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

PRESENTATION TO THE NUCLEAR WASTE TECHNICAL REVIEW BOARD

SUBJECT: ESF RAMP GRADIENT

PRESENTER: BRUCE STANLEY

PRESENTER'S TITLE AND ORGANIZATION: LEAD MINING ENGINEER
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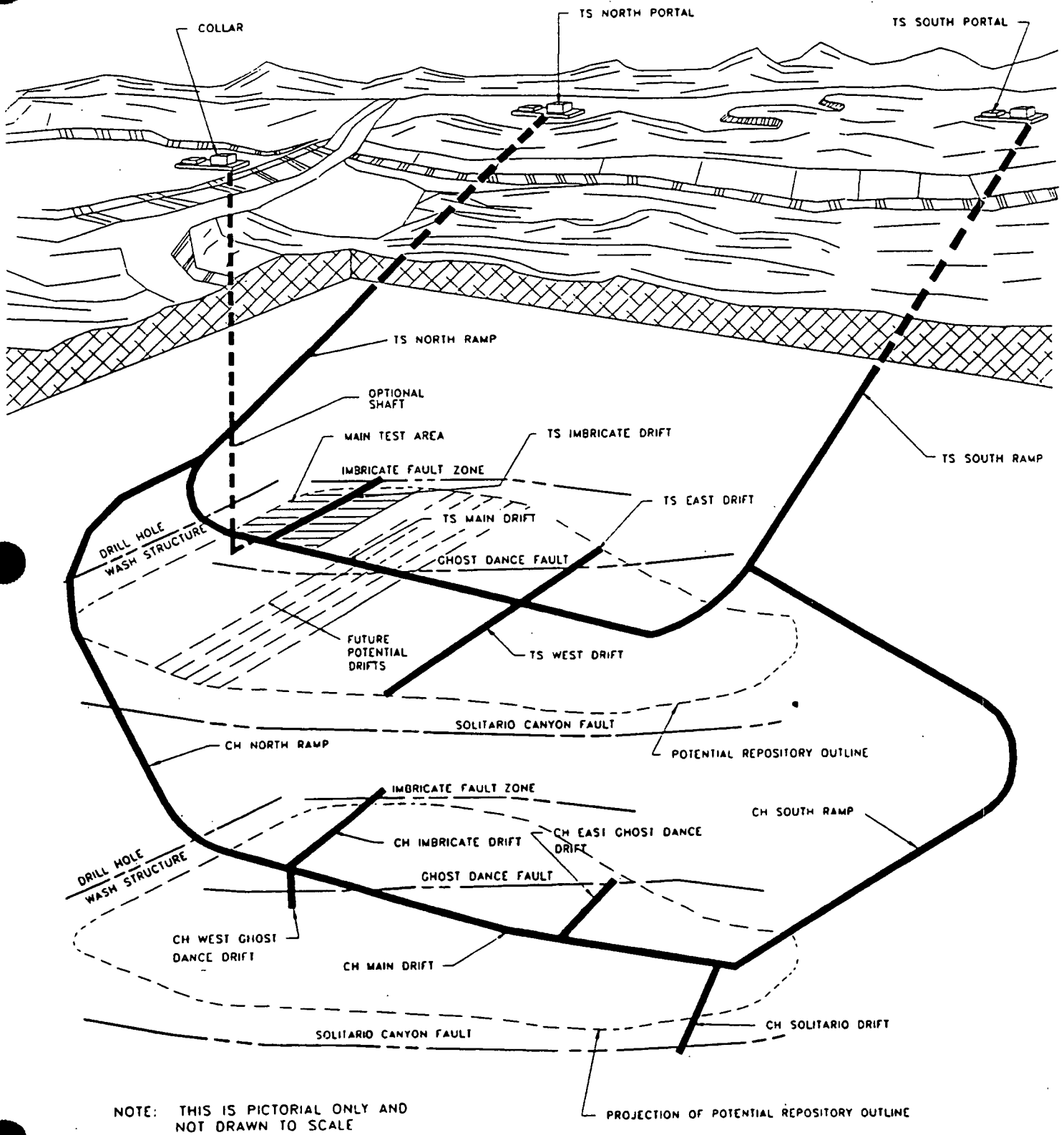
SEPTEMBER 18 - 19, 1991

ESF CONFIGURATION



NOTE: THIS IS PICTORIAL ONLY AND NOT DRAWN TO SCALE

RERGBV5P.125.NWTRB/9-18/19-91

OBJECTIVE AND SCOPE

THE OBJECTIVE OF THIS PRESENTATION IS TO REPORT ON THE PROGRESS IN DETERMINING INFORMATION WHICH CAN BE USED IN THE SELECTION OF THE ESF ACCESS RAMP GRADIENTS

THE SCOPE OF THIS PRESENTATION IS:

1. TO DESCRIBE THE EXISTING CONDITIONS WHICH AFFECT OR ARE AFFECTED BY RAMP GRADE

2. TO BRIEFLY DESCRIBE THE OPERATIONAL SAFETY AND SCHEDULE IMPLICATIONS OF SOME GRADE OPTIONS

3. TO STATE PRELIMINARY CONCLUSIONS WHICH CAN BE DRAWN FROM EXAMINATION OF THE INFORMATION PRESENTED

CONTEXT

1. THE RAMP OF PRINCIPLE INTEREST IS THE NORTH ACCESS RAMP BECAUSE THE SOUTH RAMP HAS A LOW GRADIENT OF 1.6% AT PRESENT

2. THE BRAKING PERFORMANCE SHOWN HEREIN IS THE MINIMUM PRESCRIBED BY SAE. THESE VALUES HAVE BEEN FIELD TESTED

3. THE MAXIMUM RAIL GRADE RECOMMENDED FOR THE RAMP SERVICE IS 2.5% IN ACCORDANCE WITH A.R.E.A.

4. RAMP GRADE HAS PERMANENT RAMIFICATIONS. THEREFORE, ESF AND REPOSITORY FUNCTIONS SHOULD BE CONSIDERED

EXISTING CONDITIONS AND LATEST GENERAL ARRANGEMENTS

APPLICABLE REQUIREMENTS

ESFDR REQUIREMENTS

- 1.2.6.5 PC2b - THE RAMP AND ROADWAY SHALL BE DESIGNED TO PROVIDE AN ACCEPTABLE SLOPE SUITABLE FOR EXCAVATION, SAFE VEHICLE TRAFFIC, AND MATERIAL HANDLING EQUIPMENT REQUIREMENTS

REPOSITORY DESIGN REQUIREMENTS (REFER TO SAND85-0260 DRAFT D)

- 3.3.1 WASTE RAMP C, B: THE RAMP SLOPE SHALL NOT EXCEED 10%

- 3.3.1 WASTE RAMP PC, 1: THE RAMP ENTRY POINT INTO THE REPOSITORY WILL CONSIDER THE OVERALL DESIGN OF THE REPOSITORY LAYOUT TO PROVIDE THE OPTIMUM TRAVEL ROUTE FOR THE WASTE TRANSPORTER WITH MINIMUM ACHIEVABLE GRADIENTS AND HAUL DISTANCES

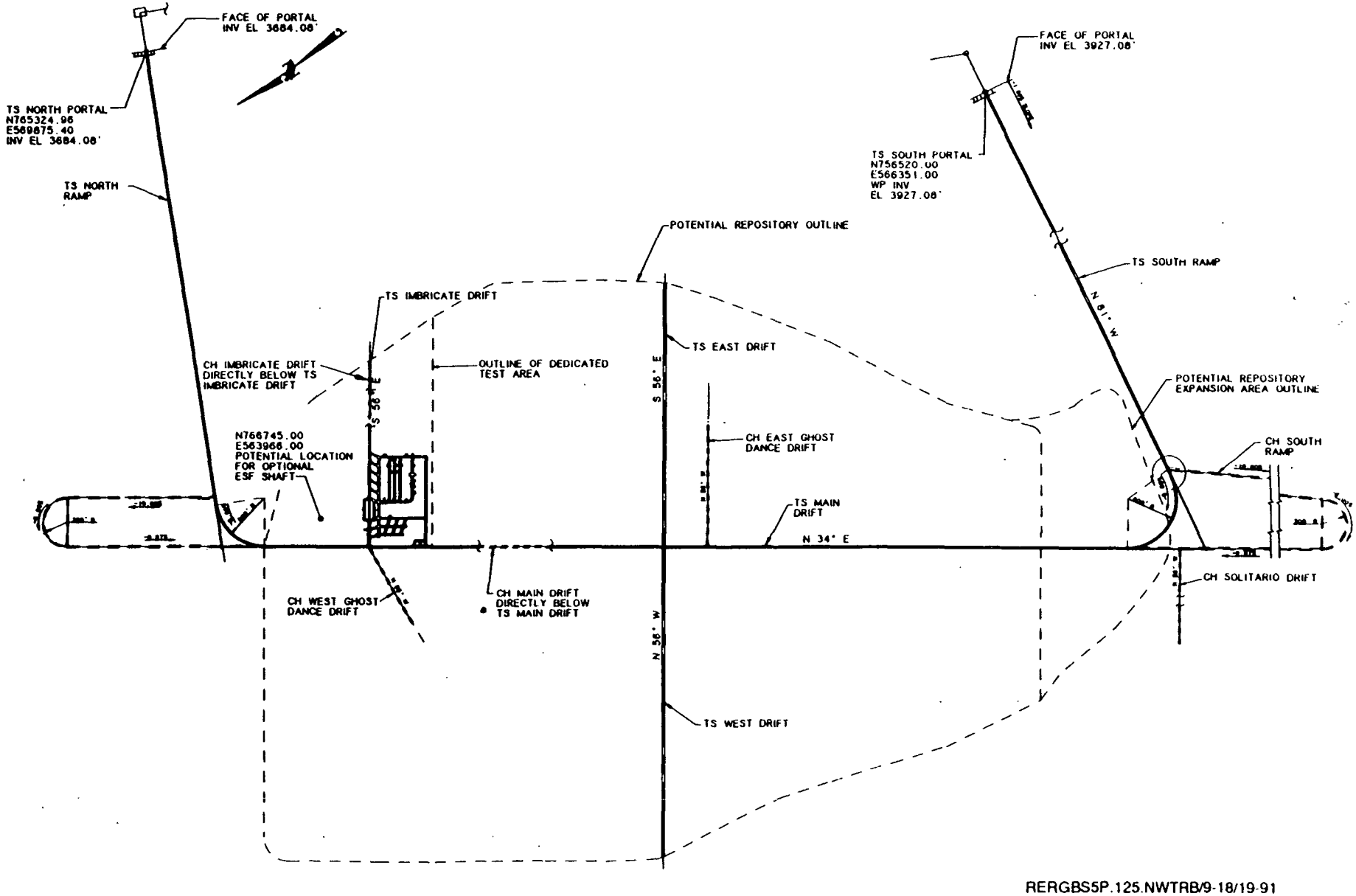
DESIGN REVIEW COMMENTS (CONDENSED AND PARAPHRASED)

1. EXPLORE THE POSSIBILITY OF RAIL HAULAGE WHICH REQUIRES FLATTER GRADES

2. MINIMIZATION OF GRADE IS DESIRABLE

3. EXAMINE THE SAFETY ASPECTS OF RAMP GRADE

SUBSURFACE ACCESS GENERAL ARRANGEMENT PLAN



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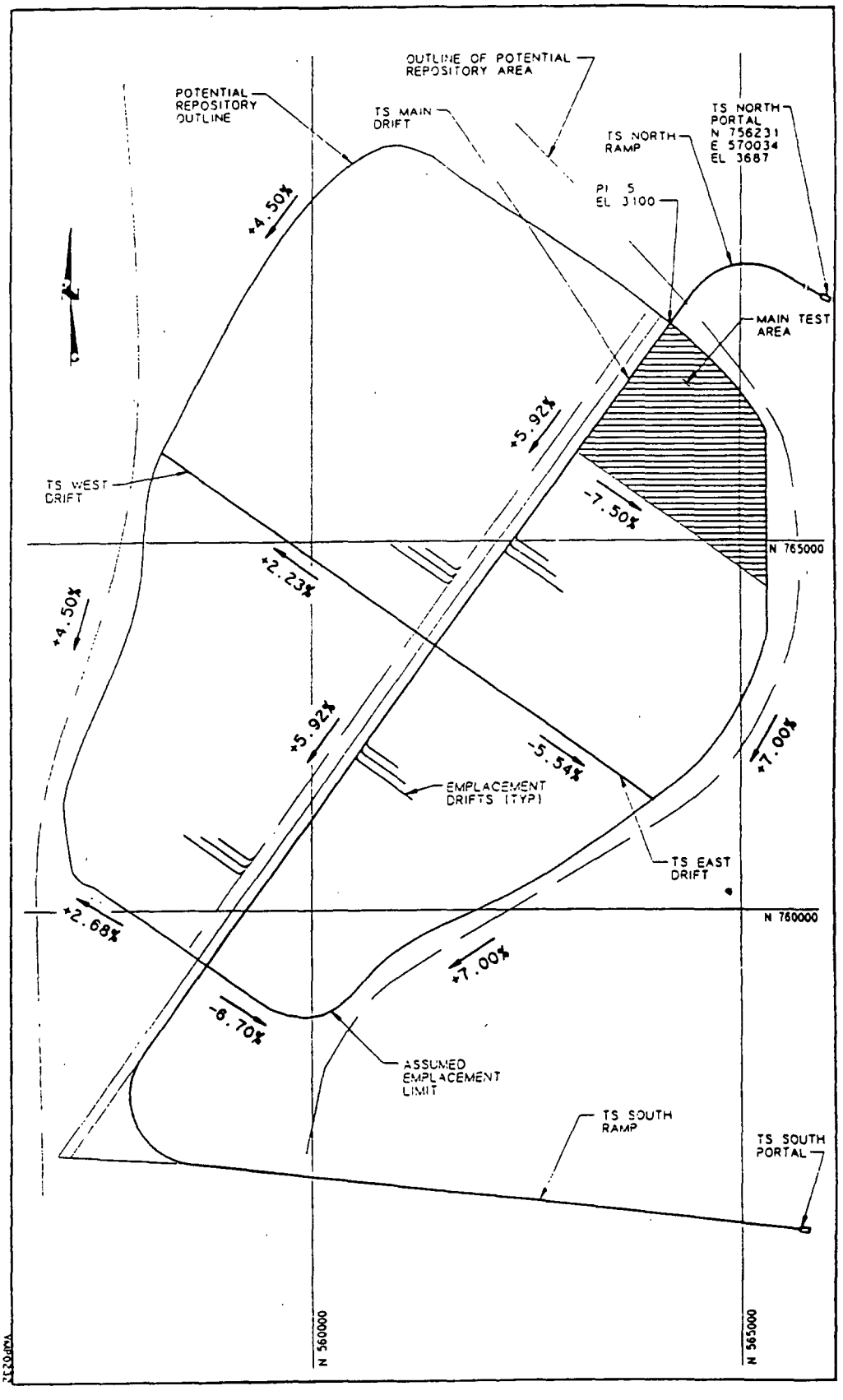
PLANNED REPOSITORY GRADES IF ELEVATION OF N. ENTRY IS 3,100 FT



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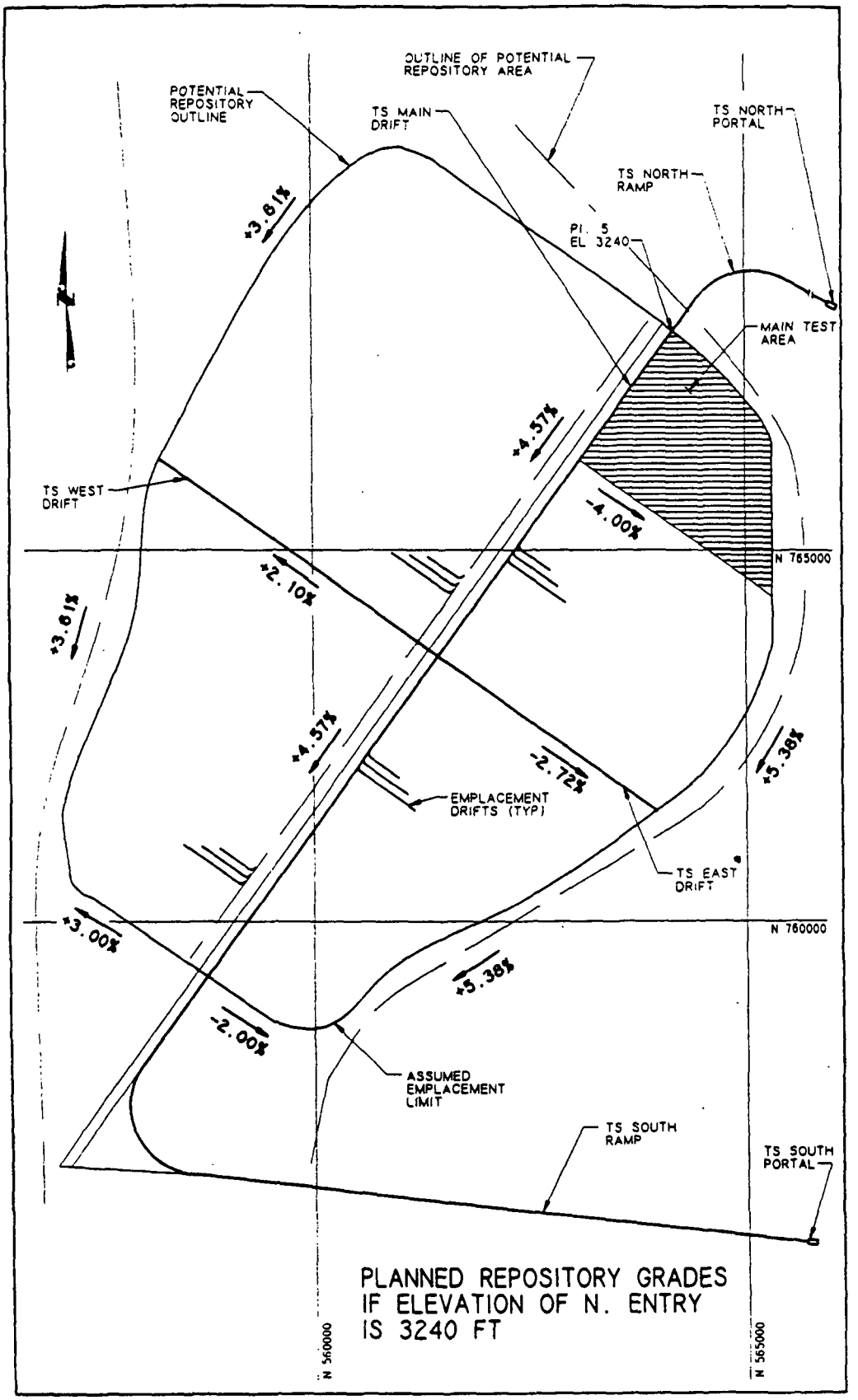
PLANNED REPOSITORY GRADES IF ELEVATION OF N. ENTRY IS 3,240 FT



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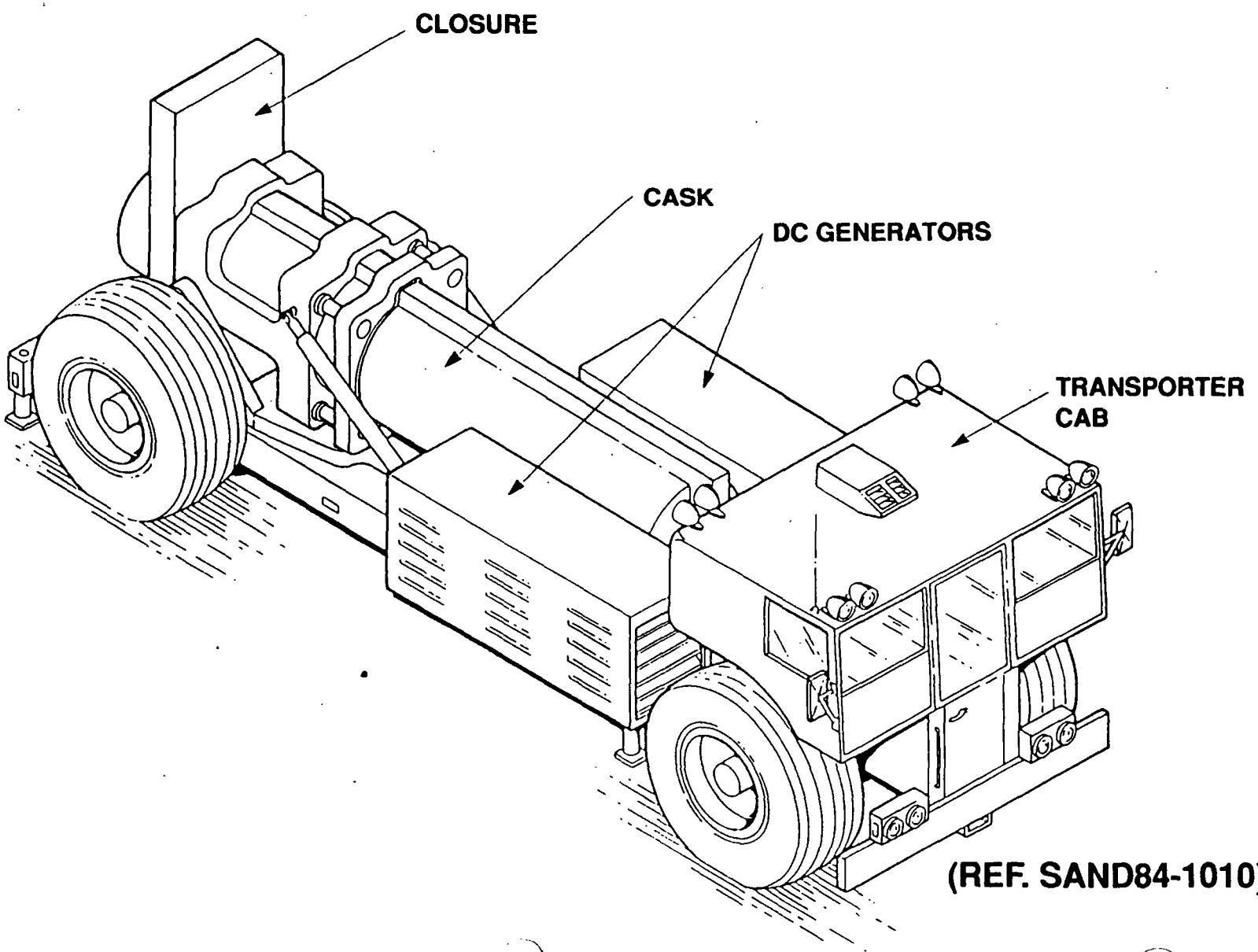
CONCEPTUAL WASTE TRANSPORTER



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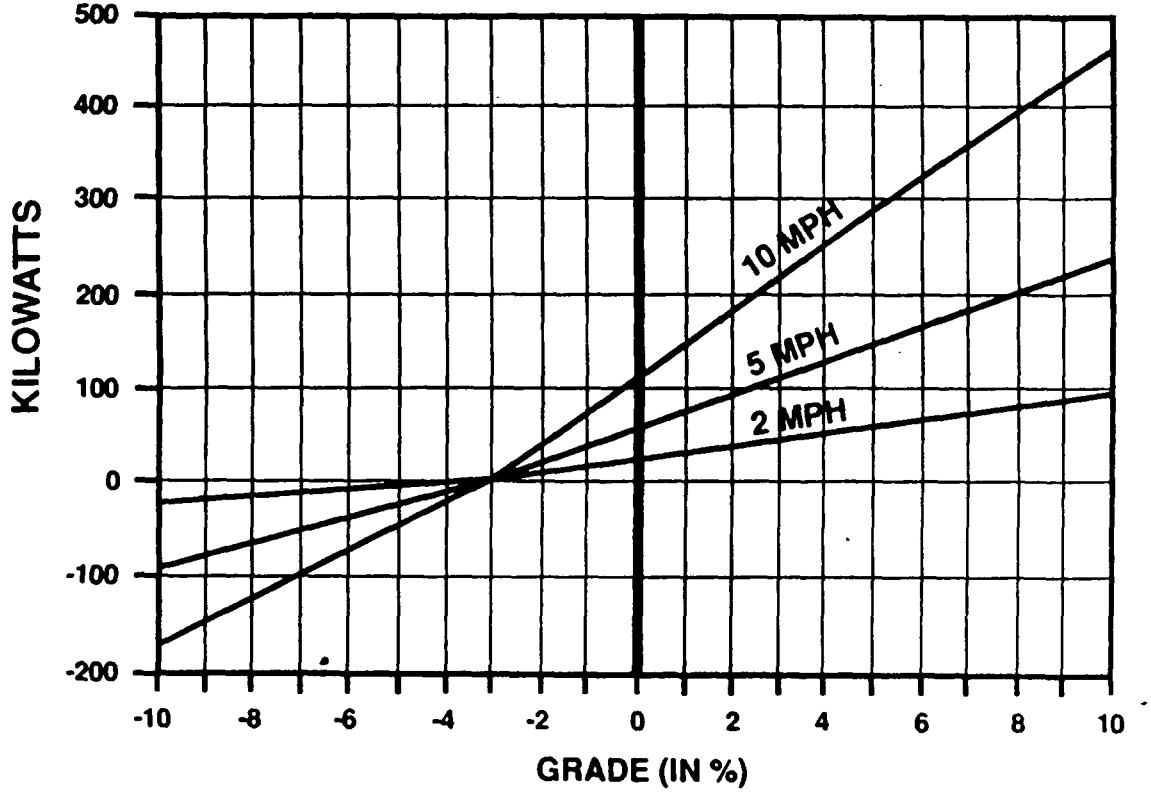
TYPICAL BRAKE SYSTEM

- NORMAL BRAKES
  - THE NORMAL BRAKES WILL BE DESIGNED TO BRING A LOADED TRANSPORTER, TRAVELING AT 5 MPH DOWN A 10% GRADE, TO A COMPLETE STOP WITHIN A DISTANCE OF 20 FT
- PARKING AND HOLDING BRAKES
  - THIS SYSTEM WILL BE DESIGNED TO HOLD THE LOADED TRANSPORTER STATIONARY ON A 25% GRADE
- EMERGENCY BRAKES
  - THE SYSTEM WILL BE INDEPENDENT OF THE OTHER BRAKE SYSTEMS AND WILL BE CAPABLE OF STOPPING THE LOADED VEHICLE, TRAVELING DOWN A 10% GRADE AT 10 MPH, WITHIN 30 FT

TRACTION POWER REQUIREMENTS: PAVED SURFACE



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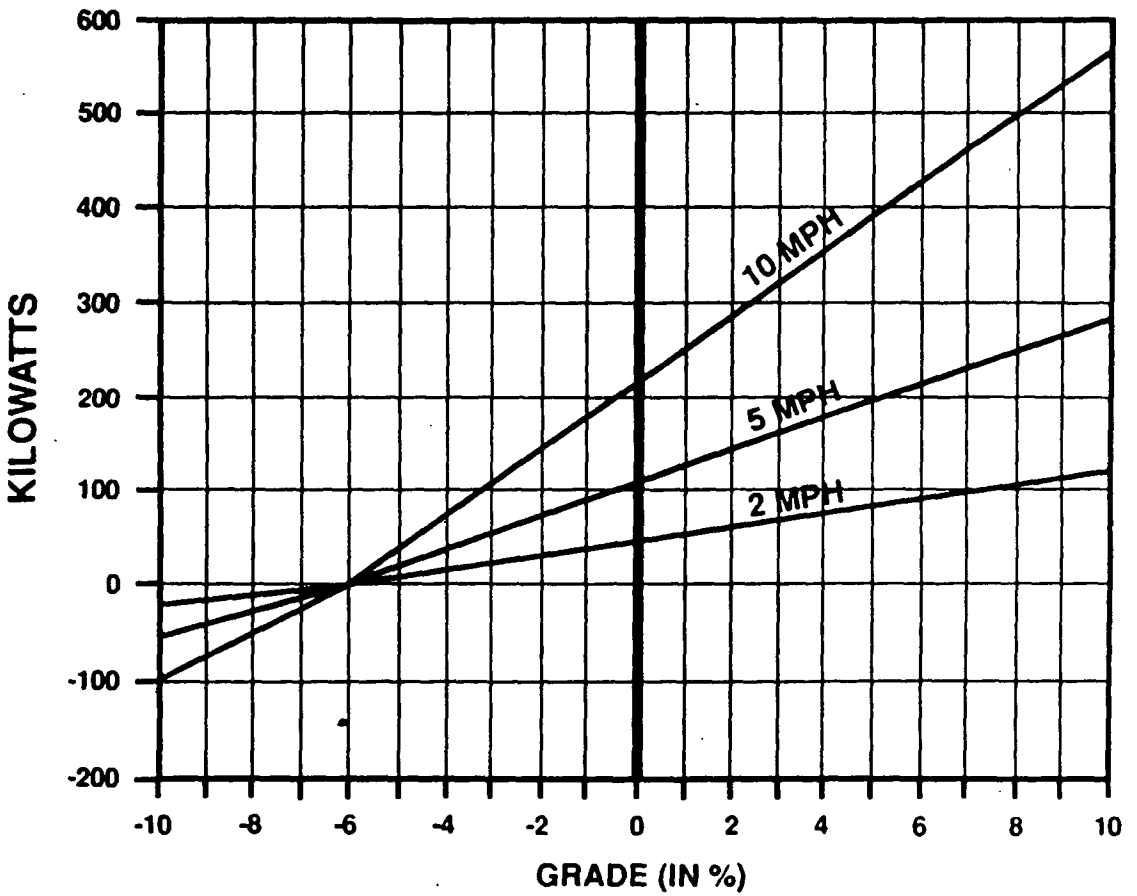
TRACTION POWER REQUIREMENTS: TUFF SURFACE



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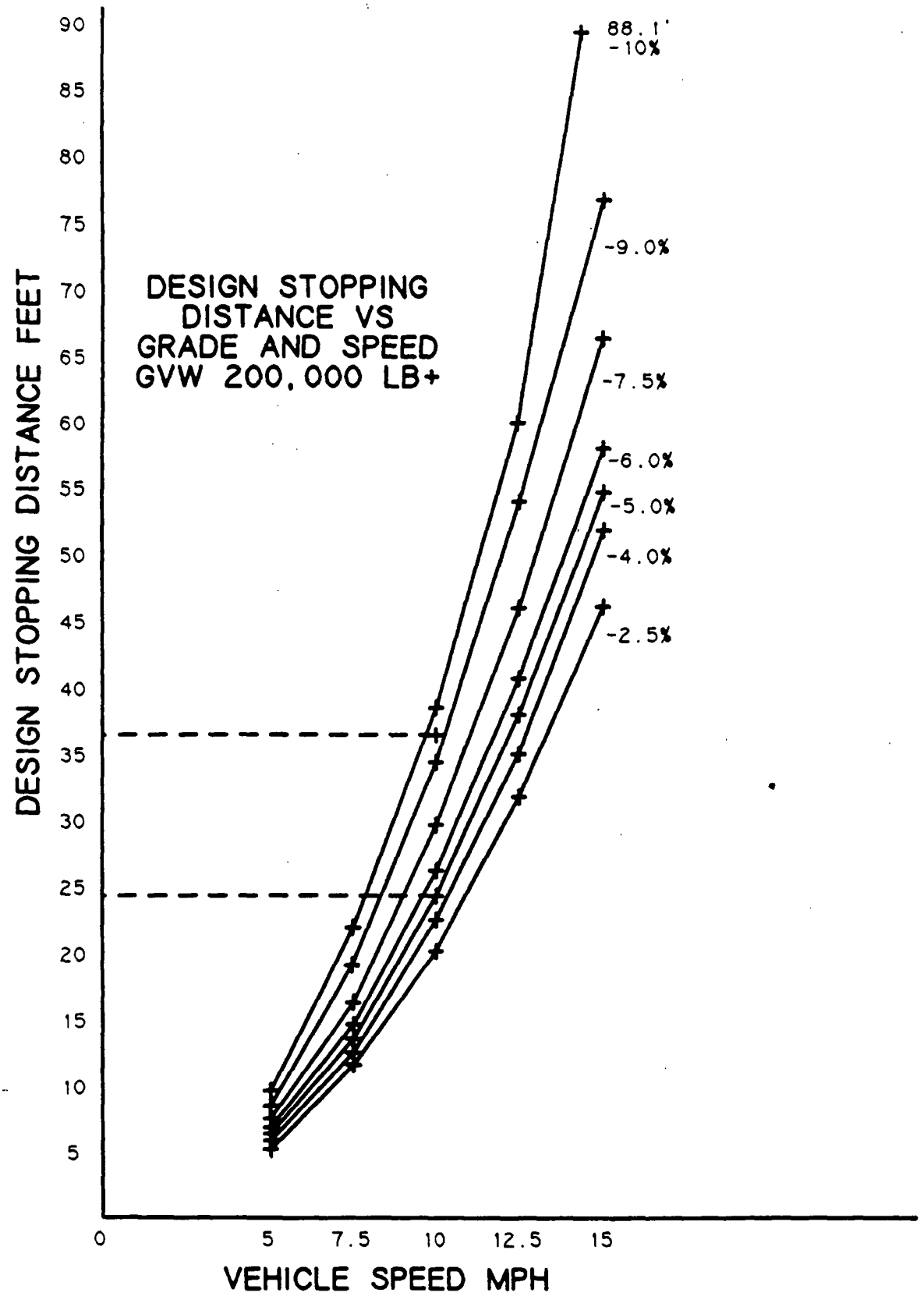
SAE MINIMUM PERFORMANCE FOR OFF HIGHWAY HAULERS 200000# GVW



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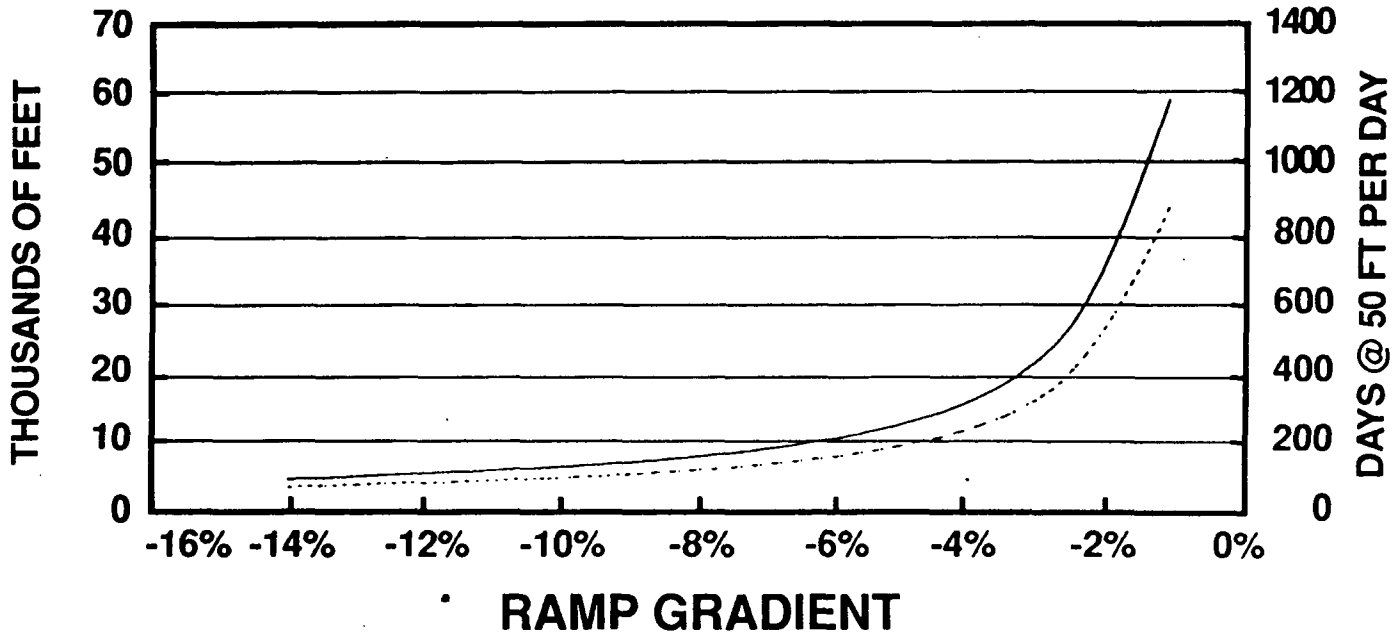
TOPOPAH SPRING NORTH RAMP
PORTAL TO TOPOPAH SPRING HORIZON



—— 3,100 FT ELEVATION ------- 3,240 FT ELEVATION

ASSUME: TS PORTAL (NORTH) = 3,684 FT
NOTE: THIS IS THE CURRENT GENERAL ARRANGEMENT ELEVATION

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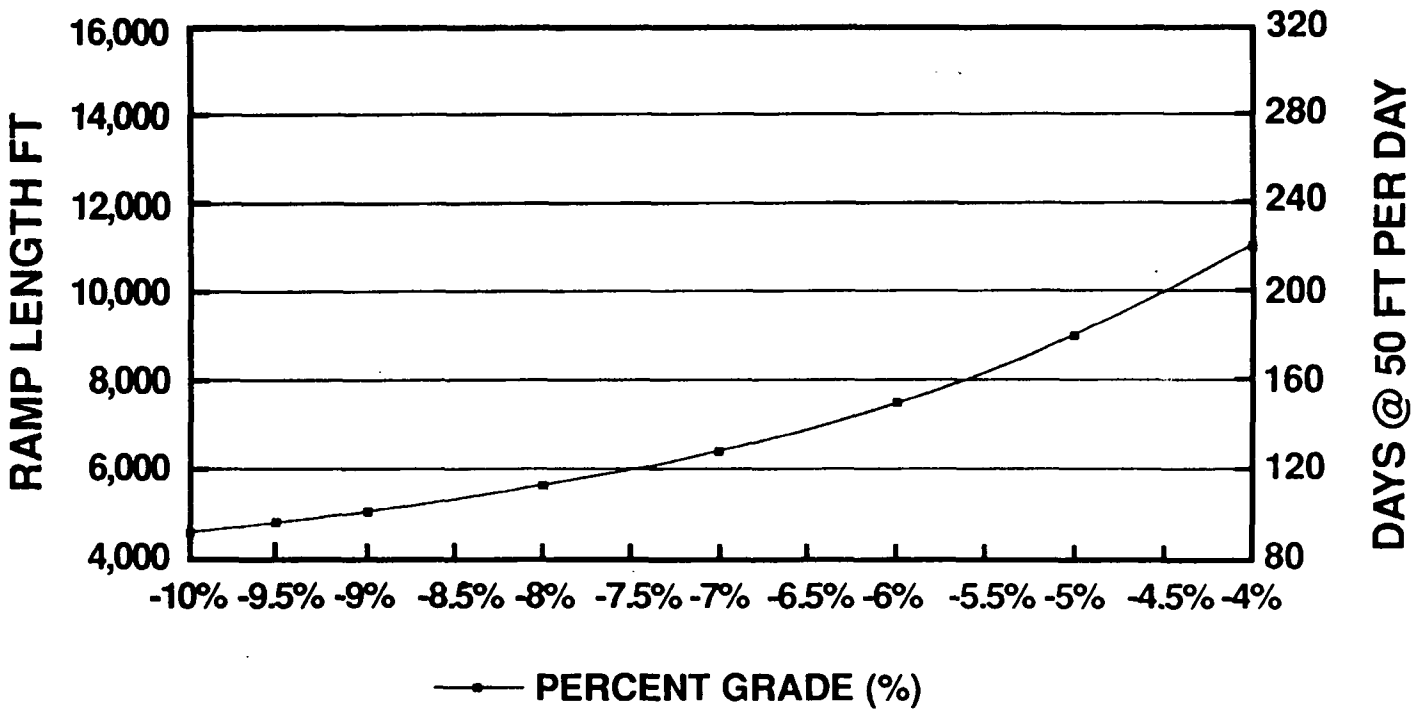
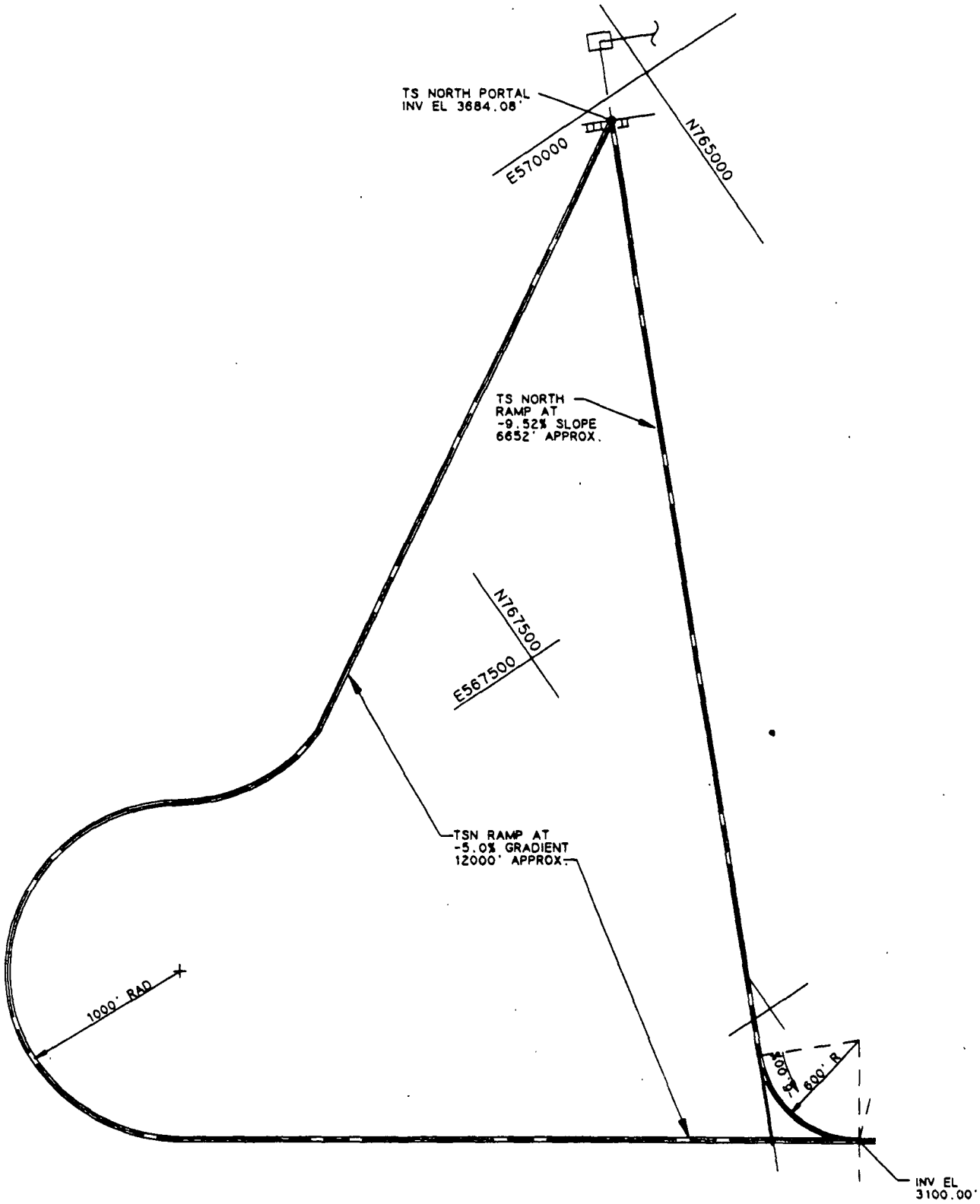
TOPOPAH SPRING NORTH RAMP PORTAL TO TOPOPAH SPRING HORIZON (NEW)



ASSUME: TS PORTAL (NORTH) = 3,684 FT
ASSUME: TS HORIZON (NORTH) = 3,240 FT
NOTE: THESE ELEVATIONS REFLECT NEW PICK

TYPICAL TS NORTH RAMP LAYOUT AT 5% GRADE



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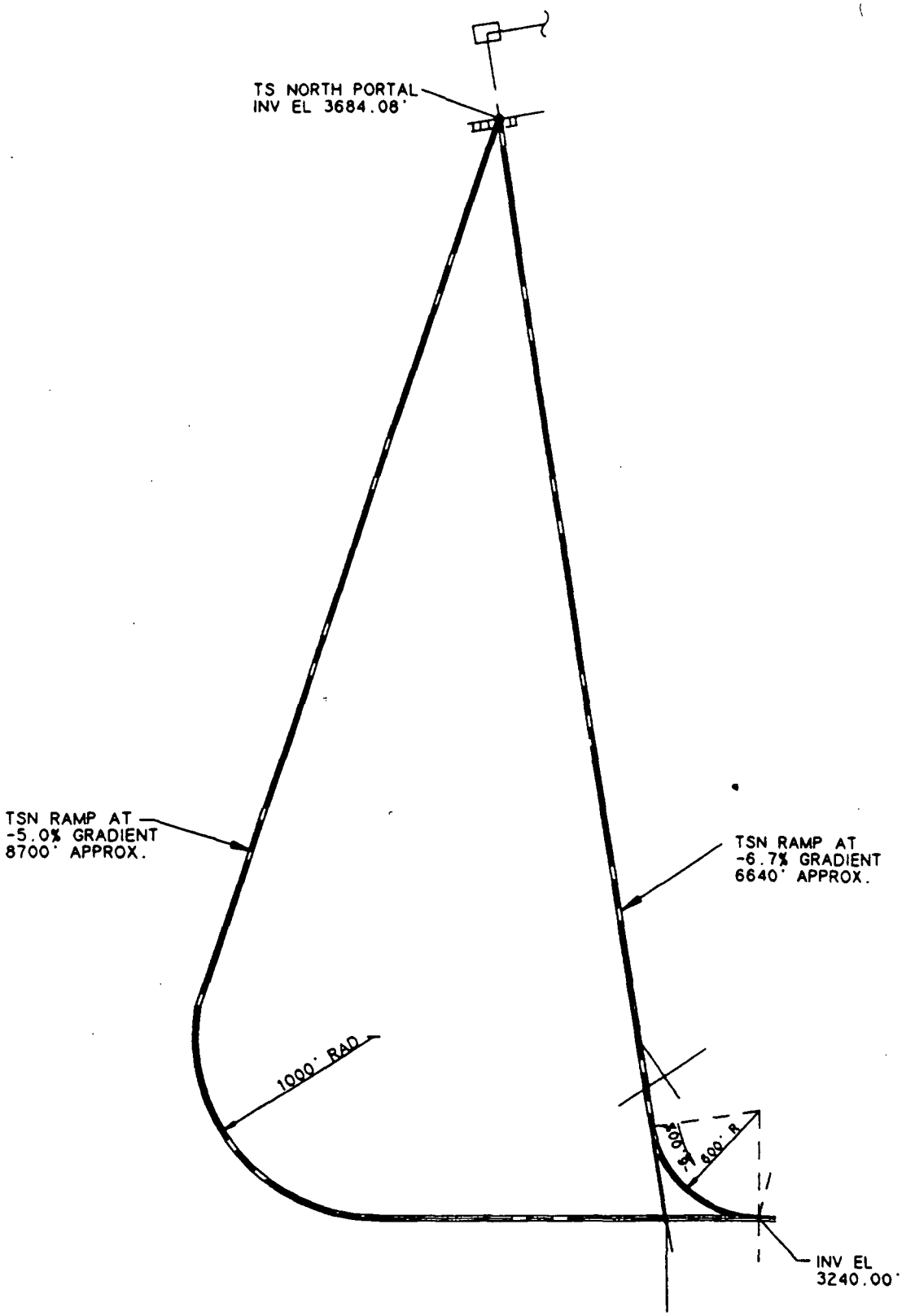
TYPICAL TS NORTH RAMP LAYOUT AT 5% GRADE



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PRELIMINARY CONCLUSIONS

1. EXISTING CONDITIONS: THE PLANNED REPOSITORY GRADES WOULD NECESSITATE THE USE OF RUBBER-TIRED VEHICLES FOR THE FINAL EMPLACEMENT OF WASTE CANISTERS AND OTHER REPOSITORY AND ESF HAULAGE TASKS.
   RAIL HAULAGE COULD BE UTILIZED IN THE ACCESS RAMPS

2. A REDUCTION IN RAMP GRADE FROM 10% TO A RAIL GRADE OF 2.5% WOULD RESULT IN A RAMP LENGTH INCREASE FROM APPROXIMATELY 6,000 FT TO 25,000 FT AND A SCHEDULE INCREASE FROM APPROXIMATELY 125 DAYS TO 510 DAYS FOR EXCAVATION

3. OPERATING SPEED IS MORE IMPORTANT FOR CONTROLLING VEHICLE STOPPING DISTANCES THAN IS OPERATING GRADIENT. A HEAVY VEHICLE TRAVELING AT 10 MPH ON A 5% DOWNGRADE WILL REQUIRE 14 FT LESS STOPPING DISTANCE THAN THE SAME VEHICLE TRAVELING AT 10 MPH ON A 10% DOWNGRADE