

March 28, 1995

0365

Mr. Ronald A. Milner, Director
for Program Management and Integration
Office of Civilian Radioactive Waste Management
U.S. Department of Energy, RW 30
1000 Independence Avenue, S.W.
Washington, D.C. 20585

SUBJECT: MINUTES OF THE JANUARY 24, 1995, EXPLORATORY STUDIES FACILITY MEETING

Dear Mr. Milner:

Enclosed are the minutes of the January 24, 1995, technical meeting between the staff of the U.S. Nuclear Regulatory Commission and the U.S. Department of Energy on items of mutual concern regarding the Exploratory Studies Facility (ESF). This meeting was held at NRC Headquarters in Rockville, Maryland. It is part of a continuing series of bi-monthly ESF meetings.

If you have any questions regarding this letter, or the meeting minutes, please contact Mr. Mark Delligatti of my staff. Mr. Delligatti can be reached at 301 415-6620.

Sincerely,

(Original signed by John O. Thoma)

John O. Thoma, Section Leader
High-Level Waste and Quality Assurance Section
High-Level Waste and Uranium Recovery Projects Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards

Enclosure: As stated

cc: See next page

DISTRIBUTION: Central file
MFederline w/o MBell
On-site reps ACNW

DWM r/w-w/
JAustin
CNWRA

HLUR r/f-w/
JSurmeier w/d

PUBLIC
JHolonich

LSS
NMSS r/f w/o

DOCUMENT NAME: S:\DWM\HLUR\MSD\ESF0124

OFC	HLUR	E	HLUR	E					
NAME	MDelligatti		JThoma	JOT					
DATE	03/27/95		3/28/95						

OFFICIAL RECORD COPY

9504070255 950328
PDR WASTE
WM-11 PDR

NHOB
wm-11
102.8

CC List for letter dated: March 28, 1995

cc: R. Loux, State of Nevada
J. Meder, Nevada Legislative Counsel Bureau
W. Barnes, YMPO
C. Einberg, DOE/Wash, DC
M. Murphy, Nye County, NV
M. Baughman, Lincoln County, NV
D. Bechtel, Clark County, NV
D. Weigel, GAO
P. Niedzielski-Eichner, Nye County, NV
B. Mettam, Inyo County, CA
V. Poe, Mineral County, NV
W. Cameron, White Pine County, NV
R. Williams, Lander County, NV
L. Fiorenzi, Eureka County, NV
J. Hoffman, Esmeralda County, NV
C. Schank, Churchill County, NV
L. Bradshaw, Nye County, NV
W. Barnard, NWTRB
R. Holden, NCAI
E. Lowery, NIEC
R. Arnold, Pahrump, NV
N. Stellavato, Nye County, NV

```

<<NUDOCS/AD>> Nuclear Regulatory Commission ADQ54 V6.3.23.0
Record 1 of 1 Full Predefined Search Results ===== Domain ALL ===
Accession #: 9504070255 Page Number: Availability: PDR
Doc Type....: CLOUT Revision...: LPDR Avail...: *
Issue Date...: 950328 Filmed 24X.: * Special Code: *
Index Date...: 950407 Size.....: A4 Text Format.: *
Backfit Ind.: * Nbr Page...: 104pp.

```

-----Title/Description-----

Forwards minutes of 950124 technical meeting between NRC & DOE in Rockville, MD o

Auth Affil-----Name-----+---Catg-----Reference Numbers-----+---Distribution---

P NOMHLWU THOMA,J.O. | | | | NH03 950407

Recip Affil-----Name-----+---Catg---Rel Dates--+---Task Number--+---Dockets---+---Domain---

P EUSDOE MILNER,R.A. | | | | | | HLWR

File Locations-----+---File Packages-----+---Microfilm Location---

PDR -WASTE-* -WM-11 950328 | 9504070255-# PDR 83453-187 83453-290
 NMSS SUBJ * 102.8 950328 |

Arrows-Scroll, TAB/HOME-New Area, ENTER-View Text, F3-New Search, F10-5 Summary.
 unt: *1 <Replace>

*see with attached
3/22/95*
MAR 27 1995

MEETING MINUTES

BI-MONTHLY EXPLORATORY STUDIES FACILITY MEETING

Staff from the Nuclear Regulatory Commission met at NRC headquarters in Rockville, Maryland with representatives of the U.S. Department of Energy on January 24, 1995 to discuss items of mutual concern regarding the Exploratory Studies Facility at Yucca Mountain. Representatives of the State of Nevada, also attended the meeting. Other Affected Units of Local Government had been invited to the meeting, but did not attend. An attendance list is included as Attachment 1.

The first presentation was an update on ESF construction by the representatives of DOE (Attachment 2). It was explained that DOE has been considering what the most effective, safe, and appropriate construction methods are for the ESF. The result has been several changes to the construction methods and materials being used. One of the primary changes is the decision to use a standard design for major components (e.g., the tunnel support system) that only need to be issued once.

The representatives of DOE described the progress that had been made by the tunnel boring machine (TBM) (see Attachment 3) and noted that progress was averaging 10.5 feet per day. The NRC staff questioned whether the amount of steel set being replaced in the tunnel would constrain progress in the near term. The DOE representatives indicated that they did not believe so.

An update on the drilling program was presented by the representatives of DOE (Attachment 4). Among the activities completed in the last quarter of calendar year 1994 were: pneumatic instrumentation (with the beginning of monitoring) at NRG-7A and NRG-6; air permeability testing at NRG-6; and the preparation of the test planning package for Nye County drilling at ONC #1.

The DOE staff presented an update on ESF design control (Attachment 5). It was noted that some of the changes that have been areas of concern recently were the result of the changeover in contracting organizations from previous contractors to the DOE Management and Operations contractor. Among the problems that occurred during this period were mis-communication between Management and Operations Contractor management and staff on the relative importance of schedule versus product quality. The DOE representatives described the temporary and permanent changes to the quality assurance and design control organizations at the Management and Operations Contractor. These changes involved how and where checking and review functions were carried out in the Management and Operations Contractor organization.

An overview of design progress and the design process was presented by the DOE staff (Attachment 6). This presentation included an overview of the various design packages and a discussion of the Management and Operations Contractor design control process. The DOE representatives also discussed revisions being made to the Basis for Design document which has been difficult to maintain and update. The Basis for Design document is being replaced on an individual basis by design packages with requirements allocations analyses.

A discussion on integration of site characterization data into repository design (Attachment 7) was the next topic addressed. The NRC staff had expressed concern on this subject and the DOE representatives described the approach being taken to address this concern. The program approach has resulted in a focusing of the testing programs to acquire the information needed to make the higher level findings which support the technical site suitability decision and subsequent licensing process. The DOE representatives stated that the designers receive training on 10 CFR Part 60. The NRC staff expressed concern as to whether the designers understood that the requirements were licensing requirements for which compliance must be demonstrated in an application for construction authorization and subsequent licensing proceedings.

102.8

Enclosure

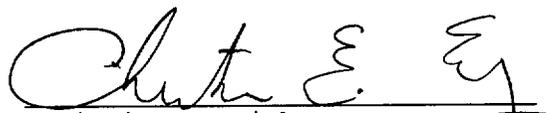
The final presentation was on DOE management of commitments to NRC (Attachment 8). It was noted that all commitments are entered into a Yucca Mountain Site Characterization relational database from which commitment status reports are generated. Notification of fulfillment of commitments is transmitted to the NRC staff.

In closing remarks, the NRC staff suggested, and the DOE representatives agreed, that a presentation on TBM lessons learned should be included in upcoming ESF meetings.

A representative of NV noted that this was the third meeting at which the design and design control processes were discussed. He wondered when the problems identified would be fixed.



Mark S. Dellicatt
Senior Project Manager
High-Level Waste and Uranium
Recovery Projects Branch
Division of Waste Management
Office of Nuclear Material Safety
and Safeguards
U.S. Nuclear Regulatory Commission



Christian E. Einberg
Regulatory Integration Division
Office of Civilian Radioactive
Waste Management

BIMONTHLY ESF MEETING

01/24/95

NAME	AFFILIATION	PHONE
MARK DELLIGATTI	NRC	415-6620
Alden Segrest	MFO	702-794-1924
KEATH J LOBO	MFO	702-794-1929
JIM REFOGLE	DOE	702-794-7920
JACK NESBITT	MFO	702-794-7152
Bob Sandifer	MFO	702-794-1869
Richard Grand	DOE	702-295-9667
Ray Wallace	USGS/MHQ	202-586-1244
Mark Sanderling	DOE/PAW-37	202-586-2279
WILLIAM BOYLE	DOE	702-794-7595
Phil HAMMOND	MFO	702-794-5153
Raymond A Mele	MFO/UCFS	702-794-7126
Bened Jaganath	NRC	301-415-6653
Bako Ibiahim	NRC	301-415-6651
Sue Gagner	NRC/OP4	301/415-8200
Carl Hamilton	DOE	702-794-5118
Steve Frushman	NU NAWPO	702/687-3744
JACK SPRAVU	NRC/OH	301-415-6715
PHILIP JUSTUS	USNRC/DWM	301-415-6745
Bob Gamble	MFO/UCFS	702-295-9663
Robert L. Johnson	NRC	301-415-7282
William Ford	NRC	301-415-6630
Avul Mozhi.	WGS70N	(202) 646-6248.

BIMONTHLY ESF MEETING

01/24/95

NAME	AFFILIATION	PHONE
Gene Rosebaum	USGS - Potomac	703-648-4422
MICHAEL BELL	NRC / DUM	301-415-7284
APRIL BIL	DOE / YMP	(702) 794-7622
TONI MIDWALLA	WESTON	(202) 646-6710
MYSORE (RAJ) Nataraja	NRC / NMSS / DWM	(301)-415-6695
Fredrick Rodgers	DOE / Hydr / Reg. Int.	(202) 586-9313
John Buckley	NRC	301-415-6607
John L Russell	CMWRA	703 / 416-1129
KUSS (M-F) (LAW)	NIDTRB	702 / 233-4412
Steve McDuffie	NRC	301-415-6684
Tom Rogers	M+O / WEP	202-488-2320

U.S. DEPARTMENT OF ENERGY

**Y
U
C
C
A

M
O
U
N
T
A
I
N**



**YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT**

**DOE/NRC TECHNICAL MEETING ON
THE EXPLORATORY STUDIES FACILITY**

ESF CONSTRUCTION UPDATE

PRESENTED BY

RICHARD L. CRAUN

ASSISTANT MANAGER

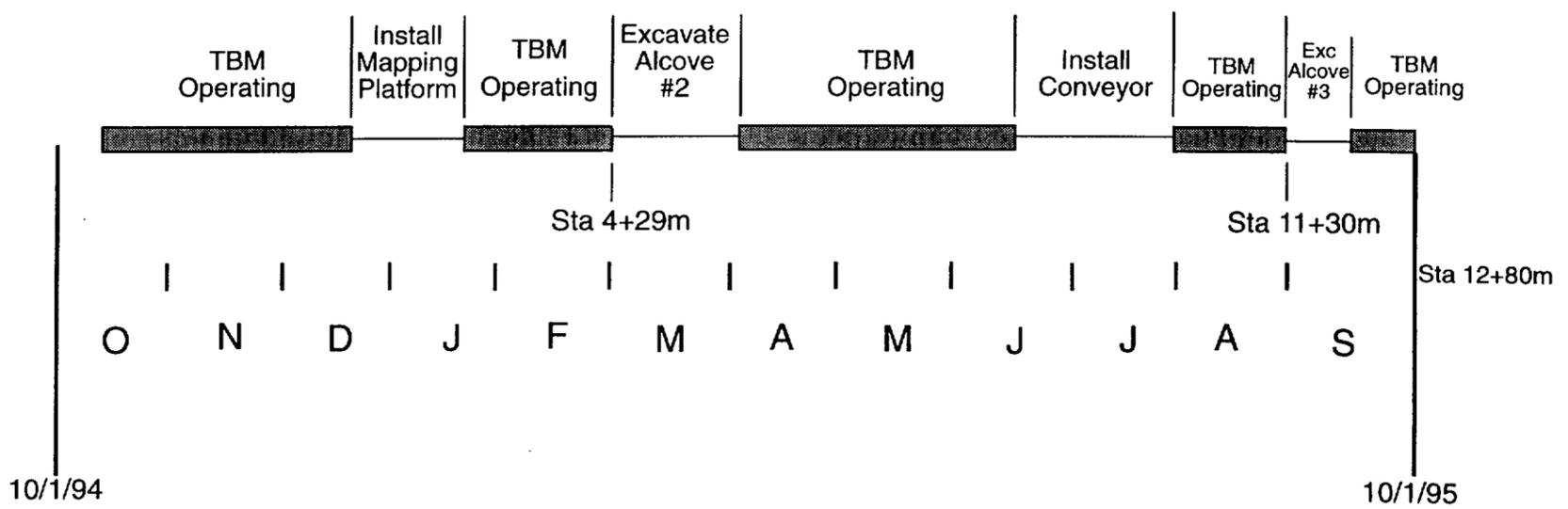
FOR ENGINEERING AND FIELD OPERATIONS



**JANUARY 24, 1995
ROCKVILLE, MD**

FY95 Excavation Schedule

FY95 Excavation Schedule



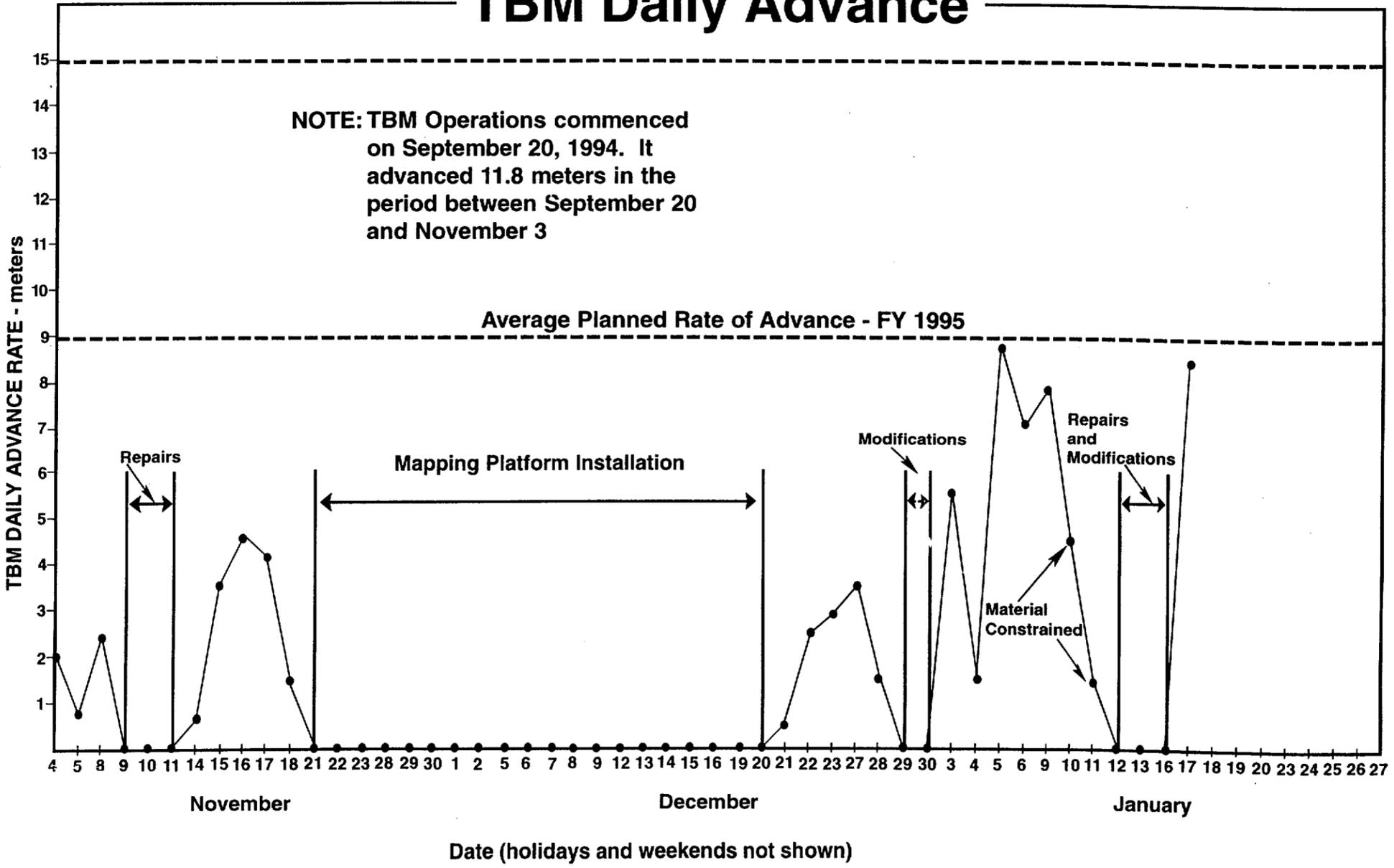
- **Current Plan 5 days/week and 3 shifts/day**
- **30-week TBM operation**
- **Average advance approximately 9 meters/days**
- **67% TBM availability; 50-60% utilization**

TBM Downtime

- **Three weeks downtime for installation of the mapping platform**
- **Four weeks downtime for excavation of Alcove #2 using drill-and-blast method**
- **Five weeks downtime for installation of the subsurface conveyor**
- **Four weeks downtime for excavation of Alcove #3 using drill-and-blast method**

TBM Daily Advance

NOTE: TBM Operations commenced on September 20, 1994. It advanced 11.8 meters in the period between September 20 and November 3



TBM Construction Lessons Learned

- **TBM consumable material was not available to support operation**
 - **Only limited number of bidders responded to initial solicitation**
 - » **Initial specification requirements exceeded those that were necessary and sufficient to ensure the adequacy of the equipment to perform its intended function**
 - **Initially, no bidders on qualified Bidders List. Now have two steel set manufacturers and two parts manufacturers qualified**
 - **Had to dedicate commercial grade device to a basic component application**
 - **Ground support design approval was included in Package 2C which was delayed in the approval process**

Long Term Construction Enhancements Under Review

- **Alcove excavation by mechanical means or drill and blast concurrent with TBM operations**
- **Use of standard designs (ground support, utilities...etc.) that span the entire ESF**
- **Simplify utility design and use of alternate utility support systems during the construction phase**
- **Conveyor delivery and installation schedules are under review for improvement**

From these topics that have been discussed at the Technical Exchange on October 4-5, 1993 and the ESF Technical Meetings on December 8, 1993, February 3, 1994, April 19, 1994, July 27, 1994 and October 4-5, 1994 the following additional information was requested:

- (1) It would assist the NRC staff in better understanding the ESF design process if DOE could indicate all DOE and M&O documents (e.g., implementing procedures, instructions, drawings) in a schematic or flowdown chart accompanied by a brief explanation of what each document is intended to accomplish. Item generated at the 10/4-5/93 meeting.

STATUS: Closed Out - Presentation "ESF Technical Baseline" given by Bob Sandifer at the April 19, 1994 meeting.

Representatives of NRC, State of Nevada, and Clark and Nye Counties agreed that additional discussion of DOE's document hierarchy for the ESF was needed. The discussion should provide insight into how the different documents in the hierarchy are used and are related to each other. It was also suggested that DOE provide examples by following requirements through the entire design control process to illustrate how a requirement is incorporated into the design and provide an example of a design change and how that change would be dealt with in the design process. Item generated at the 12/8/93 meeting.

STATUS: Closed Out - Presentation "ESF Technical Baseline" given by Bob Sandifer at the April 19, 1994 meeting.

- (2) The NRC staff noted that the Site Characterization Program Baseline document, that contains the objectives and descriptions of the site characterization program, contains editorial inconsistencies and should be revised. Item generated at the 12/8/93 meeting.

STATUS: Open - SCPB revision #11 is closed, but SCPB revision #12 is in progress.

- (3) A copy of the current Q-list was requested by the NRC staff. Item generated at the 12/8/93 meeting.

STATUS: Closed Out - Letter with enclosures from Mr. Dwight E. Shelor of the DOE to Mr. C. William Reamer of the NRC, dated January 12, 1994.

Attachment 3

- (4) The State of Nevada representative asked for a future briefing on the decision process for the enhanced design, to include information on the rationale for, and documentation of, design decisions and who was involved in those decisions. Item generated at the 12/8/93 meeting.

STATUS: Closed Out - Presentation "The Enhanced ESF Layout - Rationale and Process" given by Dan McKenzie at the 2/3/94 meeting.

- (5) The State of Nevada representative requested that explanations of the Determination of Importance Evaluation (DIE) and how DIEs are integrated with the design are needed. Item generated at the 2/3/94 meeting.

STATUS: Closed Out - Presentation "ESF Technical Baseline" given by Bob Sandifer at the April 19, 1994 meeting.

- (6) The NRC staff agreed with the Nye County representative's comment that there appears to be no formal mechanism for integrating technical data into the design and requested additional discussion on this topic at future meetings. Item generated at the 2/3/94 meeting.

STATUS: Closed Out - Presentation "Integration of Test Data into the ESF Design" given by John Pye at the July 27, 1994 meeting.

The Nye County representative expressed concerns about the potential impact of striking water at UZ-14 and SD-12 on the ESF design and test interference evaluations. The integration of test data into the ESF design process and test plans should be addressed at a future ESF meeting. Item generated at the 4/19/94 meeting.

STATUS: Closed Out - Presentation "Integration of Test Data into the ESF Design" given by John Pye at the July 27, 1994 meeting.

- (7) The NRC staff stated that it does not understand the rationale for the seismic design values presented for underground permanent items. DOE agreed to provide a statement of the rationale. Item generated at the 2/3/94 meeting.

STATUS: Open

- (8) The NRC staff requested a copy of DOE STD 1021-92, "Natural Phenomena Hazards Performance Categorization Criteria for Structures, Systems and Components". Item generated at the 2/3/94 meeting.
- STATUS: Closed Out - Letter with enclosures from Mr. Dwight E. Shelor of the DOE to Mr. Joseph J. Holonich of the NRC, dated May 4, 1994.
- (9) The NRC staff requested a copy of the description and rationale for the enhanced ESF design. Item generated at the 2/3/94 meeting.
- STATUS: Closed Out - Letter with enclosures from Mr. Dwight E. Shelor of the DOE to Mr. Joseph J. Holonich of the NRC, dated May 4, 1994.
- (10) The State of Nevada representative requested that DOE explain how decisions related to test alcove locations and excavation are integrated with technical test requirements. Item generated at the 2/3/94 meeting.
- STATUS: Closed Out - Presentation "ESF Test Alcoves" given by William Boyle at the 4/19/94 meeting.
- (11) The Clark County representative requested that DOE provide some examples of trade-off studies that were conducted. Item generated at the 2/3/94 meeting.
- STATUS: Closed Out - A list of trade-off studies were presented at the April 19, 1994 meeting.
- (12) The NRC staff requested that the graphical presentation of the document hierarchy be simplified and illustrate how the SCPB links with the other documents. Item generated at the 4/19/94 meeting.
- STATUS: Closed Out - Presentation "SCPB Relationship to Project Documents" given by Tom Geer at the July 27, 1994 meeting.
- (13) The NRC staff and Nye County representative requested a copy of the "Managed Document List". Item generated at the 4/19/94 meeting.
- STATUS: Closed Out - Letter with enclosures from Mr. Dwight E. Shelor of the DOE to Mr. Joseph J. Holonich of the NRC, dated June 13, 1994.

- (14) The NRC staff requested that the process of how items are placed on the Q-list should be addressed at the next meeting. Item generated at the 4/19/94 meeting.

STATUS: Closed Out - Presentation "Evolution of ESF Q-List" given by Tom Geer at the July 29, 1994 meeting.

- (15) The NRC staff would like to see a Program Approach timeline for site suitability and licensing processes. Item generated at the 4/19/94 meeting.

STATUS: Open. DOE provided NRC with a timeline for site suitability at the 9/21/94 Management Meeting. DOE will provide a timeline for licensing at a future Technical Meeting.

- (16) The NRC staff requested a response to the June 21, 1994 letter from Joseph Holonich to Dwight Shelor that discussed pneumatic pathway concerns, which might be impacted by tunnel boring activities. DOE agreed to address these concerns in a telecon, prior to the TBM operation. Item generated at the 7/27/94 meeting.

STATUS: Closed Out - Letter with enclosures from Dr. Stephen J. Brocoum of the DOE to Mr. Joseph J. Holonich of the NRC, dated August 10, 1994.

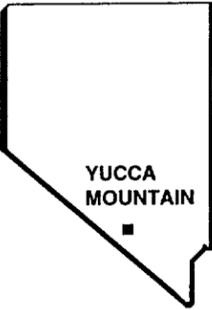
- (17) The NRC staff had questions regarding the completion of analyses of alternatives relative to the design stages, the relationship of design activities to the schedules of activities associated with DOE's Proposed Program Approach, and the relationship of the Title II design to development of the Environmental Impact Statement. DOE agreed to address these questions at a future ESF Technical Meeting. Item generated at the 7/27/94 meeting.

STATUS: Open

- (18) The NRC staff requested a presentation concerning the methodologies and analyses used for placing items on the Q-List. This item will be placed on the agenda sometime in the future when the advanced conceptual design becomes further matured. Item generated at the 7/27/94 meeting.

STATUS: Open. DOE and NRC agreed at the December, 1994 Interactions Scheduling Meeting that the DOE would delay responding to this item until after the NRC makes a decision concerning DOE's proposed rule change to the 10 CFR 60 sections on design basis events. This decision by the NRC is not anticipated prior to the later part of 1995.

**W
D
O
E
M**



**YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT**

**DOE/NRC TECHNICAL MEETING ON
THE EXPLORATORY STUDIES FACILITY**

ESF CONSTRUCTION UPDATE

PRESENTED BY

**JAMES M. REPLOGLE
DEPUTY ASSISTANT MANAGER
ENGINEERING & FIELD OPERATIONS**



**JANUARY 24, 1995
ROCKVILLE, MD**

Construction Update

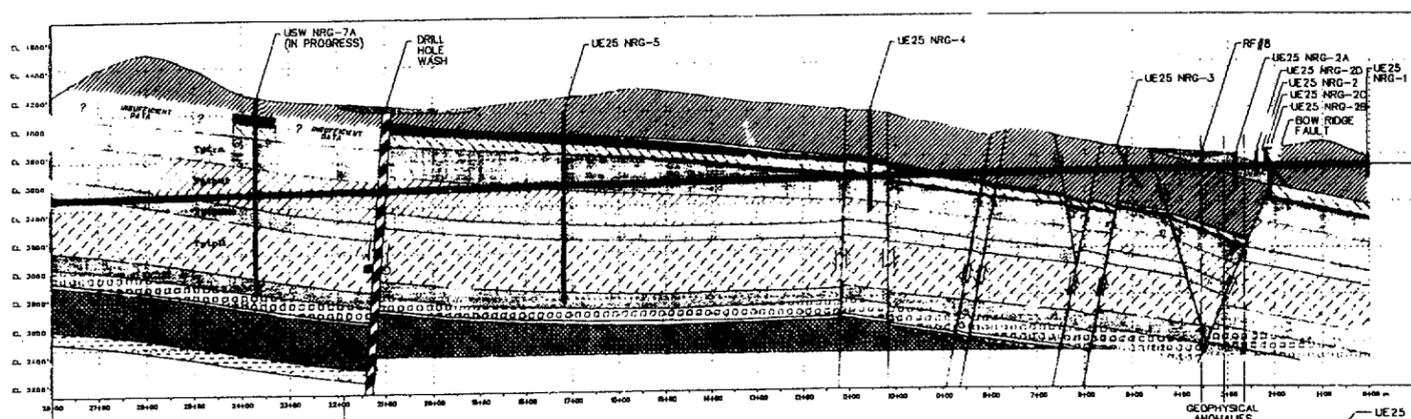
TBM Progress

- TBM resumed Phase II operations on 12-21-94
- The head of the TBM is at _____
- By end of fiscal year expect to be at Sta. 12+80 meters
- Bow Ridge Fault is expected to be encountered at approx. Sta. 01+90 meters
- We are approx. _____ meters from Bow Ridge Fault (expect to encounter it in early 95)
- Our expected rate of excavation is estimated at approx. 11.5 meters per day (5 day/wk, 3 shift/day) using muck car haulage
- _____ steel sets have been installed to date
- TBM operation with mapping gantry functional occurred on 1-18-95

SECTION VIEW

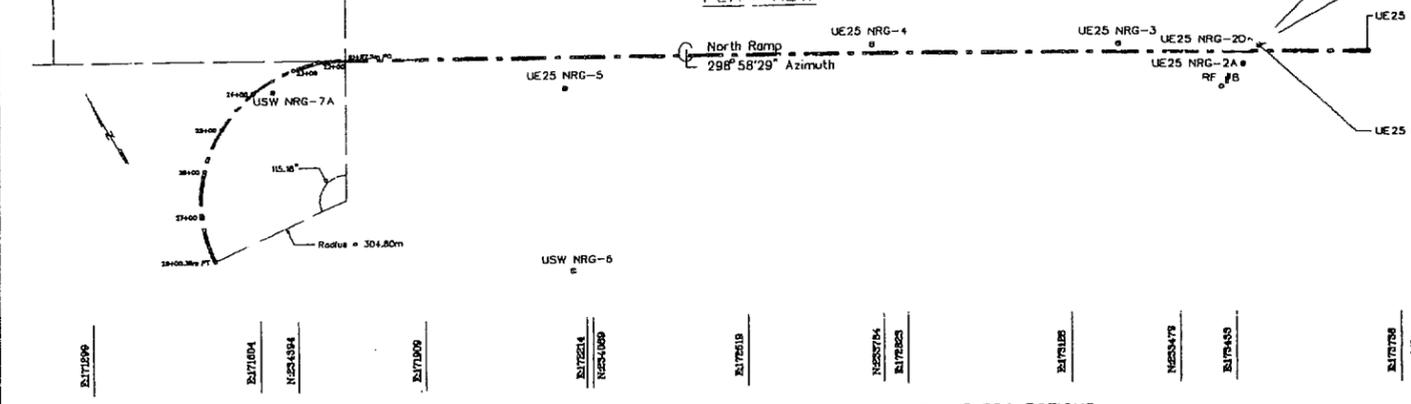
0 100 200m
SCALE

SYMBOLS



GROUP	FORMATION	SYMBOL	DESCRIPTION	UNIT
TIMBER MOUNTAIN TUFF	Qcc	[Symbol]	Qcc: Alluvium	UD
	Tm1	[Symbol]	Tm1: Robin Mass Tuff	
	Tmb1	[Symbol]	Tmb1: pre-Rainier Mesa Tuff bedded tuff	
	Tpk1	[Symbol]	Tpk1: tuff unit "x"	
TIVA CANYON TUFF	Tpc1	[Symbol]	Tpc1: Tiva Canyon Tuff	TC
	Tpb1	[Symbol]	Tpb1: pre-Tiva Canyon Tuff bedded tuff	
YUCCA MOUNTAIN TUFF	Tpy	[Symbol]	Tpy: Yucca Mountain Tuff	Pfm
	Tpl3	[Symbol]	Tpl3: pre-Yucca Mountain Tuff bedded tuff	
PAH CANYON TUFF	Tpp	[Symbol]	Tpp: Pah Canyon Tuff	Pfm
	Tpb2	[Symbol]	Tpb2: pre-Pah Canyon Tuff bedded tuff	
LITHOPHYSEAL ZONES	Tplrc	[Symbol]	Tplrc: Crystal-rich north lithophysal crystal-rich vitric zone	TS=1
	Tplur	[Symbol]	Tplur: Upper lithophysal crystal-rich and crystal-poor parts	
	Tplmr	[Symbol]	Tplmr: Middle north lithophysal crystal-poor	
	Tpllr	[Symbol]	Tpllr: Lower lithophysal crystal-poor	
TOPOGRAF SPRING	Tstov	[Symbol]	Tstov: Vitric lithophysal and non-welded subzone	TS=1
	Tstb	[Symbol]	Tstb: pre-Topograh Spring Tuff bedded tuff	
	Tstc	[Symbol]	Tstc: Calico Hills lava flow	
CALICO HILLS	Tstc	[Symbol]	Tstc: Calico Hills lava flow	TS=2
	Tstb	[Symbol]	Tstb: pre-Topograh Spring Tuff bedded tuff	
CRATER FLAT TUFF	Tstf	[Symbol]	Tstf: Crater Flat Tuff	TS=3
	Tstg	[Symbol]	Tstg: Topograh Tuff	

PLAN VIEW



STRATIGRAPHIC NOMENCLATURE DEVELOPED BY USGS

- [Symbol] DRILL HOLE WASH FALLT ZONE, LOCATION AND ALTITUDE UNCERTAIN
- [Symbol] FAULT? - ALTITUDE UNCERTAIN
- [Symbol] PROPOSED NORTH RAMP ALIGNMENT
- [Symbol] APPROXIMATE
- [Symbol] STRIKE-SLIP SEPARATION INTO PAGE
- [Symbol] STRIKE-SLIP SEPARATION OUT OF PAGE

PRELIMINARY RAMP DATA

Station (m)	Grade	State Plane Easting (m)	State Plane Northing (m)	Elevation (m)
2100 (Pavil)	-3.05%	222289.2	172879.8	1872.55
2200		222288.4	172880.8	1872.72
2300		222287.6	172881.8	1872.89
2400		222286.8	172882.8	1873.06
2500		222286.0	172883.8	1873.23
2600		222285.2	172884.8	1873.40
2700		222284.4	172885.8	1873.57
2800		222283.6	172886.8	1873.74
2900		222282.8	172887.8	1873.91
3000		222282.0	172888.8	1874.08
3100		222281.2	172889.8	1874.25
3200		222280.4	172890.8	1874.42

BOREHOLE PROJECTIONS

Borehole	Projection to Station along Azimuth	Ground Elevation (m)	Distance to Station (m)
UE25 NRG-1	182°	1872.55	0.00
UE25 NRG-2A	182°	1872.72	12.20
UE25 NRG-2B	182°	1872.89	24.40
UE25 NRG-2C	182°	1873.06	36.60
UE25 NRG-3	182°	1873.23	48.80
UE25 NRG-4	182°	1873.40	61.00
UE25 NRG-5	182°	1873.57	73.20
USW NRG-7A	210°	1873.74	125.40
RF #8	182°	1873.91	137.60

Note: Boreholes projected into cross section along strike of rock units.
NP - Not projected

REV. NO.	DATE	BY	VERSION	SUPERSEDES
5	6-20-88	ODP	QA15	QA11
4	5-28-88	ODP	QA14	QA13
3	5-8-88	ODP	QA13	QA12
2	5-4-88	ODP	QA12	QA11
1	5-1-88	ODP	QA11	QA10

ESF NORTH RAMP
YUCCA MOUNTAIN SITE
CHARACTERIZATION PROJECT
CROSS SECTION ALONG RAMP FROM
0+00 TO 28+00.38m (PT)

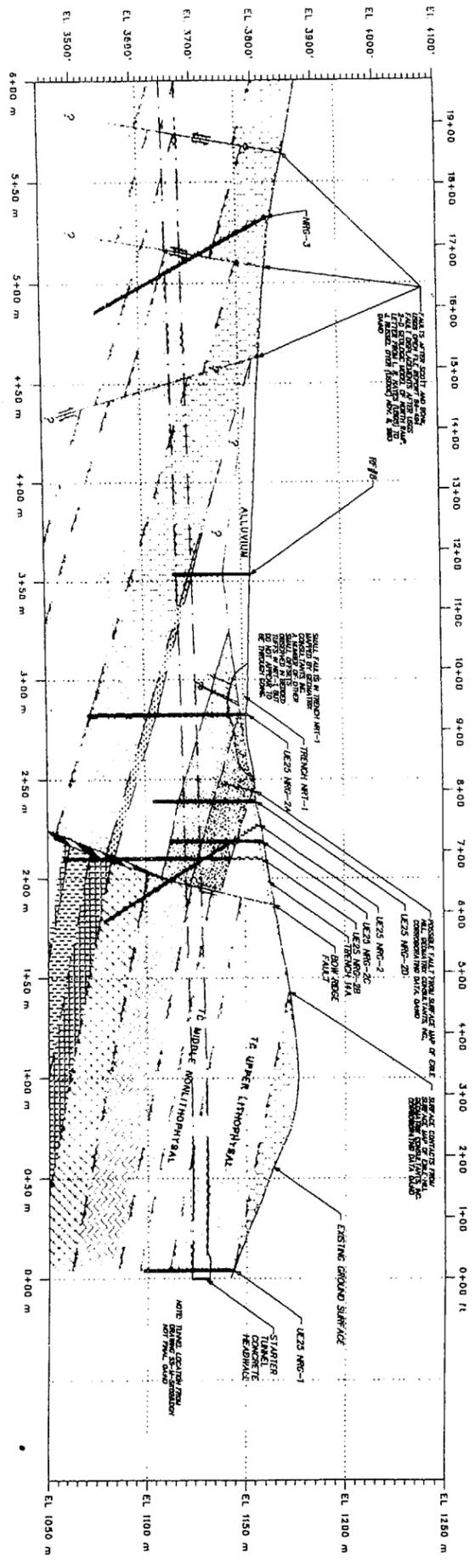
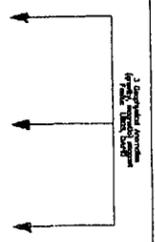
Sandia National Laboratories

BASE DRAWING: USGS 1-6-83
MODIFICATIONS: ES 1-3-84
DESIGNED BY: JPH/ML

1 - 2-D MODEL OF NORTH RAMP LETTER FROM
R. HAYES (USGS) TO J. MUSGOLD (ORNL)
NOVEMBER 8, 1983 (DAND)

DRAWING NO.: ES-88-40
VERSION: QA15
SHEET 1 OF 1

REVISIONS
QA:QA



FORMATION	MEMBER	MAJOR ZONES	CORRELATIVE SUBZONES	DISTINCTION DESCRIPTION
TUMBER MOUNTAIN TUFF	RAMBER MESA	PRE-BANKER LESS BEDDED TUFF		NON-LINED TUFF AND FALLOUT
		TUFF UNIT 2*		PROCLASTIC FLOW AND FALLOUT
PAINTBRUSH TUFF	TINA CANYON	UPPER MOUNTAINPHYSICAL	CANYON UPPER CLIFF	NON-LINED, BEDDED PROCLASTIC FLOW AND FALLOUT
		MIDDLE MOUNTAINPHYSICAL		NON-LINED TUFF AND FALLOUT
		LOWER LITHOPHYSAI		PROCLASTIC FLOW AND FALLOUT
		WAGNER COLUMNAR		NON-LINED TUFF AND FALLOUT

LEGEND	
	LITHOLOGIC CONTACT SOLID LINE
	FAULT ZONE
	PROPOSED TRENCH

Borehole	Project to Section Station	Ground Elevation	Distance to Section
UE23 NBG-1	197	1154.93	0.0
UE23 NBG-2	187	1152.53	19.40
UE23 NBG-3A	182	1152.42	20.48
UE23 NBG-3B	182	1152.42	20.48
UE23 NBG-3C	182	1152.42	22.24
UE23 NBG-3D	182	1152.42	22.88
UE23 NBG-3E	211	1163.25	20.52
UE23 NBG-3	211	1154.55	85.52

Note: Boreholes projected into cross section along strike of rock units.
 NP - Not projected



CROSS SECTION CONSTRUCTED
ALONG RAMP ALIGNMENT - AZMUTH 289°

0 20 40 60 80 100m
1:2000

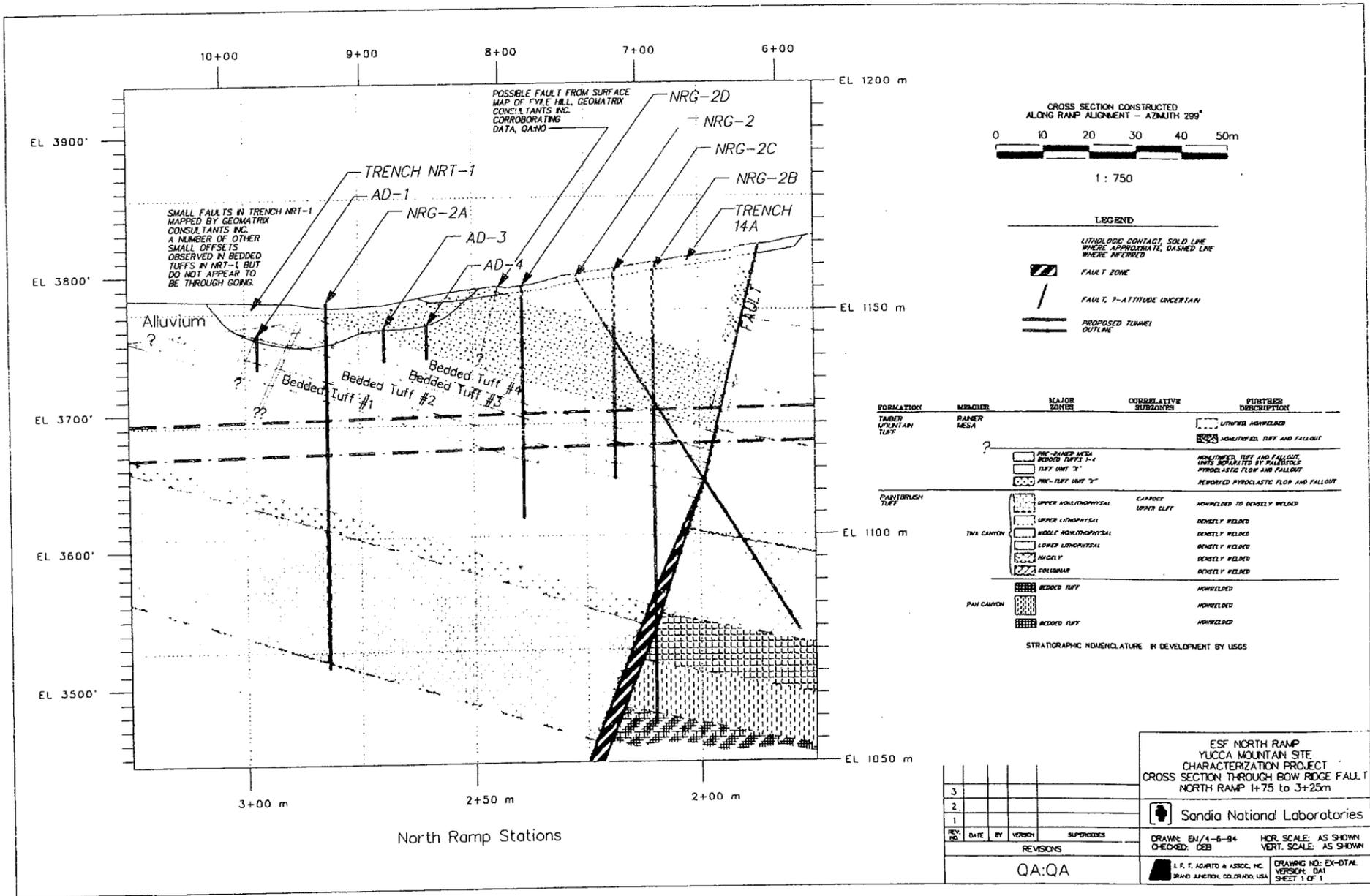
NO.	DATE	BY	REVISIONS
1	10/20/03	DAVDA	ISSUED
2	10/20/03	DAVDA	REVISED
3	10/20/03	DAVDA	REVISED

DAVDA

EST. NORTH RAMP
YUCCA MOUNTAIN SITE
CHARACTERIZATION PROJECT
CROSS SECTION THROUGH EXIST. HILL
NORTH RAMP 0+00 TO 6+00m

Sando National Laboratories

DRAWN BY: JZ-0-93
CHECKED BY: JZ-0-93
DATE: 10/20/03
SCALE: AS SHOWN
SHEET 1 OF 1



CROSS SECTION CONSTRUCTED
ALONG RAMP ALIGNMENT - AZIMUTH 299°

0 10 20 30 40 50m

1: 750

LEGEND

LITHOLOGIC CONTACT, SOLID LINE
WHERE APPROXIMATE, DASHED LINE
WHERE INFERRED

FAULT ZONE

FAULT, P-ATTITUDE UNCERTAIN

PROPOSED TUNNEL
OUTLINE

FORMATION	MEMBER	MAJOR ZONES	CORRELATIVE SUBZONES	FURTHER DESCRIPTION
TARGET MOUNTAIN TUFF	RAMBER MESA			LITHIFIED AND FALLOUT
				UNLITHIFIED TUFF AND FALLOUT
				INDISTINCT TUFF AND FALLOUT, UNITS SEPARATED BY SUBSTRATE PYROCLASTIC FLOW AND FALLOUT
				REWORKED PYROCLASTIC FLOW AND FALLOUT
PARISHRUSH TUFF				
		UPPER ANDERSONVILLE	CAPROCK UPPER ELFT	HOWELED TO DENSELY WELDED
		UPPER LINDHOLM		DENSELY WELDED
		MIDDLE ANDERSONVILLE		DENSELY WELDED
		LOWER LINDHOLM		DENSELY WELDED
		MIDDLE		DENSELY WELDED
		COLUMBIAN		DENSELY WELDED
		BEDED TUFF		HOWELED
		BEDED TUFF		HOWELED
		BEDED TUFF		HOWELED

STRATIGRAPHIC NOMENCLATURE IN DEVELOPMENT BY USGS

3									
2									
1									
REV. NO.	DATE	BY	VERSION	SUPERSEDES					
REVISIONS									
QA:QA									

ESF NORTH RAMP
YUCCA MOUNTAIN SITE
CHARACTERIZATION PROJECT
CROSS SECTION THROUGH BOW RIDGE FAULT
NORTH RAMP 1+75 TO 3+25m

Sandia National Laboratories

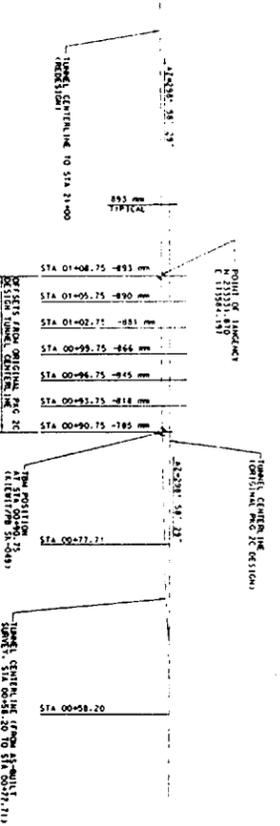
DRAWN: EM/1-5-94
CHECKED: DEB

HOR. SCALE: AS SHOWN
VERT. SCALE: AS SHOWN

L. F. AGUIRRE & ASSOC., INC.
BRAND ARIZONA, COLORADO, USA

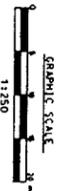
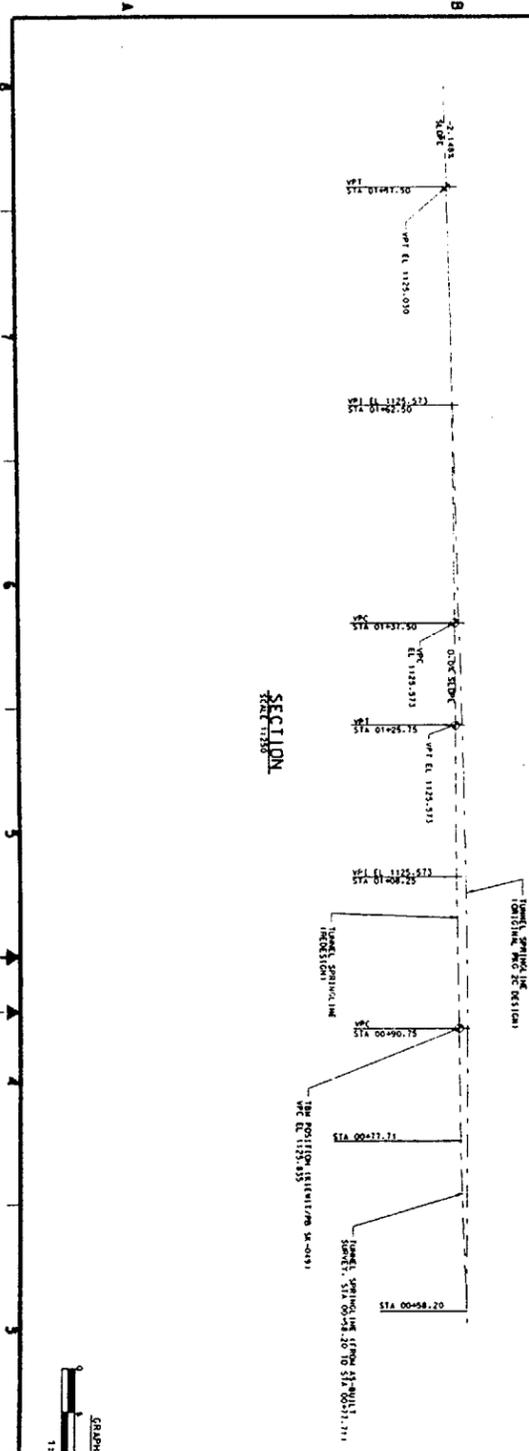
DRAWING NO. EX-DTAL
VERSION: 041
SHEET 1 OF 1

- NOTES**
1. ALL DISTANCES, INCLUDING STATIONING, SHOWN ON THIS DRAWING ARE TO BE TAKEN FROM THE COMMENCEMENT POINT OF THE CENTERLINE OF THE PLANNED LINE UNLESS OTHERWISE SHOWN.
 2. COMPARISONS, ELEVATION, DISTANCES, AND STATIONING ARE SHOWN IN FEET ON THIS DRAWING. METRIC VALUES ARE SHOWN IN METERS ON THE ORIGINAL DRAWING. METRIC VALUES ARE TO BE USED FOR CONSTRUCTION OF THE PROJECT UNLESS OTHERWISE SPECIFIED.
 3. ALL METRIC COMPARISONS ARE BASED ON THE INITIAL COMPARISON OF THE ORIGINAL DRAWING AND THE ORIGINAL DRAWING.
 4. ELEVATIONS SHOWN ON THIS DRAWING ARE FROM THE POINT OF INTERSECTION OF THE TANGENT AND VERTICAL CURVE.
 5. THE VERTICAL CURVES ARE FOUR-TANGENT PARABOLIC TYPE CURVES.

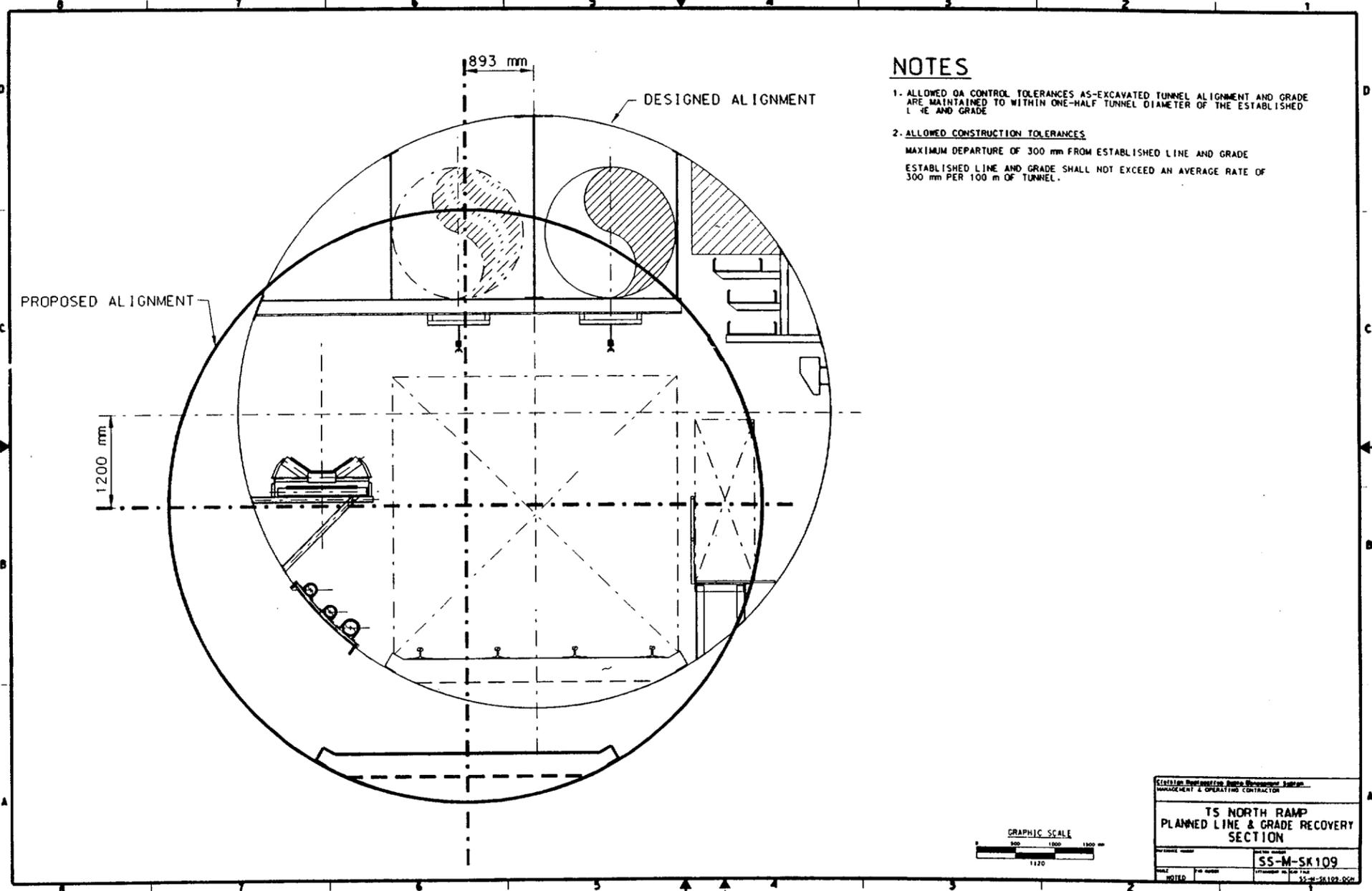


PLAN
SCALE 1:1250

SECTION
SCALE 1:1250

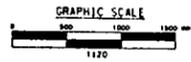


CONSULTING ENGINEER'S NAME & ADDRESS TS NORTH RAMP PLANNED LINE & GRADE RECOVERY PLAN AND SECTION	
PROJECT NO. 11250	SHEET NO. 104
DATE 11/20/04	DRAWN BY SS-M-BK104



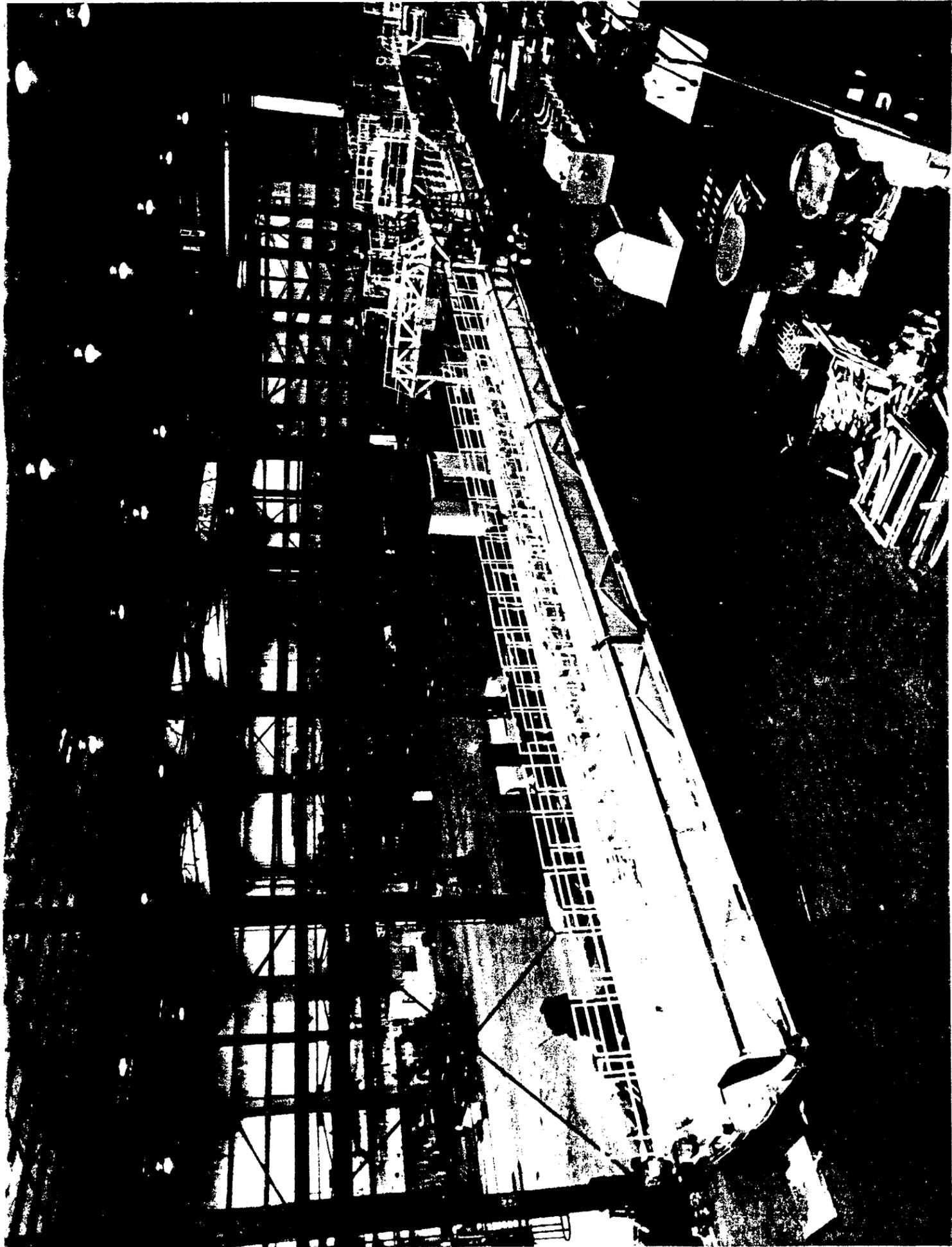
NOTES

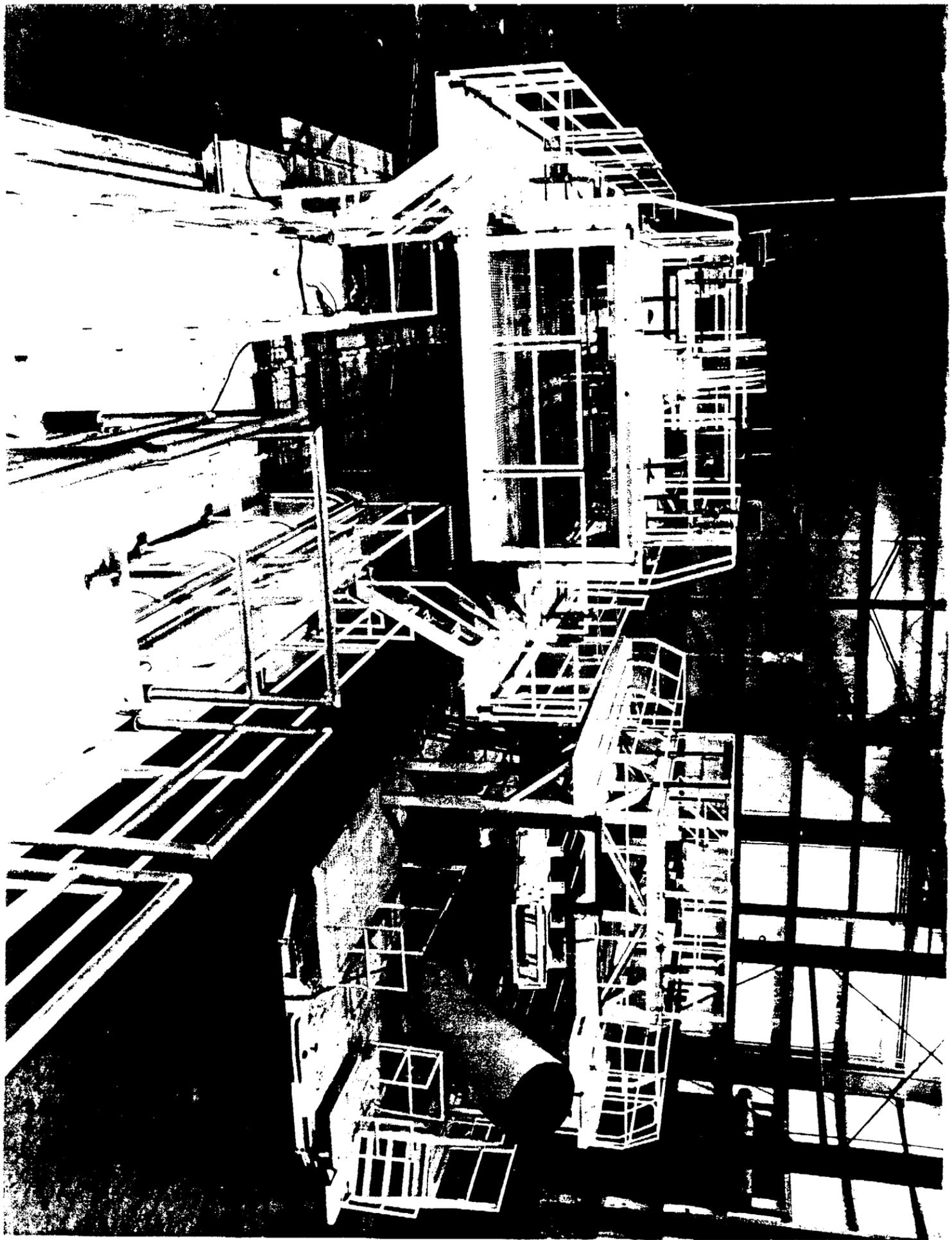
1. ALLOWED QA CONTROL TOLERANCES AS-EXCAVATED TUNNEL ALIGNMENT AND GRADE ARE MAINTAINED TO WITHIN ONE-HALF TUNNEL DIAMETER OF THE ESTABLISHED LINE AND GRADE
2. ALLOWED CONSTRUCTION TOLERANCES
 MAXIMUM DEPARTURE OF 300 mm FROM ESTABLISHED LINE AND GRADE
 ESTABLISHED LINE AND GRADE SHALL NOT EXCEED AN AVERAGE RATE OF 300 mm PER 100 m OF TUNNEL.



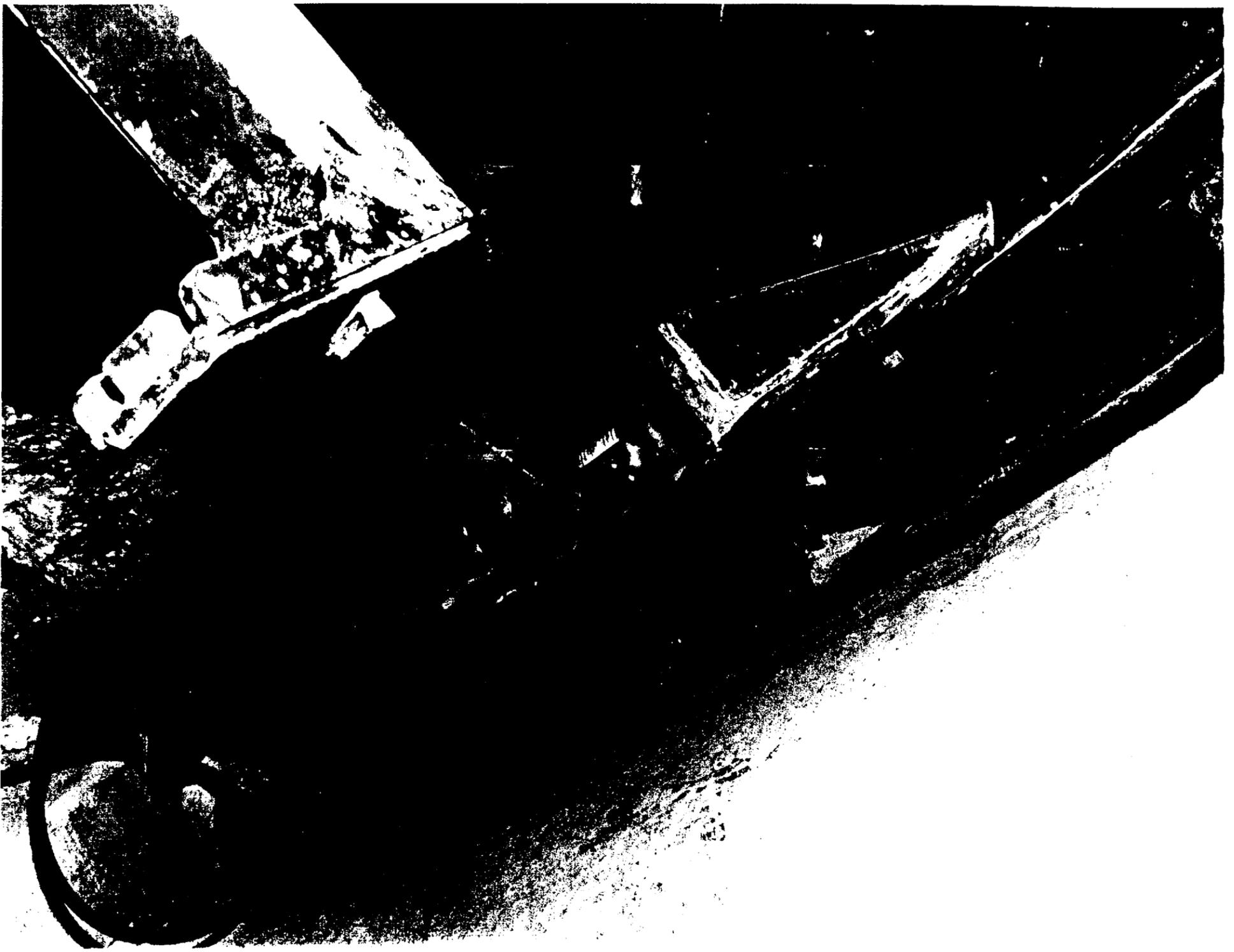
<small>Construction Management System MANAGEMENT & OPERATING CONTRACTOR</small>	
T5 NORTH RAMP PLANNED LINE & GRADE RECOVERY SECTION	
<small>PROJECT NUMBER</small> 55-M-SK109	<small>DATE</small> 11-28-1995
<small>ISSUED BY</small> [Signature]	<small>SCALE</small> 1:1120

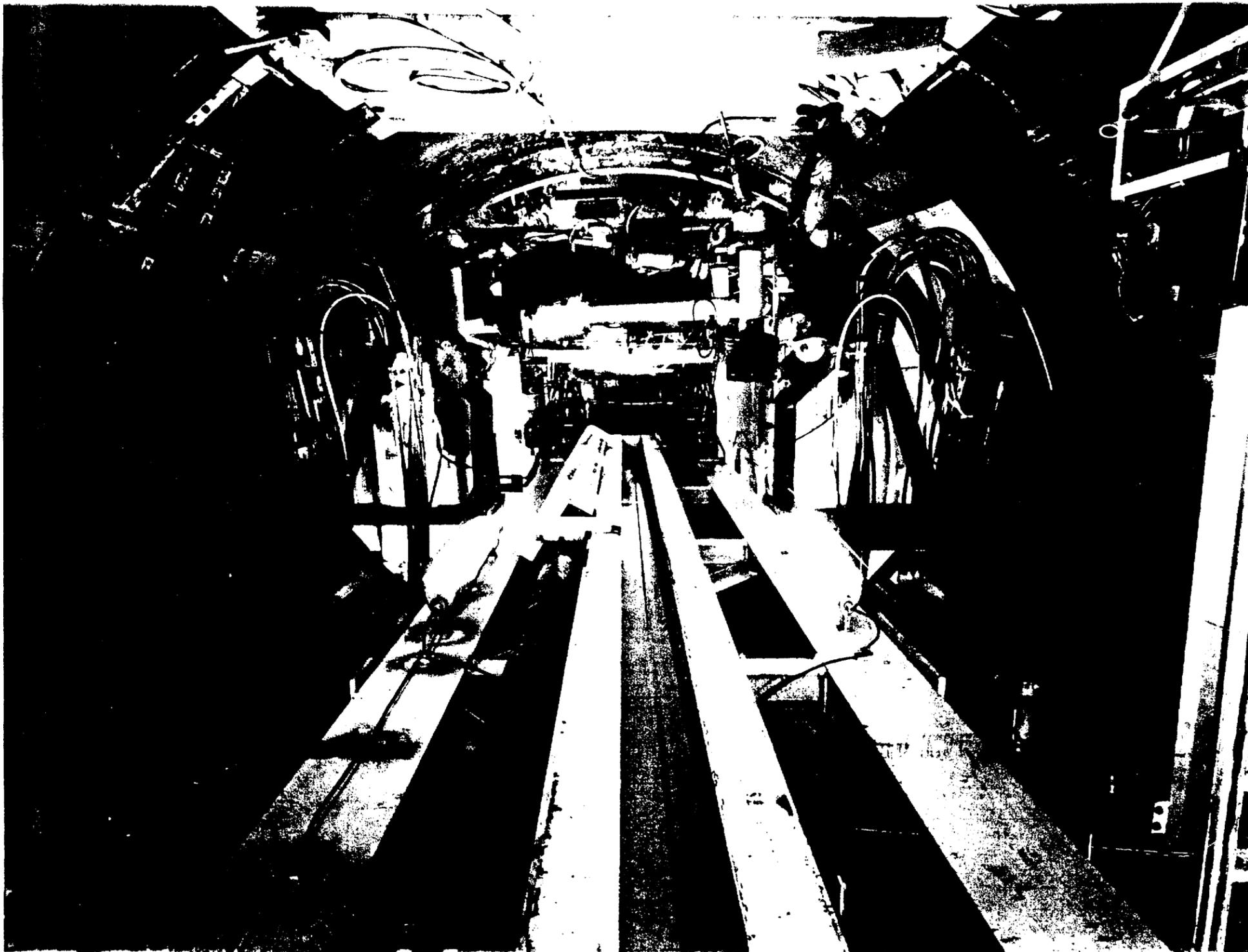
Construction Progress Pictorials



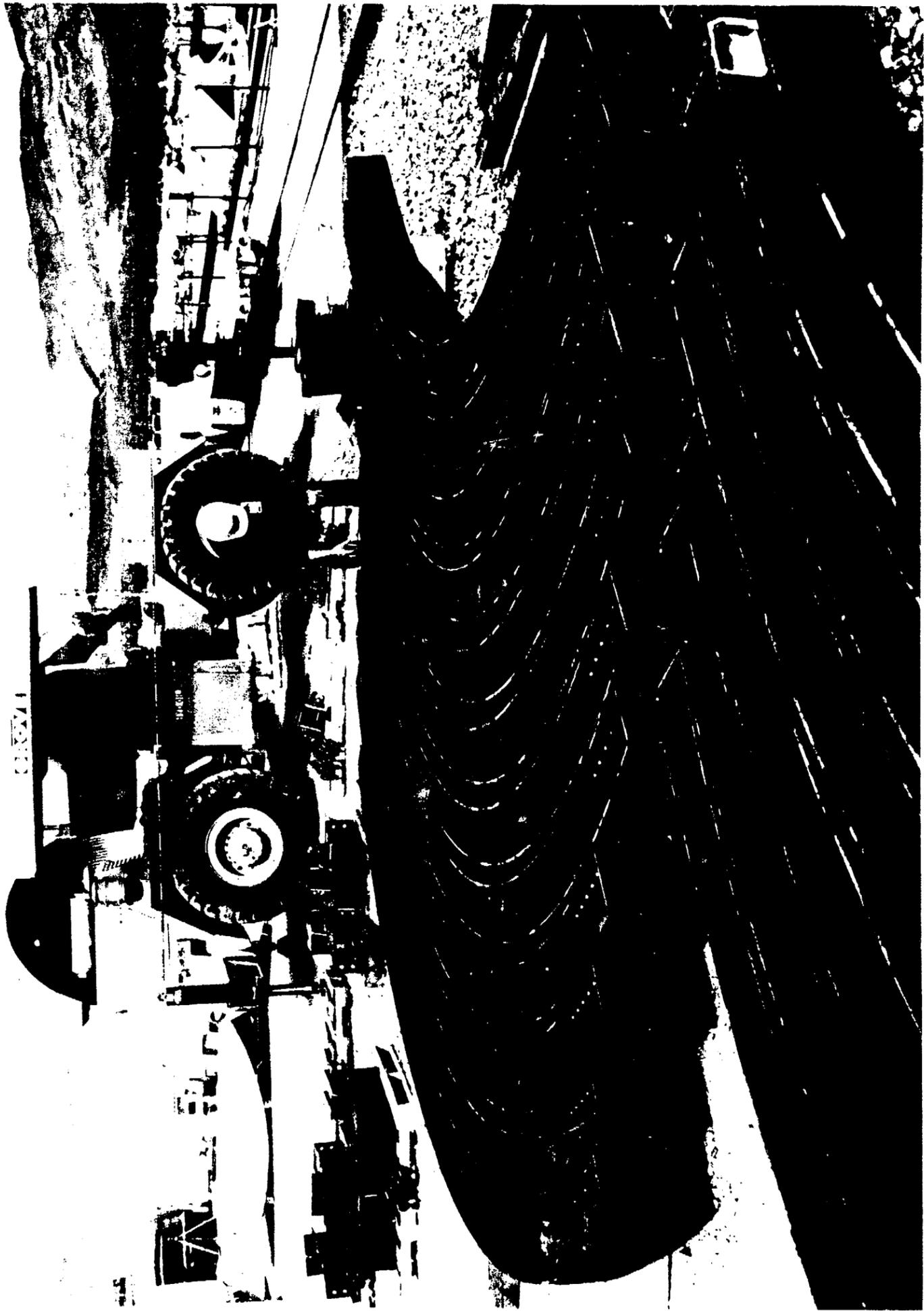


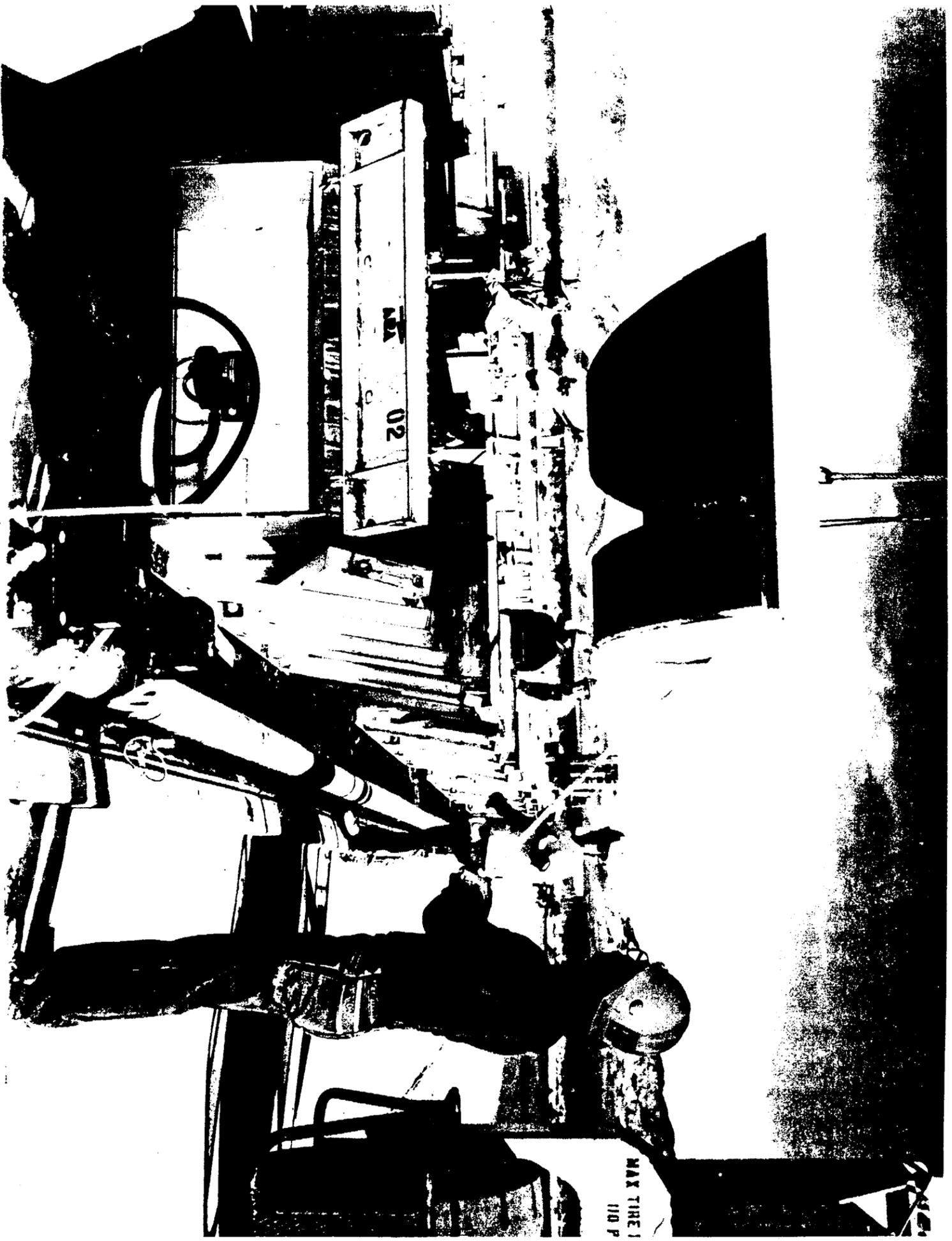




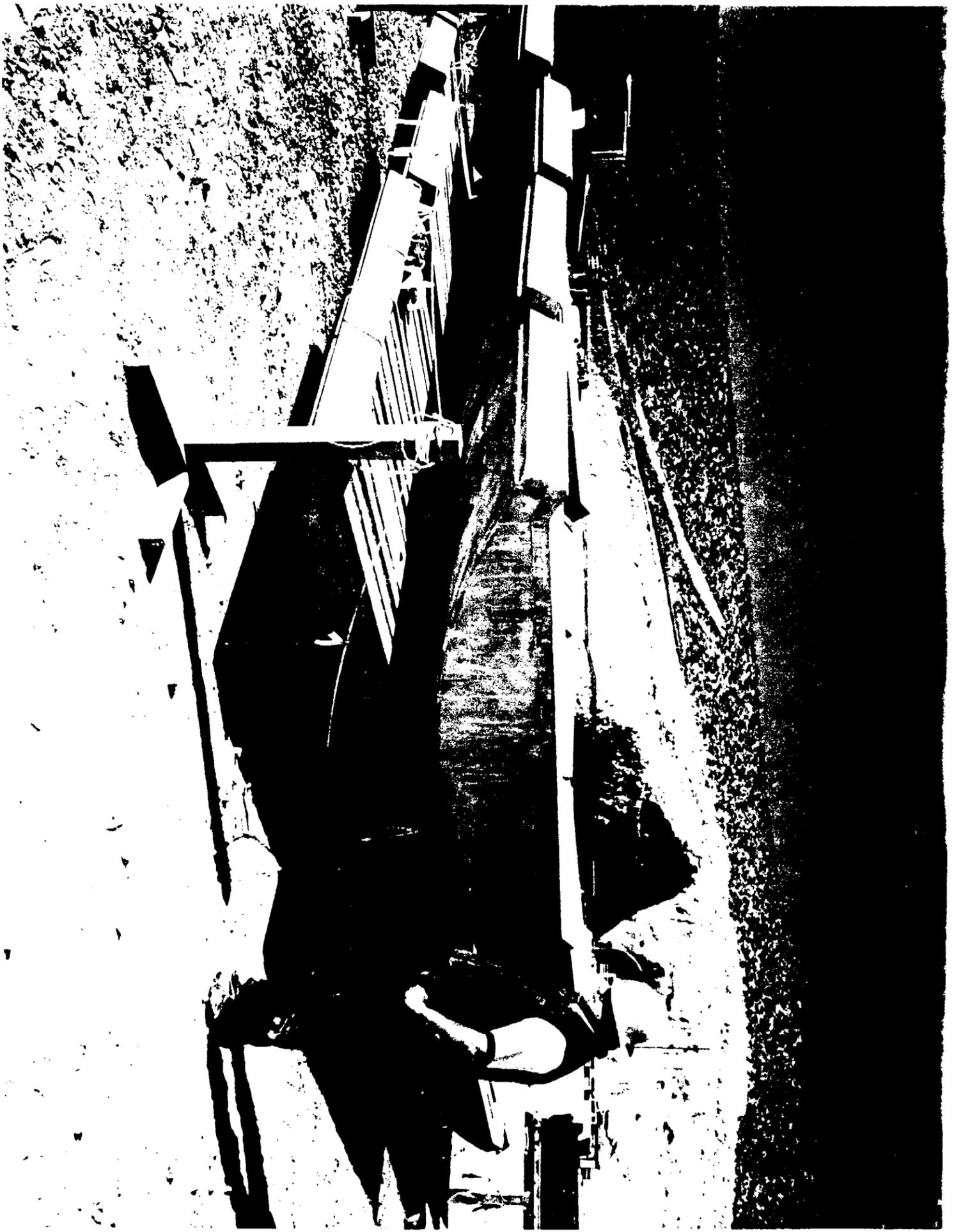




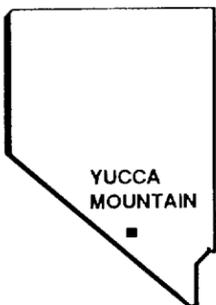




MAX TIRE 1
110 P



CRWMS



**YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT**

**DOE/NRC TECHNICAL MEETING ON
THE EXPLORATORY STUDIES FACILITY**

**OVERVIEW OF THE DESIGN PROGRESS
AND PROCESS**

PRESENTED BY

ALDEN M. SEGREST

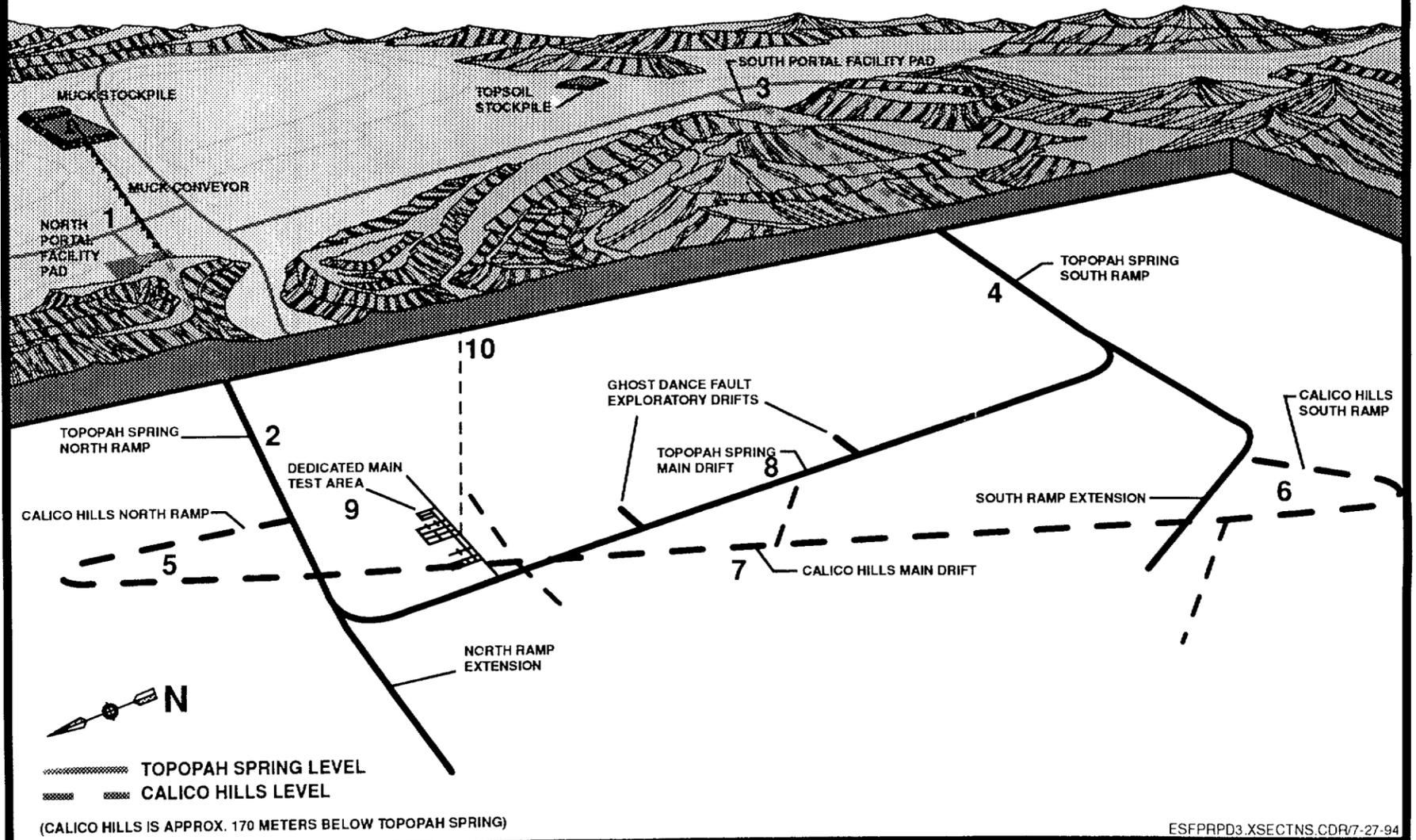
MGDS DEVELOPMENT MANAGER

CRWMS MANAGEMENT AND OPERATIONS CONTRACTOR



**JANUARY 24, 1995
ROCKVILLE, MD**

EXPLORATORY STUDIES FACILITY DESIGN



Design Status

- **ESF Design Packages**

- 1A. Site preparation and partial portal of North Ramp
- 1B. Surface facilities at North Portal
- 1C. Surface utilities at North Portal
- 1D. Surface facilities & foundations at North Portal
- 1E. Surface facilities at North Portal
- 2A. North Ramp from portal to Topopah Spring Level (TSL), analyses & early procurement
- 2B. North Ramp from portal to TSL, analyses & early procurement
- 2C. North Ramp from portal to TSL, specifications & drawings

- 8A. Main Drift at TSL

Design Status

- **Package 1A**
 - Design complete and issued to constructor
- **Package 1B**
 - Design complete and issued to constructor
- **Package 1C**
 - Design complete and issued to constructor

Design Status

- **Package 1D**
 - **Contents**
 - * **Muck Storage Area**
 - * **Conveyor Access Road**
 - * **Fuel Storage System**
 - * **Compressed Air Condensate Drain System**
 - * **Compressed Air and Generator Foundations**
 - * **Partial Site Lighting**
 - * **Partial Grounding Plan**
 - **Currently in DOE acceptance review**
 - **Package scheduled for release to constructor
January 27, 1995**

Design Status

- **Package 1E**

- **Consists of two auxiliary power generators, day tank and ancillary electrical, mechanical and structural items**
- **Design is in-process**
- **Schedule**
 - * **90% Design Review April, 1995**
 - * **Release to constructor July, 1995**

Design Status

- **Integrated Data & Control System**
 - **Description: Facility control and monitoring system as well as a test data acquisition system**
 - **Currently in DOE acceptance review**
 - **Procurement specification scheduled for release February 9, 1995**

Design Status

- **Package 2A**
 - Design complete and issued to constructor
- **Package 2B**
 - Design complete and issued to constructor

Design Status

- **Package 2C**
 - **Contents**
 - * **North ramp excavation and ground support design from the TBM launch chamber to the Topopah Spring level (Q)**
 - * **Utility System drawings and specifications**
 - * **Electrical System procurement and installation drawings and specifications**
 - * **Instrumentation drawings and specifications**
 - * **Ventilation system drawings and specifications**
 - * **Rail Haulage System installation drawings and specifications**
 - * **Balance of miscellaneous subsurface concrete and structural steel drawings and specifications required for conveyor, ventilation and utility systems**

Design Status

- **Package 2C**

- **Status**

- * **All products issued to constructor except for Drill and Blast (1 specification, 1 analysis and 5 drawings)**
 - * **Revisions to Subsurface General Construction specification and Rockbolts specification completed to allow diesel, Swellex bolts and to remove holds**
 - * **Revisions to Scoping, Stability, Shotcrete and Steelset Material Dedication analyses in process to incorporate prior commitments - no impact on design products**

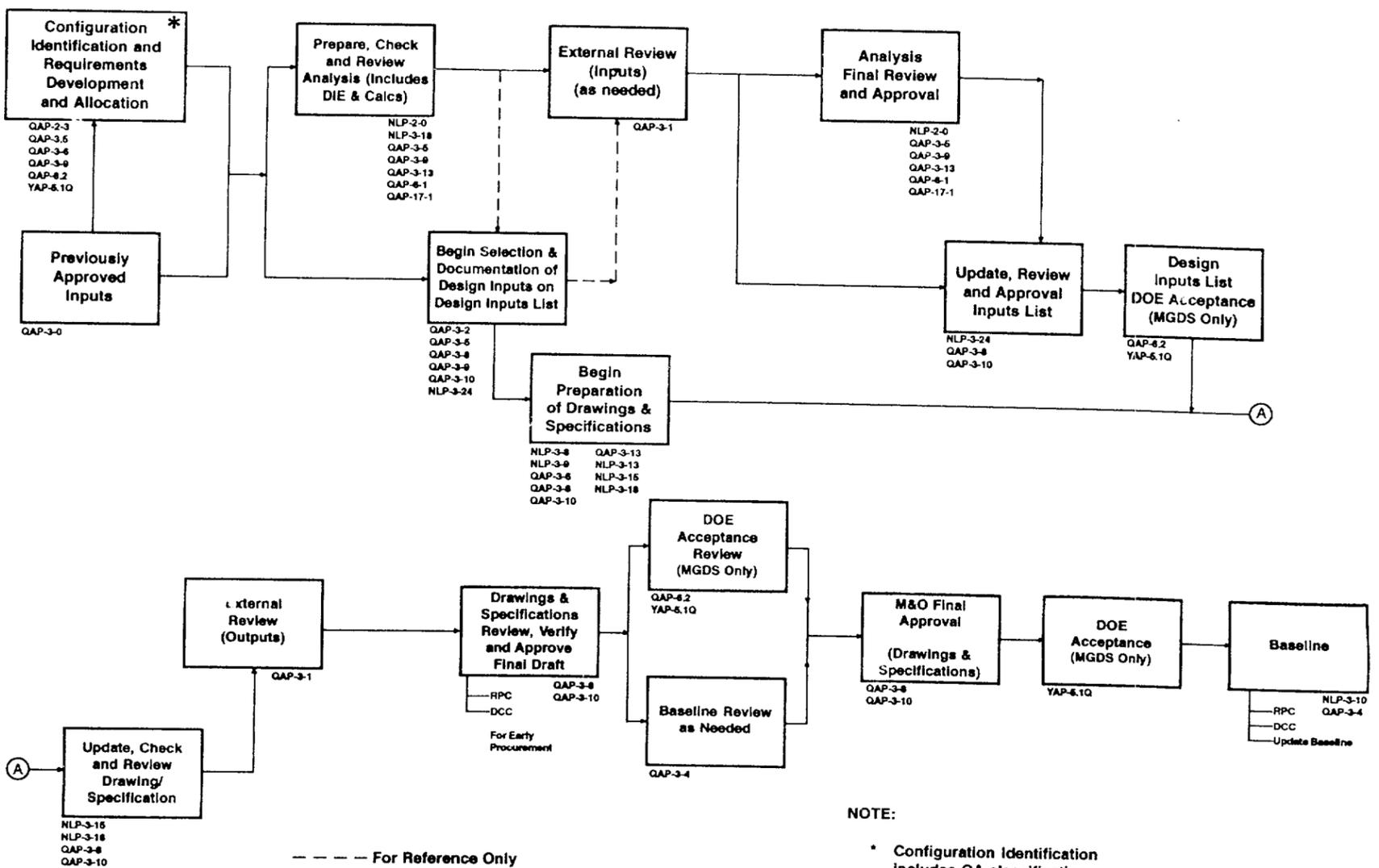
Design Status

- **Package 8A**
 - **Contents**
 - * **Main Test Drift excavation and ground support design from the end of Package 2C to the South Ramp**
 - * **Utility system drawings and specifications**
 - * **Electrical system drawings and specifications**
 - * **Instrumentation system drawings and specifications**
 - * **Rail haulage system drawings and specifications**
 - * **Balance of miscellaneous subsurface concrete, structural steel, ventilation and utility system drawings and specifications**
 - **Design is in-process**
 - **50% Design Review scheduled for April, 1995**

Changes to Design Process

- **Inputs developed, checked, reviewed & approved before drawings and specifications are checked**
- **Design basis documentation streamlined (basis for design documents are simplified)**
- **Acceptance and baseline reviews on approved final drafts**
- **Design verification clarified**

TYPICAL M&O DESIGN CONTROL PROCESS



U.S. DEPARTMENT OF ENERGY

YUCCA MOUNTAIN



YUCCA MOUNTAIN

SITE CHARACTERIZATION

PROJECT

**DOE/NRC TECHNICAL MEETING ON
THE EXPLORATORY STUDIES FACILITY**

**DRILLING, SAMPLING, AND TESTING
PROGRAM UPDATE**

PRESENTED BY

WILLIAM J. BOYLE

PHYSICAL SCIENTIST

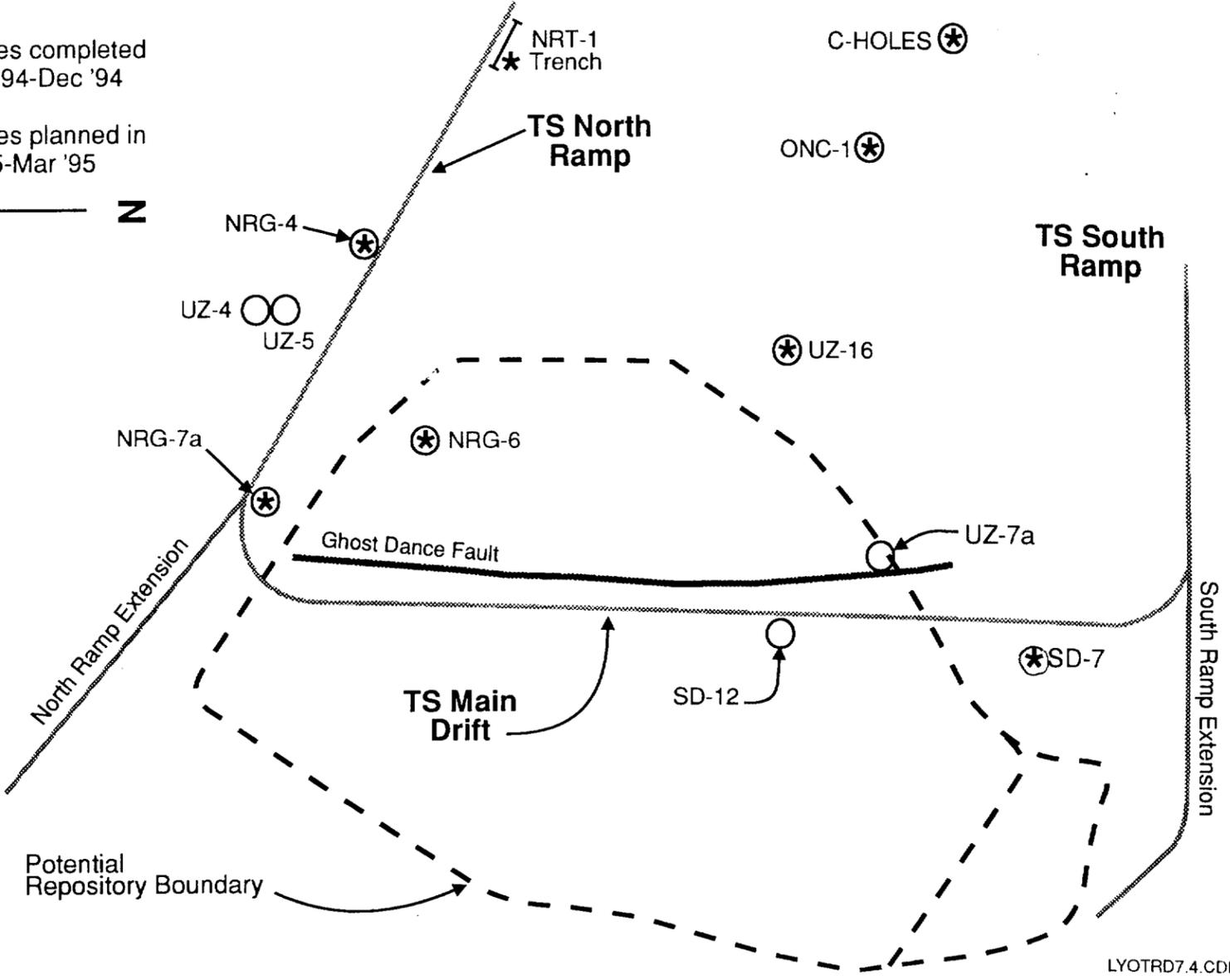
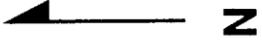


**JANUARY 24, 1995
ROCKVILLE, MD**

Borehole and Trench Locations in the Repository Area

★ Activities completed in Oct '94-Dec '94

○ Activities planned in Jan '95-Mar '95



LYOTRD7.4.CDH 124/1-17-95

Drilling\Sampling\Testing Completed October 15, 1994 - December 31, 1994

NRG-7A	Completed pneumatic instrumentation and began monitoring
NRG-6	Completed air permeability testing; completed pneumatic instrumentation; and began monitoring
UZ-16	Attempted borehole clean out without success; made plans to proceed with instrumentation
SD-7	Drilling started, cored to 256 ft and began reaming borehole to enlarge it to 12 1/4 inch diameter to that depth

Drilling\Sampling\Testing Completed October 15, 1994 - December 31, 1994

(Continued)

ONC #1	Prepared Test Planning Package for Nye County Drilling (Nye County completed borehole to TD of 1458 ft)
NRG-4	Cleaned out borehole for instrumentation by Nye County
Regional Seismic Survey	Completed shot hole drilling and completed seismic field work
Repository Geophysics	Began surface geophysical surveys (seismic reflection, gravity, electromagnetics and magnetics) over the repository area

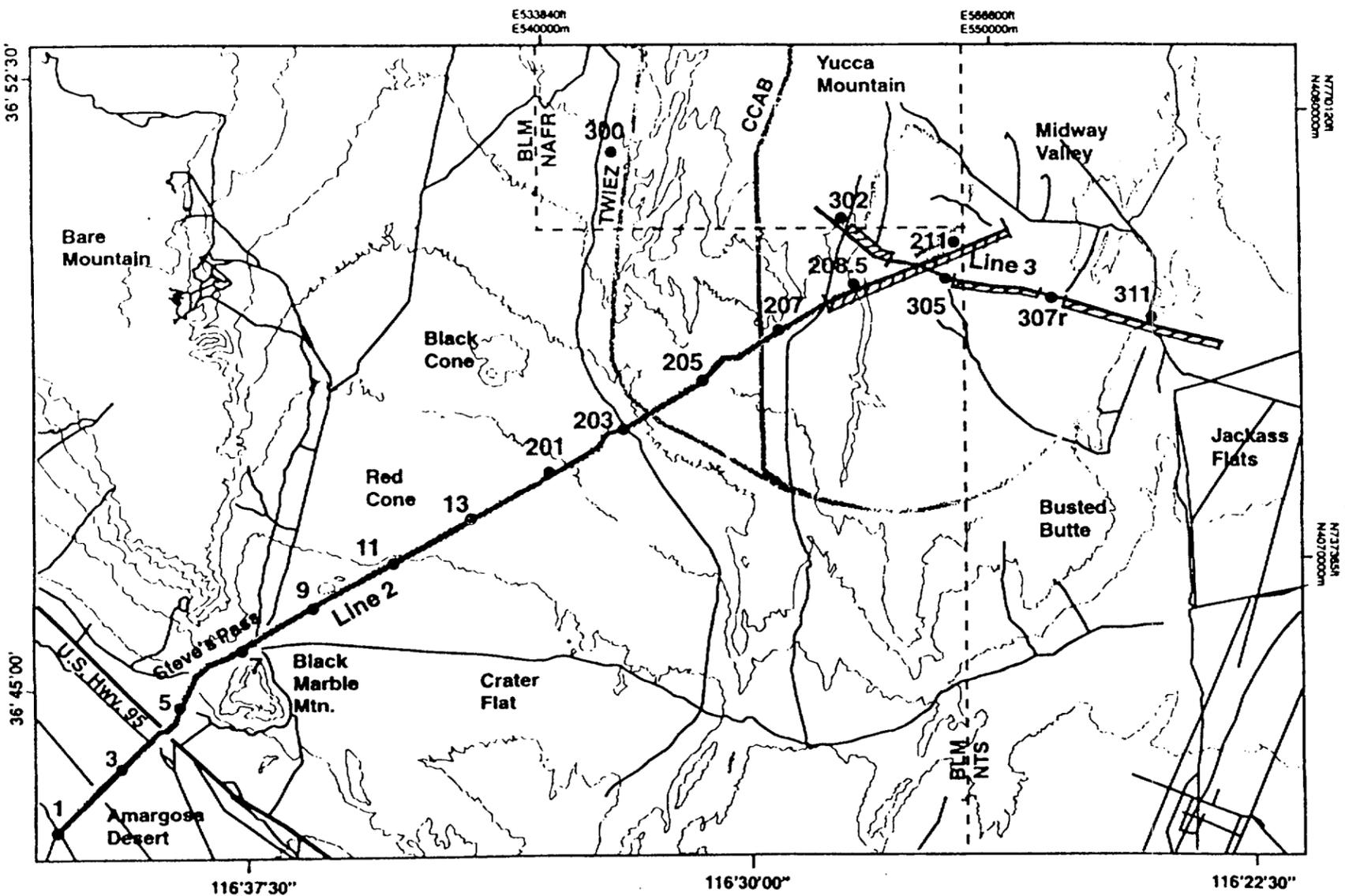
Drilling\Sampling\Testing Completed October 15, 1994 - December 31, 1994

(Continued)

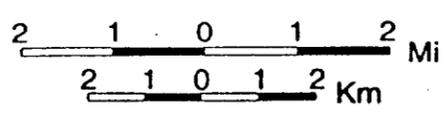
Rock Valley Fault Study	Excavated and mapped 3 trenches
Trench NRT-1	Backfilled trench with controlled, compacted fill
ESF Leach Field	Conducted percolation tests and standard penetration test
C-Hole Complex	Pulled and refurbished instrumentation and packers in C#1 and C#2. Subsequent information indicates a need for remedial work in C#2.

Borehole Geophysical Logging Completed October 15, 1994 - December 31, 1994

- **None**
(No contracts were in place to procure logging services)

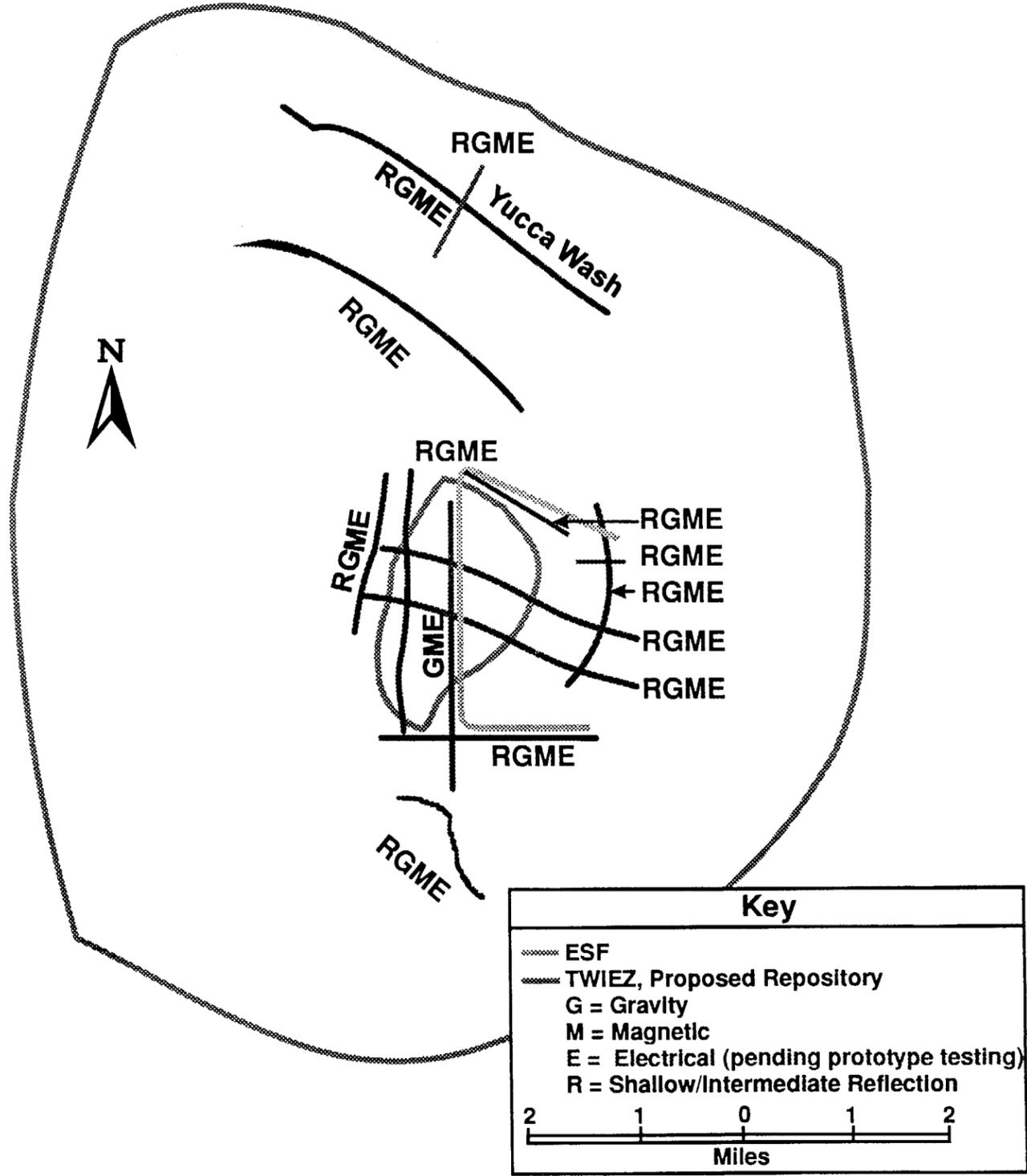


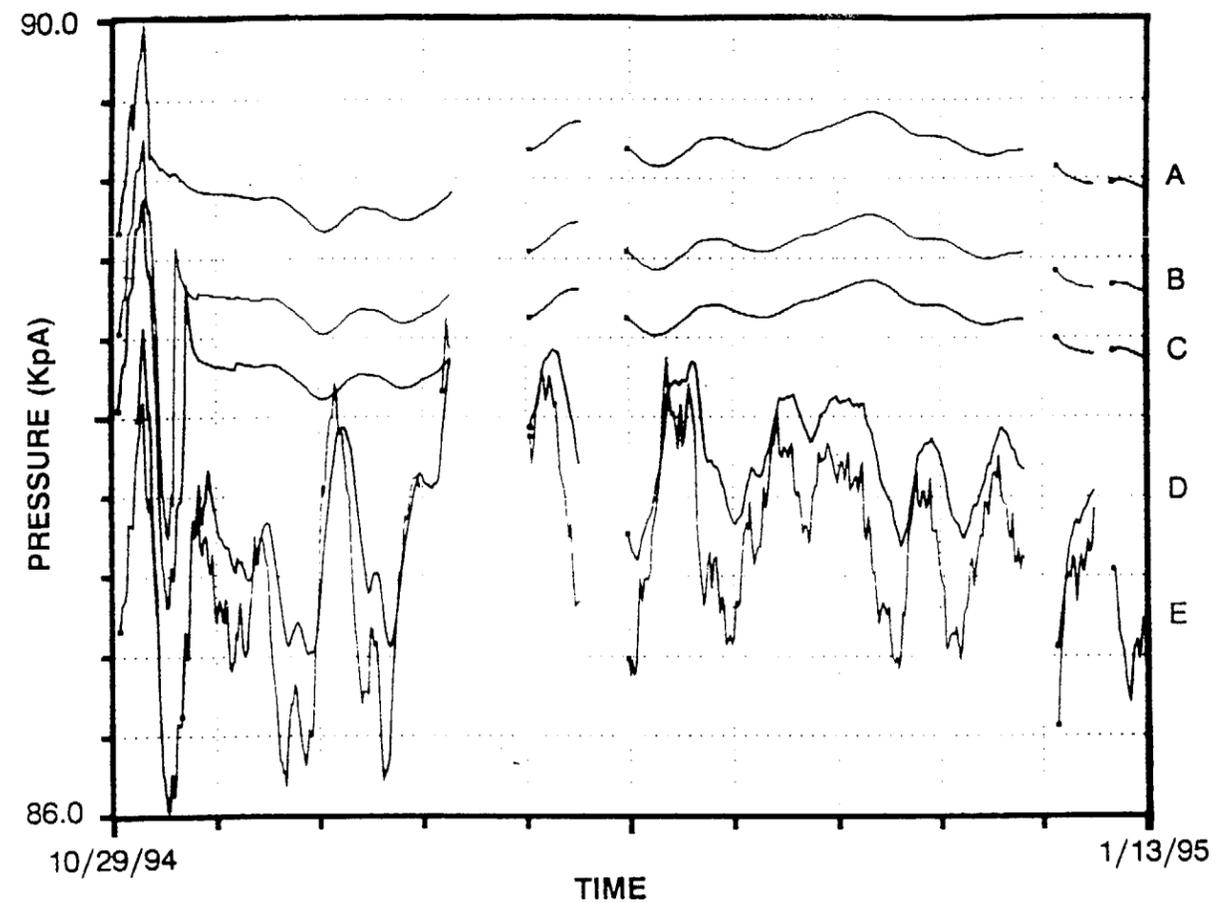
LEGEND
 ● Proposed Shothole
 — VIBROSEIS LINE
 - - - OFF ROAD (MINIHOLES & POULTER CHARGES)



**YUCCA MOUNTAIN
 SITE CHARACTERIZATION PROJECT
 PROPOSED SEISMIC REFLECTION LINES**
 SAVIMP.121.cdr/8-17-94

SCHEMATIC MAP PROPOSED 1995 GEOPHYSICS PROGRAM





Station E	17.7 feet	Alluvium/Hackly Unit of Tiva Canyon
Station D	152.7 feet	Yucca Mountain Member Bedded Tuff
Station C	387.7 feet	Upper Non-Lithophysal Topopah Spring
Station B	493.7 feet	Upper Non-Lithophysal/Upper Lithophysal TS
Station A	667.7 feet	Upper Lithophysal Topopah Spring

NOTE: These data are preliminary and subject to revision. Technical and quality-assurance reviews have not been performed. Pressure values are subject to adjustment during final application of calibration equations. (J. Rousseau, USGS, Project Chief)

**Pneumatic Pressure Record for Borehole NRG-7a
October 29, 1994 to January 13, 1995**

Drilling\Sampling\Testing Planned January 1, 1995 - March 31, 1995

NRG-7a	Continue monitoring pneumatic instrumentation
NRG-6	Continue monitoring pneumatic instrumentation
UZ-16	Install seismic instrumentation for future vertical seismic profiling tests
SD-12	Air permeability testing of the upper 1400 ft of the borehole
ESF Muck Conveyor	Conduct standard penetration tests and test pits to establish bearing values for the conveyor foundation

Drilling\Sampling\Testing Planned January 1, 1995 - March 31, 1995

(Continued)

- | | |
|-----------------------------|---|
| UZ-4 | Begin workover of the existing borehole for subsequent testing and instrumentation |
| UZ-5 | Workover the existing borehole for subsequent testing and instrumentation |
| UZ-7a | Begin drilling |
| NRG-4 and
ONC #1 | Nye County plans to instrument the two boreholes with Westbay instruments |

Drilling\Sampling\Testing Planned January 1, 1995 - March 31, 1994

(Continued)

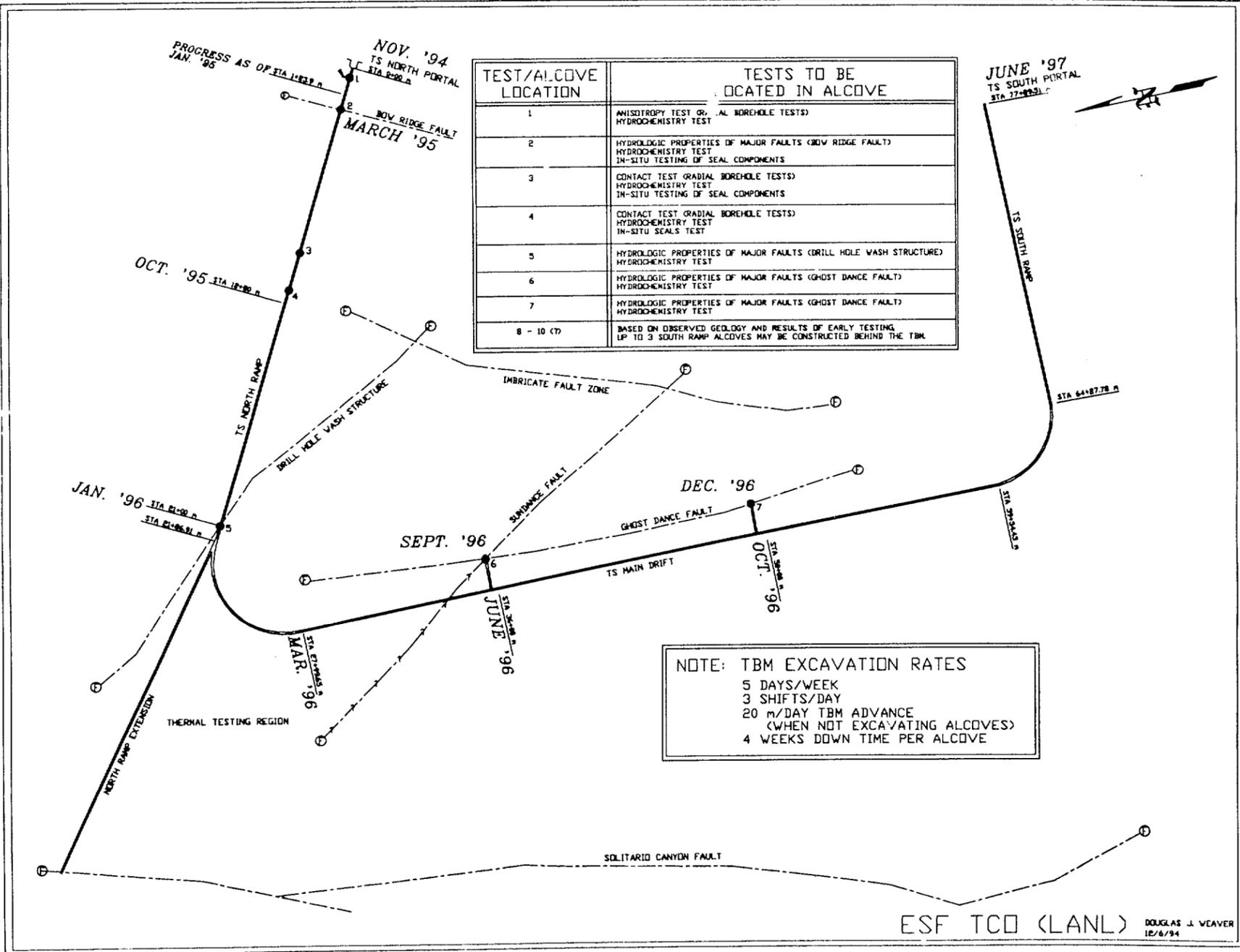
Repository Geophysics Test Program	Complete all planned geophysical tests
Bare Mountain Fault Study	Excavate and map 2 trenches and 5 test pits
Crater Flat Fault Study	Excavate and map 4 trenches
C-Hole Complex	Complete remedial work on instruments and packers for C#2

Borehole Geophysical Logging Planned January 1, 1995 - March 31, 1995

- **Conventional, gyro and/or video logging at the following boreholes:**
 - SD-7
 - SD-9
 - SD-12
 - UZ-4
 - UZ-5
 - UZ-14
 - G-2

EXPLORATORY STUDIES FACILITY

ILLUSTRATION BASED UPON FY1995 ANNUAL WORK PLAN REV.0



ESF TEST ACTIVITIES SUMMARY ACCOMPLISHMENTS AND NEAR TERM OBJECTIVES

I. GEOHYDROLOGY (PERMEABILITY) TESTS IN ALCOVE #1

- DRILLING/CORING OF 3 RADIAL BOREHOLES (30m) ACCOMPLISHED FEBRUARY - MARCH, 1994
 - CORING
 - NEUTRON LOGGING
 - TV LOGGING
- VACUUM TESTING (INITIAL GAS HYDROCHEMISTRY) COMPLETED MAY, 1994
- INITIAL TEMPERATURE/PRESSURE BASELINE DEVELOPED DURING JUNE, 1994
- SINGLE-HOLE PACKER TESTING AT VARIABLE DEPTH IN ALL THREE HOLES COMPLETED SEPTEMBER, 1994
- SECOND PHASE HYDROCHEMISTRY TESTING AT VARIABLE DEPTH IN ALL THREE HOLES COMPLETED SEPTEMBER, 1994
- HIGH CAPACITY AIR COMPRESSOR/PURIFIER FOR CROSS-HOLE TESTING ARRIVED ON-SITE, NOVEMBER, 1994
- TBM SHUTDOWN FOR MAPPING GANTRY INSTALLATION RESULTED IN 10-WEEK DELAY IN INITIATION OF CROSS-HOLE RADIAL BOREHOLE TESTING (PACKERS IN ALL 3 HOLES) (FROM MID-NOVEMBER TO EARLY FEBRUARY, 1995)
- INITIAL TESTING AND MONITORING PHASE TO CONTINUE FOR 3-4 MONTHS

ESF TESTING ACCOMPLISHMENTS AND NEAR-TERM OBJECTIVES (Cont'd)

II. CONSTRUCTION MONITORING ACTIVITIES

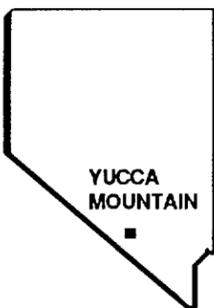
- INSTALLATION OF ALL MULTI-POINT BOREHOLE EXTENSOMETERS IN TBM STARTER TUNNEL AND ALCOVE #1 COMPLETED JANUARY, 1994
- COMPLETION OF SHELL BOLT AND BOLT LOAD CELL INSTALLATION IN ALCOVE #1 ACCOMPLISHED BY END FEBRUARY
- MONITORING OF ALL STARTER TUNNEL/ALCOVE #1 INSTRUMENTATION (CONVERGENCE PIN STATIONS, MPBX'S, ROCK BOLT LOAD CELLS) ONGOING
- BOREHOLE PRESSURE CELLS (IN ADVANCE OF TBM START-UP) ACTIVATED AND INITIALIZED AT FACE DURING AUGUST, 1994
- INITIATED TBM DATA COLLECTION ON OCTOBER 20 (TBM START)
- MONITORING ROCK RESPONSE TO TBM GRIPPER PRESSURE IS ONGOING
- PREPARATION FOR FIRST NORTH RAMP INSTRUMENTATION SECTION (ESF DESIGN VERIFICATION), 20m IN FROM BROW IS UNDERWAY. SCHEDULED START OF SECTION INSTRUMENTATION IS LAST WEEK OF NOVEMBER (DEPENDENT ON TBM ADVANCE RATE)
- FOLLOWING TBM SHUT DOWN FOR MAPPING GANTRY INSTALLATION, TBM CONSTRUCTION MONITORING ACTIVITIES RESUMED IN JANUARY, 1995
- INITIAL INSTRUMENTATION OF STEEL SETS (STRAIN GAGES, CONVERGENCE PINS) TO BEGIN ON JANUARY 17, 1995
- ROCK MASS QUALITY EVALUATIONS FOR ESF DESIGN VERIFICATION ARE ONGOING

ESF TESTING ACCOMPLISHMENTS AND NEAR-TERM OBJECTIVES (Cont'd)

III. OTHER ESF TESTING ACTIVITIES

- MAPPING OF TBM OPENING USING MAPPING PLATFORM/GANTRY TO COMMENCE IN JANUARY (INITIAL GANTRY USE SCHEDULED FOR CONSTRUCTION STATION 01+45m)
- FORMAL TEST PLANNING AND PREPARATION FOR FOLLOWING ESF TESTS IS UNDERWAY:
 - DIESEL EMISSIONS/EXHAUST VENTILATION (APRIL START)
 - INTACT FRACTURE (ESF UZ PERCOLATION) (JULY/AUGUST START)
 - CONTACT RADIAL BOREHOLES (TIVA/PAINTBRUSH NON-WELDED AND PAINTBRUSH/TOPOPAH SPRING) (SEPTEMBER/OCTOBER START)
- EXCAVATION FOR ALCOVE #2 (BOW RIDGE FAULT) SCHEDULED FOR MARCH, 1995
 - DRILLING/INSTALLATION OF TEST INSTRUMENTATION PLANNED MARCH-APRIL, 1995
- ENGINEERED BARRIER SYSTEM FIELD TESTS - LARGE BLOCK TEST AT FRAN RIDGE
 - BLOCK EXCAVATION AND INITIAL DRILLING COMPLETED OCTOBER, 1994
 - PLANNING FOR FINAL INSTRUMENTATION DRILLING/INSTALLATION AND HEATER INSTALLATION IS ONGOING
 - HEATER ACTIVATION SCHEDULED LATE FY 1995 OR EARLY FY 1996

YUCCA MOUNTAIN



**YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT**

**DOE/NRC TECHNICAL MEETING ON
THE EXPLORATORY STUDIES FACILITY**

**DOE MANAGEMENT OF COMMITMENTS
TO THE NRC**



PRESENTED BY
APRIL V. GIL
LICENSING TEAM LEADER
ASSISTANT MANAGER FOR SUITABILITY AND LICENSING

**JANUARY 24, 1995
ROCKVILLE, MD**

Objective

- **Management of DOE Commitments to the NRC**
- **Documentation of Commitment and Fulfillment**
- **Maintaining Objective Evidence**

Identification

- **Commitment made in Correspondence Meeting Minutes, or Other Approved Media**
- **Commitments Identified in Draft DOE Response**

Concurrence

- **Internal Review of DOE Correspondence**
- **Identify and Assign Responsibility**
- **Accept/Reassign Commitments**
- **Establish Due Date**

Commitment Tracking and Management

- **Commitments Entered into Database**
- **Commitment Tracking Sheet Transmitted to Appropriate Individuals**
- **Commitment Status Reports generated**

COMMITMENT TRACKING SHEET

COMMITMENT ID
NRC 111

DATE OF COMMITMENT
14-Nov-94

COMMITMENT DESCRIPTION

DOE OQA will establish an OCRWM-wide trending program in which OQA will perform data reduction.

RESPONSIBLE DOE MANAGER

RESPONSIBLE PERSON

D. Horton

D. Spence

DATE COMMITMENT DUE
07/31/1995

ACTION TAKEN TO FULFILL THE COMMITMENT

COMPLETION DATE

COMPLETION DOCUMENT REFERENCE

RESPONSIBLE DOE MANAGER APPROVAL

Signature

Commitment Fulfillment

- **Commitment Fulfilled by Responsible Individual**
- **Approved by Responsible DOE Manager**
- **Notification of Fulfillment Transmitted to the NRC**
- **Fulfillment Recorded in Database and Commitment Closure Documented**

U.S. DEPARTMENT OF ENERGY

CRWMS



YUCCA MOUNTAIN

SITE CHARACTERIZATION

PROJECT

**DOE/NRC TECHNICAL MEETING ON
THE EXPLORATORY STUDIES FACILITY**

INTEGRATION OF SITE CHARACTERIZATION DATA INTO REPOSITORY DESIGN

PRESENTED BY

ALDEN M. SEGREST

MGDS DEVELOPMENT MANAGER

CRWMS MANAGEMENT AND OPERATIONS CONTRACTOR



**JANUARY 24, 1995
ROCKVILLE, MD**

What Data from the Physical Site are needed for Repository Design?

- **Stratigraphy**
- **Rock Characteristics**
- **Rock Mass Characteristics**
- **Information about geologic structures**
- **Response of host unit, and adjacent units, to thermal loading**
- **Response of the host rock to excavation**
- **Natural Phenomena Information**
 - **Ground Motion**
 - **Weather Extremes**
- **Surface Soils Data**

How will these data be obtained by the program?

- **A major source of subsurface data will be the Exploratory Studies Facility**
- **Surface-based drilling will help produce the overall 3-D stratigraphic model needed to define the usable area**
- **Surface-based drilling and testing in drill holes will supplement ESF information in areas of the block removed from the ESF drifting**

How do we know we are seeking the right data for Repository Design?

- **Most data needs were identified in the SCP, and their acquisition has been described in various study plans**
- **Through the test planning process:**
 - **The end users of data are an integral part of the test planning process**
 - **In both the Surface Based Testing and ESF programs, the end users are brought in to provide input so that the resulting data are useful and adequate**

What are the processes through which the repository designers will obtain these data?

- **To acquire existing data, the designer utilizes the program's data base**
- **For those test programs which are currently ongoing, the designers can receive the data directly from the participant who develops it via a Technical Data Information Form (TDIF)**
- **If additional data needs are identified, specific requests are made by the designer**

Overview of the Test Planning and Data Acquisition/Distribution Process

- **Study Plans describe, at a high level, what types of information are needed**
- **Test Planning Packages (TPP) are developed which contain the details of exactly how the needed data are to be acquired. Several TPPs may result from a single study plan**
- **The test plan is executed via Job Packages which give detailed direction to the workers in the field**

Overview of the Test Planning and Data Acquisition/Distribution Process

(Continued)

- **Samples resulting from field work are processed into the sample management system, and distributed to the participants who will use the samples to produce data**
- **The participants perform the testing, develop the data, organize it into reports, and submit it, via TDIF, to the project office, project data base, and to the end users who have requested it**

Overview of the Project's Data Base System

ATDT:

- **Automated Technical Data Tracking (ATDT) system contains “Metadata” information**
- **Metadata is information describing the location and content of available data sets rather than the actual data themselves**
- **Designers can refer to the Technical Data Catalog (a listing of the ATDT's content) for information on where to find specific types of data**

SITE CHARACTERIZATION PLAN BASELINE

DATA TRACKING NO.	TITLE/DESCRIPTION	ACQN/DEVL PERIOD	ACQN/DEVL METHOD	
SNF29041993002.004	YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT GEOLOGY AND ROCK STRUCTURE LOG FOR DRILLHOLE UE25 NRG-2A.	08/01/93-08/31/93	GEOTECHNICAL CORE LOGGING OF UE25 NRG-2A. SCIENTIFIC NOTEBOOK FOR GEOTECHNICAL CORE LOGGING BY EXAMINATION OF CORE AND VIDEO RECORDS FROM NRG HOLES AND INSTRUCTIONS FOR ESTABLISHING QA RECORDS BASED UPON T&MSS ROCK STRUCTURAL LOGS.	A Y C
	ACQN/DEVL LOCATION : YMP SAMPLE MANAGEMENT FACILITY			
SNF29041993002.005	YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT GEOLOGY AND ROCK STRUCTURE LOG FOR DRILLHOLE UE25 NRG-3.	06/01/93-06/30/93	GEOTECHNICAL CORE LOGGING OF UE25 NRG-3. SCIENTIFIC NOTEBOOK FOR GEOTECHNICAL LOGGING OF CORE BY EXAMINATION OF CORE AND VIDEO RECORDS FROM NRG HOLES AND INSTRUCTIONS FOR ESTABLISHING QA RECORDS BASED UPON T&MSS ROCK STRUCTURAL LOGS.	A Y C
	ACQN/DEVL LOCATION : YMP SAMPLE MANAGEMENT FACILITY			
SNF29041993002.006	YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT GEOLOGY AND ROCK STRUCTURE LOG FOR DRILLHOLE USW NRG-6.	05/01/93-05/30/93	GEOTECHNICAL CORE LOGGING OF USW NRG-6. SCIENTIFIC NOTEBOOK FOR GEOTECHNICAL LOGGING OF CORE BY EXAMINATION OF CORE AND VIDEO RECORDS FROM NRG HOLES AND INSTRUCTIONS FOR ESTABLISHING QA RECORDS BASED UPON T&MSS ROCK STRUCTURAL LOGS.	A Y C
	ACQN/DEVL LOCATION : YMP SAMPLE MANAGEMENT FACILITY			
SNF29041993002.007	YUCCA MOUNTAIN SITE CHARACTERIZATION PROJECT GEOLOGY AND ROCK STRUCTURE LOG FOR DRILLHOLE UE25 NRG-5.	08/01/93-08/30/93	GEOTECHNICAL CORE LOGGING OF UE25 NRG-5. PREPARED IN ACCORDANCE WITH SCIENTIFIC NOTEBOOK FOR GEOTECHNICAL LOGGING OF CORE BY EXAMINATION OF CORE AND VIDEO RECORDS FROM NRG HOLES AND INSTRUCTIONS FOR ESTABLISHING QA RECORDS BASED UPON T&MSS ROCK STRUCTURE LOGS.	A Y C
	ACQN/DEVL LOCATION : YMP SAMPLE MANAGEMENT FACILITY AND JFT AGAPITO			

D Q
A U L
T A O
A L C
I A
T F T
Y I I
P E O
E D N

Project Data Base System

(Continued)

GENISES:

- **The Geographic Nodal Information and Scientific Evaluation System (GENISES) is an on-line data base**
- **User can directly access and retrieve information from the database**
- **One important segment of GENISES is the Geographic Information System (GIS)**
- **The GIS contains a wide variety of site mapping and other geographically oriented information**

Filename: plss24k

Description: Public Land Survey System

Parameter: None

Alias: ympps

Source: United States Geological Survey Digital Line Graph Data, public land survey system layer, 7.5' series including the following quadrangles and publish dates: Amargosa Valley, 1983; Ashton, 1987; Beatty Mountain, 1987; Busted Butte, 1983; Big Dune 1986; Carrara Canyon, 1987; Crater Flat, 1986; East of Beatty Mountain, 1987; Jackass Flat, 1983; Striped Hills, 1983; Topopah Spring, 1961; Topopah Spring NW, 1961.

Geographic Extent: Yucca Mountain and vicinity

Date Last Edited: 03/19/91

Original Source Scale: 1:24,000

Contact(s): Susan Ross
EG&G Energy Measurements, Inc.
Remote Sensing Laboratory
Yucca Mountain Project
Spatial Analysis Section
101 Convention Center Dr., Suite 1010
Las Vegas, Nevada 89109
702-794-7817

E533840ft
E540000m

E566660ft
E550000m

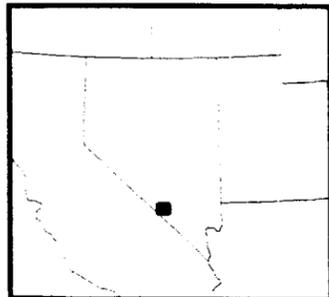
E599475ft
E560000m



116 30'00"

116 22'30"

General Extent of Data



**YUCCA MOUNTAIN
SITE CHARACTERIZATION PROJECT**

Public Land Survey System

Filename: plss24k

How has the Program Approach affected the ability of Repository Designers to get the data they need?

- **The new PA has resulted in a focusing of the testing programs to acquire the information needed to make the higher level findings which support the TSS decision and subsequent licensing process**
- **Data acquisition for end users such as ESF/repository designers has also been accommodated in this planning process**
- **The primary methodology by which the test programs develop information and provide it to the project data base and end users is unchanged**

Example of Data Transfer Process

A good example of the interaction of data developers and end users is the development and transmittal of rock mass quality data for the North Ramp Geologic (NRG) series of drill holes

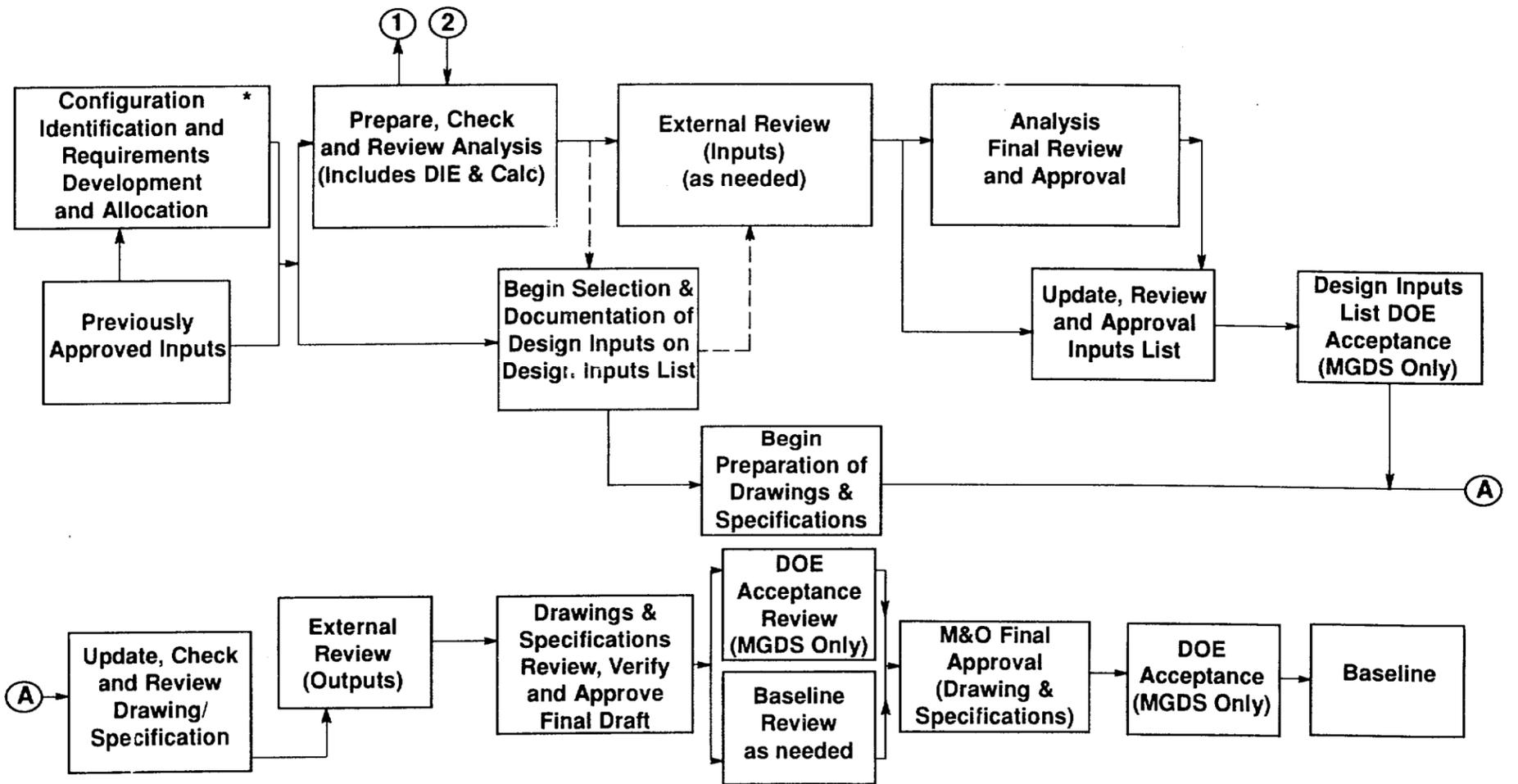
- The ESF/repository designers participated extensively in the planning of the NRG drill holes. The intervals to be cored and the tests to be run on the core were proposed by the designers**
- The participant responsible for developing the data was Sandia National Laboratory**
- Core from the North Ramp Geologic (NRG) series of drill holes (part of the Soil & Rock Properties Study Plan) was analyzed by SNL, and estimates of the rock mass quality were made**

Example of Data Transfer Process

(Continued)

- **A report was developed for this effort, and was submitted as a contract deliverable to the YMPO for input to the project data base**
- **Simultaneously, the report was transmitted to the ESF and repository designers so that it could be used in ongoing design work**

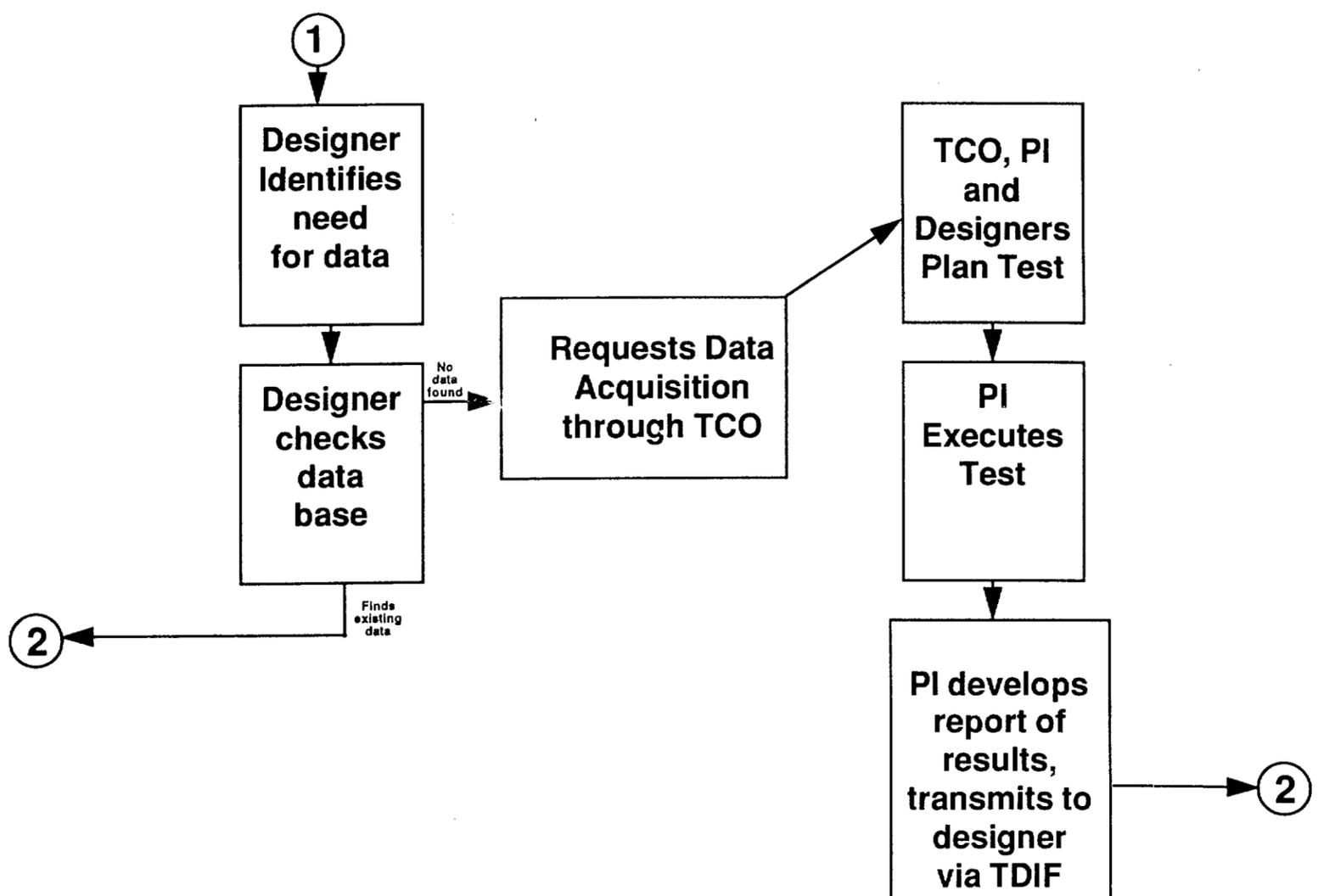
Typical M&O Design Control Process



* Configuration Identification includes QA classification

NRCREPRO.125PM41-13-95

Acquisition of Data for Design Activities



Recent Examples of Data Requests

Design Data Request:

- Rock quality information from NRG drilling
- Soils data for foundation design

Validation Data Request:

- Program for monitoring of ground control systems in the ESF

Design/Licensing Interface

- **10 CFR 60 requirements are allocated to the applicable requirements documents**
 - **Repository Design Requirements**
 - **Engineered Barrier Design Requirements**
 - **ESF Design Requirements**
- **Licensing strategies (i.e. design flexibility, robust WP) for designs and analyses are identified during development of the LA AO**
 - **GROA designs (Chapter 4)**
 - **EBS designs (Chapter 5)**
 - **Performance Assessments (Chapter 6)**
- **Requirements identified as a result of LA AO development are incorporated into the requirements documents, as appropriate**

CRWMS



**YUCCA MOUNTAIN
SITE CHARACTERIZATION
PROJECT**

**DOE/NRC TECHNICAL MEETING ON
THE EXPLORATORY STUDIES FACILITY**

ESF DESIGN CONTROL

PRESENTED BY

ROBERT M. SANDIFER

DEPUTY, MGDS OPERATIONS

CRWMS MANAGEMENT AND OPERATIONS CONTRACTOR



**JANUARY 24, 1995
ROCKVILLE, MD**

ESF Design Control

- ***Problem***
Lack of attention to details
- ***Impact***
Design documentation was not in compliance with QA procedure requirements
- ***Lessons Learned***
Culture shift emphasizing attention to details in all areas must be achieved

Additional reviews were required to assure QA compliance in the short term; these will be lifted when normal process is functioning properly

Past actions have not been effective

ESF Design Control

(Continued)

- ***Lessons Learned*** *(continued)*

Root cause analysis identified the following as issues:

- Inadequate NQA-1 background for large segment of work force
- Schedule driven misinterpretation
- Inadequate training/screening of personnel
- Procedures not user friendly

ESF Design Control

(Continued)

- ***Problem***
Errors not found due to inadequate checking
- ***Impact***
Several CARs were written identifying errors which should have been found during checking
- ***Lessons Applied***
An independent checking group has been established for the purpose of checking all design products

Checking group contains leads in each discipline with others available when needed

ESF Design Control

(Continued)

- ***Lessons Applied*** *(continued)*

Detailed checklists have been developed and will be refined and improved as determined necessary during application; these will provide standards of performance and management expectations

Originators are provided with checklists for use in assuring more error-free initial products

Checking results will be evaluated to determine if process changes, personnel training, etc. are needed based on a graded approach to selecting checking results for further evaluation and root cause analysis, etc. as a feedback to the production function

ESF Design Control

(Continued)

- ***Problem***

Design control procedures difficult to use

- ***Impact***

Verbatim compliance with QA requirements not accomplished

- ***Lessons Applied***

Design control process and procedures were revised in Spring, 1994, and made more “user friendly” (2C design was initially completed April, 1994)

Further refinements are being made to QAPs based on lessons learned in implementation of the procedures

ESF Design Control

(Continued)

- ***Problem***
Design analyses prepared in parallel with drawings and specifications
- ***Impact***
Some specifications and drawings did not address all requirements contained in the analyses
- ***Lessons Applied***
Design process modified to add more separation between preparation of analyses and preparation of drawings and specifications

ESF Design Control

(Continued)

- ***Problem***
Unrealistic schedules for completion of work
- ***Impact***
Sufficient time for check and review of products not always allowed for in the schedule
- ***Lessons Applied***
Culture shift emphasizes quality as highest priority with schedule important but secondary

Schedules for preparing and checking products must be realistic and carefully planned

ESF Design Control

(Continued)

- ***Problem***
Errors in BFD - difficulties in capturing all inputs and preparing accurate traceability matrices. BFD is a very difficult document to develop and revise
- ***Impact***
Flowdown of requirements to design could not be demonstrated in some cases and the document was prone to errors
- ***Lessons Applied***
Simplify process for documenting basis for design

ESF Design Control

(Continued)

- ***Lessons Applied*** *(continued)*

Near Term simplification

- Developed Requirements Allocation Analysis for allocating and tracing requirements to CIs
- Used input lists for each drawing and specification to identify inputs

Long term simplification

- Established a Document Development Team* to revise the ESF Design Requirements Document
 - » The revised ESFDR will assign the applicable requirements to the appropriate CI
 - » Identify which CIs are “Q” vs. “Non-Q”

* Document Development Team consists of representatives from System Requirements, Surface and Subsurface Design, DIE, and Site Characterization

ESF Design Control

(Continued)

- ***Problem***
Insufficient awareness of importance of QA and adherence to QA requirements
- ***Impact***
Documentation not completed correctly
- ***Lessons Applied***
Several options are being evaluated including:
 - QA program awareness training and annual refresher training, including a comprehensive exam
 - Providing greater emphasis on QA program compliance in performance appraisals
 - Conducting back-on-the-job evaluations to measure training effectiveness
 - Compliance contracts between employee and supervision
 - Mentoring programs

Training on all design control QAPs is now done by classroom briefing

ESF Design Control

(Continued)

- ***Lessons Applied*** *(continued)*

Training was given to all design personnel providing lessons learned through the resolution of the significant CARs written against package 2C

ESF Design Control

(Continued)

- ***Problem***
Inconsistency in content and format of design products between disciplines
- ***Impact***
No impact on the technical adequacy of the design
- ***Lessons Applied***
Reorganization combined ESF Surface and Subsurface design organizations under a single line manager (J. Naaf)

Repository design reorganized in the same manner (K. Bhattacharyya)