rec'd with letter dtd. 9/9/97

AGENDA FOR THE
QUARTERLY NRC-DOE TECHNICAL
VIDEOCONFERENCE

June 11, 1997
9:00 a.m. — 2:00 p.m. (PST)

DOE Locations:
Summerlin Building 8
1180 Town Center Drive, Room 817, Las Vegas, Nevada

Forrestal Building
1000 Independence Avenue, SW (Room 7F088),
Washington, D.C. 20585

NRC Location:
Two White Flint North, 11555 Rockville Pike, Room T2B5
Rockville, Maryland 20852

Time	*Subject*	*Lead(s)*
9:00 a.m. PST (12:00 EST)	**Opening Remarks**	DOE, NRC, State, AUGs
9:10	**ESF Construction Update**	DOE
9:30	**Engineering Design Program**	DOE, NRC
10:30	**Scientific Studies Update**	DOE
12:15 — 12:30	**BREAK**	
12:30	**Other Topics** - East/West drift - Mid-Year course correction	DOE, NRC State, AUGs
1:45	**Closing Remarks and Additional Discussion**	DOE, NRC
2:00	**Adjourn**	

ATTACHMENT 1

102

Rec'd w/LTR DTD 9710020057 970919

9710020061 970919

LIST OF ATTENDEES
AT THE QUARTERLY DOE-NRC
TECHNICAL VIDEOCONFERENCE

June 11, 1997

Center for Nuclear Waste Regulatory Analyses
R. Green L. McKague W. Patrick J. Russell

Clark County, Nevada
D. Bechtel E.V. Tieseshausen

Nevada Nuclear Waste Task Force
J. Treichel

Nye County, Nevada
N. Stellavato

State of Nevada
S. Frishman

U.S. Department of Energy (DOE)
A. Gil C. Einberg W. Boyle D. Bryan T. Fortner P. Harrington S. Hanauer
T. Hawe J. Replogle F. Rodgers M. Tynan

DOE Management and Operating Contractor
K. Ashe J. Bailey R. Datta A. Haghi K. Iyengar M. Peters A. Segrest
R. Smith M. Voegele

U.S. Geological Survey
R. Wallace

U.S. Nuclear Regulatory Commission
M. Bell B. Belke D. Brooks D. Codell C. Glen P. Justus M. Federline
M. Lee B. Leslie M. Nataraja K. Stablein S. Wastler

U.S. Nuclear Waste Technical Review Board
R. McFarland

ATTACHMENT 2

ATTACHMENT 3

YUCCA MOUNTAIN PROJECT

Studies

Exploratory Studies Facilities Construction Update

Presented to:
DOE/NRC Quarterly Technical Meeting

Presented by:
Jim Replogle
Site Operations Director
Yucca Mountain Site Characterization Office

June 11, 1997

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

Construction Update

Current status of Exploratory Study Facility (ESF) excavation

- ESF main tunnel
- Alcoves
- Hydrological niches

Special Topics

- Respirable dust abatement
- Critical systems assessment program

ESF Excavation Current Status

ESF Main Tunnel

- Completed ESF main tunnel excavation on April 25, 1997, at approximately 11:40 a.m. (PST)
- Removing TBM from the main tunnel - at the south portal
- Constructing a bulkhead to facilitate ventilation when the TBM is removed from the main tunnel
- Planning flow-through ventilation for the ESF when alcove and niche excavation is completed

ESF Excavation Current Status

(Continued)

Thermal Testing Facility (Alcove 5)

- Completed phase II excavation on February 7, 1997 to station 00+60.8 m
- Completed 76 Heated Drift (HD) and 32 Access Observation Drift (AOD) holes, as of May 30, 1997, (representing 75% completion of planned holes)
- Completed placement of 5.2 m (ID) concrete liner, 12.5 m total length, on April 26, 1997
- Drilling and testing is ongoing

ESF Excavation Current Status

(Continued)

Northern Ghost Dance Fault Alcove (Alcove 6)

- Completed phase II excavation May 9, 1997
  - Access drift station - 01+74.9 m
  - Drill alcove station - 00+24.5 m
  - Fault located at station 01+54
  - (fault zone from 01+43 to 01+55)
- Completed drill hole ESF-NDR-MF #1 May 15, 1997
- Completed drill hole ESF-NDR-MF #2 May 22, 1997
- Initiated 4 month testing status of NGDF alcove

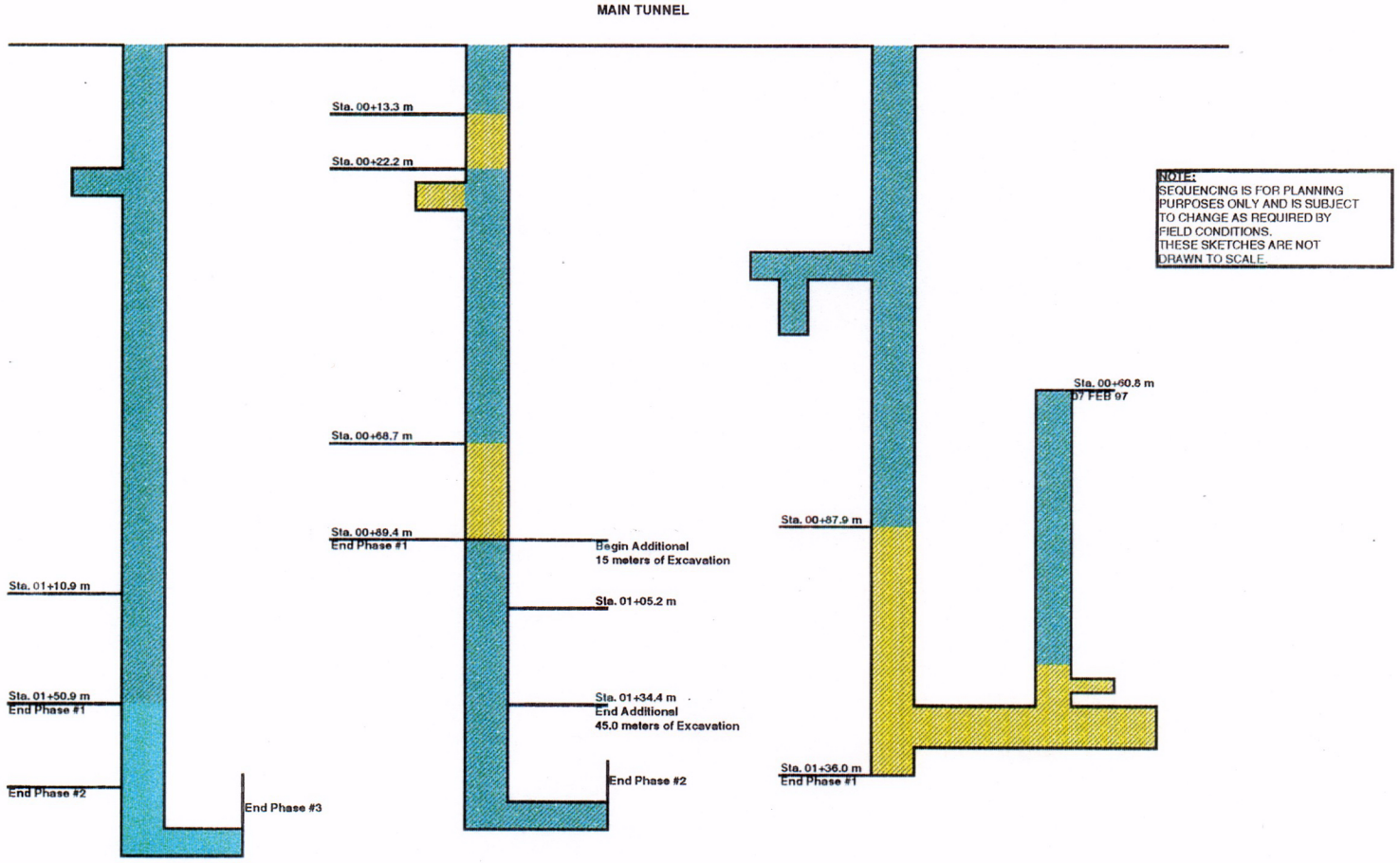
ESF Excavation Current Status

(Continued)

Southern Ghost Dance Fault Alcove (Alcove 7)

- Completed phase I excavation May 2, 1997 to station 01+50.9 m
- Planning phase II excavation initiation on July 28, 1997 with planned completion date of February 2, 1998 (remaining excavation - 91.1 m)

ALCOVE EXCAVATION SEQUENCING



SOUTH GHOST DANCE FAULT ALCOVE

SCHEDULE COMPLETION - 2 FEB 98
CR MILESTONE COMPLETION - 2 FEB 98

NORTH GHOST DANCE FAULT ALCOVE

ACTUAL COMPLETION - 09 MAY 97
MILESTONE COMPLETION - 30 APR 97

HEATER TEST ALCOVE #1

ACTUAL COMPLETION - 07 FEB 97
MILESTONE COMPLETION - 26 MAR 97

ALPINE MINER
DRILL & BLAST
COMPLETED EXCAVATION

05/30/97

C-01

ESF Excavation Current Status

(Continued)

Hydrological Niche 1 and 2

Dry mechanical excavation

- Niche 1 (Station 35+69)
  - Completed drilling of hydrological test holes
  - Completed liquid dye insertion
  - Conducting hydrological tests
  - Initiation of excavation is scheduled for June 9, 1997
- Niche 2 (Station 36+53)
  - Initiated drilling of hydrological test holes
  - Initiation of excavation is scheduled for the end of July 1997

Special Topics

- Respirable dust abatement program
- Systems evaluation

Respirable Dust Abatement Program

- Exposure to crystalline silica, especially cristobalite, is a concern during excavation of the niche, alcove, and the Enhanced Characterization of the Repository Block (ECRB)
- Niche excavation: a tiered abatement plan has been developed, and assessed by MSHA technical representatives, that combines feasible engineering and administration controls combined with personal protective equipment to minimize operator exposure and keep exposure levels below the time weighted threshold limit value (TW TLV). This tiered system allows for the implementation of more rigid controls, as necessary to meet DOE policies and regulatory requirements

Respirable Dust Abatement Program

(Continued)

- Personnel Protective Equipment (PPE)
  - Personal respirator
  - Standard equipment - hard hat, safety glasses, safety shoes, and hearing protection
- ECRB excavation: a dust abatement program is being developed that utilizes best feasible technology to minimize operator exposure (in keeping with DOE YMP ALARA policies) and assure operator exposure levels below the threshold limit value (TW TLV)

Systems Evaluation Program

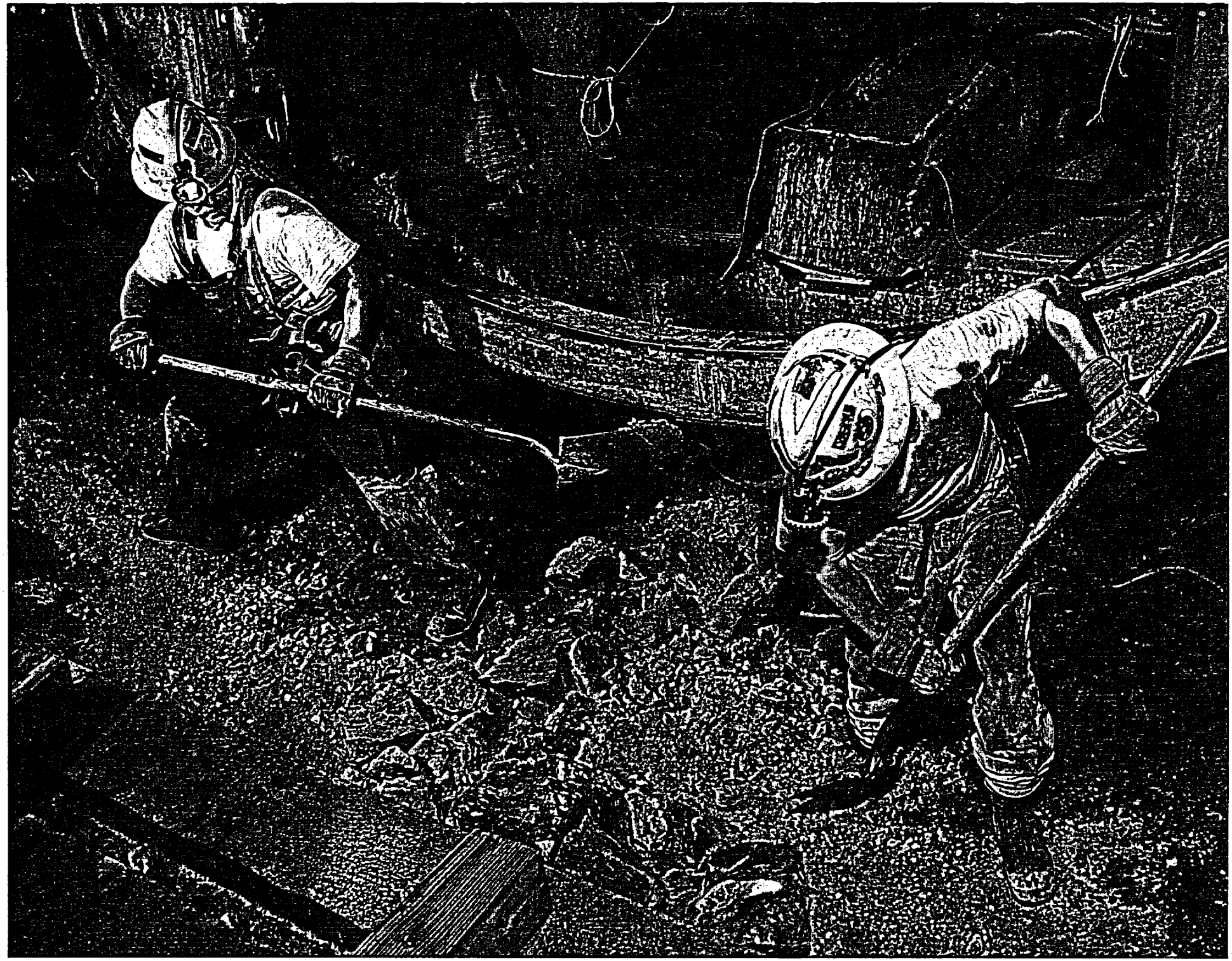
Critical systems (critical to future health, safety, environmental, and programmatic needs) are being assessed to assure that these systems will meet planned future requirements. This assessment includes the following systems:

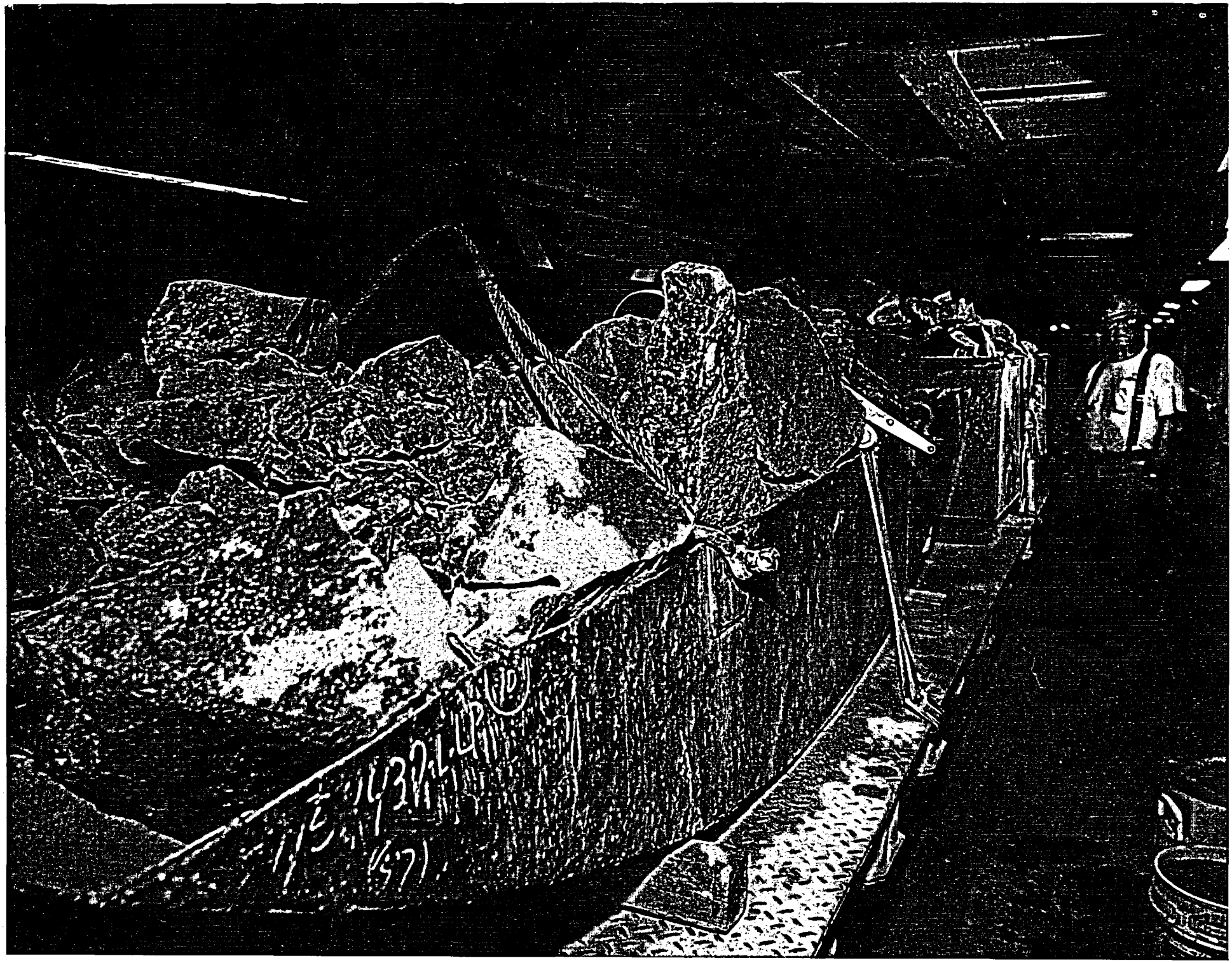
- Power system
- Roads and waste rock storage
- Waste water system
- Subsurface material handling (ECRB)
- Non-potable water system
- Subsurface lighting

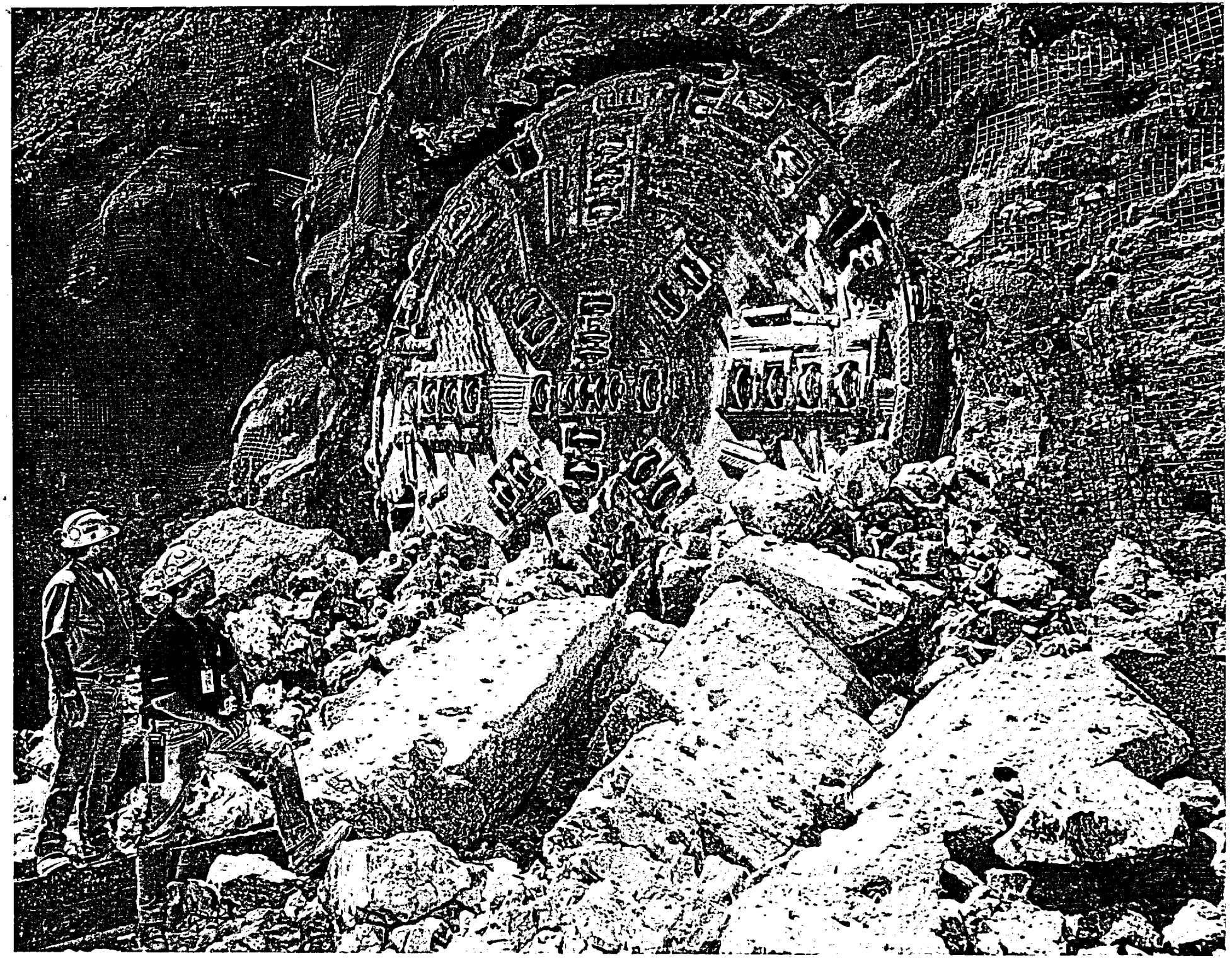
Systems Evaluation Program

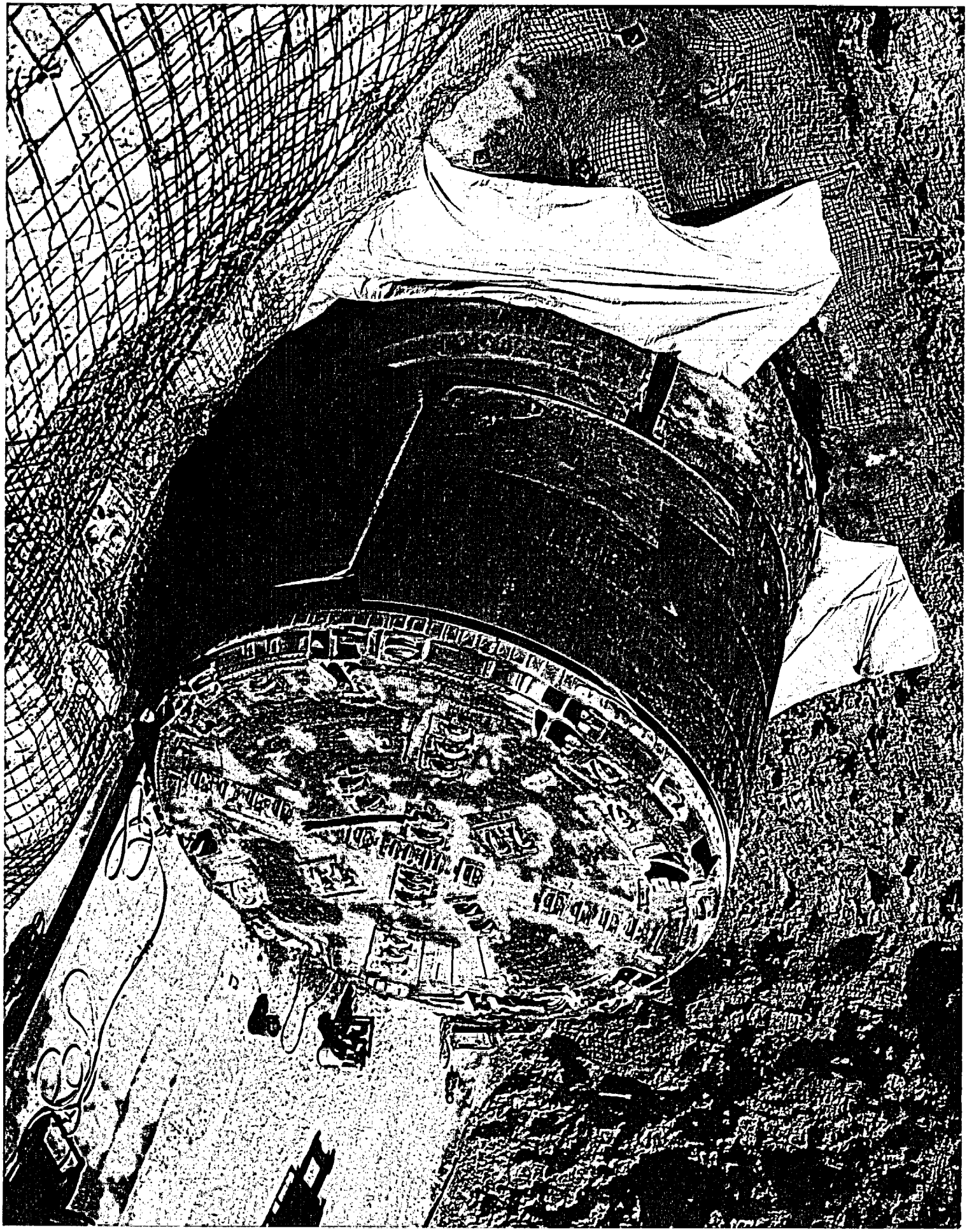
(Continued)

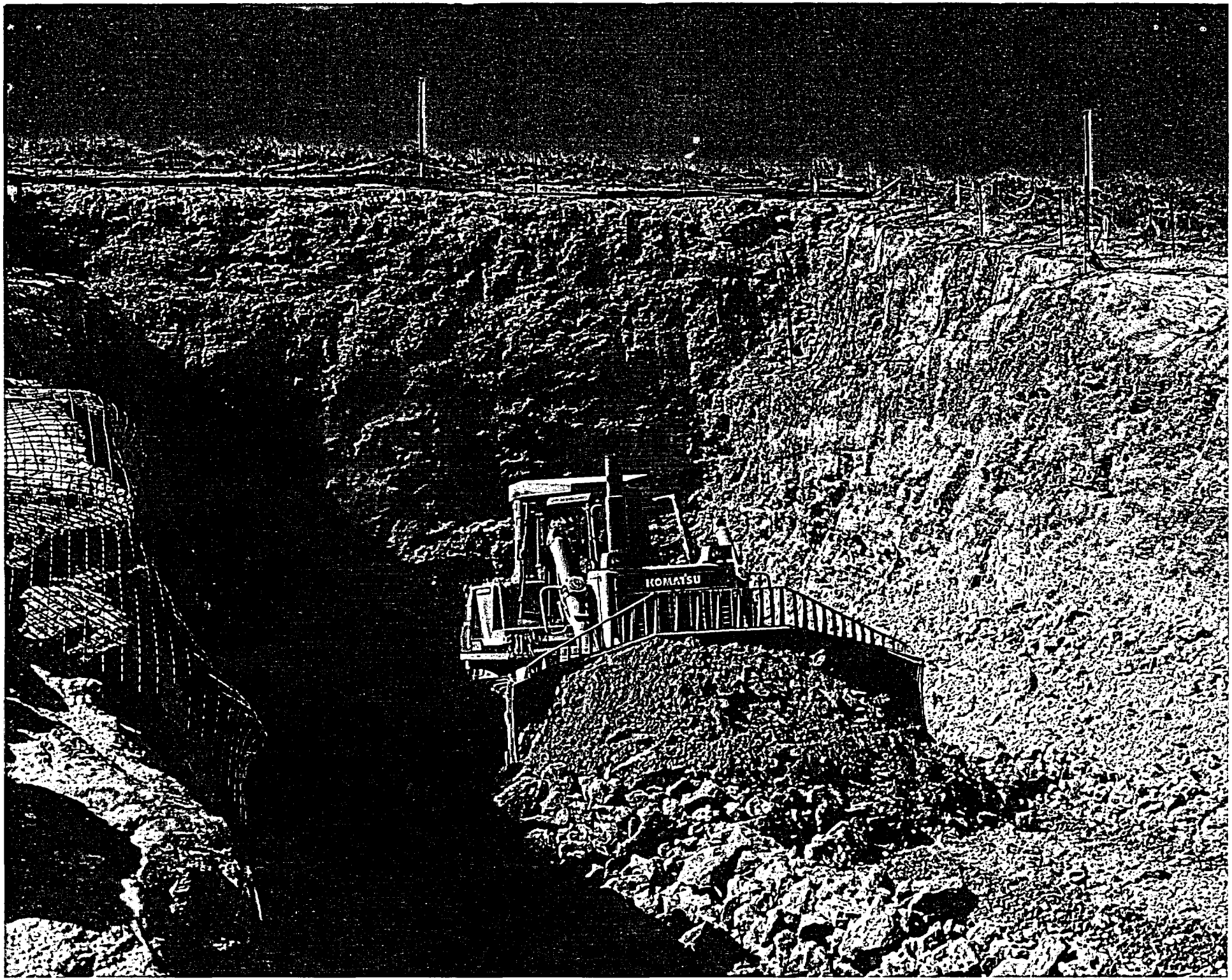
- Potable water system
- Communication system
- Fire suppression system
- Subsurface fire suppression system
- Compressed air system
- Ground support

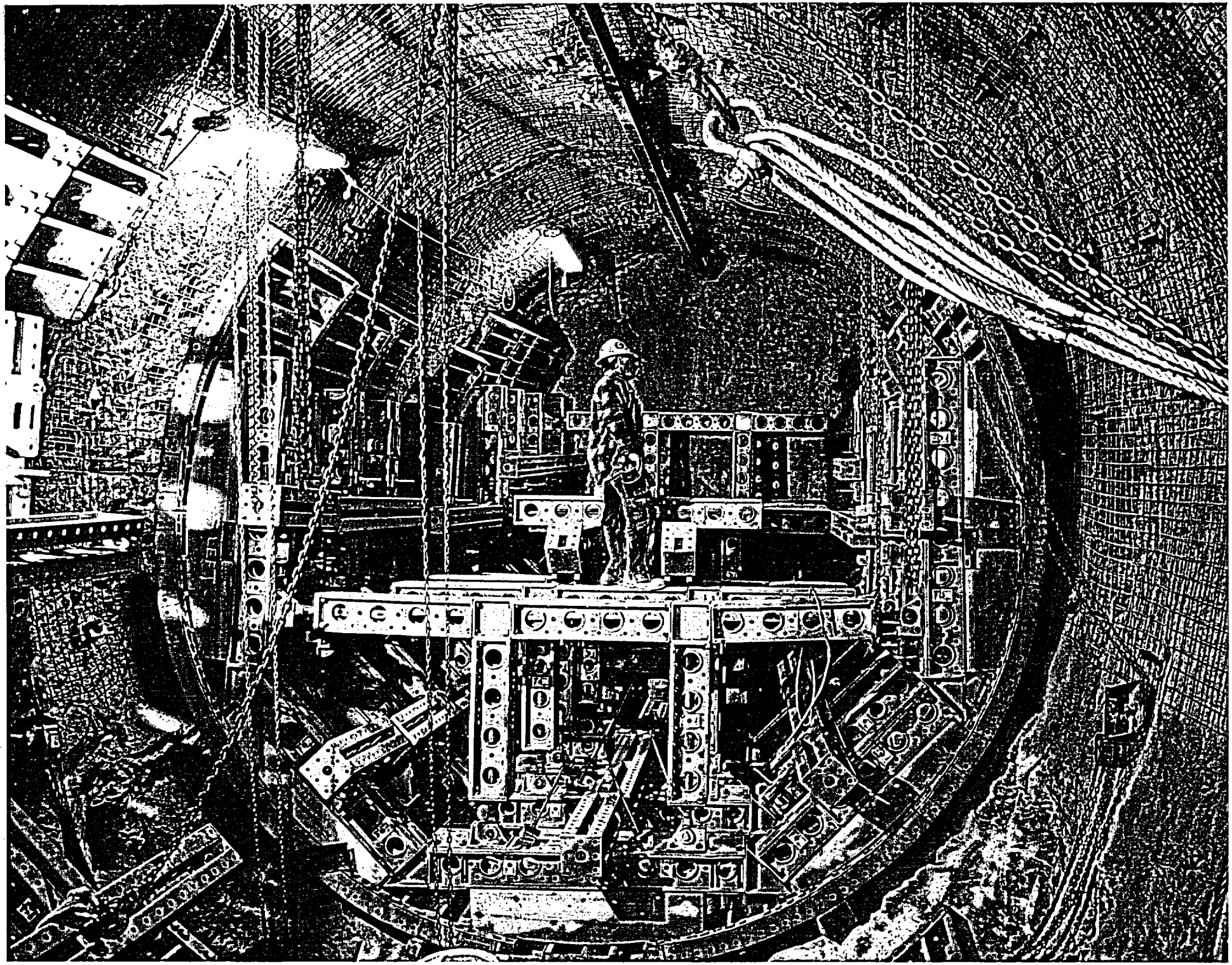


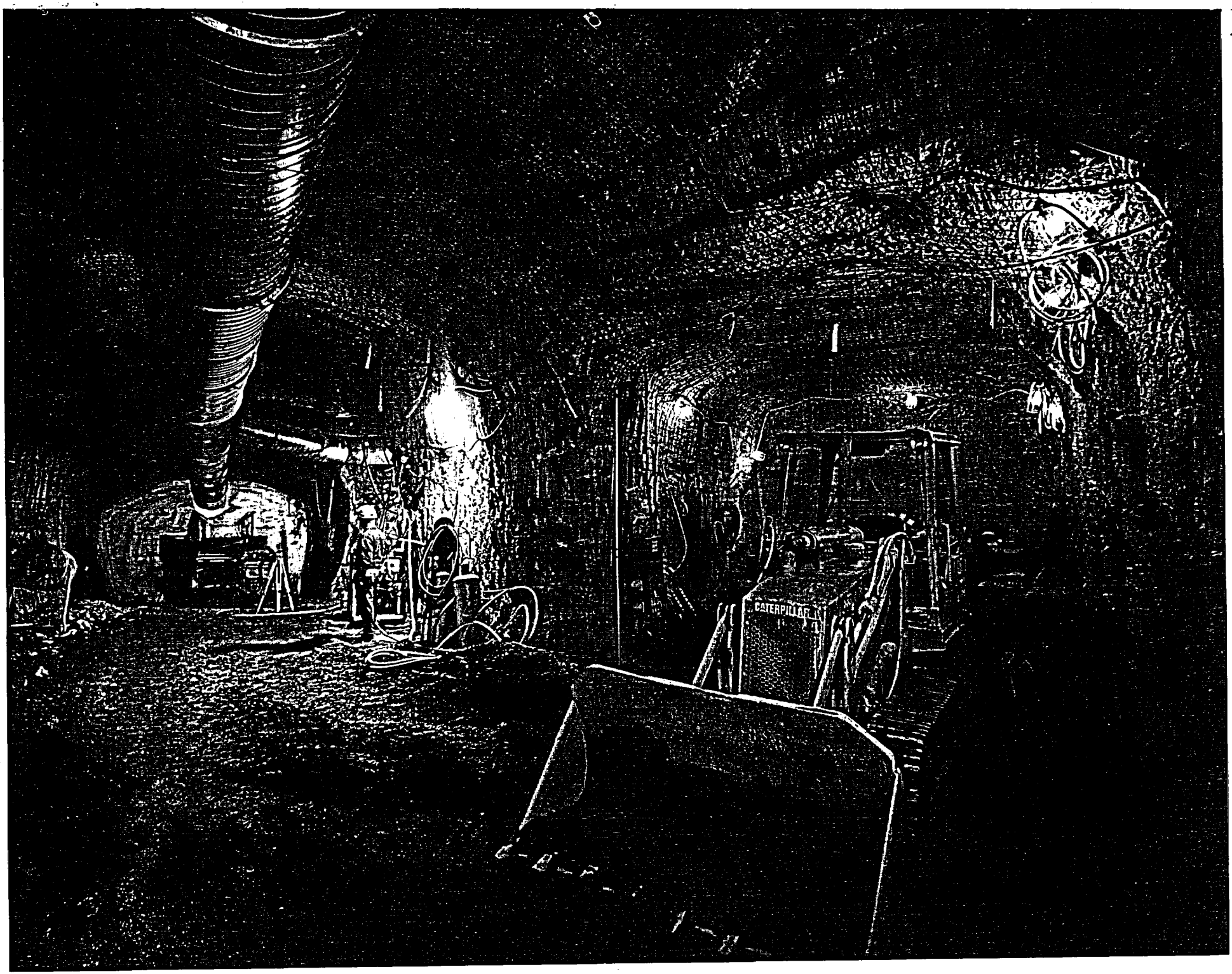







KOMATSU

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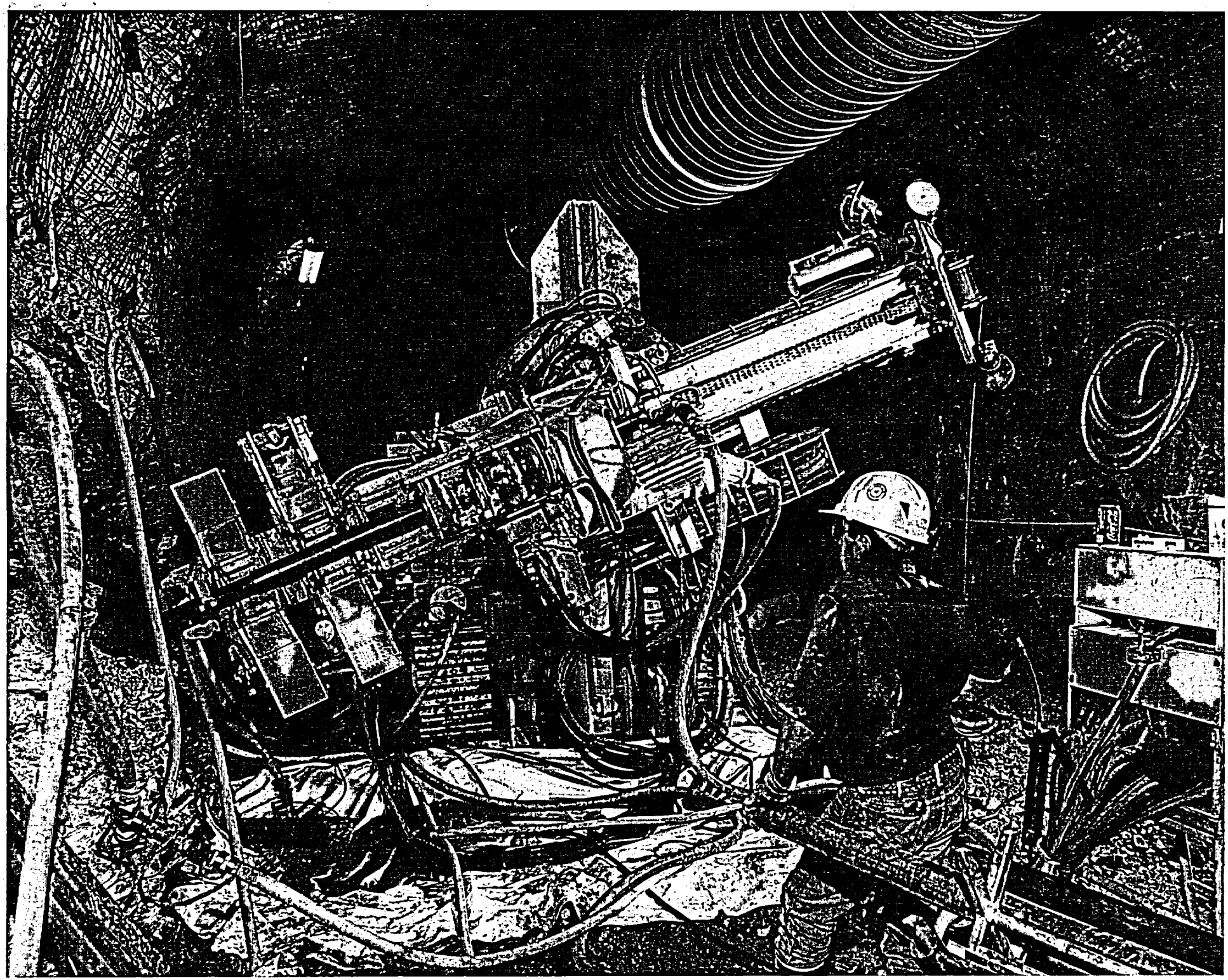
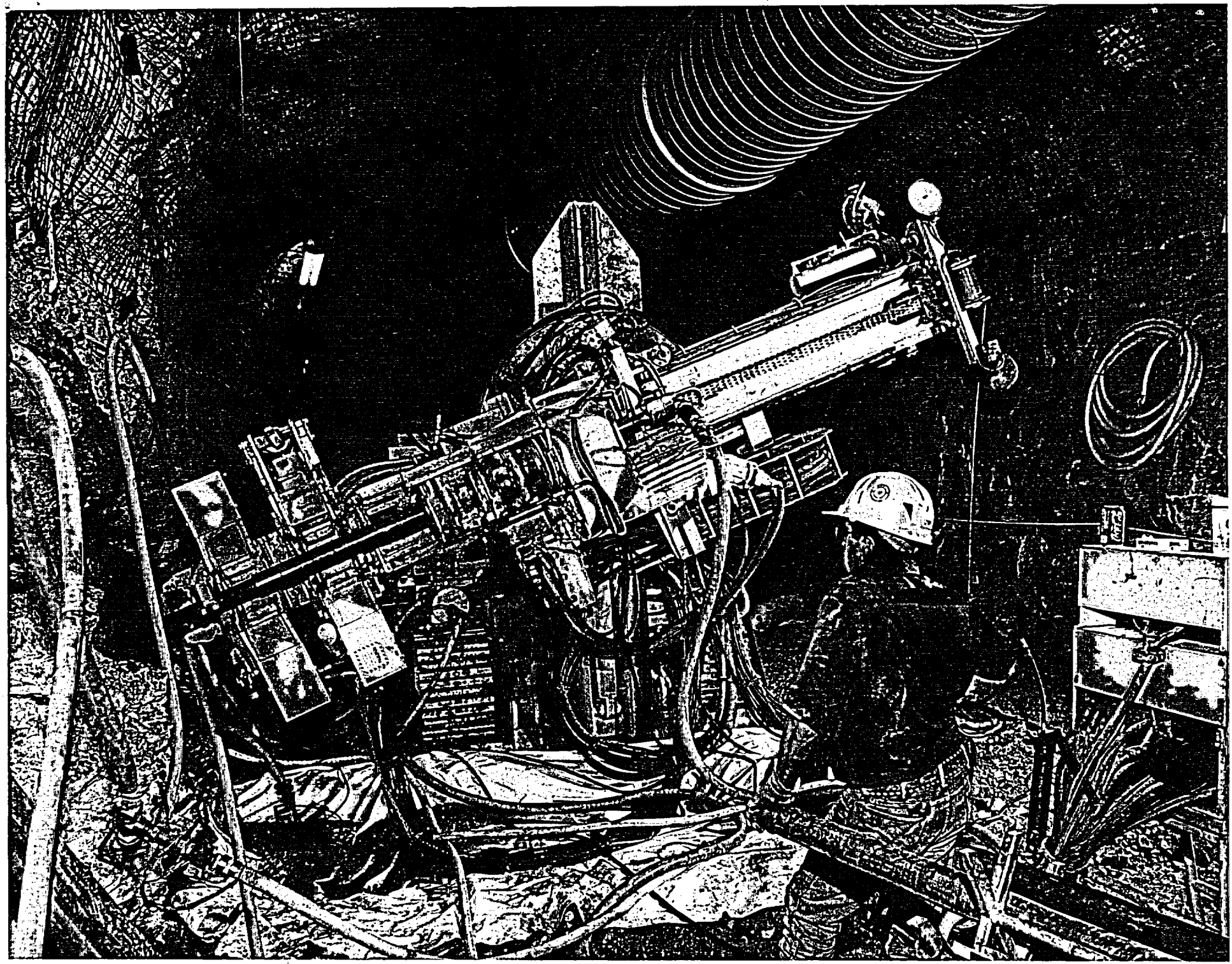
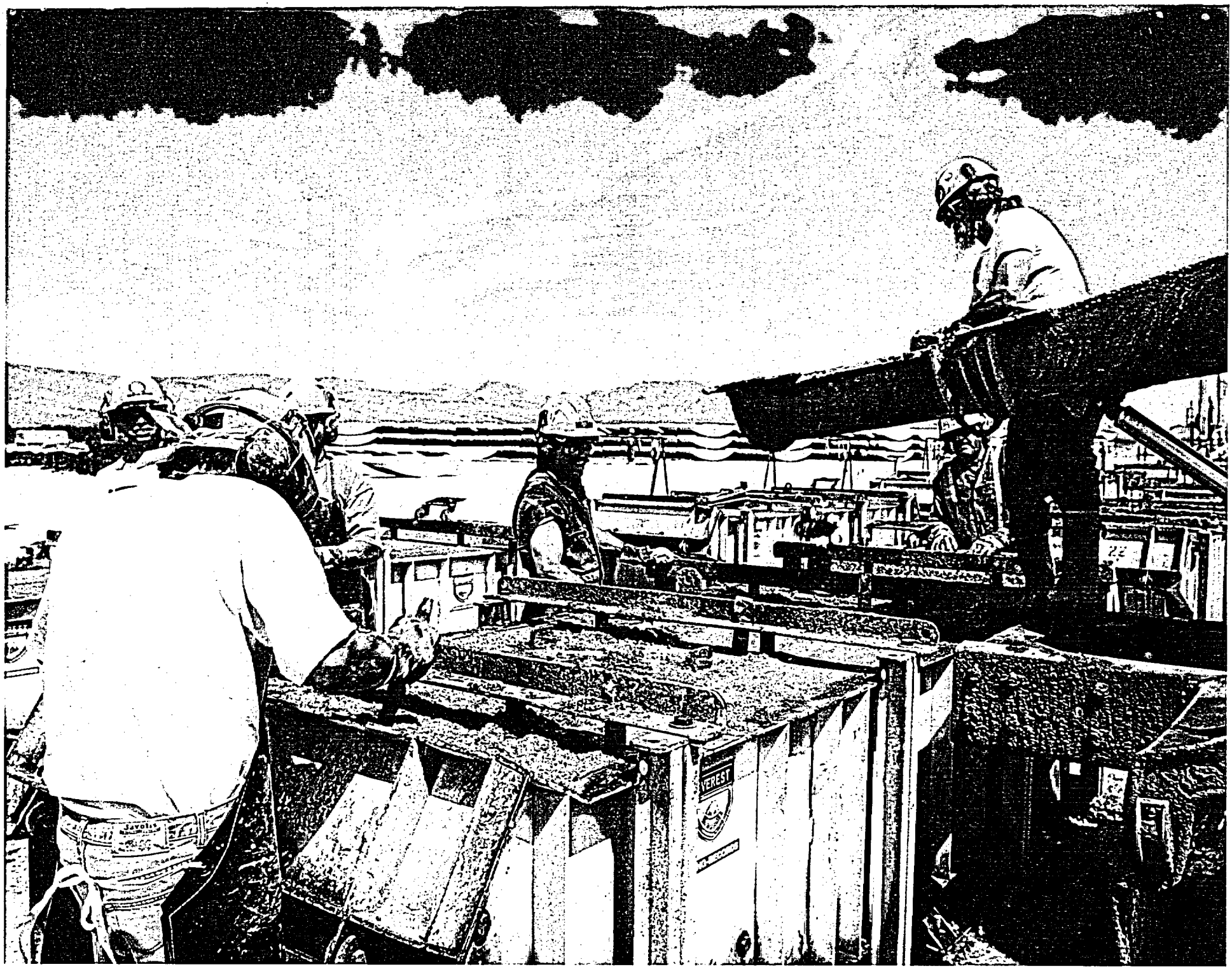
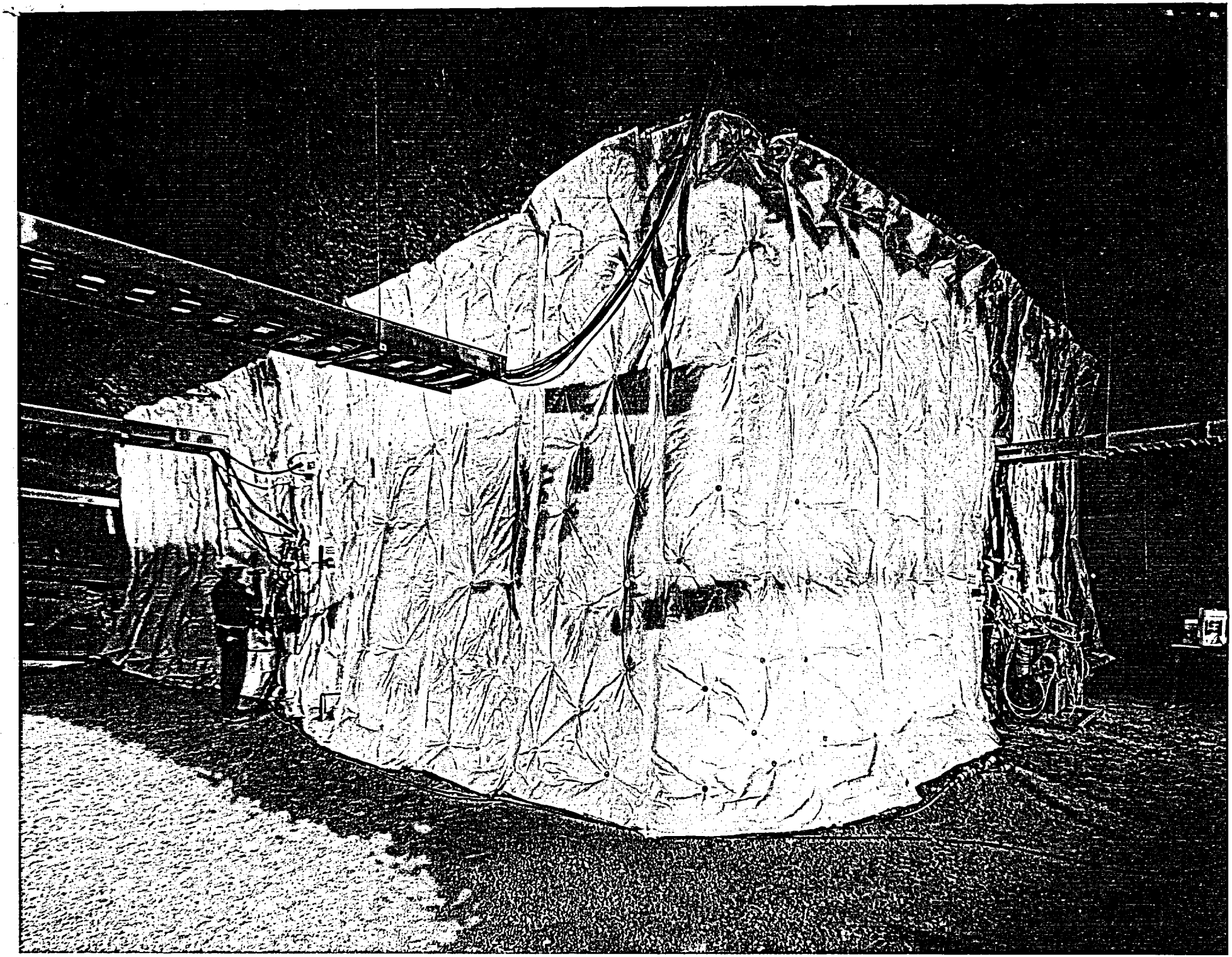





EVEREST



ATTACHMENT 4

YUCCA MOUNTAIN PROJECT

Studies

Reference Design Description

Presented to:
DOE/NRC Quarterly Technical Meeting

Presented by:
Paul Harrington, DOE Team Lead
For License Application
Yucca Mountain Site Characterization Office

June 11, 1997

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

Agenda

- Purpose
- Table of Contents
- Format
- Approval/Maintenance

Purpose

- Serve as a reporting document to improve communication of the design and cost development
- Capture and communicate the current design and key design options within M&O, DOE, and external agencies in a timely manner
- Information tool, not a design input or output document (managed distribution)
- Provide technical documentation of the current design with options

Table of Contents

- Summary of changes
- Introduction
- Repository site layout and capabilities
  - Surface layout
  - Subsurface layout
    - » Subsurface ventilation system
    - » Ground control system

Table of Contents
(Continued)

Table of Contents
(Continued)

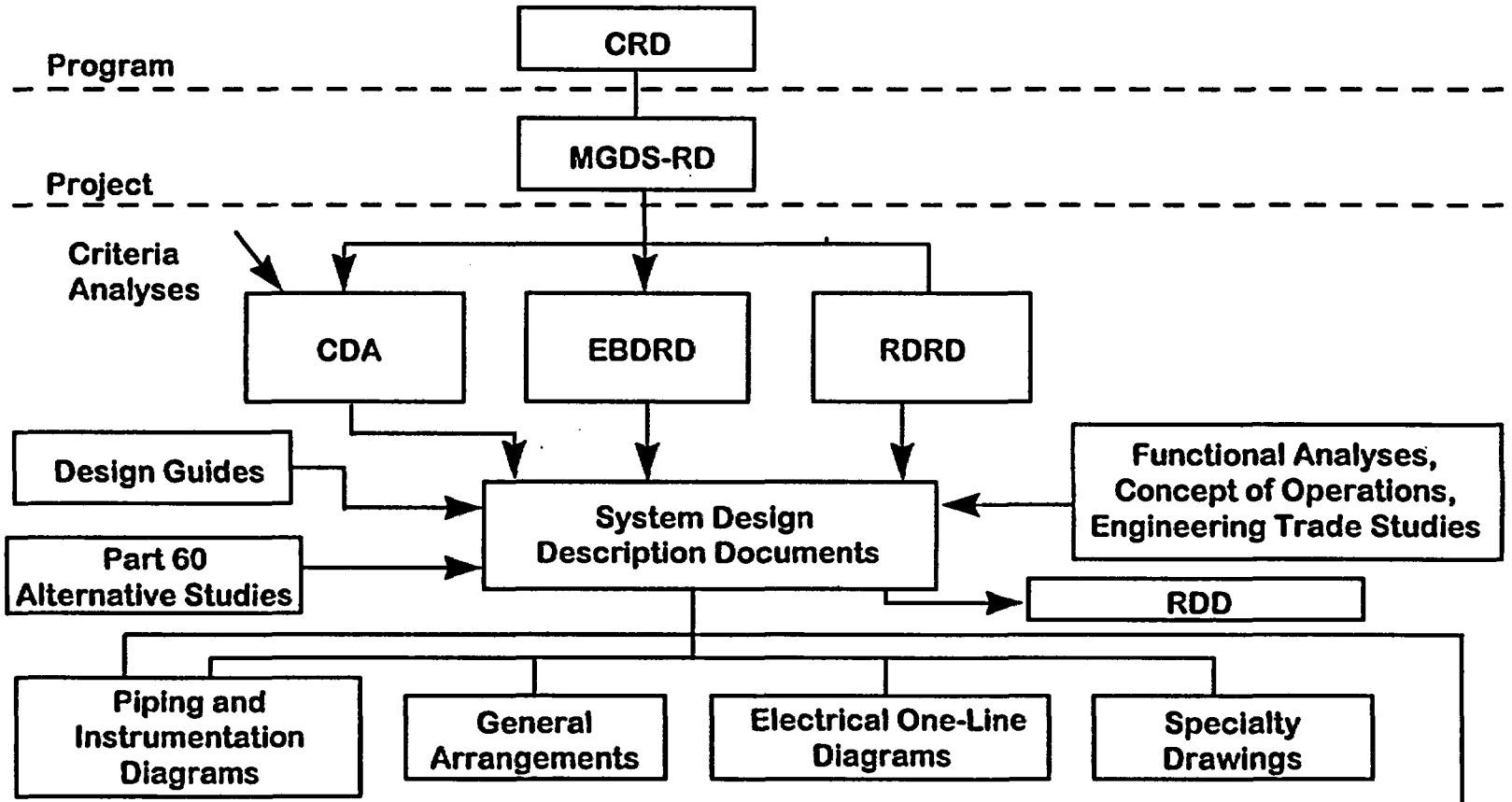
Format

- Initially developed at level similar to Director's Summary of the ACD; will be revised as the design develops
- Landscape orientation with facing pages (text and color graphics)
- Revisions approved and completed with page changes but complete documents reissued outside the M&O

Approval/Maintenance

- M&O document, approved by M&O Site Manager and coordinated with DOE
- Developed and maintained by Engineering and Integration Operations
- Current design updated based on approved changes to System Description Document (SDD) Summaries
- Design options based on design analysis and Conceptual Design Assumptions
- Reviewed bimonthly and revised as required

Documentation Hierarchy



ATTACHMENT 5

YUCCA
MOUNTAIN
PROJECT

Studies

Prioritization of Structures, Systems, and Components ("Binning")

Presented to:
DOE/NRC Quarterly Technical Meeting

Presented by:
Paul Harrington, DOE Team Lead
For License Application
Yucca Mountain Site Characterization Office

June 11, 1997

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

Structures, Systems, and Components Prioritized as Bin 1	
MGDS Site Layout	Health Safety System
Carrier/Cask Transport System	Central Command & Control Operations System
Subsurface Lighting System	Maintenance & Supply System
Subsurface Water Collection/Removal System	Administration System
Subsurface Water Distribution System	Subsurface Operational Monitoring System
Subsurface Compressed Air System	General Site Transportation System
Muck Handling System	Off-Site Rail and Road System
Off-Site Utilities System	Subsurface Development Transportation System
Site Compressed Air System	Site-Generated Hazardous & Non-Hazardous Waste Disposal System

Structures, Systems, and Components Prioritized as Bin 2	
Carrier Staging Shed System	Subsurface Fire Suppression System
Carrier Staging Shed Material Handling System	Radiological Waste Treatment Facility System
Waste Handling Facility System	Site-Generated Radiological Waste Handling System
Waste Handling Facility Electrical System	Radiological Waste Treatment Facility Ventilation System
Waste Handling Facility Fire Protection System	Subsurface Excavation System
Waste Handling Facility Radiological Monitoring System	Site Electrical Power System
Waste Handling Facility Ventilation System	Site Water System
Subsurface Facility System	Site Communications System
Subsurface Safety and Monitoring System	Security and Safeguards System
Subsurface Emplacement Transportation System	Emergency Response System
Subsurface Electrical Distribution System	Surface Environmental Monitoring System

Structures, Systems, and Components Prioritized as Bin 3	
Cask/Canister Handling System	Waste Retrieval System
Canistered Waste Transfer System	Subsurface Closure & Seal System
Uncanistered Waste Transfer System	Engineered Barrier System
Disposal Container Handling System	Uncanistered SNF Disposal Container
Waste Package Remediation System	Canistered SNF Disposal Container
Ground Control System	High Level Waste Disposal Container
Waste Emplacement System	DOE Waste Forms Disposal Container
Subsurface Ventilation System	Performance Confirmation System
Backfill Emplacement System	

ATTACHMENT 6

YUCCA MOUNTAIN PROJECT

Studies

Defense-in-Depth for the Repository Engineered Barrier System

Presented to:
DOE/NRC Quarterly Technical Meeting

Presented by:
Paul Harrington
DOE Team Lead for License Application
Yucca Mountain Site Characterization Office

June 11, 1997

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

Overview

- Defense in depth for preclosure operational period provided by
  - Prevention
  - Mitigation
  - Multiple Barriers
    - Conservatism, redundancy, diversity in design
  - QA program
  - Radiation dose standards
  - Emergency plans and procedures/limiting conditions for operation

Overview
(Continued)

- Postclosure defense in depth extends preclosure concepts
  - Prevention
  - Mitigation
  - Multiple Barriers
    - Conservatism, redundancy, diversity in design
    - Engineered barriers to compensate for uncertainties in performance of natural barriers
    - Natural barriers to compensate for uncertainties in performance of engineered barriers
  - QA program
  - Radiation dose standards
  - Limiting conditions for operation

Design Goals for the Engineered Barrier System

- Engineered barriers
  - Work in concert with natural site features
  - Not adversely impact natural barriers
  - Consist of multiple barriers to
    - Delay failure of the waste package
    - Delay release of radionuclides from waste package
    - Mitigate effects of radionuclide release

Engineering Goals for the EBS

- Meet preclosure requirements
  - Packaging
  - Handling
  - Storage
  - Closure
- Develop a design that provides acceptable performance for the expected postclosure case
- Use multiple barriers to improve confidence in the engineered system performance considering
  - uncertainties in natural processes
  - uncertainties in response of design features

Strategy for EBS Defense in Depth

- Develop design features for the expected case to provide desired performance
- Systematically evaluate options for design features that could be used to improve performance
  - Use performance assessment (PA) to analyze performance contributions
  - Evaluate sensitivities to low probability events/processes
- Systematically evaluate the PA sensitivities to identify data uncertainties
  - Document design features/options with regard to the effects of data uncertainties

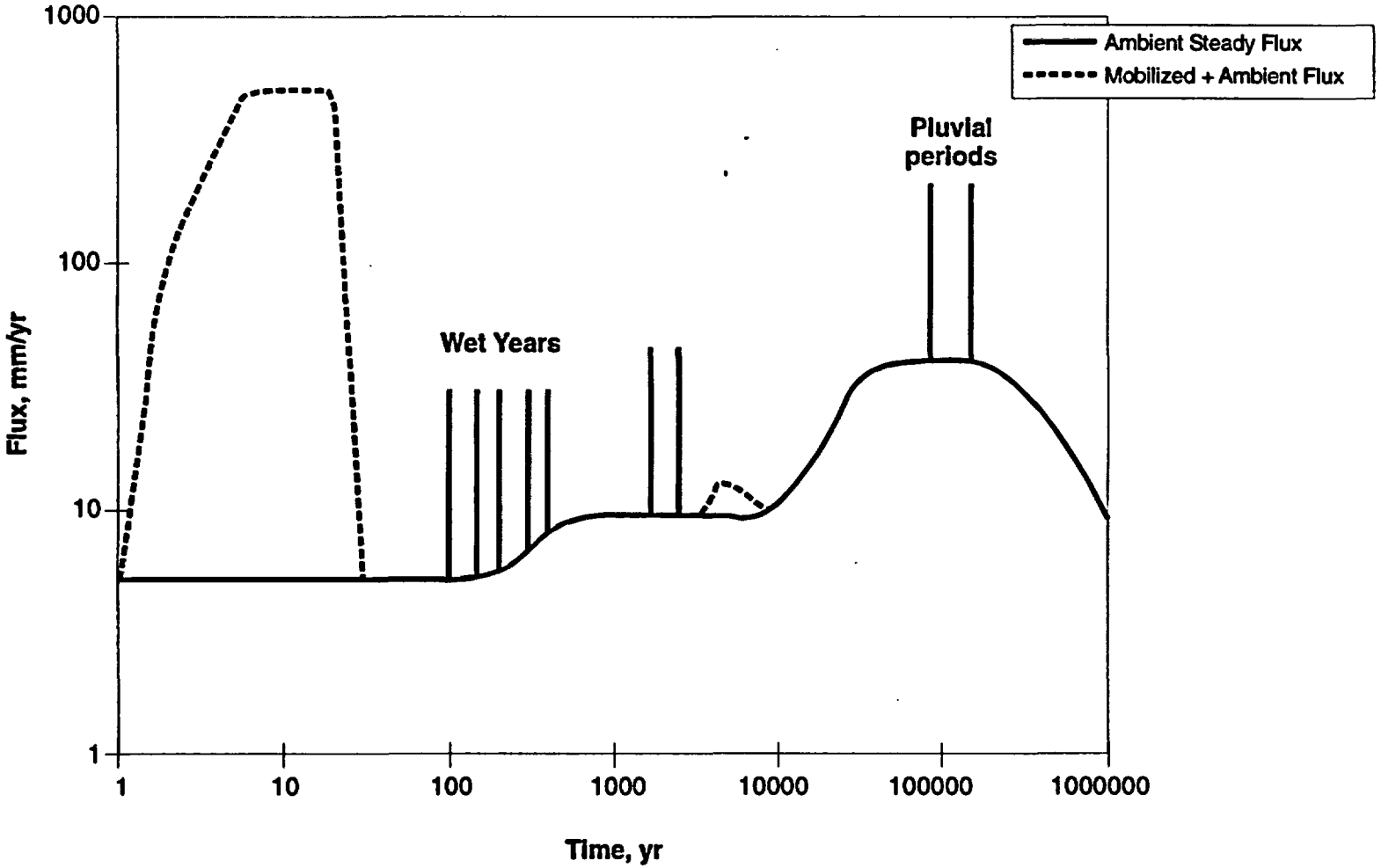
Strategy for EBS Defense in Depth
(continued)

- Systematically evaluate PA sensitivities to identify uncertainties in design feature/options response
  - Document the design features/options with regard to the effects of uncertainties of their response
- Select appropriate design features to improve performance by desired amount and offset effects of major data uncertainties

Models to Determine Design Input

- Unsaturated zone hydrology
  - Infiltration, percolation and seepage
- Thermal hydrology
  - Temperature, relative humidity, liquid saturation, seepage
- Thermal chemistry
- Unsaturated zone radionuclide transport
  - Advective velocity, matrix diffusion, retardation
- Saturated zone hydrology and radionuclide transport
  - Dispersion, dilution

Ambient Flux-Time Profile



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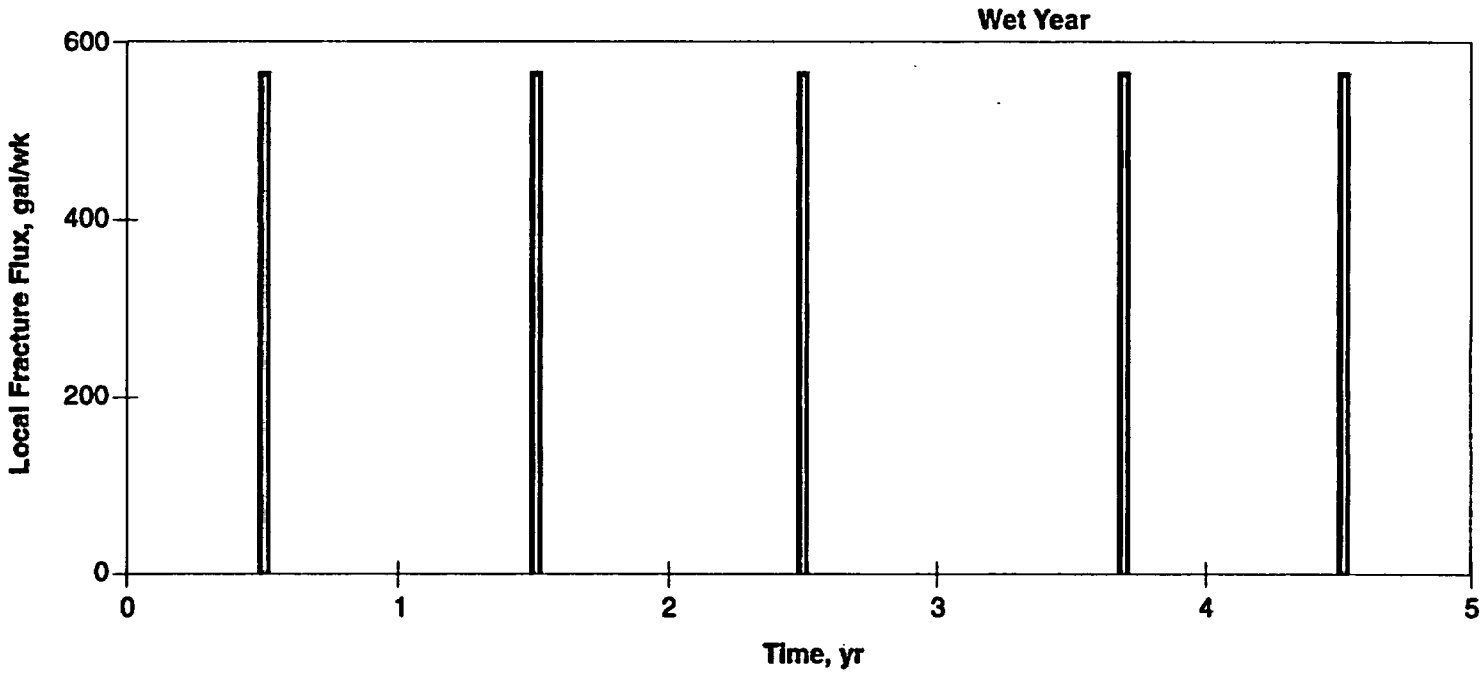
Episodic Flow-Time Profile

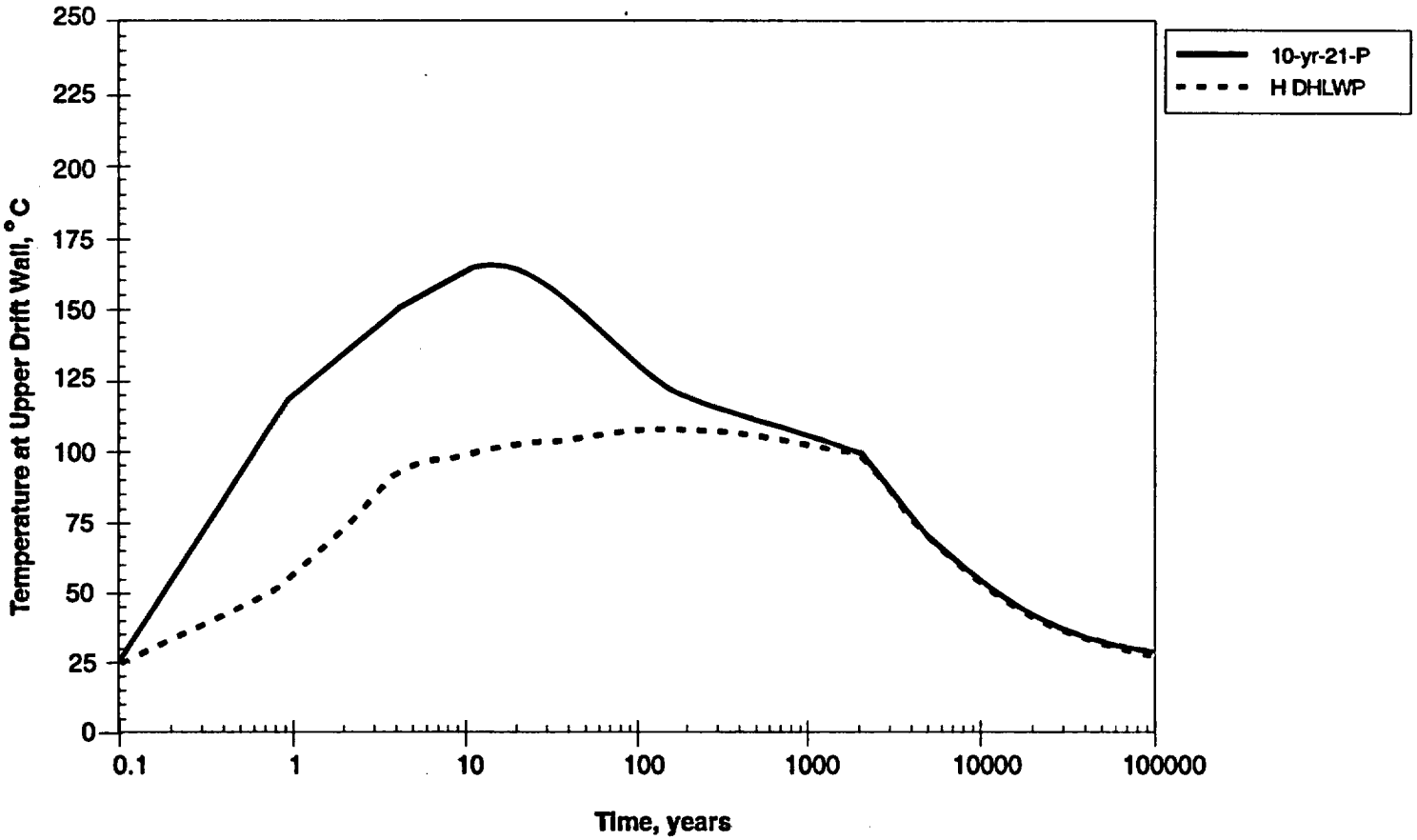
Single fracture receives annual flux from 400 m^2 area in 1 week.

2.5% of WP wetted each year



Temperature-Time Profile

83 MTU/acre, ACD Layout, Point Load, No Backfill, Low Flux



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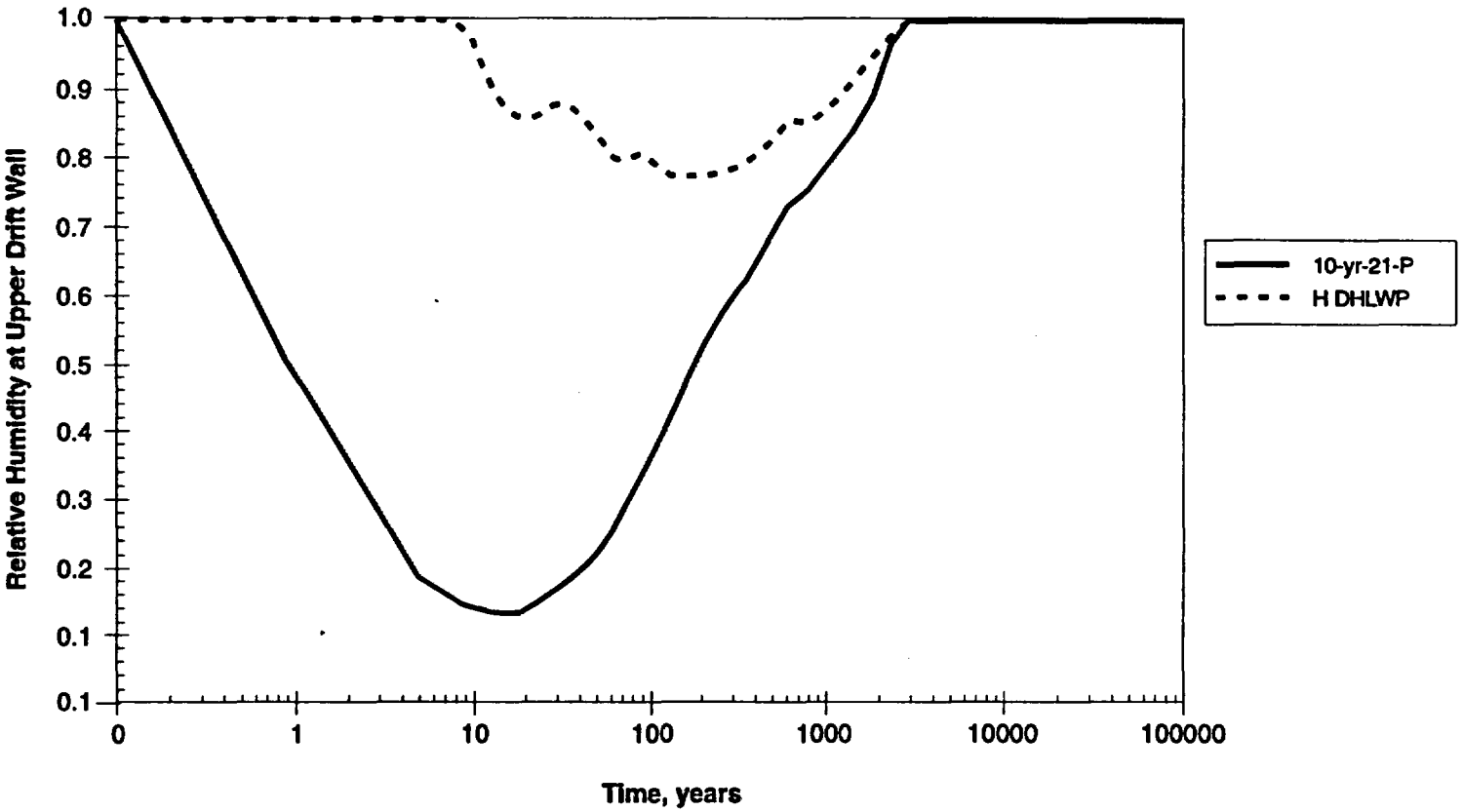
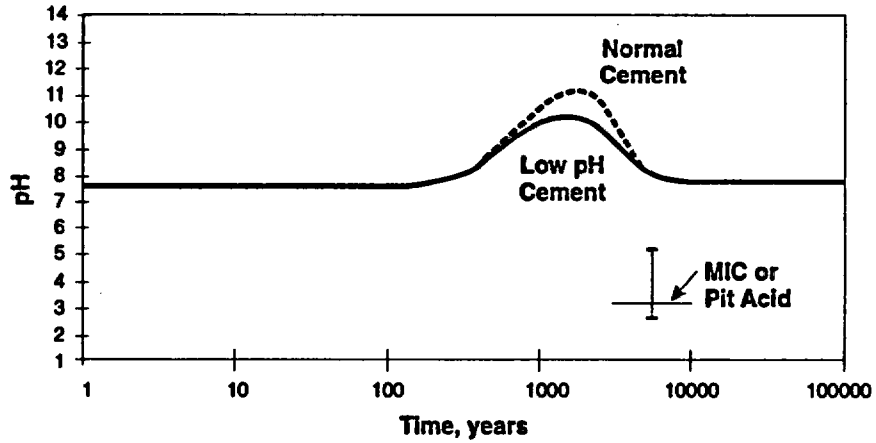
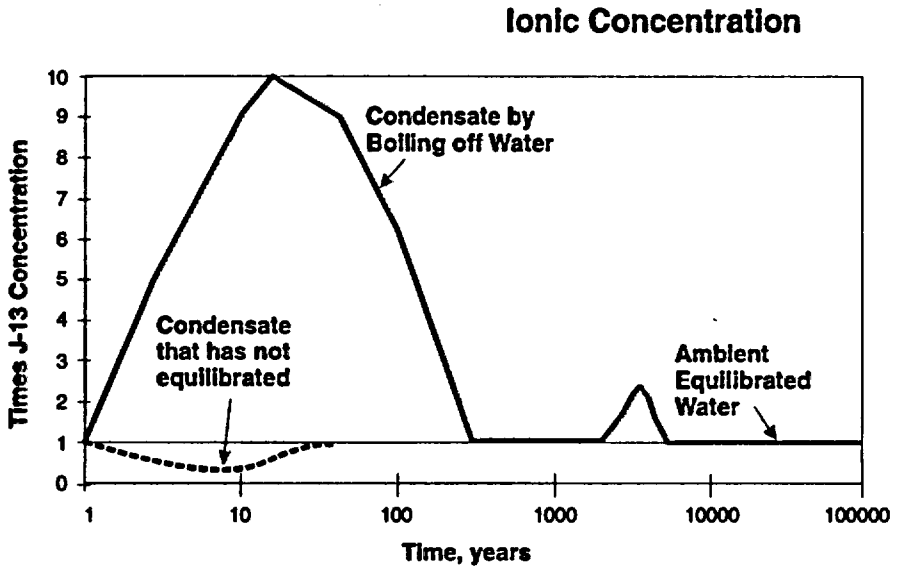
Humidity - Time Profile

83 MTU/acre, ACD Layout, Point Load, No Backfill, Low Flux

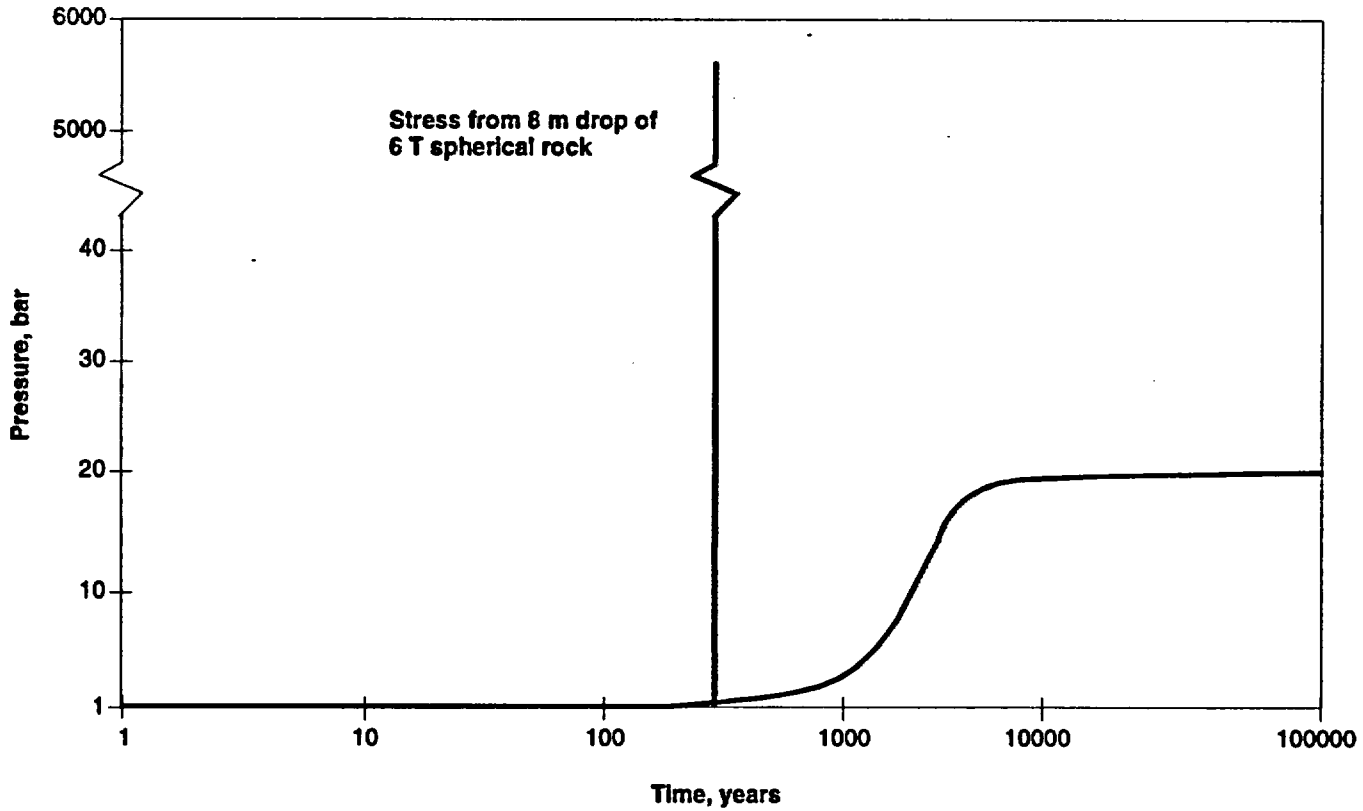


Ph/Ionic Concentration-Time Profile





Mechanical Load - Time profile



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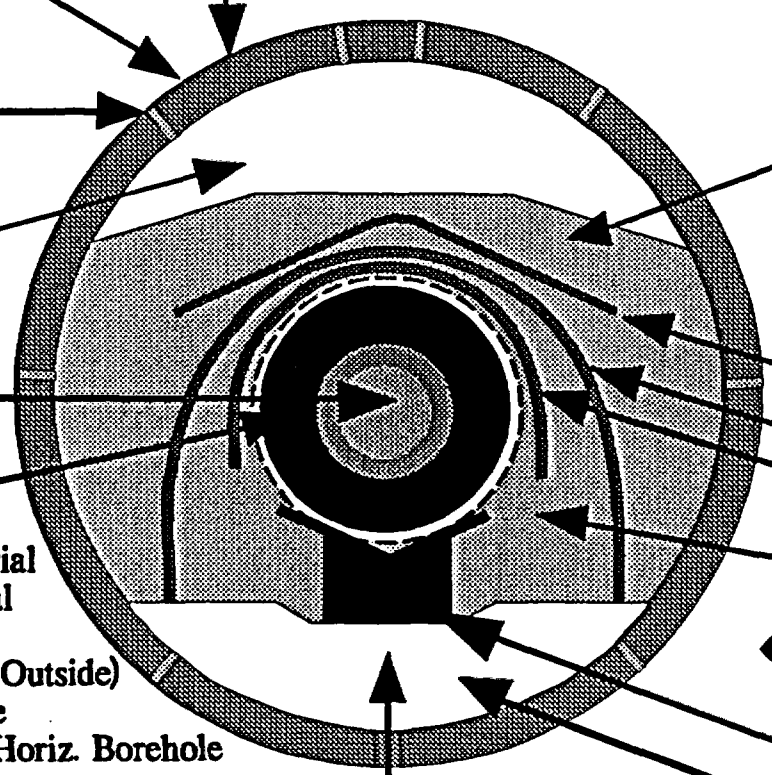
Major Features for TSPA Evaluation

- Subsurface layout
  - Drift size and spacing
  - Thermal load
  - Support and ventilation system
- Engineered barrier system
  - Invert materials
  - Packing and backfill materials
  - Flow diversion
- Waste package
  - Size and thermal load
  - Materials and fabrication technique

DRAFT

Design Options for Waste Isolation



Surface Control
- Land Withdrawal
- ■ ● Drainage Structures

◆ ■ ● Altered Near-Field Rock

Drift Liner
- ● Normal Concrete
- ● Low pH Concrete
- ■ ● Pre-Cast Concrete
- ■ ● Cast-In-Place Concrete
- ● Steel Sets

● Crown Joint
■ ● No Crown Joint

■ ● Emplacement Drift Wall

Air Gap
■ ● (Capillary Barrier)

■ Cladding Credit

Waste Package
- △ Corrosion Allowance Material
- △ Corrosion Resistant Material
- △ Galvanic Protection
- △ Ceramic Coating (inside or Outside)
- △ Large, Small, Small-in-Large
- ● In-drift, Vertical Borehole, Horiz. Borehole

Thermal Design
- ■ ● Areal Mass Load (High, Low)
- ■ ● WP Spacing (Point, Line)
- SNF Assembly Blending
  - ● To meet 18 kW limit
  - To meet criticality limit
  - ● Control Thermal Variability
- WP Sequencing
  - ● 4-Drifts Open
  - Lag Storage
    - ● Subsurface
    - ● Surface

Upper Backfill
- ● Rock Fall Protection
- ■ ● Limit Flow & Humidity
- ■ ● Richards Barrier
- ■ ● Single Layer
- ■ ● Condition Water

Drip Shield
- ■ ● Supported by Backfill
- ■ ● Free Standing
- ■ ● Supported by WP

Lower Backfill
- ■ ● Condition Water
- ◆ Sorb Releases

■ ● Pedestal

Invert
- ◆ Additives (Non-Restricted)
- ◆ Additives (Restricted)

◆ Layout of Emplacement Drift
- Sloped
- Level

◆ Zeolites

● WP Environment
△ Robust WP
■ Limit Mobilization
◆ Radionuclide Concentration Reduction

Design Features Evaluation Matrix

	POST-CLOSURE GOALS			POST-CLOSURE ENVIRONMENTS			
Engineered Features	Delay breach of WP	Prolong time from WP breach to waste release	Mitigate release from EBS	Water Flux	Relative Humidity	Chemistry	Rockfall & Drift Collapse
cladding credit		X		X		X	X
corrosion resistant material	X	Y		X		X	X
corrosion allowance material	X	Y	Y	X	X	X	X
galvanic protection	X			X	Y	X	
ceramic coating	X			X	X	X	Y
large package	X				Y		
small package			Y				
small -in-large-package		X			Y		
pedestal	X			X			
invert additives (non-hazardous)		Y	X			X	
invert additives (hazardous)		Y	X			X	
backfill	X	Y	Y	X	X	Y	X
support drip shield	Y	Y	Y	X	X	Y	X
rock fall protection	X	Y	Y	X	X	Y	X
limit flow & humidity	X	Y	Y	X	X	Y	X
Richards barrier	X	Y	Y	X	X	Y	X
condition water	X	Y	Y	X	X	Y	X
sorb releases	X	Y	Y	X	X	Y	X
drip shield	X			X	Y		
supported by backfill	X			X	Y		
free standing	X			X	Y		
supported by WP	X			X	Y		
air gap	X			X			
drift liner	Y			X			
crown joint	Y			X			X
no crown joint	Y			X			X
normal concrete		Y	Y			Y	X
low PH concrete	Y	Y	Y			X	X

Design Features Evaluation Matrix

(Continued)

	POST-CLOSURE GOALS			POST-CLOSURE ENVIRONMENTS			
Engineered Features	Delay breach of WP	Prolong time from WP breach to waste release	Mitigate release from EBS	Water Flux	Relative Humidity	Chemistry	Rockfall & Drift Collapse
pre-cast concrete	Y	Y	Y			Y	X
cast-in-place concrete	Y	Y	Y			Y	X
steel sets	Y						X
emplacement drift wall	Y			X			
altered near field rock	X	Y		X			
areal mass load - high	X			X	X		
areal mass load - low	X			Y			
WP spacing - point load	X				Y		
WP spacing - line load	X	Y		Y	Y		
SNF assembly blending	X	Y		X	X		
to meet 18kW limit	X	Y		Y	Y		
to meet criticality limit	X	Y		Y	Y		
control thermal variability	X	Y		Y	Y		
WP sequencing	X	Y		Y	Y		
4 drifts open	X	Y		Y	Y		
lag storage	X	Y		Y	Y		
subsurface	X	Y		Y	Y		
surface	X	Y		Y	Y		
surface control	X			X			
land withdrawal (limit infiltrations)							
drainage structures	X			X			
emplacement drift							
sloped							
level							
in drift emplacement	y			Y	Y		
vertical borehole							
horizontal borehole							
	Note: "X" indicates primary function of						
	feature; "Y" indicates a secondary function						
	of the feature						

Summary of Design Process to Achieve Defense in Depth

- Design for the expected case
- Determine key sensitivities through performance assessment
- Evaluate uncertainties in data used for design
  - Document design features/options
- Evaluate uncertainties in the response of design features
  - Document design features/options

Summary of Design Process
(continued)

- Consider available design features/options in the context of total system performance
  - Conservatism
  - Redundancy
  - Diverse barriers
- Select design features to provide desired level of performance

ATTACHMENT 7

YUCCA
MOUNTAIN
PROJECT

Studies

Scientific Studies Update at Yucca Mountain

Presented to:
DOE/NRC Quarterly Technical Meeting

Presented by:
Ron E. Smith, Ph.D.
Site Evaluation Program Operations
Civilian Radioactive Waste Management System
Management & Operating Contractor

June 11, 1997

U.S. Department of Energy
Office of Civilian Radioactive
Waste Management

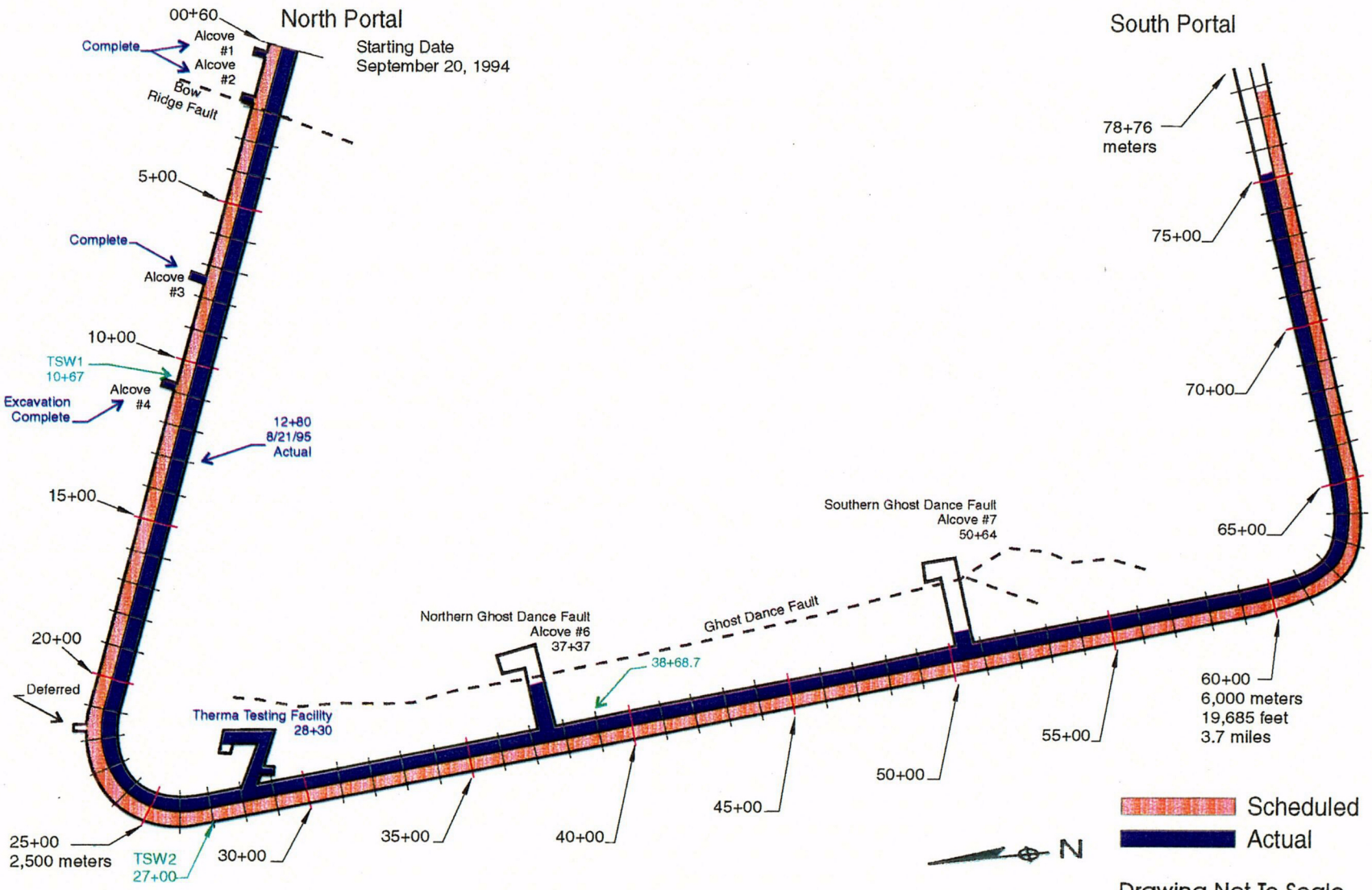
Overview - Focus of the Briefing

- Thermal testing --

  Ongoing investigations
  - Large Block Test (Fran Ridge)
  - Single Heater Test (ESF)
  - Drift Scale Test (ESF)

- ESF testing
  - Fault testing
  - Moisture studies
  - South Ramp geology
- C - Well Complex
  - Saturated zone
  - Hydraulic and tracer testing

Tunnel Boring Machine Progress



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C-02

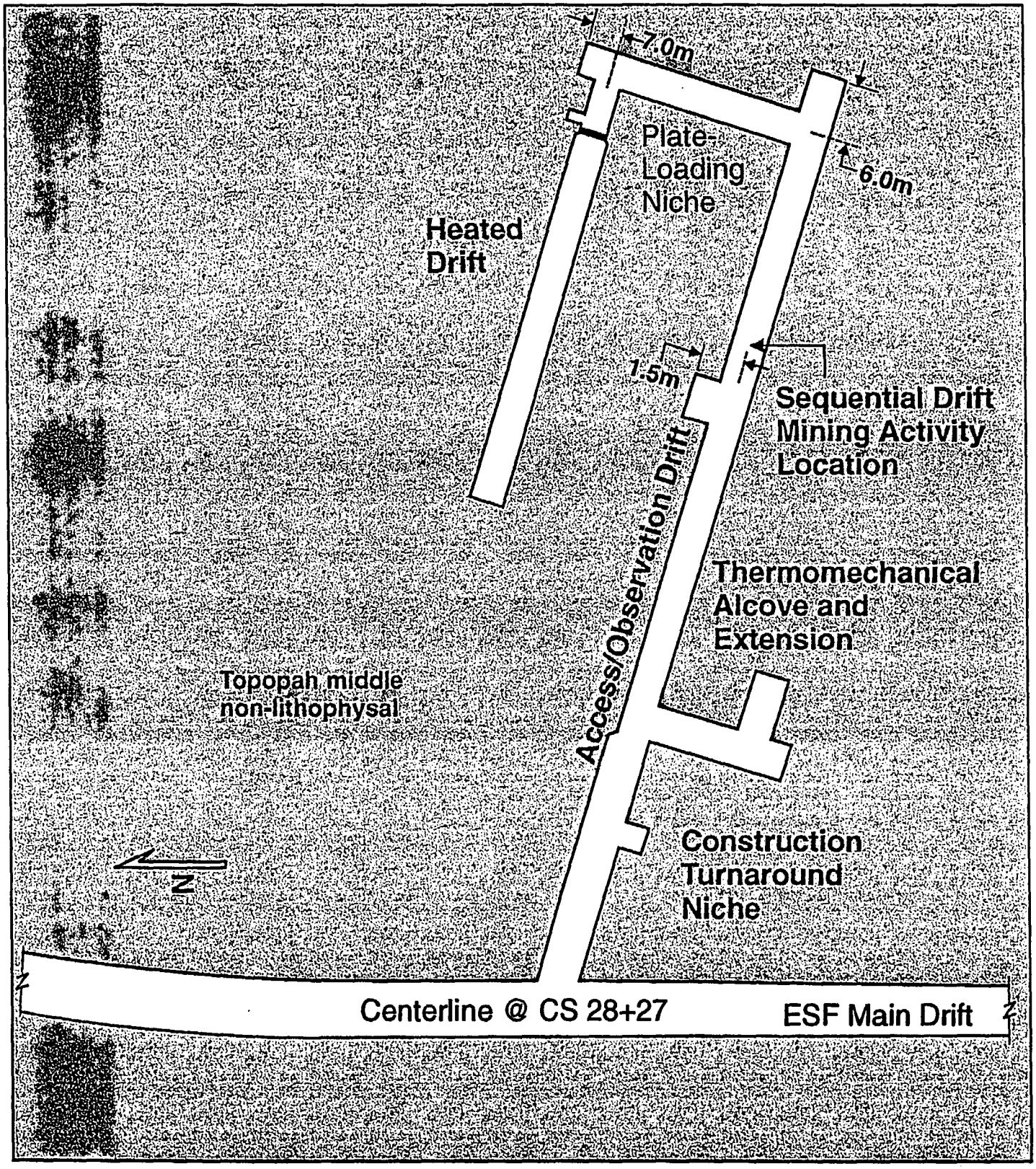
Large Block Test - Objectives

- Enhance our understanding of how thermal loading will affect hydrology of the near-field environment
- Conduct field tests in a meter-scale block of TSw to look at phenomena such as:
  - Thermally-driven dryout and condensation
  - Condensate refluxing
  - Related mechanical and chemical responses

Large Block Test - What We Have Learned

- Mapped the fracture system in detail and constructed a 3-D model of fractures
- Temperature distributions in the block correlate very well with model predictions
- Saturation profiles from electrical resistivity tomography (ERT) measurements appear similar to model predictions

ESF Alcove 5
Thermal Test Facility

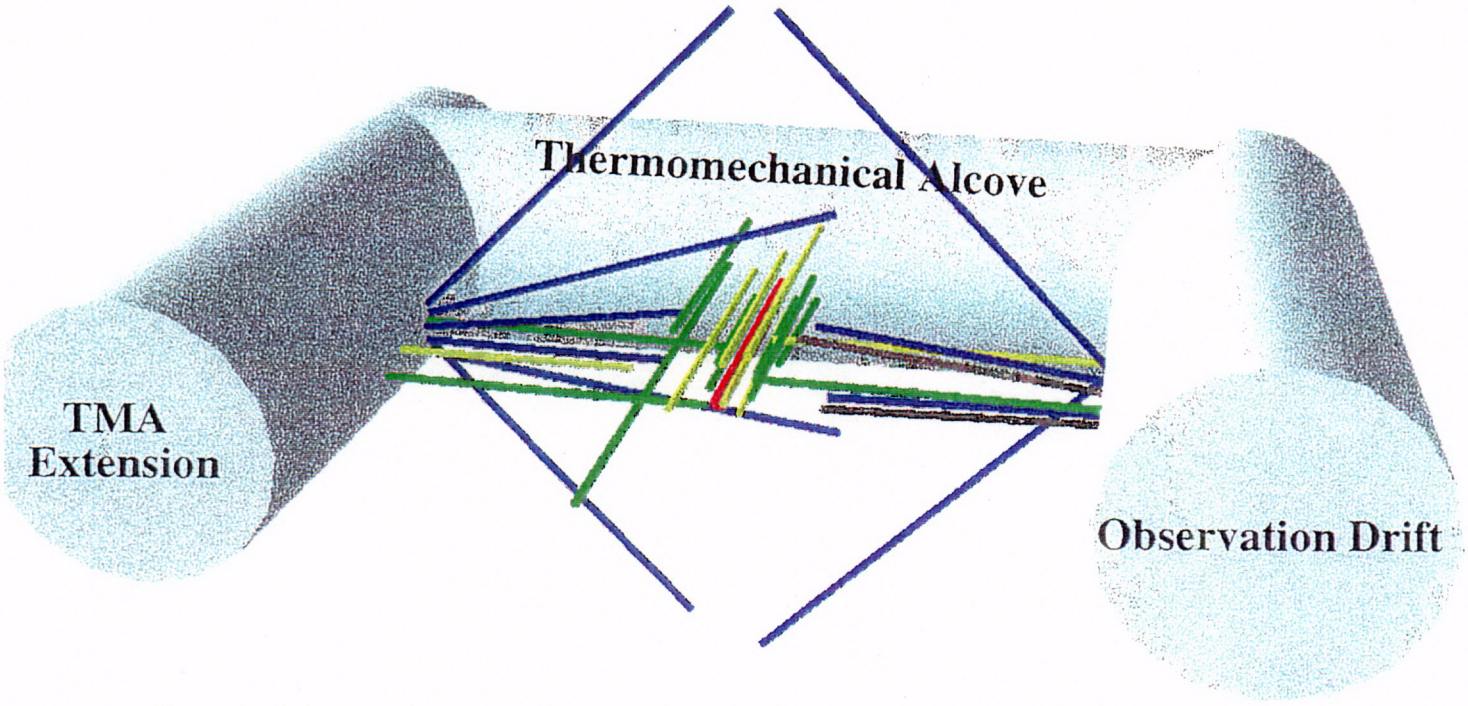


Single Heater Test - Objectives

- Develop a simple insitu thermal test in preparation for the Drift Scale Test to shakedown instrument performance and logistical components
- Advance the understanding of T-M-H-C processes anticipated in the rock mass surrounding a repository using an intermediate-scale field test

Single Heater Test

Borehole Perspective

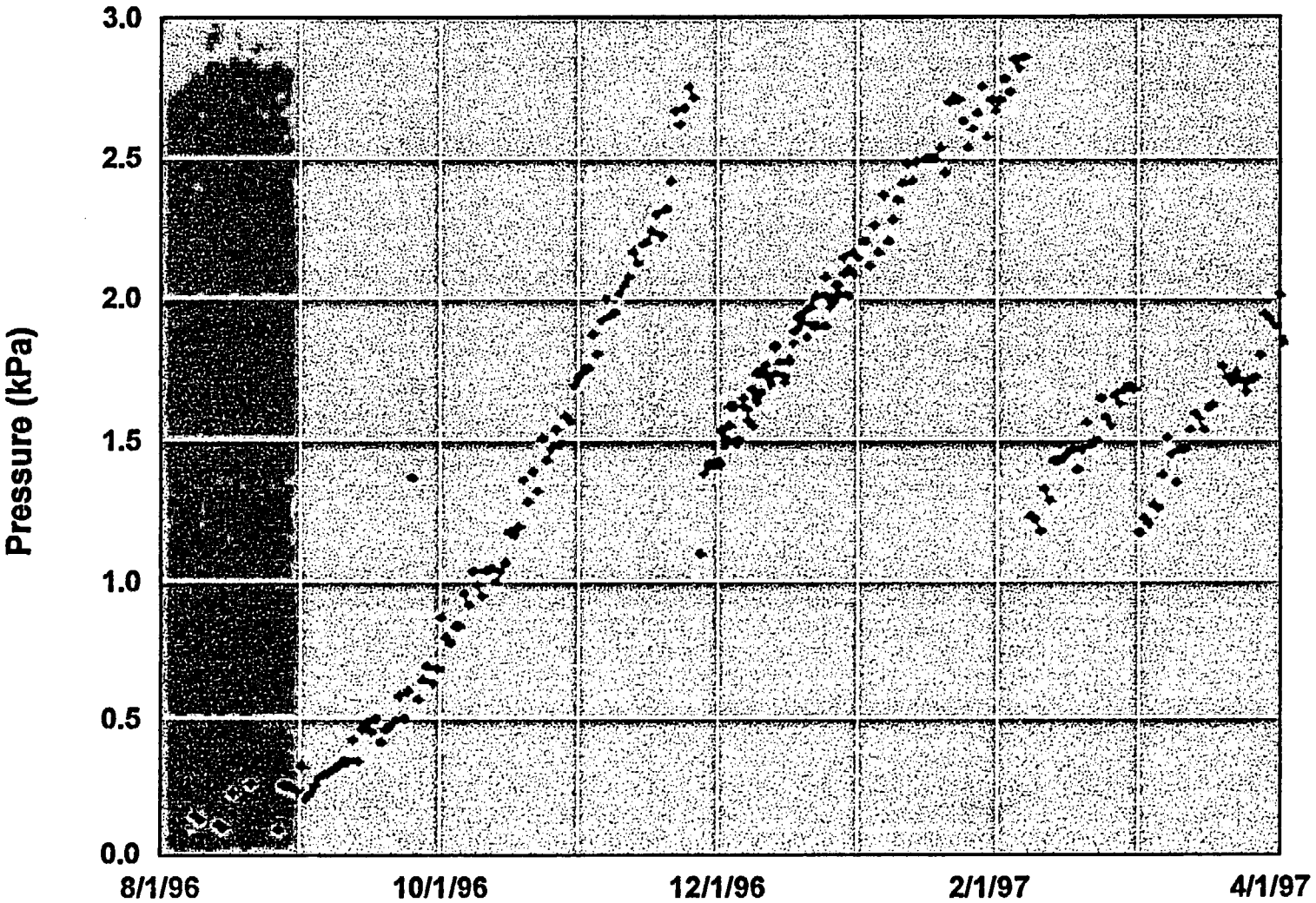


Heater
Thermal
Mechanical
Hydrological
Chemical

Single Heater Test - What We Have Learned

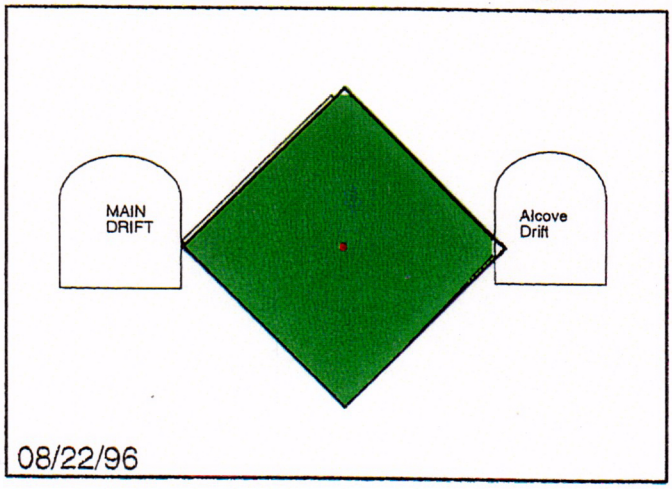
- There is a direct correlation between measurements from pressure transducers and water accumulation
- Liquid saturations and their propagation can be tracked from instrument data interpretations
- Predicted and measured mechanical displacement and temperature show a good match
- Heater turned off on May 28, 1997, cooldown began

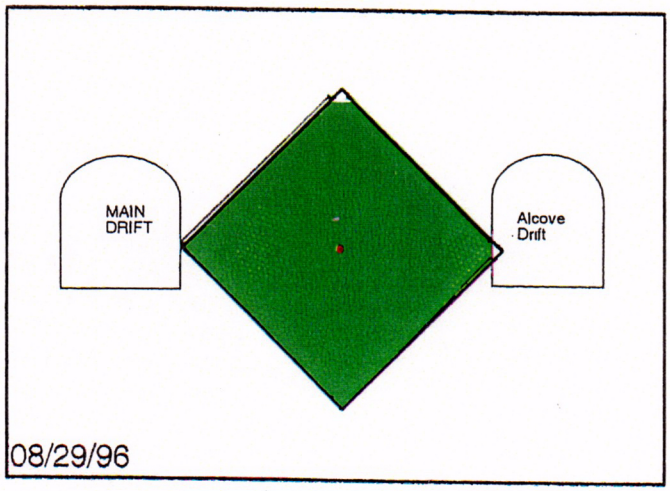
Single Heater Test: Measured Pressure From 16-4

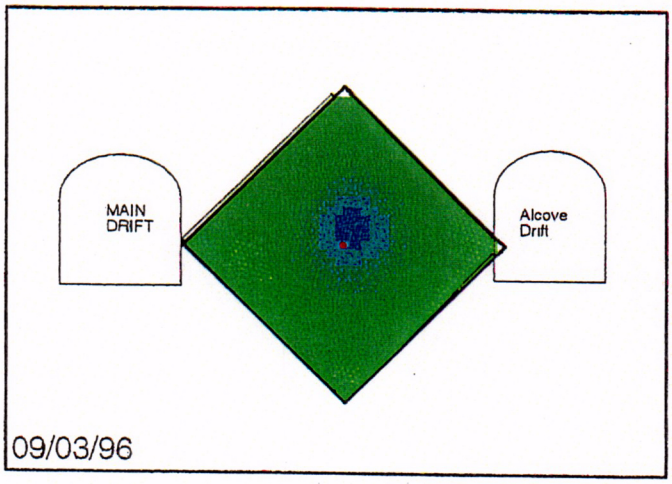


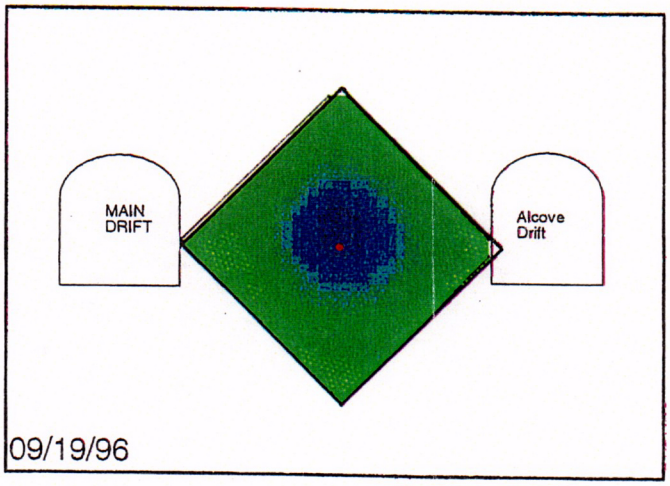
Note: Pressure increases and decreases from condensate accumulation and water collection, respectively.

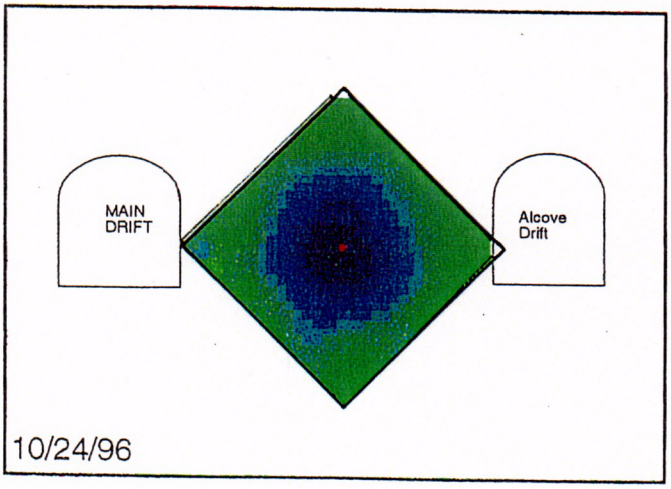
Chronology of Measured Resistivity Ratios
Single Heater Test

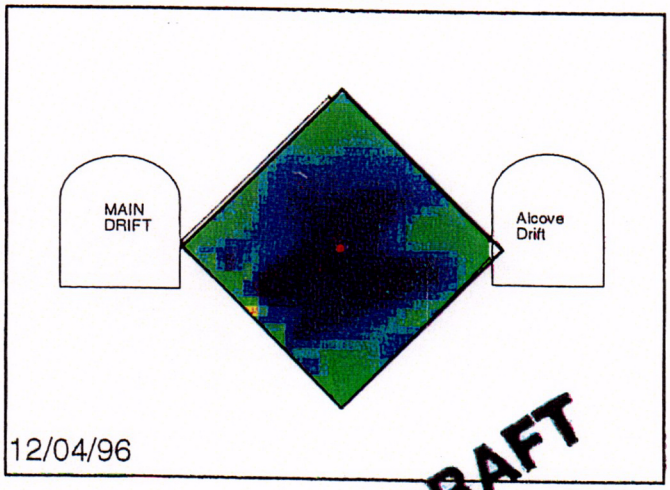












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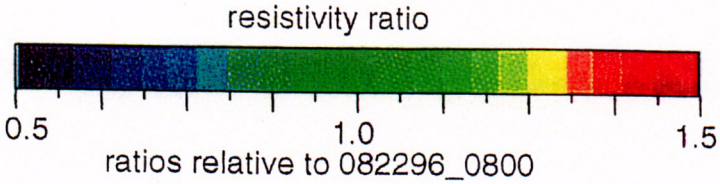


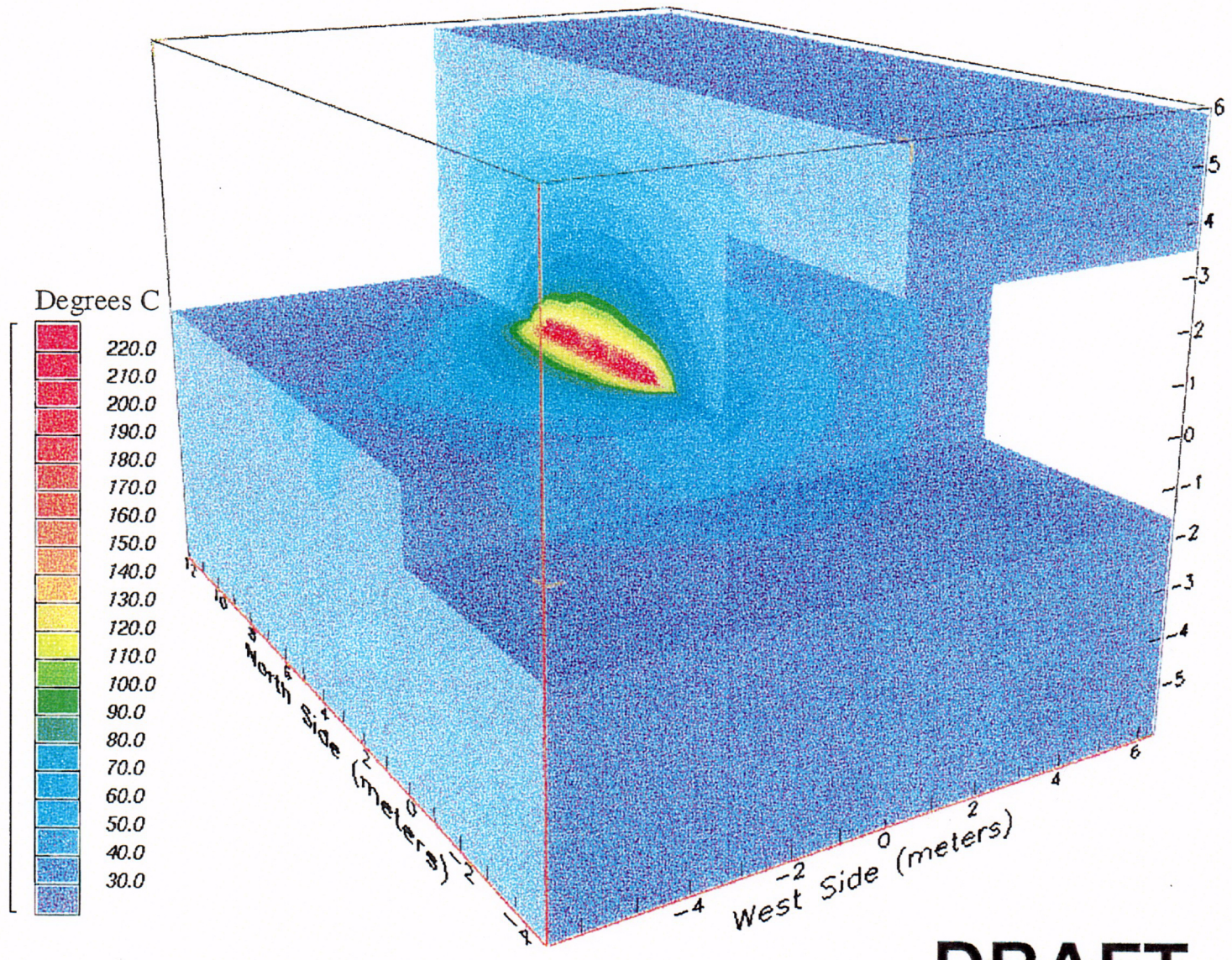
C-04

Single Heater Test: Predictions

Perspective Isotherms

Cutaway Along Heater

May 14, 1997 (Day 261)



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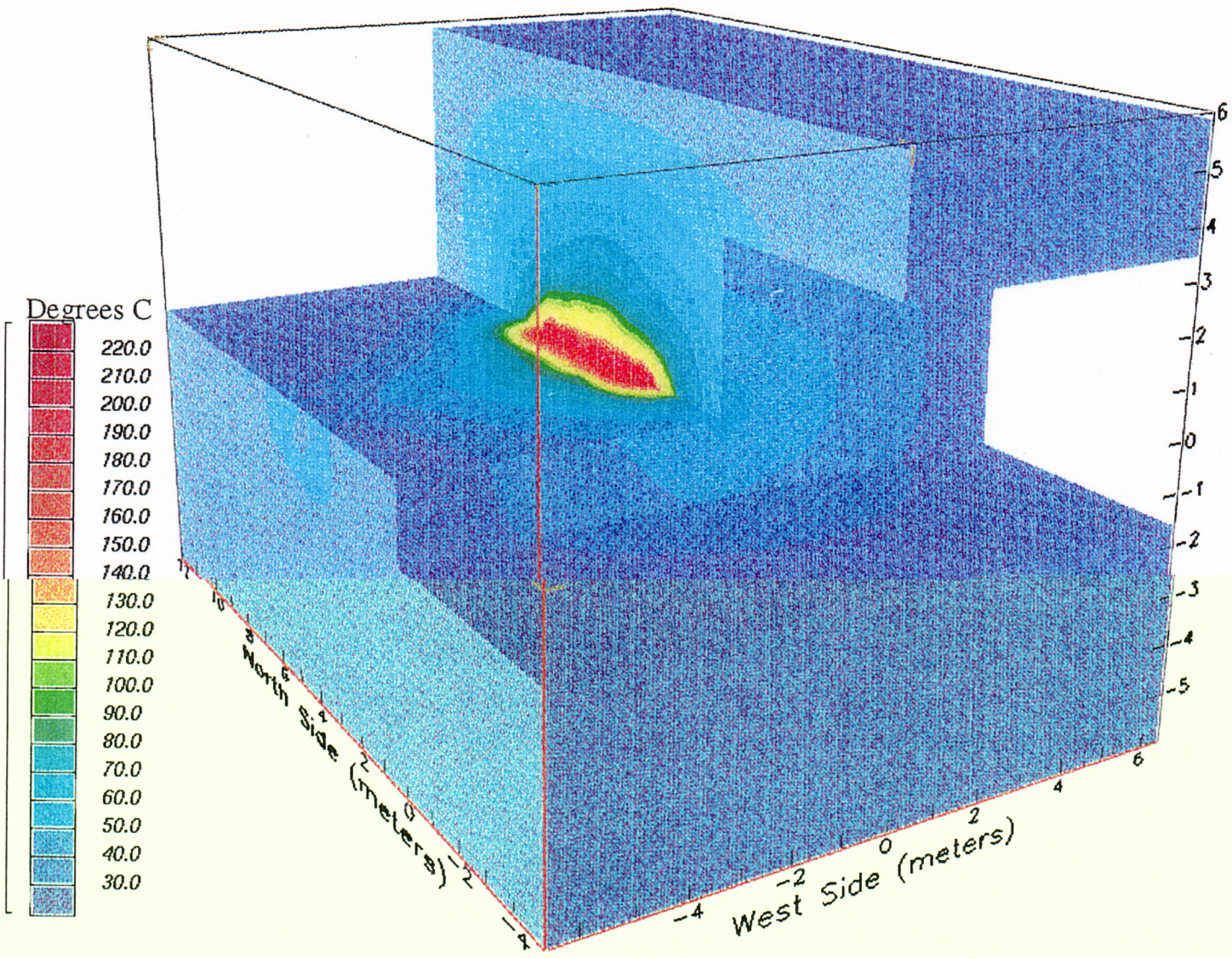
C-05

Single Heater Test: Predictions

Perspective Isotherms

Cutaway Along Heater

April 30, 1997 (Day 245)



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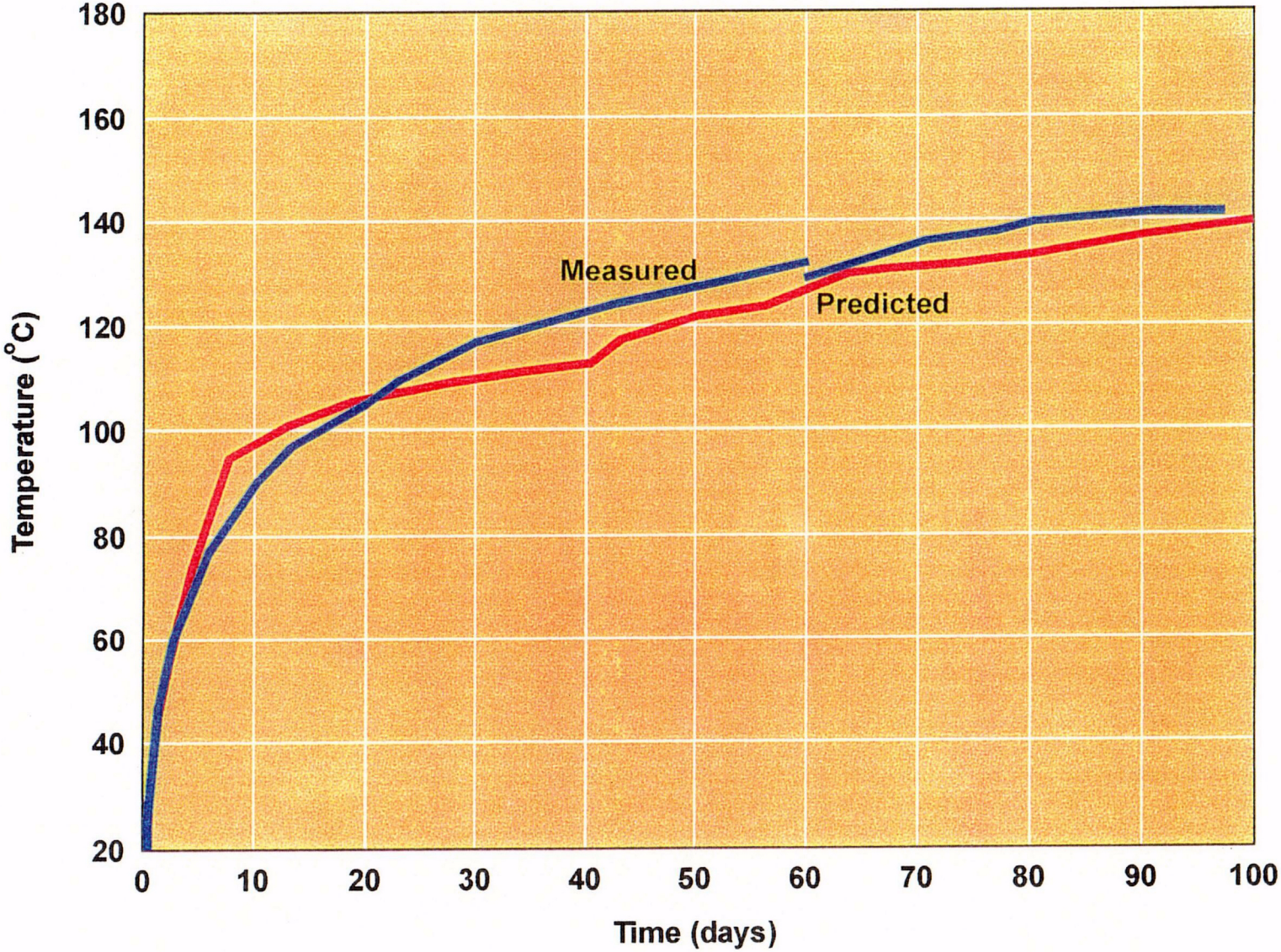
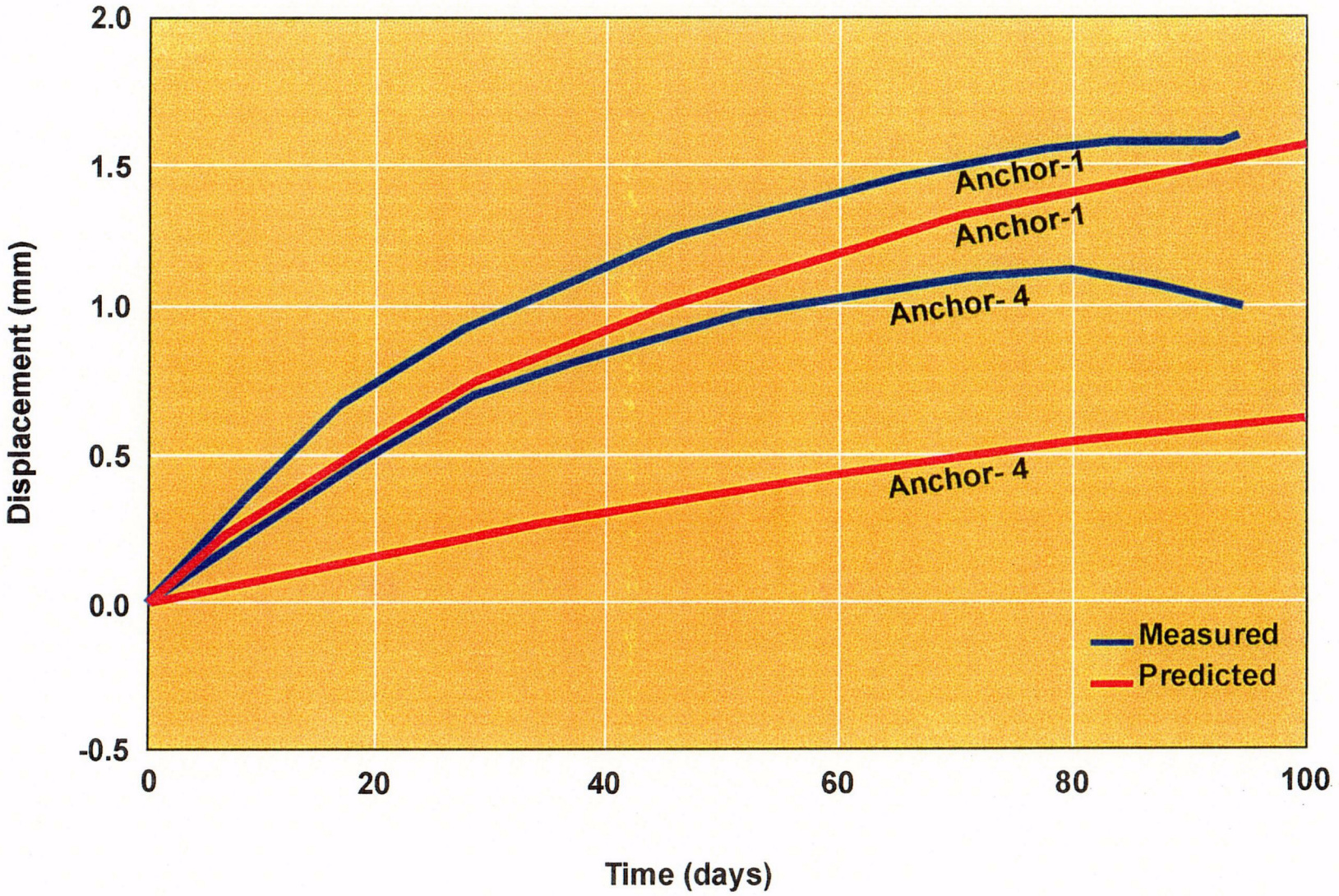
C-06

Single Heater Test: Thermal Results



C-07

Single Heater Test: Mechanical Results

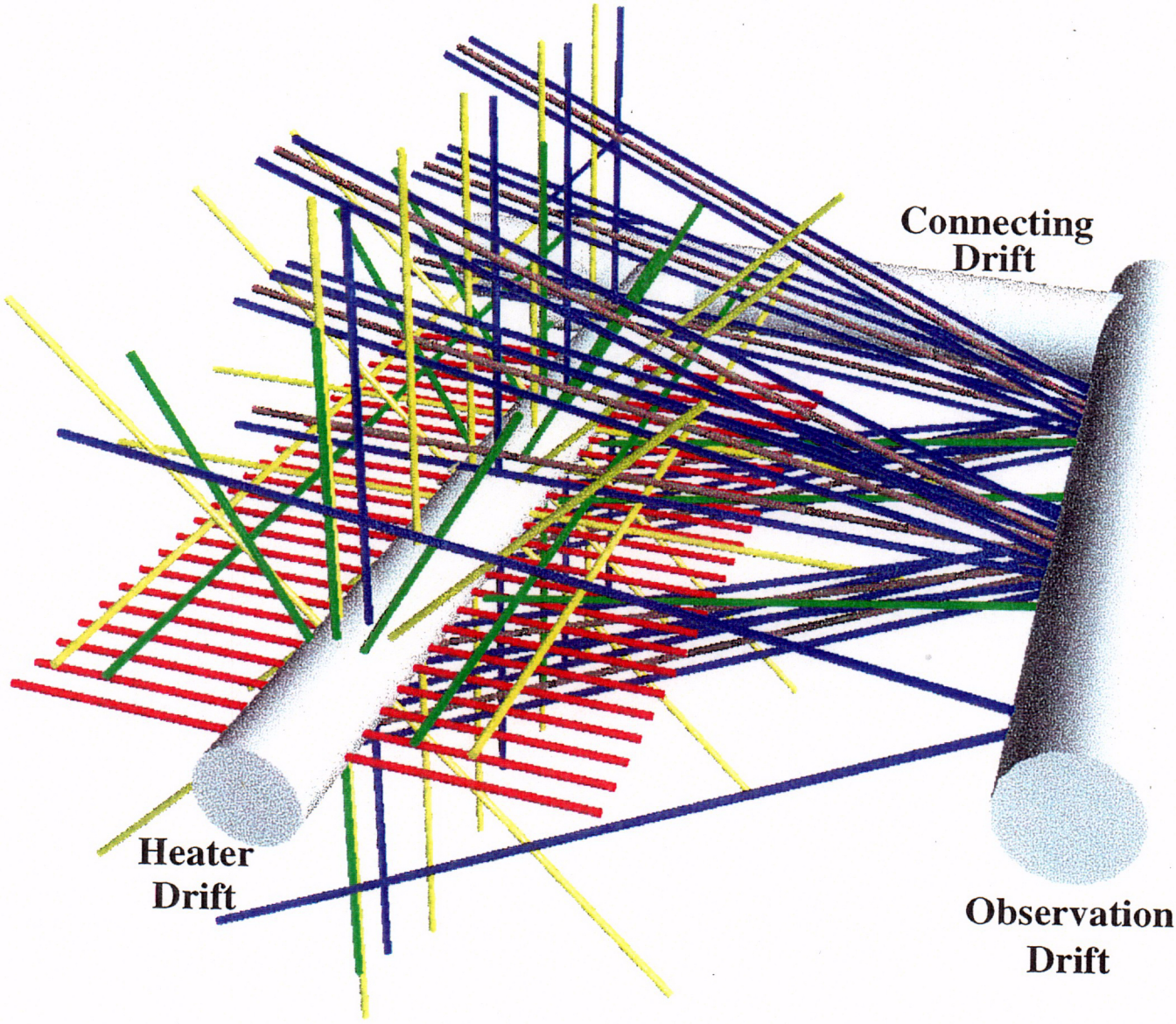


C-08

Drift Scale Test - Objectives

- Develop a more comprehensive understanding of the coupled T-M-H-C processes in the rock mass surrounding a repository which includes:
  - Temperature distribution and heat transfer modes
  - Propagation of the drying and re-wetting regions
  - Changes in water chemistry and mineralogy
  - Thermal expansion and deformation modulus

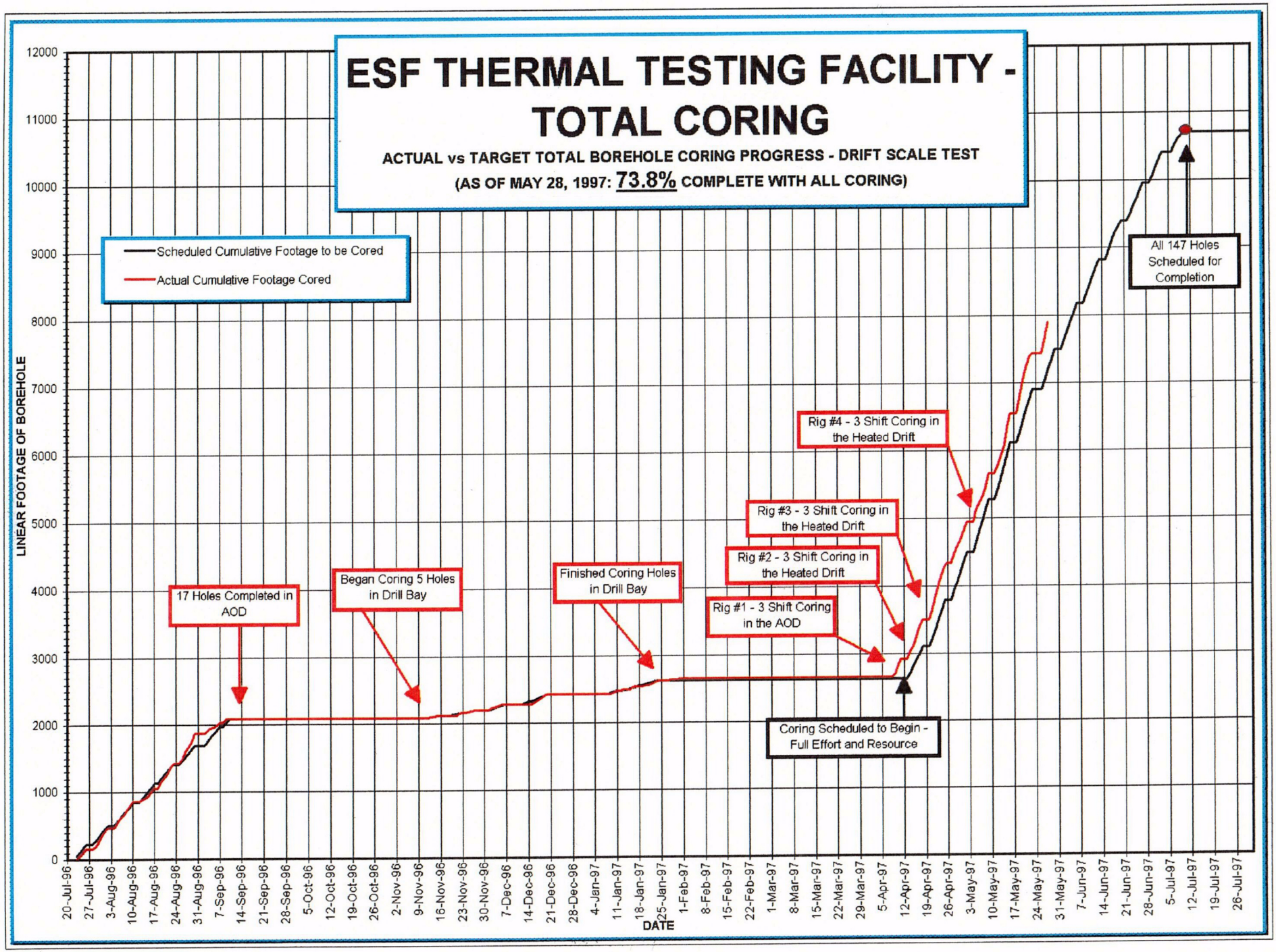
Drift Scale Test
Borehole Perspective



- Wing Heaters
- Thermal
- Mechanical
- Hydrological
- Chemical

Drift Scale Test - What We Have Learned

- Excavation complete
- Procurement on schedule
- Drilling in the Heated Drift (HD) and Access Observation Drift (AOD) ahead of schedule
- Installation of instruments, wing heaters, and data collection system ongoing
- Heater Turn-On on schedule for December 8, 1997



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Drift Scale Test - What We Have Learned

- Pre-test characterization of the test bed is ongoing. Activities include:
  - Geologic mapping
  - Scanline mapping
  - Air permeability - single-hole and cross-hole
  - Infrared mapping
  - Laboratory measurements of thermal, mechanical, hydrologic, hydrochemical, and mineralogic-petrologic properties

Drift Scale Test - What We Have Learned

- Pre-test air permeability measurements
  - The majority of air permeability values in the Drift Scale Test bed (for packed-off zones of approximately 11 meters) range from 10 to 50 millidarcies
  - Data indicate that fractures are well-connected and therefore, a heterogeneous fracture continuum is a suitable conceptual model for the test bed

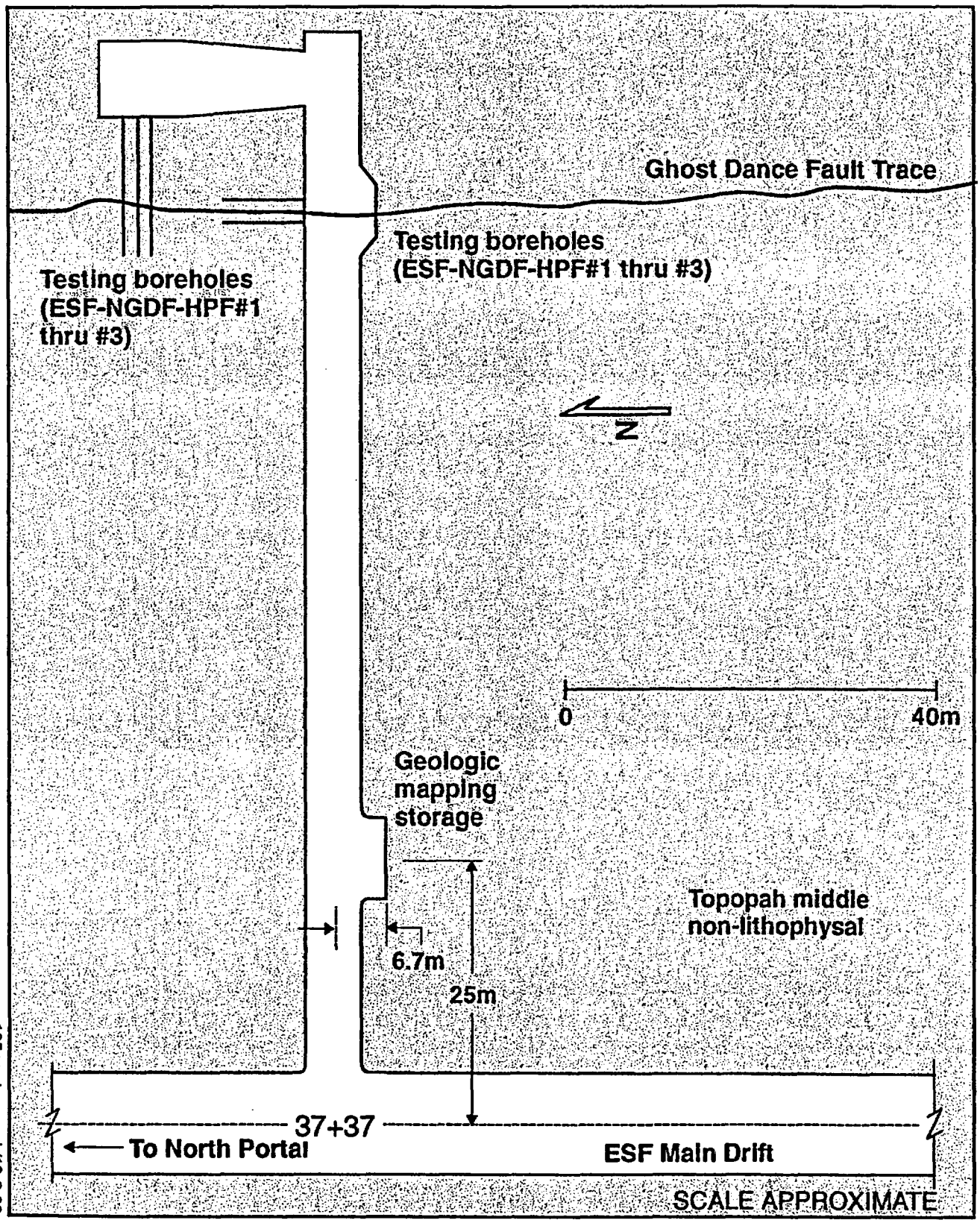
Thermal Testing - Why It is Important

- To Performance Assessment
  - Allows for performance confirmation of near field process models that feed into the development of PA models
- To design
  - Assess the effects of thermal loading on prototypical ground support systems
  - Measure corrosion rates on typical waste package materials subjected to harsh thermal environments

ESF Fault Testing - Objectives

- Evaluate geologic relationships along the Ghost Dance Fault (GDF) based on data from surface exposures, boreholes and the ESF.
- Measure in situ fault properties including:
  - Temperature (geothermal) profiles
  - Pneumatic properties
  - Gas-chemistry
  - Environmental isotope / fracture filling characterization

ESF Alcove 6
Northern Ghost Dance Fault Alcove: Phase II



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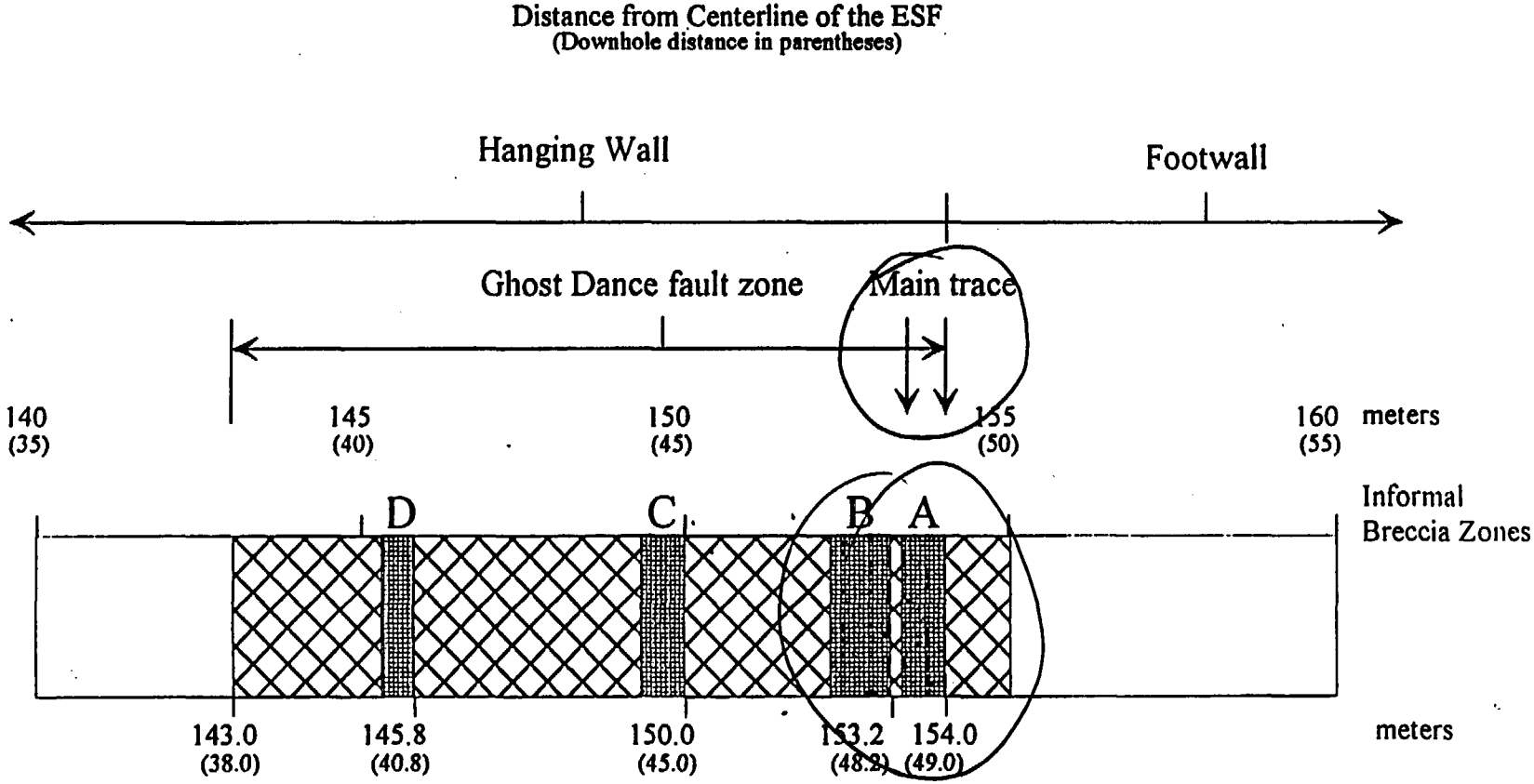
Fault Testing - What We Have Learned

- Based on the geothermal borehole in Alcove #6, the GDF was estimated to be 12 meters wide with a broken zone and 4 splays. Examination of the fault after excavation revealed the fault to be approximately 1 meter wide with broken zones on either side

Backup

Preliminary Sketch of the Ghost Dance Fault and Related Structures in Borehole ESF-NAD-GTB#1A



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