

DE88 001766

ORNL LIQUID LOW-LEVEL WASTE SOLIDIFICATION* - R. M. Schultz,
T. H. Monk, S. P. du Mont, R. E. Helms, M. V. Keigan, M. I. Morris,
Martin Marietta Energy Systems, Oak Ridge, Tennessee

Routine radioactive liquid low-level waste (LLLW) operations at Oak Ridge National Laboratory (ORNL) generate approximately 30,000 gallons per year of evaporator bottoms. Eight 50,000 gallon tanks at the Melton Valley Storage Tank Facility (MVST) are used to store this waste but the inventory of these tanks is nearing capacity. In the past, the LLLW were disposed of by underground injection into a deep bedded shale formation at the ORNL Hydrofracture Facilities. In 1984, hydrofracture operations ceased due to permitting complications and operational anomalies. ORNL took steps to handle the LLLW problem: the volume of newly generated LLLW was reduced, the volume reduction factor for LLLW evaporator was increased from 9:1 to 30:1, Process Waste (PW) system was largely decoupled from the LLLW system, and solidification of LLLW using commercially available immobilization technology is planned for implementation.

The solidification of LLLW at ORNL has developed two basic strategies, a near-term or backup flowsheet is planned to alleviate the immediate capacity problem for storage of concentrated LLLW and a long-term or reference flowsheet is planned to incorporate filtration of the settleable TRU and cesium and strontium decontamination of the LLLW. Presently a feasibility study is evaluating the process alternatives for segregating LLLW from remote-handled transuranic (RH-TRU) sludges, decontamination of the LLLW for beta-gamma radionuclides such as cesium and strontium, and the handling and storage of the RH-TRU sludges and decontamination media.

As the inventory of the generated LLLW approaches the maximum tank capacity, use of the backup flowsheet is planned for implementation in 1988. A qualified vendor with mobile, commercially demonstrated, cement solidification equipment will immobilize approximately 50,000 gal of LLLW. After settling, the concentrated LLLW stored in the MVST will have segregated into two distinct layers, an upper layer of concentrated LLLW and a sludge layer where the RH-TRU have accumulated. A decanting module will be built to decant the LLLW to a containment structure where the commercial vendor will solidify the LLLW in a cement matrix. After decantation but before solidification, the liquid will be tested for TRU content. The resultant waste form will be a six foot by six foot cylinder which will be transported to the Solid Waste Storage Area-6 (SWSA-6) for disposal on a tumulus pad.

The reference flowsheet will incorporate filtration and decontamination of the LLLW. Investigation of cross-flow filtration to remove the suspended solids and inorganic zeolite ion exchange to remove radioactive ions from the LLLW to reduce pathways disposal concerns is underway. This effort will have to be closely coupled

MASTER

with RH-TRU processing and repackaging plans. The reference flowsheet will not be implemented until the 1990s.

*Research sponsored by the Office of Defense Waste and Transportation Management, U.S. Department of Energy, under contract DE-AC05-84OR21400 with Martin Marietta Energy Systems, Inc.

DISCLAIMER

This report was prepared as an account of work sponsored by an agency of the United States Government. Neither the United States Government nor any agency thereof, nor any of their employees, makes any warranty, express or implied, or assumes any legal liability or responsibility for the accuracy, completeness, or usefulness of any information, apparatus, product, or process disclosed, or represents that its use would not infringe privately owned rights. Reference herein to any specific commercial product, process, or service by trade name, trademark, manufacturer, or otherwise does not necessarily constitute or imply its endorsement, recommendation, or favoring by the United States Government or any agency thereof. The views and opinions of authors expressed herein do not necessarily state or reflect those of the United States Government or any agency thereof.

LIQUID LOW-LEVEL WASTE (LLLW) SOLIDIFICATION

AT

OAK RIDGE NATIONAL LABORATORY

R. M. SCHULTZ

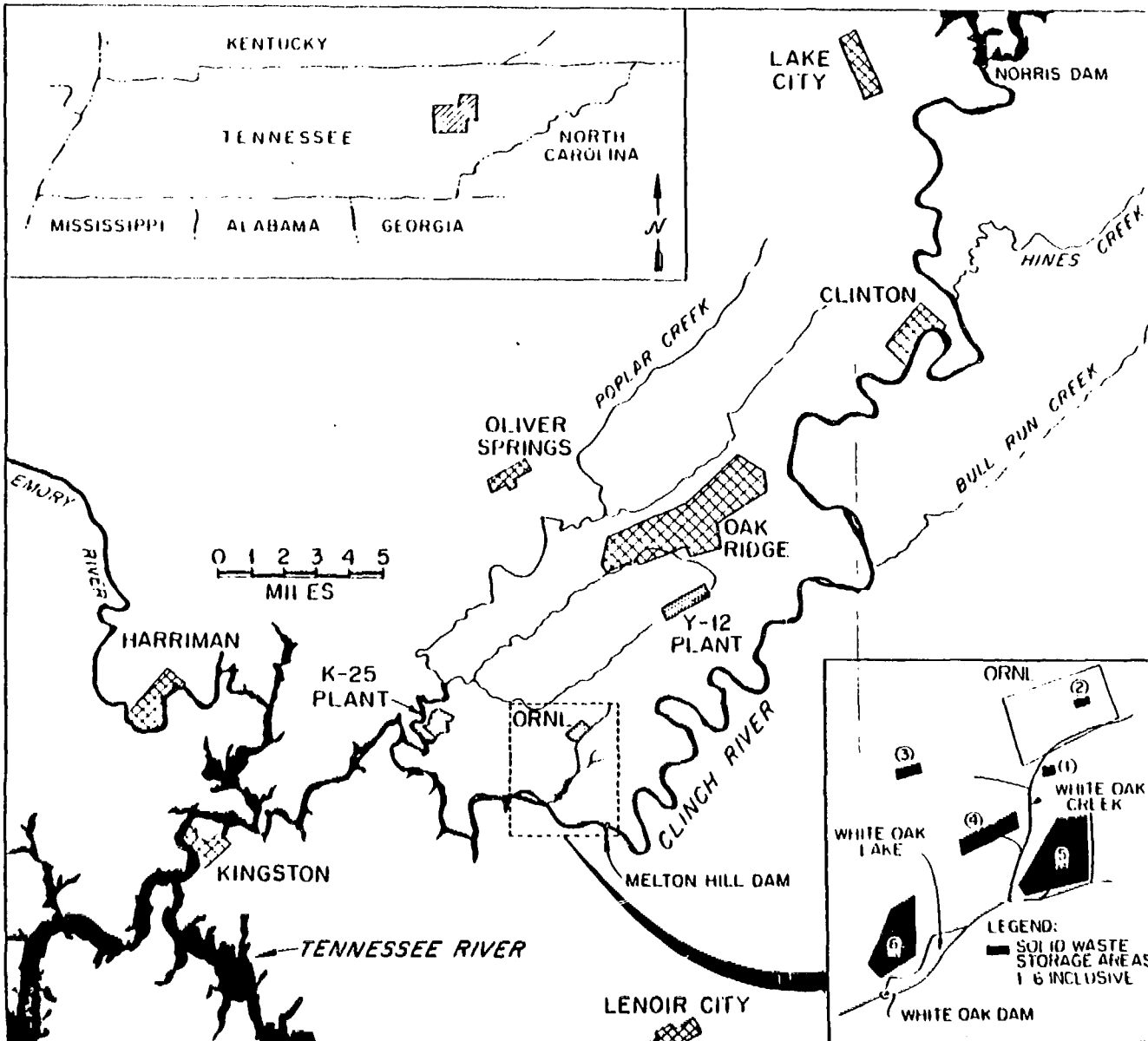
T. H. MONK

S. P. DU MONT

R. E. HELMS

M. V. KEIGAN

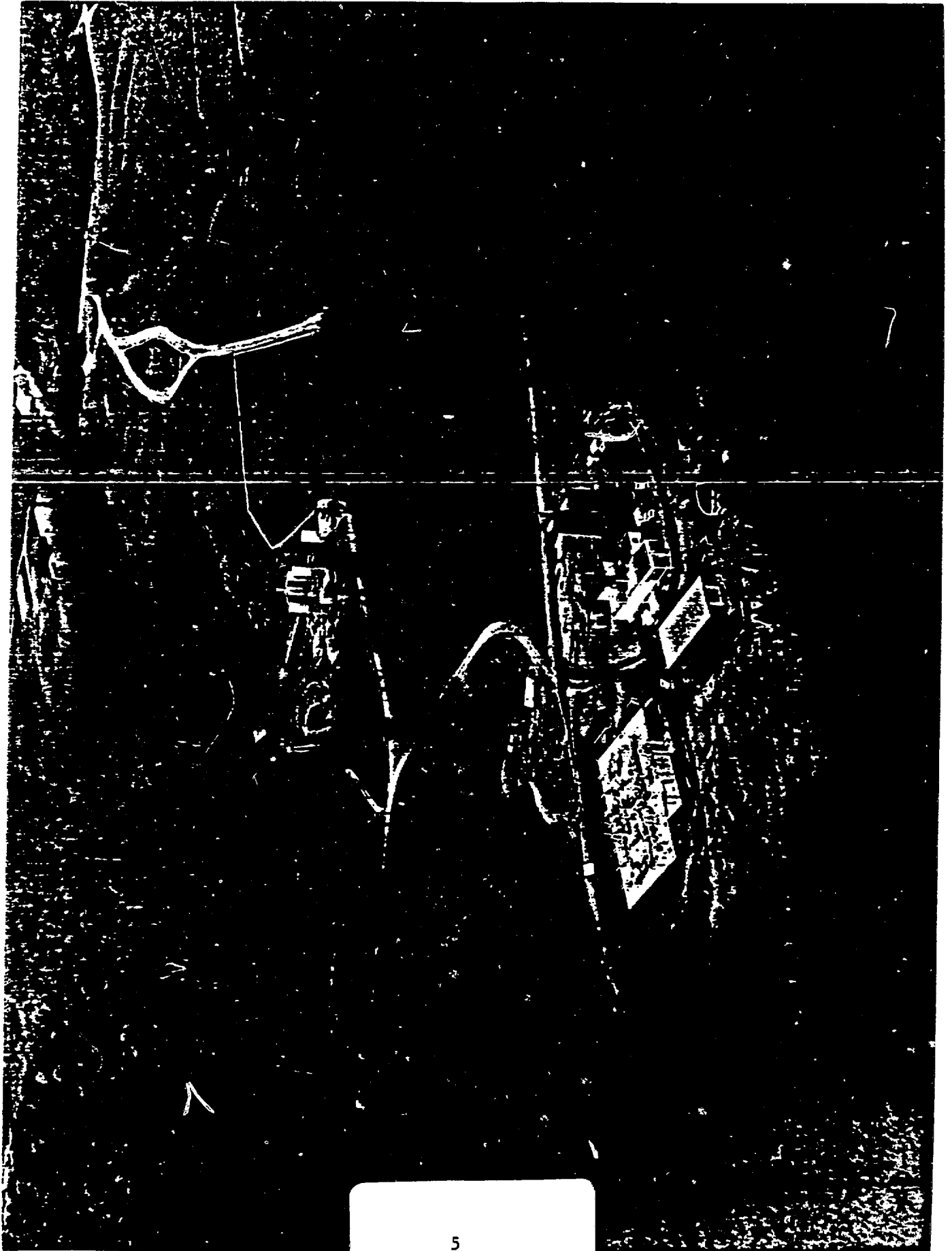
M. I. MORRIS



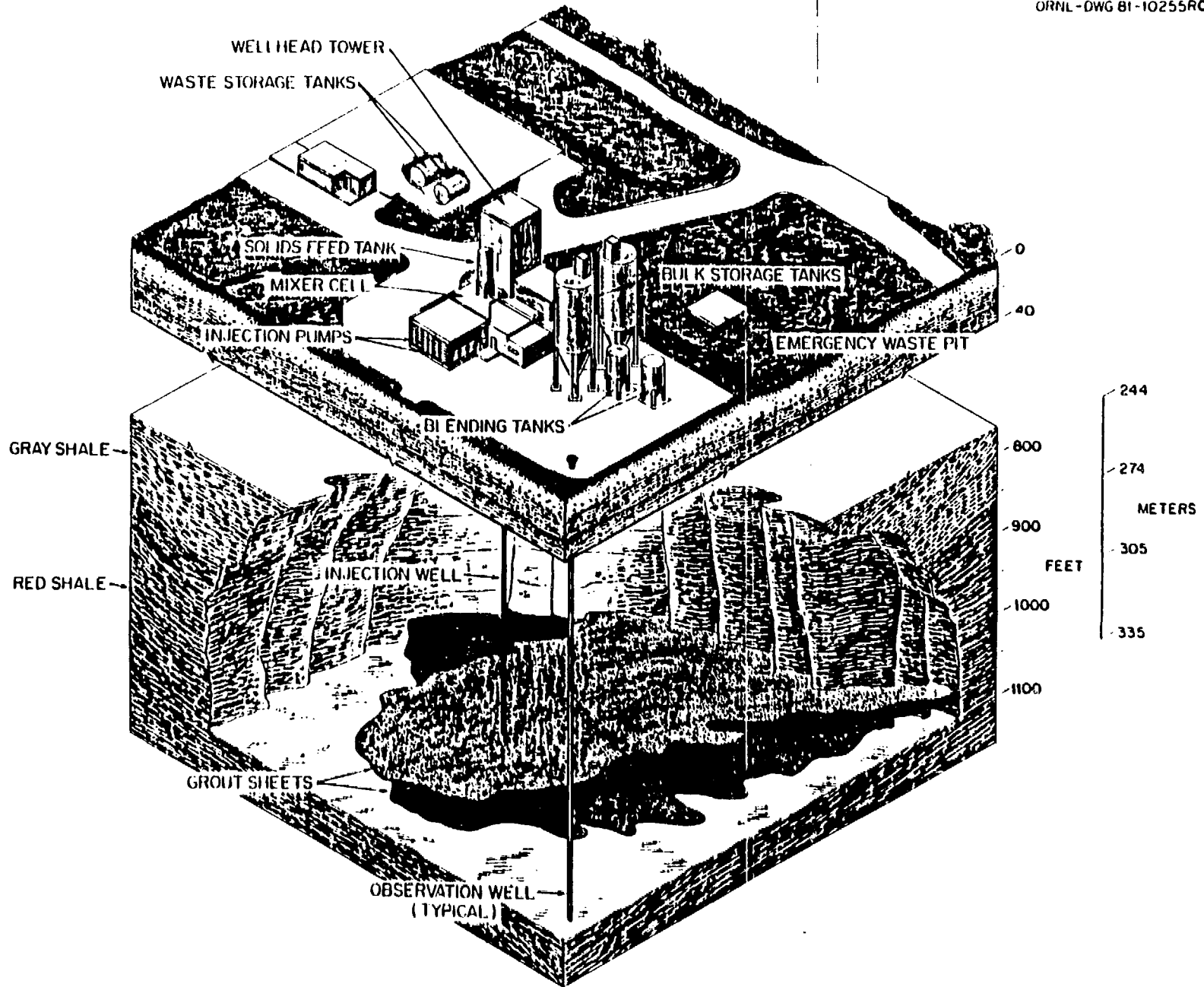
BACKGROUND - PAST PRACTICES

11/11/2011

4



9



THE NEED

- ORNL CURRENTLY HAS ABOUT 400,000 GALLONS OF LIQUID LLW (LLLW) IN STORAGE AT MELTON VALLEY STORAGE TANKS (MVST) AND THE EVAPORATOR FACILITY. ROUGHLY 600,000 GALLONS OF LLLW ARE STORED IN VARIOUS INACTIVE SYSTEMS INCLUDING THE GUNITE TANKS.
- LLLW WAS DISPOSED BY HYDROFRACTURE UNTIL 1984.
- ANOTHER DISPOSAL TECHNOLOGY MUST BE DEVELOPED FOR THE STORED WASTE, AND NEWLY GENERATED WASTE, TO AVOID DISRUPTION OF WASTE GENERATING OPERATIONS.

THE NEED (CONT'D)

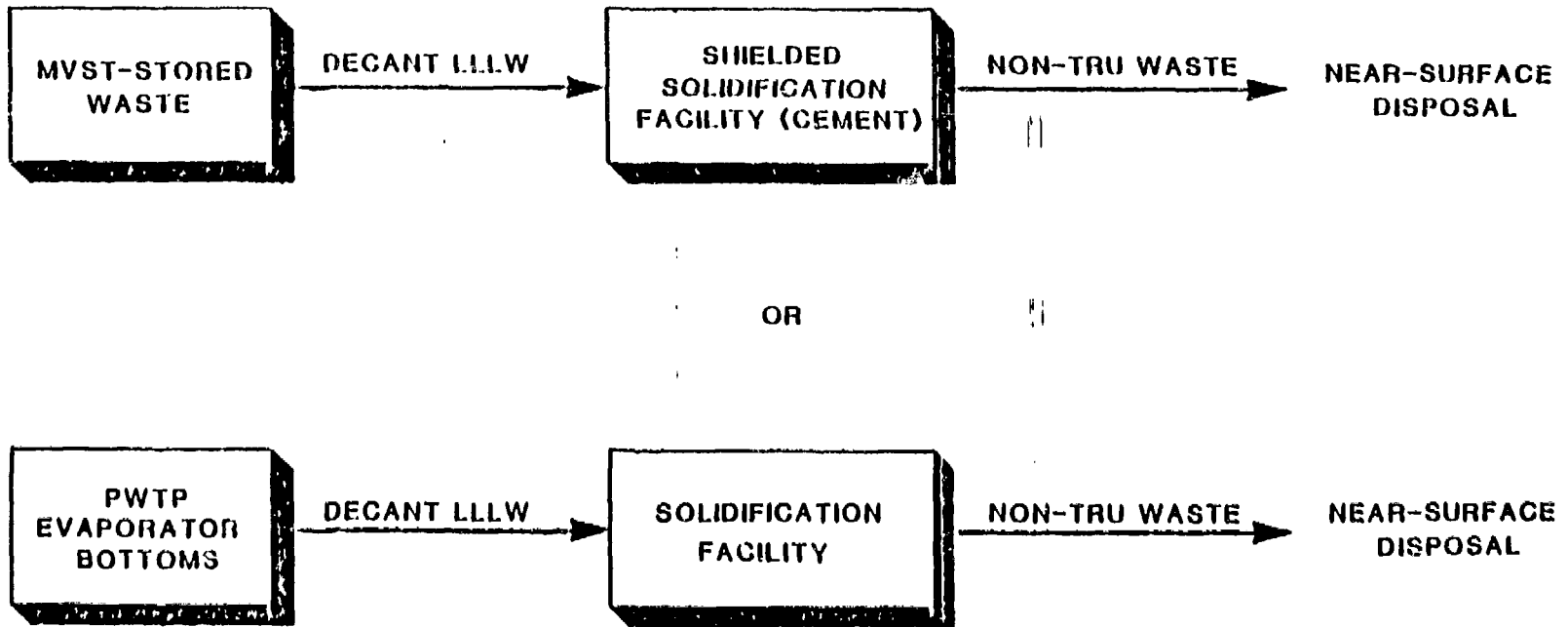
- IN ADDITION TO THE LLLW, ORNL HAS APPROXIMATELY 250,000 GALLONS (SLUICED) OF RH-TRU AT MVST AND GUNITE TANKS, PLUS AN UNCERTAIN QUANTITY IN INACTIVE TANKS, WHICH MUST BE SOLIDIFIED FOR SHIPMENT TO WIPP.

- THE TIMING ASSOCIATED WITH DISPOSAL OF THE LLLW IS URGENT; HOWEVER, THE TIMING FOR THE RH-TRU WASTE IS NOT URGENT, BUT THE TWO PROBLEMS ARE RELATED:
 - MELTON VALLEY STORAGE TANKS (MVST) CONTAIN BOTH LLLW AND RH-TRU SLUDGE.
 - SOLIDIFICATION OF THE LLLW REQUIRES A PHYSICAL SEPARATION FROM THE SLUDGE.

||
47

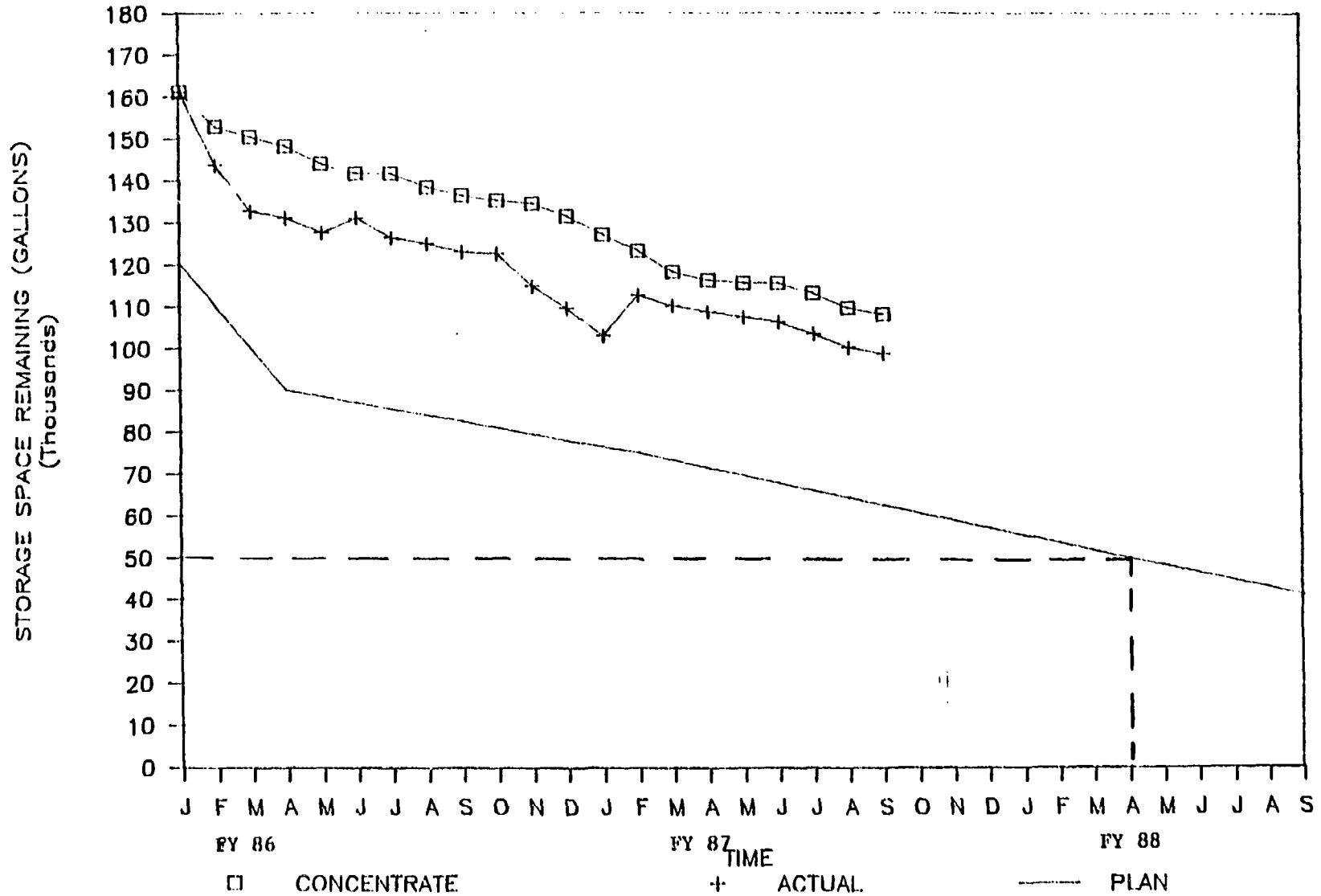
NEAR-TERM LIQUID LOW-LEVEL SOLIDIFICATION

- 0 BACK-UP FLOWSHEET
- 0 TYPICAL SOLIDIFICATION COMMERCIAL EQUIPMENT
- 0 LOCATION AT ORNL
- 0 FACILITIES

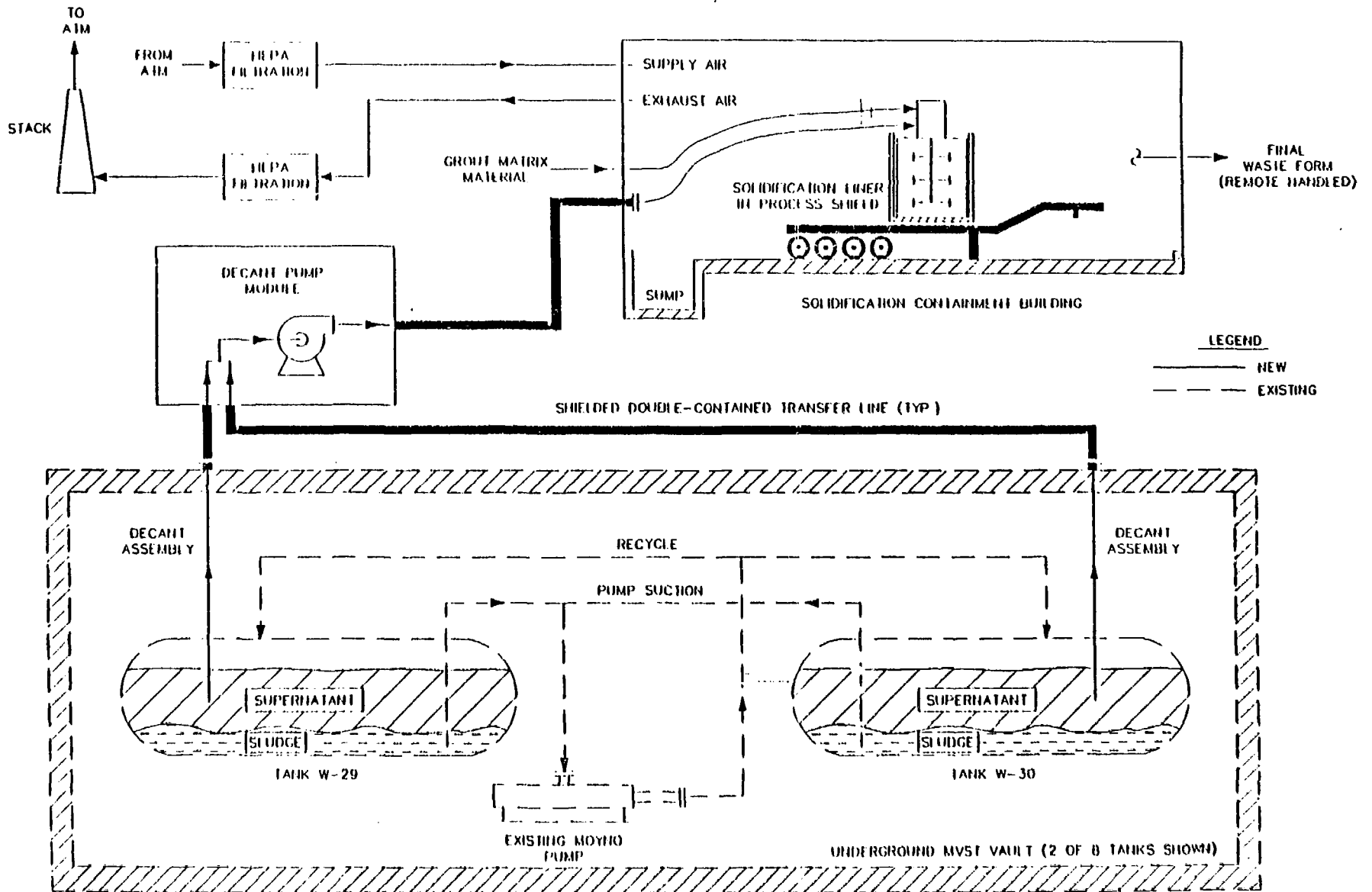


STORAGE SPACE REMAINING VS TIME

II



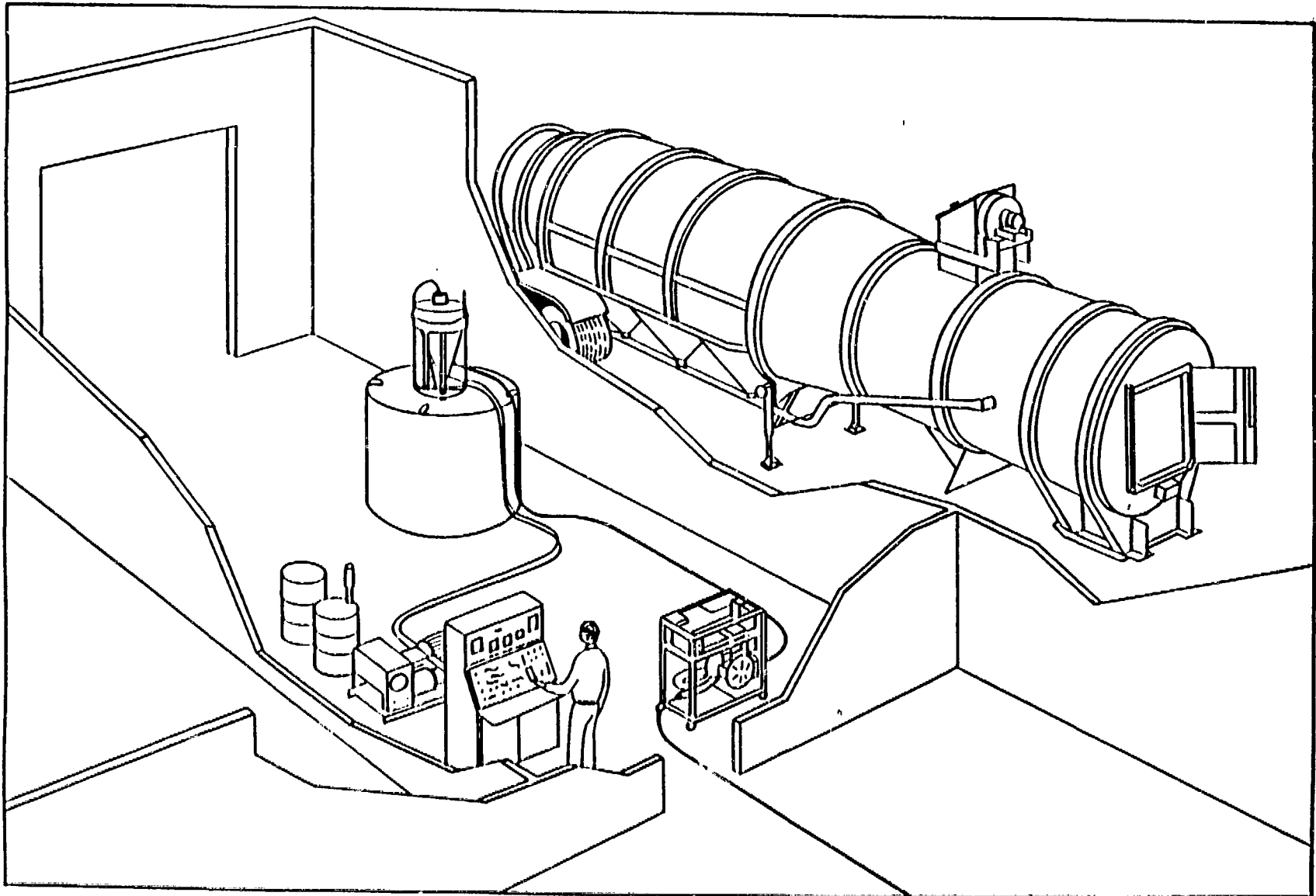
BACKUP FLOW SHEET



COMPARISON OF DECANT CONCENTRATIONS

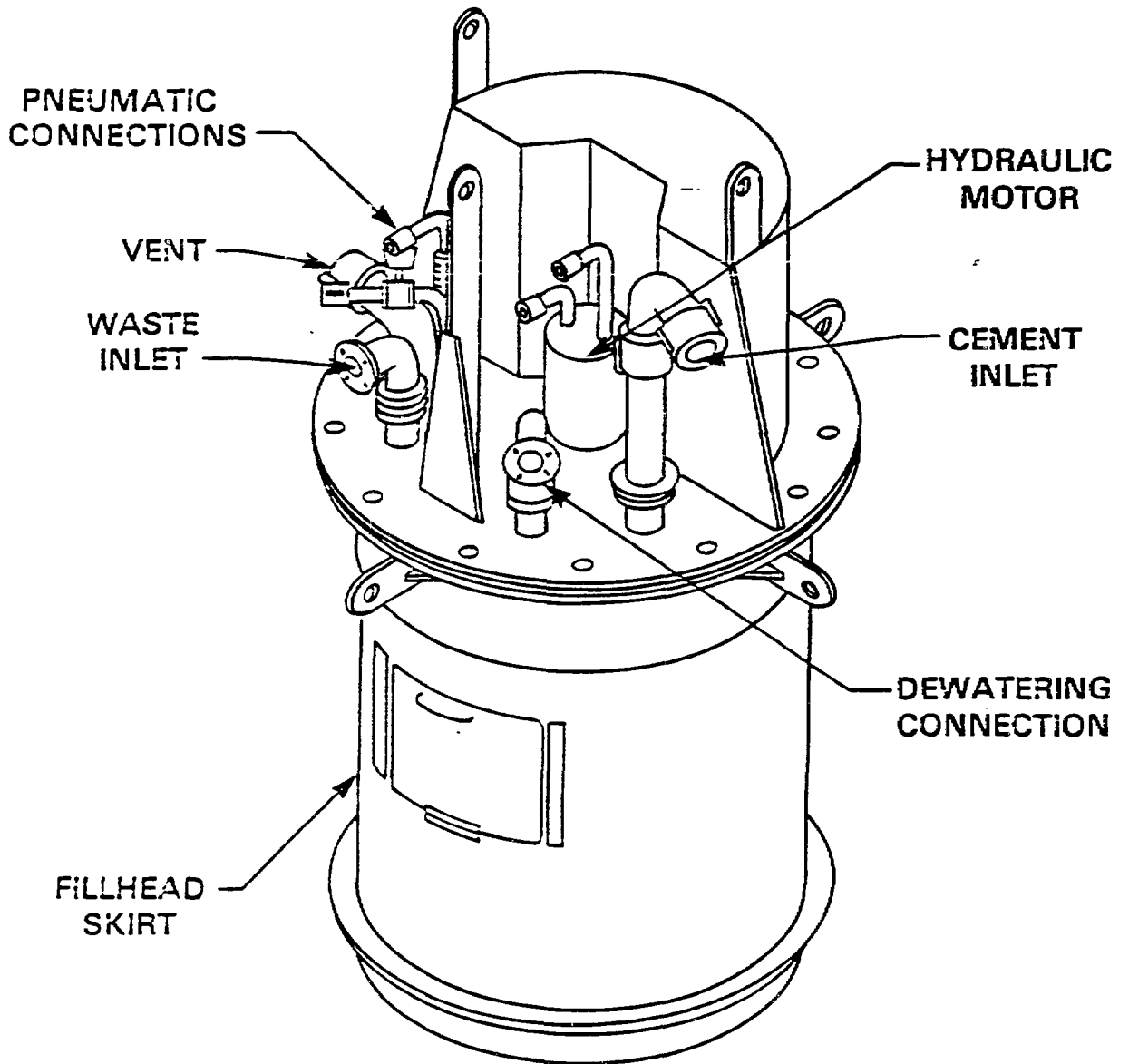
<u>ISOTOPE</u>	<u>SOW & PSAR</u>	<u>ANTICIPATED</u>
Sr-90	4410	400
Cs-137	13,600	4,300
Cs-134	244	200
Co-60	320	40
Eu-152, -154	600	3
Cm-244	75	2.5
Am-241	11	0.2
Cm-246	-	0.1
U-233	4	0.2

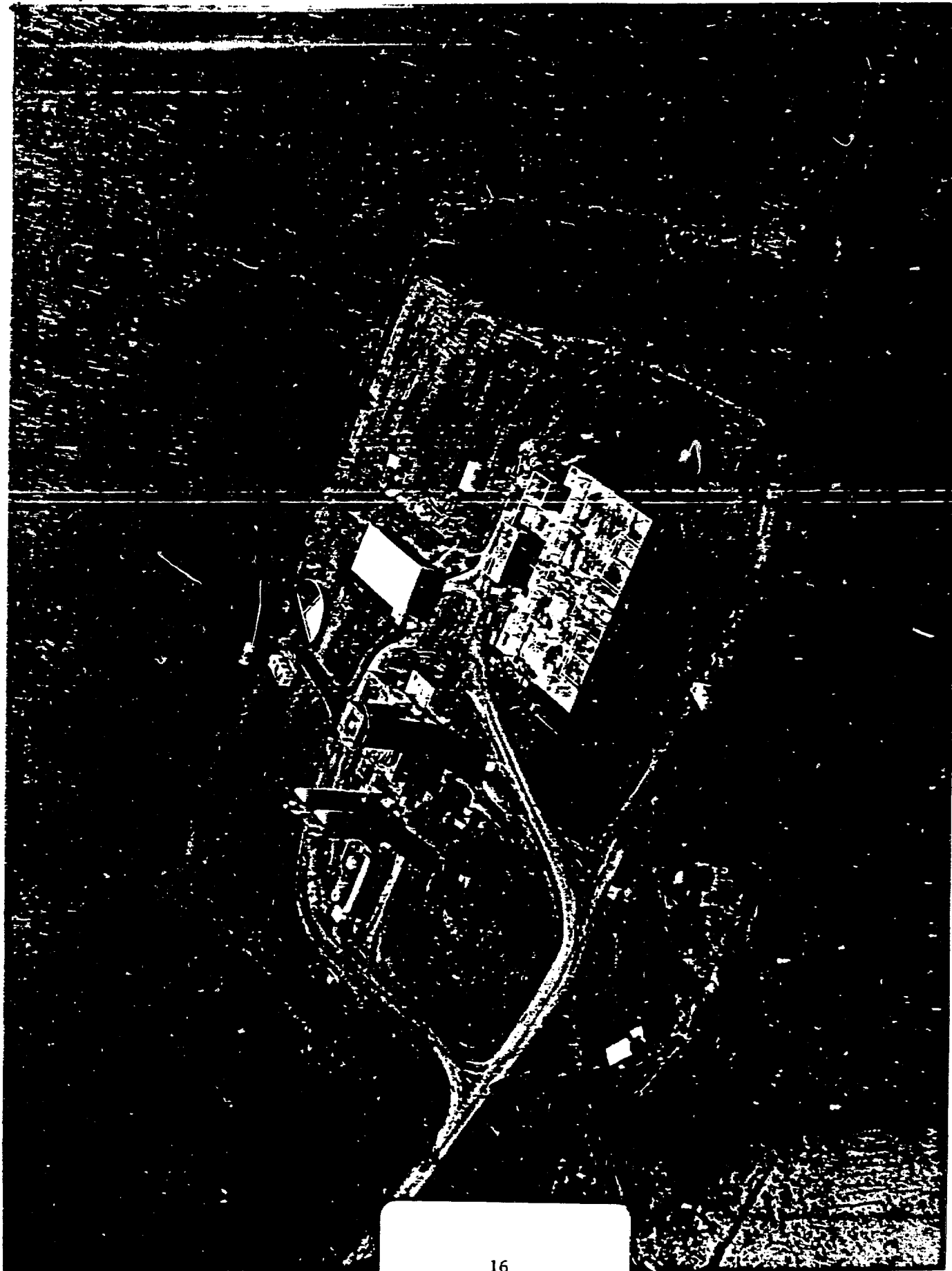
RADWASTE SOLIDIFICATION SYSTEM TYPICAL SYSTEM ARRANGEMENT



14

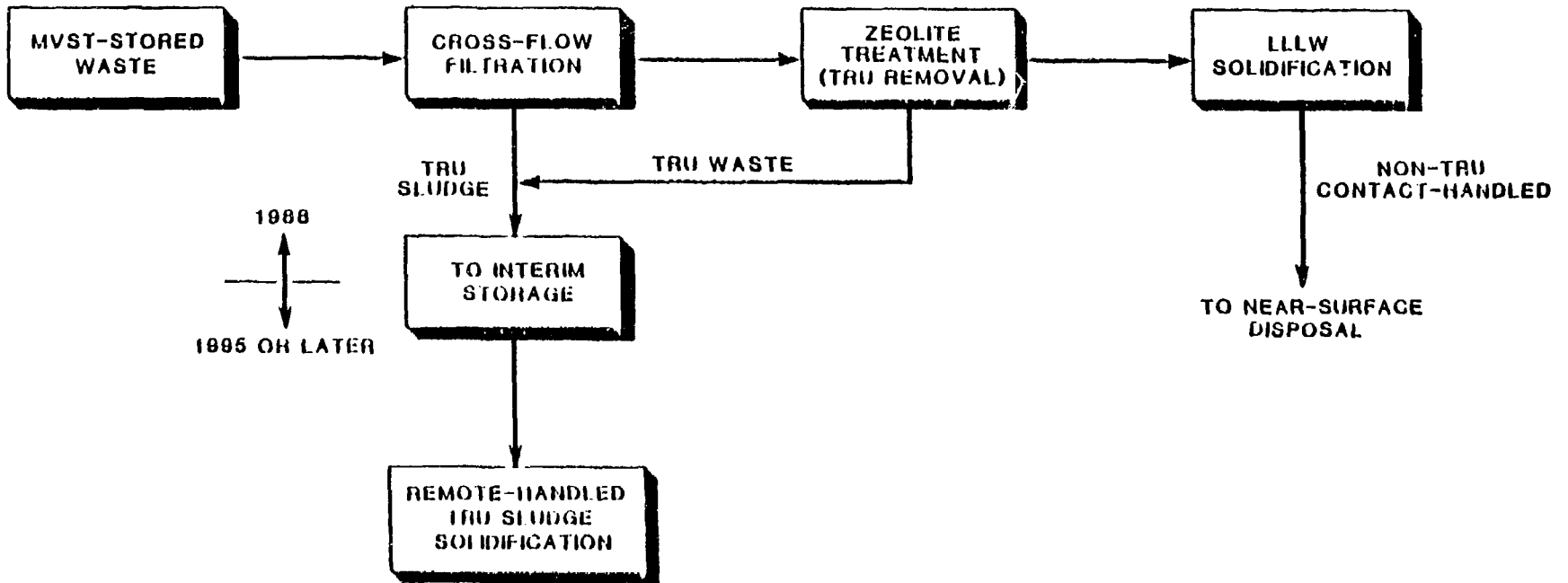
MOBILE SOLIDIFICATION SYSTEM FILLHEAD



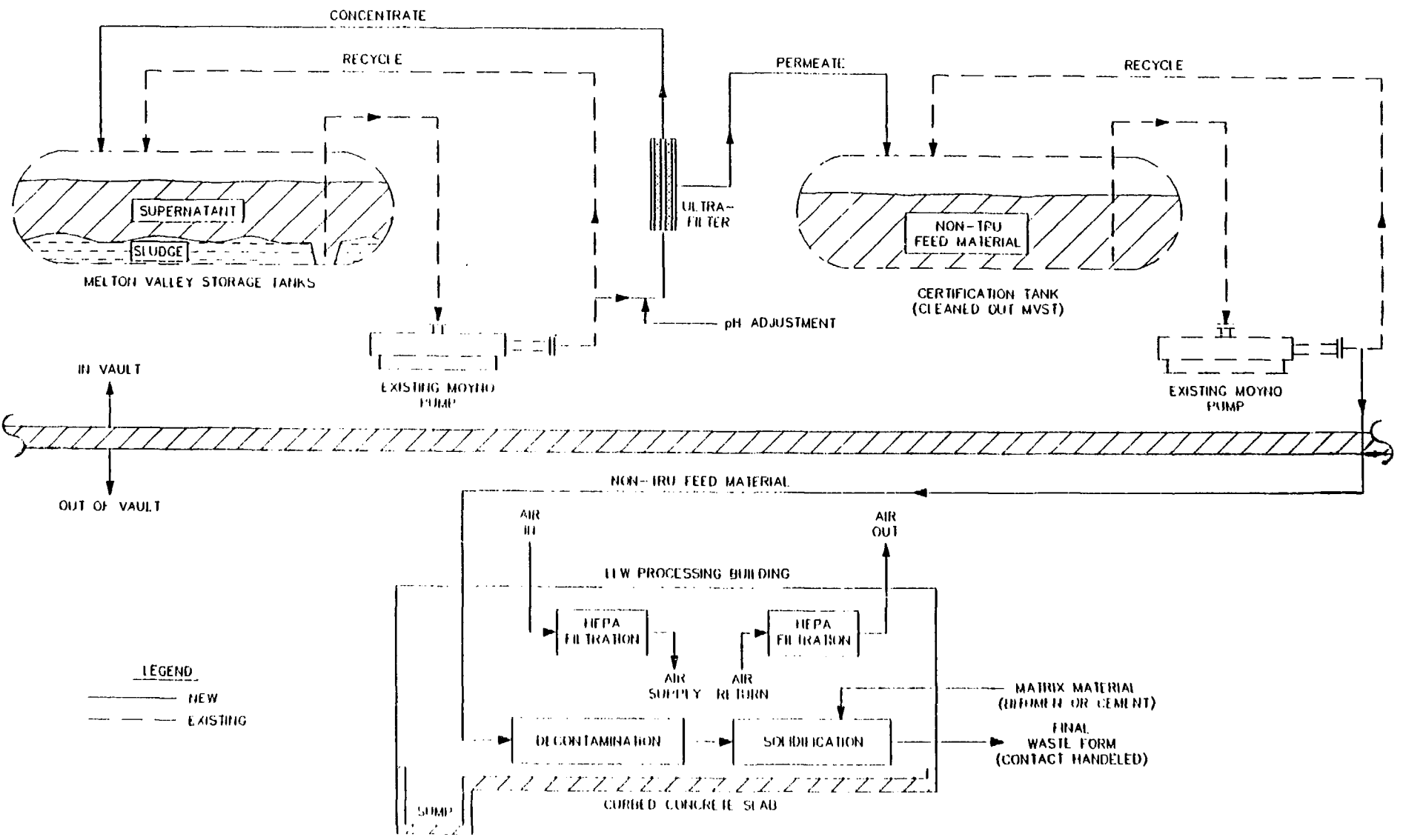


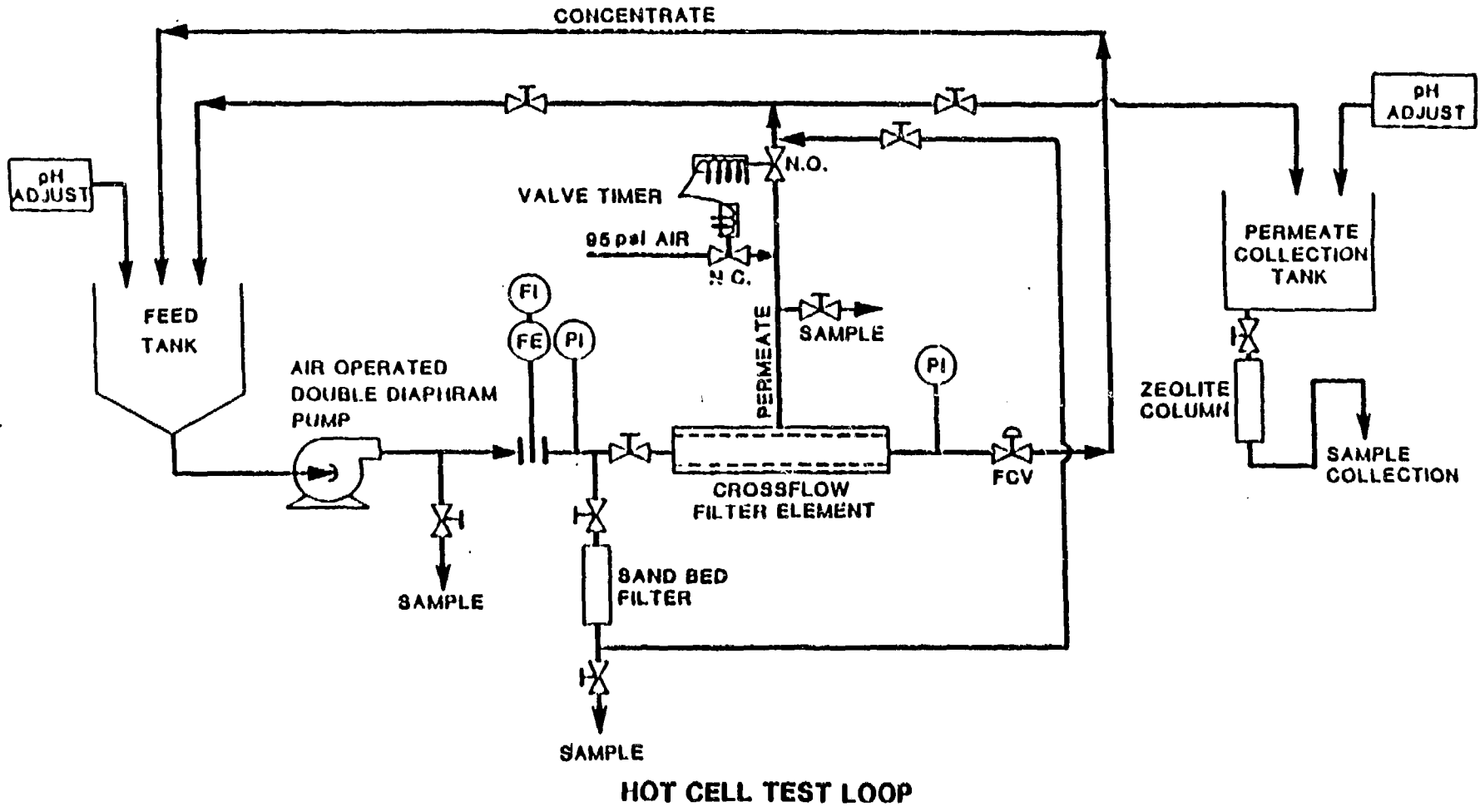
REFERENCE FLOWSHEET

00000000



REFERENCE FLOW SHEET





20

HOT CELL TEST LOOP

SUMMARY

NEAR TERM - OCTOBER 1987

- CEMENT SOLIDIFICATION OF LLLW
- APPROXIMATELY 50,000 GALLONS LLLW
- TEMPORARY "BREATHING ROOM"
- COORDINATION OF EFFORT WITH STORAGE/DISPOSAL
 - o TUMULUS
 - o SILO

LONG TERM - 1990

- INVESTIGATION OF FILTRATION
- INVESTIGATION OF DECONTAMINATION
- FEASIBILITY STUDY UNDERWAY