

**STATUS OF WASTE CHARACTERIZATION,
RETRIEVAL, PRETREATMENT AND GROUT
ACTIVITIES TO SUPPORT HWVP**

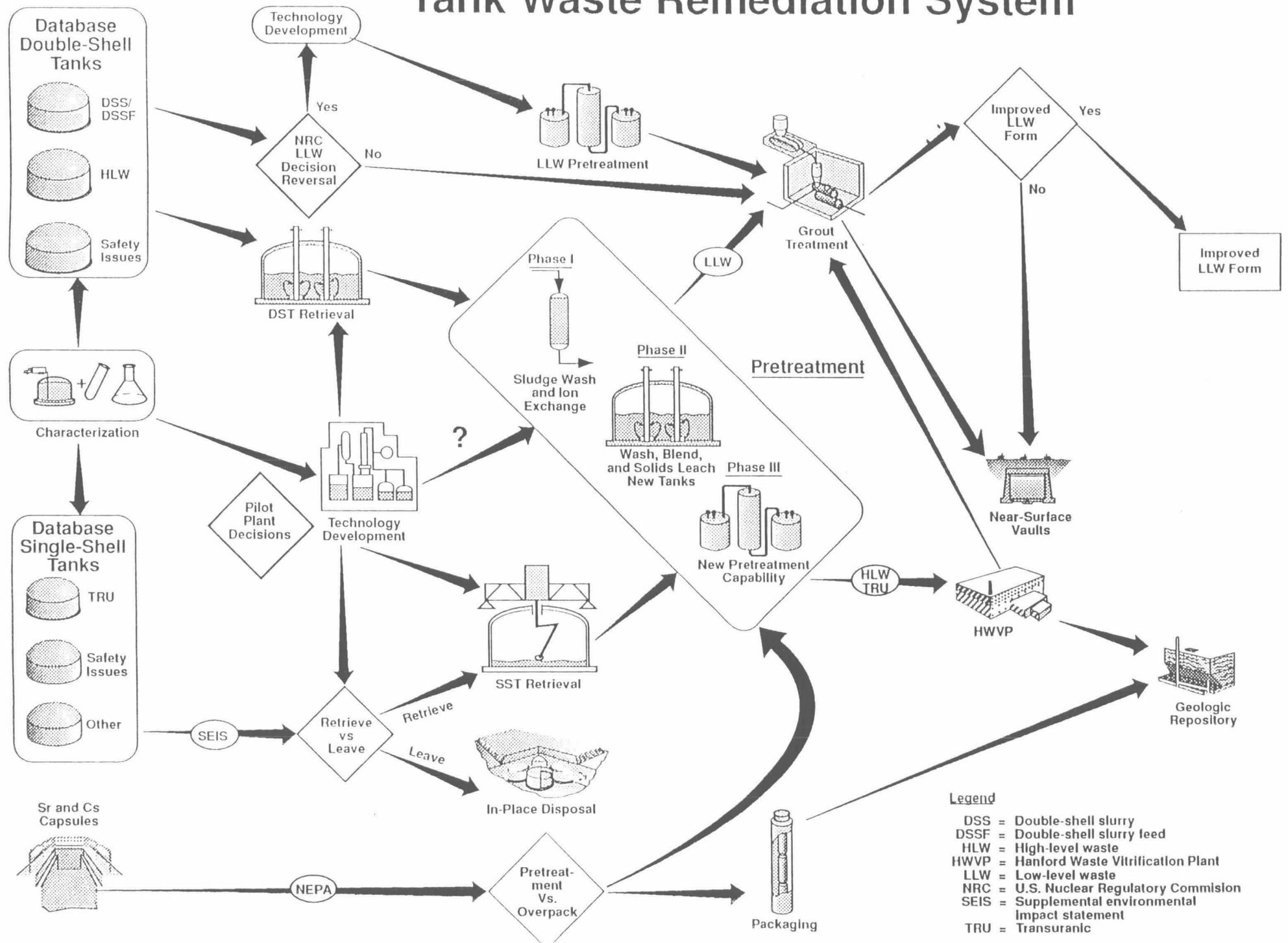
Presented to:

Nuclear Waste Technical Review Board

D. J. Newland

**Richland, Washington
May 11, 1992**

Tank Waste Remediation System



Waste Characterization

Waste Characterization

Purpose / Objective

- Provide tank waste data
 - Chemical
 - Physical
 - Radiological

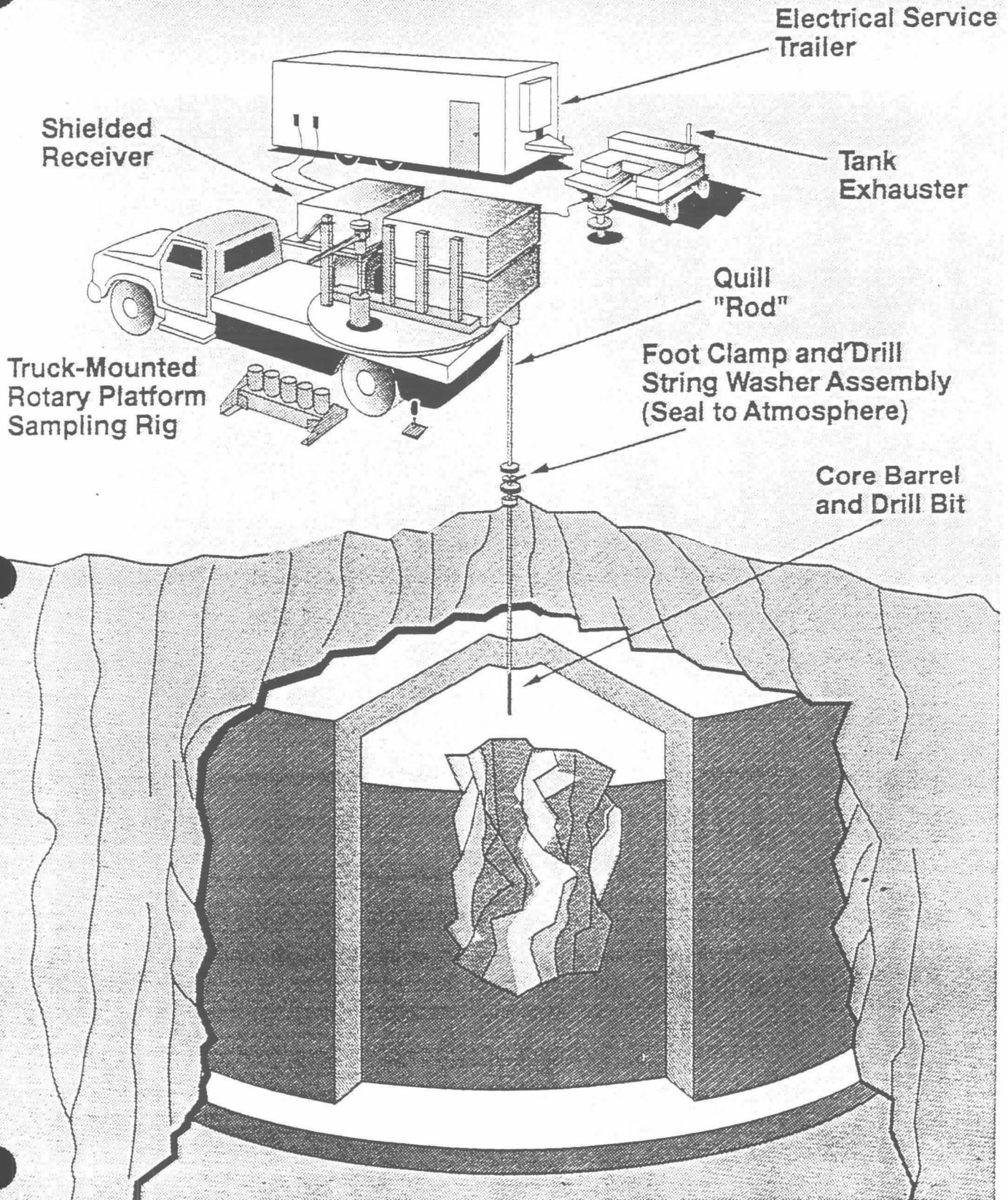
- To support:
 - Resolution of tank safety issues
 - Development of waste retrieval and pretreatment processes
 - Preparation of grout formulations
 - Qualification of glass waste form
 - Double-shell tank RCRA permit
 - Evaporator and waste transfer operations

Waste Characterization

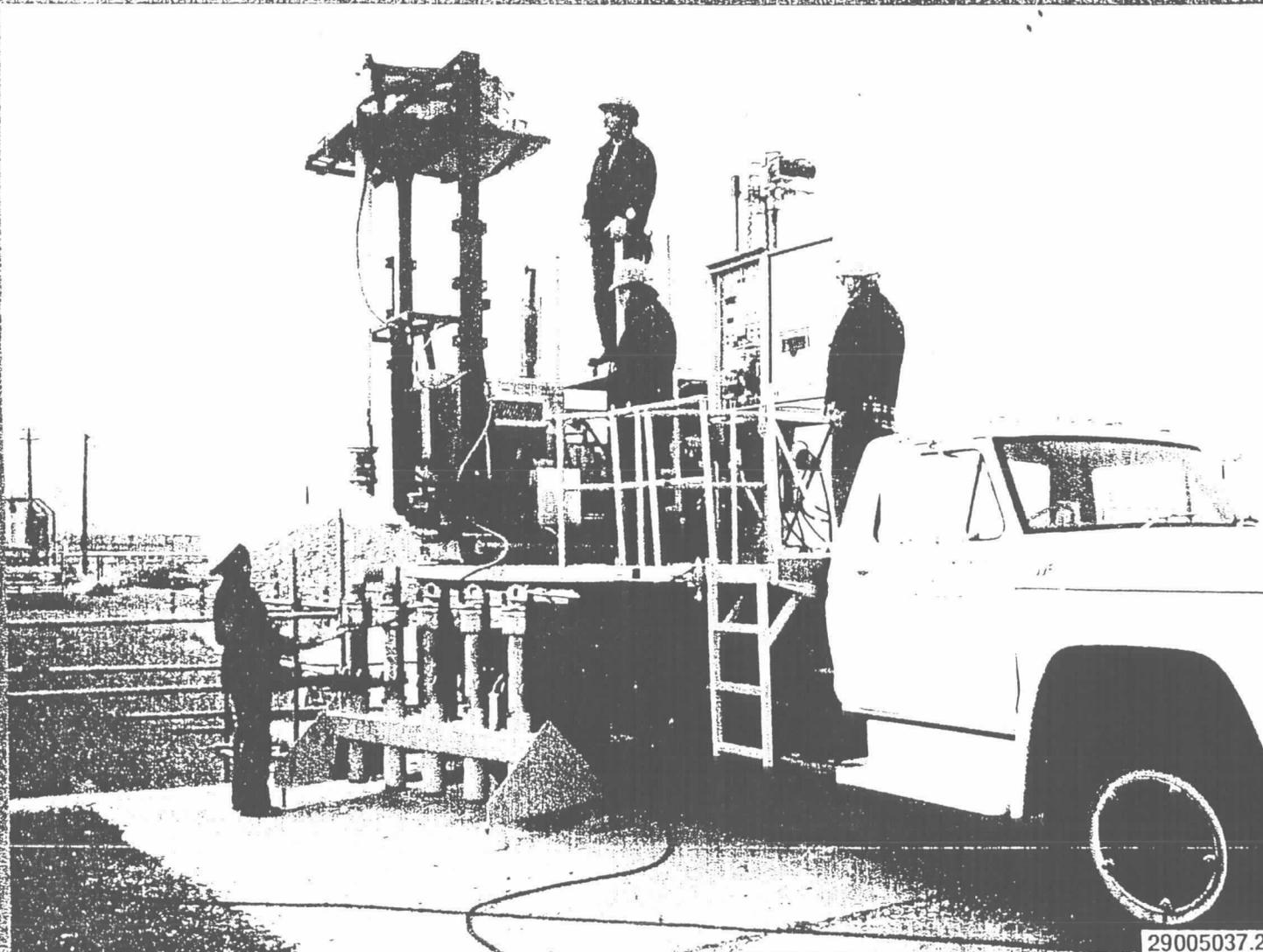
Scope

- **Liquid Sampling**
 - "Bottle-on-a-string"
- **Sludge and Saltcake Sampling**
 - Push-mode core sampler
 - Rotary mode core sampler
- **Laboratory Analysis**
 - Several chemical, physical, and radionuclide methods in use or under development
- **In-Situ Characterization**
 - Methods under development

Waste Characterization

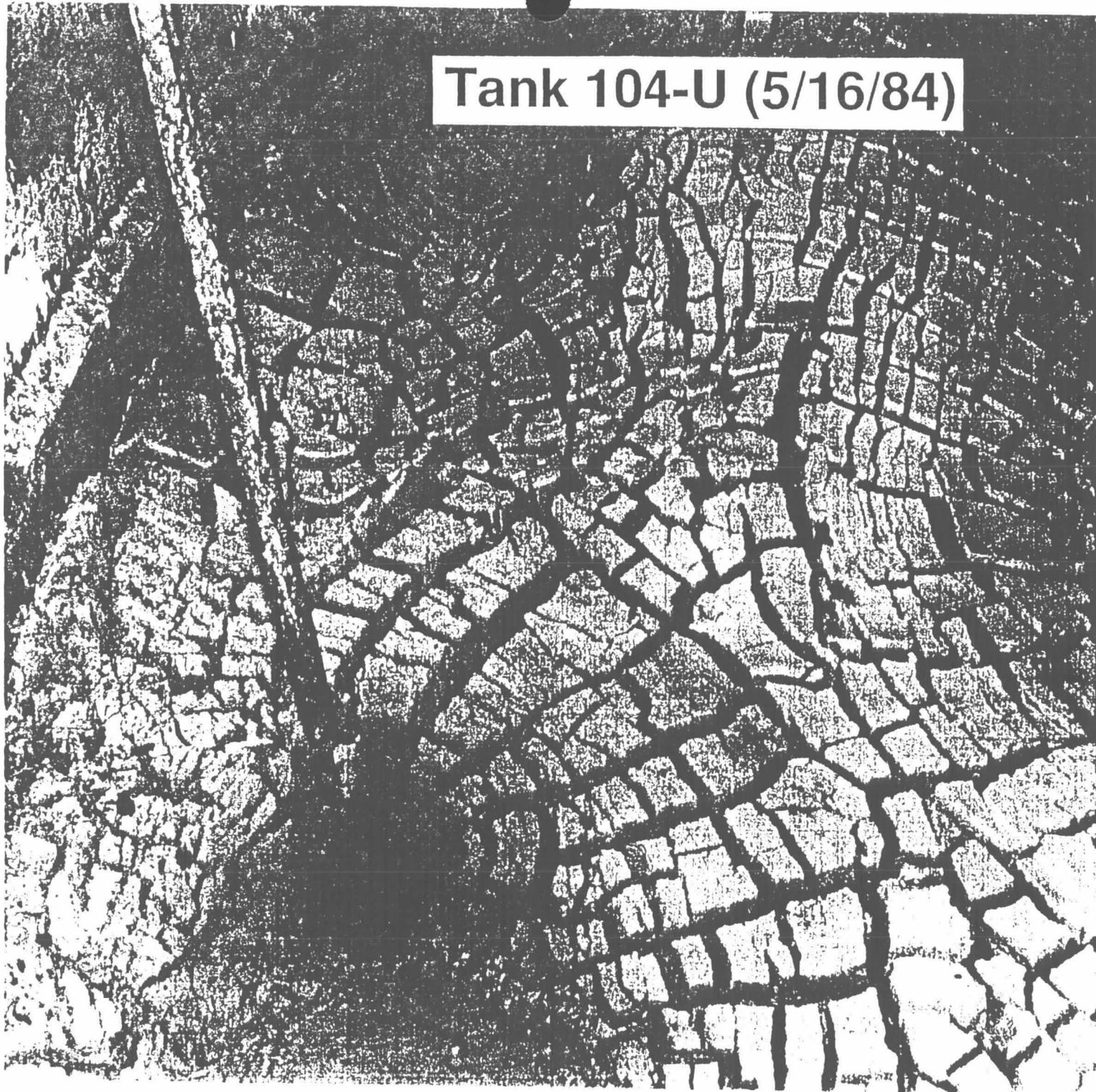


Core Sampling Truck **Hanford Designed and Developed**

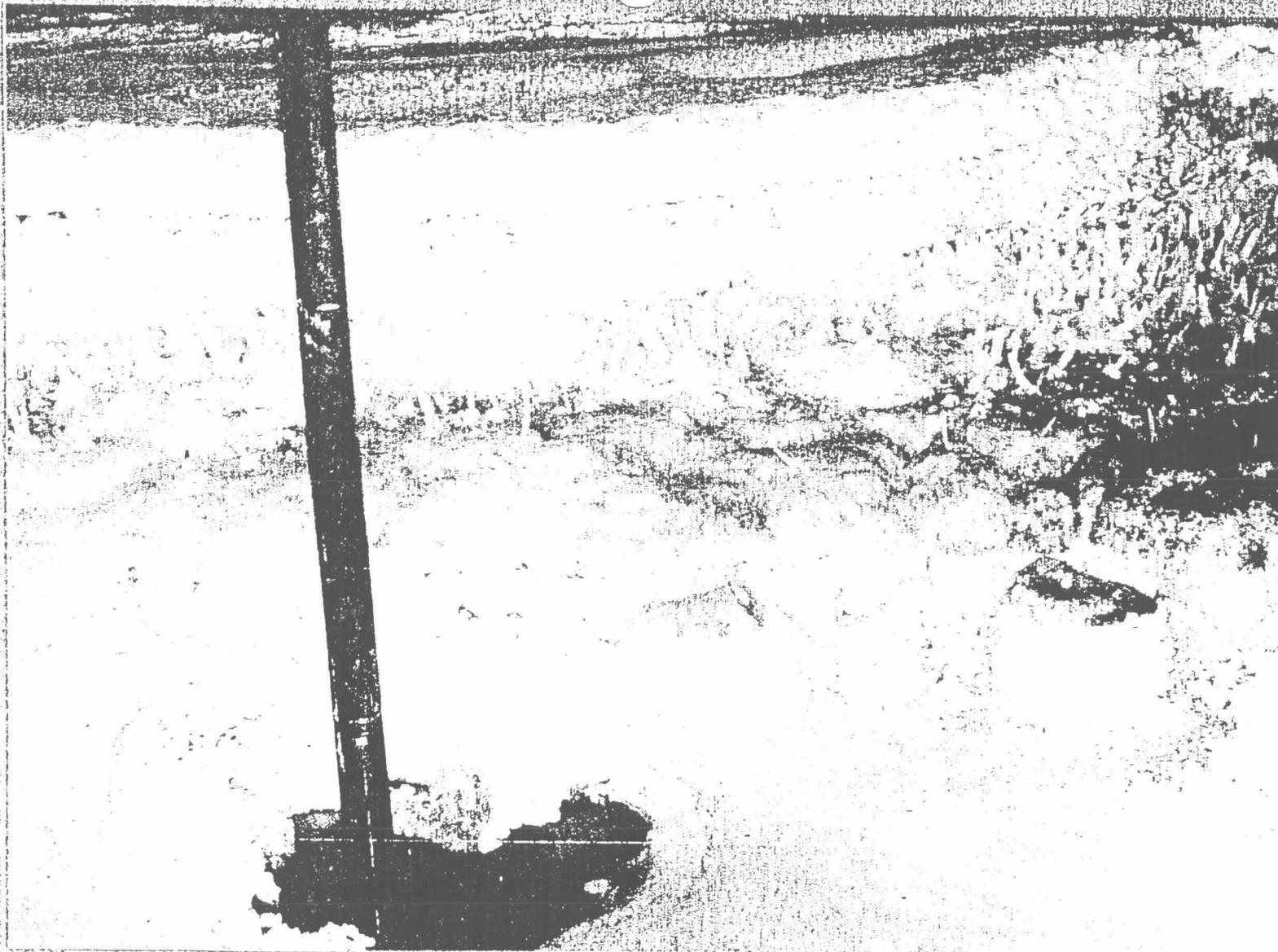


29005037.27

Tank 104-U (5/16/84)



Saltcake in a Single-Shell Tank



201506718

Waste Characterization

Status

- Liquid samples taken routinely as required

- Sludge and saltcake sampling
 - All sampling to-date by push mode
 - Total of 15 double-shell tanks sampled
 - Total of 27 single-shell tanks sampled
 - 10 tanks planned to be sampled in FY 1992
 - Rotary mode sample truck to be available March 1993

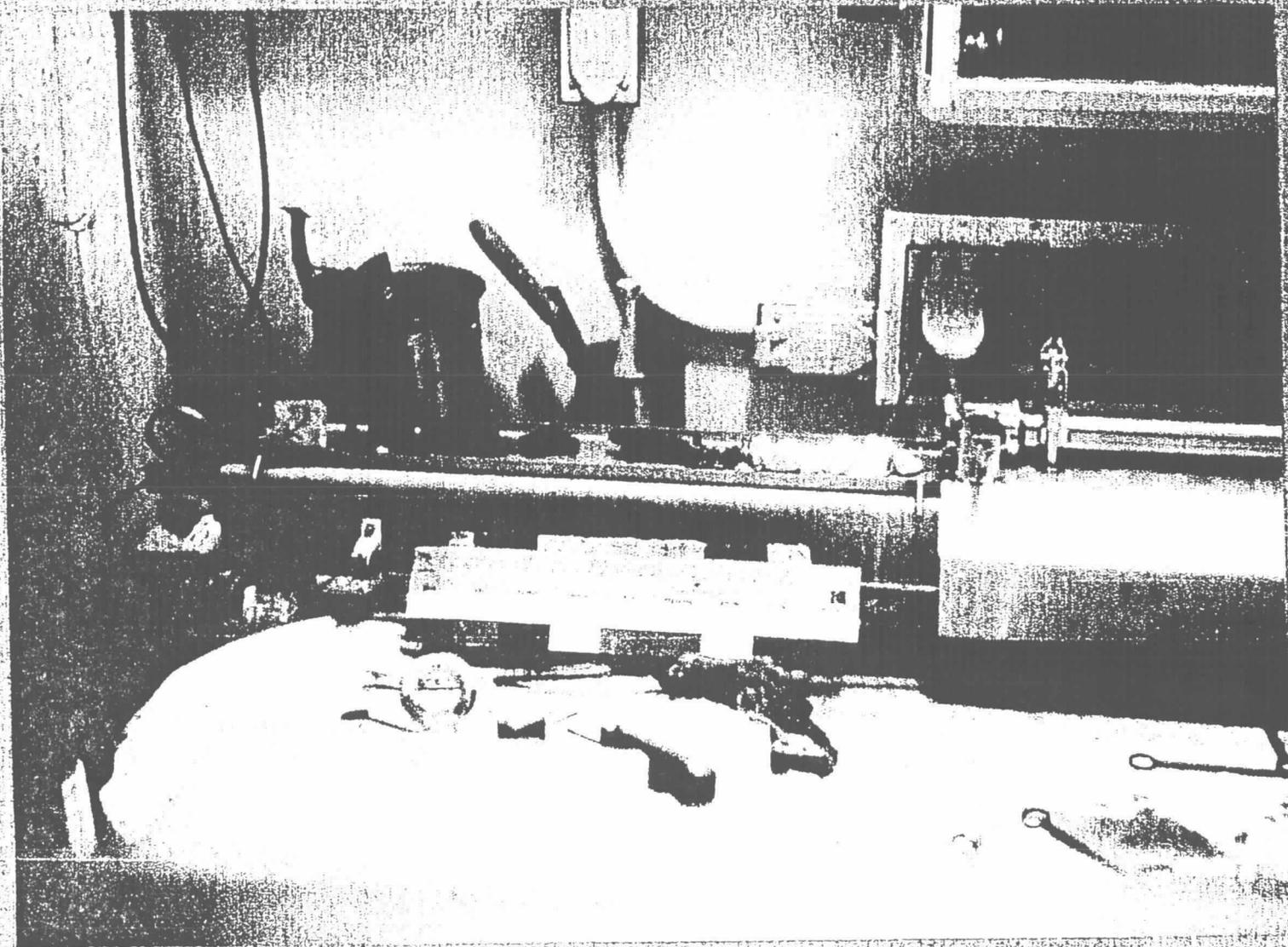
- Will double sampling capability

Waste Characterization

Status (cont)

- Laboratory analyses
 - Measurements currently made for cations, anions, organics, radionuclides, corrosivity, chemical reactivity, and physical characteristics
 - Methods under development for ferrocyanide speciation, organic complexants, and noble metals
- In-situ characterization
 - Remote sensors and robotic systems under development

Tank 110-U Core Sample



280508-22

Waste Characterization

Key Issues

- **Magnitude of characterization data needs for Tank Waste Remediation System**
- **Limited analytical laboratory capacity**
- **No hard saltcake sampling capability currently exists**
- **Impacts of tank safety issues on sampling**
- **Regulatory requirements for single-shell tank waste sampling**

Tank Waste Retrieval

Tank Waste Retrieval

Purpose / Objective

- **Remove wastes from double- and single-shell tanks**
- **Treat wastes as necessary to allow transport**
- **Support mitigation of tank safety issues**
- **Provide suitable feed materials to pretreatment, vitrification, and grout facilities**

Tank Waste Retrieval

Scope

- **Double-Shell Tank Wastes**
 - 28 tanks (one million gallons each)
 - 24 million gallons of mostly liquid and sludge, with limited saltcake

- **Single-Shell Tank Wastes**
 - 149 tanks (55,000 to one million gallons)
 - 37 million gallons of mostly saltcake and sludge, with limited liquid

Tank Waste Retrieval

Scope (cont)

- **Development, demonstration, and construction of retrieval systems**
 - **In-tank waste mobilization hardware**
 - **Waste treatment for transport**
 - **Tank structure and support system modifications**
 - **Confinement barriers**
 - **Safety and environmental analyses and permitting**

Tank Waste Retrieval

Status

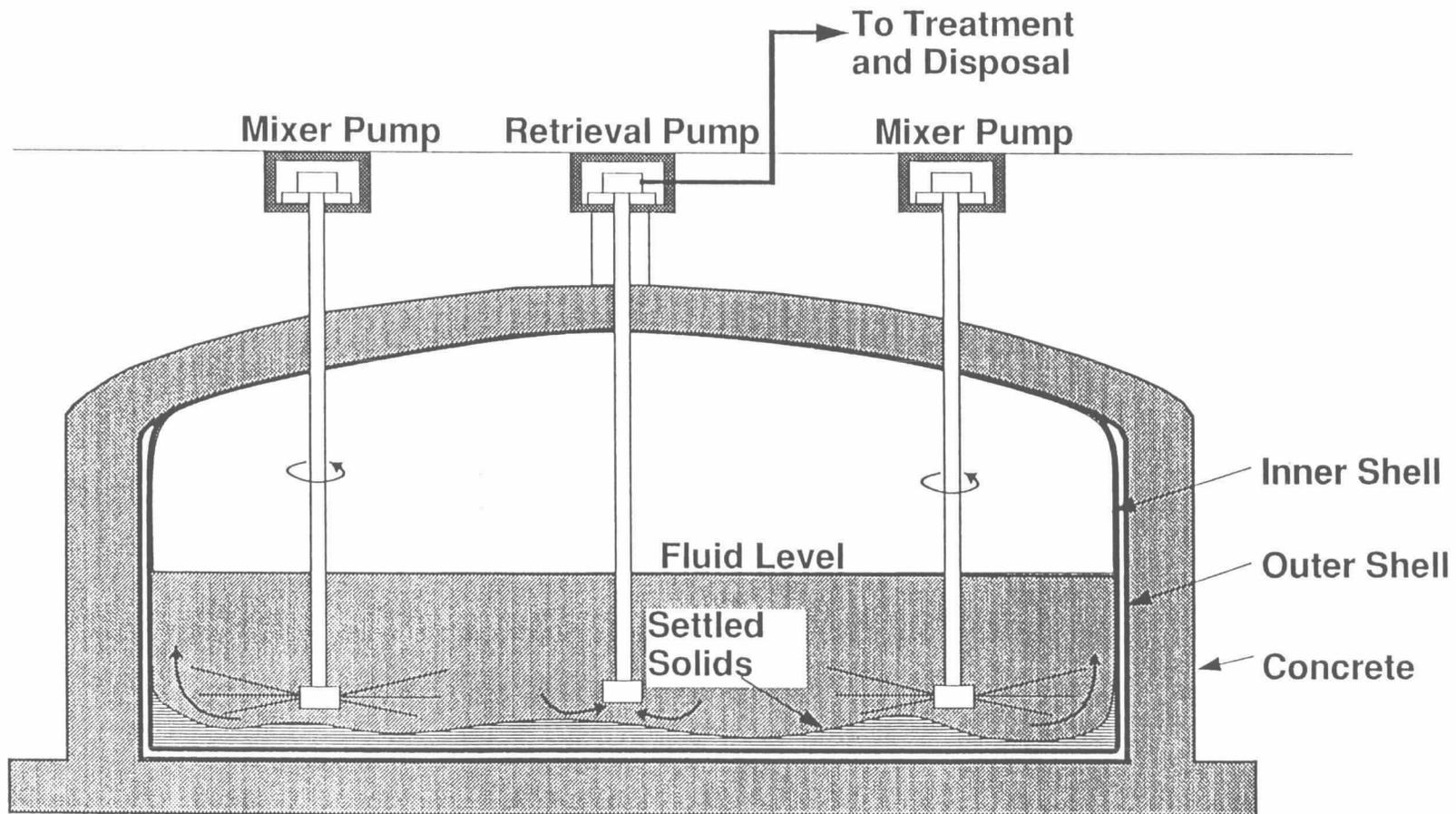
- **Double-Shell Tank Waste Retrieval**
 - Efforts have been focussed on using Savannah River mixer pump technology. Activities include analysis and testing of:
 - Slurry properties
 - Mixing capabilities
 - Erosion
 - Process monitoring
 - Development performed in 1/12-scale mockup facility
 - o Construction of 1/4-scale test facility proceeding
 - o Priority given to retrieve wastes from safety watch list tanks, while maintaining support to tank waste disposal

Tank Waste Retrieval

Status (cont)

- **Double-Shell Tank Waste Retrieval (cont)**
 - **Mixer pumps expected to work for high priority watchlist tank wastes (101-SY and 103-SY)**
 - **Confident mixer pump approach will work for initial feed to HWVP**
 - **Other methods may be required for higher shear strength wastes**
 - **In-tank demonstration of mixer pumps to be performed in CY 1996**

Mixing Pumps Using Slurry Jets to Re-suspend Sludge



Tank Waste Retrieval

Status (cont)

- Single-Shell Tank Waste Retrieval
 - Current efforts focussed on identification, evaluation, and demonstration of applicable technologies for:
 - Waste simulants
 - Tank and waste mapping
 - Tank modifications
 - Sludge and saltcake dislodging
 - In-tank maneuvering and control
 - Surveillance
 - Transport of retrieved wastes
 - Initial priority given to retrieval of safety watchlist tanks

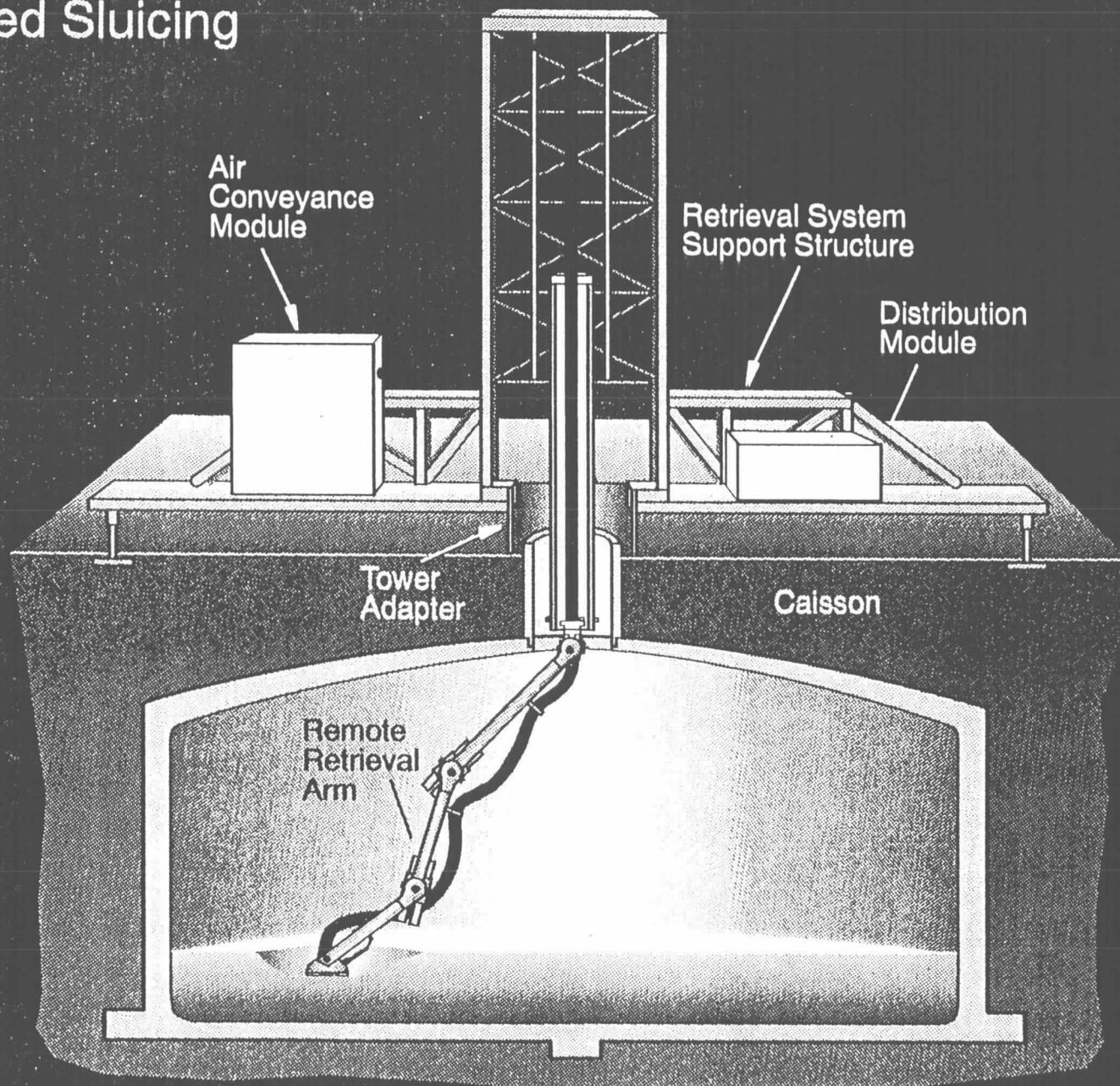
Tank Waste Retrieval

Status (cont)

- **Single-Shell Tank Waste Retrieval (cont)**
 - Prior engineering studies identified long-reach robotic systems with multiple end effectors as prime candidates
 - High-water volume past practice sluicing is also a key candidate if environmental concerns can be resolved
 - Initial demonstration of candidate technologies will be completed in CY 1994
 - In-tank demonstration will be completed in CY 1999

Single-Shell Tank Retrieval

Confined Sluicing



Tank Waste Retrieval

Key Issues

- **Several waste types with unique chemical and physical properties**
- **Tank safety issues**
- **Limited waste characterization data**
- **66 known or suspected leaking single-shell tanks**
- **Aging transfer systems and tank farm infrastructure**
- **Limited double-shell tank storage space available for retrieved wastes**

Tank Waste Pretreatment

Tank Waste Pretreatment

Purpose / Objective

- Resolve tank safety issues by destroying organics and ferrocyanides
- Minimize glass volume and disposal costs through efficient separation of radionuclides and inert material
 - Large fraction (~90%) of waste suitable for near surface disposal (grout)
 - Small fraction (~10%) requires disposal in geologic repository
- Provide feed for vitrification and grout within allowable feed specifications

Tank Waste Pretreatment

Scope

- Separation of radionuclides from all Hanford high-level tank wastes
- Development, demonstration, and construction of pretreatment processes and related facilities
 - Dissolution of soluble salts
 - Removal of cesium and strontium
 - TRU extraction
 - Organic and ferrocyanide destruction
- Safety and environmental analyses and permitting

Tank Waste Pretreatment

Status

- Disposal alternatives have been under investigation since 1970's
- Priority being given to resolution of tank safety issues
 - Scoping studies initiated on ferrocyanide and organic destruction
- Solids-liquid separation, dissolution of soluble salts, and cesium removal by ion exchange are generally proven technologies
 - Will result in high number of canisters without more advanced separations for many waste types
- Lab-scale testing performed on solvent extraction process to dissolve sludges in acid and remove TRU
 - Bench and pilot-scale testing planned

Tank Waste Pretreatment

Status (cont)

- Investigation of alternate advanced processes initiated
 - Splitting by salt crystallization
 - Solid sorbants
 - Nitrate destruction
 - Selective leaching
 - Calcination and leaching

Tank Waste Pretreatment

Key Issues

- Previous reference pretreatment facility (B Plant) determined to not be feasible
 - Ability to provide continuing feed to vitrification and grout facilities
- Limited waste characterization data
- High disposal costs for glass canisters indicate need for advanced separation processes and potentially large facilities to minimize volume of waste made into glass
- Candidate advanced separation processes are technically complex and based on limited development and testing
- Potential need to remove cesium from initial grout feeds

Grout Disposal Program

Grout Disposal Program

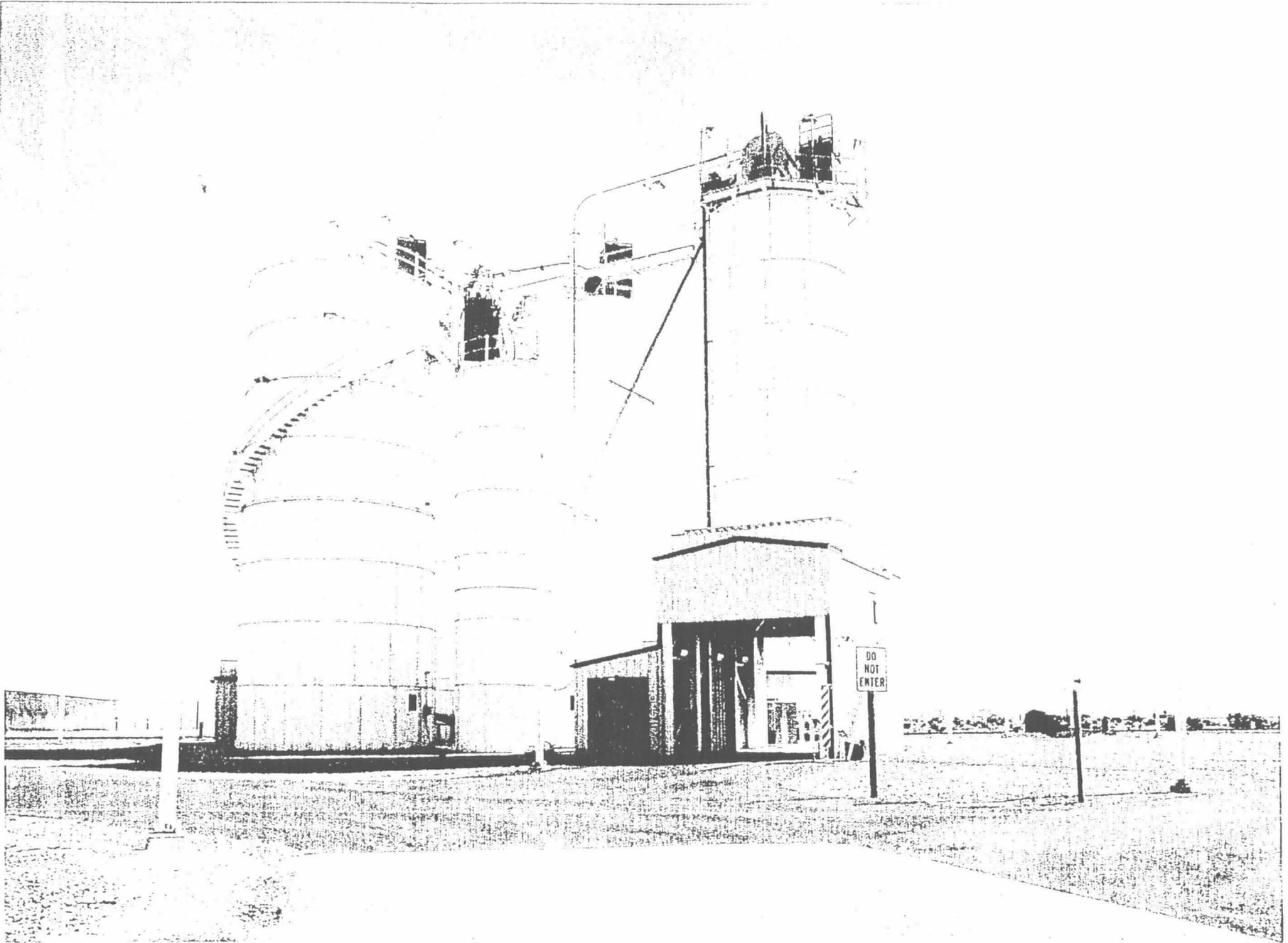
Purpose / Objective

- Environmentally safe disposal of liquid low-level tank waste
- Provide tank space for retrieval and pretreatment of high-level tank wastes

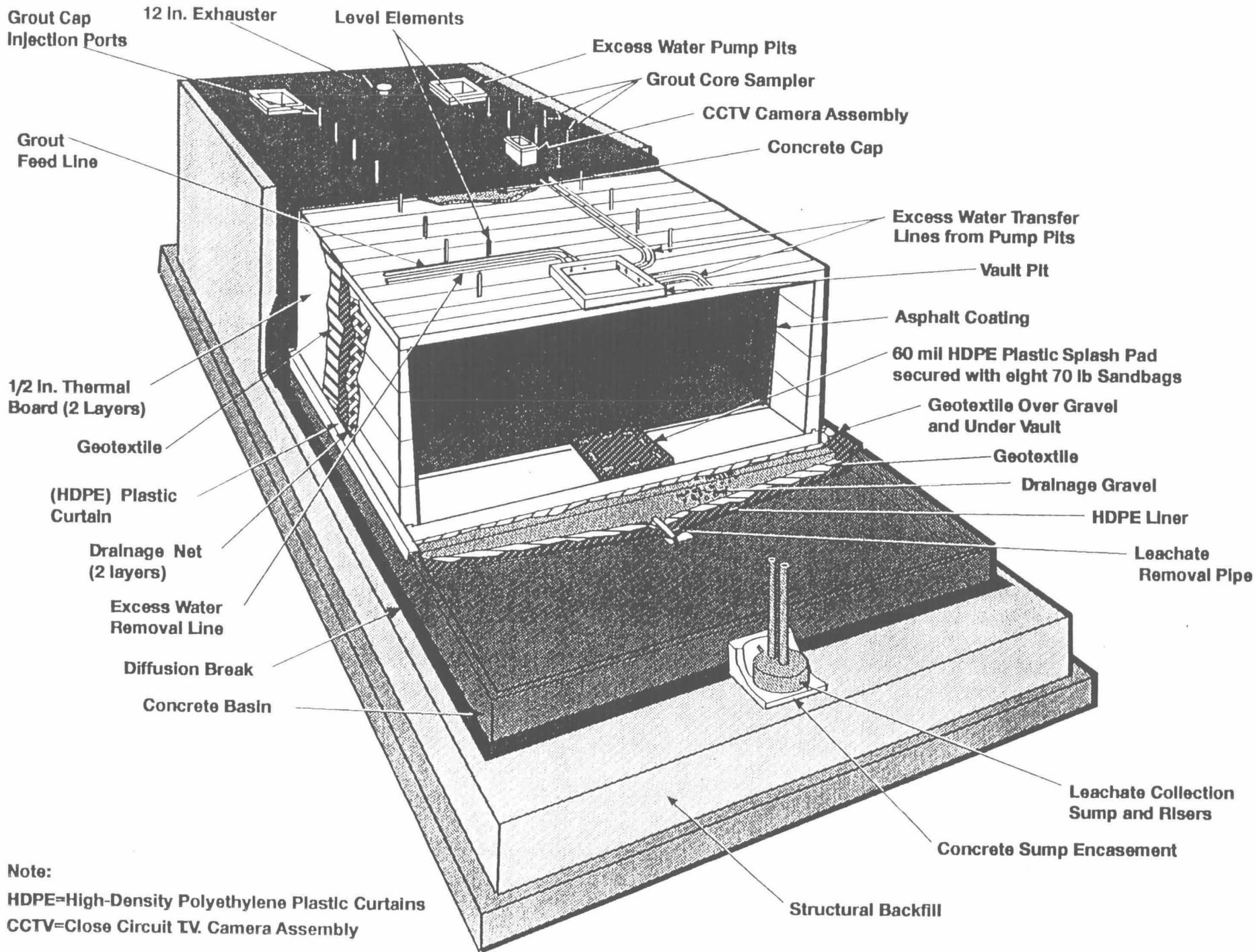
Grout Disposal Program

Scope

- **Development of grout formulations and related technology**
- **Dry material and mixing facilities**
- **Underground storage vaults**
- **Safety and environmental analyses and assessments**



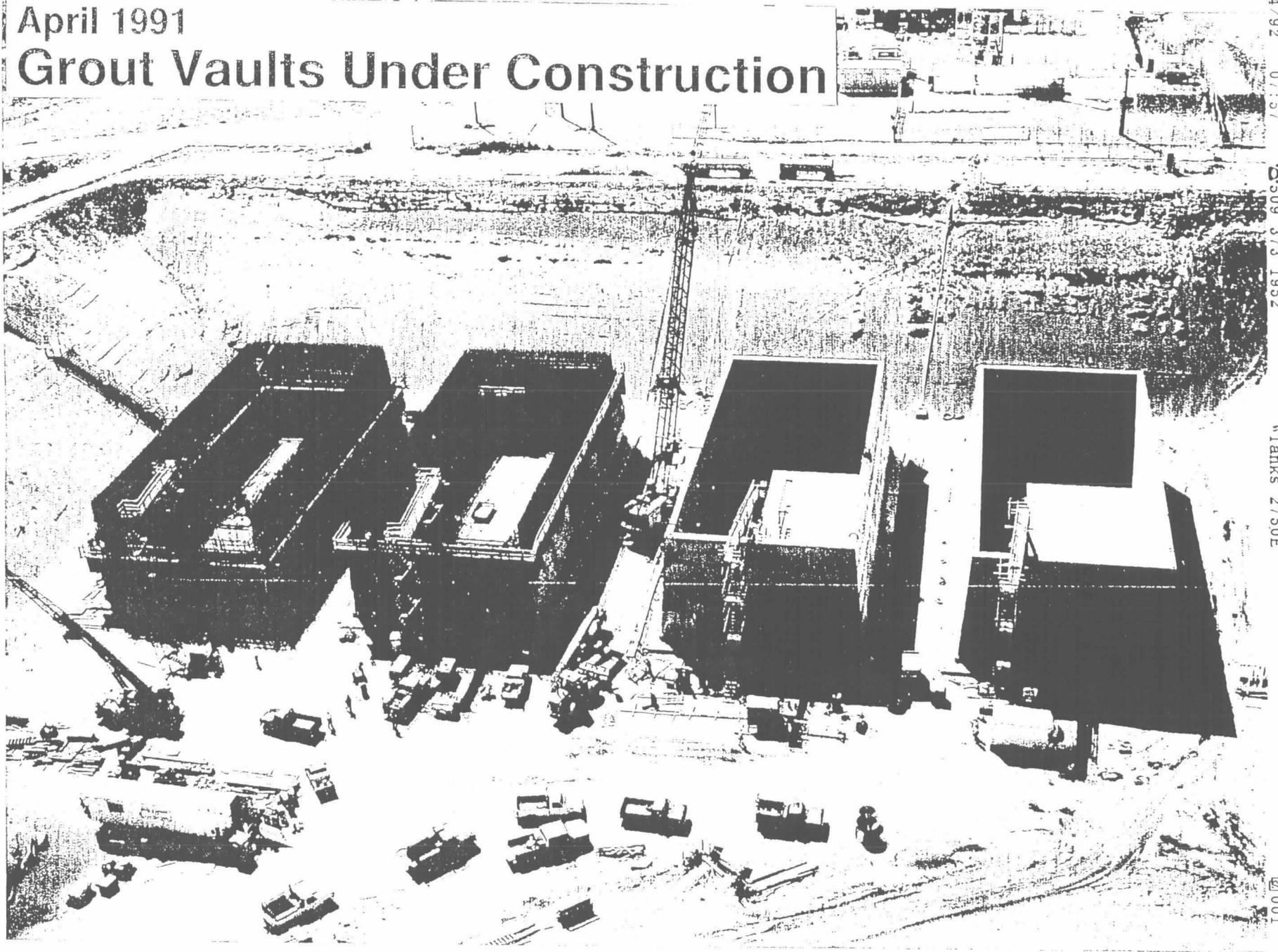
Dry Materials Facility



Note:
 HDPE=High-Density Polyethylene Plastic Curtains
 CCTV=Close Circuit TV. Camera Assembly

April 1991

Grout Vaults Under Construction



05/04/92 07:57

509 373 1952

WTanks 2750E

001

Grout Disposal Program

Status

- Major facilities constructed
- Initial demonstration vault filled with grout in 1989
- Construction of next four vaults nearing completion
- Final Safety Analysis Report being finalized
- Procedures and facilities being completed
- Long-term environmental Performance Assessment being augmented to address peer review comments
- Operational Readiness Review underway

Grout Disposal Program

Key Issues

- Amount of radionuclides in waste planned for grout disposal
- Petition to NRC on prior ruling on Hanford low-level wastes
- Grout waste form and barrier performance and degradation
- Uncertain variety and quantity of Land Disposal Restricted materials in Hanford tank wastes
- Impacts of tank space limitations if grout program delayed
- Implementation of alternate waste form for future low-level wastes