U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT

PRESENTATION TO THE NUCLEAR WASTE TECHNICAL REVIEW BOARD

SUBJECT: REPOSITORY DESIGN REFERENCE CONFIGURATION AS DESCRIBED IN SITE CHARACTERIZATION PLAN

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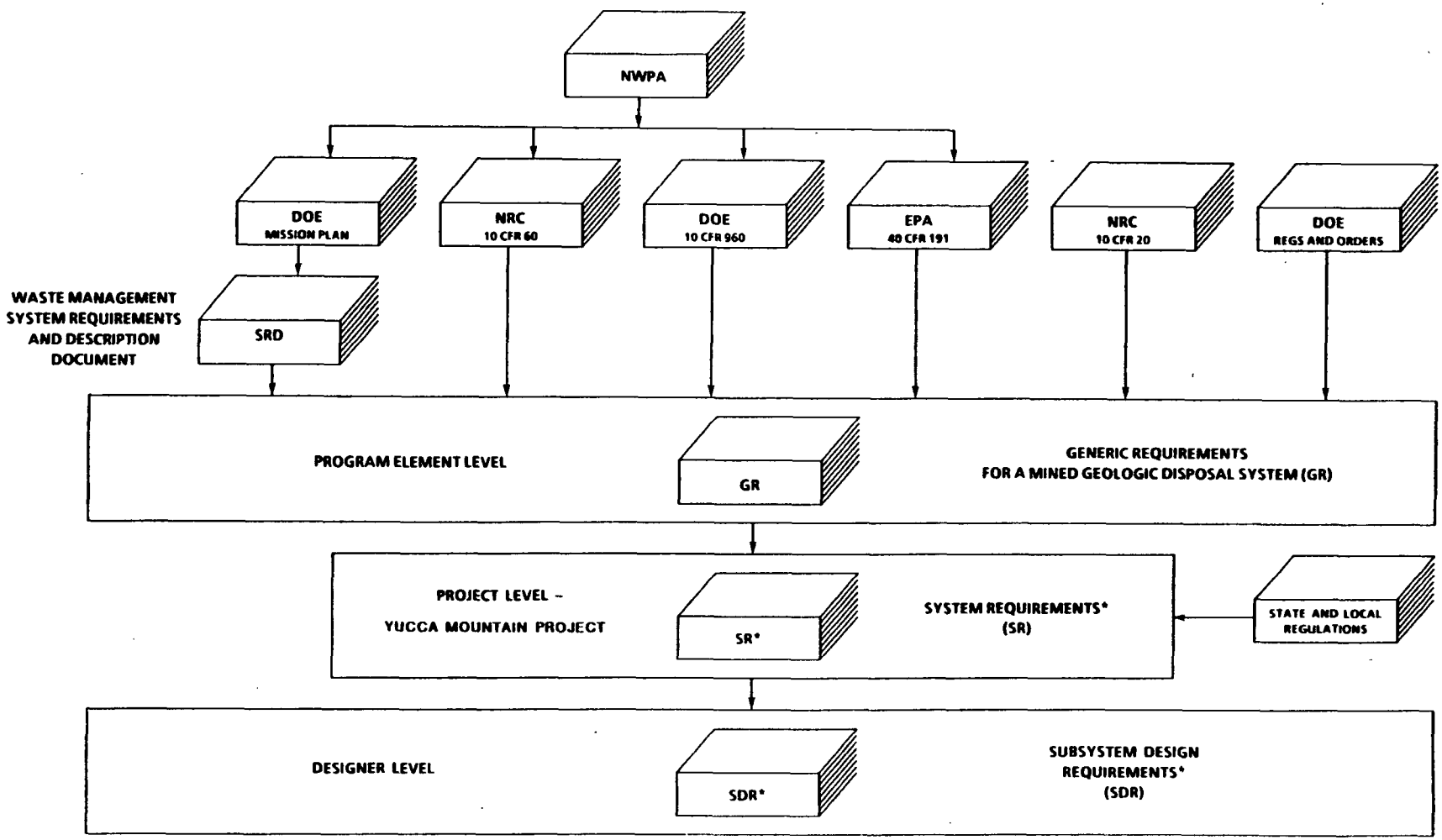
CONCEPTUAL DESIGN OF A REPOSITORY

DESIGN BASIS

- REPOSITORY DESIGN REQUIREMENTS
- REFERENCE DESIGN DATA BASE

- ANALYTICAL TOOLS FOR GEOTECHNICAL DESIGN
- STRUCTURES, SYSTEMS, AND COMPONENTS IMPORTANT TO SAFETY
- BARRIERS IMPORTANT TO WASTE ISOLATION

RELATIONSHIP OF SUBSYSTEM DESIGN REQUIREMENTS TO PRIMARY REQUIREMENTS



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AERIAL VIEW OF YUCCA MOUNTAIN

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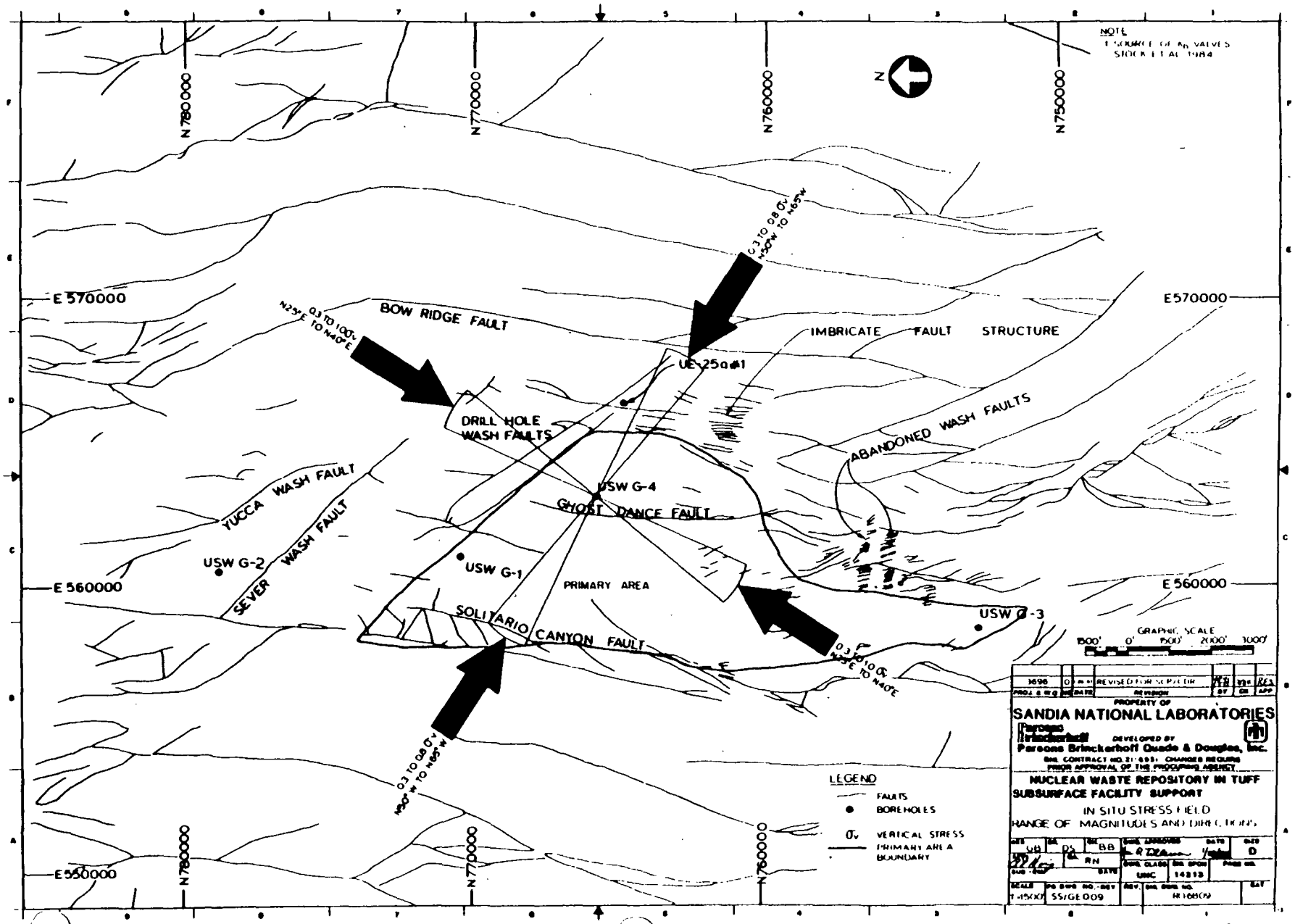
SITE STRUCTURAL FEATURES: SCP-CDR



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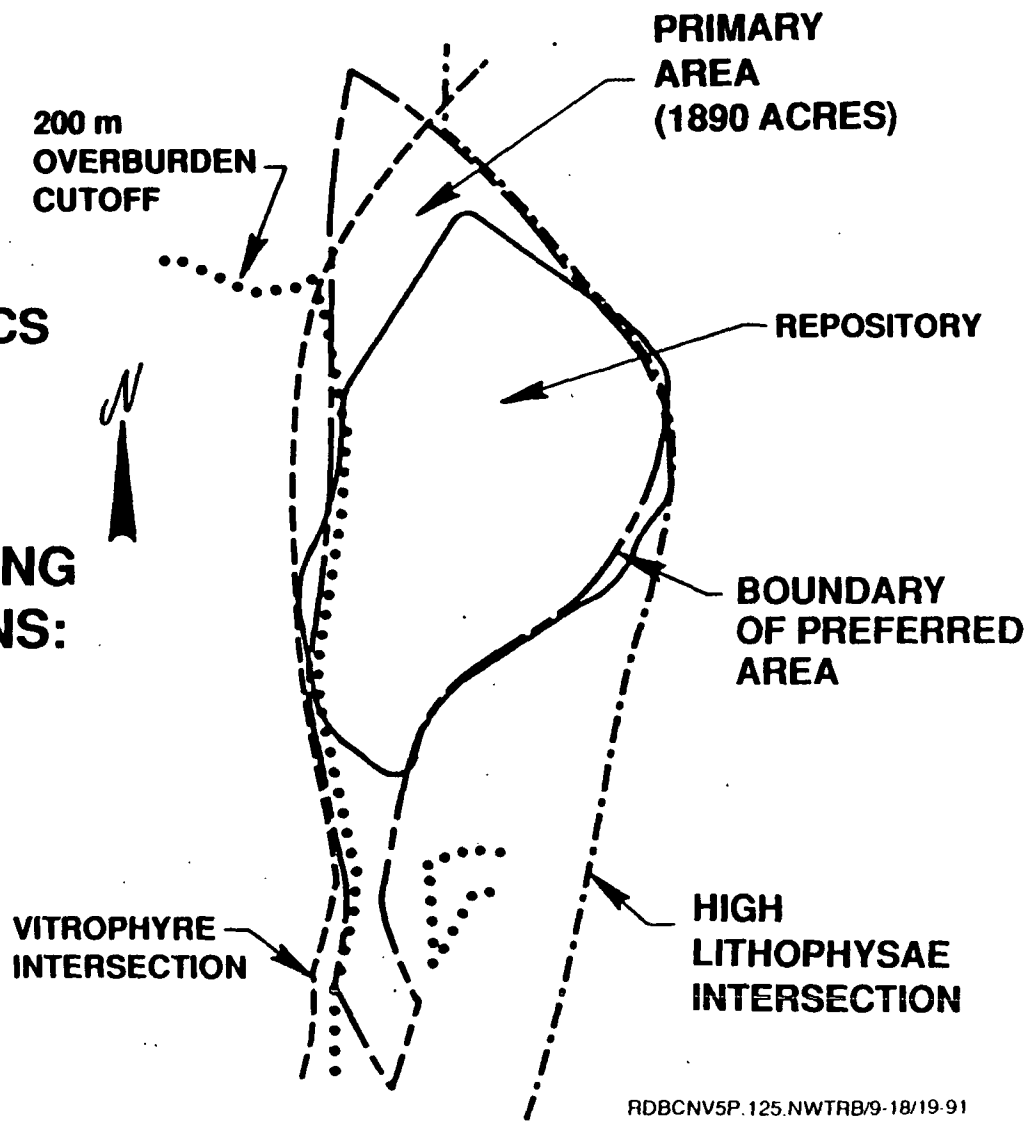
PRIMARY AREA FOR NUCLEAR WASTE DISPOSAL IN YUCCA MOUNTAIN

CONSTRAINTS:

- SITING GUIDELINES:
  - 200 m OVERBURDEN
  - ROCK CHARACTERISTICS
    - * LITHOPHYSAE
    - * VITROPHYRE
- MINING/WASTE HANDLING EQUIPMENT LIMITATIONS:
  - 10% MAXIMUM GRADE

MODEL:

- 3-D GRAPHICS REPRESENTATION OF YUCCA MOUNTAIN



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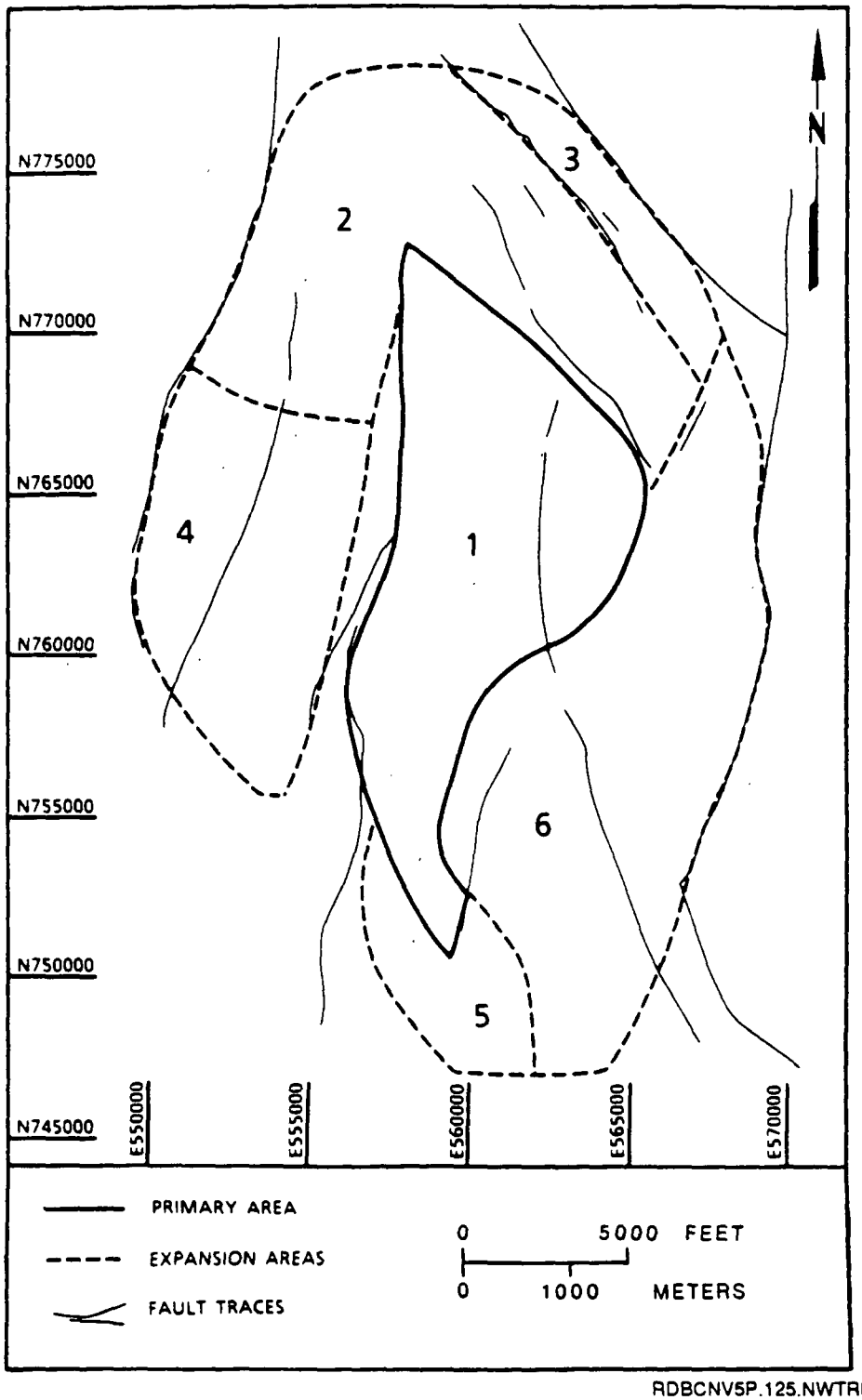
PRIMARY AREA (AREA 1) FOR THE UNDERGROUND REPOSITORY AND POTENTIAL EXPANSION AREA (AREAS 2 THROUGH 6)



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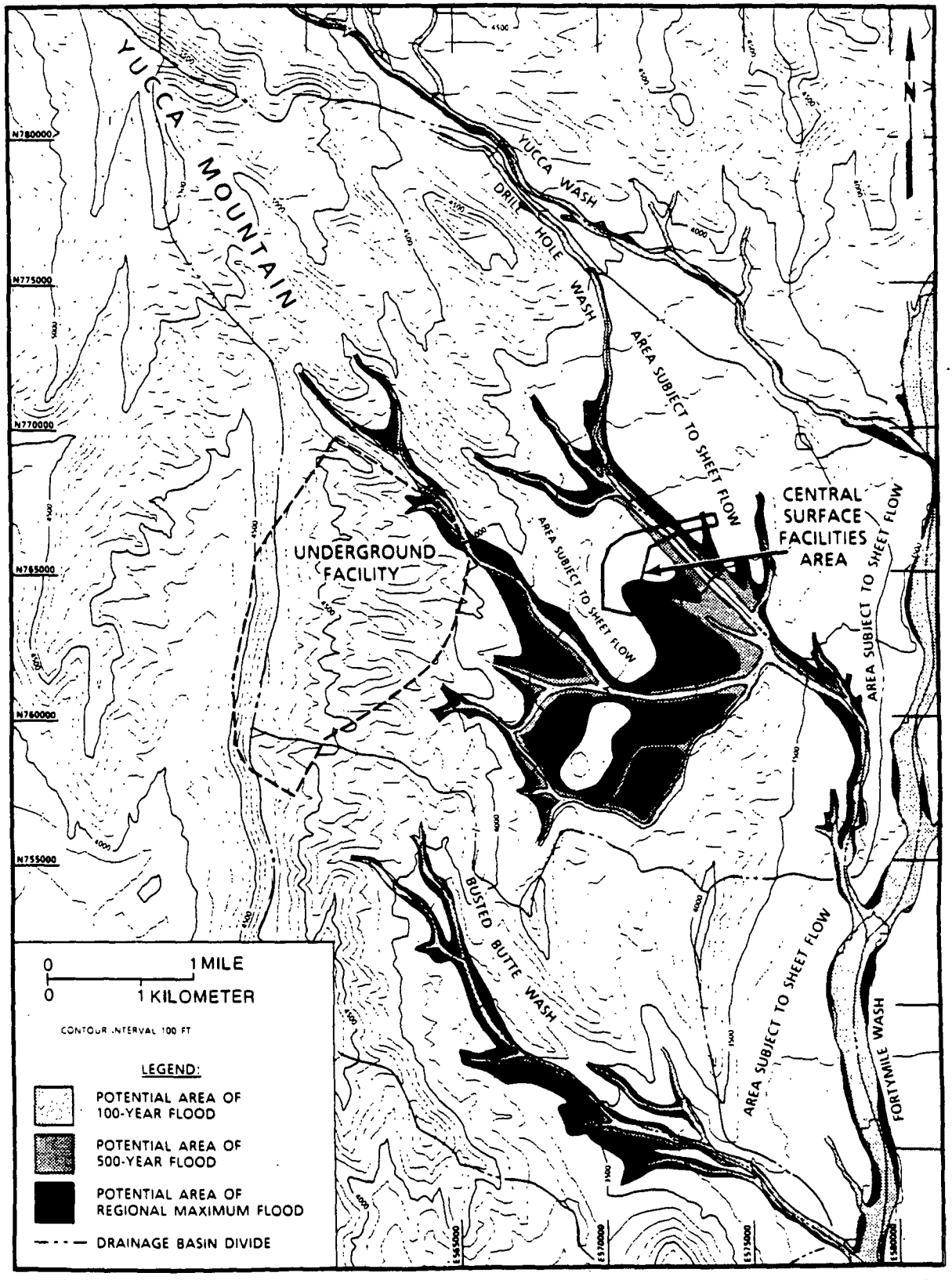
SITE TOPOGRAPHY AND FLOOD POTENTIAL AREAS



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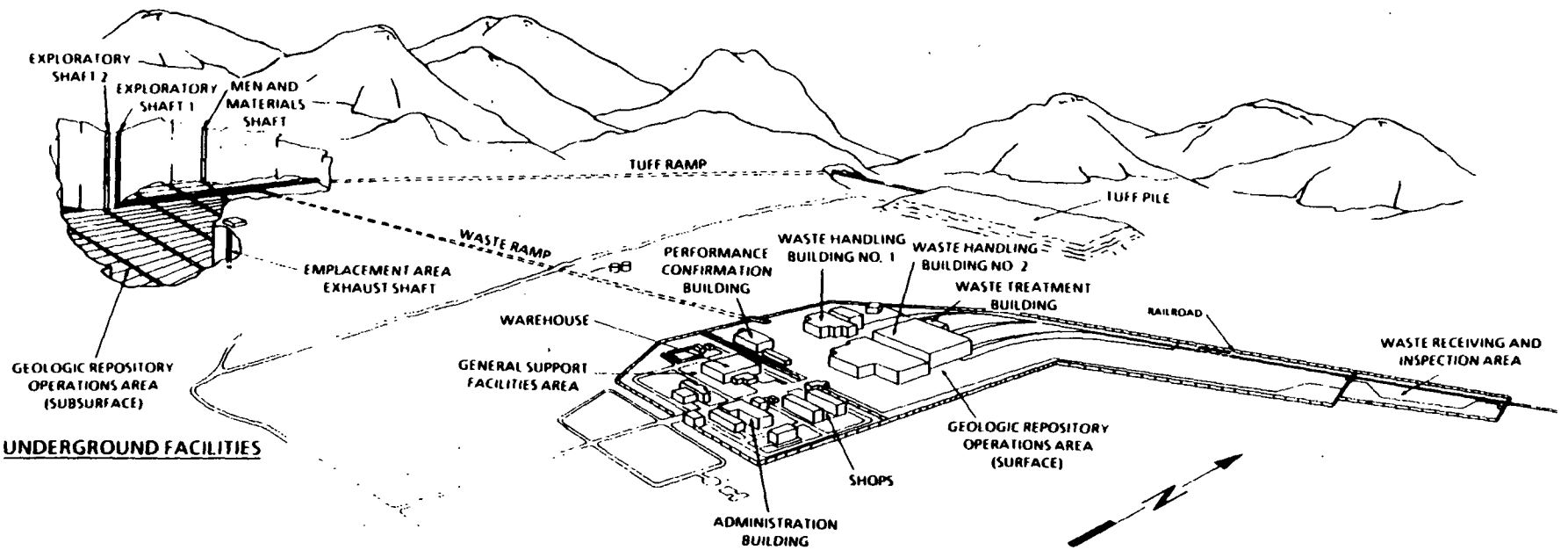
CONCEPTUAL DESIGN OF A REPOSITORY

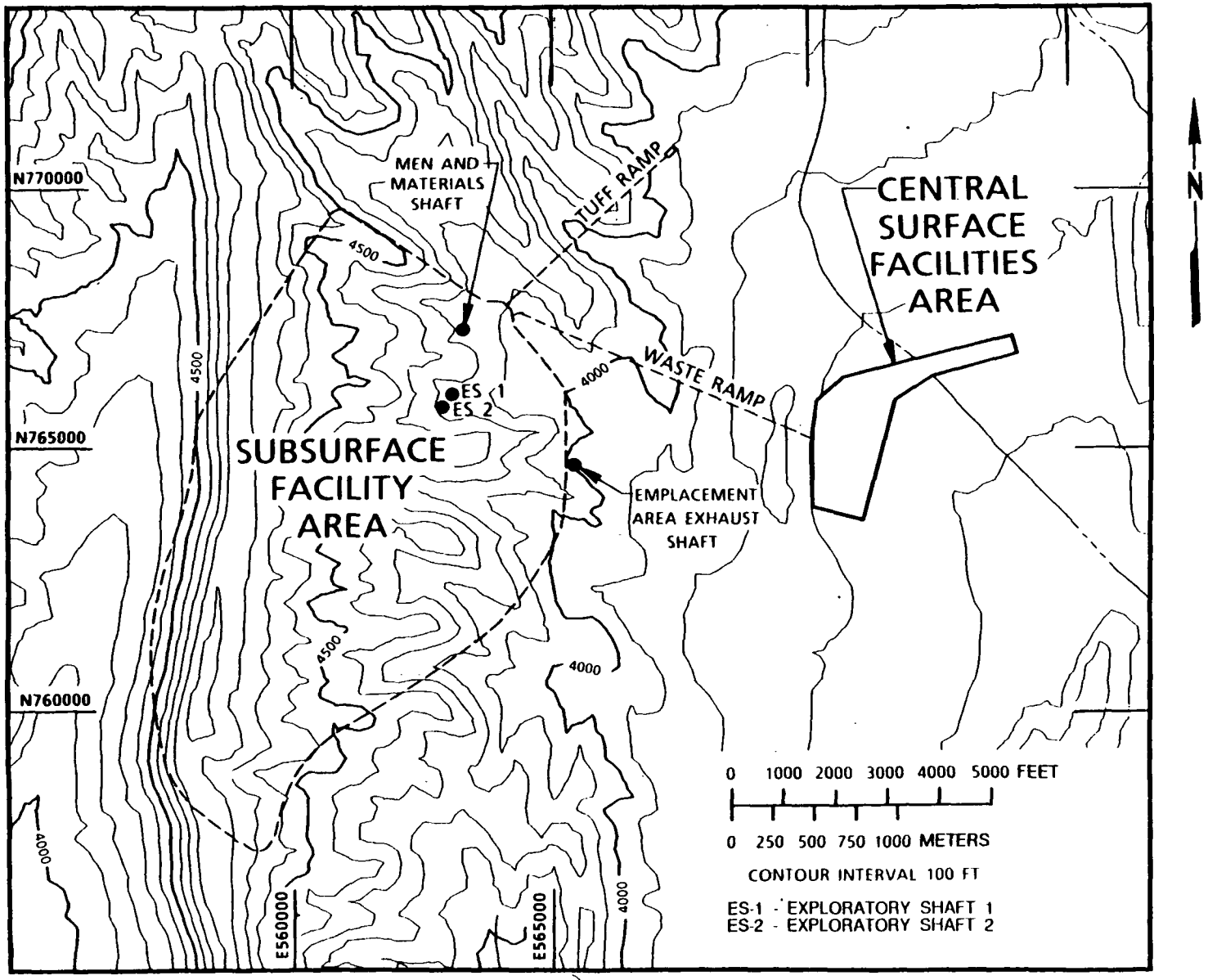
REFERENCE REPOSITORY DESIGN DESCRIPTION

- OVERALL FACILITY DESIGN
- REPOSITORY OPERATIONS
- SURFACE FACILITIES
- SHAFT AND RAMP DESIGN
- SUBSURFACE DESIGN
- BACKFILL OF UNDERGROUND OPENINGS
- SEALS
- RETRIEVAL

PRELIMINARY DRAWING OF PROPOSED REPOSITORY COMPLEX



SURFACE FACILITY AREA FOR THE SITE CHARACTERIZATION PLAN CONCEPTUAL DESIGN



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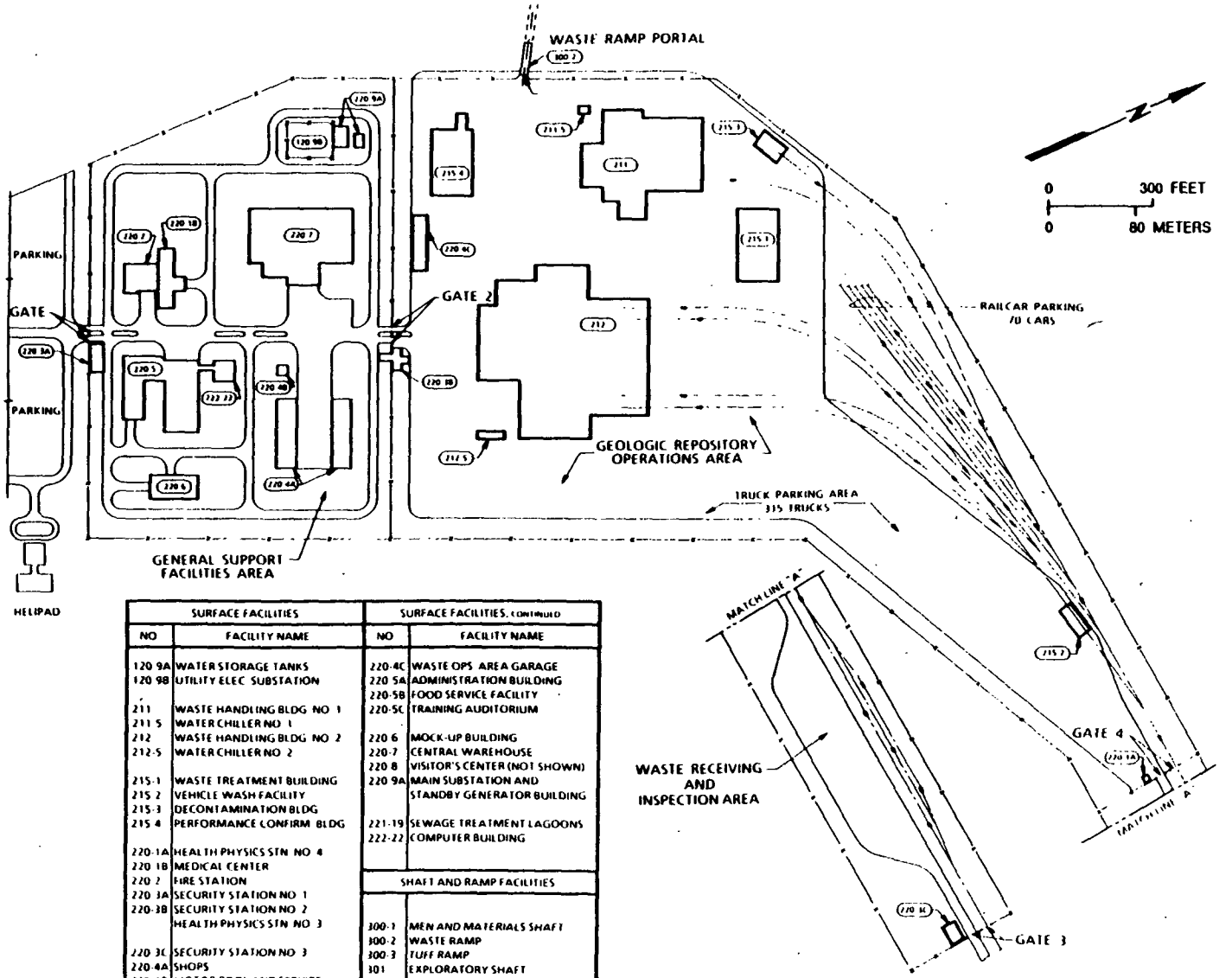
CENTRAL SURFACE FACILITIES AREA



SURFACE FACILITIES	
NO	FACILITY NAME
120 9A	WATER STORAGE TANKS
120 9B	UTILITY ELEC SUBSTATION
211	WASTE HANDLING BLDG NO 1
211 5	WATER CHILLER NO 1
212	WASTE HANDLING BLDG NO 2
212-5	WATER CHILLER NO 2
215-1	WASTE TREATMENT BUILDING
215 2	VEHICLE WASH FACILITY
215-3	DECONTAMINATION BLDG
215 4	PERFORMANCE CONFIRM BLDG
220-1A	HEALTH PHYSICS STN NO 4
220 1B	MEDICAL CENTER
220 2	FIRE STATION
220 3A	SECURITY STATION NO 1
220-3B	SECURITY STATION NO 2 HEALTH PHYSICS STN NO 3
220 3C	SECURITY STATION NO 3
220-4A	SHOPS
220 4B	MOTOR POOL AND SERVICE STATION

SURFACE FACILITIES, CONTINUED	
NO	FACILITY NAME
220-4C	WASTE OPS AREA GARAGE
220 5A	ADMINISTRATION BUILDING
220-5B	FOOD SERVICE FACILITY
220-5C	TRAINING AUDITORIUM
220 6	MOCK-UP BUILDING
220-7	CENTRAL WAREHOUSE
220 8	VISITOR'S CENTER (NOT SHOWN)
220 9A	MAIN SUBSTATION AND STANDBY GENERATOR BUILDING
221-19	SEWAGE TREATMENT LAGOONS
222-22	COMPUTER BUILDING
SHAFT AND RAMP FACILITIES	
300-1	MEN AND MATERIALS SHAFT
300-2	WASTE RAMP
300-3	TUFF RAMP
301	EXPLORATORY SHAFT
300 8	EMPLACEMENT EXHAUST SHAFT

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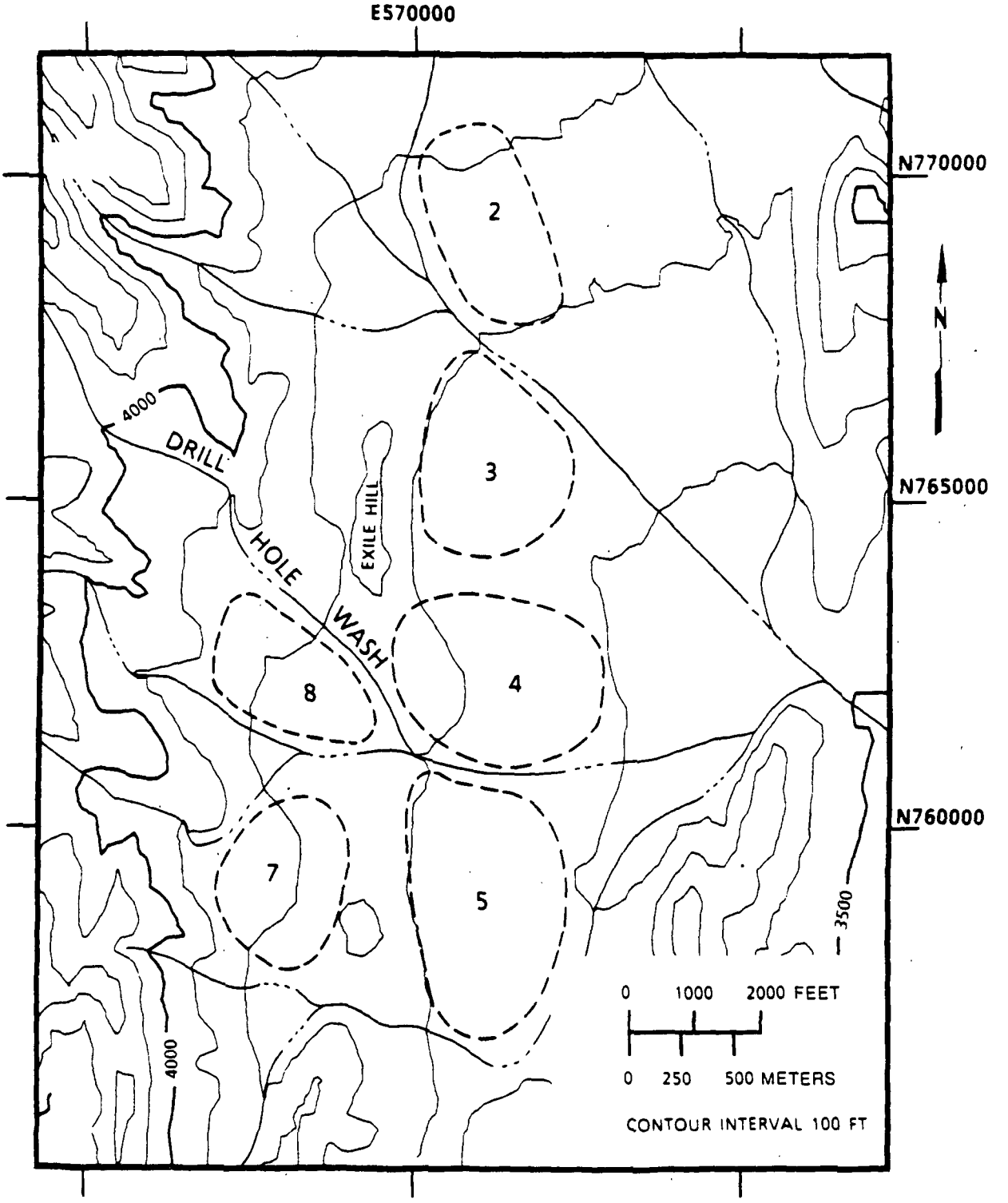
LOCATIONS OF THE SIX CANDIDATE AREAS FOR THE SURFACE FACILITIES



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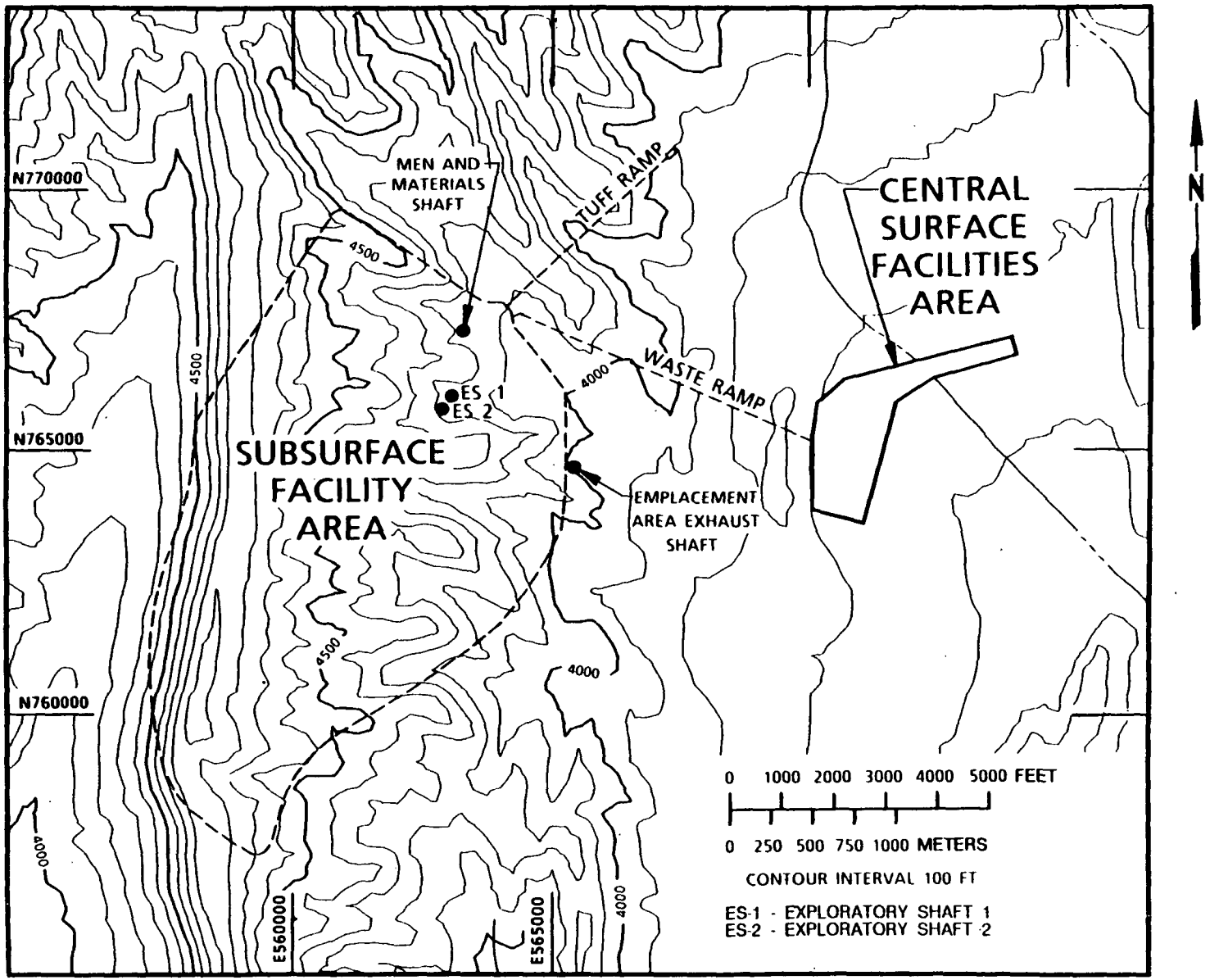
UNDERGROUND FACILITY AREA FOR THE SITE CHARACTERIZATION PLAN CONCEPTUAL DESIGN



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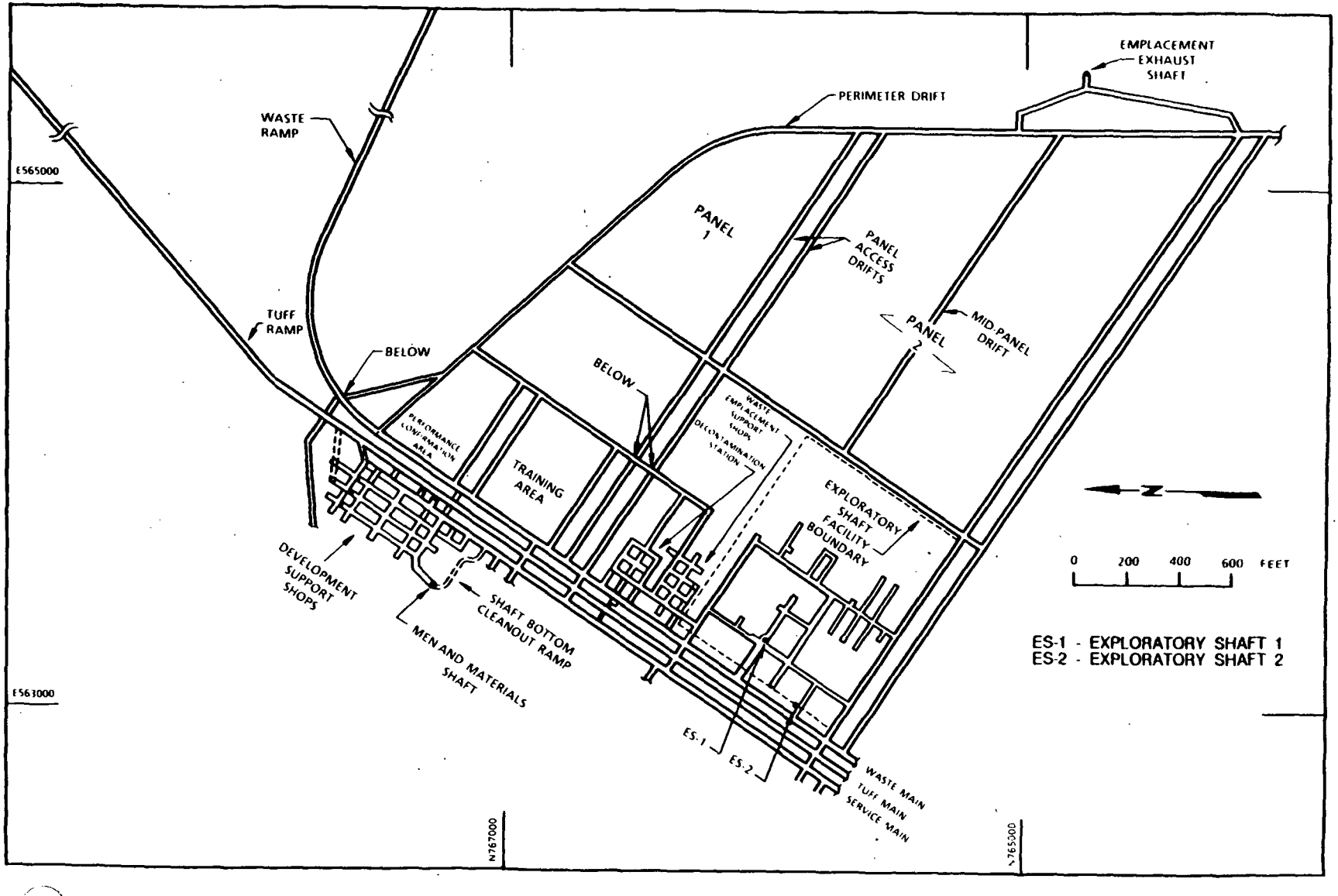
LOCATION OF SHAFTS AND RAMPS



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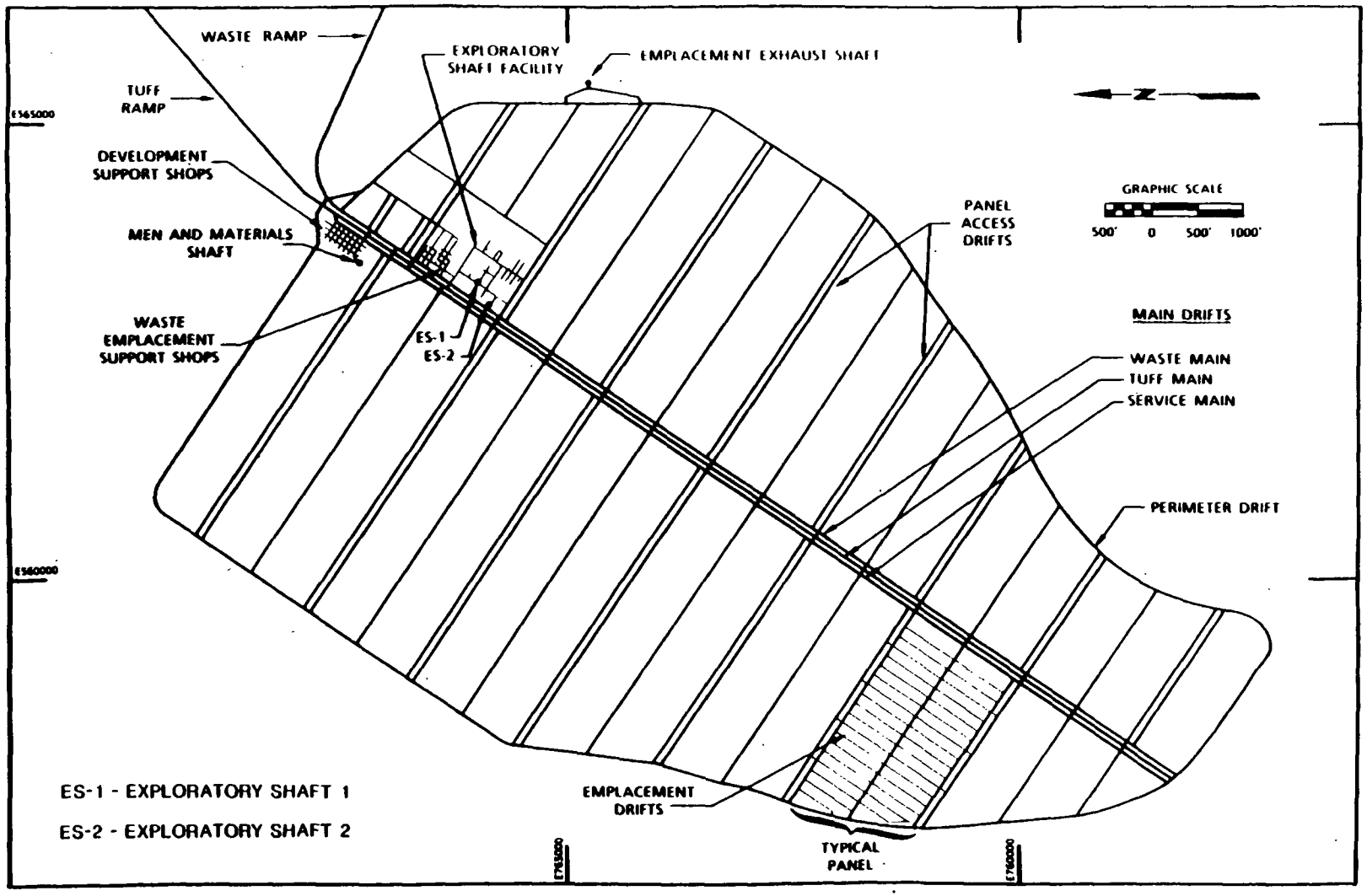
DIMENSIONS OF REPOSITORY CDR ACCESSES

OPENING	LENGTH OR DEPTH (ft)	SLOPE (%)	DIAMETER HORIZONTAL EMPLACEMENT CONFIGURATION (ft)	DIAMETER VERTICAL EMPLACEMENT CONFIGURATION (ft)
WASTE RAMP	6,603	8.9	21	23
TUFF RAMP	4,627	17.9	21	25
EXPLORATORY SHAFT 1	1,480		12	12
EXPLORATORY SHAFT 2	1,020		6	6
MEN-AND-MATERIALS SHAFT	1,090		20	20
EMPLACEMENT AREA EXHAUST SHAFT	1,030		20	20

VERTICAL EMPLACEMENT CONFIGURATION



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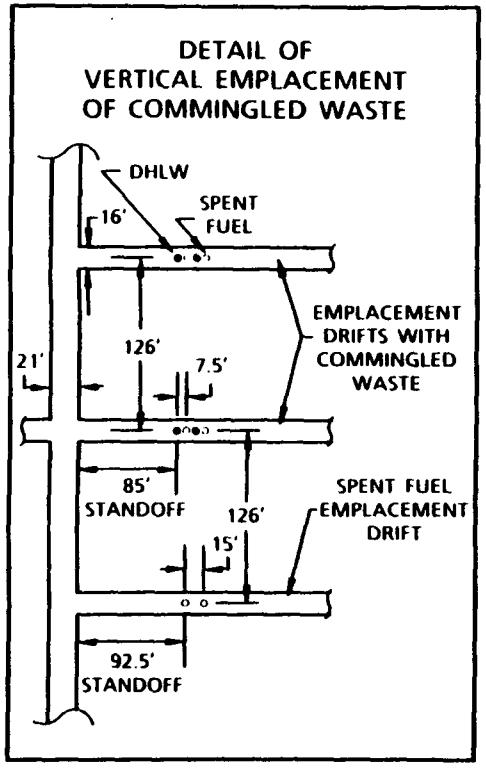
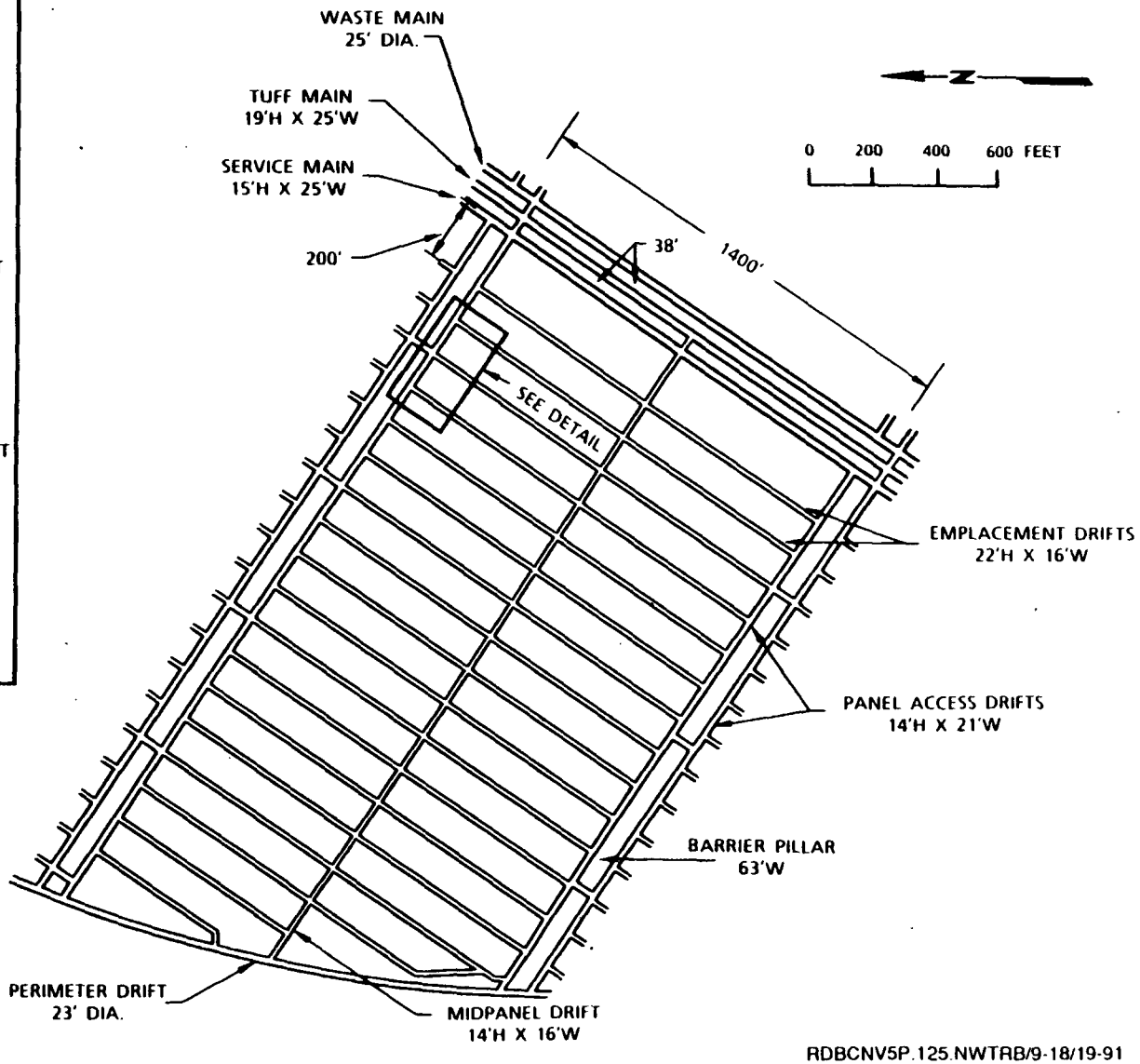
TYPICAL PANEL LAYOUT FOR VERTICAL EMPLACEMENT



DHLW - DEFENSE HIGH-LEVEL WASTE
H. - HEIGHT
W. - WIDTH
DIA. - DIAMETER



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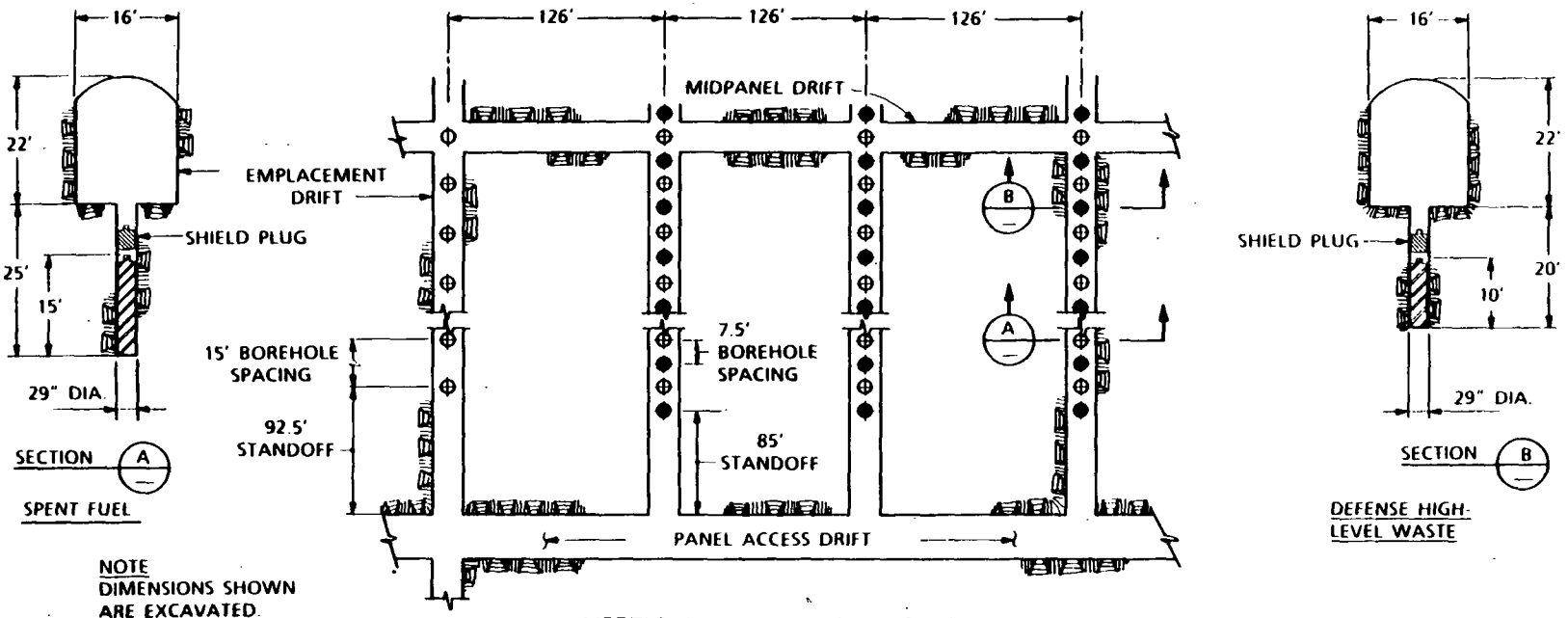
PANEL DETAILS FOR VERTICAL EMPLACEMENT

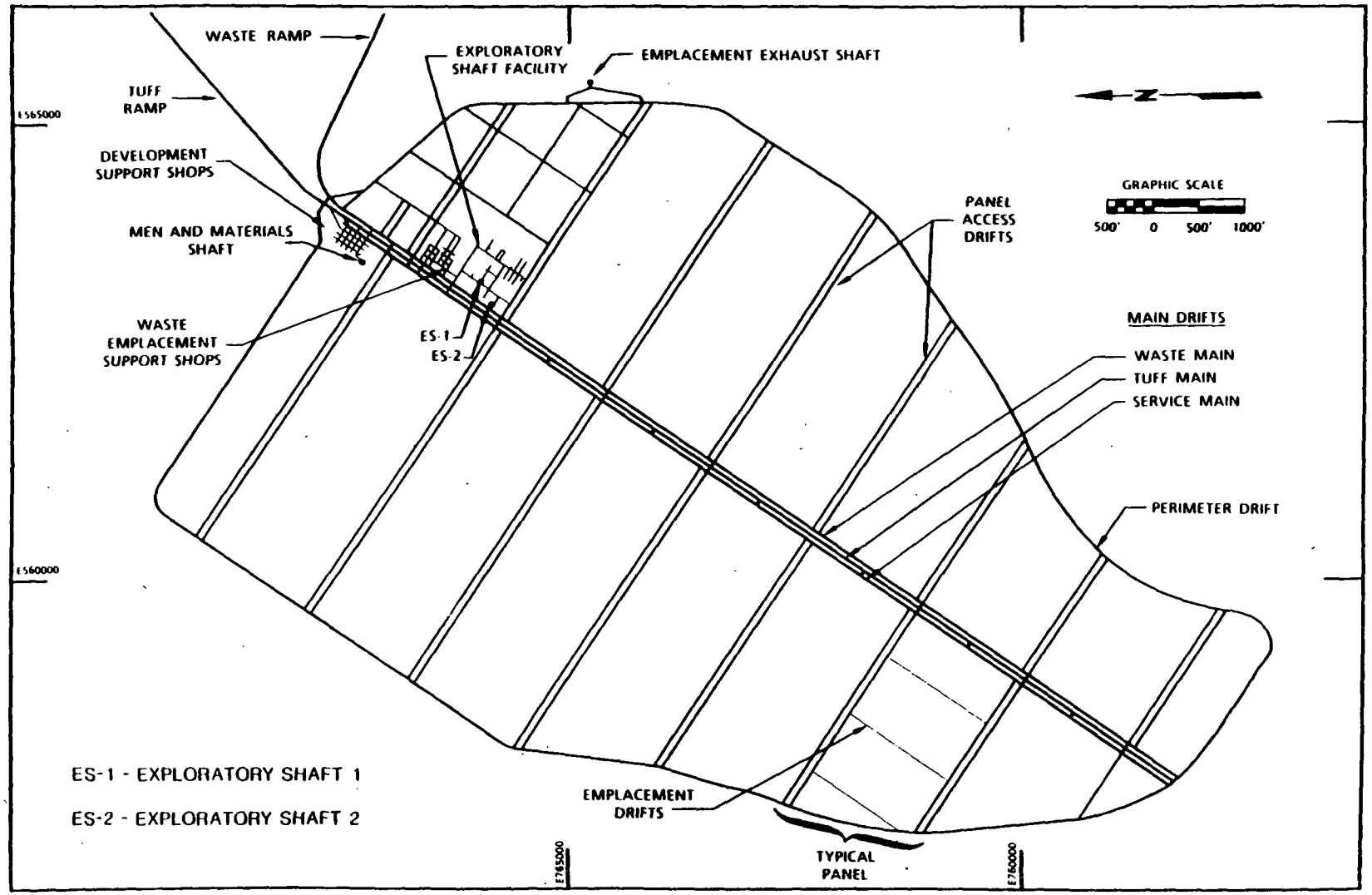


VERTICAL EMPLACEMENT PLAN

NOTE
DIMENSIONS SHOWN ARE EXCAVATED.

DIA. - DIAMETER

HORIZONTAL EMPLACEMENT CONFIGURATION



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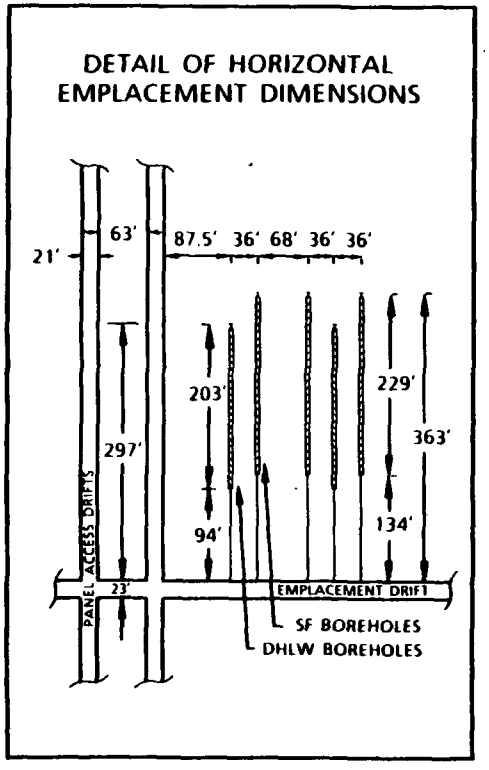
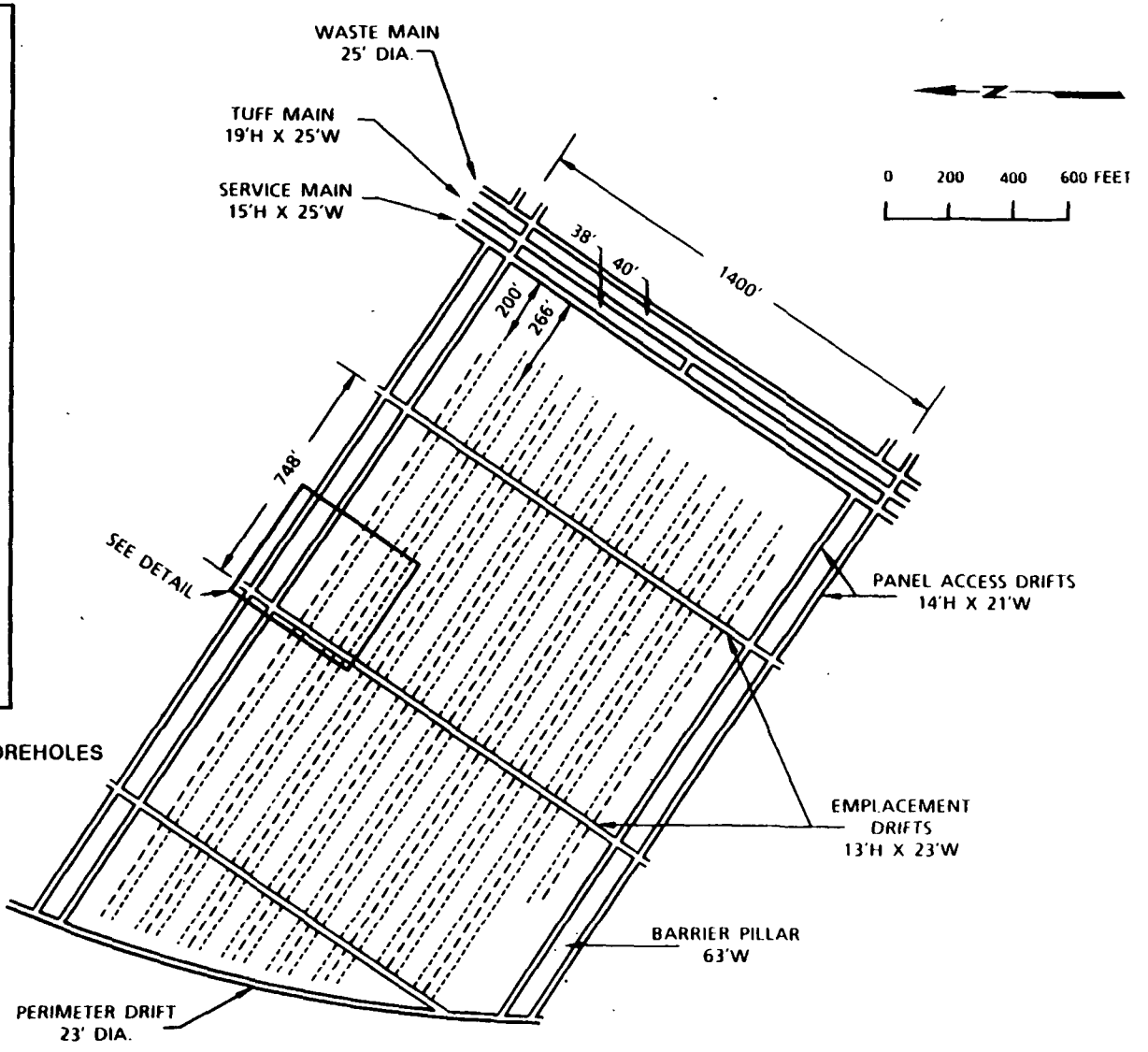
TYPICAL PANEL LAYOUT FOR HORIZONTAL EMPLACEMENT





---- DEFENSE HIGH-LEVEL WASTE BOREHOLES

------- SPENT FUEL BOREHOLES

DHLW - DEFENSE HIGH-LEVEL WASTE
DIA. - DIAMETER
H - HEIGHT
SF - SPENT FUEL
W - WIDTH

NOTE: BOREHOLES ARE NOT CONTINUOUS BETWEEN EMPLACEMENT DRIFTS DUE TO SLOPE OF THE PANEL ACCESS DRIFTS.

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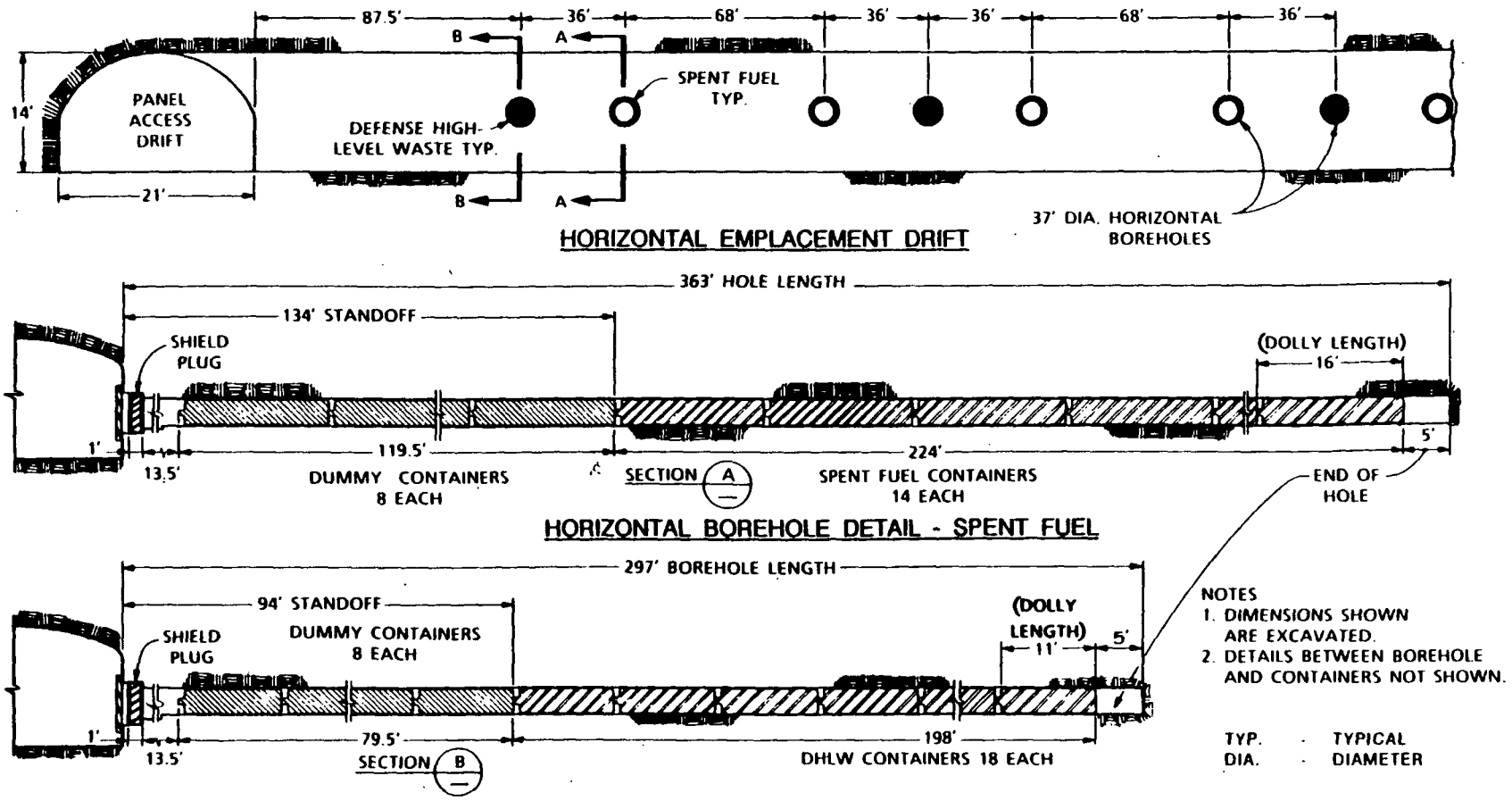
PANEL DETAILS FOR HORIZONTAL EMPLACEMENT



NOTES
1. DIMENSIONS SHOWN ARE EXCAVATED.
2. DETAILS BETWEEN BOREHOLE AND CONTAINERS NOT SHOWN.

TYP. - TYPICAL
DIA. - DIAMETER

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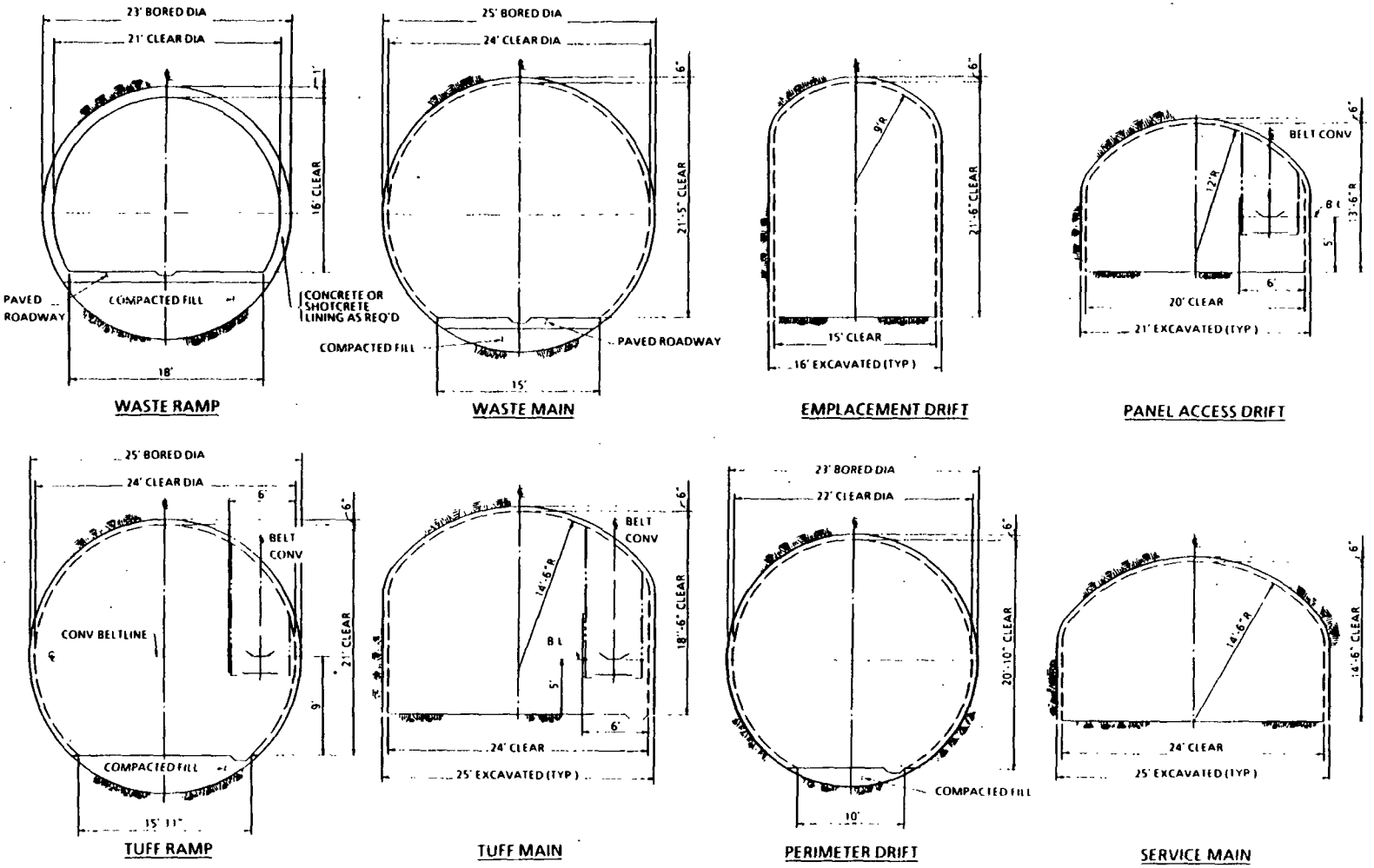
DRIFT AND RAMP CROSS SECTIONS FOR VERTICAL EMPLACEMENT



DIA. - DIAMETER
TYP. - TYPICAL
CONV. - CONVEYOR

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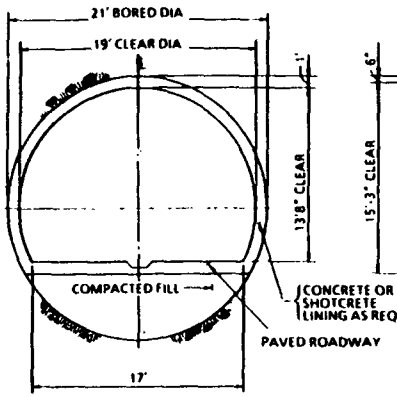
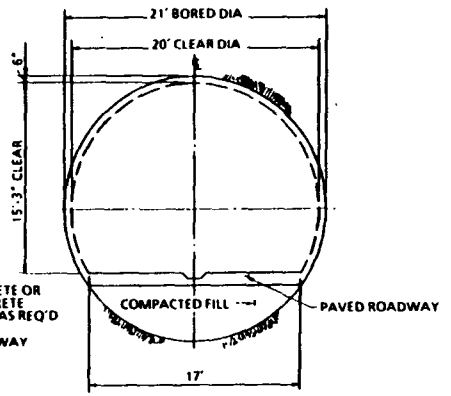
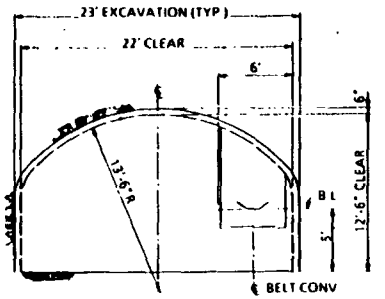
DRIFT AND RAMP CROSS SECTIONS FOR HORIZONTAL EMPLACEMENT



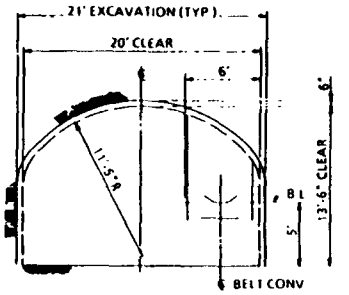
WASTE RAMP



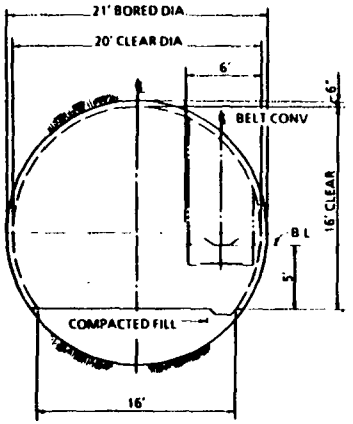
WASTE MAIN



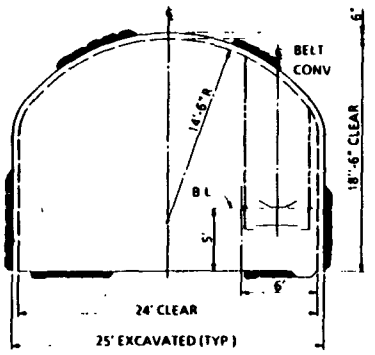
EMPLACEMENT DRIFT
CONVEYOR USED FOR DEVELOPMENT ONLY



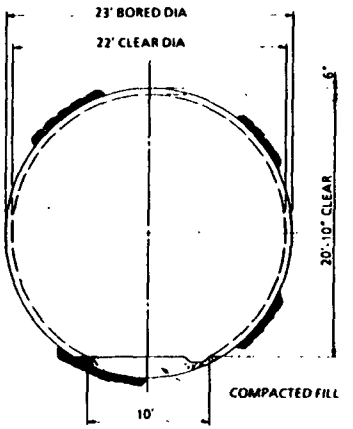
PANEL ACCESS DRIFT



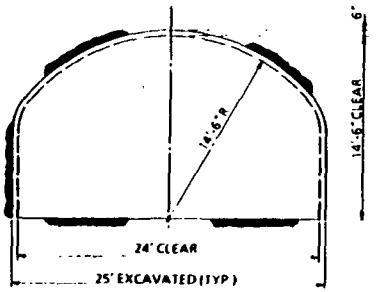
TUFF RAMP



TUFF MAIN



PERIMETER DRIFT



SERVICE MAIN

DIA. - DIAMETER
TYP. - TYPICAL
CONV. - CONVEYOR
B.L. - BELT LINE

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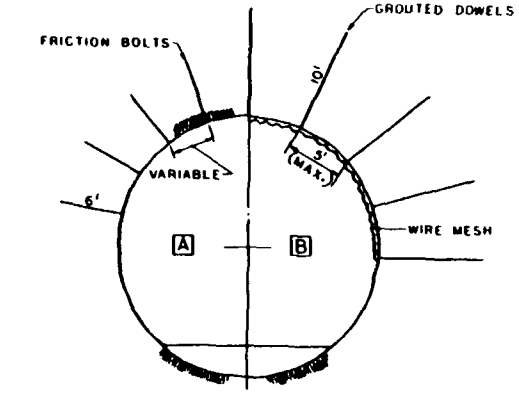
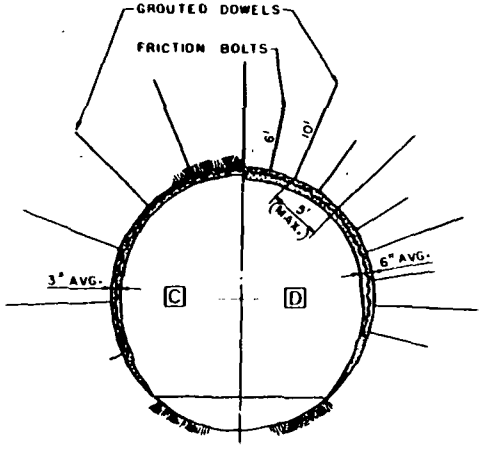
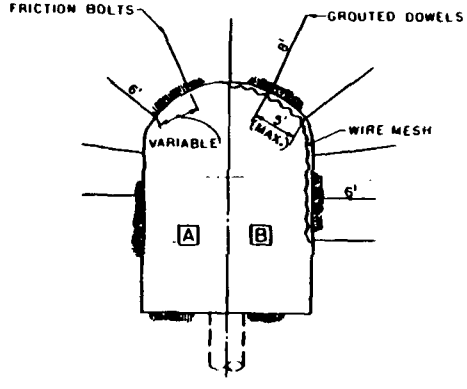
TYPICAL GROUND SUPPORT CROSS SECTIONS

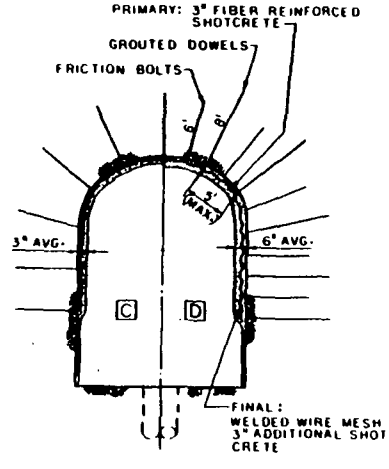
BORED DRIFTS (TYPICAL)



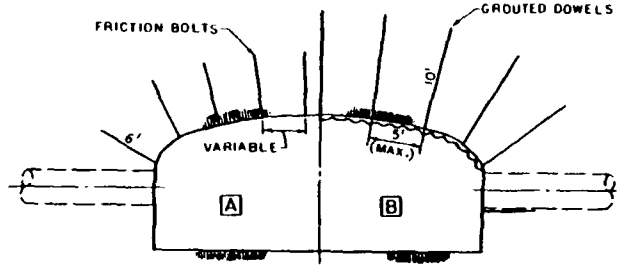


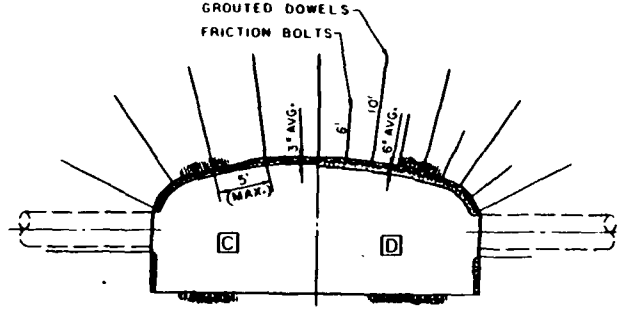
VERTICAL CONFIGURATION





HORIZONTAL CONFIGURATION

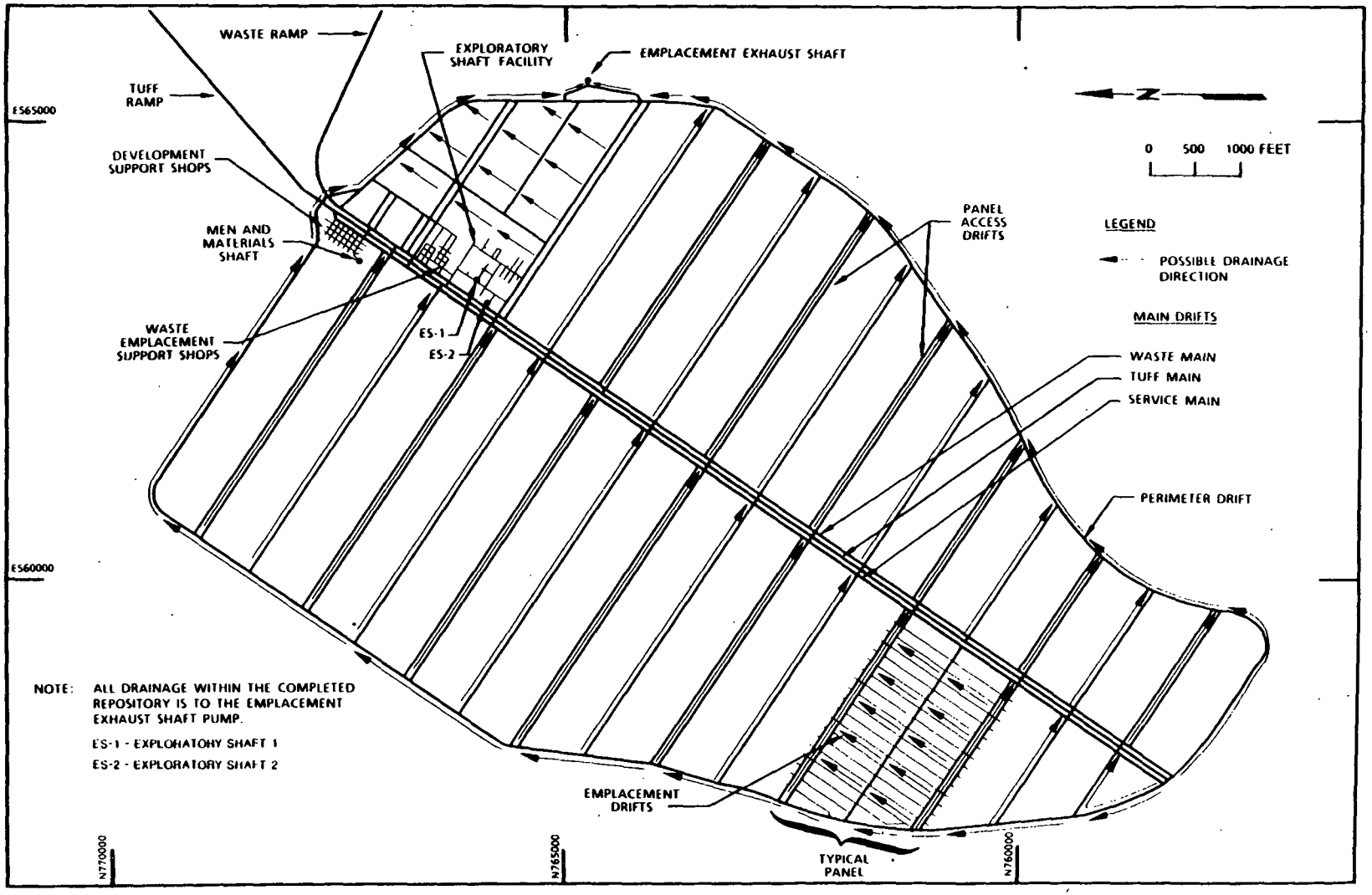




ROCK CLASSIFICATIONS:

- **A** - FRICTION TYPE ROCK BOLTS PLACED AS NEEDED FOR CONDITIONS
- **B** - WELDED WIRE MESH AS NEEDED IN CROWN WITH GROUTED DOWELS IN A PATTERN IN CROWN AND UPPER HALF
- **C** - WELDED WIRE MESH IN CROWN AND SIDES, SUPPORTED BY GROUTED DOWELS PLACED IN A PATTERN AND 3 INCHES OF SHOTCRETE
- **D** - PRIMARY SUPPORT: FRICTION TYPE BOLTS WITH 3 INCHES OF STEEL FIBER REINFORCED SHOTCRETE
  FINAL SUPPORT: GROUTED DOWELS, PLACED IN A PATTERN, WELDED WIRE MESH, AND 3 INCHES OF ADDITIONAL SHOTCRETE

GENERAL UNDERGROUND FACILITY LAYOUT SHOWING DRAINAGE DIRECTIONS FOR VERTICAL EMPLACEMENT



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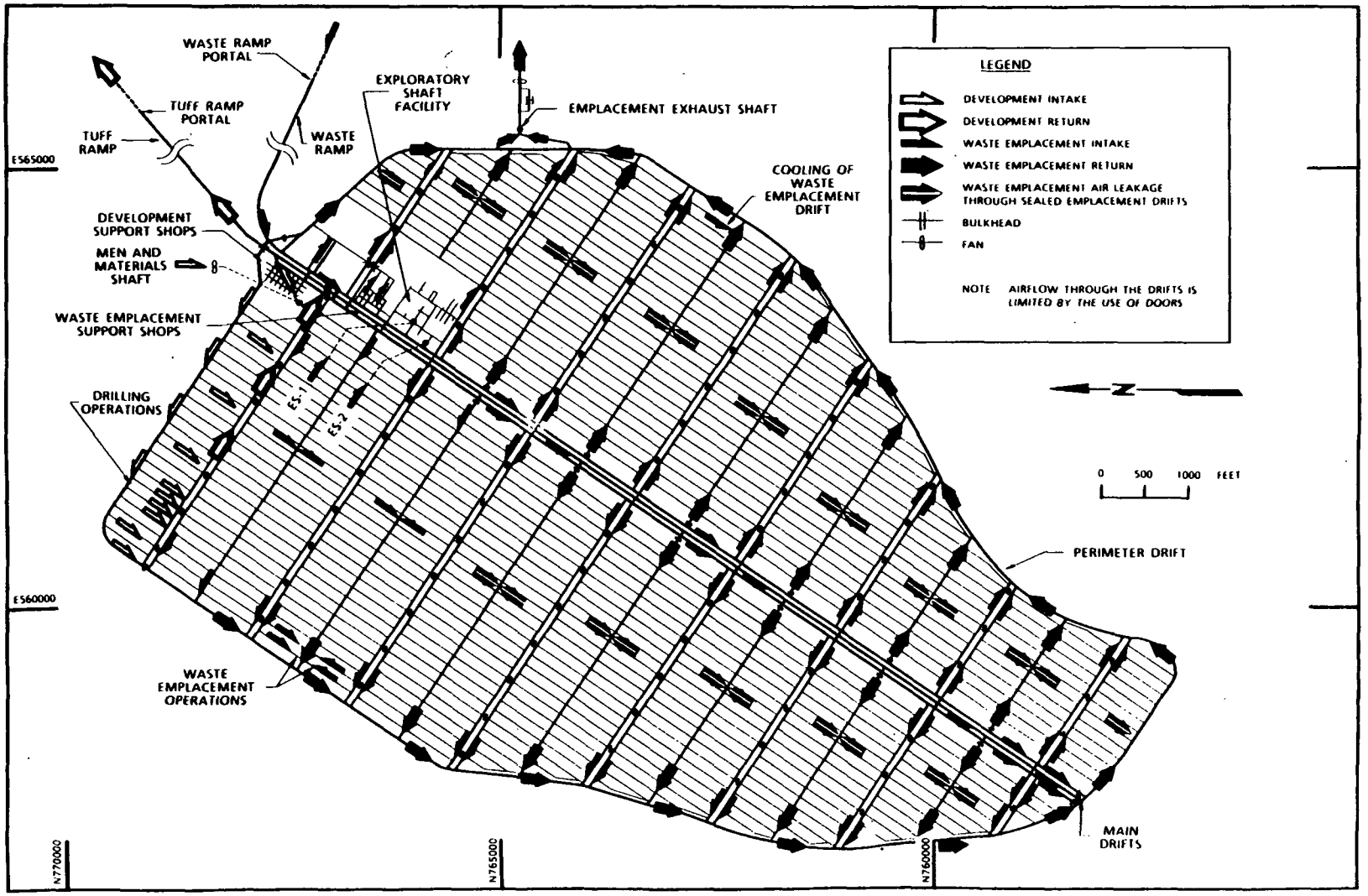
AIRFLOW DIRECTIONS AND MAIN FAN LOCATIONS FOR THE WASTE EMPLACEMENT AREA FOR VERTICAL EMPLACEMENT



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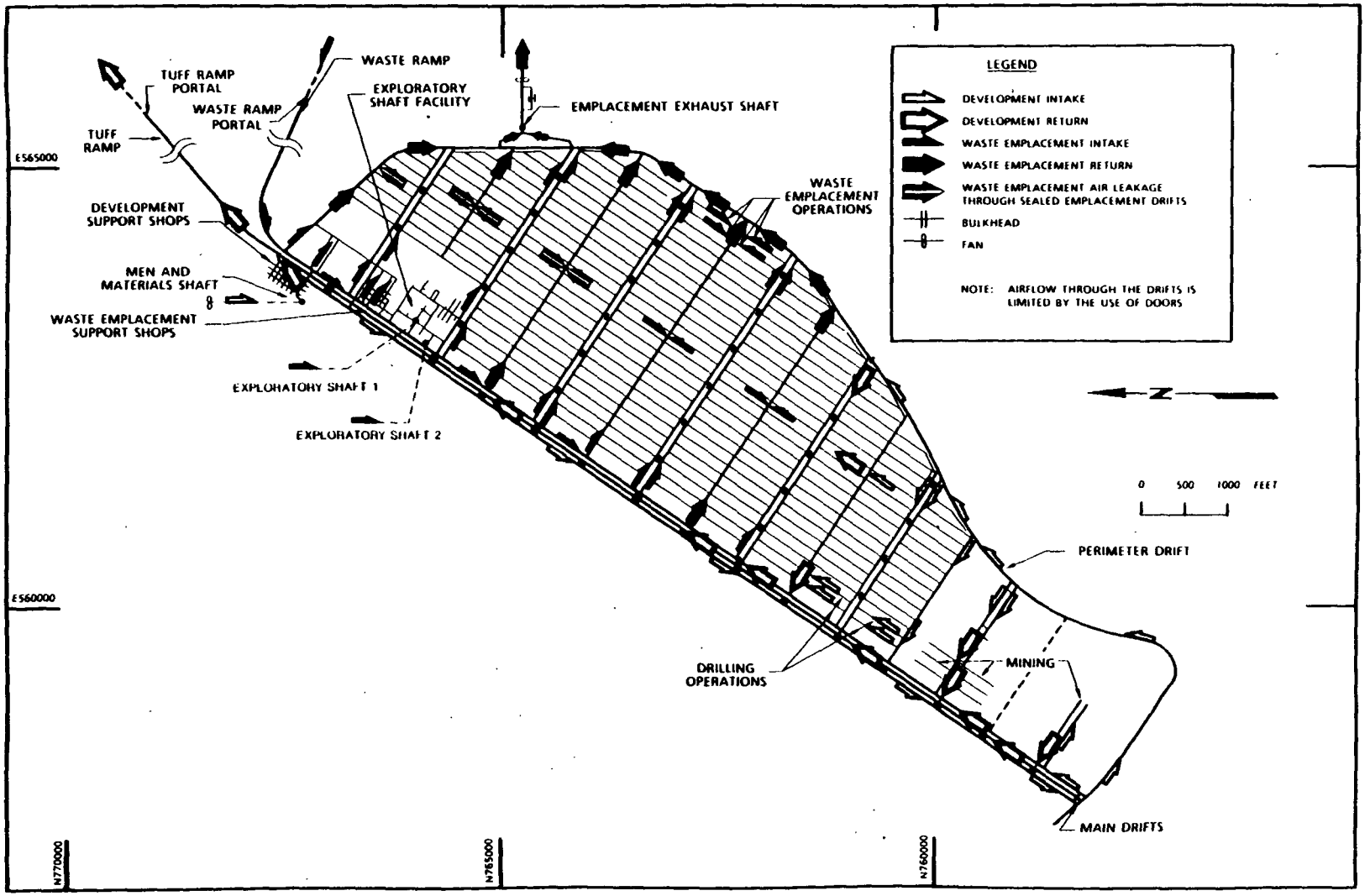
AIRFLOW DIRECTIONS AND PROPOSED MAIN FAN LOCATIONS FOR THE WASTE EMPLACEMENT AREA FOR VERTICAL EMPLACEMENT



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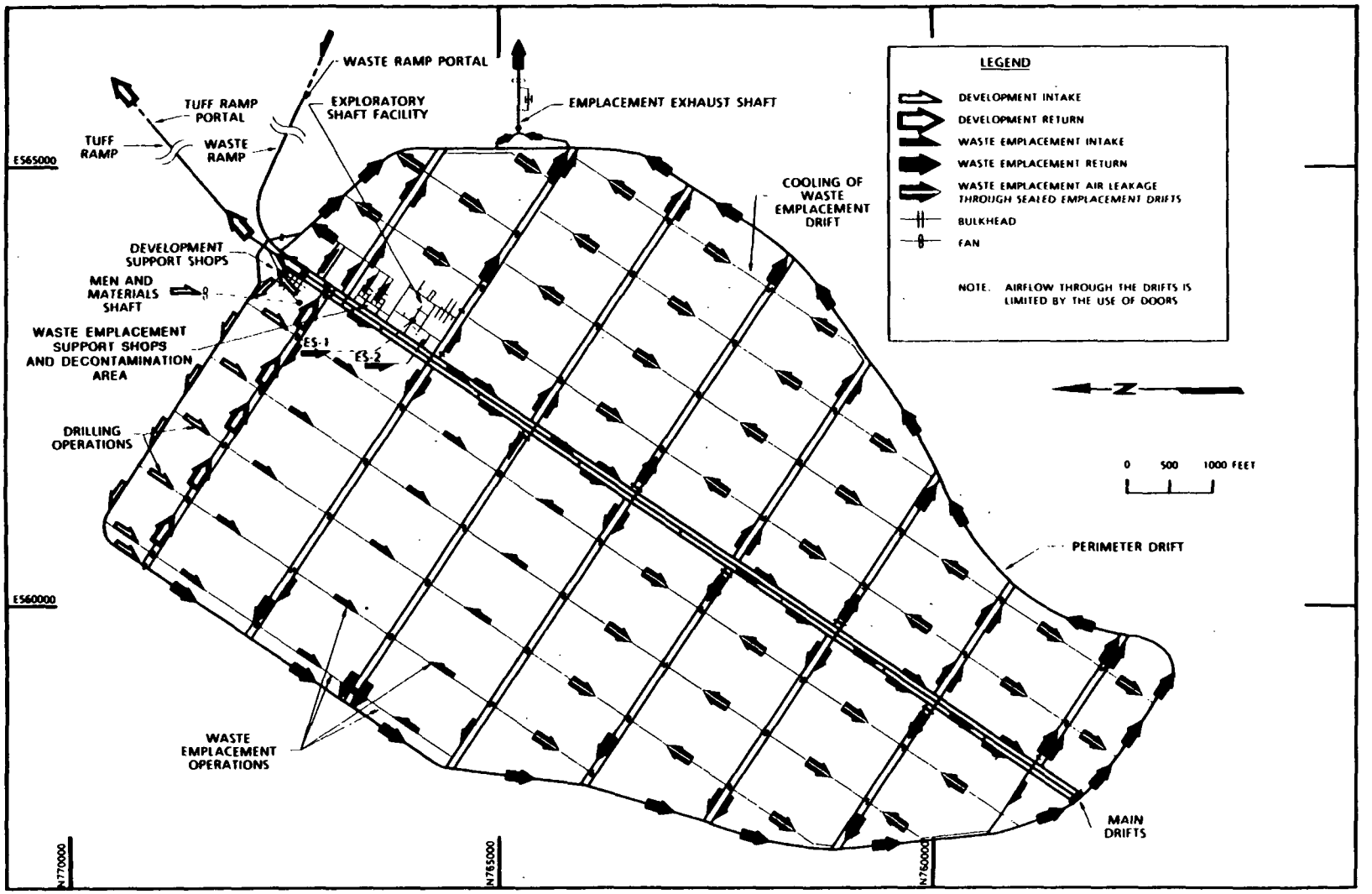
AIRFLOW DIRECTIONS AND MAIN FAN LOCATIONS FOR THE WASTE EMPLACEMENT AREA FOR HORIZONTAL EMPLACEMENT



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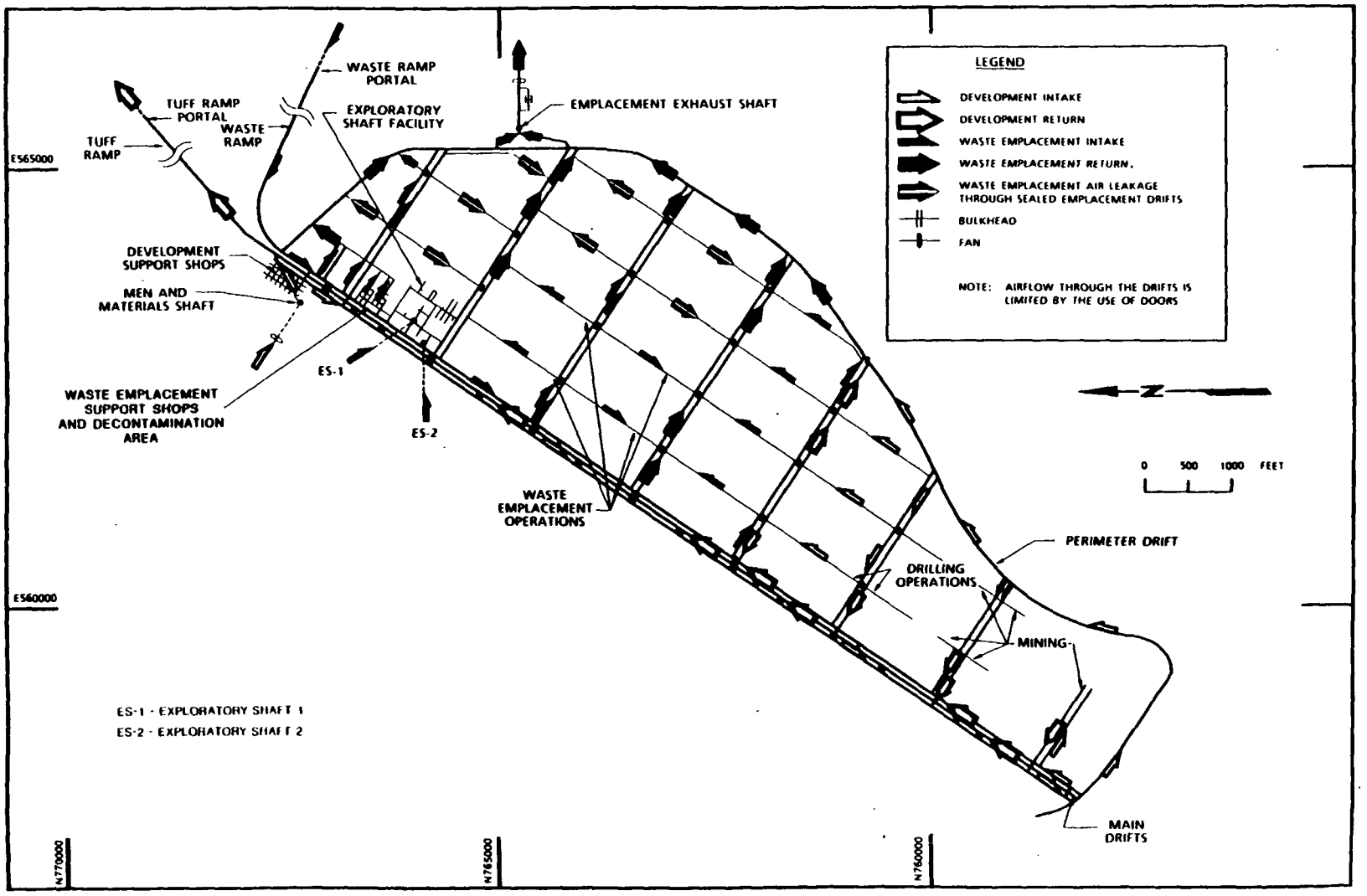
AIRFLOW DIRECTIONS AND MAIN FAN LOCATIONS FOR THE DEVELOPMENT AREA FOR HORIZONTAL EMPLACEMENT



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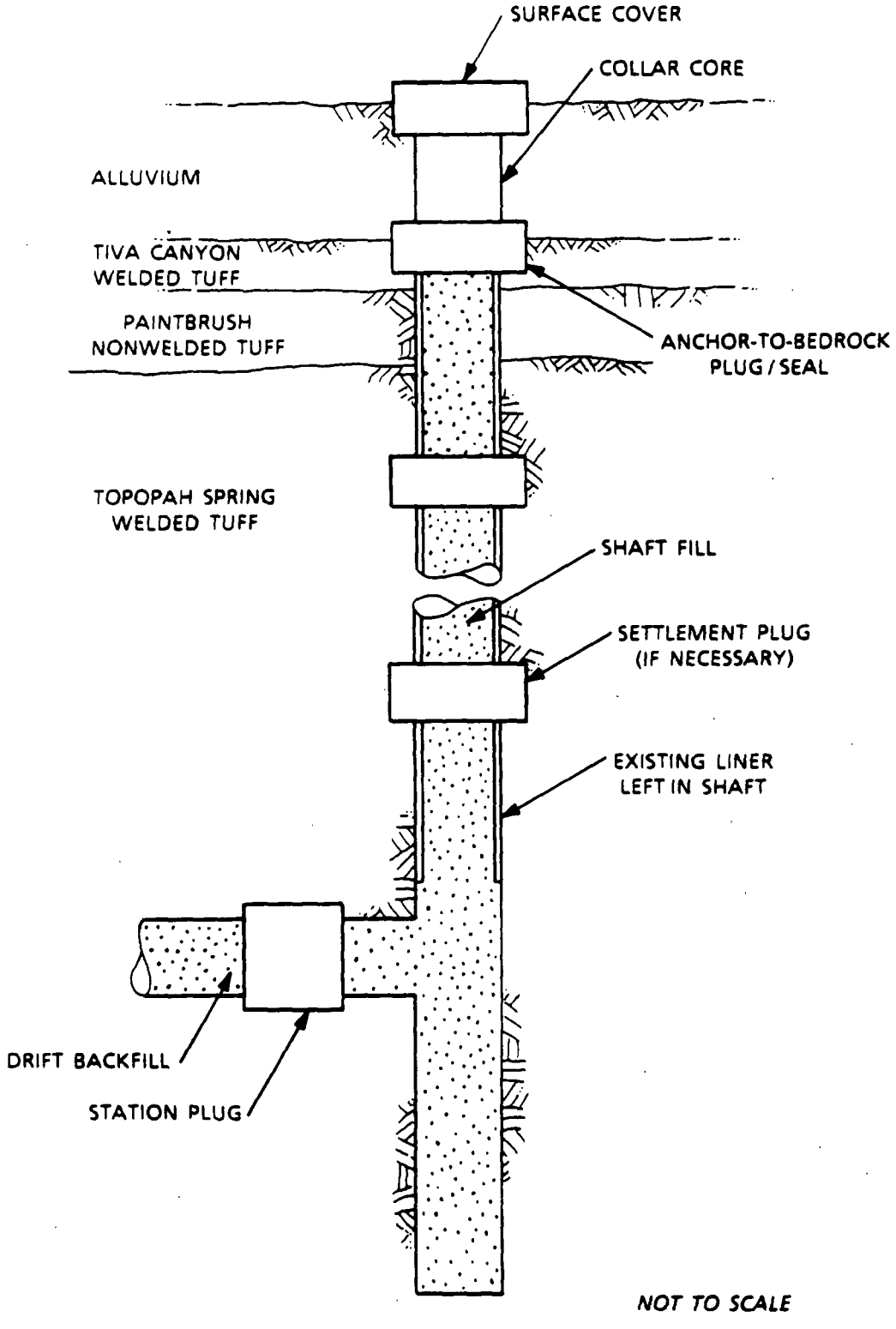
GENERAL ARRANGEMENT FOR SHAFT SEALS



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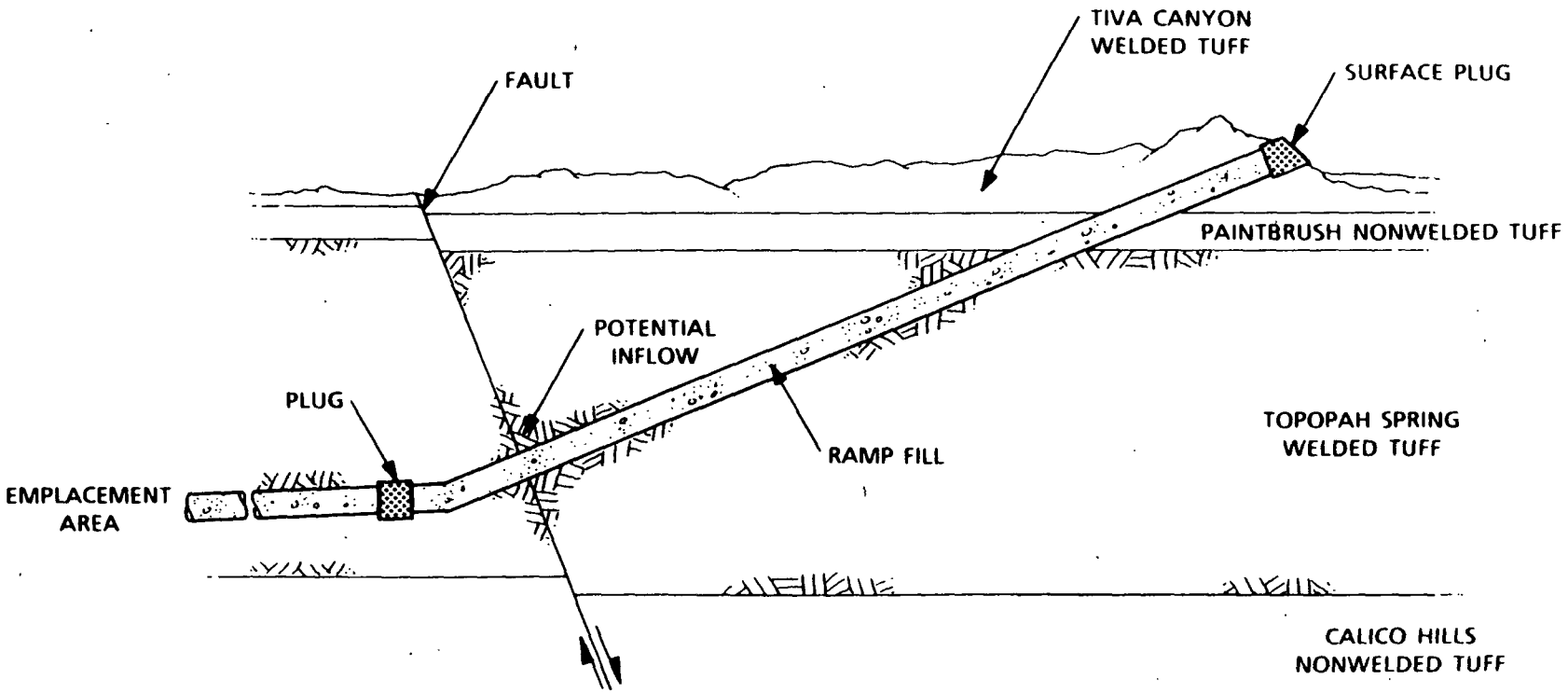
GENERAL ARRANGEMENT FOR RAMP SEALS



NOT TO SCALE

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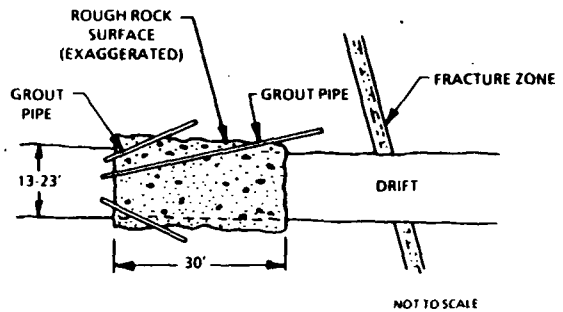
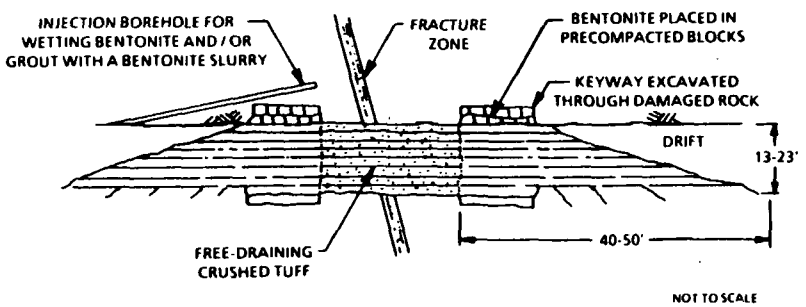
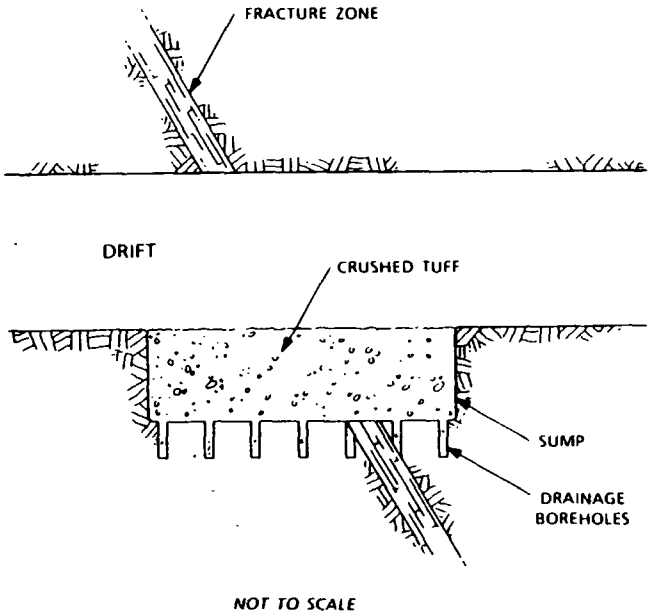
CONCEPTS FOR WATER INFLOW CONTROL



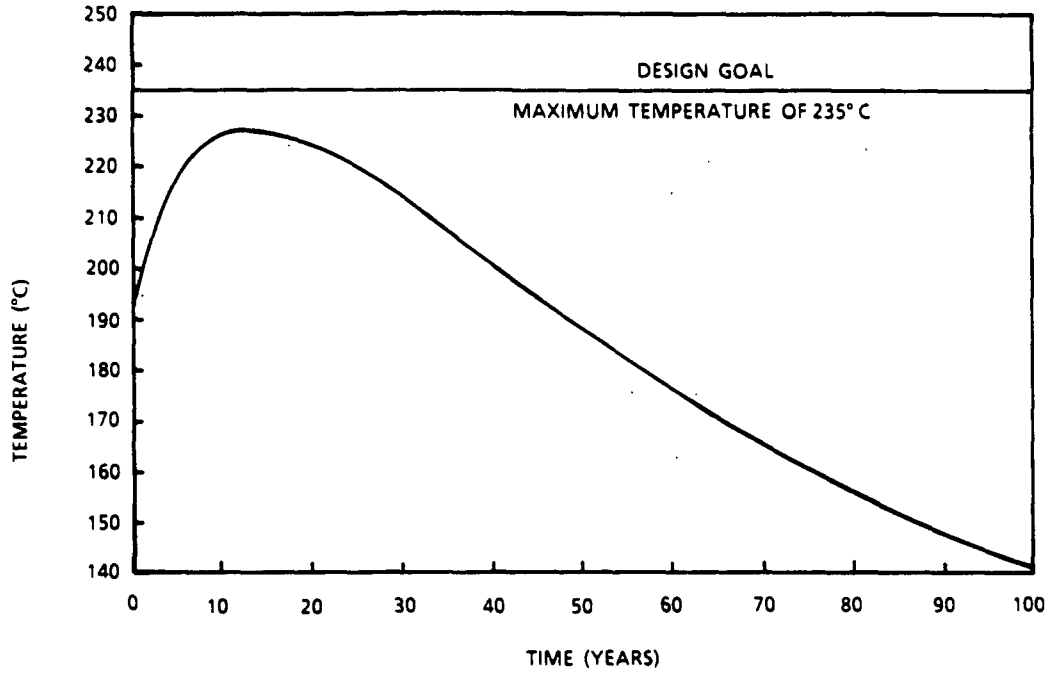


CONCEPTS FOR ISOLATING MAJOR INFLOWS WITH GROUTING OR DRIFT BULKHEADS

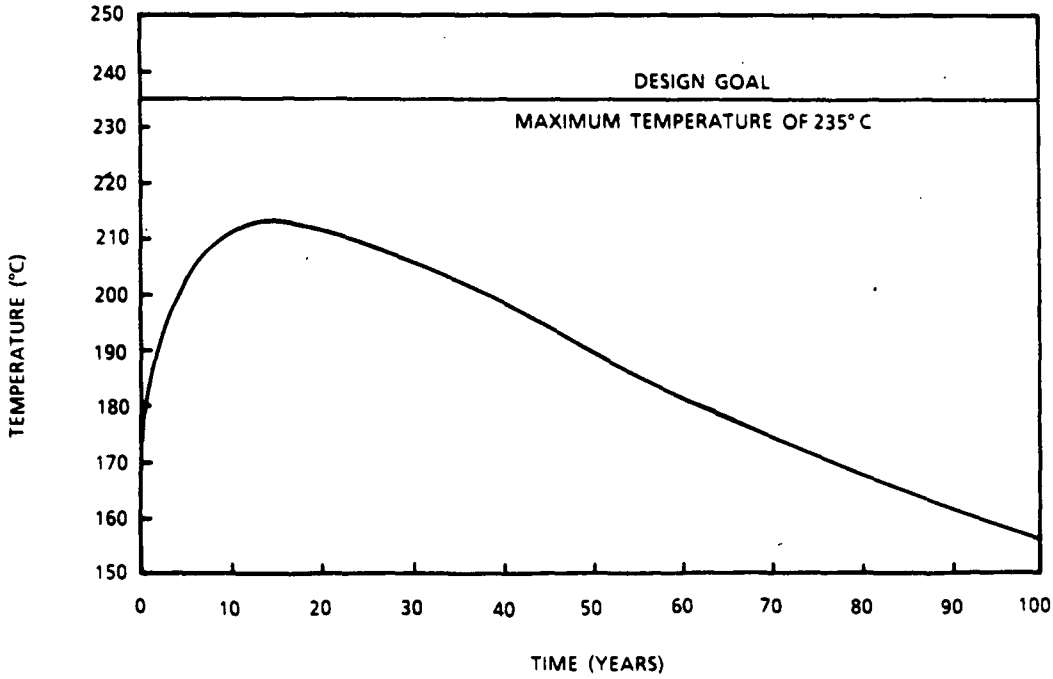


CONCEPT FOR IMPOUNDING AND DIVERTING WATER INFLOW USING SUMPS AND DRAINS

PREDICTED TEMPERATURES FOR EMPLACEMENT BOREHOLES



BOREHOLE WALL TEMPERATURE - VERTICAL EMPLACEMENT



BOREHOLE WALL TEMPERATURE - HORIZONTAL EMPLACEMENT

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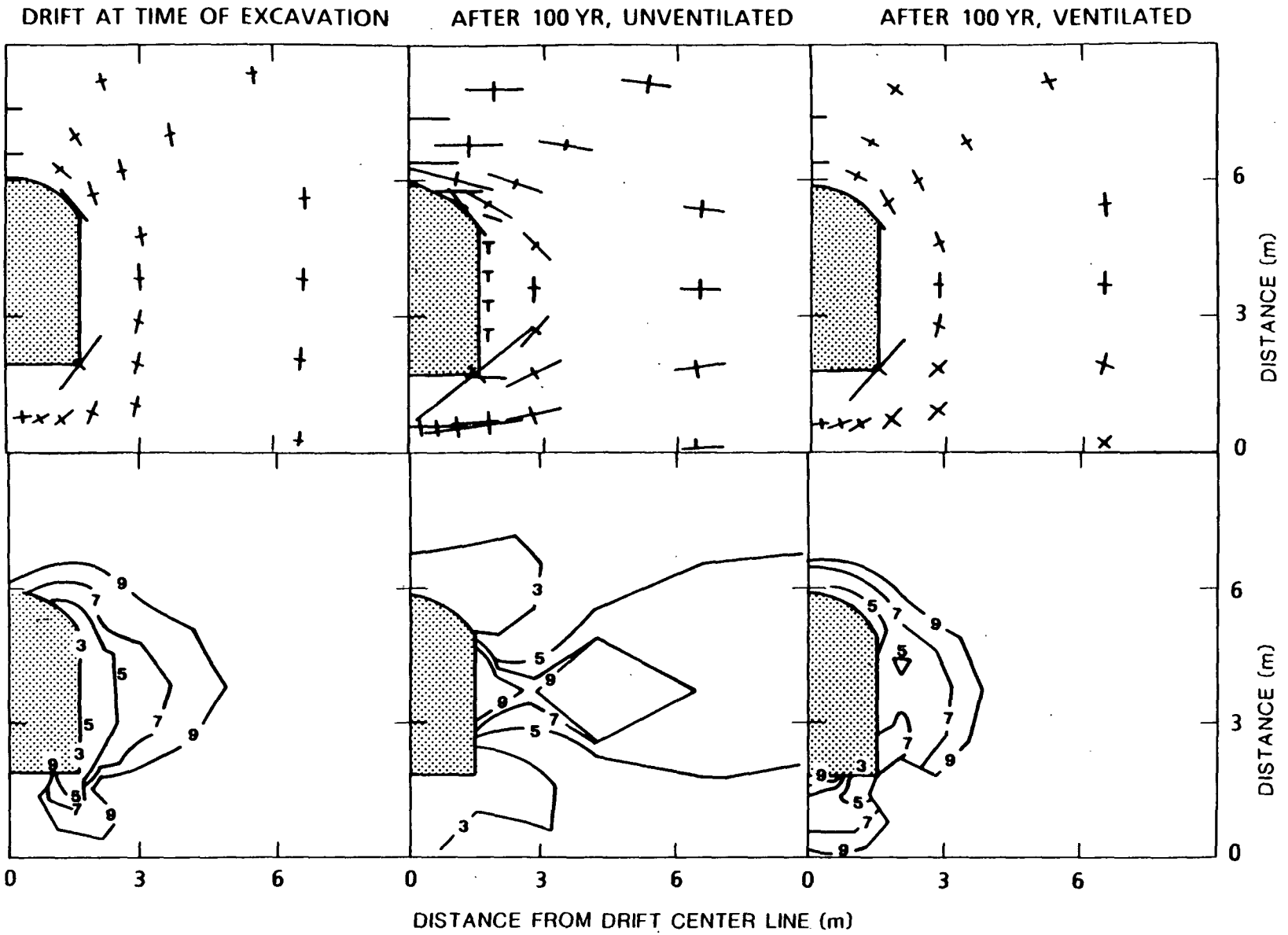
PRINCIPAL STRESSES - VERTICAL EMPLACMENT DRIFT



RATIO BETWEEN MATRIX STRENGTH AND STRESS - VERTICAL EMPLACMENT DRIFT

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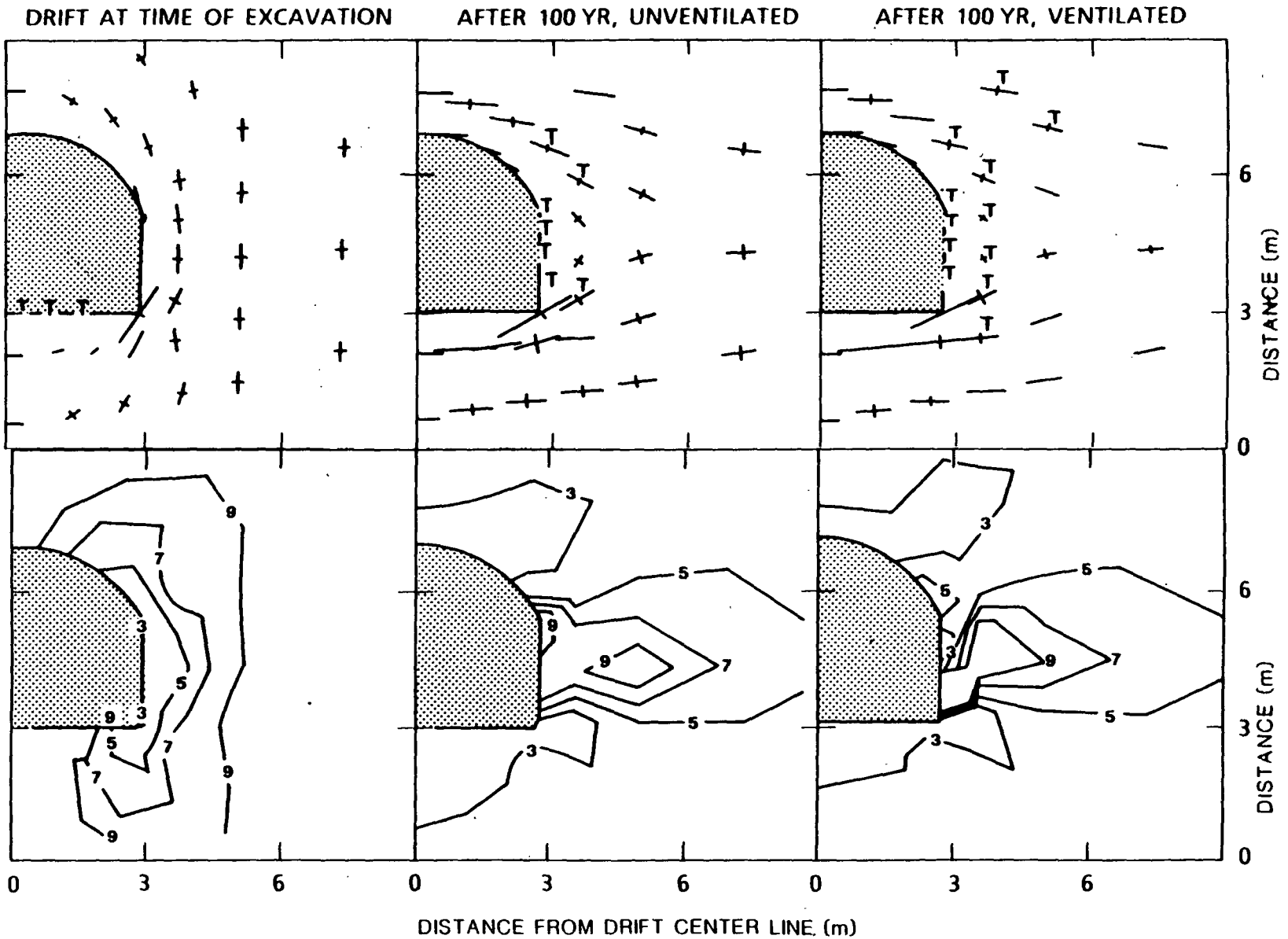
PRINCIPAL STRESSES - HORIZONTAL EMPLACMENT DRIFT



RATIO BETWEEN MATRIX STRENGTH AND STRESS - HORIZONTAL EMPLACMENT DRIFT

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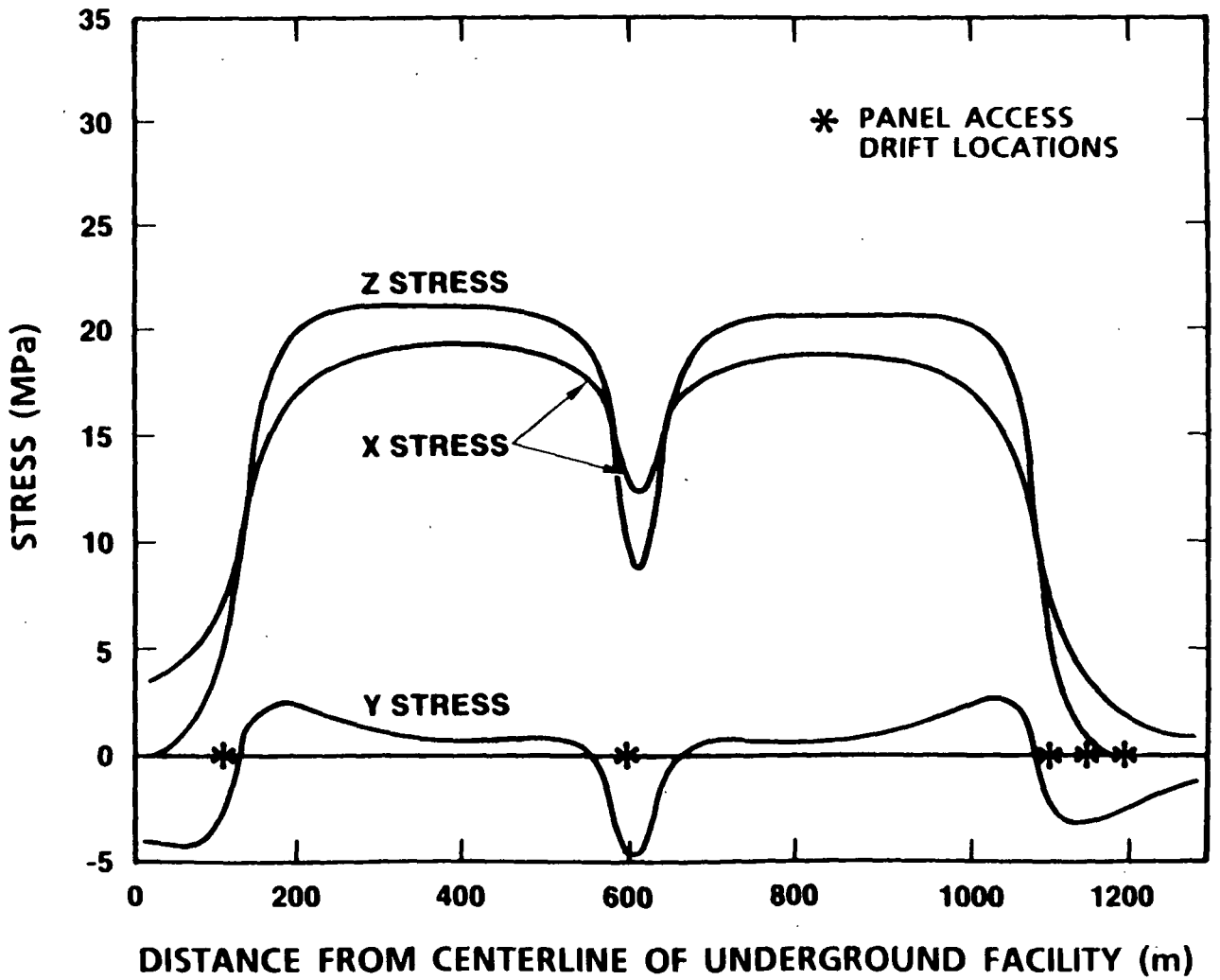
INDUCED STRESS PROFILE ON REPOSITORY HORIZON 50 YR AFTER WASTE EMPLACEMENT