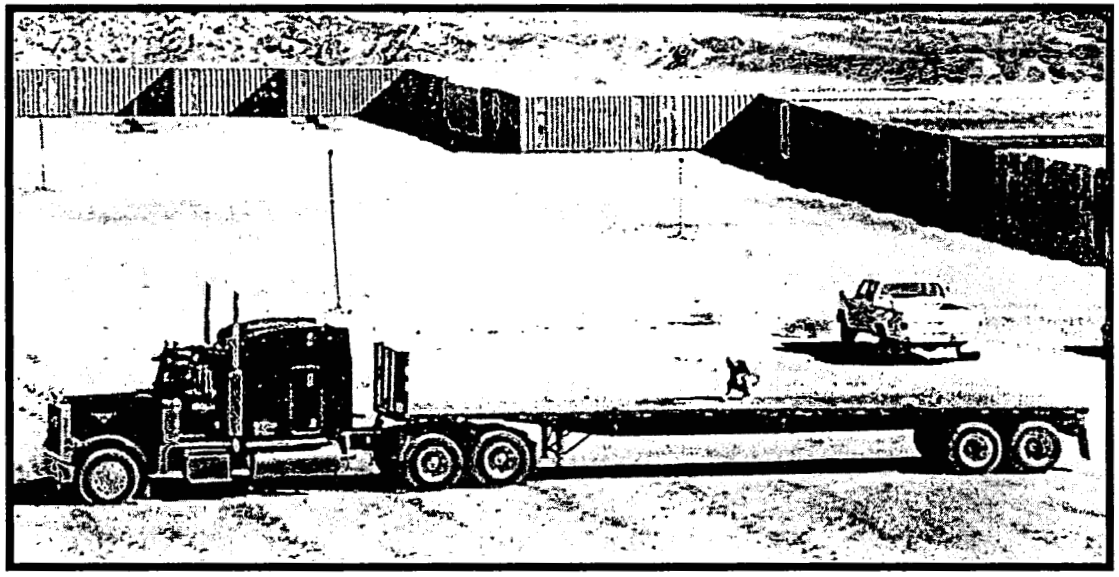
Offloading and Disposal. . . . . .





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.

One Last Step. . . . .



Prior to leaving the site, the trailer is monitored to assure that no signs of contamination are present.

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Questions. . . . . .

Discussion. . . . . .

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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

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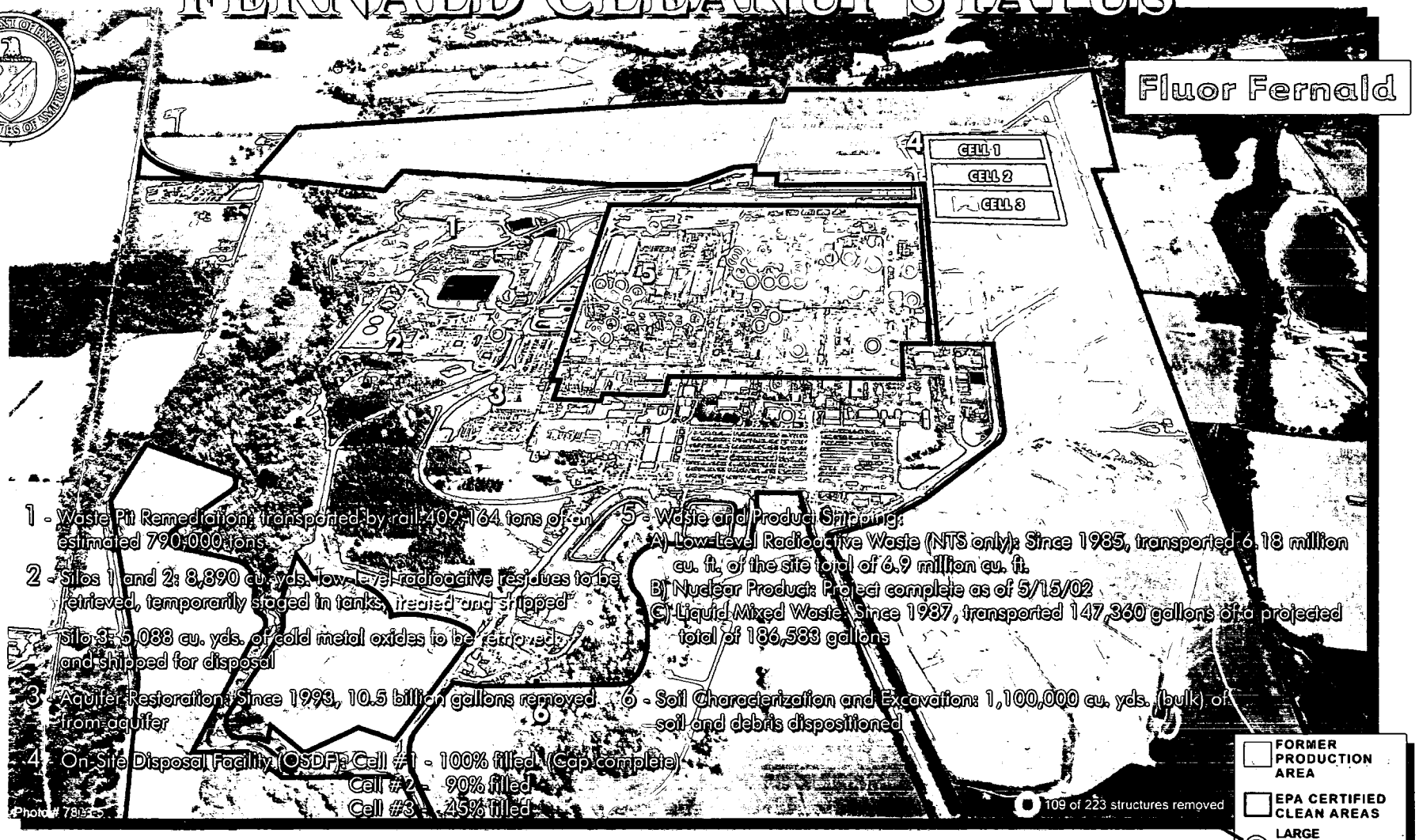
FERNALD CLEANUP STATUS



AS OF AUGUST 31, 2002

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