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DESIGN ANALYSIS

ON-BOARD REVIEW

BASIN F

LIQUID WASTE DISPOSAL FACILITY
ROCKY MOUNTAIN ARSENAL
Commerce City, Colorado

FY 81

Project No. 36

Prepared by

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Kansas City, Missouri

For

U.S. ARMY ENGINEER DISTRICT, OMAHA
CORPS OF ENGINEERS
Omaha, Nebraska
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13. ABSTRACT (Maximum 200 words) THIS DESIGN DOCUMENT FOR THE LIQUID WASTE DISPOSAL FACILITY, BASIN F, WAS AUTHORIZED BY DIRECTIVE NO. 14, DESIGN 81-MCA-OMAHA DISTRICT, DATED 7 APRIL 1981. THIS WORK CONSISTS OF THE DESIGN AND PREPARATION OF A FINAL DESIGN DOCUMENT, WITH ON-BOARD REVIEW FOR THE CONSTRUCTION OF FACILITIES TO REDUCE THE AMOUNT OF FREE LIQUID IN BASIN F TO A MINIMUM TO FACILITATE CAPPING. CHAPTERS INCLUDE: ACCELERATED EVAPORATION, CIVIL GEOTECHNICAL INVESTIGATION, STRUCTURAL, MECHANICAL, ELECTRICAL, ROADS AND DRAINAGE, SAFETY. AS A GENERAL DESCRIPTION OF THE WORK, THE BASIN F ENHANCED EVAPORATION PROJECT SHALL CONSIST OF THE FOLLOWING: (1) CONSTRUCT A DIKE BETWEEN THE WET AND DRY AREAS IN THE BASIN, (2) CONSTRUCT AN INTERIOR DIKE BETWEEN THE WET AND DRY AREAS OF THE BASIN AS THE LIQUID SURFACE RECEDES, (3) CONSTRUCT A BERM AND/OR DITCH ALONG THE EAST SIDE OF THE BASIN, (4) EXCAVATE AND DISPOSE OF THE CHEMICAL SEWER SYSTEM FROM SOUTH PLANTS TO BASIN F, (5) PROVIDE PUMP CAPACITY AND TRICKLE DISCHARGE PIPELINE, (6) PROVIDE ELECTRICAL POWER
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TABLE OF CONTENTS

	Page
CHAPTER I - INTRODUCTION	
A. AUTHORITY AND SCOPE	I-1
B. APPLICABLE CRITERIA	I-1
C. PURPOSE AND FUNCTION	I-2
D. GENERAL DESCRIPTION OF WORK	I-2
CHAPTER II - ACCELERATED EVAPORATION	
A. GENERAL	II-1
B. DESIGN	II-1
C. CONCEPT PHILOSOPHY	II-2
CHAPTER III - CIVIL	
CHAPTER IV - STRUCTURAL	
A. SCOPE OF WORK	IV-1
B. DESIGN LOADING	IV-1
C. MATERIALS	IV-1
D. ALTERNATIVES	IV-1
E. CONTRACTION AND CRACK CONTROL	IV-1
CHAPTER V - MECHANICAL	
A. CRITERIA LISTING	V-1
B. PUMPING SYSTEM	V-1
CHAPTER VI - ELECTRICAL	
A. GENERAL	VI-1
B. SCOPE	VI-1
C. EXTERIOR	VI-1
CHAPTER VII - ROADS AND DRAINAGE	
A. ROADS	VII-1
B. DRAINAGE	VII-1
CHAPTER VIII - SAFETY	
A. STANDARD OPERATING PROCEDURES	VIII-1
CHAPTER IX - LIST OF SPECIFICATIONS	
CALCULATIONS	
APPENDIX A - BORING LOGS	
APPENDIX B - PERMIT/REGULATION REVIEW	

CHAPTER I
INTRODUCTION

A. AUTHORITY AND SCOPE.

1. Authority. The Design Documents for the Liquid Waste Disposal Facility, Basin F, were authorized by Directive No. 14, Design 81-MCA-Omaha District, dated 7 April 1981.

2. Scope. This work consists of the design and preparation of Final Design Documents, with on-board review, for the construction of facilities to reduce the amount of free liquid in Basin F to a minimum to facilitate capping.

B. APPLICABLE CRITERIA.

1. General.

Appendix D, Revised 24 February 1981, with Supplemental Instructions for Contract No. DACA45-79-C-0019.

2. Publications.

Department of Labor, Occupational Safety and Health Act Standards Manual

Department of Defense, DOD 4270.1-M, Construction Criteria Manual

Department of the Army Technical Manual, TM 5-822-2, General Provisions and Geometric Design for Roads, Streets, Walks, and Open Storage Areas

Department of the Army Technical Manual, TM 5-822-5, Flexible Pavements for Roads, Streets, Walks, and Open Storage Areas

Department of the Army Technical Manual, TM 5-820-4, Drainage
for Areas other than Airfields

National Electrical Code NFPA No. 70

Life Safety Code NFPA No. 101

National Electrical Safety Code

C. PURPOSE AND FUNCTION. The primary purpose and function of this project is to reduce contaminant levels leaving Rocky Mountain Arsenal to within approved standards. These contaminants are leaking from storage basins, entering the subsurface soil and water table, and in some cases are being transported across the Arsenal boundaries by groundwater.

D. GENERAL DESCRIPTION OF WORK.

1. The Basin F enhanced evaporation project shall consist of the following:

- a. Construct a dike approximately 2,800 feet in length between the wet and dry areas in the basin.
- b. Construct an interior dike between the wet and dry areas of the basin as the liquid surface recedes.
- c. Construct a berm and/or ditch along the east side of the basin.
- d. Excavate and dispose of the chemical sewer system from the South Plants Area to Basin F.
- e. Provide pump capacity to spread liquid waste between interior dike and the main dike.
- f. Provide electrical power service to the Basin F dike area.

CHAPTER II

ACCELERATED EVAPORATION

A. GENERAL. Basin F is a liquid waste-holding lagoon which is highly suspect as a source of groundwater pollution. In accordance with the State of Colorado's Cease and Desist Orders, the Basin F site must be controlled.

Since the issuance of the State's orders, numerous studies have been completed and concepts developed and analyzed for the purpose of understanding the interactions of Basin F with environmental, geological and groundwater conditions. These studies, and analyses have concluded that it would be in the best immediate interest to eliminate the liquid contents of the basin through evaporation and elimination of direct liquid inputs. This project is scoped to design facilities to accomplish these goals.

B. DESIGN. The Basin F design will include the following major elements:

1. Earth dike between the wet and dry areas of the basin,
2. Removal and deposition of the existing contaminated waste sewer from December 7th Avenue to the Basin,
3. Pumping facility to transfer liquids from the lagoon pool to future dry areas, and
4. Drainage control by grading to isolate the east side of the basin from surface runoff.

C. CONCEPT PHILOSOPHY. The basic philosophy or premise upon which this design is based is to enhance evaporation by isolating the existing lagoon pool from future inputs and maintaining the pool's surface area at nearly its present size. The isolation of the lagoon pool from future inputs will be achieved by removing the source sewer, overland runoff and direct rainfall on currently unused basin areas. Enhanced evaporation will be achieved by spreading liquid wastes onto anticipated future dry areas. Mechanical evaporators, or use of the total Basin F area are not acceptable measures because of concern regarding increasing air pollution over existing levels.

The placement of an earthen dike between the wet and dry areas of the basin is intended to prevent precipitation which falls on the existing dry area from reaching and mixing with the waste pool, thus increasing its volume. As evaporation takes place, the lagoon's pool will decrease in both volume and surface area. The dry area resulting from evaporation will then be isolated by a dike for reasons cited above. However, during dry periods, Basin F liquid will be pumped into this isolated area, thus increasing the effective evaporative surface of the basin to that approaching the current surface area. This process will be repeated until such time when Basin F is essentially dry and it can be backfilled and capped with an impervious cover. The initial interior dike position will be based on an assumed liquid level drop of 3 feet.

Removal of the contaminated sewer system with appurtenances from the vicinity of December 7th Avenue will solve three problems. First, it will stop further discharge of liquid wastes into Basin F; secondly it will eliminate an avenue for infiltrated groundwater to reach the

basin; and thirdly, it prevents a potentially hazardous situation occurring in the event that the Arsenal reverts to non-Governmental controls.

Drainage control through grading will result in redirecting surface runoff away from the basin. This will effectively remove a potential source of additional liquid necessitating control.

CHAPTER III

CIVIL

The rainfall retention dikes shall be constructed in the location and to the sections shown on the drawings.

The dike material will be a silty to clayey sand as indicated by the borings and test pits performed by Earth Sciences Associates on the first of May, 1981. Field identification of the materials indicates a fairly cohesionless fine grained soil. Laboratory tests are being run to determine the cohesive content of the material. Due to design considerations of retaining a low head of water only long enough to evaporate, the silty sand materials though not providing a seepage cutoff, will be adequate to minimize rainfall seepage through the dikes.

The dike height has been determined based on wave run up analysis on the existing contaminated fluid level of El. 5192.4. The wave run up is 1.8 feet and a 1.3 foot freeboard has been added. The height then is determined to be El. 5195.5.

The dike width of 12.0 feet is determined based on width and operating requirements of the earth moving equipment.

The 3H:1V dike slopes are determined based on judgment of stability required. No stability analysis was conducted due to the relatively low dike height and small depth of probable rainfall water retention behind the dike. Also the 3H:1V slopes result in a lower volume of soil required and a greater area available for evaporation as opposed to a flatter slope.

The 10-foot distance from the dike toe to the contaminated fluid level was chosen to allow for equipment working space if needed, and to found the dike on a more stable soil than would exist right at the fluid level. This 10-foot distance will be variable due to the configuration of the existing fluid shoreline and the proposed dike alignment.

The dike shall be constructed by end dumping from trucks and spreading and compacting via track mounted bulldozers. The construction methods proposed will probably destroy or reduce the integrity of the existing asphalt liner. If this integrity needs to be maintained then alternate construction methods or provisions for maintaining a lower integrity should be discussed and established.

CHAPTER IV

STRUCTURAL

A. SCOPE OF WORK. Recommended structures to be provided by this project include the following:

1. Slab on grade with sump for construction equipment washing facility.

B. DESIGN LOADING. For the wash rack slab subject to heavy loading, a 20,000 pound axle loading will be used. Slab on grade will be designed in accordance with the Standard Specifications for Highway Bridges as adopted by the American Association of State Highway and Transportation Officials as amended by Interim Specifications Bridge, 1980.

C. MATERIALS. Class A concrete, having a compressive strength of 3,000 pounds per square inch will be used where required.

Reinforcement will be in accordance with ASTM A 615 or ASTM A 617, and will be Grade 60 steel.

D. ALTERNATIVES. There are no structural systems competitive with reinforced concrete for facilities included in this project.

E. CONTRACTION AND CRACK CONTROL. No masonry walls are proposed by this project. Detailed locations of contraction joints and temperature reinforcement for crack control will be determined.

CHAPTER V
MECHANICAL

A. CRITERIA LISTING.

1. Publications.

Department of Defense Manual, DOD 4270.1-M, Construction
Criteria Manual

Project Development Brochure, Rocky Mountain Arsenal, Liquid
Waste Disposal Facility, Basin "F", FY-81, Appendix "D", Revised
24 February 1981.

B. PUMPING SYSTEM.

1. System Description.

a. A pumping system will be provided to maintain the present
wet-surface area in Basin F. Discharge from the pumping system is piped
to an interior dike area through acid-resisting pipe. The pump will be
located at the north end of the basin at the deepest part of the wet
area.

The system piping will drain when the pump shuts off. The system
will also be drained to prevent freezing in the winter.

2. Equipment.

Pump:	100 gpm @ 69-foot head
:	Allis-Chalmers Model 100
:	Paco Model KP-2095-2
:	Ingersoll-Rand Model 3X95B

CHAPTER VI
ELECTRICAL

- A. GENERAL. The electrical system provided is for the new pumping station being added to help increase liquid evaporation.
- B. SCOPE. This design will generally consist of the following details:
1. Exterior.
 - a. Primary Service
 - b. Transformers
 - c. Overhead Distribution
 - d. Motor Starters
- C. EXTERIOR.
1. Primary service to the existing Building 806 is 13.8 kV, three-phase, three-wire. A new service will be provided for the new pump at 13.8 kV, single-phase, to the new transformer.
 2. A transformer will be provided to serve the new pump. A 10-kVA pole-mounted single-phase transformer will provide 13.8 kV-240/120 volt service. Service to the pump will be underground.
 3. Aerial conductors for the primary line will be based on ASCR, size No. 2.
 4. Fused cutouts and lightning arrestors will be provided at the transformer.
 5. Motor starter will be a combination motor starter, NEMA size #1 with a weatherproof enclosure mounted on the utility pole near the new pump.

CHAPTER VII
ROADS AND DRAINAGE

A. ROADS.

1. Repairs to existing Arsenal roads shall be designed in accordance with pavement evaluation results.

B. DRAINAGE.

1. Design Storm: 25-year return frequency.

CHAPTER VIII

SAFETY

A. STANDARD OPERATING PROCEDURES. This project will necessitate working with and close to hazardous materials and conditions. To reduce risks to health and safety of individuals engaged in this work, specific safety criteria have been established by the USAEHA and RMA for implementation. These criteria will be incorporated in Contract Specifications and will be accounted for in cost estimates and assessing the constructibility of the project.

CHAPTER IX
LIST OF SPECIFICATIONS

DIVISION 1 - NOT USED

DIVISION 2 - SITE WORK

- 2A Clearing and Grubbing for Structures
- 2B Demolition
- 2C Excavation, Trenching and Backfilling for Utilities Systems
- 2D Removal and Disposition of Materials from Contaminated Sewers and Appurtenances
- 2E Grading
- 2F Subbase Coarse
- 2G Bituminous Surface Coarses (Central-Plant Hot Mix)
- 2H Bituminous Tack Coat
- 2J Seeding
- 2K Chain-Link Security Fence and Gates

DIVISION 3 - CONCRETE

- 3A Concrete for Building Construction (Minor Requirements)

DIVISION 5 - METALS, STRUCTURAL AND MISCELLANEOUS

- 5A Miscellaneous Metals

DIVISION 15 - MECHANICAL

- 15A Pumps
- 15B Force Mains; Contaminated Waste
- 15C Water Lines

DIVISION 16 - ELECTRICAL

- 16A Electrical Distribution, Underground
- 16B Electrical Distribution, Aerial

CALCULATIONS

INDEX TO CALCULATIONS

	<u>Page</u>
CIVIL	
Determination of Berm Height Based on Wave Size	1 of 57
STRUCTURAL	
Truck Wash Facility Pad	8 of 57
MECHANICAL	
Pump Sizing	15 of 57
HYDRAULIC AND HYDROLOGIC	
Rainfall Determination for Project Area	23 of 57
Drainage Area for Diversion Area	26 of 57
Typical Discharges at Culvert	29 of 57
Culvert Size	30 of 57
Check Capacity of Diversion Ditch	32 of 57
Drainage Areas of Basin F	34 of 57
Drainage Areas Behind Proposed Levee	49 of 57
Volume of Selected Rainfall Events	57 of 57

CIVIL

Wave Runup and Wind Setup on
Reservoir Embankments

Bruce L. McCartney

ETL 1110-2-221

29 Nov 1976

Coordinates of center point

N 189,045

E 2,180,815

Figure 10 - p.12

α	$\cos \alpha$	x_i (ft)	$x_i \cos \alpha$
42°	.743	1400	1040
36°	.809	1515	1226
30°	.866	1610	1394
24°	.914	1720	1572
18°	.951	1845	1755
12°	.978	1870	1829
6°	.995	1890	1881
0°	1.00	1925	1925
6°	.995	1850	1841
12°	.978	1720	1682
18°	.951	1615	1536
24°	.914	1480	1353
30°	.866	1340	1160
	<u>11.96</u>		<u>20,194</u>

Effective fetch $f_e = \frac{20,194}{11.96} = 1688 \text{ ft} = 0.32 \text{ mile}$

From figure 3 - fastest mile of record (spring) = 50 mph ✓

From figure 6 & 7 - fastest hour of record \approx 50 mph ✓

For 2-m. = (50)(.96) = 48 mph ✓ p. 11

Wind velocities over water - fetch : 0.32 mi. Figure 11 p.13

1 mile : (50 mph)(1.08) = 54 mph ✓

1 hour : (50 mph)(1.08) = 54 mph ✓

2 hours : (48 mph)(1.08) = 52 mph ✓

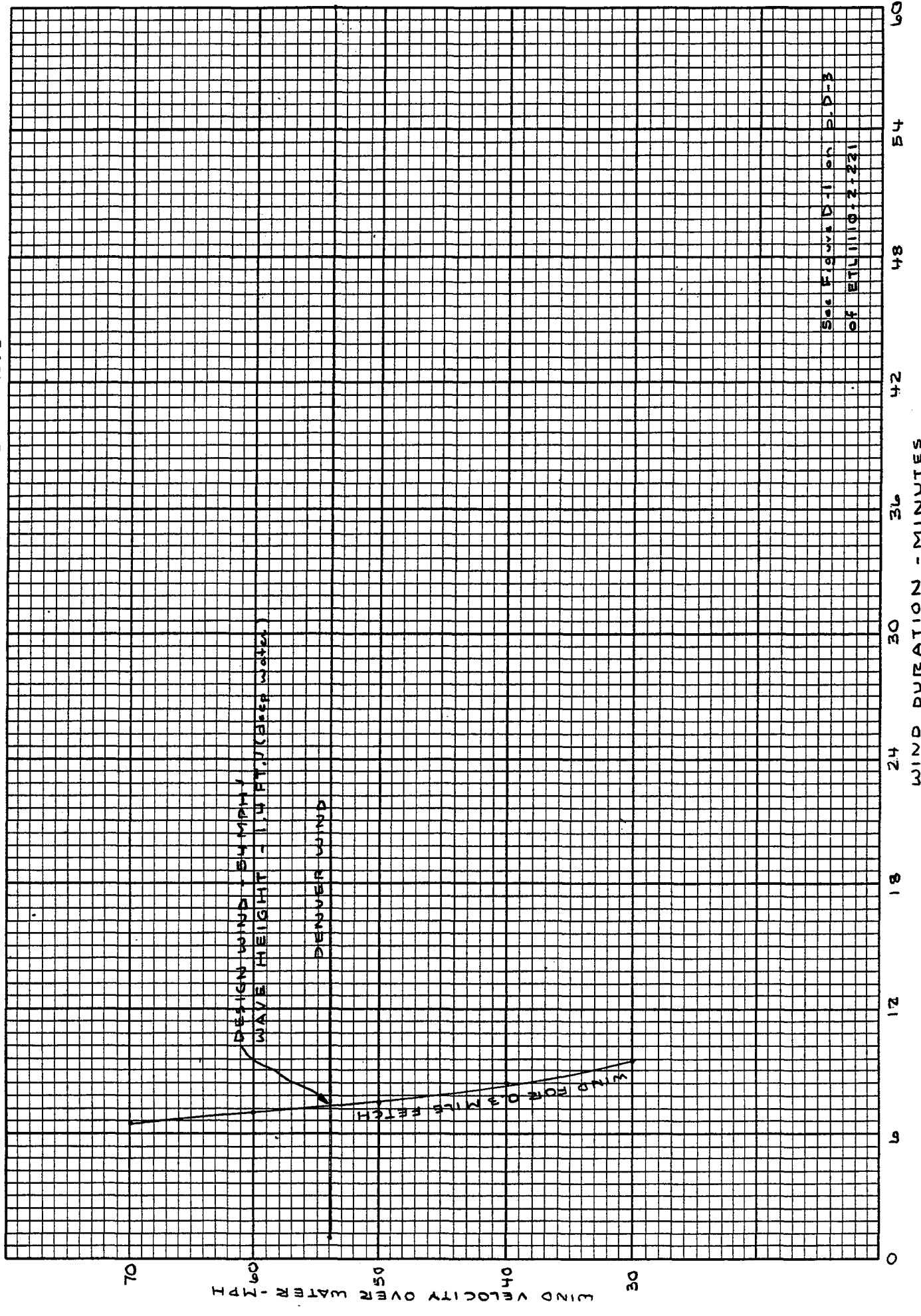
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ROCKY MOUNTAIN ARSENAL
BASIN 'E',
9029.201

WIND VELOCITY - DURATION CURVE



See Figure D-1 on P.D-3
of ETL1110-2-231

WIND DURATION - MINUTES

WIND VELOCITY OVER EXPOSURE

WIND FOR 0.3 MILES FETCH

DESIGN WIND - 54 MPH
WAVE HEIGHT - 14 FT. (Beer water)

DENVER WIND

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Figure 11	Wind Velocity
<u>Wind Duration - Min.</u>	<u>Over Water - Mph</u>
9.5	30
8.4	40
7.5	50
7.2	54
7.0	60
6.6	70

From Figure 11 : $H_s = 1.4$ ft. ✓

Figure 12 : $T = 2.05$ seconds / for Fetch = 0.32 miles ; velocity = 54 mph

Equation 1 (p. 14) $L_0 = 5.12T^2 = (5.12)(2.05)^2 = 21.5$ ft. ✓

For there to be no effect from the bottom of the basin the water must be $(0.5)(21.5$ ft) ≈ 11 ft. deep ✓

Max. water depth = $5192.6 - 5184 = 8.6$ ft. ✓

Shore Protection Manual Volume 1
U.S. Army Coastal Engineering Research Center

Figures 3-23 and 3-24 p. 3-49

(F)
For fetch ≈ 1700 ft and wind speed $U = 54$ mph

from figure 3-23 $d = 5$ ft $h = 1.3$ ft. ✓

from figure 3-24 $d = 10$ ft $h = 1.5$ ft. ✓

∴ For these conditions the effect of a maximum depth less than $.5L_0$ on the wave height seems negligible.

Shore Protection Manual p. 2-67

Formula 2-77
p. 2-67

$$\frac{H}{H_0} = \sqrt{\left(\frac{1}{2}\right)\left(\frac{1}{n}\right)\left(\frac{C_0}{c}\right)} \sqrt{\frac{b_0}{b}}$$

where H = wave height in shallow water

H₀ = wave height in deep water

$$n = \frac{1}{2} \left[1 + \frac{4\pi d/L}{\sinh(4\pi d/L)} \right]$$

where d = water depth

L = wave length

C₀ = wave velocity in deep water

c = wave velocity in shallow water

b₀ = distance between orthogonals in deep water

b = distance between orthogonals in shallow water.

Assume $\frac{b_0}{b} = 1$ due to contours in basin 'F'

Determine wave height for d = .1'

$$c^2 = \frac{gL}{2\pi} \tanh\left(\frac{2\pi d}{L}\right) \quad \text{Formula 2-2 p. 2-65}$$

where g = gravitational constant

other variables are the same as above

$$c^2 = \frac{(32.2 \text{ ft/sec}^2)(21.5 \text{ ft})}{(2)(3.14)} \tanh\left(\frac{(2)(3.14)(0.1 \text{ feet})}{21.5 \text{ feet}}\right) = 3.2 \checkmark$$

$$c = 1.8 \text{ ft/sec. } \checkmark$$

$$C_0^2 = \frac{gL}{2\pi} \quad \text{for deep water velocity}$$

$$C_0^2 = \frac{(32.2 \text{ ft/sec}^2)(21.5 \text{ ft})}{(2)(3.14)} = 110.2 \checkmark$$

$$C_0 = 10.5 \text{ ft/sec. } \checkmark$$

$$n = \frac{1}{2} \left[1 + \frac{(4)(3.14)(.1) / 21.5}{\sinh[(4)(3.14)(.1) / 21.5]} \right] \approx 1 \checkmark$$

$$\frac{H}{1.4} = \sqrt{\left(\frac{1}{2}\right)(1)\left(\frac{10.5}{1.8}\right)}$$

$$H = 2.4 \text{ ft. } \checkmark$$

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Determine wave height for $d = .01'$

$$C^2 = \frac{gL}{2\pi} \tanh\left(\frac{2\pi d}{L}\right)$$

$$C^2 = \frac{(32.2 \text{ ft/sec}^2)(21.5 \text{ ft})}{(2)(3.14)} \tanh\left(\frac{(2)(3.14)(.01 \text{ feet})}{21.5 \text{ feet}}\right) = .32 \checkmark$$

$$C = .6 \text{ ft/sec.} \checkmark$$

$$n = \frac{1}{2} \left[1 + \frac{(4)(3.14)(.01)/21.5}{\sinh[(4)(3.14)(.01)/21.5]} \right] \approx 1 \checkmark$$

$$\frac{I}{L} = \sqrt{\left(\frac{1}{2}\right)(1)\left(\frac{10.5}{0.6}\right)}$$

$$H = 4.1 \text{ ft.} \checkmark$$

Determine wave height for $d = 5'$

$$C^2 = \frac{(32.2 \text{ ft/sec}^2)(21.5 \text{ ft})}{(2)(3.14)} \tanh\left(\frac{(2)(3.14)(5 \text{ feet})}{21.5 \text{ feet}}\right) = 98.9 \checkmark$$

$$C = 9.9 \text{ ft/sec} \checkmark$$

$$n = \frac{1}{2} \left[1 + \frac{(4)(3.14)(5)/21.5}{\sinh[(4)(3.14)(5)/21.5]} \right] = .66 \checkmark$$

$$\frac{I}{L} = \sqrt{\left(\frac{1}{2}\right)\left(\frac{1}{.66}\right)\left(\frac{10.5}{9.9}\right)}$$

$$H = 1.3 \text{ ft.} \checkmark$$

Determine wave height for $d = 1'$

$$C^2 = \frac{(32.2 \text{ ft/sec}^2)(21.5 \text{ ft})}{(2)(3.14)} \tanh\left(\frac{(2)(3.14)(1 \text{ foot})}{21.5 \text{ feet}}\right) = 31 \checkmark$$

$$C = 5.6 \text{ ft/sec.} \checkmark$$

$$n = \frac{1}{2} \left[1 + \frac{(4)(3.14)(1)/21.5}{\sinh[(4)(3.14)(1)/21.5]} \right] = .97 \checkmark$$

$$\frac{I}{L} = \sqrt{\left(\frac{1}{2}\right)\left(\frac{1}{.97}\right)\left(\frac{10.5}{5.6}\right)}$$

$$H = 1.4 \text{ ft.} \checkmark$$

Shore Protection Manual Volume III

From Table on p. C-2 $\frac{H}{H_0} \rightarrow 4.5$ as $\frac{d}{L_0} \rightarrow 0$

Assume $H_0 = 2.4 \text{ ft.} (d = .1')$

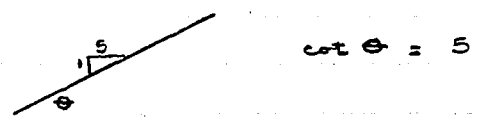
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Determine relative runup

$$\frac{R_s}{H_s} = \frac{1}{0.4 + (H_s/L_0)^{1/2} \cot \theta} \quad \begin{array}{l} \text{for an earth embankment} \\ \text{with riprap} \end{array}$$

- where H_s = significant wave height
- R_s = runup
- L_0 = deep water wave length
- θ = angle of structure slope relative to horizontal

For a slope of 5:1



$$\frac{R_s}{2.4} = \frac{1}{0.4 + [(2.4/21.5)^{1/2}](5)} \quad R_s = 1.2 \text{ ft. } \checkmark$$

For a slope of 1:1 $\cot \theta = 1$

For a 3:1 slope $R_s = 1.7 \text{ ft. } \checkmark$

$$\frac{R_s}{2.4} = \frac{1}{0.4 + [(2.4/21.5)^{1/2}]} \quad R_s = 3.3 \text{ ft. } \checkmark$$

$$R_M = 1.5 R_s \quad \text{p. 17 of ETL 1110-2-221}$$

- for 5:1 slope $R_M = 1.8 \text{ ft. } \checkmark$
- for 1:1 slope $R_M = 4.9 \text{ ft. } \checkmark$
- for 3:1 slope $R_M = 2.6 \text{ ft. } \checkmark$

Compute wind setup

$$S = \frac{U^2 F}{1400 D}$$

- where S = setup in feet above the still water level that would prevail with zero wind action
- U = average wind velocity in statute miles / hr. over water = 54 mph
- D = average water depth in feet along the fetch line
max depth = $8.6/2 = 4.3 \text{ ft. } \checkmark$

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F = wind fetch, miles, equal to twice the effective fetch used for wave generation = $(2)(.32) = .64 \checkmark$

$$S = \frac{(54 \text{ mph})^2 (0.64 \text{ mi})}{(1400)(4.3 \text{ ft})} = 0.3 \text{ ft.} \checkmark$$

For a 1:1 slope berm height = $4.9 + 0.3 = 5.2 \text{ ft.} \checkmark$

For a 3:1 slope berm height = $2.6 + 0.3 = 2.9 \text{ ft.} \checkmark$

For a 5:1 slope berm height = $1.8 + 0.3 = 2.1 \text{ ft.} \checkmark$

Determine runup based on method for shallow water fronting structure.

Shore Protection Manual Volume II

$$H_o' = 1.4 \text{ ft.} \checkmark \quad \frac{H_o'}{T^2} = \frac{1.4 \text{ ft}}{(2.05 \text{ sec})^2} = .33 \checkmark \quad \cot \theta = 3 \text{ for a } 3:1 \text{ slope} \checkmark$$

From Figure 7-8 for wave runup on smooth, impermeable slopes where $d_o / H_o' = 0$ with the structure fronted by a 1:10 slope

$$\frac{R}{H_o'} = 0.65 \checkmark \quad R = (0.65)(1.4) = 0.9 \text{ feet} \checkmark$$

From Figure 7-13 find runup correction factor, $k = 1.12$ for $\cot \theta = 3.0$

$$R = (0.9 \text{ feet})(1.12) = 1.0 \text{ ft.} \checkmark$$

From Figure 7-15 for wave runup on a riprapped embankment

$$\frac{R}{H_o'} = 0.35 \checkmark \quad \frac{[R/H_o']_{\text{riprap}}}{[R/H_o']_{\text{smooth}}} = \frac{0.35}{0.65} = (.54)(1.0) = .54 \text{ ft.} \checkmark$$

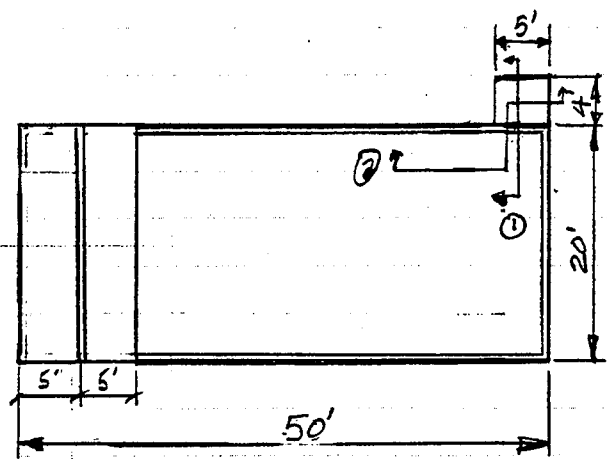
$$R_M = 1.5 R_s = (1.5)(.54) = 0.8 \checkmark \quad \approx R_M = (1.5)(1.0) = 1.5$$

For a 3:1 slope berm height = $0.8 + 0.3 = 1.1 \text{ ft.} \checkmark$ with riprap

berm height = $1.5 + 0.3 = 1.8 \text{ ft.} \checkmark$ no riprap

STRUCTURAL

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Concrete Slab on Grade

$\frac{50}{20} = 2.50 \therefore$
one way slab

f'_c concrete, 3000 psi
steel grade 60

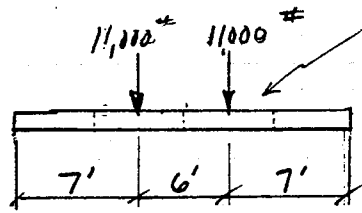
Loading - H₂O (8,000# Front axles - 32,000# Rear axles)

assume Live Load = 10% or $0.10 \times 20,000 = 2000 \#$

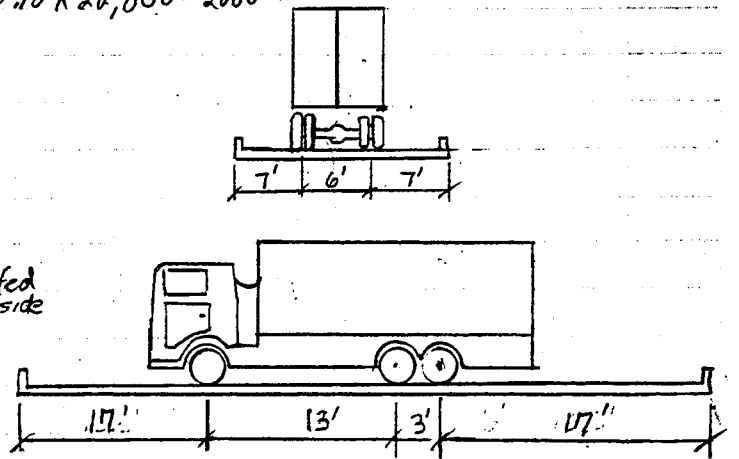
$\therefore P = \frac{20,000 + 2000}{2} = 11,000 \#$

Full Load (use max load 20,000#)

Slab Beam Design



Load distributed over 3' each side of wheels



Moment, $M_{max} = 11,000 \times 7 = 77,000 \text{ ft-lb.}$

Reaction, $R = 11,000 \cdot \text{lb.}$

Assume Dead Load slab (8") = $(\frac{8}{12})(1)(150) = 100 \#/\text{ft} \therefore w = 100 \#/\text{ft}$

Ultimate Load Moment, $M_u = 1.7(77,000) + \frac{(1.4)(100)(20')^2}{8} = 137,900 \# = 138 \text{ k-ft}$

$h = 8"$ Allowable soil pressure = 2000 psf $\therefore M_u$ is actually $< 138 \text{ k-ft}$

$d = 4.5"$ Check bearing: $(50' \times 20' \times \frac{8}{12} \times 150 \#/\text{ft}^3) + 20,000 = 120,000 \#$ or 120 psf

@ wheel: $6' \times 6' \times 150 \times \frac{8}{12} + 11,000 / 36 \text{ ft}^2 = 405 \text{ psf. OK}$

puncture pressure: $\frac{\frac{8}{12} \times \frac{34}{12} \times \frac{8}{12} \times 150 + 11,000}{(\frac{8}{12} \times \frac{34}{12})} = 1112 \text{ psf OK}$

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SUBJECT

RMA

WORK

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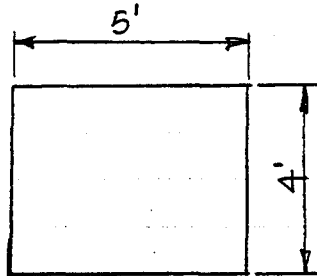
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Temperature steel OK in 8in slab.

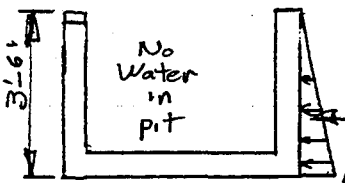
$$A_s = 0.0018 \times 12 \times 8 = 0.173 \text{ in}^2 \Rightarrow \text{use \#5@12" EWEF}$$

\Rightarrow Use 3" cover for bottom steel.

Sump Design



3 Ft deep
use $w_{soil} = 120 \#/ft^3$
try 6" thick walls



Soil Pressure on one side - empty on other side

$W = \frac{w_e l^2}{2}$
 $w_e = 3' \times 120 \#/ft^3 = 360 \#/ft$

$M = \frac{w_e l^2}{2} \times \frac{1}{3} h = \frac{(360)(3.5)^2}{2} \times \frac{3.5}{3} = 858 \text{ l-}\#$
Ultimate $M_u = 1.4 \times 858 \approx 1201 \text{ l-}\#$ or approx. 1.2 k-ft

$h = 6 \text{''}$
 $d = 3.5$

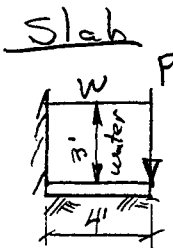
Moment strength $= \frac{M_u}{\phi f'_c b d^2} = \frac{1.2 \times 12}{0.9 \times 3 \times 12 \times (3.5)^2} = 0.1036 \therefore w = 0.031$

Steel Req. : $p = w f'_c / f_y$

$A_s = p d d$
 $A_s = 0.031 \times 60 \times 12 \times 3.5$
 $A_s = 0.065 \text{ in}^2$

$A_{temp} = 0.0018 \times 12 \times 6$
 $= 0.13 \text{ in}^2$

Use temp steel #4 @ 12" EW for all walls



$P = \text{load from wall} = \frac{6}{12} \times 3' \times 150 = 225 \#/l$
 $w_{water} = (1' \times 3') (4' / 4') (62.5) \approx 188 \#/l$

$M_u = 1.4 \left[\left(\frac{188 \times (4)^2}{8} \right) + \frac{150 (4)^2}{8} \right] = 946 \text{ l-}\# \approx 1 \text{ k-ft}$
Moment strength $= \frac{M_u}{\phi f'_c b d^2} = \frac{1.0 \times 12}{0.9 \times 3 \times 12 \times (3.0)^2} = 0.041$
 $\therefore w = 0.042$

$h = 6 \text{''}$
 $d = 3 \text{'' (3" cover)}$

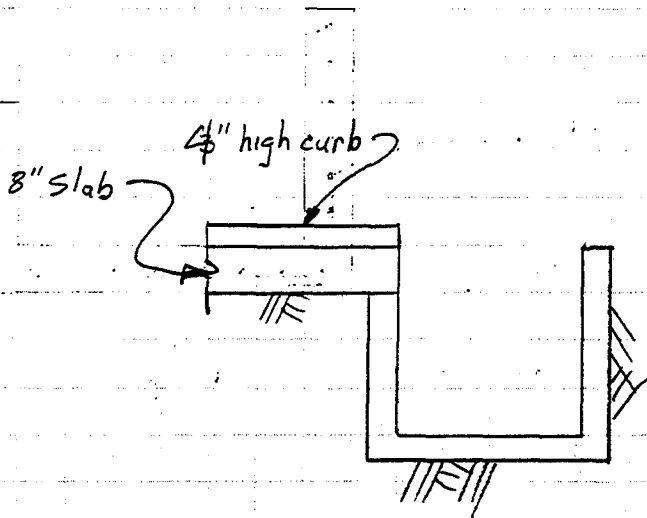
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Steel Req.: $A_s = \rho b d = 0.042 \times \frac{3}{60} \times 12 \times 3.0 = \underline{\underline{0.076 \text{ in}^2}}$

Temp steel: $A_s = \rho b h = 0.0018 \times 12 \times 6 = 0.13 \text{ in}^2$

Use #4 @ 12" EW

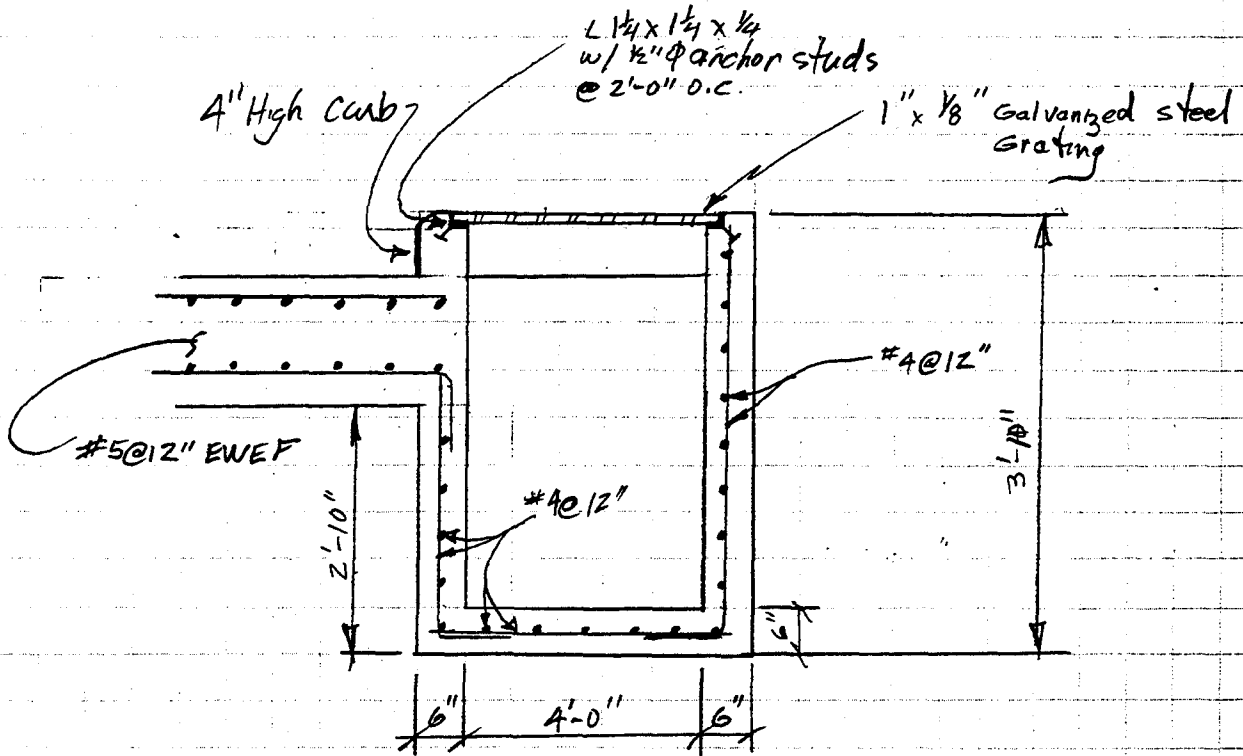


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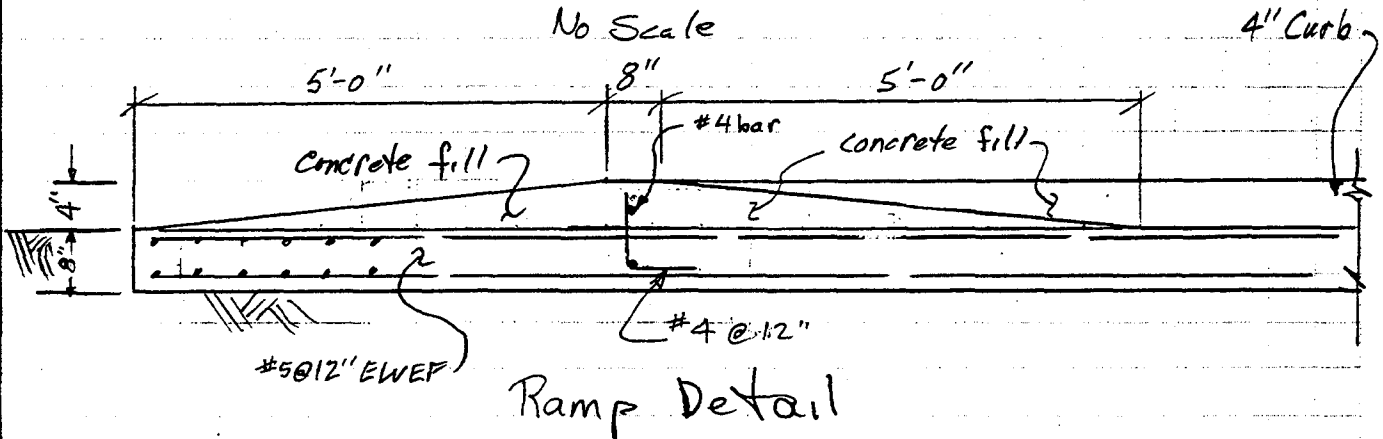
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Section D-D
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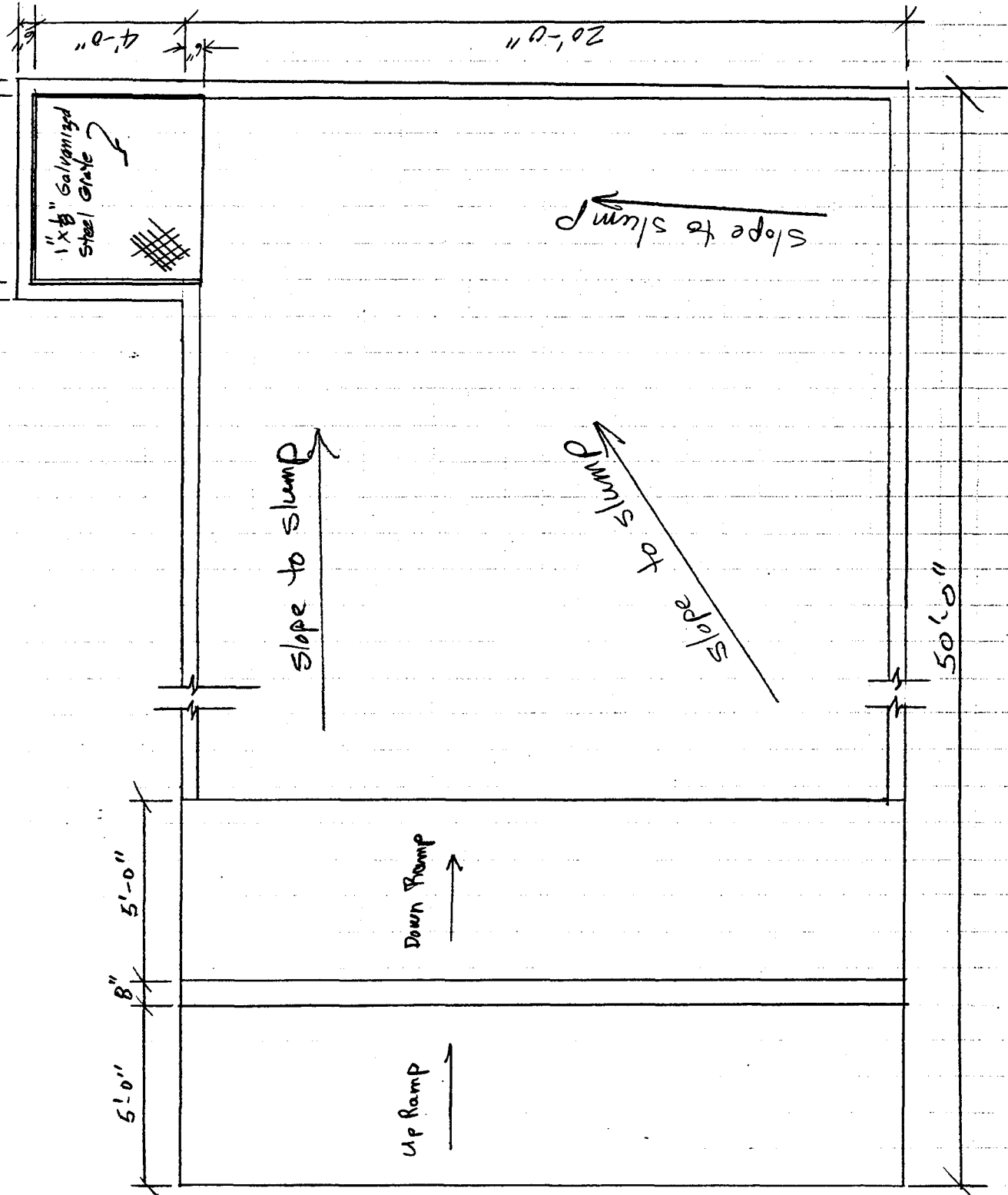
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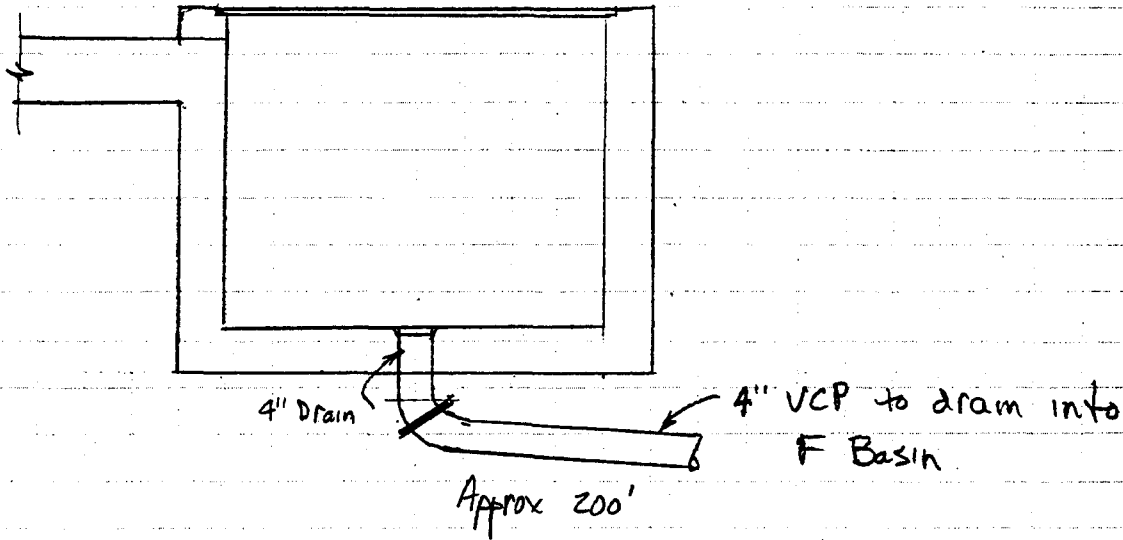
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PUMP: ALLIS-CHALMERS
SERIES 8000 SIZE: 3X2X11S MODEL 100
AXIALLY-SPLIT PUMPS
SINGLE-STAGE DOUBLE-SUCTION 5 HP 1750 rpm
PIPING: 3" ϕ PVC SCHEDULE 80, TYPE I
SIZE: 100 gpm ; 69 FE.

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OTHER PUMP MANUFACTURERS:

PACO MODEL 2095
INGERSOLL-RAND MODEL 3X9SB

PIPE HANGERS

GRINNELL FIG 259 PIPE STANCHION SADDLE
F&S CENTRAL FIG. 427

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PAGE No. 2 OF 8

USE 3' PIPE 2000' PIPE

$$\text{PUMP HEAD} = (z_2 - z_1) + \frac{V^2}{2g} \left(1 + \sum K_L + \frac{fL}{D} \right)$$

$$= (z_2 - z_1) + \frac{V^2}{2g} \left(\frac{fL}{D} + K_e + K_b + K_E \right)$$

$$= (z_2 - z_1) + \frac{Q^2}{2gA^2} \left[\frac{fL}{D} + K_e + K_b + K_E \right]$$

$$= 15 + \frac{Q^2}{2(32.2)(\pi(\frac{1.5}{12})^2)^2} \left[\frac{0.02(2000)}{3/12} + 6.64 \right]$$

$$= 15 + \frac{Q^2}{0.16} [166.64]$$

$$h_p = 15 + 1073.87 Q^2$$

$$Q = 100 \text{ gpm} \left[\frac{\text{ft}^3/\text{sec}}{449 \text{ gpm}} \right] = 0.22 \text{ ft}^3/\text{sec} \quad Q^2 = 0.050$$

$$h_p = 15 + 1073.87(Q^2) = 15 + 1074(0.05)$$

$$= 15 + 53.3$$

$$= 68.3 \text{ ft}$$

$$h_p = 68.3 \text{ ft}$$

69 ft

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PIPE ENTRANCE $K_e = 0.50$

10-90° ELBOWS $K_b = 3.5$

3 GATE VALVES
WIDE OPEN $K_v = 0.6$

1 TEE $K_t = 1.8$

1 EXPANSION 2" → 3" $K_E = 0.22$

6.64

18

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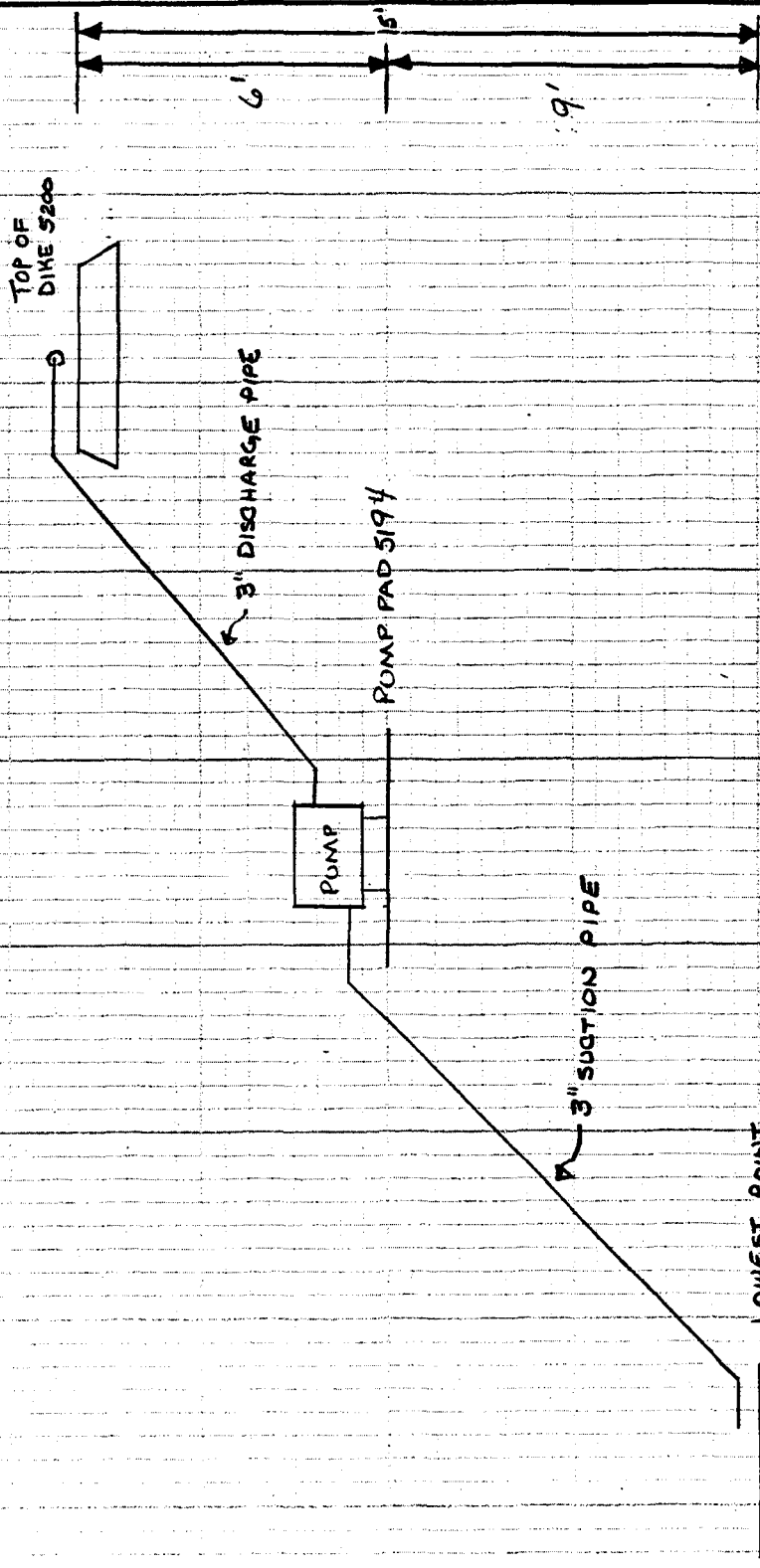
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LOWEST POINT OF BASIN 5185

P-GN-025-A

+

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DATE 5/15 1981

WORK PUMP SYSTEM

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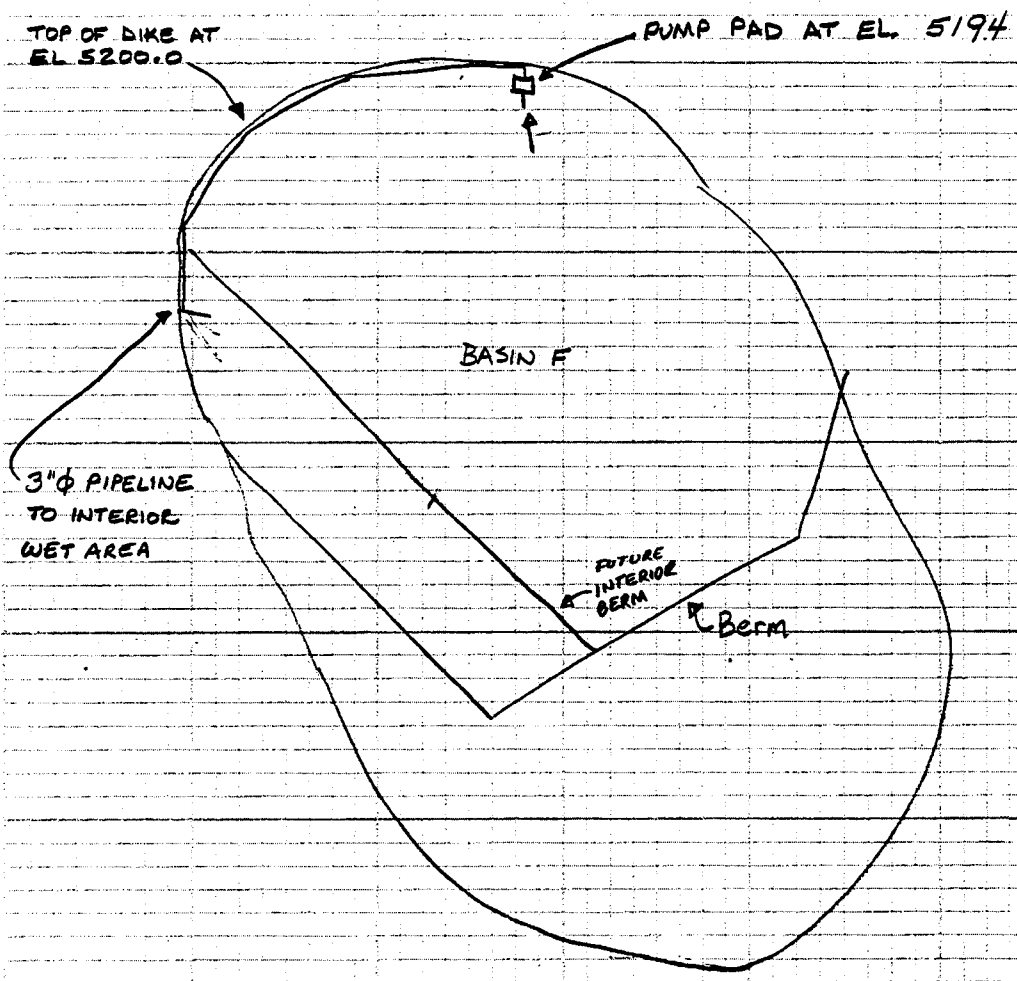
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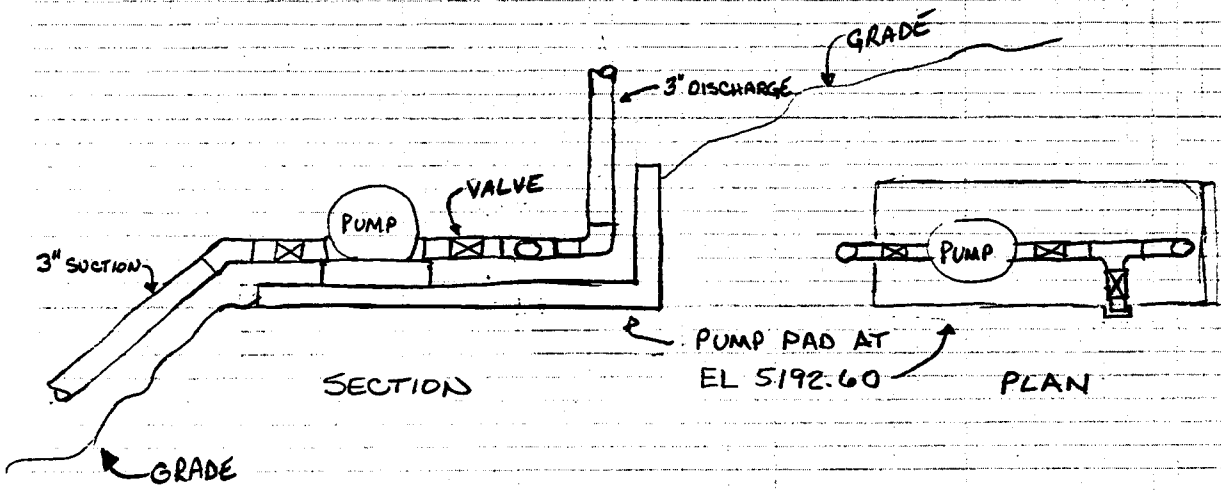
PAGE No. 5 OF 8

PIPE ROUTING:



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DO NOT WRITE



P-GN-025-A

PIPE SADDLE SUPPORT WITH U-BOLT

20
6/8

FIG. 425

STEEL

SERVICE APPLICATION: For general piping running close to the floor.

FINISH: Black, galvanized or painted.

ORDERING: Specify size, figure number and finish. Welded base plate and pipe, as shown, or screwed flange and pipe must be ordered separately. Saddle furnished complete with U-Bolt.

PIPE SIZE	A	B	WGT./C APPROX.
4	3	4 $\frac{3}{8}$	1075
5	3	4 $\frac{3}{8}$	1210
6	3	5 $\frac{1}{8}$	1270
8	3	6 $\frac{1}{8}$	2130
10	3	8 $\frac{1}{8}$	2570
12	3	9 $\frac{1}{8}$	3120
14	4	10 $\frac{1}{8}$	5000
16	4	12 $\frac{3}{8}$	5700
18	4	13 $\frac{3}{8}$	6400
20	6	15 $\frac{3}{8}$	11350
24	6	17 $\frac{3}{8}$	13700
26	6	19 $\frac{1}{8}$	14650
30	6	21 $\frac{3}{8}$	17400
36	8	24 $\frac{1}{2}$	26800

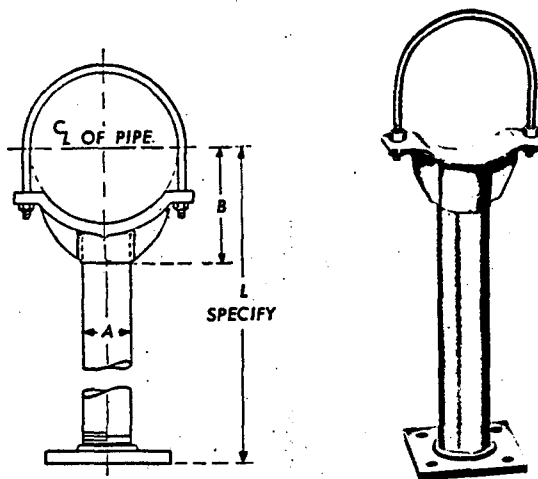


FIG. 427

STEEL

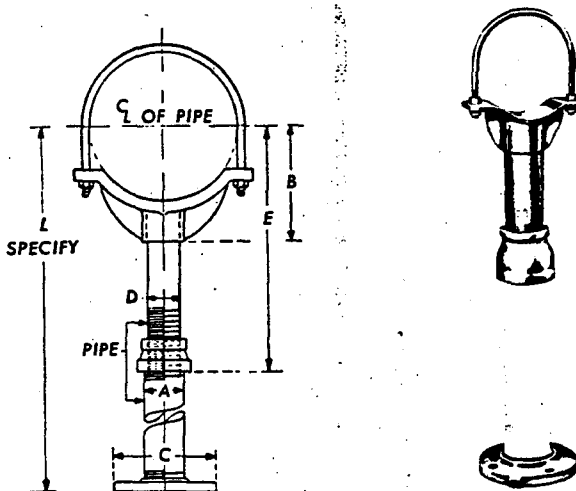
SERVICE APPLICATION: For general piping running close to the floor.

FINISH: Black, galvanized or painted.

ORDERING: Specify size, figure number and finish. Complete unit consists of saddle, nipple and cast iron reducer assembled. Saddle may be ordered separately. Screwed floor flange and pipe, as shown, or welded base plate and pipe must be ordered separately.

ADJUSTABLE PIPE SADDLE SUPPORT WITH U-BOLT

PIPE SIZE	A	B	C	D	DIMENSION E		WEIGHT/C APPROX.	
					MIN.	MAX.	COM- PLETE	SADDLE ONLY
2 $\frac{1}{2}$	2 $\frac{1}{2}$	3 $\frac{3}{8}$	9	1 $\frac{1}{2}$	8	13	900	480
3	2 $\frac{1}{2}$	3 $\frac{1}{8}$	9	1 $\frac{1}{2}$	8 $\frac{1}{4}$	13 $\frac{1}{4}$	920	500
3 $\frac{1}{2}$	2 $\frac{1}{2}$	3 $\frac{1}{8}$	9	1 $\frac{1}{2}$	8 $\frac{1}{2}$	13 $\frac{1}{2}$	940	520
4	3	4 $\frac{3}{8}$	9	2 $\frac{1}{2}$	9 $\frac{1}{4}$	14	1500	760
5	3	4 $\frac{1}{8}$	9	2 $\frac{1}{2}$	10	14 $\frac{3}{4}$	1665	925
6	3	5 $\frac{1}{8}$	9	2 $\frac{1}{2}$	10 $\frac{1}{2}$	15 $\frac{1}{4}$	1765	1025
8	3	6 $\frac{1}{8}$	9	2 $\frac{1}{2}$	11 $\frac{3}{4}$	16 $\frac{1}{2}$	2020	1280
10	3	8 $\frac{1}{8}$	9	2 $\frac{1}{2}$	13 $\frac{1}{2}$	18 $\frac{1}{4}$	2515	1775
12	3	9 $\frac{1}{8}$	9	2 $\frac{1}{2}$	15	19 $\frac{3}{4}$	2900	2160
14	4	10 $\frac{1}{8}$	11	3	16 $\frac{1}{4}$	20 $\frac{3}{4}$	4920	3800
16	4	12 $\frac{3}{8}$	11	3	17 $\frac{3}{4}$	22 $\frac{1}{4}$	5320	4200
18	6	13 $\frac{3}{8}$	13 $\frac{1}{2}$	3 $\frac{1}{2}$	19 $\frac{1}{2}$	24	7080	5100
20	6	15 $\frac{3}{8}$	13 $\frac{1}{2}$	3 $\frac{1}{2}$	21	25 $\frac{1}{2}$	10480	8500
24	6	17 $\frac{1}{8}$	13 $\frac{1}{2}$	4	23 $\frac{3}{4}$	28 $\frac{1}{4}$	13000	11000
30	6	21 $\frac{3}{8}$	13 $\frac{1}{2}$	4	27	31 $\frac{1}{2}$	17000	15000
32	6	22 $\frac{1}{2}$	13 $\frac{1}{2}$	4	28 $\frac{1}{4}$	32 $\frac{3}{4}$	18100	16100
36	6	24 $\frac{1}{2}$	13 $\frac{1}{2}$	4	30 $\frac{1}{4}$	34 $\frac{3}{4}$	24900	22900



Axially-Split Pumps

8000 Series Single-Stage Double-Suction
Pumps with Mechanical Seal or Packing
Bare Pumps
Model 100



DIMENSIONS

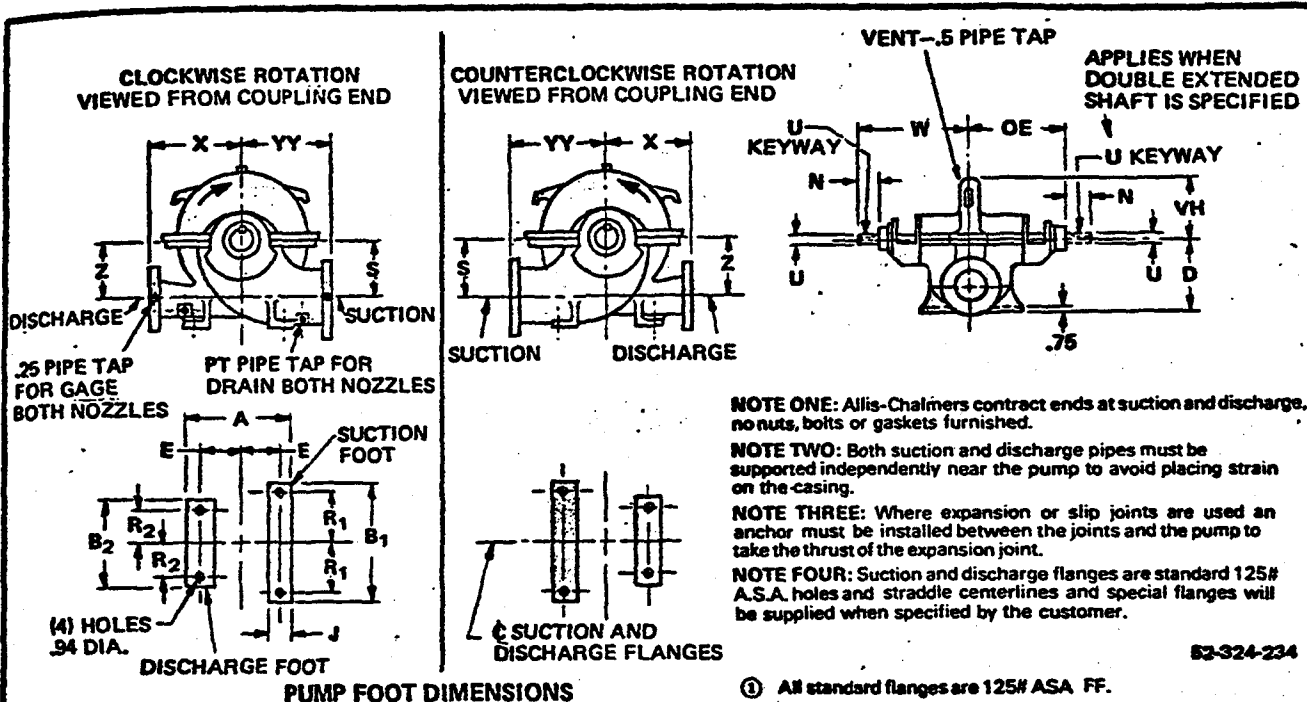
CP 3a
Page 301

21
7/8

January, 1977

Supersedes all previous issues

(1) FLANGED NOZZLES



Key No.	Pump Size	Suct.	Disch.	A	B ₁	R ₁	J	E	R ₂	B ₂	YY	X	S&Z	PT	OE	W	U	VH	D	N	U-Keyway	
																					Width	Depth
43 & 44	6x4x10	6	4	15.00	15.00	6.50	2.50	6.50	4.00	10.00	13.00	11.50	6.50	1.00	14.18	18.50	1.375	7.88	11.00	4.32	.312	.156
45 & 46	6x4x12	6	4	15.00	15.00	6.50	3.50	6.50	4.00	10.00	13.00	11.50	7.75	1.00	12.88	17.50	1.125	9.20	12.00	4.62	.250	.125
47 & 48	6x4x14	6	4	15.00	15.00	6.50	3.50	6.50	4.00	10.00	13.00	11.50	7.75	1.00	12.88	17.50	1.125	9.62	12.00	4.62	.250	.125
49 & 50	8x6x12	8	6	15.00	15.00	6.50	3.50	6.50	4.00	10.00	14.00	14.00	9.00	1.00	12.88	17.50	1.125	9.60	14.00	4.62	.250	.125
50.1	8x6x13	9	6	16.25	18.50	8.25	3.75	7.12	4.25	10.50	15.50	13.00	8.00	1.00	15.18	21.25	1.375	9.40	12.75	6.07	.312	.156
51, 52 & 53	8x6x17	8	6	16.25	18.50	8.25	3.75	7.12	4.25	10.50	16.00	14.00	9.00	1.00	15.18	21.25	1.375	11.75	14.00	6.07	.312	.156
54	8x8x12	8	8	16.25	18.50	8.25	3.75	7.12	4.25	10.50	16.50	14.00	8.00	1.00	15.18	21.25	1.375	10.25	12.75	6.07	.312	.156
55	8x8x17	8	8	18.00	20.00	9.00	3.75	8.00	5.00	12.00	16.50	15.00	9.50	1.00	16.50	22.50	1.625	12.00	14.50	6.25	.375	.188
56	10x8x12	10	8	18.00	20.00	9.00	3.75	8.00	5.00	12.00	17.00	14.00	8.50	1.00	16.50	22.50	1.625	11.50	14.25	6.25	.375	.188
57	10x8x17	10	8	18.00	20.00	9.00	3.75	8.00	5.00	12.00	18.00	16.00	10.00	1.00	16.50	22.50	1.625	12.81	16.00	6.25	.375	.188
58	10x10x12	10	10	18.00	22.00	10.00	3.75	8.00	6.00	14.00	18.00	16.00	9.00	1.00	18.00	24.00	1.625	11.19	14.75	6.25	.375	.188
59	12x10x12	12	10	18.00	22.00	10.00	3.75	8.00	6.00	14.00	19.00	16.00	10.00	1.00	18.00	24.00	1.625	11.50	16.75	6.25	.375	.188
60	12x10x14	12	10	18.00	20.00	9.00	3.75	8.00	5.00	12.00	20.00	18.00	11.00	1.00	16.50	22.50	1.625	13.44	18.00	6.25	.375	.188
61	12x10x17	12	10	18.00	20.00	9.00	3.75	8.00	5.00	12.00	20.00	18.00	11.00	1.00	16.50	22.50	1.625	13.44	18.00	6.25	.375	.188

NOT FOR CONSTRUCTION, INSTALLATION OR APPLICATION PURPOSES UNLESS CERTIFIED

Certified For:

CO #	ID #	SO #					
PUMP DATA	Size & Type	Model	Curve No.	GPM	Head	Rotation	Flanges
						CW	CCW

Sign:

Date: _____/_____/_____

DIMENSIONS

NOT USED

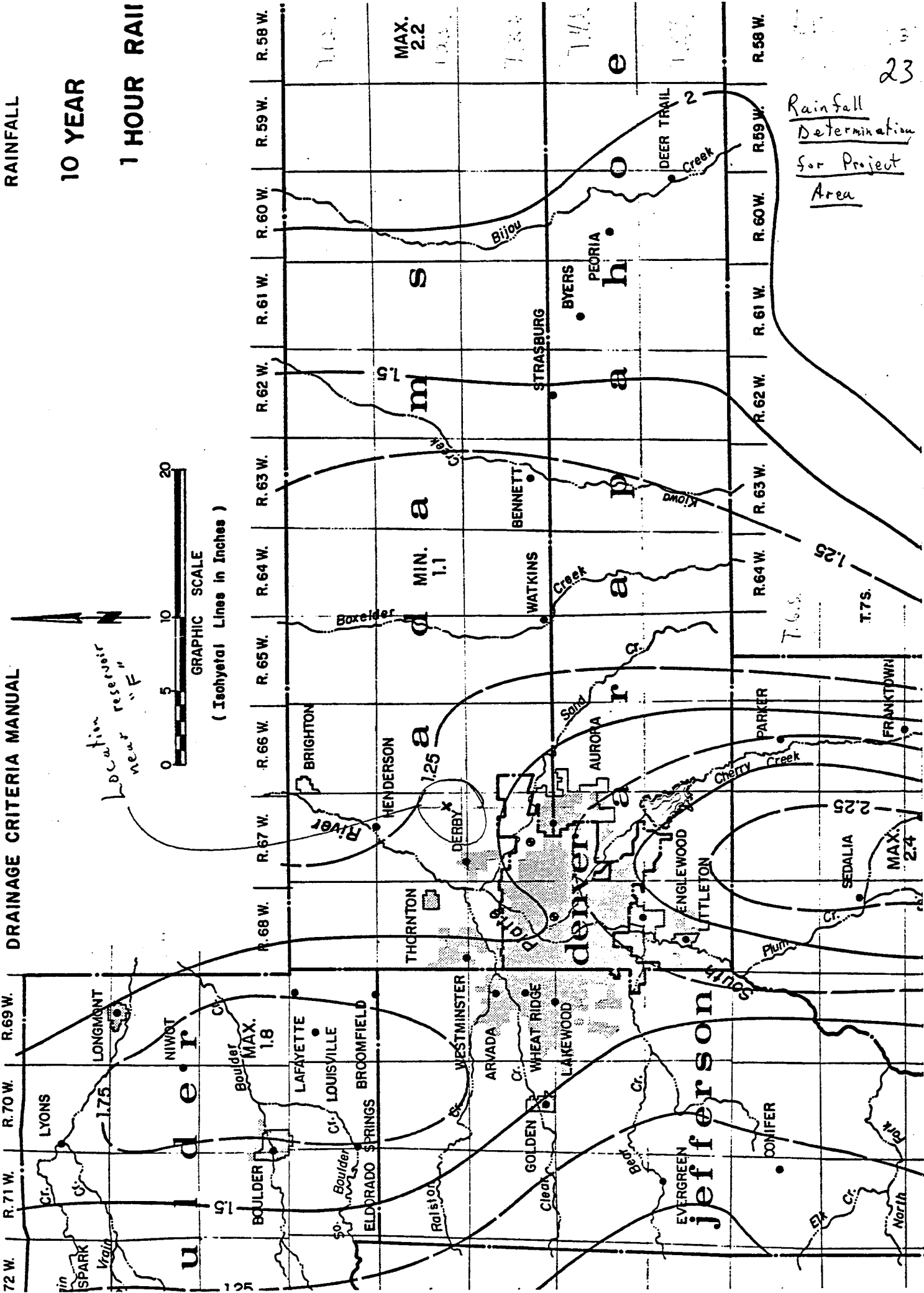
HYDRAULIC AND HYDROLOGIC

DRAINAGE CRITERIA MANUAL

RAINFALL

10 YEAR

1 HOUR RAIN



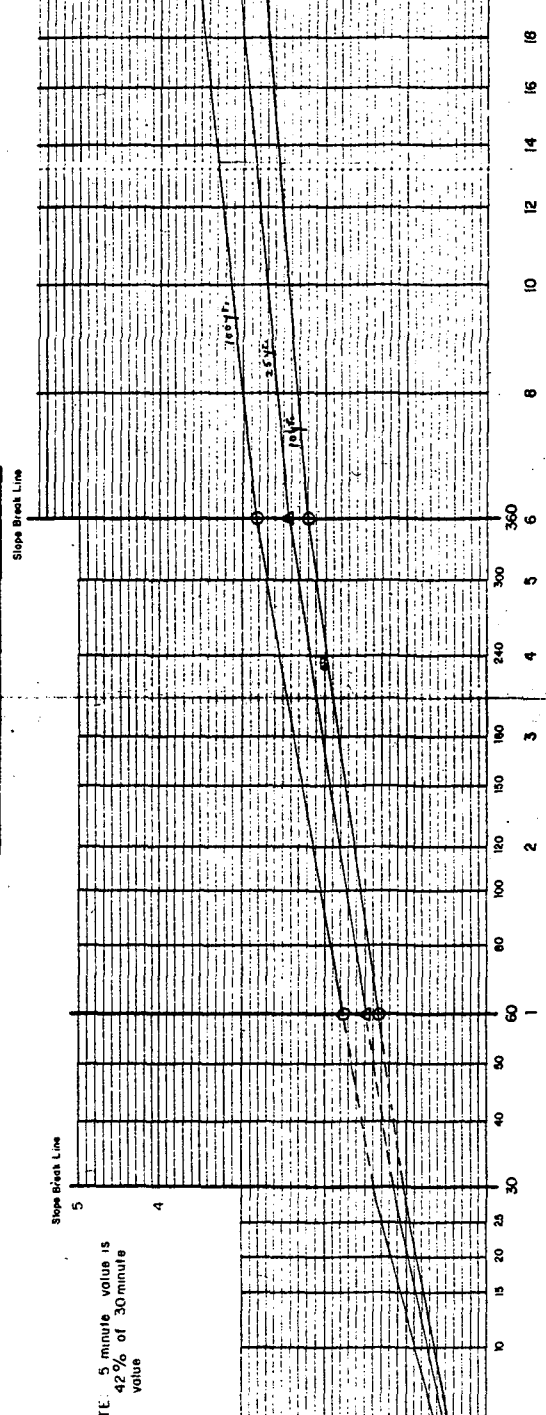
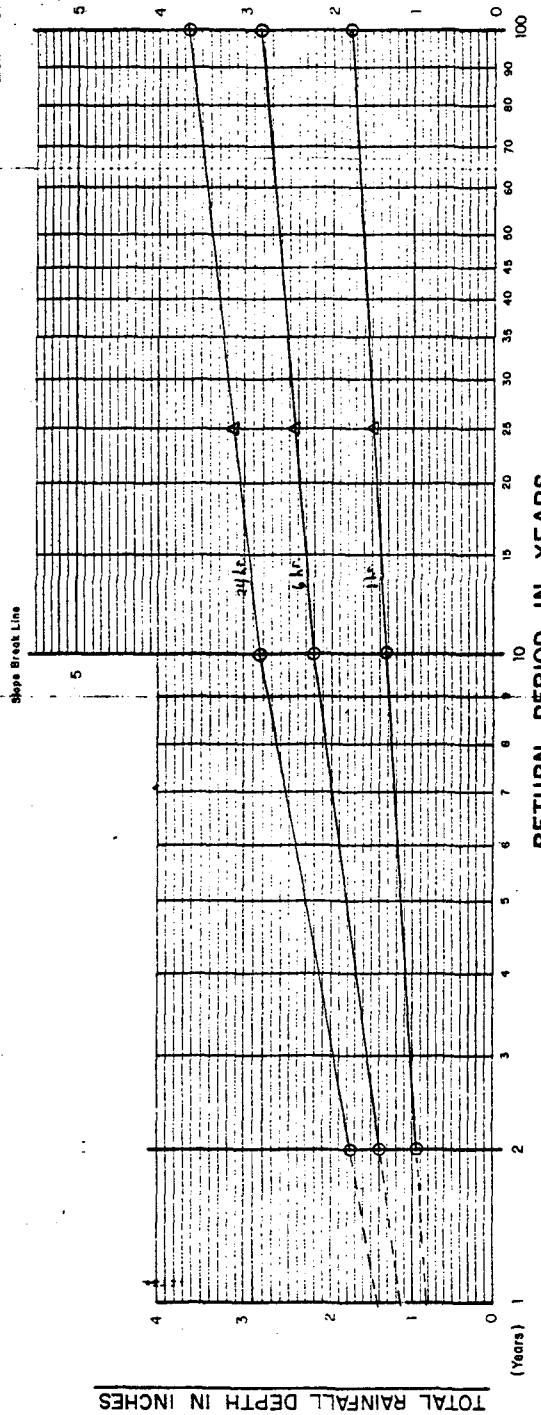
GRAPHIC SCALE
(Isohyetal Lines in Inches)

Rainfall
Determination
for Project
Area

P.N. 9029-201

DEA
5/6/81

2/3
24



NOTE: 5 minute value is 42% of 30 minute value

- - Values from Reservoir Depth-Duration-Frequency Map Figure 7-1, 7-7, 7-9
- △ - interpolated points
- - calculated points

DURATION IN MINUTES AND HOURS

RETURN PERIOD IN YEARS

**RAINFALL
DEPTH-DURATION - FREQUENCY GRAPHS
Denver Region**

Location:
1.22mi. W. of R. 47W } near Reservoir "F"
1.51mi. N. of T. 25 }
Section 3, 7, 25, 18, 51W.

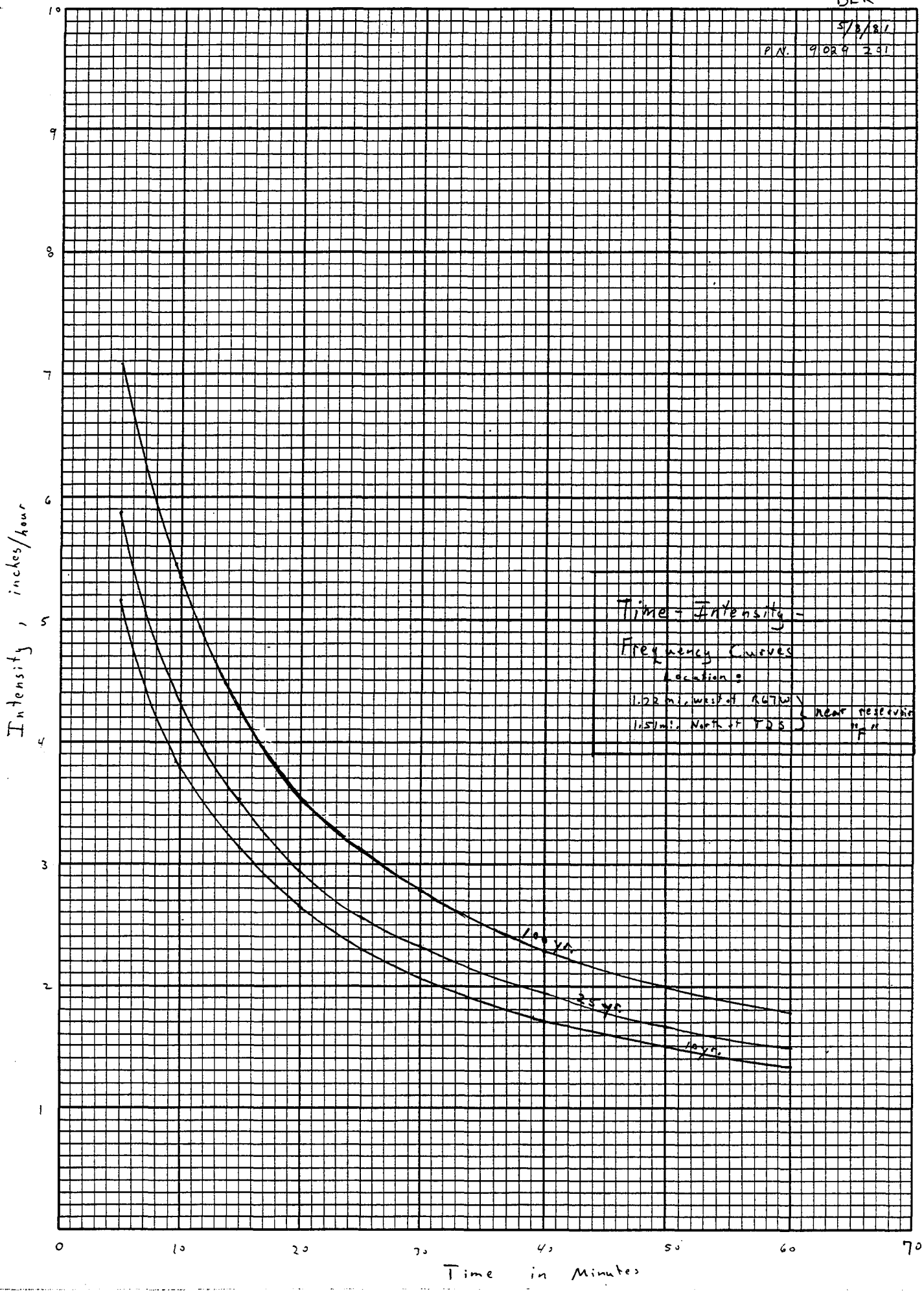
DENVER REGIONAL COUNCIL OF GOVERNMENTS

Wright - McLaughlin Engineers

5/8/81

P.N. 9029 231

#7A



SUBJECT R.M.A. "F" Basin
Diversion Channel around East side of Basin
WORK Drainage Area for diversion area

DATE 5/12/26 1931
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PAGE No. 1 OF 3

PROJECT No. 9029 201

FILE No. _____

Calibration of Planimeter

Area 6" x 6" @ 1" = 50', Area = (6 x 50)² = 90,000 ft² = 2.066 acres

Readings: 9540

	-	2929	} ave = 2929
12469			
	-	2931	
5400			
	-	2927	
8327			

Area #1 (on bottom of north sheet)

Readings: 1548

	-	1737	} ave = <u>1734.3</u>
3285			
	-	1732	
5017			
	-	1734	
6751			

Area #2 (on top of south sheet)

Readings: 9512

	-	4288	} ave = <u>4289.6</u>
13900			
	-	4292	
8092			
	-	4289	
12381			

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SUBJECT R.M.A. "F" Basin
Diversion Channel around east side of "F" Basin
WORK Drainage Area

27

DATE 5/12/1981
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Area #3 (s.e. side of sheet)

Readings: 0347
 6932
 13528
 0113

- 6585
- 6596
- 6585

} ave = 6588.6

Area #4 (s.w. side of area)

Readings: 9136
 9958
 10770
 1585

- 822
- 812
- 815

} ave = 816.3

Total Area above culvert = $816.3 + 6588.6 + 4289.6 + 1734.3$
 $= 13,429$

Area = $\frac{2,066}{2929} = \frac{x}{13429}$ $x = 9.5 \text{ acres} \approx \underline{\underline{10 \text{ acres}}}$

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SUBJECT R.M.A. "F" Basin
Diversions Channel
WORK Time of concentration

DATE 5/12/1931
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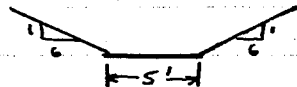
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PROJECT No. 9024 201

FILE No.

Length of channel from culvert to basin divide = 1860'

Typical channel - Assumed



$$V = \frac{1.486}{n} R^{2/3} S^{1/2}$$

Assume: 1) $y = 2'$ depth in channel
2) channel slope = $1/280'$
= 0.00357

$$= \frac{1.486}{0.03} \left[\frac{(5 + 6(2)) 2}{5 + 2(2) \sqrt{1+(6)^2}} \right]^{2/3} (0.00357)^{1/2}$$

3) $n = 0.03$

$$= (2.9596) (1.1035)$$

$$V = 3.27 \text{ ft/sec.}$$

$$Q = AV$$

$$Q = (5 + 6(2)) 2 \cdot 3.27$$

$$Q = 111 \text{ cfs}$$

$$\text{Time of concentration} = \frac{1860'}{3.27} = 568.8 \text{ sec} = \underline{\underline{9.5 \text{ min.}}}$$

Assume $y = 1'$

$$V = (2.9596) \left[\frac{(5 + 6(1)) 1}{5 + 2(1) \sqrt{1+(6)^2}} \right]^{2/3}$$

$$V = (2.9596) (0.4056)$$

$$V = 1.2 \text{ ft/sec.}$$

$$Q = AV$$

$$= (5 + 6) 1 \cdot 1.2$$

$$Q = 13 \text{ cfs}$$

$$\text{Time of concentration} = \frac{1860}{1.2} = 1550 \text{ sec} = 25 \text{ min.}$$

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SUBJECT R.M.A. Basin "F"
Diversion Channel around east side of Basin
WORK Typical Discharges @ culvert

DATE 5/12/1981
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FILE No. _____

Rational Formula

$$Q = CIA$$

Assume: 1) $C = 0.3$

$$Q_{10} = 0.3 (3.85) (10)$$

2) values of
I from Time-Frequency Curves

$$Q_{10} = 11.6 \text{ cfs}$$

$$Q_{25} = 0.3 (4.38) (10)$$

$$Q_{25} = 13.1 \text{ cfs}$$

$$Q_{100} = 0.3 (5.45) (10)$$

$$Q_{100} = 16.4 \text{ cfs}$$

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SUBJECT RMA. Basin "F"
Diversion Channel around east side of Basin
WORK Culvert Size

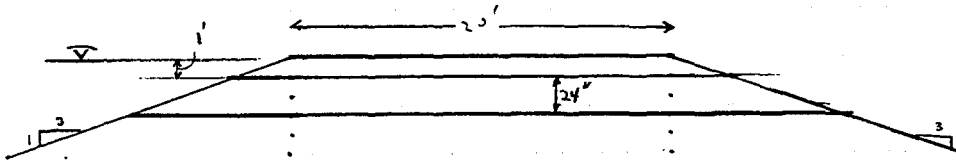
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FILE No. _____

DATE 5/12/1981 30
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PAGE No. 1 OF 2

Assume : 1) Flowing full

2) slope of culvert = 0.003/ft



for 10-yr. design $Q = 11.6$ cfs head needed for 24" CMP = 0.8'

25-yr. design $Q = 13.1$ cfs head needed for 24" CMP = 1.0'

Will use 24" Corrugated Metal Pipe
Slope = 0.003 ft/ft.

if we used a 18" CMP $Q_{10} = 11.6$ cfs $H = 3.1'$

if we used a 12" CMP $Q_{10} = 11.6$ cfs $H = \text{over } 20'$

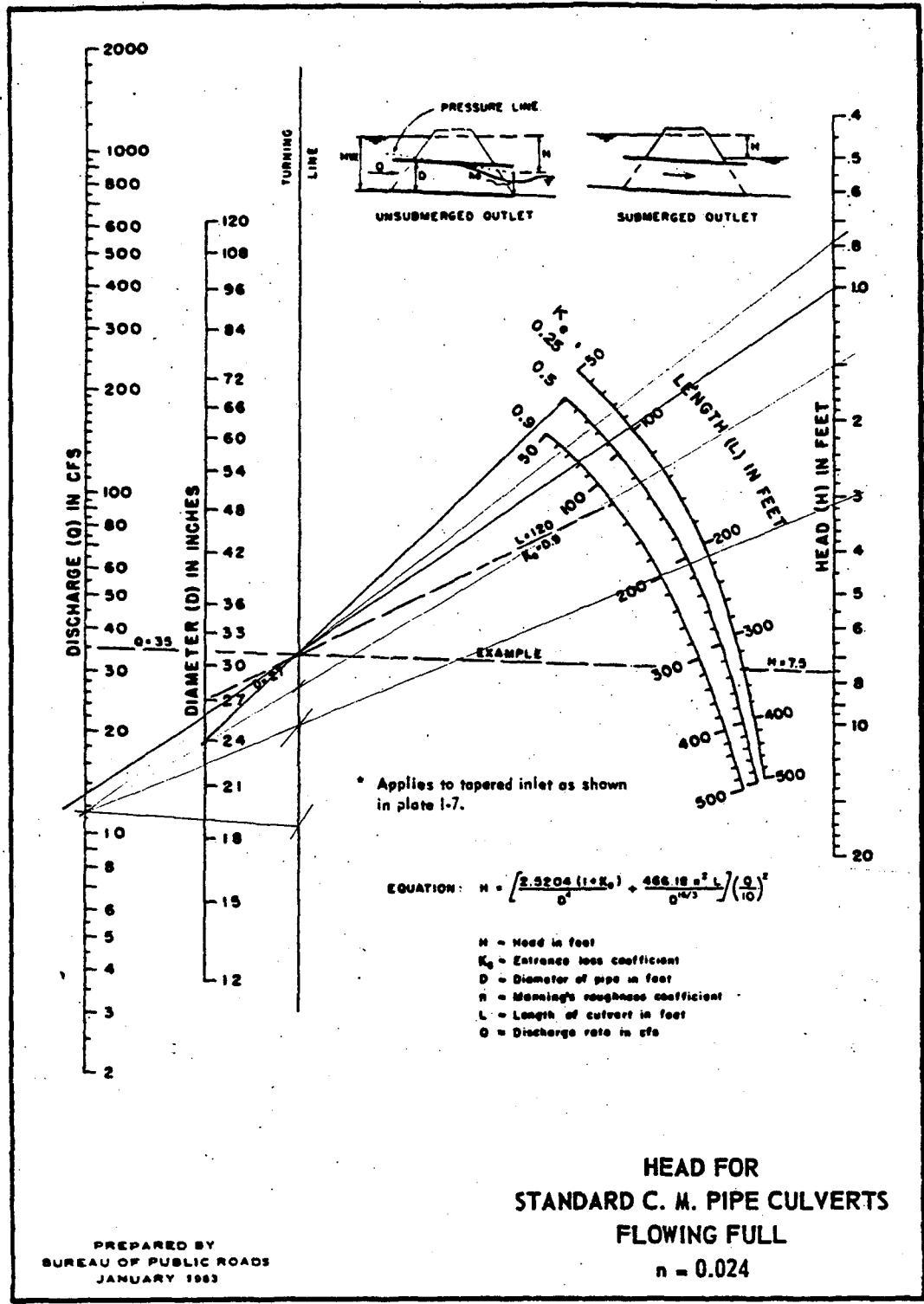
if we used a 21" CMP $Q_{10} = 11.6$ cfs $H = 1.5'$

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DER
2/2

EM 1110-345-284
App. I
14 Aug 64



PREPARED BY
BUREAU OF PUBLIC ROADS
JANUARY 1953

PLATE I-11

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SUBJECT R.M.A. Basin F

DATE 5/15/1931

WORK Check capacity of diversion ditch

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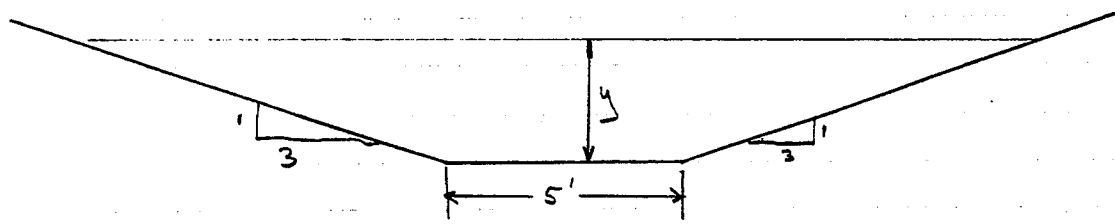
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PAGE No. 1 OF 2

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$$Q = \frac{1.486}{n} R^{2/3} A S^{1/2}$$

A = area
P = wetted perimeter

$$Q = \frac{1.486}{n} \frac{A^{5/3}}{P^{2/3}} S^{1/2}$$

Assume $n = 0.03$ $S = 0.005$
 $y = 2.5'$

$$Q = \frac{1.486}{0.03} \frac{[(5 + 3(2.5))2.5]^{5/3}}{[5 + 2(2.5)\sqrt{1+3^2}]^{2/3}} (0.005)^{1/2}$$

$$= 3.5025316 (40.97792)$$

Q = 144 cfs

Assume: y = 1'

$$Q = 3.5025316 \frac{[(5 + 3(1))1]^{5/3}}{[5 + 2(1)\sqrt{1+3^2}]^{2/3}}$$

$$= (3.5025316) (6.345553)$$

Q = 22 cfs

SUBJECT R.M.A. Basin F

WORK check capacity of diversion ditch

PROJECT No. 9029.201

FILE No. _____

DATE 5/15/1981

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PAGE No. 2 OF 2

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Assume $y = 0.5'$

$$Q = 3.5025316 \frac{[(5 + 3(0.5))0.5]^{1.6}}{[5 + 2(0.5)\sqrt{1+3^2}]^{0.6}}$$

$$= 3.5025316 (1.7534937)$$

$Q = 6 \text{ cfs}$

Assume $y = 0.75'$

$$Q = 3.5025316 \frac{[(5 + 3(0.75))0.75]^{1.6}}{[5 + 2(0.75)\sqrt{1+3^2}]^{0.6}}$$

$$Q = (3.5025316) (3.635717)$$

$Q = 13 \text{ cfs}$

Assume $y = 2.0'$

$S = 0.001$

$$Q = \frac{1.486}{0.03} \frac{[(5 + 3(2.0))2.0]^{5/3}}{[5 + 2(2.0)\sqrt{1+3^2}]^{3/2}} (0.001)^{1/2}$$

$$= (1.566) (25.431)$$

$Q = 40 \text{ cfs}$

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SUBJECT R.M.A. Basin F

WORK Drainage Areas of Basin F

PROJECT No. 9029 201

FILE No. _____

34

DATE 5/13/1981
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PAGE No. 1 OF 15

Calibration of Planimeter

Area 8" x 8" @ 1" = 50' Area = 16000 ft² = 3.6731 acres

Readings: 6528

10206	- 3678	}	ave 3678
3887	- 3681		
7562	- 3675		

Area #1 of Basin F @ 1" = 50'

Contour 5187

8623	- 1400	}	ave = 1402.6
10023	- 1402		
1425	- 1406		
2831			

Contour 5188

2831	- 3635	}	ave = 3637.3
6466	- 3638		
0104	- 3639		
3743			

Contour 5189

3743	- 4109	}	ave = 4112.3
7852			
1966	- 4114		
6080	- 4114		

Contour 5190

6080	- 4316	}	ave = 4314.3
0396	- 4319		
4715	- 4308		
9023			

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SUBJECT R.M.A. Basin F

WORK Drainage Areas for basin F

PROJECT No. 9029.201

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Area #1 cont.

Contour 5191

Readings: 9023 - 4696
3719 - 4699 } ave = 4697.5
8418
3081 - ~~4663~~

Contour 5192

Readings: 3081 - 5057
8138 - 5059 } ave = 5059.6
3197
8260 - 5063

Contour 5193

Readings: 8260 - 5234
3494 - 5244 } ave = 5234.6
8738
3964 - 5226

Contour 5194

Readings: 3964 - 5364
9333 - 5363 } ave = 5366
4696

Contour 5195

Readings: 4696 - 5531
0227 - 5533 } ave = 5532
5760

Contour 5196

Readings: 5760 - 5746
1506 - 5737 } ave = 5741.5
7243

@ Basin Divide

Readings: 7243 - 6714
3957 - 6716 } ave = 6715
0673

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SUBJECT R.M.A. Basin F
WORK Drainage Areas for Basin F
PROJECT No. 9029.201

DATE 5/13/1981
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PAGE No. 3 OF 15

FILE No. _____

Area #2

Contour 5187 Readings: 5608 - 655 }
6263 - 651 } ave. = 653
6914

Contour 5188 Readings: 6914 - 1451 }
8365 - 1448 } ave. = 1449.5
9813

Contour 5189 Readings: 9813 - 2327 }
2140 - 2326 } ave. = 2326.5
4466

Contour 5190 Readings: 4466 - 2895 }
7361 - 2898 } ave. = 2896.5
0259

Contour 5191 Readings: 0259 - 3727 }
3986 - 3728 } ave. = 3727.5
7714

Contour 5192 Readings: 7714 - 4611 }
2325 - 4605 } ave. = 4608
6930

Contour 5193 Readings: 6930 - 5149 }
2079 - 5148 } ave. = 5148.5
7227

Contour 5194 Readings: 7227 - 5812 }
3039 - 5804 } ave. = 5808
8843

Contour 5195 Readings: 8843 - 6345 }
5188 - 6347 } ave = 6346
1535

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SUBJECT R.M.A. Basin F

DATE 5/13/1981

WORK Drainage Areas for Basin F

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Area #2 cont.

Contour 5196 Readings: 1535 - 6725 }
8260 - 6721 } ave = 6723
4981

@ Basin Divide Readings: 4981 - 7229 }
2210 - 7226 } ave = 7227.5
9436

Area #3

Contour 5187 Readings: 0560 - 573 }
1133 - 562 } ave = 567
1695 - 566 }
2261

Contour 5188 Readings: 2261 - 1017 }
3278 - 1013 } ave = 1015
4291

Contour 5189 Readings: 4291 - 1454 }
5745 - 1456 } ave = 1455
7201

Contour 5190 Readings: 7201 - 2156 }
9357 - 2159 } ave = 2157.5
1516

Contour 5191 Readings: 1516 - 3577 }
5093 - 3577 } ave = 3577
8670

Contour 5192 Readings: 8670 - 5101 }
3771 - 5102 } ave = 5101.5
8873

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DO NOT WRITE

Area #3 cont.

Contour 5193 Readings: 8873 - 6451
5324 - 6446 } ave = 6448.5
1770

Contour 5194 Readings: 1770 - 7249
9019 - 7254 } ave = 7251.5
6273

Contour 5195 Readings: 6273 - 7882
4155 - 7883 } ave = 7882.5
2038

Contour 5196 Readings: 2038 - 8784
0822 - 8787 } ave = 8785.5
9609

@ Basin Divide Readings: 9609 - 9250
8867 - 9210 } ave = 9234
8077

Area #4

Contour 5191 Readings: 4364 - 535
4899 - 529 } ave = 532
5428

Contour 5192 Readings: 5428 - 1988
7416 - 1984 } ave = 1986
9400

Contour 5193 Readings: 9400 - 4850
4258 - 4862 } ave = 4860
9120

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SUBJECT R.M.A. Basin F
WORK Drainage Areas for Basin F
PROJECT No. 9029.201

DATE 5/14/1931
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PAGE No. 6 OF 15

FILE No. _____

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Area #4 cont.

Contour 5194

Readings: 9120 - 6437 }
5557 - 6430 } ave = 6433.5
1987

Contour 5195

Readings: 1987 - 7371 }
9358 - 7368 } ave = 7369.5
6726

Contour 5196

Readings: 6726 - 8028 }
4754 - 8034 } ave = 8031
2788

@ Basin Divide

Readings: 2788 - 8681 }
1469 - 8684 } ave = 8682.5
0153

Area #5

Contour 5194

Readings: 6185 - 1255 }
7440 - 1260 } ave = 1257.5
8700

Contour 5195

Readings: 8700 - 4868 }
3568 - 4877 } ave = 4872.5
8445

Contour 5196

Readings: 8445 - 6324 }
4769 - 6321 } ave = 6322.5
1090

@ Basin Divide

Readings: 2332 - 7928 }
0260 - 7918 } ave = 7923
8178

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SUBJECT RMA Basin F
WORK Drainage Area for Basin F
PROJECT No. 9029.201

DATE 5/14/1931
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PAGE NO. 7 OF 15

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Area #6

Contour 5192

Readings: 0023 - 555
0578 - 554 } ave = 554.5
1132

Contour 5193

Readings: 1132 - 2832
3964 - 2831 } ave = 2831.5
6795

Contour 5194

Readings: 6795 - 5062
1857 - 5070 } ave = 5066
6927

Contour 5195

Readings: 6927 - 8345
5272 - 8344 } ave = 8344.5
3616

Contour 5196

Readings: 3616 - 9493
3109 - 9499 } ave = 9496
2608

@ Basin Divide

Readings: 2608 - ~~7042~~
3580 - 11068
4648 - 11057 } ave = 11062.5
5705

Area #7

Contour 5191

Readings: 0010 - 1629
1639 - 1634 } ave = 1631.5
3273

Contour 5192

Readings: 3273 - ~~3738~~
7011 - 5091
2092 - 5074 } ave = 5077.5
7166

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SUBJECT RMA. Basin F
WORK Drainage Area for Basin F
PROJECT No. 9029.201

41

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Area #7 cont.

Contour 5193

Readings: 7166 - 7282
4448
1731 - 7283 } ave = 7282.5

Contour 5194

Readings: 1731 - 9143
0929
0132 - 9203 } ave = 9200.5

Contour 5195

Readings: 0132 - 10018
0150
0165 - 10015 } ave = 10016.5

Contour 5196

Readings: 0165 - 10794
0959
1745 - 10786 } ave = 10790

@ Basin Divide (doesn't include small Basin F @ southeast area)

Readings: 1745
4416 - 12671
7060 - 12644 } ave = 12657.5

Small Basin F

Drainage area of southern half

Readings: 0376 - 3596
3972
7574 - 3602 } ave = 3599

Drainage area of northern half

Readings: 5700 - 4337
0037
4375 - 4338 } ave = 4337.5

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SUBJECT

R.M.A. Basin F

DATE

5/14/1931

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Drainage Area For Basin F

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9

PAGE NO.

OF 15

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PROJECT No. 9029.201

FILE No.

Area # 8

Contour 5186

Readings: 3626
3676 - 50
3737 - 51
3788 - 51 } ave = 50.5

Contour 5187

Readings: 3787
4938 - 1151
6087 - 1149 } ave = 1150

Contour 5188

Readings: 6087
9835 - 3743
3576 - 3741 } ave = 3744.5

Contour 5189

Readings: 3576 - 5285
8861 - 5276
4137 - 5276 } ave = 5280.5

Contour 5190

Readings: 4137 - 7241
1378 - 7239
8617 - 7239 } ave = 7240

Contour 5191

Readings: 8617 - 9320
7937 - 9308
7245 - 9308 } ave = 9314

Contour 5192

Readings: 7245 - 10078
7323 - 10070
7393 - 10070 } ave = 10074

Contour 5193

Readings: 7393 - 11139
8531 - 11119
9650 - 11119 } ave = 11128.5

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WORK Drainage Area for Basin F

PROJECT No. 9029.201

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DATE 5/14/1981

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PAGE No. 10 OF 15

43

Area #8 cont.

Contour 5194

Readings: 9650 - 11696 }
1346 - 11693 } ave. = 11694.5
3039

Contour 5195

Readings: 3039 - 12057 }
5096 - 12074 } ave. = 12065.5
7170

Contour 5196

Readings: 7170 - 12551 }
9721 - 12550 } ave. = 12550.5
2271

@ Basin Divide

Readings: 2271 - 15349 }
7620 - 15364 } ave. = 15356.5
2984

Area #9

Contour 5185

Readings: 6440 - 1153 }
7593 - 1150 } ave = 1151.5
8743

Contour 5186

Readings: 0748 - 5184 }
5932 - 5186 } ave = 5185
1118

Contour 5187

Readings: 1115 - 8083 }
9198 - 8087 } ave = 8085
7285

Contour 5188

Readings: 0010 - 9196 }
9206 - 9198 } ave = 9197
8404

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SUBJECT R.M.A. Basin F

WORK Drainage Areas for Basin F

PROJECT No. 9029.201

FILE No. _____

44

DATE 5/15/1981
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PAGE No. 11 OF 15

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Area # 9 cont.

Contour 5189

Readings: 8404 - 9596 }
8000 - 9582 } ave. = 9589
7582

Contour 5190

Readings: 7582 - 9755 }
7337 - 9743 } ave. = 9749
7080

Contour 5191

Readings: 7080 - 9845 }
6925 - 9850 } ave. = 9847.5
6775

Contour 5192

Readings: 6775 - 9931 }
6706 - 9924 } ave. = 9927.5
6630

Contour 5193

Readings: 6630 - 10032 }
6662 - ~~9820~~ } ave. = 10020.5
6490 - 10009 }
6499

Contour 5194

Readings: 6499 - 10136 }
6635 - 10147 } ave. = 10141.5
6782

Contour 5195

Readings: 6782 - 10248 }
7030 - 10277 } ave. = 10262.5
7307

Contour 5196

Readings: 7307 - 10453 }
7760 - 10449 } ave. = 10451
8209

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SUBJECT R.M.A. Basin F
WORK Drainage Areas for Basin F
PROJECT No. 9029.201
FILE No. _____

45

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Area #9 cont.

@ Basin Divide Readings: 8209 - 11524 }
9733 - 11522 } ave. = 11523
1255

Area #10

Contour 5187 Readings: 0009 - 1046 }
1055 - 1041 } ave. = 1043.5
2096

Contour 5188 Readings: 2096 - 1655 }
3751 - 1652 } ave. = 1653.5
5403

Contour 5189 Readings: 5403 - 1779 }
7182 - 1735 } ave. = 1782
8967

Contour 5190 Readings: 8967 - 1866 }
0833 - 1860 } ave. = 1863
2693

Contour 5191 Readings: 2693 - 2152 }
4845 - 2143 } ave. = 2147.5
6988

Contour 5192 Readings: 6988 - 2197 }
9185 - 2204 } ave. = 2200.5
1389

Contour 5193 Readings: 1389 - 2250 }
3639 - 2250 } ave. = 2250
5889

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SUBJECT R.M.A. Basin F

WORK Drainage Areas for Basin F

DATE 5/15/19 81 47

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PAGE No. 14 OF 15

PROJECT No. 90 29.201

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Location	Area #1	Area #2	Area #3	Area #4	Area #5	Area #6	Area #7	Area #8	Area #9	Area #10	Total
CONTOURS											
5185	-	-	-	-	-	-	-	-	1151.5	-	1151.5
5186	-	-	-	-	-	-	-	50.5	5185	-	5235.5
5187	1402.6	653	567	-	-	-	-	1150	8085	1043.5	12901.6
5188	3637.3	1449.5	1015	-	-	-	-	3744.5	9197	1653.5	20696.83
5189	4112.3	2326.5	1455	-	-	-	-	5280.5	9589	1782	24545.3
5190	4314.3	2896.5	2157.5	-	-	-	-	7240	9749	1863	28220.3
5191	4697.5	3727.5	3577	532	-	-	1631.5	9314	9847.5	2147.5	35474.5
5192	5059.6	4608	5101.5	1986	-	554.5	5077.5	10074	9927.5	2200.5	44584.6
5193	5234.6	5148.5	6448.5	4860	-	2831.5	7282.5	11128.5	10020.5	2250	55204.6
5194	5366	5808	7251.5	6433.5	1257.5	5066	9200.5	11694.5	10141.5	2307	64526.0
5195	5532	6346	7882.5	7369.5	4872.5	8344.5	10016.5	12065.5	10262.5	2361	75052.5
5196	5741.5	6723	8785.5	8031	6322.5	9496	10790	12550.5	10451	2429.5	81320.5
Basin	6715	7227.5	9234	8682.5	7923	11062.5	12657.5	15356.5	11523	2849	93230.5
Divide											3599
Small F south											4337.5
Small F north											

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SUBJECT R.M.A. Basin F
WORK Drainage Areas & Volumes for Basin F

DATE 5/15/1981
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PAGE No. 15 OF 15

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PROJECT No. 9029.201 FILE No. _____

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Location	Total (x)	Area (A) (acres)	Volume (V) (acre-ft.) (Average end method)
CONTOURS:			
5185	1151.5	1.15	0
5186	5235.5	5.23	$0 + \left(\frac{1.15 + 5.23}{2}\right) 1 = 3.19$
5187	12901.16	12.88	$3.19 + \left(\frac{5.23 + 12.88}{2}\right) 1 = 12.24$
5188	20696.83	20.67	$12.24 + \left(\frac{12.88 + 20.67}{2}\right) 1 = 29.02$
5189	24545.3	24.51	$29.02 + \left(\frac{20.67 + 24.51}{2}\right) 1 = 51.61$
5190	28220.3	28.18	$51.61 + \left(\frac{24.51 + 28.18}{2}\right) 1 = 77.96$
5191	35474.5	35.42	$77.96 + \left(\frac{28.18 + 35.42}{2}\right) 1 = 109.76$
5192	44589.16	44.53	$109.76 + \left(\frac{35.42 + 44.53}{2}\right) 1 = 149.74$
5193	55204.6	55.13	$149.74 + \left(\frac{44.53 + 55.13}{2}\right) 1 = 199.57$
5194	64526.0	64.44	$199.57 + \left(\frac{55.13 + 64.44}{2}\right) 1 = 259.36$
5195	75052.5	74.95	$259.36 + \left(\frac{64.44 + 74.95}{2}\right) 1 = 329.06$
5196	81320.5	81.21	$329.06 + \left(\frac{74.95 + 81.21}{2}\right) 1 = 407.14$
@ Basin Divide	93230.5	93.10	
Small F south	3599	3.59	
Small F north	4337.5	4.33	

Area : $\frac{3.6731}{3678} = \frac{A}{X}$

Calibration of Planimeter

Area 8" x 8" @ 1" = 50' Area = 160,000 ft² = 3.6731 acres

Readings: 8343

- 3757	}	ave = <u>3759</u>
2150		
- 3759		
5909		
- 3761		
9670		

Area #2

Total Drainage Area behind levee (dry side) Readings: 9089
 0390 - 1801
 2685 - 1795
 1798

$$\frac{3.6731}{3759} = \frac{A}{1798} \quad A = \underline{1.757 \text{ acres}}$$

Contour 5197 Readings: 2543
 2930 - 392
 3306 - 376 } 379 A = 0.370 acres

Contour 5195 Readings: 0036
 0961 - 925
 1884 - 923 } 924 A = 0.903 acres

Contour 5196 Readings: 1884
 3190 - 1306
 4495 - 1305 } 1305.5 A = 1.276 acres

Area #3

Total Drainage Area behind levee (dry side) Readings: 6133
 3950 - 2317
 1771 - 2321 } 2819
A = 2.754 acres

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SUBJECT R.M.A. Basin F
WORK Drainage Area behind proposed levee
PROJECT No. 9029.201
FILE No. _____

DATE 5/13/1981
SET UP BY DER
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CHECKED BY _____
PAGE No. 3 OF 8

Area #4 cont.

Contour 5193 Readings: $\begin{matrix} 0009 \\ 0750 - 741 \\ 1491 - 741 \end{matrix} \left. \vphantom{\begin{matrix} 0009 \\ 0750 \\ 1491 \end{matrix}} \right\} 741$ $\frac{3.6731}{3759} = \frac{A}{741}$
A = 0.724 acres

Contour 5194 Readings: $\begin{matrix} 1491 \\ 3305 - 1814 \\ 5110 - 1805 \end{matrix} \left. \vphantom{\begin{matrix} 1491 \\ 3305 \\ 5110 \end{matrix}} \right\} 1809.5$

$\frac{3.6731}{3759} = \frac{A}{1809.5}$ A = 1.768 acres

Contour 5195

$\begin{matrix} 7369.5 \\ 6433.5 \\ 936.0 \end{matrix} \left. \vphantom{\begin{matrix} 7369.5 \\ 6433.5 \end{matrix}} \right\} \begin{matrix} \text{from calc. 5/14} \\ \text{page 6 of 15} \end{matrix}$ $\frac{3.6731}{3678} = \frac{A}{936}$ A = 0.935

Total 1.768 + 0.935 = 2.703 acres

Contour 5196

$\begin{matrix} 8031.0 \\ 6433.5 \\ 1597.5 \end{matrix} \left. \vphantom{\begin{matrix} 8031.0 \\ 6433.5 \end{matrix}} \right\} \begin{matrix} \text{calc. 5/14} \\ \end{matrix}$ $\frac{3.6731}{3678} = \frac{A}{1597.5}$ A = 1.595

Total = 1.768 + 1.595 = 3.363 acres

Area #5

Total Drainage Area behind levee (dry side)

wet side Readings: $\begin{matrix} 3706 \\ 3961 - 255 \\ 4219 - 255 \end{matrix} \left. \vphantom{\begin{matrix} 3706 \\ 3961 \\ 4219 \end{matrix}} \right\} 256.5$ $\frac{3.6731}{3759} = \frac{A}{256.5}$ A = 0.25 acres

Total = 0.251 - $\frac{7923 \times 3.6731}{3678}$ = 7.662 acres

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WORK Drainage Areas behind proposed levee

DATE 5/13/1991
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PAGE NO. 4 OF 8

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PROJECT No. 9029.201 FILE No. _____

Area #5 cont.

Contour 5194 (see calc. 5/14 pg. 6-15)

$$\frac{3.6731}{3678} = \frac{A}{1258.5}$$

$$A = 1.256$$

$$\text{Total} = 1.256 - 0.251 = \underline{\underline{1.005 \text{ acres}}}$$

Contour 5195

$$\frac{3.6731}{3678} = \frac{A}{4872.5}$$

$$A = 4.866$$

$$\text{Total} = 4.866 - 0.251 = \underline{\underline{4.615 \text{ acres}}}$$

Contour 5196

$$\frac{3.6731}{3678} = \frac{A}{6322.5}$$

$$A = 6.314$$

$$\text{Total} = 6.314 - 0.251 = \underline{\underline{6.063 \text{ acres}}}$$

Area #6

Drainage Area behind levee (dry side)

wet side Readings: 4149 }
7717 - 3568 } 3566.5
1292 - 3565 }

$$\frac{3.6731}{3759} = \frac{A}{3566.5}$$
$$A = 3.485 \text{ acres}$$

$$\text{Total} = \frac{11062.5 \times 3.6731}{3678} - 3.485 = \underline{\underline{7.563 \text{ acres}}}$$

Contour 5193

Readings: 5416 }
5536 - 120 } 118.5
5653 - 117 }

$$\frac{3.6731}{3759} = \frac{A}{118.5}$$
$$A = \underline{\underline{0.116 \text{ acres}}}$$

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SUBJECT R.M.A. Basin F

WORK Drainage Areas behind proposed levee

PROJECT No. 9029.201

DATE 5/13/1931

SET UP BY DER

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PAGE No. 5 OF 8

FILE No. _____

Area #6 cont.

Contour 5194 Readings: 5654
 7274 - 1620 } 1622.5
 8899 - 1625 }

A = 1.585 acres

Contour 5195

8344.5 } from calc. 5/14 3.6731 = A A = 3.274
 - 5066 } pg 7 of 15 3678 3278.5
 3278.5

Total = 3.274 + 1.585 = 4.859 acres

Contour 5196

9496 } see calc. 5/14 3.6731 = A A = 4.424
 - 5066 } 3678 4430
 4430

Total = 4.424 + 1.585 = 6.009 acres

Area #7

Drainage Area behind levee (dry side)

wet side Readings: 0063 - 6939 } 6946.5 3.6731 = A
 7002 - 6954 } 3759 6946.5
 3956 - 6954 } A = 6.788 acres

Total = $\frac{12657.5 \times 3.6731}{3678} - 6.788 = \underline{5.853 \text{ acres}}$

Contour 5193

Readings: 2811
 3374 - 563 } 564
 3939 - 565 }

$\frac{3.6731}{3759} = \underline{A}$
 564
A = 0.551

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Area #7 cont.

Contour 5194 Readings: 4035 - 2465 }
6500 - 2466 } 2465.5
8966

$$\frac{3.6731}{3759} = \frac{A}{2465.5} \quad \underline{A = 2.409 \text{ acres}}$$

Contour 5195

10016.5 } from calc. 5/14
- 9200.5 } pg. 8 of 15
816.0

$$\frac{3.6731}{3678} = \frac{A}{816} \quad A = 0.815$$

$$\text{Total} = 0.815 + 2.409 = \underline{3.224 \text{ acres}}$$

Contour 5196

10740.0
- 9200.5
1539.5

A = 1.587

$$\text{Total} = 1.587 + 2.409 = \underline{3.997 \text{ acres}}$$

Area #8

Drainage Area behind levee (dry side)

Readings: 4655 - 1164 }
5819 - 1190 } 1167
6989

$$\underline{A = 1.140 \text{ acres}}$$

Contour 5194

Readings: 9083 - 31 }
9114 - 39 } 35
9153

$$\underline{A = 0.034 \text{ acres}}$$

Contour 5195

Readings: 9201 - 145 }
9346 - 138 } 141.5
9484

$$\underline{A = 0.138 \text{ acres}}$$

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WORK Drainage Area behind proposed levee

PROJECT No. 9029.201

FILE No. _____

DATE 5/13/1981

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PAGE No. 7 OF 8

Area # 8 cont.

Contour 5196

Readings: 9529 - 3335 }
9864 - 333 } 33#
0197 - 333 }

A: 0.326 acres

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WORK Drainage Areas behind proposed levee
PROJECT No. 9029.201

DATE 5/13/1991 ⁵⁶
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CHECKED BY _____
PAGE No. 9 OF 8

FILE No. _____

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Location	Area #2	Area #3	Area #4	Area #5	Area #6	Area #7	Area #8	Total (acres)	Volume (ac-ft.)
Contours:									
5193	—	0.061	0.724	—	0.116	0.551	—	1.452	
5194	0.370	0.753	1.768	1.005	1.585	2.409	0.034	7.924	$0 + \left(\frac{1.452 + 7.924}{2} \right) = 4.69$
5195	0.903	1.383	2.703	4.615	4.859	3.224	0.138	17.825	$4.69 + \left(\frac{7.924 + 17.825}{2} \right) = 17.56$
5196	1.276	2.285	3.363	6.063	6.009	3.997	0.326	23.319	$17.56 + \left(\frac{17.825 + 23.319}{2} \right) = 38.13$
Dry side of levee	1.757	2.754	4.021	7.662	7.563	5.853	1.140	30.750	
Small F south								3.594	
Small F north								4.331	

Volume @ 5195.5: $\frac{17.56 + 38.13}{2}$
= 27.85 ac-ft.

P-GN-024-A

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From "Urban Storm Drainage" Criteria Manual Vol. 1

2-year - 1hr. rainfall = 0.95 inches

2-year - 24hr. rainfall = 1.77 inches

10-year - 1hr. rainfall = 1.32 inches

10-year - 24hr. rainfall = 2.84 inches

100 year - 1hr. rainfall = 1.78 inches

100 year - 24hr. rainfall = 3.66 inches

Check of volume needed to overtop levee (dry side)

Approximate area behind proposed levee = 30.75 acres
(top of levee = 5195.5)

Volume @ 5195.5 = 27.85 ac-ft.

$$27.85 \text{ ac-ft.} = 30.75 \text{ in.} (x)$$

$$x = 0.906 \text{ ft} = 10.87 \text{ inches}$$

If we consider small F :

$$27.85 \text{ ac-ft.} = [30.75 + 3.594 + 4.331] (x)$$

$$= (38.675) (x)$$

$$x = 0.72 \text{ ft} = 8.64 \text{ inches}$$

APPENDIX A
BORING LOGS

NOTE:

The following data will be included in the final Contract Specifications.

EARTH SCIENCES ASSOCIATES

DRILLING AND SAMPLING LOG

PROJECT H108 RMA Basin F Borrow DATE DRILLED 5/6/81 HOLE NO. H-1
 LOCATION Near Southwest corner of borrow area - 463' N 29 W 1/4 sec 17 GROUND SURFACE ELEV. ~ 5255'
 DRILLING CONTRACTOR CUSTOM AUGERS LOGGED BY SB DEPTH TO GROUND WATER -
 TYPE OF RIG CMF 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL -
 SURFACE CONDITIONS Slightly sloping - near base grassy WEATHER Three-Win G

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
2	SM-SC	00-2.0 <u>Topsoil - Silty to Clayey Sand</u> ; ~30% low to med plastic fines, ~80% fine to med grained sand.	B-1	AD	Arrived on site ~ 9:00 Bob Cleveland drilling (Elnor helping) using 6" flight auger
4	SM	2.0-10 <u>Silty Sand</u> ; ~25% non to low plastic fines, ~80% fine grained sand.	B-2		
6		5.0-7.0 Mat'l is lighter in color, pos. CaCO ₃ present	B-3		
8		7.0 Mat'l is redder in color pos. Fe present	B-4		
10	SP	10.0-20.0 <u>Sand</u> - rel. clean; gen'l 5% fines, fine grained	B-5		
12		12.0 Slightly darker yellow (No. 4)			
14		14.0 Becomes denser -			14.0 is slightly more difficult to penetrate
16			B-6		
18			B-7		Terminated hole at 20.0
20		BH 20.0'	B-8		SHEET <u>1</u> OF <u>1</u>

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DRILLING AND SAMPLING LOG

PROJECT H 108 RMA Basin F borrow DATE DRILLED 5-6-71 HOLE NO. H-2
 LOCATION Near N.W. corner of borrow area ~ 169' E of C/O road GROUND SURFACE ELEV. ~5231
 DRILLING CONTRACTOR Custom Auger LOGGED BY SB DEPTH TO GROUND WATER -
 TYPE OF RIG CME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL -
 SURFACE CONDITIONS Flat & Grassy WEATHER Threatening rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
2	SC	0.0-3.0 <u>Topsoil - Clayey Sand -</u> 25-30% low to med plastic fines. 70-75% fine to med grained sand. 2.0-4.0 Gradational Contact to;	B-1	AD	Bob Cleveland drilling using 6" flight auger
4	SM- ML	3.0-13.0 <u>Silty Sand to Sandy Silt;</u> 40-60% low plastic fines; 40-60% fine grained sand w/ occasional coarse grains pres. 4.0 Occasional Grains present up to 1.5" in diameter, CaCO ₃ cementation evident on grains and in blebs.	B-2		mid bl-2;
6			B-3		
8			B-4		mid Chatter
10			B-5		
12			B-6		
14	SP- SW?	13.0-17.5 <u>Gravelly Sand, ~ 75% low plastic fines, ~ 55% fine-coarse grained sand, ~ 20 fine-coarse gravel (up to 3" pieces), quartz, quartzite, and other lithics, cuttings show silt, fine to coarse sand present also</u>	B-7		
16			B-8		
18	SP	17.5-20.0 <u>Gravelly Sand; ~ 50% is all around 1/2" occasional 1-2" gravel present; some fine to coarse sand also.</u>	B-9		Terminated hole at 20.0
		BH 20.0'			SHEET <u>1</u> OF <u>1</u>

EARTH SCIENCES ASSOCIATES

DRILLING AND SAMPLING LOG

PROJECT H108 RME Basin F Borrow DATE DRILLED 5-6-81 HOLE NO. H-3
 LOCATION Near NE corner of borrow area ~ 634.5' N75E of ^{power pole #2} GROUND SURFACE ELEV. ~ 5234'
 DRILLING CONTRACTOR Custom Auger LOGGED BY SB DEPTH TO GROUND WATER —
 TYPE OF RIG CME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL —
 SURFACE CONDITIONS flat + grassy WEATHER Threatening rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS	
2.0	SM-SC	0.0-1.0 <u>Topsoil - Silty to Clayey Sand</u> 25-30% low to mod plastic fines	B-1	AD	Bob Cleveland drilling using 6" flight Auger	
	SC-CL	1.0-9.0 <u>Clayey Sand to Sandy Clay</u> 40-60% low to mod plastic fines; 40-50% fine grained sand	B-2			
4.0			B-3			
6.0		5.0 = Occasional gravel pieces up to 1" dia,	B-4			3.0 mid bucket
8.0			B-5			
10.0	SP-SW	9.0-12.0 <u>Gravelly Sand</u> , ~25% fines, ~60% fine-coarse grained sand; ~15% gravel up to 1.5" dia.	B-6			
12.0	SC	12.0-14.0 <u>Clayey Sand</u> ~30-40% mod plastic fines, 60-70% fine grained sand.	B-7 B-7a			12.0 Heavy Chatter - sitting on rock?
14.0	CL	14.0-20.0 <u>Sandy Clay</u> , ~70-80% mod plastic fines; 20-30% fine grained sand.	B-8 B-8a			14.0-15.0 begins to chatter
16.0			B-9			
18.0					Terminated hole at 20.0	
20.0		BH-20.0'			SHEET <u>1</u> OF <u>1</u>	

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DRILLING AND SAMPLING LOG

PROJECT H108 RME Basin F Borrow DATE DRILLED 5-6-81 HOLE NO. H-4
 LOCATION In NE 1/4 of borrow area ~ 173,5 N 56 E 1/2 Pownall # 5 GROUND SURFACE ELEV. ~5246
 DRILLING CONTRACTOR Custom Auger LOGGED BY SB DEPTH TO GROUND WATER -
 TYPE OF RIG RME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL -
 SURFACE CONDITIONS Flat & Grassy WEATHER Threatening rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
	SM-SC	0.0-1.0 <u>Topsoil - Silty to Clayey Sand; ~20% low plastic fines</u>			
1	SM-ML	1.0-7.0 <u>Silty Sand to Sandy Silt; ~50% low plastic fines (May border on SC-CL); ~50% fine grained sand.</u>	B-1		AD Bob Cleveland drills using 6" flight auger
4		4.0- Becomes slightly redder; pos. Fe staining	B-2		
6			B-3		
8	SM-SC	7.0-12.0 <u>Silty to Clayey Sand; (small is lighter than mat'l above, pos. CaCO₃ present) ~35% low to mod plastic fines ~65% fine grained sand (slightly coarser than mat'l above) 8.0 gravel present</u>	B-4		
10			B-5		
12	CL	12-17 <u>Sandy Clay ~60-70% mod plastic fines; 30-40% fine grained sand</u>	B-6		8.0 Mod Chert (brk)
14					
16			B-7		
18		BH- 17'			Terminated hole at 17.0
20					SHEET <u>1</u> OF <u>1</u>

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DRILLING AND SAMPLING LOG

PROJECT H108 RME Basin F Borrow DATE DRILLED 5/6/81 HOLE NO. H-5
 LOCATION Near middle of E. side of borrow area ~ 221.5' W of center GROUND SURFACE ELEV. ~ 5252.5
 DRILLING CONTRACTOR Custom Auger LOGGED BY SB DEPTH TO GROUND WATER —
 TYPE OF RIG CME-45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL —
 SURFACE CONDITIONS Flat + Grassy WEATHER Threatening rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
2	SM-SC	0.0-1.0 <u>TOPSOIL - silty to clayey sand</u> <u>~ 25% low plastic fines; ~ 75% fine-med sand</u>	B-1	AD	Bob Cleveland drills w/ 6" flight auger.
	ML	1.0-4.0 <u>SANDY SILT ~ 60-70% non</u> <u>to v. low plastic fines</u>	B-2		
4	SM-SC	4.0-12.0 <u>Silty to Clayey Sand ~ 40%</u> <u>low to med plastic fines; ~ 60%</u> <u>fine grained sand</u>	B-3		
6			B-4		
8			B-5		
10			B-6		
12	SC	12-15 <u>Clayey Sand ~ 40% med</u> <u>plastic fines; ~ 60% fine grained</u> <u>sand.</u>	B-6		
14					
16		BH 15.0			Terminated hole at 15.0

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DRILLING AND SAMPLING LOG

PROJECT H108 RME Basin F Borrow DATE DRILLED 5/6/81 HOLE NO. H-6
 LOCATION W. SE 1/4 of borrow area 585 E of Power Pole #9 - 200' W of fence GROUND SURFACE ELEV. ~5254.5
 DRILLING CONTRACTOR Custom Auger LOGGED BY STB DEPTH TO GROUND WATER -
 TYPE OF RIG CME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL -
 SURFACE CONDITIONS Flat + Grassy WEATHER Threatening Rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
0	SC-SM	0.0-1.0 Topsoil - Silty to Clayey Sand ~25% low plastic fines ~75% sand			AD Bob Cleveland drilling w/ 6" flight Auger
2	SM	1.0-10.0 Silty Sand ~35% low plastic fines; ~65% fine to v. fine grained sand	B-1		
4			B-2		
6			B-3		
8			B-4		
10	SM	10.0-15.0 Silty Sand, ~35% low plastic fines; similar to silty sand above except sand is slightly coarser but still w/in fine range; slightly lighter color, CaCO ₃ present	B-5		
12			B-6		
14		15.0 gravel			15.0 chatter Terminated hole at 15.0
16		BH 15.0			

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DRILLING AND SAMPLING LOG

PROJECT H108 PMA Basin F Borrow DATE DRILLED 5-6-81 HOLE NO. H-7
 LOCATION Near Center of Borrow Area ~128.5' N55W of Power Pole #7 GROUND SURFACE ELEV. ~5242.5
 DRILLING CONTRACTOR Custom Auger LOGGED BY SB DEPTH TO GROUND WATER —
 TYPE OF RIG CME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL —
 SURFACE CONDITIONS Flat & Grassy WEATHER Threatening Rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
2	SC	0.0-2.0 <u>Topsoil - Clayey Sand</u> ~20% low to mod plastic fines ~80% fine to med grained sand	B-1	AD	Bob Cleveland drilling w/ 6" flight auger
4	SM	2.0-10.0 <u>Silty Sand</u> ~35% low plastic fines, ~65% fine grained sand	B-2		
6			B-3		
8			B-4		
10	SM	10.0-12.0 <u>SILTY SAND</u> as above except sand is slightly coarser and CaCO ₃ is evident in blobs	B-5		
12		~12.0 Mat's becomes slightly clayey - some cuttings are sticking together, low to mod plastic - gradational contact to:	B-6		
14	SC	14.0-20.0 <u>Clayey Sand</u> ~35% low to mod plastic fines, ~65% fine grained sand	B-7		
16			B-8		
18					Terminated hole at 20.0
20		BH - 20.0			SHEET <u>1</u> OF <u>1</u>

EARTH SCIENCES ASSOCIATES

DRILLING AND SAMPLING LOG

PROJECT H108 RMA Basin F Borrow DATE DRILLED 5-6-81 HOLE NO. H-8
 LOCATION In SE 1/4 of borrow area ~254' S 65 E of Power Pkwy #12 GROUND SURFACE ELEV. ~5265.5
 DRILLING CONTRACTOR Custom Auger LOGGED BY SR DEPTH TO GROUND WATER —
 TYPE OF RIG CME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL —
 SURFACE CONDITIONS Flat + grassy WEATHER Threatening Rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
2	SM-SC	0.0 - 2.5 <u>Topsoil - Silty to Clayey Sand, ~25% low plastic fines, ~75% fine to med grained sand</u>	B-1	A.D	Bob Cleveland drilling using 6" flight auger
4	SP-SM	2.5 - 20.0 <u>Sand to Silty Sand: gen. <10% non to v. low plastic fines, 90-100% fine to v. fine grained sand, v. uniform, dry to slightly moist, Mod. yel. brown;</u>	B-2		
6			B-3		
8			B-4		
10			B-5		
12			B-6		
14			B-7		
16					Terminated hole at 20.0
18			B-2		
20		BH-20.0			SHEET <u>1</u> OF <u>1</u>

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DRILLING AND SAMPLING LOG

PROJECT H108 PMA Basin F Borrow DATE DRILLED 5-6-81 HOLE NO. H-9
 LOCATION W SW 1/4 of borrow area ~ 340' N 75 E of Point #13 GROUND SURFACE ELEV. ~5265.5
 DRILLING CONTRACTOR Custom Auger LOGGED BY SB DEPTH TO GROUND WATER -
 TYPE OF RIG CME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL -
 SURFACE CONDITIONS Flat & Grassy WEATHER Threatening Rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
2	SM-SC	~6" Topsoil - Silty to Clayey Sand			AD Bob Cleveland drilling w/ 6" Flight Auger
	SP-SM	1.5-7.0 ~20% non-plastic fines Sand to Silty Sand, gen. <10% low plastic fines; 90-95% poorly graded, fine grained sand, Mod Yel brown, clay to slightly moist	B-1		
	4		B-2		
6		5.0' grades lighter in color - poss. CaCO ₃ present	B-3		
8	SM	7.0-12.0 Silty Sand ~25% non to low plastic fines ~75% fine grained sand, light we color, lots of CaCO ₃ present	B-4		
10			B-5		
12	SC-SM	12.0-15.0 Silty to Clayey Sand - 25% low to med plastic fines, as above otherwise			
14		13.0 Occasional gravel present <1" dia. (fine gravel)	B-6		
15		BH 15.0			Terminated hole at 15.0

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DRILLING AND SAMPLING LOG

PROJECT H108 RMA Basin F Borrow DATE DRILLED Mar 6, 1981 HOLE NO. H-10
 LOCATION Near Center of W side of Borrow Area ~ 487.5 S 75 W of corner of Plot B-7 GROUND SURFACE ELEV. 452.45
 DRILLING CONTRACTOR Custom Auger LOGGED BY SB DEPTH TO GROUND WATER -
 TYPE OF RIG CME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL -
 SURFACE CONDITIONS Flat + grassy WEATHER Threatening Rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
2	SC-SM	0.0-2.5 Topsoil - Silty Sand to Clayey Sand ~ 20% low plastic fines ~ 80% fine to med grained sand	B-1	AD	Bob Cleveland drilling using 6" flight auger
4	SP-SM	2.5-7.0 Sand to Silty Sand 5-15% non to low plastic fines, 85-95% fine grained sand.	B-2		
6			B-3		
8	SM-SC	7.0-15.0 Silty to Clayey Sand, ~26% low to med plastic fines, ~80% fine grained sand, CaCO ₃ evident lighter than matl above	B-4		
10			B-5		
12			B-6		
14					
16		15.0 BH			Terminated hole at 15.0

EARTH SCIENCES ASSOCIATES

DRILLING AND SAMPLING LOG

PROJECT H108 RMA Basin F Borrow DATE DRILLED 5-6-81 HOLE NO. H-11
 LOCATION In NW 1/4 of borrow area ~143' E of road (N79W of Power Pole 6) GROUND SURFACE ELEV. ~5233
 DRILLING CONTRACTOR Custom Auger LOGGED BY SB DEPTH TO GROUND WATER —
 TYPE OF RIG CME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL —
 SURFACE CONDITIONS Flat + Grassy WEATHER Threatening Rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
0-2	SM	0.0-7.0 Silty Sand, ~30-40% low plastic fines. 60-70% fine grained sand	B-1	AD	Bob Cleveland drilling w/ 6" flight auger
2-4			B-2		
4-6			B-3		
6-8					
8-10	SM-SC	7.0-10.0 Silty to Clayey Sand, as above but low to med plastic fines	B-4		
10-12	SC	10.0-15.0 Clayey Sand - ~30% med plastic fines ~70% fine to med grained sand	B-5		
12-14			B-6		
14-15		BH-15'			Terminated hole at 15.0

EARTH SCIENCES ASSOCIATES

DRILLING AND SAMPLING LOG

PROJECT H108 RMA Basin F Borrow DATE DRILLED 5-6-81 HOLE NO. H-12
 LOCATION W NW 1/4 of borrow area ~168' 559 W of Powerline #2 GROUND SURFACE ELEV. ~5234
 DRILLING CONTRACTOR Custom Auger LOGGED BY SB DEPTH TO GROUND WATER _____
 TYPE OF RIG CME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL _____
 SURFACE CONDITIONS Flat + Grassy WEATHER Threatening rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
	SC	0.0-0.5 <u>Topsoil - Clayey Sand ~30% low</u>		AD	Bob Cleveland drilling w/ 6" flight auger
2	SC-CL	0.5-12.0 <u>Clayey Sand to Sandy Clay</u> <u>~40-60% low to mod plastic fines 40-60% fine grained sand</u>	B-1		
4			B-2		
6			B-3		
8			B-4		
10			B-5		
12	SC-CL	12.0-15.0 <u>Clayey Sand to Sandy Clay, also more plastic - some mod. plastic</u>	B-6		
14					Terminated hole at 15.0
16		BH 15.0			

EARTH SCIENCES ASSOCIATES

DRILLING AND SAMPLING LOG

PROJECT H 108 RMA Basin F Borrow DATE DRILLED 5-6-81 HOLE NO. H-13
 LOCATION W NE 1/4 of Borrow area ~ 107.5 ST & E of Power line 2 GROUND SURFACE ELEV. 5237.5
 DRILLING CONTRACTOR Custom Drilling LOGGED BY SLB DEPTH TO GROUND WATER —
 TYPE OF RIG CME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL —
 SURFACE CONDITIONS Flat + grassy WEATHER Thundering rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
2	SC	0.0-2.0 <u>Topsoil - Clayey Sand, ~30% low to mod plastic fines, ~70% fine-med grained sand.</u>	B-1	AD	Bob Cleveland drills w/ 6" flight auger
4	SC-CL	2.0-10.0 <u>Clayey Sand to Sandy Clay</u>	B-2		
6		40-65% low to mod plastic fines, 40-60% fine grained sand	B-3		
8			B-4		
10	SC-CL	10.0-13.0 <u>Clayey Sand to Sandy Clay</u>	B-5		
12		as above but slightly more plastic ~ mod plastic			
14	SC	13.0-15.0 <u>Clayey Sand - ~30% mod plastic fines, ~70% fine to med sand ~ occas. fine gravel</u>	B-6		
16		BH 15.0			Terminated hole at 15.0

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DRILLING AND SAMPLING LOG

PROJECT H108 RMA Basin F Borrow DATE DRILLED 5-6-81 HOLE NO H-14
 LOCATION 1/4 NE 1/4 of borrow area ~ 108' S 79E of Power Pole #10 GROUND SURFACE ELEV. ~5259.5
 DRILLING CONTRACTOR Custom Auger LOGGED BY SB DEPTH TO GROUND WATER —
 TYPE OF RIG ME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL —
 SURFACE CONDITIONS Flat + grassy WEATHER Threatning Rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
	SM-SC	0.0-1.0 Topsoil - Silty Clayey Sand ~ 20% low plastic fines	B-1	AD	Bob Cleveland drilling w/ 6" flight auger
2	SM	1.0-12.0 Silty Sand ~ 30% low plastic fines, ~ 70% fine grained sand.	B-2		
4			B-3		
6			B-4		
8			B-5		
10			B-6		
12	SM	12.0-15.0 Silty Sand ~ 20% low plastic fines, ~ 80% fine grained sand.			
14					
15.0		15.0 B-H			15.0 Terminated hole
16					

EARTH SCIENCES ASSOCIATES

DRILLING AND SAMPLING LOG

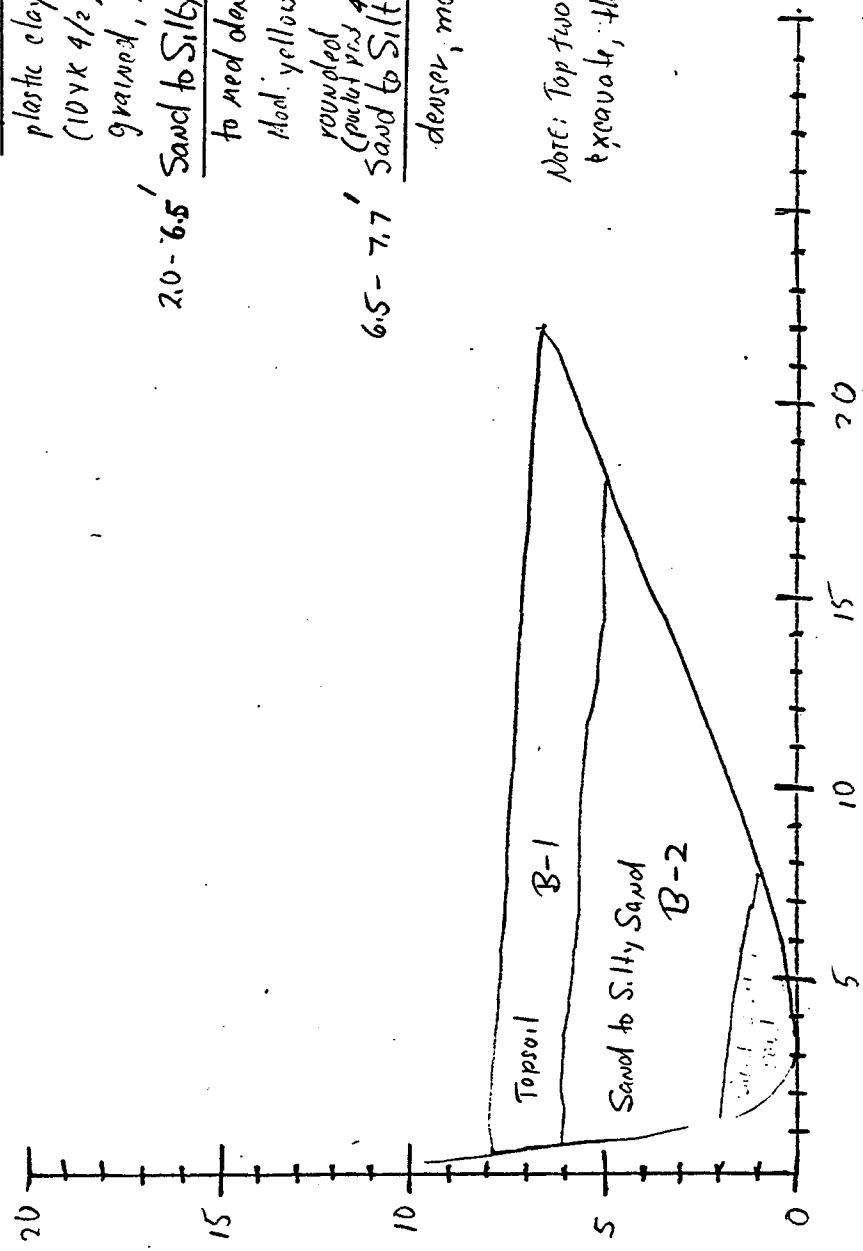
PROJECT H108 RMA Basin F Borrow DATE DRILLED 5-6-81 HOLE NO H-15
 LOCATION In NW 1/4 of borrow area ~ 431' due W of Power Pole #10 GROUND SURFACE ELEV. ~5253
 DRILLING CONTRACTOR Custom Auger LOGGED BY SB DEPTH TO GROUND WATER -
 TYPE OF RIG CME 45 HOLE DIAMETER 6" HAMMER WEIGHT AND FALL -
 SURFACE CONDITIONS Flat + grassy WEATHER Threatening Rain

DEPTH (feet)	CLASS.	FIELD DESCRIPTION	SAMPLE	MODE	REMARKS
2	SM-SC	0.0-3.0 <u>Topsoil Silty to Clayey Sand, ~20% low plastic fines, ~80% fine to med grained sand</u>	B-1	AD	Bob Cleveland drilling w/6" flight auger
4	SP-SM	3.0-5.0 <u>Sand to Silty Sand 5-15% non to low plastic fines, 85-95% fine grained sand</u>	B-2		
6	SM-SC	5.0-9.0 <u>Silty to Clayey sand ~20% low to med plastic fines ~80% fine grained sand</u>	B-3		
8			B-4		
10	SC	9.0-15.0 <u>Clayey Sand - 30-40% med plastic fines; 60-70% fine to med grained sand</u>	B-5		
14			B-6		
16		BH-15'			Terminated hole 15.0'

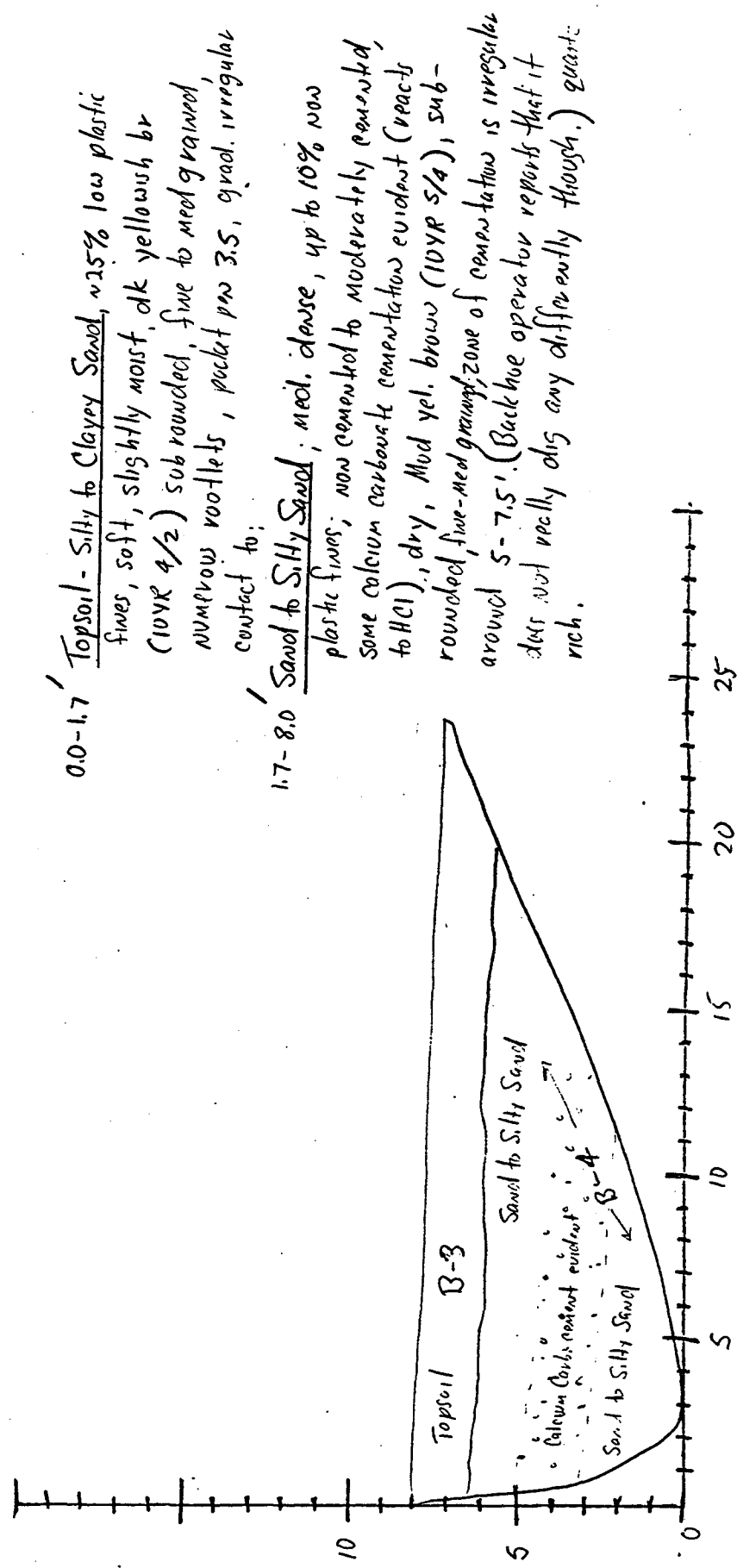
PROJECT #108 RMA Basin F Borrow TRENCH NO F-1 DATE 5-A-81/SB
 IN SW 1/4 of borrow area
 LOCATION below depression ~ 310 feet W of Power Pole # 11, 7.7 deep 21' long TRENCH N87E 2° slope
 TRENCHING CONTRACTOR RAILL VALLEY INC TYPE OF RIG ALLIS CHALMERS E16
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS Flat and grassy e1 ~ 5254.5

- 0.0-2.0' Topsoil - Clayey sand, 20-30% loam to med plastic clay, soft, moist, dk yellowish brown (10YR 4/2), sub rounded, fine to med grained, numerous root lts, pocket pos 1.75
- 2.0-6.5' Sand to Silty Sand - up to 10% silt, loose to med dense, weakly to non cemented, dry Mod. yellowish brown (10YR 5/4), sub-rounded, fine to med. grained, quartz rich, (pocket pos 4.5+)
- 6.5-7.7' Sand to Silty Sand - as above, slightly denser, more difficult to excavate

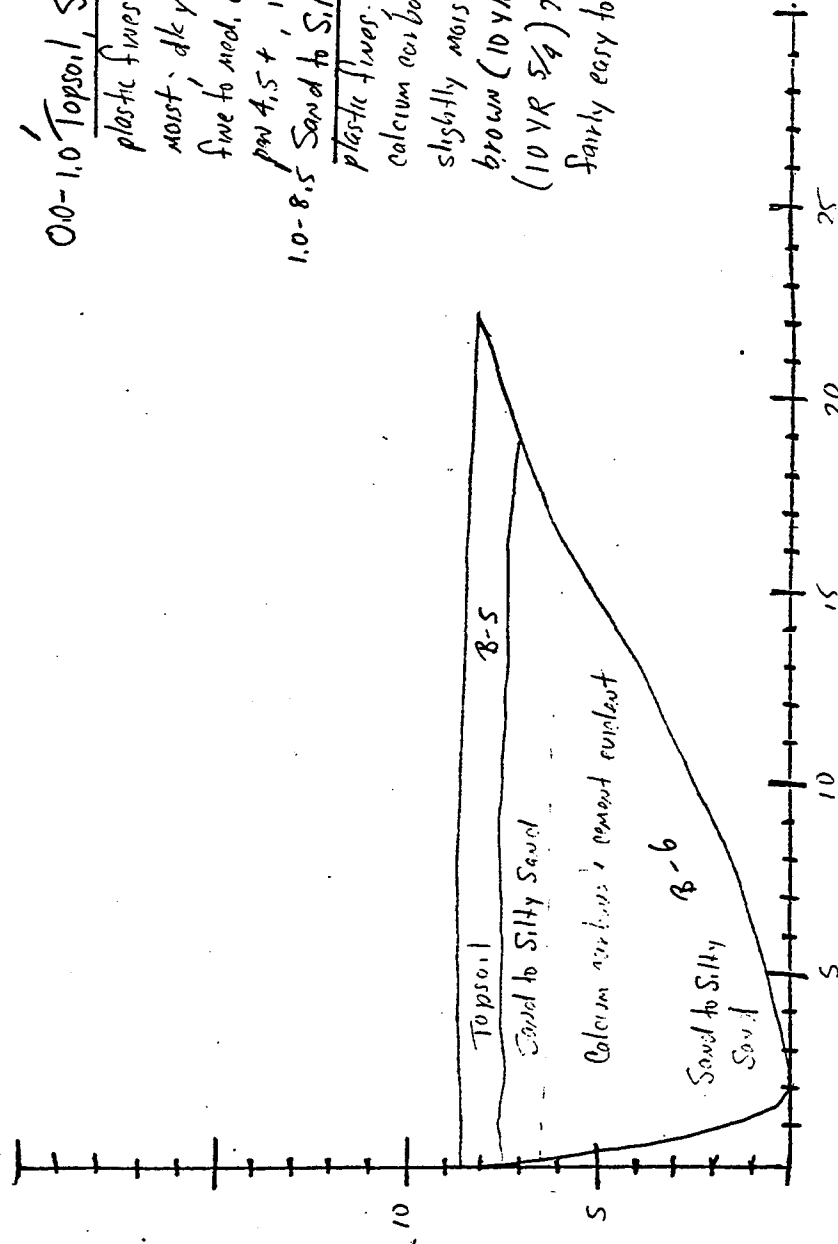
NOTE: Top two units are relatively easy to excavate, the bottom unit is more difficult



PROJECT H108 RMA Basin F Borrow TRENCH NOT-2 DATE 5-4-81 / SB
in SE 1/4 of porpoose area
 LOCATION to intercalated area S 76 W of Water tower A 75.5' S 38 E 1/4 11, 8' dia, 24' dia. TRENCH N10W 0° dip
 TRENCHING CONTRACTOR PLATE VALLEY INC TYPE OF RIG ALLIS CHALMERS 816
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS Flat and thisty elev 5259



PROJECT H108 RMA Basin F Borrow TRENCH NO T-3 DATE 5-4-81/SB
in SE 1/4 of borrow area
 LOCATION On high ground 581' W of E of Power Pole #15 21' long 8.5' deep TRENCH NO N3462
 TRENCHING CONTRACTOR Plate Valley Inc TYPE OF RIG Atlas Chalmers 816
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS Flat & Grassy c/n 5270



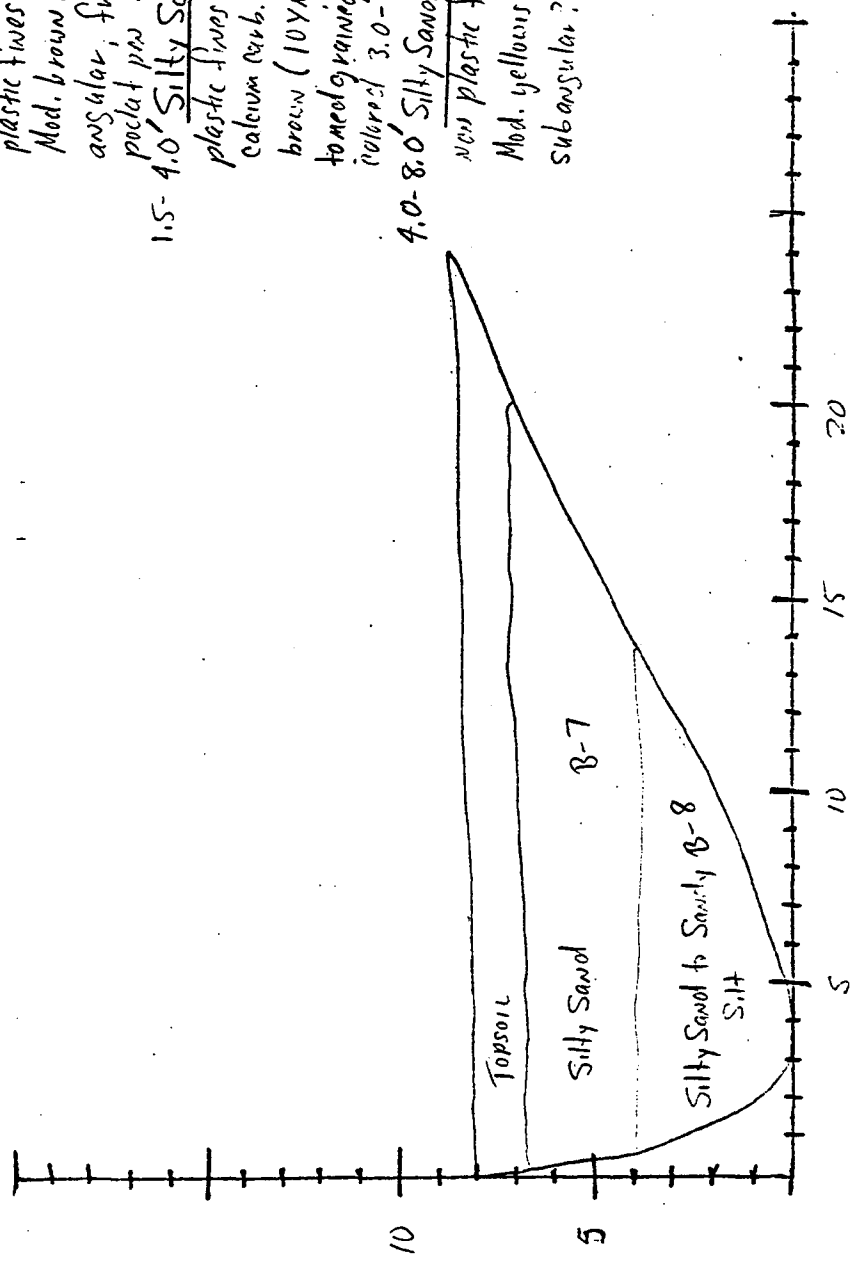
00-1.0 Topsoil, Silty to Clayey Sand, ~3% low plastic fines, soft to med-stiff, dry to slightly moist, dk yellowish brown (10 YR 4/2), subrounded, fine to med. gravel, numerous rootlets, prob. $pm\ 4.5+$, irregular contact to
1.0-8.5 Sand to Silty Sand; med dense, up to 15% non plastic fines; non to weakly cemented, some calcium carbonate cementation equivalent 2.0-5.0'; slightly moist 1.0-2.0, dry 2.0-8.5; Mod brown (10 YR 5/6) 1.0-2.0; Med yellowish brown (10 YR 5/4) 2.0-8.5; sub rounded, fine to med grained; fairly easy to excavate; quartz rich

PROJECT H108 RMA Basin F Corridor TRENCH NO T-4 DATE 5-7-81 / SR
near north of borrow areas
 LOCATION N 71° E 165.7' S 54° E from Point A 7, 23' long 8' deep TRENCH MS 62 2° dip
 TRENCHING CONTRACTOR Rail Valley Inc TYPE OF RIG ALLIS CHAMBERS 816
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS lightly sloping & grassy e/MS 246

0.0-1.5' Topsoil; Silty to Clayey Sand ~ 30% low plastic fines, soft to med stiff, slightly moist, Mod. brown (SYR 4/4) subrounded to sub angular, fine to med grained, numerous rootlets, pocket pns 4.5+

1.5- 4.0' Silty Sand; med. dense, ~30% non plastic fines, non to weakly cemented, some calcium carb. cementation evident, dry; Mod. yellowish brown (10YR 5/4), subrounded to subangular, fine to med grained, fairly easy to excavate, slightly light colored 3.0-4.0 - Pale yel. br (10YR 5 1/2)

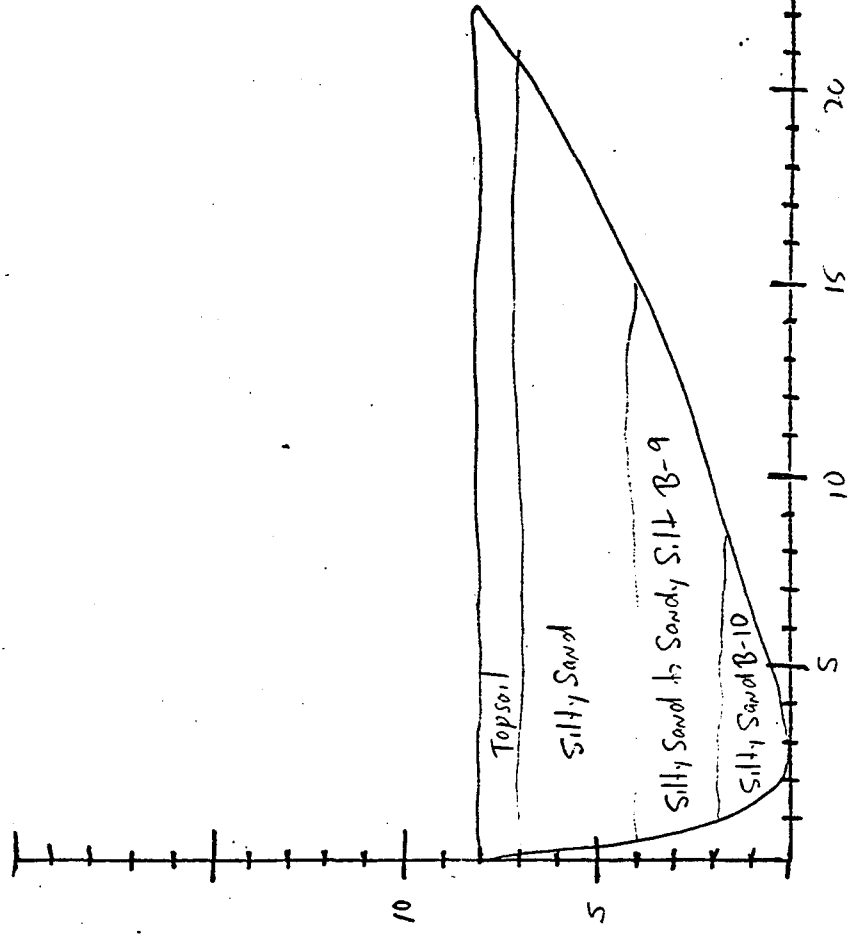
4.0- 8.0' Silty Sand to Sandy Silt; med dense, ~40-60% non plastic fines; non to weakly cemented; dry, Mod. yellowish brown (10YR 5/4), subrounded to subangular?; fine grained; fairly easy to excavate



PROJECT H108 RMA Basin F (Sovvol) TRENCH NOTES DATE 5-9-81 / SB
 LOCATION in NW 1/4 of bottom area
in NW 1/4 of top area 126.5' N 60W of Power Pole # 6; 8' deep 22' long TRENCH N17W 1° dip
 TRENCHING CONTRACTOR PLATE VALLEY INC TYPE OF RIG ALLIS CHALMERS 816
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS Gently sloping to flat, grass + flowers. el. #5237.5

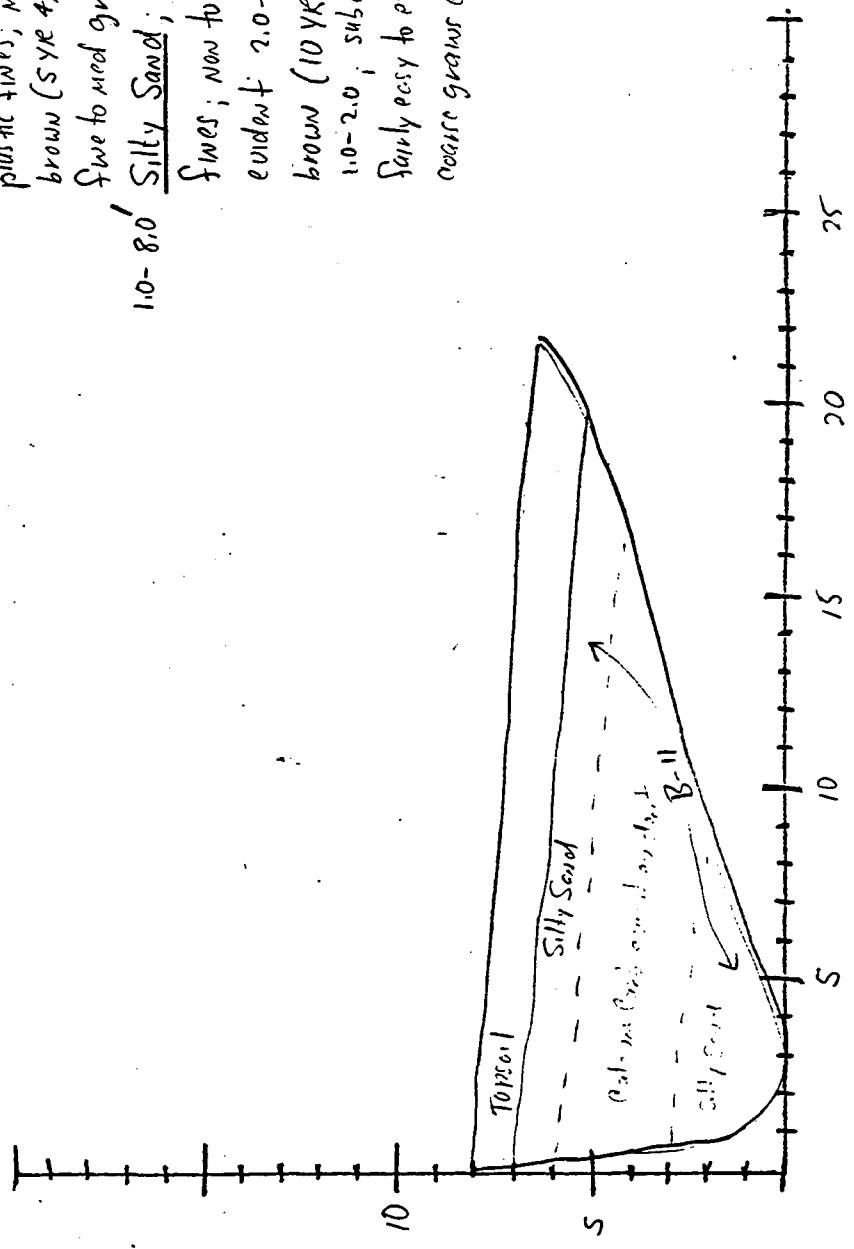
0.0-1.0' Topsoil, Clayey Sand; ~30% low to med plastic fines; med. stiff; slightly moist; Med. brown (SYR 4/4); subrounded to subangular; fine to med grained; num. roots, pebbles pass 4.5+
 1.0-4.0' Silty Sand; med dense; ~35% non plastic fines; non to med cemented; some calcium carb. cement evident; dry; Mod. yel. brown (10YR 5/4); subrounded to subangular; fine grained; fairly easy to excavate, gradational contact to:

4.0-6.0' Silty Sand to Sandy Silt; med dense, ~50% non plastic fines, non to weakly cemented, dry; Mod yel. brown (10YR 5/4); fine grained; fairly easy to excavate; calcium carb cementation evident as white roots and flecks
 6.0-8.0' Silty Sand; med. dense; ~30% non to low plastic fines; non to weakly cemented w/ calcium carb.; dry; Med. brown (SYR 4/4); sub rounded to
 8.0-25' sub angular; fine to med grained w/ occasional coarse grain; qtz, chert, + granitic lithics evident; calcium carb cement is in blobs and clumps. Fairly easy to excavate



PROJECT H108 RMA Basin F Borrow TRENCH NOTE 6 DATE 5-4-81 / SB
 LOCATION 1/4 NW 1/4 of borrow area 422.6' S 86W of #9 Power Pole, 21' long 8' deep TRENCH NASE 4° dip
 TRENCHING CONTRACTOR PLATE VALLEY INC TYPE OF RIG ALLIS CHALMERS 816
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS Gently Sloping, grassy, e/s 5252.5

0.0-1.0' Topsoil, Silty Sand to Clayey Sand, ~30% low plastic fines, med stiff; slightly moist; Mod. brown (5 YR 4/4), sub rounded to sub angular, fine to med grain, numerous rootlets
 1.0-8.0' Silty Sand; med. dense, ~35% non plastic fines; non to med cemented, some calcium carb. evident 2.0-5.0; dry; gen. Mod yellowish brown (10 YR 5/4) except slightly redder 1.0-2.0; sub angular to sub rounded, fine grain, fairly easy to excavate. 5.0-8.0 occasional med to coarse grains evident



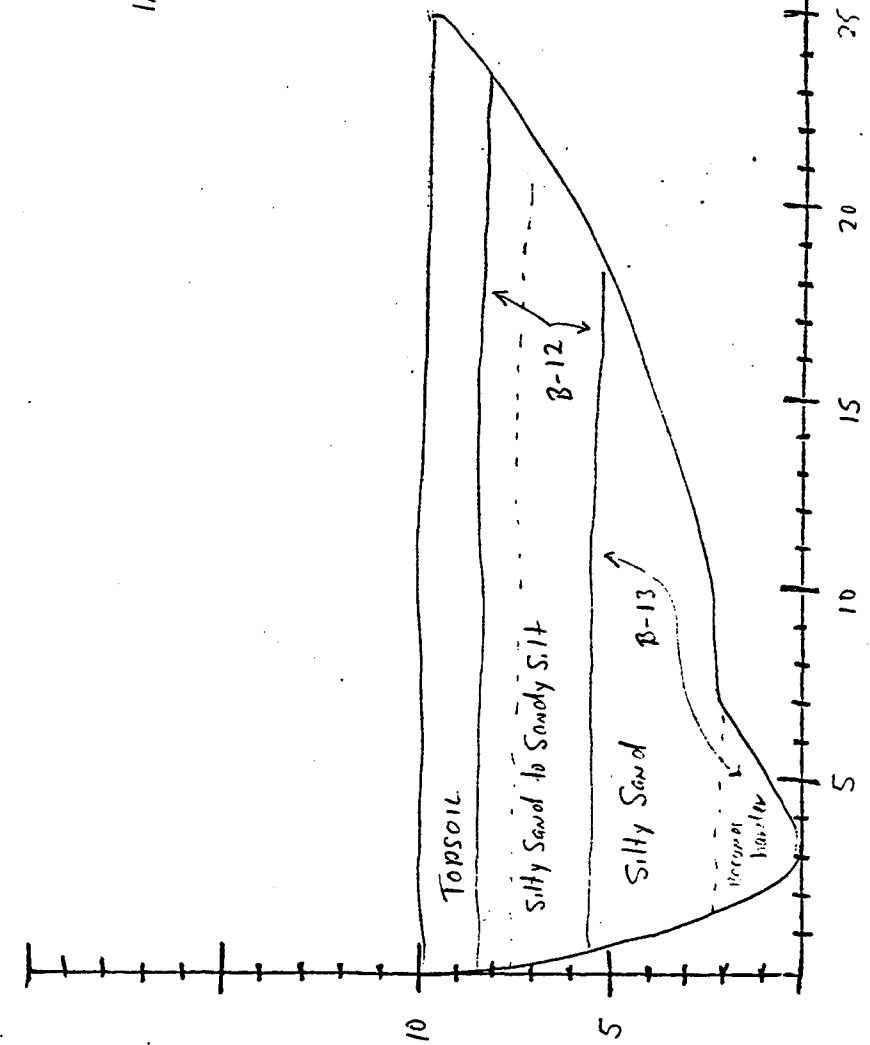
PROJECT H108 RMA Basin F Borrow TRENCH NOT-7 DATE 5-8-81 / SB
 ON NE of Borrow Area
 LOCATION 204' N 82W of Power Pole #2 10' deep 25' long TRENCH N10W 0° dip
 TRENCHING CONTRACTOR PLANT VALLEY INC TYPE OF RIG ALLIS CHALMERS 816
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS Flat & Grassy elev 5232

0.0-1.5' Topsoil; Clayey Sand, ~35% low to med plastic fines, med stiff, slightly moist, Dk. yellowish brown (10YR 4/2) subrounded to sub angular; fine grained; numerous roots

1.5-4.5' SILTY SAND to SANDY SILT; med dense; 40-60% non to v. low fines; non to weakly cemented; dry, Med yellowish brown (10YR 5/4) - slightly sandier and redder

1.5-2.5' fairly easy to excavate, calcium carb. evident as flecks and rocks; gm. fine grained

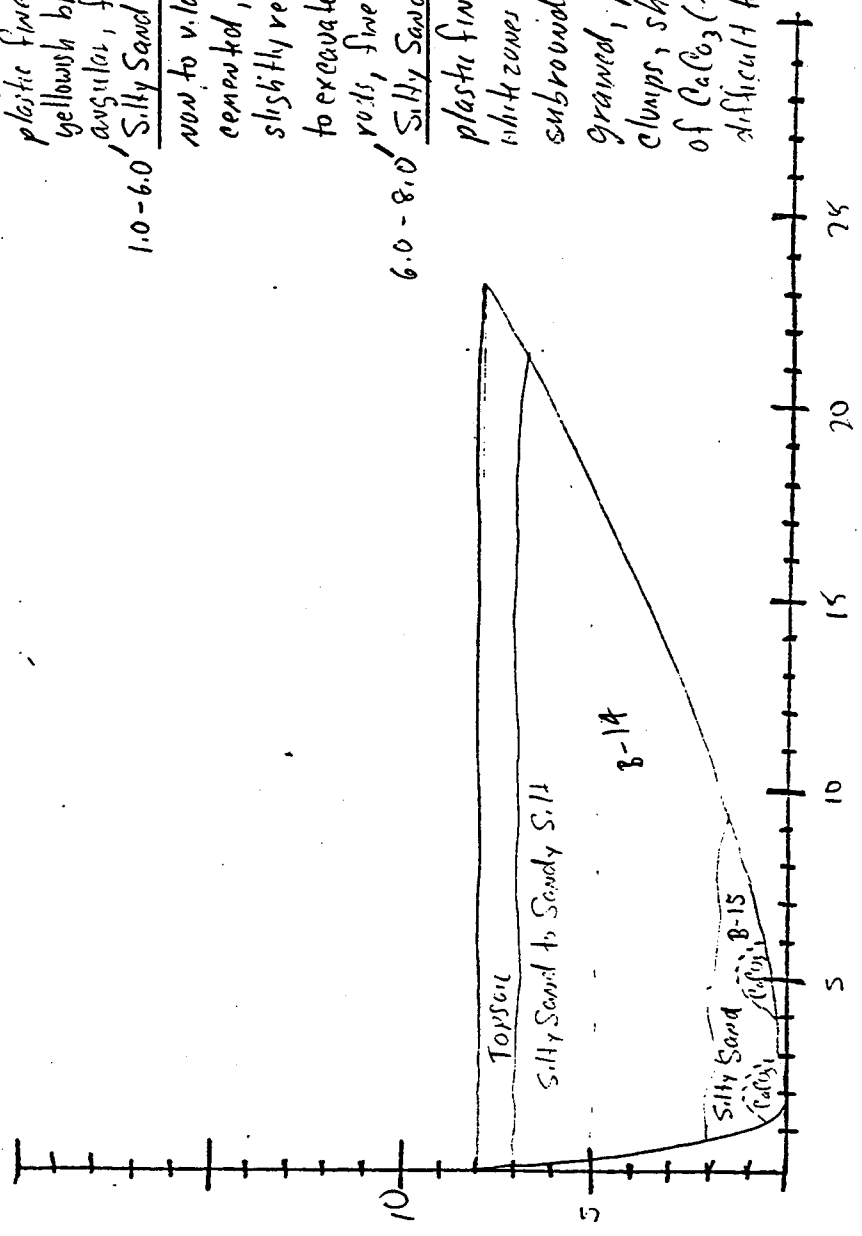
4.5-10.0' Silty Sand, med dense, ~30% non to low plastic fines, non to med cemented with whit zones of calcium carbonate, dry; med brown (5YR 4/4) with whit CaCO₃ mottling; sub rounded to sub angular, fine to med grained w occasional coarse grain, porous, Calcium carb. cement in w blobs and clumps. Becomes difficult to excavate ~ 7.5'



PROJECT H108 RMA Basin I Borrows TRENCH NOTE 8 DATE 5-5-81 / SR
 LOCATION NE 1/4 of borrow area of Power Pole #2 ~ N 32W of Dakota Town TRENCH 23' long 8' deep NR86E
 TRENCHING CONTRACTOR PLAINE VALLEY INC TYPE OF RIG ALLIS CHALMERS 816
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS Flat & Grassy elev 5240

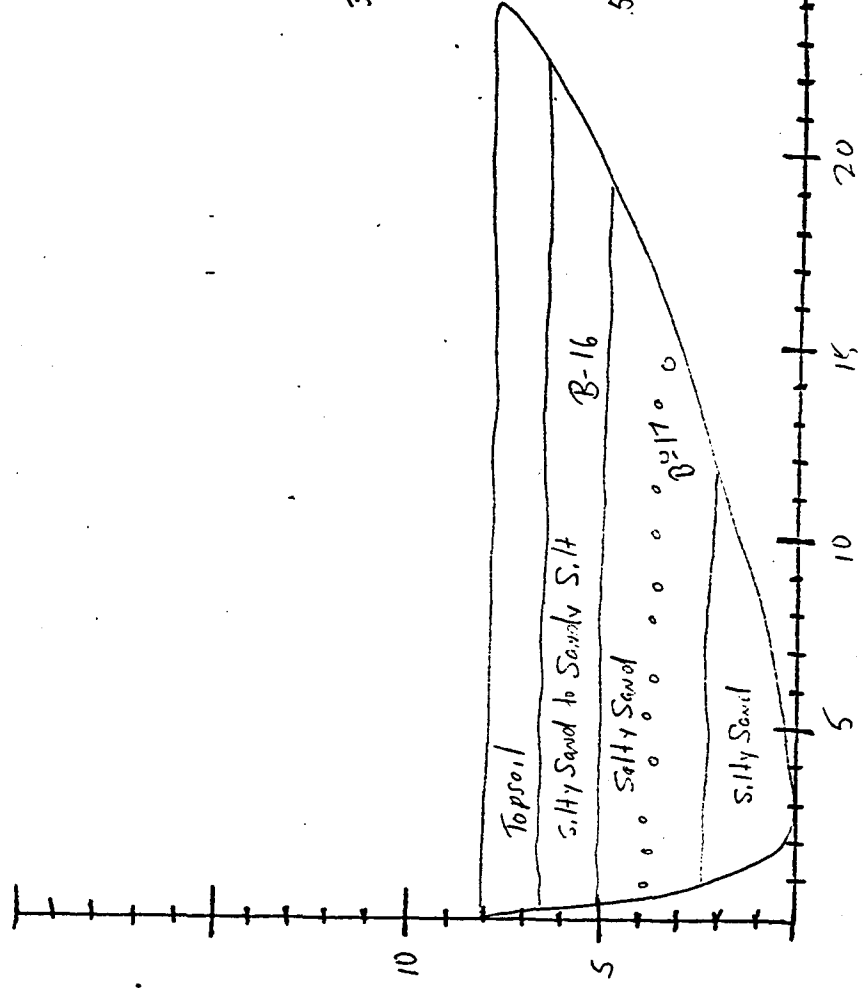
0.0-1.0' Topsoil Silty to Clayey Sand ~ 35% low to med plastic fines, med stiff, slightly moist. Dk yellowish brown (10YR 4/2) subrounded to sub-angular, fine grained, numerous roots.
 1.0-6.0' Silty Sand to Sandy Silt, med dense, 40-60% non to v. low plastic fines; non to moderately cemented, dry, Med yellowish brown (10YR 5/4) slightly redder 3.0-6.0; porous, fairly easy to excavate to 5', CaCO₃ evident in flakes and roots, fine grained. Mat'l becomes harder to excavate to 5'

6.0-8.0' Silty Sand, med dense, 30-35% non to low plastic fines, non to med cemented with white zones of CaCO₃, dry, Med br (5YR 4/4) subrounded to sub angular, fine to med. grained, porous, Calcium carb is in blobs and clumps, shows some zones of high concentration of CaCO₃ (~ 3' diameter) at 7.0' mat'l is more difficult to excavate.

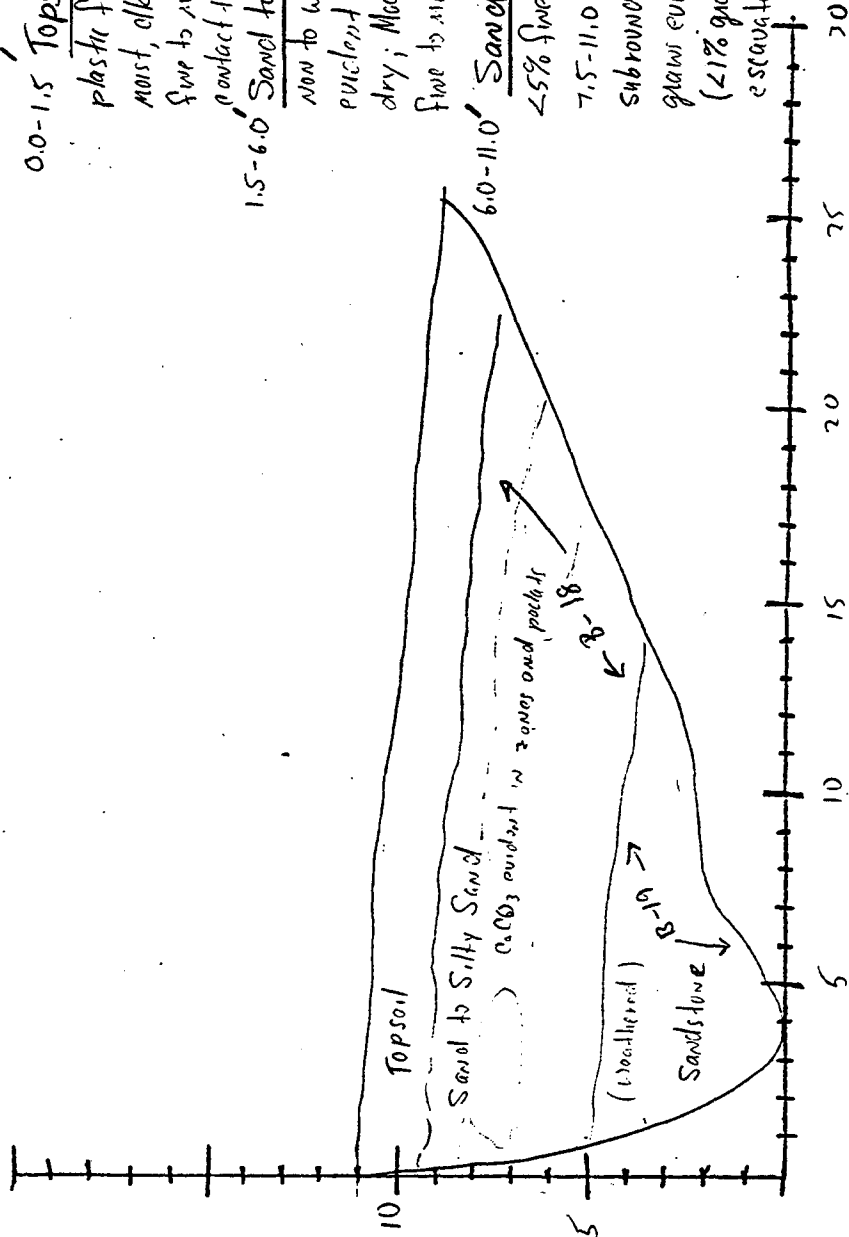


PROJECT H108 RMA Basin 1 (Balford) TRENCH NOT-9 DATE 5-5-81/SB
 LOCATION 1/4 mile NE of borrow area ~ 290' N85E of power pole #4, 23' long 8' deep TRENCH N-S O'Clock
 TRENCHING CONTRACTOR PLATE VALLEY INC TYPE OF RIG ALLIS CHALMERS 816
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS flat & grassy elev 5243

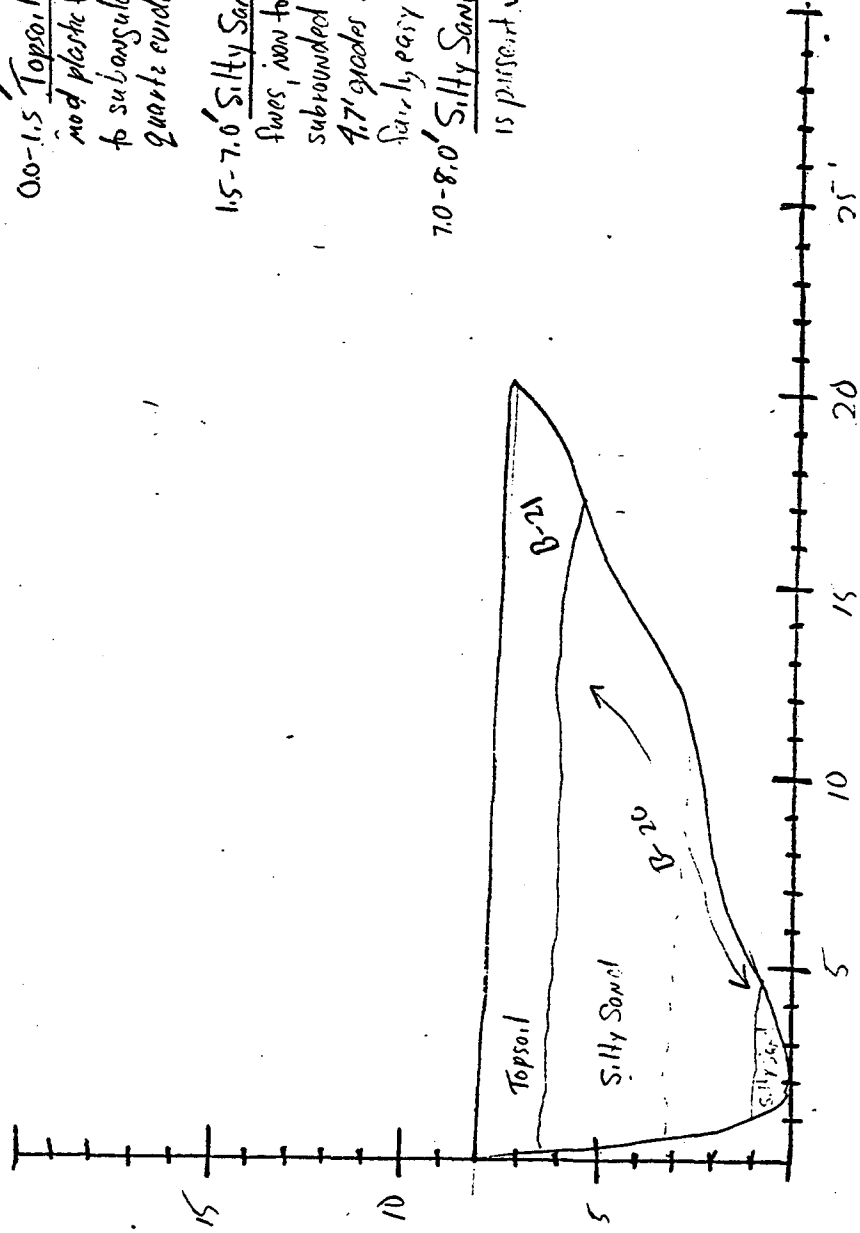
- 0.0-1.5' Topsoil Silty to Clayey Sand ~ 25-30% low plastic fines, slightly moist, DK yellowish brown (10YR 4/2) subround to subangular, fine grained, numerous roots.
- 1.5-3.0' Silty Sand to Sandy Silt, med dense, 40-60% non plastic fines, non to weakly cemented, dry, Mod. yellow br (10YR 5/4), porous, subrounded, fine grained, fairly easy to excavate, CaCO₃ evident in flecks and roots
- 3.0-5.5' Silty Sand, med dense, 30-35% non to v. low plastic fines, non to weakly cemented, dry, Mod. yellow br (10YR 5/4), subround to sub angular, fine to med. grained w/ grains up to 1/8" present at ~ 4.0', porous, Calcium Carb present in flecks and roots, fairly easy to excavate, (rose quartz pebble found at 4.0')
- 5.7-8.0' Silty Sand, as above except Calcium Carb is in clumps and blobs, and is much more widely spread



PROJECT H108 RMA Borrow TRENCH NO T-10 DATE 5-5-81/SB
 LOCATION South 1/4 of Section 13, 25' long 11' deep TRSND N30E 4° dip
 TRENCHING CONTRACTOR PLATTE VALLEY INC TYPE OF RIG ALLIS CHALMERS 816
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS Gently Sloping & grassy e/w 5258



PROJECT H108 RMA BASIN F BORROW TRENCH NO TF 11 DATE 5-5-81
 LOCATION IN SW 1/4 of borrow area S86W of Pown pole 3, 8' deep 20' long TRENCH N86 E 1° dip
 TRENCHING CONTRACTOR PLATTE VALLEY INC TYPE OF RIG ALLIS CHALMERS 816
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS Flat and grassy el N 232.5



00-1.5' Topsoil - Clayey Sand, med dense; ~35% low to mod plastic fines, moist, Med. brown (10 YR 4/4), subrounded to subangular, fine grained, numerous roots, mica and quartz evident; irregular contact to:

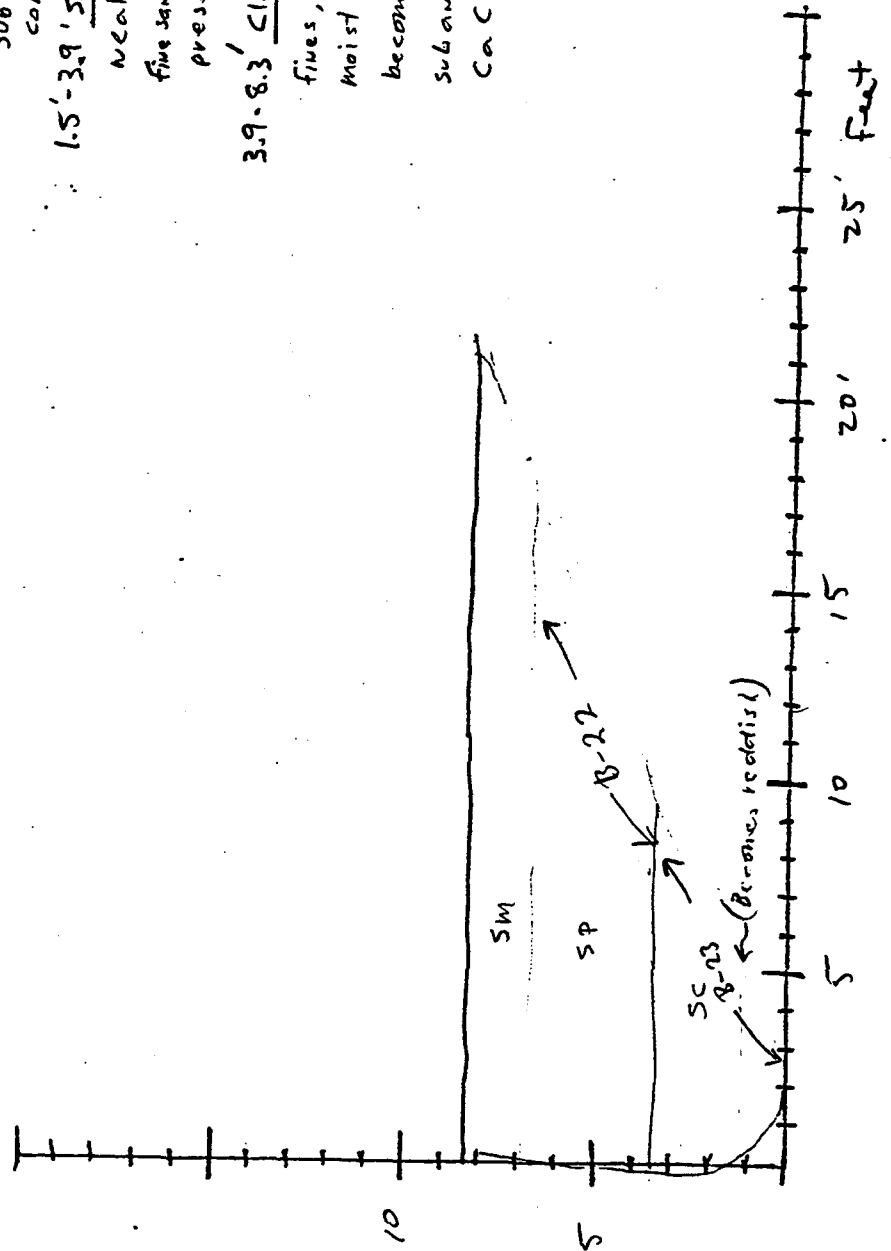
1.5-7.0' Silty Sand; med dense; ~25% non to low plastic fines, non to weakly cemented, dry, Med. yel. br (10 YR 5/4) subrounded to subangular; gen fine grained, at 4.7' grades redder and slightly coarser; porous. Fairly easy to excavate, mat' roots to HCl (CaCO₃ cement?)

7.0-8.0' Silty Sand, as above except Calcium carbonate is present visibly in blebs, roots, etc.

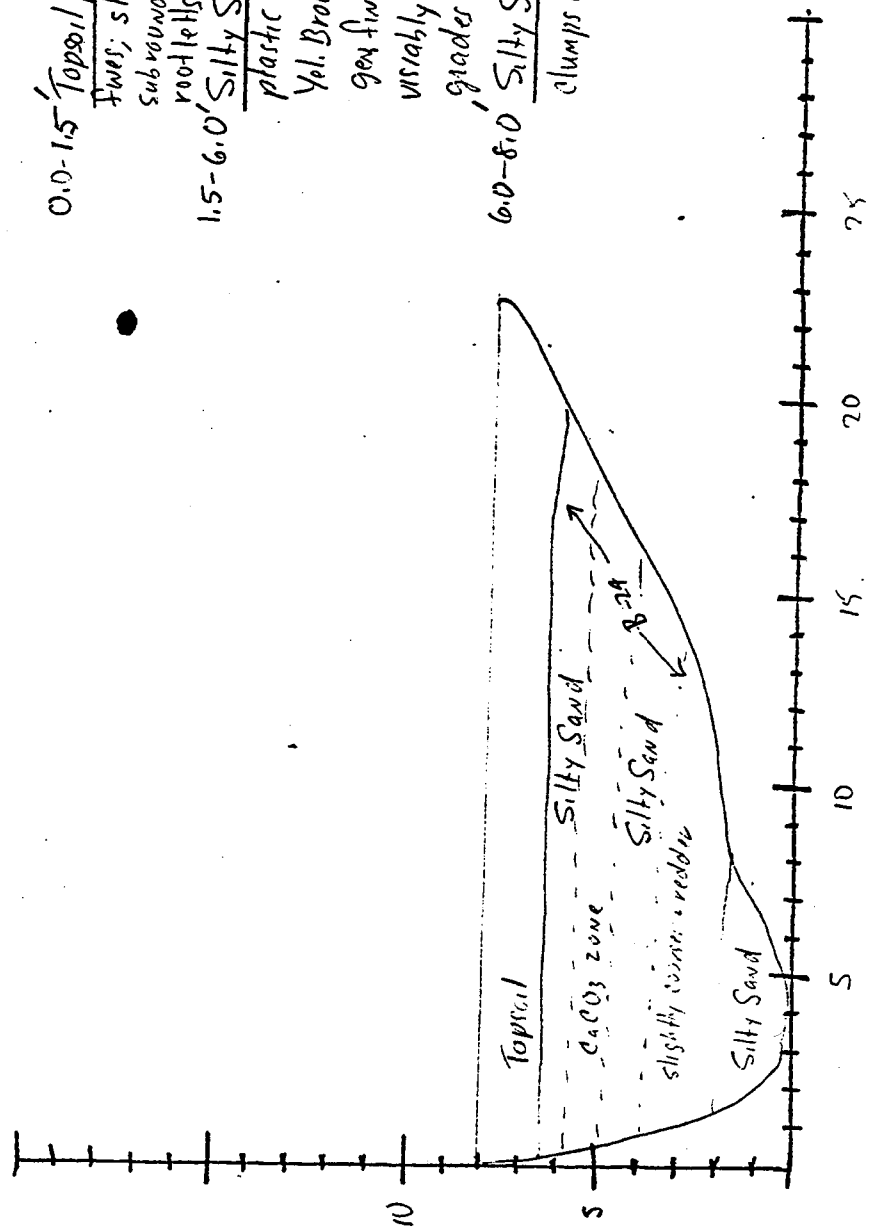
PROJECT H 108 TRENCH NO T-12 DATE MAY 5 1981 / MWZ
 IN NW 1/4 of borrow area
 LOCATION 307' S 1/2 W of T-11 on S 10W of Sec 4 21' long 8' 4" deep TRENCH N 5° W LEVEL
 TRENCHING CONTRACTOR PLATTE VALLEY INC. TYPE OF RIG OLLIS CHALMERS 816
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS flat, level, grass buffalo (?) grass.

0.0'-1.5' TOPSOIL - SILTY SAND: med. dense, ~40% low-non plastic fines, weakly to non cemented, dry, dark yell. brown (10 YR 4/2), sub-angular, organic material (roots), irregular contact to:
 1.5'-3.9' SAND-SILTY SAND, loose to med dense, 10% non-plastic fines, weakly to non cemented, dry, Mod. yell brown (10 YR 5/4), fine sand ~90%, sub rounded - sub angular, CaCO₃ present in blebs.

3.9'-8.3' CLAYEY SAND, med. dense, ~40% med plastic fines, v. weakly to non cemented, grades slightly moist at 3.9', dark yell brown (10 YR 4/2), becomes more reddish at 5.9', sub-rounded to subangular fine sand ~50-60%, blebs of CaCO₃.



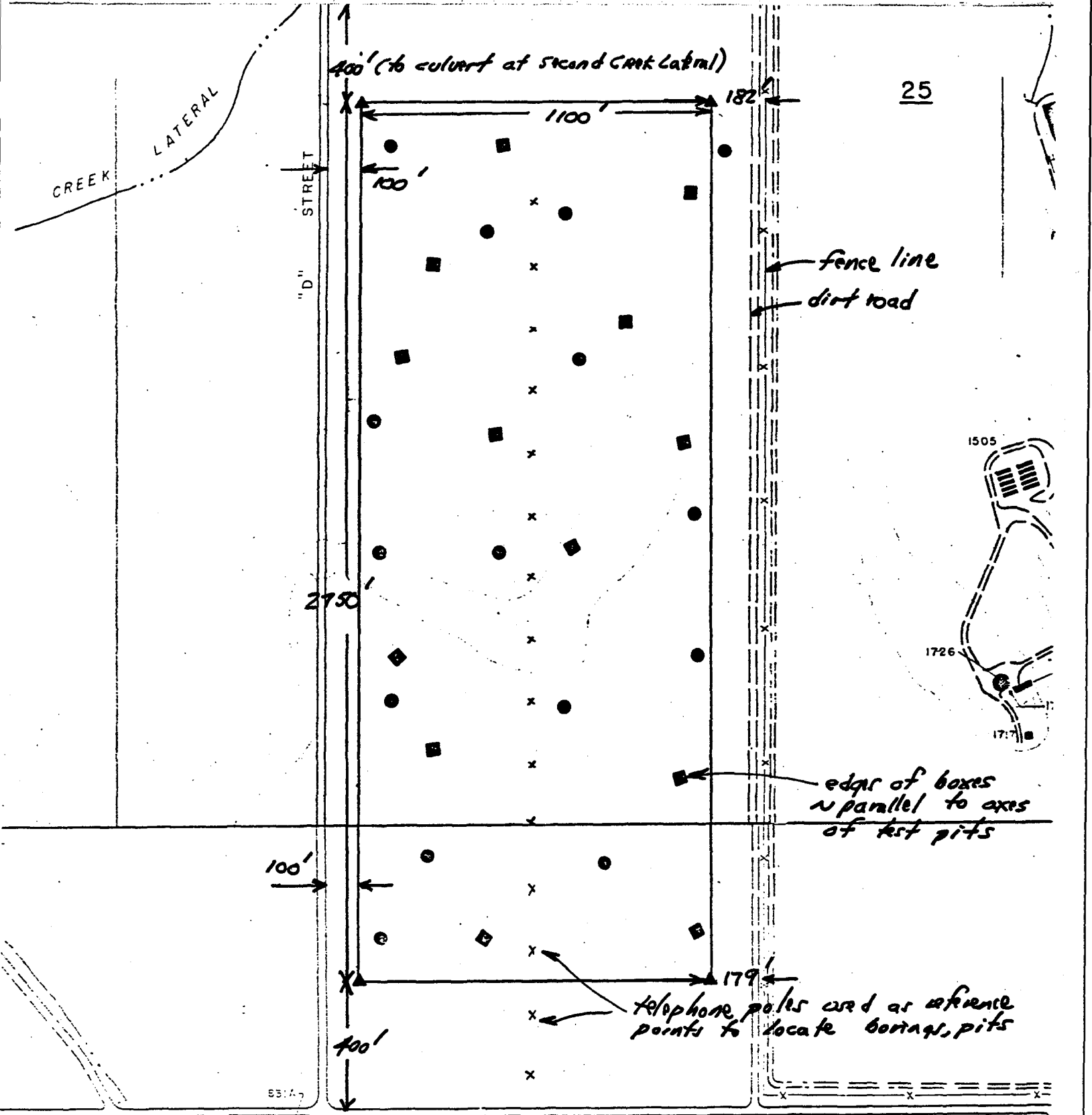
PROJECT WIDE PILE FOUNDATION TRENCH NO T-13 DATE 5-5-81/STR
 LOCATION Near central Eastern part of borrow area ~ 496.8 N 86 E of Pumps # 6 TRENCH WIDE 20
 TRENCHING CONTRACTOR PLATE VALLEY INC TYPE OF RIG ALLIS CHALMERS 816
 BUCKET WIDTH 24" NO OF TEETH 5 SURFACE CONDITIONS Flat + Grassy c/w S250



0.0-1.5' Topsoil, Silty to Clayey Sand, ~30% low plastic fines; slightly moist, Dk yel brown (10YR 4/2) subrounded to subangular, fine grained, num. rootlets

1.5-6.0' Silty Sand, med dense, ~25-35% non to v. low plastic fines, non to weakly cemented, dry, Mod. Yel. Brown (10YR 5/4), subrounded to subangular, very fine grained, porous, calcium carb. variably present 2.0-3.0'. At 4.0' mat'l grades slightly coarser and redder

6.0-8.0' Silty Sand, as above except CaCO3 is in clumps and Hobs and is much more widespread



25

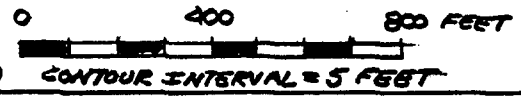
Note: corner stakes were located approximately as shown by the dimensions on this drawing using tape and compass techniques

H108 - 5/13/91
DMY-ESA

H-2 T-7 H-3
 T-8
 H-12 H-13
 T-11
 T-9
 T-12 H-4
 H-11 T-5 T-13
 H-5
 H-10 H-7 T-4
 H-6
 T-6 H-15 H-14
 T-1
 T-2
 H-9 H-8
 H-1 T-10 T-3



Eighth Avenue



Note: Base map from RMA General Site Map, Areas 4 and 5 (Dwp. No. 18-02-01, sheets 24, 33)

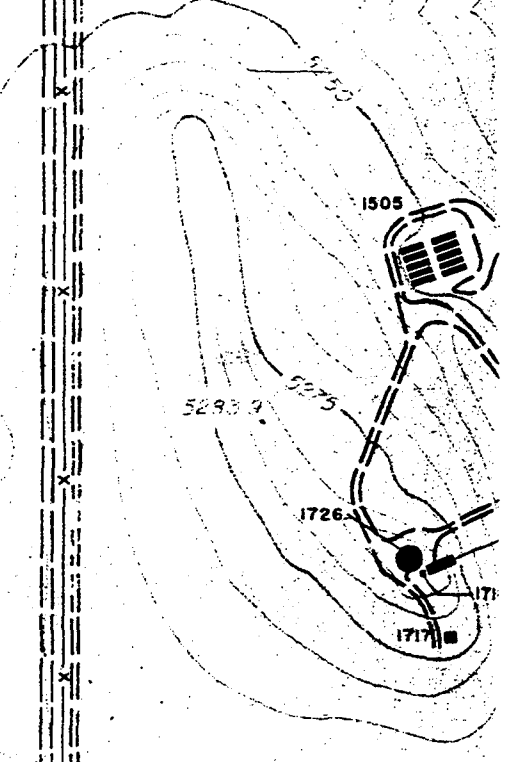
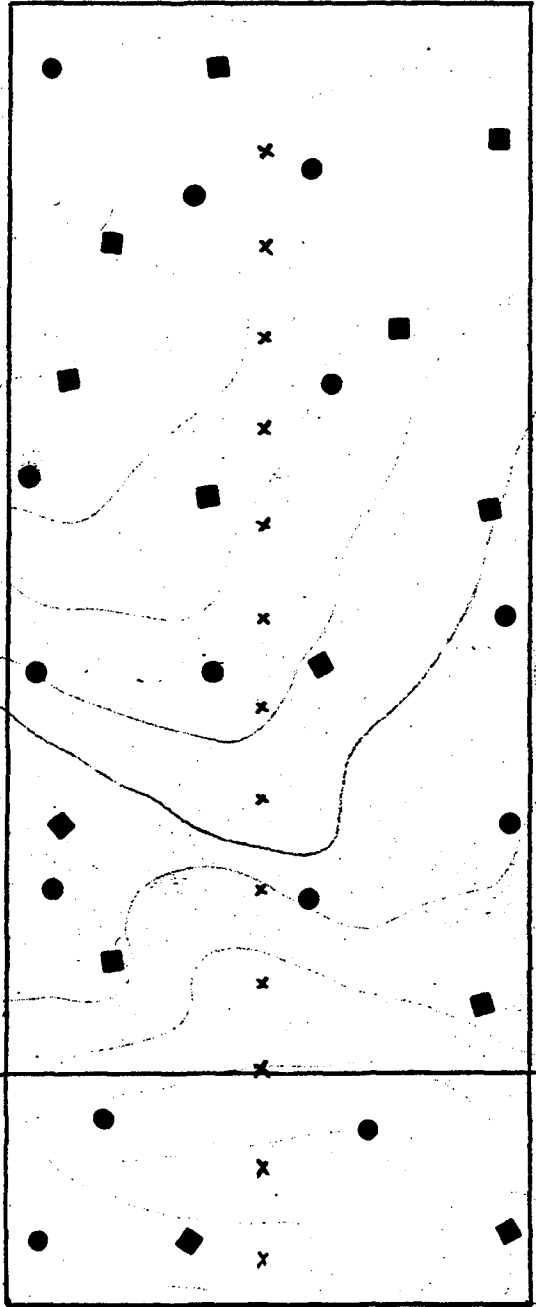
<p>EXPLANATION</p> <p>H-4 ● Auger boring; ESA, 5/81</p> <p>T-7 ■ Test pit; ESA, 5/81</p>	<p>Earth Sciences Associates</p> <p><small>Palo Alto, California</small></p>	
	<p>RMA-Basin F Enhanced Evap. Proj.</p> <p>Borrow Area Exploration Map</p>	
	<p>Checked by _____ Date _____</p> <p>Approved by _____ Date _____</p>	<p>Project No. _____</p> <p>Figure No. _____</p>

H108

CREEK LATERAL

"D" STREET

25



831A

831

836

305

834

APPENDIX B

**PERMIT/REGULATION
REVIEW**

SYNOPSIS OF PERMIT/REGULATION REVIEW
LIQUID WASTE DISPOSAL FACILITY
ROCKY MOUNTAIN ARSENAL - BASIN F

WATER QUALITY CONTROL

Robert Shukle of the Colorado Department of Health - Water Quality Control Division was contacted. He did not think their regulations would affect the project. Regulation material was received from the Colorado Department of Health and has been reviewed. No Water Quality control permits will be required for the project.

BUILDING - CONSTRUCTION REGULATIONS

Representatives for Adams County and Commerce City were contacted concerning Building and Construction permits. No regulations apply since they do not have jurisdiction over RMA property. It may be necessary to obtain a permit from the state of Colorado to construct the project. This will be verified later when specifications and working drawings are more complete

AIR POLLUTION CONTROL

John Dale of the U.S.-EPA and John Plog of the Colorado Department of Health-Air Pollution Control Division. Mr. Dale advised that their agency's regulations applied only to permanent pollution emitting sources. Mr. Plog thought that their "fugitive dust" regulations may affect the project. Colorado Air Quality Control Division regulation materials have been reviewed. A permit will be required based on the following criteria:

If the site is greater than five acres, including any new road to the site, a construction permit will be necessary. If less than five acres but more than 165 vehicles per day use the existing roads to the site, a permit is required. A vehicle using an existing road to the site is classified as one vehicle; the vehicle going to and from the site is counted as two vehicles in arriving at the 165 vehicles per day.

HAZARDOUS WASTE CONTROL

The State of Colorado does not have a RCRA approved Hazardous Waste Management (HWM) program. The Environmental Protection Agency (EPA), therefore, handles the hazardous waste regulations and guidelines for the State of Colorado.

A Hazardous Waste Activity Form (8700-12) has been obtained to notify EPA of our intended project scope and activity. An "Interim Status" permit will be required for authorization to dispose of or store hazardous wastes in RMA-Basin F. The permit application asks for information on the quantity and chemical composition of the waste along with pertinent technical data on the project.

According to EPA guidelines an existing facility shall have interim status and shall be treated as having been issued a permit to the extent the owner/operator has:

(1) Notified the Administration within 90 days from the promulgation or revision of Part 261 as required in Section 3010 of RCRA (this may be done by completing EPA Form 8700-12)

(2) Complied with EPA requirements governing the submission of Part A applications.

SOLIDS WASTES DISPOSAL

Ned Noack of the Colorado Department of Health-Radiation and Hazardous Waste Control Division and John Martyny of the Tri-County District Health Department were contacted. These two agencies work together in approving solid waste disposal sites. The present state regulations were collected. The application goes to the County first who checks it for a number of things, such as zoning. Then the State reviews for technical compliance. If the County approves but State disapproves, then disposal is rejected. If approved by both, a permit is issued. The time required from application to permit, assuming no objections, is about 90 days.

Under existing regulations, the Arsenal could establish a solid disposal site on Arsenal property. Basin F is the proposed solid waste disposal site for this project.

ENDANGERED SPECIES ACT

A copy of the Endangered Species Act of 1973, as amended through 1978, and a list of the endangered and threatened species in Colorado was obtained. These were secured from the U.S. Fish and Wildlife Service in Denver. The F&WL Service is presently writing the regulations pertaining to the Act.

From information received from Mr. Wayne Walthen of the F&WL Service, a critical point to consider is that the work being done on Basin F of RMA is classified as a federal major construction project requiring an environmental impact statement. A Draft Environmental Impact Statement was completed for Basin F Containment Operations in April 1979.

Since an EIS is required, the Corps will request a list of the species and proposed species that may be endangered or threatened by the project. The Corps is required to prepare a biological assessment of the project area of influence within 180 days. This biological assessment is forwarded to the Fish & Wildlife Service with a determination of effect. If there is no effect and the F&WL Service concurs, the project proceeds. If there is an effect, the Corps requests consultation with the F&WL Service and the Service has to prepare a biological opinion within 90 days. If the biological opinion says there is jeopardy to an endangered species, alternatives are presented, evaluated, and discussed with the Corps. If a conflict still exists, the Corps can request a variance. It is doubtful to Black & Veatch that the Arsenal project will require such extreme measures.

INTERIM STATUS REQUIREMENTS
FOR HAZARDOUS WASTE DISPOSAL FACILITIES

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL REGISTER NOVEMBER 19, 1980

122.1 DEFINITIONS

"Existing hazardous waste management (HWM) facility" or "existing facility" means a facility which was in operation or for which construction commenced on or before November 19, 1980.

"Disposal" means the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters.

"Disposal facility" means a facility or part of a facility at which hazardous waste is intentionally placed into or on any land or water, and at which waste will remain after closure.

"EPA hazardous waste number" means the number assigned by EPA to each hazardous waste listed in Part 261, Subpart D, of this Chapter and to each characteristic identified in Part 261, Subpart C, of this Chapter.

"Management" or "hazardous waste management" means the systematic control of the collection, source separation, storage, transportation, processing, treatment, recovery, and disposal of hazardous waste.

"Person" means an individual trust, firm, joint stock company, Federal Agency, corporation (including a government corporation), partnership, association, State, municipality, commission, political subdivision of a State, or any interstate body.

"Regional Administrator" means the Regional Administrator for the EPA Region in which the facility is located, or his designee.

"Solid Waste" means garbage, refuse, sludge, or sewage disposal plants, and other discarded solid materials, including solid waste materials resulting from industrial, commercial, and community activities but does not include agricultural wastes.

"Storage" means the holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere.

261.3 DEFINITION OF A HAZARDOUS WASTE

If a person has determined that his material is a "solid waste", the next question he should ask is, "Is the solid waste I handle a hazardous waste?"

A solid waste is a hazardous waste if it is listed or has constituents listed in the following section 261.30 of Subpart A.

Subpart B - Requirements for Hazardous Waste Programs Under the Resource Conservation and Recovery Act

Sec. 122.21 Purpose and Scope of Subpart B.

(a) Content of Subpart B. The regulations in this Subpart set forth the specific requirements for the RCRA permit program. The regulations in this Subpart supplement the requirements in Part 122, Subpart A, which contains requirements for all programs.

(b) Authority for this Subpart and other RCRA Subtitle C Regulations.

(1) Section 3001 of RCRA requires EPA (i) to establish criteria for identifying the characteristics of hazardous waste and for listing hazardous waste, and (ii) using those criteria to identify the characteristics of hazardous waste and list particular wastes considered to be hazardous.

(2) Section 3002 of RCRA requires EPA to establish standards applicable to generators of hazardous waste. Section 3002 also requires establishment of a manifest system to assure that hazardous waste which is transported off-site goes to a permitted treatment, storage, or disposal facility.

(3) Section 3003 of RCRA requires EPA to establish standards applicable to transporters of hazardous waste.

(4) Section 3004 of RCRA requires EPA to establish standards for the location, design, construction, monitoring, and operation of hazardous waste treatment, storage, and disposal facilities.

(5) Section 3005 of RCRA requires EPA to publish regulations requiring each person owning or operating a hazardous waste treatment, storage, or disposal facility to obtain a RCRA permit.

(6) Section 3008 of RCRA requires EPA to publish guidelines to assist States in developing hazardous waste management programs.

(7) Section 3010 of RCRA requires any person who generates or transports hazardous waste, or who owns or operates a facility for the treatment, storage, or disposal of hazardous waste, to notify EPA (or States having approved hazardous waste programs under section 3006 of RCRA) of such activity within 90 days of the promulgation or revision of regulations under section 3001 of the RCRA. Section 3010 provides that no hazardous waste subject to regulations

under Subtitle C or RCRA may be transported, treated, stored, or disposed of unless the required notification has been given.

Sec. 122.22 Application for a permit.

(a) Existing HWM facilities.

(1) Not later than six months after the first promulgation of regulations in 40 CFR Part 261 listing and identifying hazardous wastes, all owners and operators of existing hazardous waste treatment, storage, or disposal facilities must submit Part A of their permit application with the Regional Administrator.

(2) At any time after promulgation of Phase II the owner and operator of an existing HWM facility may be required to submit Part B of their permit application. The State Director may require submission of Part B (or equivalent completion of the State RCRA application process) if the State in which the facility is located has received interim authorization for Phase II or final authorization; if not, the Regional Administrator may require submission of Part B. Any owner or operator shall be allowed at least six months from the date of request to submit Part B of the application. Any owner or operator of an existing HWM facility may voluntarily submit Part B of the application at any time.

Sec. 122.23 Interim Status.

(a) Qualifying for interim status. Any person who owns or operates an "existing HWM facility" shall have interim status and shall be treated as having been issued a permit to the extent he or she has:

(1) Notified the Administrator within 90 days from the promulgation or revision of Part 261 as required in Section 3010 of RCRA (This may be done by completing EPA form 8700-12); and

(2) Complied with the requirements of Sec. 122.22 (a) and (c) governing submission of Part A applications;

(3) When EPA determines on examination or reexamination of a Part A application that it fails to meet the standards of these regulations, it may notify the owner or operator that the application is deficient and that the owner or operator is therefore not entitled to interim status. The owner or operator will then be subject to EPA enforcement for operating without a permit.

(b) Coverage. During the interim status period the facility shall not:

(1) Treat, store, or dispose of hazardous waste not specified in Part A of the permit application;

(2) Employ processes not specified in Part A of the permit application; or

(3) Exceed the design capacities specified in Part A of the permit application.

Sec. 122.24 Contents of Part A.

Part A of the RCRA application shall include the following information:

(a) The latitude and longitude of the facility.

(b) The name, address, and telephone number of the owner of the facility.

(c) An indication of whether the facility is new or existing and whether it is a first or revised application.

(d) For existing facilities, a scale drawing of the facility showing the location of all past, present, and future treatment, storage, and disposal areas.

(e) For existing facilities, photographs of the facility clearly delineating all existing structures; existing treatment, storage, and disposal areas; and sites of future treatment, storage, and disposal areas.

(f) A description of the processes to be used for treating, storing, and disposing of hazardous waste, and the design capacity of these items.

(g) A specification of the hazardous wastes listed or designated under 40 CFR Part 261 to be treated, stored, or disposed at the facility, an estimate of the quantity of such wastes to be treated, stored, or disposed annually, and a general description of the processes to be used for such wastes.

Sec. 122.25 Contents of Part B. (Applicable to State RCRA programs, see Sec. 123.7.)

Part B of the RCRA application includes the following:

(a) General information requirements. The following information is required for all facilities:

(1) A general description of the facility.

(2) Chemical and physical analyses of the hazardous wastes to be handled at the facility. At a minimum, these analyses shall contain all the information which must be known to treat, store, or dispose of the wastes in accordance with Part 264.

(3) A copy of the waste analysis plan required by Sec. 264.13(b) and, if applicable, Sec. 264.13(c).

(4) A description of the security procedures and equipment required by Sec. 264.14, or a justification demonstrating the reasons for requesting a waiver of this requirement.

(5) A copy of the general inspection schedule required by Sec. 264.15(b).

(6) A justification of any request for a waiver(s) of the preparedness and prevention requirements of Sec. 264.30.

(7) A copy of the contingency plan required by Part 264, Subpart D.

(8) A description of procedures, structures, or equipment used at the facility to:

(i) prevent uncontrolled reaction of incompatible wastes (for example, procedures to avoid fire, explosions, or toxic gases).

(ii) Prevent hazards in unloading operations (for example, ramps, special forklifts).

(iii) Prevent runoff from hazardous waste handling areas to other areas of the facility or environment, or to prevent flooding (for example, berms, dikes, trenches).

(iv) Prevent contamination of water supplies.

(v) Mitigate effects of equipment failure and power outages.

(vi) Prevent undue exposure of personnel to hazardous waste (for example, protective clothing).

(9) Traffic pattern, volume and control (for example, show turns across traffic lanes, and stacking lanes (if appropriate); provide access road surfacing and load bearing capacity; show traffic control signals; provide estimates of traffic volume (number, types of vehicles)).

IDENTIFICATION AND LISTING OF HAZARDOUS WASTE

Subpart B - Criteria for identifying the Characteristics of Hazardous
Waste and for Listing Hazardous Waste

Sec. 261.10 Criteria for identifying the characteristics of hazardous waste.

(a) The Administrator shall identify and define a characteristic of hazardous waste in Subpart C only upon determining that:

(1) A solid waste that exhibits the characteristic may:

(i) Cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or

(ii) Pose a substantial present or potential hazard to human health or the environment when it is improperly treated, stored, transported, disposed of or otherwise managed; and

(2) The characteristic can be:

(i) Measured by an available standardized test method which is reasonably within the capability of generators of solid waste or private sector laboratories that are available to serve generators of solid waste; or

(ii) Reasonably detected by generators of solid waste through their knowledge of their waste.

Sec. 261.11 Criteria for listing hazardous waste.

(a) The Administrator shall list a solid waste as a hazardous waste only upon determining that the solid waste meets one of the following criteria:

(1) It exhibits any of the characteristics of hazardous waste identified in Subpart C.

(2) It has been found to be fatal to humans in low doses or, in the absence of data on human toxicity, it has been shown in studies to have an oral LD 50 toxicity (rat) of less than 50 milligrams per kilogram, an inhalation LC 50 toxicity (rat) of less than 2 milligrams per liter, or a dermal LD 50 toxicity (rabbit) of less than 200 milligrams per kilogram or is otherwise capable of causing or significantly contributing to an increase in serious irreversible, or incapacitating reversible, illness. (Waste listed in accordance with these criteria will be designated Acute Hazardous Waste.)

(3) It contains any of the toxic constituents listed in Appendix VIII unless the Administrator concludes that the waste is not capable of posing a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of, or otherwise managed.

Subpart C - Characteristics of Hazardous Waste

Sec. 261.20 General.

(a) A solid waste, as defined in Sec. 261.2, which is not excluded from regulation as a hazardous waste under Sec. 261.4(b), is a hazardous waste if it exhibits any of the characteristics identified in this Subpart.

(Comment: Sec. 262.11 of this Chapter sets forth the generator's responsibility to determine whether his waste exhibits one or more of the characteristics identified in this Subpart)

(b) A hazardous waste which is identified by a characteristic in this subpart, but is not listed as a hazardous waste in Subpart D, is assigned by EPA Hazardous Waste Number set forth in the respective characteristic in this Subpart. This number must be used in complying with the notification requirements of Section 3010 of the Act and certain recordkeeping and reporting requirements under Parts 262 through 265 and Part 122 of this Chapter.

(c) For purposes of this Subpart, the Administrator will consider a sample obtained using any of the applicable sampling methods specified in Appendix I to be a representative sample within the meaning of Part 260 of this Chapter.

Subpart D - Lists of Hazardous Wastes

Sec. 261.33 General.

(a) A solid waste is a hazardous waste if it is listed in this Subpart, unless it has been excluded from this list under Sections 260.20 and 260.22.

(b) The Administrator will indicate his basis for listing the classes or types of wastes listed in this Subpart by employing one or more of the following Hazard Codes:

Ignitable Waste	(I)
Corrosive Waste	(C)
Reactive Waste	(R)
EP Toxic Waste	(E)
Acute Hazardous Waste	(H)
Toxic Waste	(T)

Appendix VII identifies the constituent which caused the Administrator to list the waste as an EP Toxic Waste (E) or Toxic Waste (T) in Sections 261.31 and 261.32.

(c) Each hazardous waste listed in this Subpart is assigned an EPA Hazardous Waste Number which precedes the name of the waste. This number must be used in complying with the notification requirements of Section 3010 of the Act and certain recordkeeping and reporting requirements under Parts 262 through 265

and Part 122 of this Chapter. A list of constituents in Rocky Mountain Arsenal, Basin-F are listed at the end of this section.

§ 261.31 Hazardous waste from nonspecific sources.

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
Generic:		
F001	The spent halogenated solvents used in degreasing, tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and the chlorinated fluorocarbons; and sludges from the recovery of these solvents in degreasing operations.	(T)
F002	The spent halogenated solvents, tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, o-dichlorobenzene, trichlorofluoromethane and the still bottoms from the recovery of these solvents.	(T)
F003	The spent non-halogenated solvents, xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, n-butyl alcohol, cyclohexanone, and the still bottoms from the recovery of these solvents.	(T)
F004	The spent non-halogenated solvents, cresols and creosote acid, nitrobenzene, and the still bottoms from the recovery of these solvents.	(T)
F005	The spent non-halogenated solvents, methanol, toluene, methyl ethyl ketone, methyl isobutyl ketone, carbon disulfide, isobutanol, pyridine and the still bottoms from the recovery of these solvents.	(U, T)
F006	Wastewater treatment sludges from electroplating operations.	(R)
F007	Spent plating bath solutions from electroplating operations.	(R, T)
F008	Plating bath sludges from the bottom of plating baths from electroplating operations.	(R, T)
F009	Spent stripping and cleaning bath solutions from electroplating operations.	(R, T)
F010	Quenching bath sludge from oil baths from metal heat treating operations.	(R, T)
F011	Spent solutions from salt bath pot cleaning from metal heat treating operations.	(R, T)
F012	Quenching wastewater treatment sludges from metal heat treating operations.	(R, T)
F013	Potassium tailings from selective flotation from mineral metals recovery operations.	(R, T)
F014	Cyanation wastewater treatment tailing pond sediment from mineral metals recovery operations.	(R, T)
F015	Spent cyanide bath solutions from mineral metals recovery operations.	(R, T)
F016	De-watered air pollution control scrubber sludges from coke ovens and blast furnaces.	(T)

§ 261.32 Hazardous waste from specific sources.

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
Wood Preservation: K001	Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol	(T)
Inorganic Pigments:		
K002	Wastewater treatment sludge from the production of chrome yellow and orange pigments	(R, T)
K003	Wastewater treatment sludge from the production of molybdate orange pigments	(R, T)
K004	Wastewater treatment sludge from the production of zinc yellow pigments	(R, T)
K005	Wastewater treatment sludge from the production of chrome green pigments	(R, T)
K006	Wastewater treatment sludge from the production of chrome oxide green pigments (anhydrous and hydrated)	(R, T)
K007	Wastewater treatment sludge from the production of iron blue pigments	(R, T)
K008	Over residue from the production of chrome oxide green pigments	(R, T)
Organic Chemicals:		
K009	Distillation bottoms from the production of acetaldehyde from ethylene	(R, T)
K010	Distillation side cuts from the production of acetaldehyde from ethylene	(R, T)
K011	Bottom stream from the wastewater stripper in the production of acrylonitrile	(R, T)
K012	SNL bottoms from the final purification of acrylonitrile in the production of acrylonitrile	(R, T)
K013	Bottom stream from the acetonitrile column in the production of acrylonitrile	(R, T)
K014	Bottoms from the acetonitrile purification column in the production of acrylonitrile	(R, T)
K015	Sill bottoms from the distillation of benzyl chloride	(R, T)
K016	Heavy ends or distillation residues from the production of carbon tetrachloride	(R, T)
K017	Heavy ends (SNL bottoms) from the purification column in the production of epichlorohydrin	(R, T)
K018	Heavy ends from fractionation in ethyl chloride production	(R, T)
K019	Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production	(R, T)
K020	Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production	(R, T)
K021	Aqueous spent antimony catalyst waste from fluoromethanes production	(R, T)
K022	Distillation bottom tars from the production of phenol/acetone from cumene	(R, T)
K023	Distillation light ends from the production of phthalic anhydride from naphthalene	(R, T)
K024	Distillation bottoms from the production of phthalic anhydride from naphthalene	(R, T)
K025	Distillation bottoms from the production of nitrobenzene by the nitration of benzene	(R, T)
K026	Stripping still tails from the production of methyl ethyl pyridine	(R, T)
K027	Centrifuge residue from toluene diisocyanate production	(R, T)
K028	Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane	(R, T)
K029	Waste from the product stream stripper in the production of 1,1,1-trichloroethane	(R, T)
K030	Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene	(R, T)
Pesticides:		
K031	By-products salts generated in the production of MSMA and cacodylic acid	(R, T)
K032	Wastewater treatment sludge from the production of chlordane	(R, T)
K033	Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane	(R, T)
K034	Finer solids from the filtration of hexachlorocyclopentadiene in the production of chlordane	(R, T)
K035	Wastewater treatment sludges generated in the production of creosote	(R, T)
K036	Still bottoms from toluene reclamation distillation in the production of disulfoton	(R, T)
K037	Wastewater treatment sludges from the production of disulfoton	(R, T)
K038	Wastewater from the washing and stripping of phorate production	(R, T)
K039	Filter cake from the filtration of diethylphosphorodithionic acid in the production of phorate	(R, T)
K040	Wastewater treatment sludge from the production of phorate	(R, T)
K041	Wastewater treatment sludge from the production of toxaphene	(R, T)
K042	Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T	(R, T)
K043	2,5-Dichlorophenol waste from the production of 2,4-D	(R, T)
Explosives:		
K044	Wastewater treatment sludges from the manufacturing and processing of explosives	(R, T)
K045	Spent carbon from the treatment of wastewater containing explosives	(R, T)
K046	Wastewater treatment sludges from the manufacturing, formulation and loading of lead-based initiating compounds	(R, T)
K047	Print/red water from TNT operations	(R, T)
Petroleum Refining:		
K048	Dissolved air flotation (DAF) float from the petroleum refining industry	(R, T)
K049	Slop oil emulsion solids from the petroleum refining industry	(R, T)
K050	Heat exchanger bundle cleaning sludge from the petroleum refining industry	(R, T)
K051	API separator sludge from the petroleum refining industry	(R, T)
K052	Tank bottoms (leaded) from the petroleum refining industry	(R, T)
Leather Tanning Finishing:		
K053	Chrome (blue) trimmings generated by the following subcategories of the leather tanning and finishing industry: hair pulp/chrome tan/retan/wet finish; hair sewer/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue; and shearing.	(T)

§ 261.32 Hazardous waste from specific sources. —Continued

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
K084	Chrome (blue) shavings generated by the following subcategories of the leather tanning and finishing industry: hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue; and shearing.	(T)
K085	Buffing dust generated by the following subcategories of the leather tanning and finishing industry: hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; and through-the-blue.	(T)
K086	Sewer screenings generated by the following subcategories of the leather tanning and finishing industry: hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue; and shearing.	(T)
K087	Wastewater treatment sludges generated by the following subcategories of the leather tanning and finishing industry: hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; retan/wet finish; no beamhouse; through-the-blue and shearing.	(T)
K088	Wastewater treatment sludges generated by the following subcategories of the leather tanning and finishing industry: hair pulp/chrome tan/retan/wet finish; hair save/chrome tan/retan/wet finish; and through-the-blue.	(R, T)
K089	Wastewater treatment sludges generated by the following subcategory of the leather tanning and finishing industry: hair save/non-chrome tan/retan/wet finish.	(R)
Iron and Steel:		
K090	Ammonia still lime sludge from coking operations	(R)
K091	Emission control dust/sludge from the electric furnace production of steel	(R)
K092	Spent pickle liquor from steel finishing operations	(R)
K093	Sludge from lime treatment of spent pickle liquor from steel finishing operations	(R)
Primary Copper: K084	Acid plant blowdown slurry/sludge resulting from the thickening of blowdown slurry from primary copper production	(R)
Primary Lead: K085	Surface impoundment solids contained in and dredged from surface impoundments at primary lead smelting facilities	(R)
Primary Zinc:		
K096	Sludge from treatment of process wastewater and/or acid plant blowdown from primary zinc production	(R)
K097	Electrolytic anode slimes/sludges from primary zinc production	(R)
K098	Calcium plant leach residue (iron oxide) from primary zinc production	(R)
Secondary Lead: K089	Emission control dust/sludge from secondary lead smelting	(R)

Hazardous waste No.	Substance ¹
	1080 see P058
	1081 see P057
	(Aceto)phenylmercury see P092
	Acetone cyanohydrin see P069
P001	3-(alpha-Acetoxybenzyl)-4-hydroxycoumarin and salts
P002	1-Acetyl-2-thiourea
P003	Acrolein
	Agarni see P007
	Agrosan GN 5 see P092
	Aldicarb see P069
	Aldifen see P048
P004	Aldrin
	Aligmycin see P092
P005	Allyl alcohol
P006	Aluminum phosphide (R)
	ALVIT see P037
	Aminoethylene see P054
P007	5-(Aminomethyl)-3-isoxazolol
P008	4-Aminopyridine
	Ammonium metavanadate see P119
P009	Ammonium picrate (R)
	ANTIMUCIN WDR see P092
	ANTURAT see P073
	AQUATHOL see P089
	ARETIT see P020
P010	Arsenic acid
P011	Arsenic pentoxide
PJ12	Arsenic trioxide
	Athrombin see P001
	AVITROL see P008
	Azirdene see P054
	AZOFOS see P061
	Azophos see P061
	BANTU see P072
P013	Barium cyanide
	BASENITE see P020
	BCME see P016
P014	Benzenechloride
	Benzocapin see P060
P015	Beryllium dust
P016	Bis(chloromethyl) ether
	BLADAN-M see P071
P017	Bromocastore
P018	Brucine
P019	2-Butanone peroxide
	BUFEN see P092
	Butaphene see P020
P020	2-sec-Butyl-4,5-dinitrophenol
P021	Calcium cyanide
	CALDON see P020
P022	Carbon disulfide
	CERESAN see P092
	CERESAN UNIVERSAL see P092
	CHEMOX GENERAL see P020
	CHEMOX P.E. see P020
	CHEM-TOL see P090
P023	Chloroacetaldehyde
P024	p-Chloroaniline
P025	1-(p-Chlorobenzoyl)-5-methoxy-2-methylindole-3-acetic acid
P026	1-(o-Chlorophenyl)thiourea
P027	3-Chloropropionitrile
P028	alpha-Chlorotoluene
P029	Copper cyanide
	CRETOX see P108
	Coumatin see P001
	Coumatan see P001
P030	Cyanides

Hazardous waste No.	Substance
P031	Cyanogen
P032	Cyanogen bromide
P033	Cyanogen chloride
	Cyclodan see P050
P034	2-Cyclohexyl-4,6-antiphenol
	D-COON see P001
	DETHIACOR see P001
	DETHINEL see P001
	DFF see P043
P035	2,4-Dichlorophenoxyacetic acid (2,4-D)
P036	Dichlorophenylarsine
	Dicyanogen see P031
P037	Dieldrin
	DILOREX see P037
P038	Diethylarsine
P039	0,0-Diethyl-S-(2-(ethyloxy)ethyl)ester of phosphorothioic acid
P040	0,0-Diethyl-O-(2-pyrazinyl)phosphorothioate
P041	0,0-Diethyl phosphonic acid, O-p-nitrophenyl ester
P042	3,4-Dihydroxy-alpha-(methylamino)-methyl benzyl alcohol
P043	Di-isopropylfluorophosphate
	DIMETATE see P044
	1,4,5,8-Dimethanonaphthalene, 1,2,3,4,10,10-hexachloro-1,4,4a,5,8,8a-hexahydro endo, endo see P060
P044	Dimetate
P045	3,3-Dimethyl-1-(methylthio)-2-butanone-O-[(methylamino)carbamoyl] oxime
P046	alpha, alpha-Dimethyl-phenethylamine
	Dinitrochlorobenzene see P034
P047	4,5-Dinitro-o-cresol and salts
P048	2,4-Dinitrophenol
	DINOSEB see P020
	DINOSEBE see P020
	Disulfoton see P039
P049	2,4-Dithioburet
	DNSP see P020
	DOLCO MOUSE CEREAL see P108
	DOW GENERAL see P020
	DOW GENERAL WEED KILLER see P020
	DOW SELECTIVE WEED KILLER see P020
	DOMICIDE G see P030
	DYANACIDE see P092
	EASTERN STATES DUCCIDE see P001
	ELGETOL see P020
P050	Endosulfan
P051	Endrin
	Epinephrine see P042
P052	Ethylcyanide
P053	Ethylenediamine
P054	Ethyleneimine
	FASCO FASCAT POWDER see P001
	FEMMA see P091
P055	Femic cyanide
P056	Fluorine
P057	2-Fluoroacetamide
P058	Fluoroacetic acid, sodium salt
	FOLCOOL-60 see P071
	FOLCOOL M see P071
	FOSFERNO M 50 see P071
	FRATOL see P056
	Fuminate of mercury see P065
	RINGITOX OR see P022
	RUSSOF see P057
	GALLOTOX see P092
	GEARPHOS see P071
	GERUTOX see P020
P059	Haptachlor
P060	1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-endo, endo-dimethanonaphthalene
	1,4,5,8,7-Hexachloro-cyclo-5-norbornene-2,3-dimethanol sulfate see P060.
P061	Hexachloropropene
P062	Hexaethyl tetraphosphate
	HOSTAQUICK see P092
	HOSTAQUIK see P092
	Hydrazomethane see P068
P063	Hydrocyanic acid
	ILLOXOL see P037
	INDOCI see P025
	Indomethacin see P025
	INSECTOPHENE see P050
	Iodrin see P060
P064	Isoacetic acid, methyl ester
	KILCOSEB see P020
	KOP-THODAN see P050
	KWR-KL see P108
	KWRKAN see P092
	KUMADER see P001
	KYPFARIN see P001
	LEYTOSAN see P092
	LICUPHENE see P092

Hazardous waste No.	Substance
	MAILK see P050
	MAREVAN see P001
	MAR-FRIN see P001
	MARTIND MAR-FRIN see P001
	MAVERAN see P001
	MEGATOX see P005
P065	Mercury fulminate
	MERSOLITE see P092
	METACID 50 see P071
	METAFOG see P071
	METAPHOR see P071
	METAPHOS see P071
	METASOL 30 see P092
P066	Methomyl
P067	2-Methylaziridine
	METHYL-E 605 see P071
P068	Methyl hydrazine
	Methyl isocyanate see P064
P069	2-Methylacetone
P070	2-Methyl-2-(methylthio)propionaldehyde-O-(methylcarbamoyl) oxime
	METHYL NIRON see P042
P071	Methyl parathion
	METRON see P071
	MOLE DEATH see P108
	MOUSE-NOTS see P108
	MOUSE-RID see P108
	MOUSE-TOX see P108
	MUSCIMOL see P007
P072	1-Nicotinyl-2-thiourea
P073	Nickel carbonyl
P074	Nickel cyanide
P075	Nicotine and salts
P076	Nitric oxide
P077	p-Nitroaniline
P078	Nitrogen dioxide
P079	Nitrogen peroxide
P080	Nitrogen tetroxide
P081	Nitrozoacetyl (R)
P082	N-Nitrosoacetamide
P083	N-Nitrosoaniline
P084	N-Nitrosodimethylamine
	NYLMERATE see P092
	OCTALOX see P037
P085	Octamethylpyrophosphoramide
	OCTAN see P092
P086	Olefin alcohol condensed with 2 moles ethylene oxide
	OMPA see P085
	OMPACIDE see P035
	OMPAX see P085
P087	Osmium tetroxide
P088	7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid
	PANIVARFIN see P001
	PANCORAM D-31 see P037
	PANTHERINE see P007
	PANWARFIN see P001
P089	Parathion
	PCP see P090
	PENNCAP-M see P071
	PENOXYL CARBON N see P048
P090	Pentachlorophenol
	Pentachlorophenolate see P090
	PENTA-KILL see P090
	PENTASOL see P090
	PENWAR see P090
	PERMAGUARD see P090
	PERMATOX see P090
	PERMITE see P090
	PERTOX see P090
	PESTOX III see P085
	PHENMAD see P092
	PHENOTAN see P020
P091	Phenyl dichloroarsine
	Phenyl mercaptan see P014
P092	Phenylmercury acetate
P093	N-Phenylthiourea
	PHILIPS 1861 see P008
	PHIX see P092
P094	Phorate
P095	Phosgene
P096	Phosphine
P097	Phosphorothioic acid, O,O-dimethyl ester, O-ester with N,N-dimethyl benzene sulfonamide
	Phosphorothioic acid, O,O-dimethyl-O-(p-nitrophenyl) ester see P071
	PIED PIPER MOUSE SEED see P108
P098	Potassium cyanide
P099	Potassium silver cyanide
	PREMERGE see P020
P100	1,2-Propenediol
P101	Propargyl alcohol see P102
	Propionitrile

Hazardous waste No.	Substance
P102	2-Propyn-1-ol
	PROTHROMADIN See P001
	QUICKSAM see P092
	QUINTOX see P037
	RAT AND MICE BAIT see P001
	RAT-A-WAY see P001
	RAT-B-GON see P001
	RAT-O-GIDE #2 see P001
	RAT-GUARD see P001
	RAT-KILL see P001
	RAT-MIX see P001
	RATS-NO-MORE see P001
	RAT-OLA see P001
	RATOREX see P001
	RATTUNAL see P001
	RAT-TROL see P001
	RO-DETH see P001
	RO-DEX see P108
	ROSEX see P001
	ROUGH & READY MOUSE MIX see P001
	SANASEED see P108
	SANTOBRITE see P090
	SANTOPHEN see P090
	SANTOPHEN 20 see P030
	SCHRADAN see P085
P103	Selenourea
P104	Silver Cyanide
	SMITE see P105
	SPARIC see P020
	SPOR-KIL see P092
	SPRAY-TROL BRAND RODENT-TROL see P001
	SPURGE see P020
P105	Sodium azide
	Sodium coumatin see P001
P106	Sodium cyanide
	Sodium fluoracetate see P056
	SODIUM WARFARIN see P001
	SOLFARIN see P001
	SOLFOBLACK B3 see P048
	SOLFOBLACK SB see P048
P107	Strontium sulfide
P108	Strychnine and salts
	SUBTEX see P020
	SYSTEM see P085
	TAG FUNGICIDE see P092
	TEKWAISA see P071
	TEMIC see P070
	TEMIK see P070
	TERMI-TROL see P090
P109	Tetraethylthiopyrophosphate
P110	Tetrazethyl lead
P111	Tetraethylpyrophosphate
P112	Tetrakisoxethane
	Tetraphosphoric acid, hexaethyl ester see P062
	TETROSULFUR BLACK PB see P048
	TETROSULPHUR PBR see P048
P113	Thalic acid
	Thallium peroxide see P113
P114	Thallium selenite
P115	Thallium (I) sulfate
	THIFOR see P092
	THIMUL see P092
	THODAN see P090
	THIOFOR see P090
	THOMUL see P090
	THONEX see P090
	THOPHENT see P071
P116	Thiosemicarbazide
	Thiosulfan formal see P090
P117	Thiram
	THOMPSON'S WOOD FX see P090
	THOVL see P090
P118	Trichloromethane
	TWIN LIGHT RAT AWAY see P001
	USAF RH-8 see P090
	USAF EX-4890 see P002
P119	Vanadic acid, ammonium salt
P120	Vanadium pentoxide
	VOFATOX see P071
	WANADU see P120
	WARCOUNIN see P001
	WARFARIN SODIUM see P001
	WARFICIDE see P001
	WOFOTOX see P072
	YANOCK see P057
	YASOKNOCK see P090
	ZIARNIK see P092
P121	Zinc cyanide
P122	Zinc phosphide (R,T)
	ZOOCCUMARIN see P001

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Hazardous Waste No.	Substance ¹
	AAF see U005
U001	Acetaldehyde
U002	Acetone (l)
U003	Acetonitrile (l,T)
U004	Acetophenone
U005	2-Acetylaminofluorene
U006	Acetyl chloride (C,T)
U007	Acrylamide
	Acetylene tetrachloride see U209
	Acetylene trichloride see U228
U008	Acrylic acid (l)
U009	Acrylonitrile
	AEROTHENE TT see U226
	3-Amino-5-(p-acetamidophenyl)-1H-1,2,4-triazole hydrate see U011
U010	6-Amino-1,1a,2,8,8a,9b-hexahydro-8-(hydrazinylmethyl)-imidazo[5-methyl]carbamate azino[2,3':3,4']pyrrolo[1,2-a] indole-4,7-dione (ester)
U011	Aniline
U012	Aniline (l)
U013	Asbestos
U014	Auramine
U015	Azaserine
U016	Benz(c)acridine
U017	Benzal chloride
U018	Benz(a)anthracene
U019	Benzene
U020	Benzenesulfonyl chloride (C,R)
U021	Benzidine
	1,2-Benzothiazolin-3-one, 1,1-dioxide see U202
	Benzo(a)anthracene see U018
U022	Benzo(a)pyrene
U023	Benzonitrone (C,R,T)
U024	Bis(2-chloroethoxy)methane
U025	Bis(2-chloroethyl) ether
U026	N,N-Bis(2-chloroethyl)-2-naphthylamine
U027	Bis(2-chloroisopropyl) ether
U028	Bis(2-ethylhexyl) phthalate
U029	Bromomethane
U030	4-Bromophenyl phenyl ether
U031	n-Butyl alcohol (l)
U032	Calcium chromate
	Carbolic acid see U168
	Carbon tetrachloride see U211
U033	Carbonyl fluoride
U034	Chloral
U035	Chlorambucil
U036	Chloroform
U037	Chlorobenzene
U038	Chlorobenzene
U039	p-Chloro-m-cresol
U040	Chlorodibromomethane
U041	1-Chloro-2,3-epoxypropane
	CHLOROETHENE NU see U226
U042	Chloroethyl vinyl ether
U043	Chloroethane
U044	Chloroform (l,T)
U045	Chloromethane (l,T)
U046	Chloromethyl methyl ether
U047	2-Chloronaphthalene
U048	2-Chlorophenol
U049	4-Chloro-o-toluidine hydrochloride
U050	Chrysene
	Cl 23060 see U073
U051	Cresote
U052	Cresols
U053	Crotonaldehyde
U054	Crotylic acid
U055	Cumene
	Cyanomethane see U003
U056	Cyclohexane (l)
U057	Cyclohexanone (l)
U058	Cyclophosphamide
U059	Damocyan
U060	DDC

Hazardous Waste No.	Substance ¹
U061	DDT
U062	Diallate
U063	Dibenz(a,h)anthracene
	Dibenz(a,h)anthracene see U063
U064	Dibenz(a,i)pyrene
U065	Dibromochloromethane
U066	1,2-Dibromo-3-chloropropane
U067	1,2-Dibromoethane
U068	Dibromomethane
U069	Di-n-butyl phthalate
U070	1,2-Dichlorobenzene
U071	1,3-Dichlorobenzene
U072	1,4-Dichlorobenzene
U073	3,3'-Dichlorobenzidine
U074	1,4-Dichloro-2-butene
	3,3'-Dichloro-4,4'-diaminobiphenyl see U073
U075	Dichlorodifluoromethane
U076	1,1-Dichloroethane
U077	1,2-Dichloroethane
U078	1,1-Dichloroethylene
U079	1,2-trans-dichloroethylene
U080	Dichloromethane
	Dichloromethylbenzene see U017
U081	2,4-Dichlorophenol
U082	2,6-Dichlorophenol
U083	1,2-Dichloropropane
U084	1,3-Dichloropropane
U085	Diopropylurea (l,T)
U086	1,2-Diethylhydrazine
U087	0,0-Diethyl-S-methyl ester of phosphorodithioic acid
U088	Diethyl phthalate
U089	Diethylstilbestrol
U090	Dihydrostilbene
U091	3,3'-Dimethoxybenzidine
U092	Dimethylamine (l)
U093	p-Dimethylaminoazobenzene
U094	7,12-Dimethylbenz(a)anthracene
U095	3,3'-Dimethylbenzidine
U096	alpha.alpha.-Dimethylbenzylhydroperoxide (R)
U097	Dimethylcarbamoyl chloride
U098	1,1-Dimethylhydrazine
U099	1,2-Dimethylhydrazine
U100	Dimethylnitrosamine
U101	2,4-Dimethylphenol
U102	Dimethyl phthalate
U103	Dimethyl sulfate
U104	2,4-Dinitrophenol
U105	2,4-Dinitrotoluene
U106	2,6-Dinitrotoluene
U107	Di-n-octyl phthalate
U108	1,4-Dioxane
U109	1,2-Diphenylhydrazine
U110	Dipropylamine (l)
U111	Di-n-propylnitrosamine
	EBOC see U114
	1,4-Epoxybutane see U213
U112	Ethyl acetate (l)
U113	Ethyl acrylate (l)
U114	Ethylenebis(dithiocarbamate)
U115	Ethylene oxide (l,T)
U116	Ethylene thiourea
U117	Ethyl ether (l,T)
U118	Ethylmethacrylate
U119	Ethyl methanesulfonate
	Ethynitrile see U003
	Freemaster T23P see U235
U120	Fluoranthene
U121	Fluorochloromethane
U122	Formaldehyde
U123	Formic acid (C,T)
U124	Furan (l)
U125	Furfural (l)
U126	Glycidylaldehyde
U127	Hexachlorobenzene
U128	Hexachlorobutadiene
U129	Hexachlorocyclohexane
U130	Hexachlorocyclopentadiene
U131	Hexachloroethane
U132	Hexachlorophene
U133	Hydrazine (R,T)
U134	Hydrofluoric acid (C,T)
U135	Hydrogen sulfide
	Hydroxybenzene see U188
U136	Hydroxymethyl arsine oxide
	4,4'-(thiocarbonyl)bis(N,N-dimethylaniline) see U014
U137	Indeno(1,2,3-cd)pyrene
U138	Iodomethane
U139	Iron Dextran
U140	Isobutyl alcohol

Hazardous Waste No.	Substance ¹
U141	Isoctriole
U142	Kapone
U143	Lasocarpine
U144	Lead acetate
U145	Lead phosphate
U146	Lead subacetate
U147	Maleic anhydride
U148	Maleic hydrazide
U149	Malonitrile
	MEK Peroxide see U160
U150	Melphalan
U151	Mercury
U152	Methacrylonitrile
U153	Methanethiol
U154	Methanol
U155	Methapyrene
	Methyl alcohol see U154
U156	Methyl chloroacetate
	Methyl chloroform see U226
U157	3-Methylcholanthrene
	Methyl chloroform see U156
U158	4,4'-Methylene-bis(2-chloroaniline)
U159	Methyl ethyl ketone (MEK) (l,T)
U160	Methyl ethyl ketone peroxide (R)
	Methyl iodide see U138
U161	Methyl isobutyl ketone
U162	Methyl methacrylate (R,T)
U163	N-Methyl-N-nitro-N-nitrosoguanidine
U164	Methylthiourea
	Mitomycin C see U010
U165	Naphthalene
U166	1,4-Naphthoquinone
U167	1-Naphthylamine
U168	2-Naphthylamine
U169	Nitrobenzene (l,T)
	Nitrobenzol see U169
U170	4-Nitrophenol
U171	2-Nitropropane (l)
U172	N-Nitrosod-n-butylamine
U173	N-Nitrosodiphenylamine
U174	N-Nitrosodipropylamine
U175	N-Nitrosod-n-propylamine
U176	N-Nitroso-n-methylurea
U177	N-Nitroso-n-methylurea
U178	N-Nitroso-n-methylurethane
U179	N-Nitrosopentane
U180	N-Nitrosopyrrolidine
U181	5-Nitro-o-toluene
U182	Paraldehyde
	PCNB see U185
U183	Pentachlorobenzene
U184	Pentachloroethane
U185	Pentachloronitrobenzene
U186	1,3-Pentadiene (l)
	Perc see U210
	Perchloroethylene see U210
U187	Phenacetin
U188	Phenol
U189	Phosphorous sulfide (R)
U190	Phthalic anhydride
U191	2-Picoline
U192	Pronamide
U193	1,3-Propene sulfone
U194	n-Propylamine (l)
U195	Pyridine
U196	Quinones
U200	Reserpine
U201	Resorcinol
U202	Saccharin
U203	Strolole
U204	Selenious acid
U205	Selenium sulfide (R,T)
	Silver see U233
U206	Streptozotocin
	2,4,5-T see U222
U207	1,2,4,5-Tetrachlorobenzene
U208	1,1,1,2-Tetrachloroethane
U209	1,1,2,2-Tetrachloroethane
U210	Tetrachloroethene
	Tetrachloroethylene see U210
U211	Tetrachloromethane
U212	2,3,4,6-Tetrachlorophenol
U213	Tetrahydrofuran (l)
U214	Thallium (l) acetate
U215	Thallium (l) carbonate
U216	Thallium (l) chloride
U217	Thallium (l) nitrate
U218	Thioacetamide
U219	Thiourea
U220	Toluene
U221	Toluenediamine
U222	o-Toluidine hydrochloride

Hazardous Waste No.	Substance ¹
U223	Toluene diisocyanate
U224	Toxaphene
	2,4,5-TP see U223
U225	Tribromomethane
U226	1,1,1-Trichloroethane
U227	1,1,2-Trichloroethane
U228	Trichloroethane
	Trichloroethylene see U225
U229	Trichlorofluoromethane
U230	2,4,5-Trichlorophenol
U231	2,4,6-Trichlorophenol
U232	2,4,5-Trichlorophenoxyacetic acid
U233	2,4,5-Trichlorophenoxypropionic acid alpha, alpha, alpha-Trichloroethane see U223
	TRI-CLENE see U225
U234	Trinorbornane (R,T)
U235	Tri(2,3-dibromopropyl) phosphite
U236	Trypan blue
U237	Uracil mustard
U238	Urethane
	Vinyl chloride see U043
	Vinylidene chloride see U078
U239	Xylene

¹ The Agency included those trade names of which it was aware; an omission of a trade name does not imply that it is not hazardous. The material is hazardous if it is listed under its generic name.

EPA Hazardous Waste No.	Hazardous constituents for which listed
K020	ethylene dichloride, 1,1,1-trichloroethane, 1,1,2-trichloroethane, tetrachloroethanes (1,1,2,2-tetrachloroethane and 1,1,1,2-tetrachloroethane), tetrachloroethylene, tetrachloroethylene, carbon tetrachloride, chloroform, vinyl chloride, vinylidene chloride
K021	antimony, carbon tetrachloride, chloroform
K022	phenol, tars (polycyclic aromatic hydrocarbons)
K023	phthalic anhydride, maleic anhydride
K024	phthalic anhydride, polynuclear tar-like materials, naphthoquinone
K025	meta-dinitrobenzene, 2,4-dinitrotoluene
K026	paraldehyde, pyridine, 2-picoline
K027	toluene diisocyanate, toluene-2,4-diamine, tars (benzimidazole)
K028	1,1,1-trichloroethane, vinyl chloride
K029	1,2-dichloroethane, 1,1,1-trichloroethane, vinyl chloride, vinylidene chloride, chloroform
K030	hexachlorobenzene, hexachlorobutadiene, hexachloroethane, 1,1,1,2-tetrachloroethane, 1,1,2,2-tetrachloroethane, ethylene dichloride
K031	arsenic
K032	hexachlorocyclopentadiene
K033	hexachlorocyclopentadiene
K034	hexachlorocyclopentadiene
K035	creosote, benz[a]anthracene, benzo[b]fluoranthene, benzo[a]pyrene
K036	toluene, phosphorodithioic and phosphorothioic acid esters
K037	toluene, phosphorodithioic and phosphorothioic acid esters
K038	phorate, formaldehyde, phosphorodithioic and phosphorothioic acid esters
K039	phosphorodithioic and phosphorothioic acid esters
K040	phorate, formaldehyde, phosphorodithioic and phosphorothioic acid esters
K041	toxaphene
K042	hexachlorobenzene, ortho-dichlorobenzene
K043	2,4-dichlorophenol, 2,6-dichlorophenol, 2,4,6-trichlorophenol
K044	N.A.
K045	N.A.
K046	lead
K047	N.A.
K048	chromium, lead
K049	chromium, lead
K050	chromium
K051	chromium, lead
K052	lead
K053	chromium
K054	chromium
K055	chromium, lead
K056	chromium, lead
K057	chromium, lead
K058	chromium, lead
K059	N.A.
K060	cyanide, naphthalene, phenolic compounds, arsenic
K061	chromium, lead, cadmium
K062	chromium, lead
K063	chromium, lead
K064	lead, cadmium
K065	lead, cadmium
K066	lead, cadmium
K067	lead, cadmium
K068	lead, cadmium
K069	chromium, lead, cadmium

N.A.—Waste is hazardous because it meets either the ignitability, corrosivity or reactivity characteristic.

Appendix VIII—Hazardous Constituents

Acetaldehyde
(Acetato)phenylmercury
Acetonitrile
3-(alpha-Acetylbenzyl)-4-hydroxycoumarin and salts
2-Acetylaminofluorene
Acetyl chloride
1-Acetyl-2-thiourea
Acrolein
Acrylamide
Acrylonitrile
Aflatoxins
Aldrin
Allyl alcohol
Aluminum phosphide
4-Aminobiphenyl
6-Amino-1.1a,2.8.8a,8b-hexahydro-8-(hydroxymethyl)-8a-methoxy-5-methylcarbamate azirino(2',3':3,4)pyrrolo(1,2-a)indole-4,7-dione (ester) (Mitomycin C)
5-(Aminomethyl)-3-isoxazolol
4-Aminopyridine
Amtriole
Antimony and compounds, N.O.S. ¹
Aramite
Arsenic and compounds, N.O.S.
Arsenic acid
Arsenic pentoxide
Arsenic trioxide
Auramine
Azaserine
Barium and compounds, N.O.S.
Barium cyanide
Benz[c]acridine
Benz[a]anthracene
Benzene
Benzenearsonic acid
Benzenethiol
Benzidine
Benzo[a]anthracene
Benzo[b]fluoranthene
Benzo[j]fluoranthene
Benzo[a]pyrene
Benzotrithloride
Benzyl chloride
Beryllium and compounds, N.O.S.
Bis(2-chloroethoxy)methane
Bis(2-chloroethyl) ether
N,N-Bis(2-chloroethyl)-2-naphthylamine
Bis(2-chloroisopropyl) ether
Bis(chloromethyl) ether
Bis(2-ethylhexyl) phthalate
Bromoacetone
Bromomethane
4-Bromophenyl phenyl ether
Brucine
2-Butanone peroxide
Butyl benzyl phthalate
2-sec-Butyl-4,6-dinitrophenol (DNEP)
Cadmium and compounds, N.O.S.
Calcium chromate
Calcium cyanide
Carbon disulfide
Chlorambucil
Chlordane (alpha and gamma isomers)
Chlorinated benzenes, N.O.S.
Chlorinated ethane, N.O.S.
Chlorinated naphthalene, N.O.S.
Chlorinated phenol, N.O.S.
Chloroacetaldehyde
Chloroalkyl ethers
p-Chloroaniline
Chlorobenzene
Chlorobenzilate
1-(p-Chlorobenzoyl)-5-methoxy-2-methylindole-3-acetic acid
p-Chloro-m-cresol
1-Chloro-2,3-epoxybutane
2-Chloroethyl vinyl ether
Chloroform
Chloromethane
Chloromethyl methyl ether
2-Chloronaphthalene
2-Chlorophenol
1-(o-Chlorophenyl)thiourea
3-Chloropropionitrile
alpha-Chlorotoluene
Chlorotoluene, N.O.S.
Chromium and compounds, N.O.S.
Chrysene
Citrus red No. 2
Copper cyanide
Creosote
Crotonaldehyde
Cyanides (soluble salts and complexes), N.O.S.
Cyanogen
Cyanogen bromide
Cyanogen chloride
Cycasin
2-Cyclohexyl-4,6-dinitrophenol
Cyclophosphamide
Daunomycin
DDD
DDE
DDT
Diallate
Dibenz[a,h]acridine
Dibenz[a,i]acridine
Dibenz[a,h]anthracene(Dibenzo[a,h]anthracene)
7H-Dibenzo[c,g]carbazole
Dibenzo[a,e]pyrene
Dibenzo[a,h]pyrene
Dibenzo[a,i]pyrene
1,2-Dibromo-3-chloropropane
1,2-Dibromoethane
Dibromomethane
Di-n-butyl phthalate
Dichlorobenzene, N.O.S.
3,3'-Dichlorobenzidine
1,1-Dichloroethane
1,2-Dichloroethane
trans-1,2-Dichloroethane
Dichloroethylene, N.O.S.
1,1-Dichloroethylene
Dichloromethane
2,4-Dichlorophenol
2,6-Dichlorophenol
2,4-Dichlorophenoxyacetic acid (2,4-D)
Dichloropropane
Dichlorophenylarsine
1,2-Dichloropropane
Dichloropropanol, N.O.S.
Dichloropropene, N.O.S.
1,3-Dichloropropene
Dieldrin
Diepoxybutane
Diethylarsine
0,0-Diethyl-S-(2-ethylthio)ethyl ester of phosphorothioic acid
1,2-Diethylhydrazine
0,0-Diethyl-S-methylester phosphorodithioic acid
0,0-Diethylphosphoric acid, 0-p-nitrophenyl ester
Diethyl phthalate
0,0-Diethyl-0-(2-pyrazinyl)phosphorothioate
Diethylstilbestrol
Dihydroarsifrole
3,4-Dihydroxy-alpha-(methylamino)-methyl benzyl alcohol
Di-isopropylfluorophosphate (DFP)
Dimethoate
3,3'-Dimethoxybenzidine
p-Dimethylaminoazobenzene
7,12-Dimethylbenz[a]anthracene
3,3'-Dimethylbenzidine
Dimethylcarbamoyl chloride

¹The abbreviation N.O.S. signifies those members of the general class "not otherwise specified" by name in this listing.

1,1-Dimethylhydrazine
1,2-Dimethylhydrazine
3,3-Dimethyl-1-(methylthio)-2-butanone-O-
((methylamino) carbonyl)oxime
Dimethylnitrosamine
alpha, alpha-Dimethylphenethylamine
2,4-Dimethylphenol
Dimethyl phthalate
Dimethyl sulfate
Dinitrobenzene, N.O.S.
4,6-Dinitro-o-cresol and salts
2,4-Dinitrophenol
2,4-Dinitrotoluene
2,6-Dinitrotoluene Di-n-octyl phthalate
1,4-Dioxane
1,2-Diphenylhydrazine
Di-n-propylnitrosamine
Disulfoton
2,4-Dithiobiuret
Endosulfan
Endrin and metabolites
Epichlorohydrin
Ethyl cyanide
Ethylene diamine
Ethylenebisdithiocarbamate (EBDC)
Ethyleneimine
Ethylene oxide
Ethylenethiourea
Ethyl methanesulfonate
Fluoranthene
Fluorine
2-Fluoroacetamide
Fluoroacetic acid, sodium salt
Formaldehyde
Glycidialdehyde
Halomethane, N.O.S.
Heptachlor
Heptachlor epoxide (alpha, beta, and gamma
isomers)
Hexachlorobenzene
Hexachlorobutadiene
Hexachlorocyclohexane (all isomers)
Hexachlorocyclopentadiene
Hexachloroethane
1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-
hexahydro-1,4:5,8-endo,endo-
dimethanonaphthalene
Hexachlorophene
Hexachloropropene
Hexaethyl tetraphosphate
Hydrazine
Hydrocyanic acid
Hydrogen sulfide
Indeno(1,2,3-c,d)pyrene
Iodomethane
Isocyanic acid, methyl ester
Isosafrole
Kepone
Lasiocarpine
Lead and compounds, N.O.S.
Lead acetate
Lead phosphate
Lead subacetate
Maleic anhydride
Malononitrile
Melphalan
Mercury and compounds, N.O.S.
Methapyrilene
Methomyl
2-Methylaziridine
3-Methylcholanthrene
4,4'-Methylene-bis-(2-chloroaniline)
Methyl ethyl ketone (MEK)
Methyl hydrazine
2-Methylacetonitrile
Methyl methacrylate

Methyl methanesulfonate
2-Methyl-2-(methylthio)propionaldehyde-o-
(methylcarbonyl) oxime
N-Methyl-N'-nitro-N-nitrosoguanidine
Methyl parathion
Methylthiouracil
Mustard gas
Naphthalene
1,4-Naphthoquinone
1-Naphthylamine
2-Naphthylamine
1-Naphthyl-2-thiourea
Nickel and compounds, N.O.S.
Nickel carbonyl
Nickel cyanide
Nicotine and salts
Nitric oxide
p-Nitroaniline
Nitrobenzene
Nitrogen dioxide
Nitrogen mustard and hydrochloride salt
Nitrogen mustard N-oxide and hydrochloride
salt
Nitrogen peroxide
Nitrogen tetroxide
Nitroglycerine
4-Nitrophenol
4-Nitroquinoline-1-oxide
Nitrosamine, N.O.S.
N-Nitrosodi-N-butylamine
N-Nitrosodietanolamine
N-Nitrosodietethylamine
N-Nitrosodimethylamine
N-Nitrosodiphenylamine
N-Nitrosodi-N-propylamine
N-Nitroso-N-ethylurea
N-Nitrosomethylethylamine
N-Nitroso-N-methylurea
N-Nitroso-N-methylurethane
N-Nitrosomethylvinylamine
N-Nitrosomorpholine
N-Nitrososarcosine
5-Nitro-o-toluidine
Octamethylpyrophosphoramide
Oleyl alcohol condensed with 2 moles
ethylene oxide
Osmium tetroxide
7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic
acid
Parathion
Pentachlorobenzene
Pentachloroethane
Pentachloronitrobenzene (PCNB)
Pentachlorophenol
Phenacetin
Phenol
Phenyl dichloroarsine
Phenylmercury acetate
N-Phenylthiourea
Phosgene
Phosphine
Phosphorothioic acid, O,O-dimethyl ester, O-
ester with N,N-dimethyl benzene
sulfonamide
Phthalic acid esters, N.O.S.
Phthalic anhydride
Polychlorinated biphenyl, N.O.S.
Potassium cyanide
Potassium silver cyanide
Pronamide
1,2-Propanediol
1,3-Propane sultone
Propionitrile

Propylthiouracil
2-Propyn-1-ol
Pryidine.
Reserpine
Saccharin
Safrole
Selenious acid
Selenium and compounds, N.O.S.
Selenium sulfide
Selenourea
Silver and compounds, N.O.S.
Silver cyanide
Sodium cyanide
Streptozotocin
Strontium sulfide
Strychnine and salts
1,2,4,5-Tetrachlorobenzene
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)
Tetrachloroethane, N.O.S.
1,1,1,2-Tetrachloroethane
1,1,2,2-Tetrachloroethane
Tetrachloroethene (Tetrachloroethylene)
Tetrachloromethane
2,3,4,6-Tetrachlorophenol
Tetraethyldithiopyrophosphate
Tetraethyl lead
Tetraethylpyrophosphate
Thallium and compounds, N.O.S.
Thallic oxide
Thallium (I) acetate
Thallium (I) carbonate
Thallium (I) chloride
Thallium (I) nitrate
Thallium selenite
Thallium (I) sulfate
Thioacetamide
Thiosemicarbazide
Thiourea
Thiuram
Toluene
Toluene diamine
o-Toluidine hydrochloride
Tolylene diisocyanate
Toxaphene
Tribromomethane
1,2,4-Trichlorobenzene
1,1,1-Trichloroethane
1,1,2-Trichloroethane
Trichloroethene (Trichloroethylene)
Trichloromethanethiol
2,4,5-Trichlorophenol
2,4,6-Trichlorophenol
2,4,5-Trichlorophenoxyacetic acid (2,4,5-T)
2,4,5-Trichlorophenoxypropionic acid (2,4,5-
TP) (Silvex)
Trichloropropane, N.O.S.
1,2,3-Trichloropropane
O,O,O-Triethyl phosphorothioate
Trinitrobenzene
Tris(1-azridinyl)phosphine sulfide
Tris(2,3-dibromopropyl) phosphate
Trypan blue
Uracil mustard
Urethane
Vanadic acid, ammonium salt
Vanadium pentoxide (dust)
Vinyl chloride
Vinylidene chloride
Zinc cyanide
Zinc phosphide
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Final Report

on

ALTERNATIVES FOR REDUCING THE LIQUID
PORTION OF THE CONTENTS OF BASIN F,
ROCKY MOUNTAIN ARSENAL

to

U.S. Army Toxic & Hazardous Materials Agency
Aberdeen Proving Ground, MD

by

Dr. Gary L. McKown and
Dr. Lee G. Taft

BATTELLE
Columbus Division
November 5, 1980

Report Number
DRXTH-IS-CR-80059

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TABLE 1. BASIN F CONSTITUENCY (MAJOR COMPONENTS)

Aldrin	Sulfate
Isodrin	Copper
Dieldrin	Iron
Endrin	Nitrogen
Dithiane	O-PO ₄
	Total Phosphorus
Dicylopentadiene	Fluoride
Diisopropylmethyl phosphonate	Sodium
Dimethylmethylphosphonate	Arsenic
Sulfoxide	Cyanide
Sulfone	Boron
Chloride	Cadmium
Hardness	Nickel
Residue (total solids)	Mercury
COD	
TOC	

INTERIM STATUS STANDARDS
FOR HAZARDOUS WASTE MANAGEMENT SYSTEMS

ENVIRONMENTAL PROTECTION AGENCY
FEDERAL REGISTER MAY 19, 1980

Subpart A - General

Section 265.1 Purpose, scope, and applicability.

(a) The purpose of this Part is to establish minimum national standards which define the acceptable management of hazardous waste during the period of interim status.

(b) The standards in this Part apply to owners and operators of facilities which treat, store, or dispose of hazardous waste who have fully complied with the requirements for interim status under Section 3005(e) of RCRA and Sec. 122.22 of this Chapter, until final administrative disposition of their permit application is made. These standards apply to all treatment, storage, or disposal of hazardous waste at these facilities after the effective date of these regulations, except as specifically provided otherwise in this Part or Part 261 of this Chapter.

Subpart B - General Facility Standards

Section 265.10 Applicability

The regulations in this Subpart apply to owners and operators of all hazardous waste facilities, except as Sec. 265.1 provides otherwise.

Section 265.11 Identification number.

Every facility owner or operator must apply to EPA for an EPA identification number in accordance with the EPA notification procedures (45 FR 12746).

Section 265.12 Required notices.

(a) The owner or operator of a facility that has arranged to receive hazardous waste from a foreign source must notify the Regional Administrator in writing at least four weeks in advance of the date of the waste is expected to arrive at the facility. Notice of subsequent shipments of the same waste from the same foreign source is not required.

Section 265.13 General waste analysis.

(a) (1) Before an owner or operator treats, stores, or disposes of any hazardous waste, he must obtain a detailed chemical and physical analysis of a representative sample of the waste. At a minimum, this analysis must contain all the information which must be known to treat, store, or dispose of the waste in accordance with the requirements of this Part.

(2) The analysis may include data developed under Part 261 of this Chapter, and existing published or documented data on the hazardous waste or on waste generated from similar processes.

(3) The analysis must be repeated as necessary to ensure that it is accurate and up to data. At a minimum, the analysis must be repeated:

(i) When the owner or operator is notified, or has reason to believe, that the process or operation generating the hazardous waste has changed; and

(ii) For off-site facilities, when the results of the inspection required in paragraph (a)(4) of this Section indicate that the hazardous waste received at the facility does not match the waste designated on the accompanying manifest or shipping paper.

Section 265.14 Security

(a) The owner or operator must prevent the unknowing entry, and minimize the possibility for the unauthorized entry, of persons or livestock onto the active portion of his facility.

Section 265.15 General Inspection Requirements

(a) The owner or operator must inspect his facility for malfunctions and deterioration, operator errors, and discharges which may be causing - or may lead to -

(1) Release of hazardous waste constituents to the environment or

(2) A threat to human health. The owner or operator must conduct these inspections often enough to identify problems in time to correct them before they harm human health or the environment.

(b)(1) The owner or operator must develop and follow a written schedule for inspecting all monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or responding to environmental or human health hazards.

(c) The owner or operator must remedy any deterioration or malfunction of equipment or structures which the inspection reveals on a schedule which ensures that the problem does not lead to an environmental or human health hazard. Where a hazard is imminent or has already occurred, remedial action must be taken immediately.

(d) The owner or operator must record inspections in an inspection log or summary. He must keep these records for at least three years from the date of

inspection. At a minimum, these records must include the date and time of the inspection, the name of the inspector, a notation of the observations made, and the date and nature of any repairs or other remedial actions.

Section 265.16 Personnel training.

(a)(1) Facility personnel must successfully complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures the facility's compliance with the requirements of this Part. The owner or operator must ensure that this program includes all the elements described in the document required under paragraph (d)(3) of this Section.

(2) This program must be directed by a person trained in hazardous waste management procedures, and must include instruction which teaches facility personnel hazardous waste management procedures (including contingency plan implementation) relevant to the positions in which they are employed.

(3) At a minimum, the training program must be designed to ensure that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment, and emergency systems.

Subpart C - Preparedness and Prevention

Section 265.30 Applicability.

The regulations in this Subpart apply to owners and operators of all hazardous waste facilities, except at Sec. 265.1 provides otherwise.

Section 265.32 Required equipment.

All facilities must be equipped with the following, unless none of the hazards posed by waste handled at the facility could require a particular kind of equipment specified below:

(a) An internal communications or alarm system capable of providing immediate emergency instruction (voice or signal) to facility personnel;

(b) A device, such as a telephone (immediately available at the scene of operations) or a hand-held two-way radio, capable of summoning emergency assistance from local police departments, fire departments, or State or local emergency response teams;

(c) Portable fire extinguishers, fire control equipment (including special extinguishing equipment, such as that using foam, inert gas, or dry chemicals),

spill control equipment, and decontamination equipment; and

(d) Water at adequate volume and pressure to supply water hose streams, or foam producing equipment, or automatic sprinklers, or water spray systems.

Subpart D - Contingency Plan and Emergency Procedures

Section 265.50 Applicability .

The regulations in this Subpart apply to owners and operators of all hazardous waste facilities, except as Sec. 265.1 provides otherwise.

Section 265.51 Purpose and implementation of Contingency Plan .

(a) Each owner or operator must have a contingency plan for his facility. The contingency plan must be designed to minimize hazards to human health or the environment from fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water.

(b) The provisions of the plan must be carried out immediately whenever there is a fire, explosion, or release of hazardous waste or hazardous waste constituents which could threaten human health or the environment.

Section 265.52 Content of contingency plan.

(a) The contingency plan must describe the actions facility personnel must take to comply with Sections 265.51 and 265.56 in response to fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water at the facility.

(b) If the owner or operator has already prepared a Spill Prevention Control, and Countermeasures (SPCC) Plan in accordance with Part 112 or Part 151 of this Chapter, or some other emergency or contingency plan, he need only amend that plan to incorporate hazardous waste management provisions that are sufficient to comply with the requirements of this Part.

(c) The plan must describe arrangements agreed to by local police departments, fire departments, hospitals, contractors, and State and local emergency response teams to coordinate emergency services, pursuant to Sec. 265.37.

(d) The plan must list names, addresses, and phone numbers (office and home) of all persons qualified to act as emergency coordinator (see Sec. 265.55), and this list must be kept up to date. Where more than one person is listed, one must be named as primary emergency coordinator and others must be listed in the order in which they will assume responsibility as alternatives.

(e) The plan must include a list of all emergency equipment at the facility (such as fire extinguishing systems, spill control equipment, communications and alarm systems, spill control equipment, communications and alarm systems (internal and external), and decontamination equipment), where this equipment is required. This list must be kept up to date. In addition, the plan must include the location and a physical description of each item on the list, and a brief outline of its capabilities.

(f) The plan must include an evacuation plan for facility personnel where there is a possibility that evacuation could be necessary. This plan must describe signal(s) to be used to begin evacuation, evacuation routes, and alternate evacuation routes (in cases where the primary routes could be blocked by releases of hazardous waste or fires).

Section 265.53 Copies of contingency plan.

A copy of the contingency plan and all revisions to the plan must be:

- (a) Maintained at the facility; and
- (b) Submitted to all local police departments, fire departments, hospitals, and State and local emergency response teams that may be called upon to provide emergency services.

Section 265.55 Emergency coordinator.

At all times, there must be at least one employee either on the facility premises or on call (i.e. available to respond to an emergency by reaching the facility within a short period of time) with the responsibility for coordinating all emergency response measures. This emergency coordinator must be thoroughly familiar with all aspects of the facility's contingency plan, all operations and activities at the facility, the location and characteristics of waste handled, the location of all records within the facility, and the facility layout. In addition, this person must have the authority to commit the resources needed to carry out the contingency plan.

Subpart G-Closure and Post-Closure.

Section 265.110 Applicability.

Except as Section 265.1 provides otherwise:

(a) Sections 265.111-265.115 (which concern closure) apply to the owners and operators of all hazardous waste management facilities; and
(b) Sections 265.117-265.120 (which concern post-closure care) apply to the owners and operators of all hazardous waste disposal facilities.

Section 265.111 Closure performance standard

The owner or operator must close his facility in a manner that:

(a) Minimizes the need for further maintenance, and
(b) Controls, minimizes or eliminates, to the extent necessary to protect human health and the environment, post-closure escape of hazardous waste, hazardous waste constituents, leachate, contaminated rainfall, or waste decomposition products to the ground or surface waters or to the atmosphere.

Section 265.112 Closure plan; amendment of plan.

(a) By May 19, 1981, the owner or operator must have a written closure plan. He must keep a copy of the closure plan and all revisions to the plan at the facility until closure is completed and certified in accordance with Section 265.115. This plan must identify the steps necessary to completely or partially close the facility at any point during its intended operating life. The closure plan must include, at least:

(1) A description of how and when the facility will be partially closed. If applicable, and finally closed. The description must identify the maximum extent of the operation which will be unclosed during the life of the facility, and how the requirements of Sections 265.111, 265.113, 265.114, and 265.115 and the applicable closure requirements of Sections 265.197, 265.228, 265.280, 265.310, 265.351, 265.381, 265.404 will be met;

(2) An estimate of the maximum inventory of wastes in storage and in treatment at any time during the life of the facility;

(3) A description of the steps needed to decontaminate facility equipment during closure; and

(4) An estimate of the expected year of closure and a schedule for final closure. The schedule must include, at a minimum, the total time required for intervening closure activities which will allow tracking of the progress of closure. (For example, in the case of a landfill, estimates of the time required to treat and dispose of all waste inventory and of the time required to place a final cover must be included.)

(b) The owner or operator may amend his closure plan at any time during the active life of the facility. (The active life of the facility is that period during which wastes are periodically received.) The owner or operator must amend the plan whenever changes in operating plans or facility design affect the closure plan, or whenever there is a change in the expected year of closure of the facility. The plan must be amended within 60 days of the changes.

(c) The owner or operator must submit his closure plan to the Regional Administrator at least 180 days before the date he expects to begin closure.

Section 265.113 Closure; time allowed for closure.

(a) Within 90 days after receiving the final volume of hazardous wastes, or 90 days after approval of the closure plan, if that is later, the owner or operator must treat, remove from the site, or dispose of on-site all hazardous wastes in accordance with the approved closure plan. The Regional Administrator may approve a longer period using the procedures under Section 265.112(d) if the owner or operator demonstrates that:

(1)(i) The activities required to comply with this paragraph will, of necessity, take him longer than 90 days to complete; or

(ii)(A) The facility has the capacity to receive additional wastes;

(B) There is a reasonable likelihood that a person other than the owner or operator will recommence operation of the site; and

(C) Closure of the facility would be incompatible with continued operation of the site; and

(2) He has taken and will continue to take all steps to prevent threats to human health and the environment.

(b) The owner or operator must complete closure activities in accordance with the approved closure plan and within 180 days after receiving the final volume of wastes or 180 days after approval of the closure plan, if that is later. The Regional Administrator may approve a longer closure period using the procedures under Section 265.112(c) if the owner or operator demonstrates that:

(1)(i) The closure activities will, of necessity, take him longer than 180 days to complete; or

- (ii)(A) The facility has the capacity to receive additional waste;
- (B) There is a reasonable likelihood that a person other than the owner or operator will recommence operation of the site;
- (C) Closure of the facility would be incompatible with continued operation of the site; and

(2) He has taken and will continue to take all steps to prevent threats to human health and the environment from the unclosed but inactive facility.

Section 265.114 Disposal or decontamination of equipment.

When closure is completed, all facility equipment and structures must have been properly disposed of, or decontaminated by removing all hazardous waste and residues.

Section 265.115 Certification of closure.

When closure is completed, the owner or operator must submit to the Regional Administrator certification both by the owner or operator and by an independent registered professional engineer that the facility has been closed in accordance with the specifications in the approved closure plan.

Section 265.117 Post-closure care and use of property.

(a) Post-closure care must continue for 30 years after the date of completing closure and must consist of at least the following:

- (1) Ground-water monitoring and reporting in accordance with the requirements of Subpart F, and
- (2) Maintenance of monitoring and waste containment systems as specified in Sections 265.91, 265.223, 265.228, 265.280, and 265.310, where applicable.

(b) The Regional Administrator may require continuation of any of the security requirements of Section 265.14 for 30 years after the date closure has been completed when:

- (1) Wastes may remain exposed after completion of closure, or
- (2) Access by the public or domestic livestock may pose a hazard to human health.

In extending any of these requirements the Regional Administrator will use the procedures of Section 265.118(c).

(c) Post-closure use of property on or in which hazardous wastes remain after closure must never be allowed to disturb the integrity of the final cover, liner(s), or any other components of any containment system, or the function of the facility's monitoring systems, unless the owner or operator can demonstrate to the Regional Administrator, either in the post-closure plan or by petition, through the procedures in Section 265.118(c) or (f), as appropriate, that the disturbance:

- (1) Is necessary to the proposed use of the property, and will not increase the potential hazard to human health or the environment, or
- (2) Is necessary to reduce a threat to human health or the environment.

(d) All post-closure care activities must be performed in accordance with the provisions of the approved post-closure plan as specified in Section 265.118.

Section 265.118 Post-closure plan; amendment of plan.

(a) By May 19, 1981, the owner or operator of a disposal facility must have a written post-closure plan. He must keep a copy of the post-closure plan and all revisions to the plan at the facility until the post-closure care period begins. The post-closure plan must identify the activities which will be carried on after closure and the frequency of these activities, and include at least:

- (1) A description of the planned ground-water monitoring activities and frequencies at which they will be performed to comply with Subpart F during the post-closure period;
- (2) A description of the planned maintenance activities and frequencies at which they will be performed, to ensure:
 - (i) The integrity of the cap and final cover or other containment structures as specified in Sections 265.223, 265.228, 265.280, and 265.310, where applicable; and
 - (ii) The function of the facility monitoring equipment as specified in Section 265.91; and
- (3) The name, address, and phone number of the person or office to contact about the disposal facility during the post-closure care period. This person or office must keep an updated post-closure plan during the post-closure care period.

(b) The owner or operator may amend his post-closure plan at any time during the active life of the disposal facility. The owner or operator must amend his plan any time changes in operating plans or facility design or events which occur during the active life of the facility, affect his post-closure plan. The plan must be amended within 60 days after the changes or events occur.

(c) The owner or operator of a disposal facility must submit his post-closure plan to the Regional Administrator at least 180 days before the date he expects to begin closure. The date when he "expects to begin closure" should be immediately after the date on which he expects to receive the final volume of wastes.

Section 265.119 Notice to local land authority.

Within 90 days after closure is completed, the owner or operator of a disposal facility must submit to the local land authority and to the Regional Administrator a survey plat indicating the location and dimensions of landfill cells or other disposal areas with respect to permanently surveyed benchmarks. This plat must be prepared and certified by a professional land surveyor. The plat filed with the local land authority must contain a note, prominently displayed, which states the owner's or operator's obligation to restrict disturbance of the site as specified in Section 265.117(c). In addition, the owner or operator must submit to the Regional Administrator and to the local land authority a record of the type, location, and quantity of hazardous wastes disposed of within each cell or area of the facility. The owner or operator must identify the type, location, and quantity of hazardous wastes disposed of within each cell or area of the facility. For wastes disposed of before these regulations were promulgated, the owner or operator must identify the type, location, and quantity of the wastes to the best of his knowledge and in accordance with any records he has kept.

Section 265.120 Notice in deed to property.

The owner of the property on which a disposal facility is located must record, in accordance with State law, a notation on the deed to the facility property -or on some other instrument which is normally examined during title search -that will in perpetuity notify any

potential purchaser of the property that:

(1) the land has been used to manage hazardous waste, and (2) its use is restricted under Section 265.117(c).

Subpart H -- Financial Requirements.

Section 265.140 Applicability.

(a) The requirements of Sections 265.142, 265.143, and 265.146-151 apply to owners and operators of all hazardous waste facilities, except as provided otherwise in this section or in Section 265.1

(b) The requirements of Sections 265.144 and 265.145 apply only to owners and operators of disposal facilities.

(c) States and the Federal Government are exempt from the requirements of this Subpart.

SAFTEY GUIDANCE FY81 MCA
PROJECT PHASE I

HSE-OI-F (9 Feb 81) 1st Ind
SUBJECT: Safety Guidance FY81 MCA Project Phase I

Mr. S. Graham/eag/671-2559

USAEHA, APG, MD 21010

27 APR 1981

TO: Commander, US Army Toxic and Hazardous Materials Agency, ATTN:
DRXIH-IS/Mr. McKinney, APG, MD 21010

1. Basic letter requests guidance concerning personal protective equipment, emergency provisions, personnel and equipment decontamination requirements, medical surveillance and delineation of work areas or zones in which equipment must be worn. This guidance will be incorporated into the Phase I construction contract for Basin F, Rocky Mountain Arsenal (RMA).

2. Discussion between personnel of the Industrial Hygiene Division (IHD) and Occupational and Environmental Medicine Division (OEMD), this Agency lead to the following suggested methods of protecting Basin F personnel. These methods are believed to provide personnel with reasonable and prudent protection against contaminants and other sources of insult as a result of operations dealing with the Basin F project.

a. Work Zones. Work zones should be established to contain contaminated soil within the smallest area possible and to protect worker personnel and others from exposure to contaminants. Personal protective equipment should be required for all workers including drivers, equipment operators, laborers, supervisors, and visitors performing or observing operations involving work around the chemical sewer trench and work around Basin F. Operations involved include but are not limited to backhoe work, loading and unloading dump trucks, bulldozer/grading work, drag line crane work, and pick and shovel work in the trench. Pick and shovel work is considered work required to aid the backhoe in dirt removal around utilities and piping which cannot be removed or damaged during the sewer line removal phase.

(1) Hot Area. This work zone should encompass the sewer line trench and Basin F pond (include also the service road used to transport soil from the trench excavation site to the Basin F dump site). Requirements for the use of personal protective equipment should be enforced from within a minimum of 50 feet of the excavated trench, service road and any point around the Basin F pond (refer to respiratory/eye protection in para 2b below).

(2) Neutral Area. This work zone should act as a buffer area between the hot area and support or surrounding areas. Equipment decontamination stations should be located in this area along with emergency equipment such as self-contained breathing apparatuses and emergency showers/eye lavages. This zone should be no less than 50 feet wide.

(3) Support Area. This work zone should encompass the remaining area of the job site. Change and shower rooms, lunch and break areas, operational direction and support facilities (to include supplies, equipment storage, and maintenance) should be located in this area. Eating, drinking, and smoking should be allowed only in this area.

[Note: All support operations located in the neutral and support areas should be positioned upwind (in relation to prevailing winds) of the actual trench and Basin F construction.]

b. Respiratory/Eye Protection.

(1) General Protection. To be used by all personnel in the hot area except as specified under Special Situation Use [para 2b(2) below]. [Equipment. Full facepiece, air-purifying, chemical cartridge respirator with combination high-efficiency filter(s) and organic vapor cartridge(s).]

(2) Special Situation Use. Confined spaces, manholes, direct chemical sewer line work, work around liquid chemical spills or pools¹ (includes pick and shovel work performed in the presence of liquid chemical pools). [Equipment. Self-contained breathing apparatus, positive pressure demand devices only.]

(3) Cartridge Change-Out Requirements. These requirements for air-purifying respirators should be based on the following criteria:

- (a) Daily
- (b) When the respirator wearer detects breakthrough (odor/smell)
- (c) When increased breathing resistance occurs.

(4) Eye Protection. This protection should be required as stipulated by construction/safety standards pertinent to this project or as indicated by requirement for wearing respiratory protective devices.

c. Skin Protection.

(1) General. Coveralls and rubber boots (knee high) should be worn. Gloves (rubber or cotton) should be provided when contact with contaminated dry soil is involved.

(2) Potential Liquid chemical Contact. Coveralls, hip wader boots, rubber gloves, rubber apron or jacket should be worn.

(3) Trench Excavating of Sewer Line/Contact with Sewer Line. Coveralls, hip wader boots, rubber gloves, rubber apron or jacket should be worn.

¹Pools - defined as an obvious accumulation of liquid or wet appearing soil (prior to application of wet controls for dust suppression) within the excavated trench site or on the ground surface of the work site. The evaporation pit of the Basin F proper is not included under the definition of a pool.

HSE-OI-F(9 Feb 81)

SUBJECT: Safety Guidance FY81 MCA Project Phase I

(4) Personal Protective Equipment. Hard hats, safety shoes or boots and other personal protective equipment required as stipulated by construction/safety standards pertinent to this project.

d. Emergency Provisions.

(1) Portable emergency showers/eye lavage should be provided within the neutral area. Showers/eye lavages should have a capacity for providing sufficient amounts of clean water for at least a 15-20 minute period.

(2) Self-contained breathing apparatuses should be provided within the neutral area for personnel to don in the event of uncovering a liquid chemical pool during trench work or for other emergency use purposes.

e. Personnel and Equipment Decontamination.

(1) Personnel should be provided clean change rooms and shower facilities. Personnel should use the shower facilities before changing into their street clothes at the end of their work shift. Work clothes should be provided, used, and left in the change facility. No work clothing (including shoes or boots) should be worn off the project area. Clean work clothes should be provided and laundered as appropriate and necessary. Boots and hip wader boots, rubber gloves and respirators should be free of soil from the hot area by means of decontamination wash down performed in the neutral area prior to entrance by personnel to the support area. Eating, drinking and smoking should not be permitted except in facilities provided in the support area.

(2) An equipment decontamination station should be required within the neutral area for removing soil from all equipment leaving the hot area or installation. A special "clean area" should be established for performing equipment maintenance. This area should be used when personnel are required by normal practices to expose themselves to contact with ground soil (i.e., crawling under a vehicle to change engine oil). The clean area should be located in the support area with all equipment being decontaminated by wash down in the neutral area prior to maintenance work. Maintenance such as greasing a crane or bulldozer need not require removal to the clean area unless the job requires body contact with ground soil.

f. Medical Surveillance.

(1) Personnel involved in this operation should be provided with medical surveillance prior to the onset of operations, at the conclusion of operations, and at 6-month intervals during the progress of operations. Medical surveillance should include a complete medical and work history, a physical examination with emphasis on the skin, renal, hepatic and neurological systems, and laboratory examinations to include blood tests for liver and renal function, a complete blood count and a urinalysis.

HSE-OI-F(9 Feb 81)

SUBJECT: Safety Guidance FY81 MCA Project Phase I

(2) Personnel involved in this operation should also be medically evaluated prior to the onset of operations for their ability to wear personal respiratory protection and other potentially stressful protective equipment (e.g., extensive rubber clothing ensembles). This evaluation should include, as a minimum, an examination of the cardiorespiratory system and pulmonary function testing (i.e., forced vital capacity and forced respiratory volume - 1 second). Other tests of the respiratory and cardiovascular systems should be performed if indicated on the basis of an individual's past history, findings of the above evaluation, and/or the type of equipment the individual may be required to use. The evaluation should be repeated at 6-month intervals during the course of operations to insure continued ability to use protective equipment safely and effectively.

3. General discussion is as follows:

a. The Corps of Engineers' contract for the Basin F project should include requirements for the contractor to abide by all occupational safety and health standards cited in appropriate Federal codes.

b. The contract should stipulate who supplies personal protective equipment, both for workers and visitors, as well as the cleaning and maintenance of such devices.

c. Standing operating procedures (SOPs) for all operations should be prepared by the contractor for Army concurrence.

d. A complete respiratory protection program as outlined in Title 29, Code of Federal Regulations, Part 1910.134, Respiratory Protection should be established by the contractor.

4. Point of contact is Mr. Stephan Graham, Industrial Hygiene Division, this Agency, AUTOVON 584-2559/3928.

FOR THE COMMANDER:

wd all incl



ARTHUR R. MORTON

COL, MC

Director, Occupational and
Environmental Health

CF:

Cdr, DARCOM (DRCSG-I)

HQDA (DASG-PSP-E)

Cdr, HSC (HSPA-P)

RULES FOR NOTIFICATION OF HAZARDOUS WASTE
ACTIVITY; PUBLIC NOTICE

WHO MUST FILE

The Resource Conservation and Recovery Act of 1976 (RCRA) requires anyone who generates or transports hazardous waste, or who owns or operates a facility for treating, storing, or disposing of hazardous waste to notify EPA of their activity. This includes individuals, trusts, firms, joint stock companies, corporations (including government corporations), partnerships, associations, States, municipalities, commissions, interstate bodies and Federal Agencies. If you transport, treat, store, or dispose of hazardous waste without filing a notification, you may be subject to civil and criminal penalties.

WHAT INFORMATION SHOULD BE FILED

When filing a notification, you must identify the hazardous wastes that you handle and give a general description of your activity including its location. You can submit all this information by simply completing the enclosed EPA Form 8700-12.

NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

How Many Forms Should Be Filed: You need submit only one Notification Form per site or location, provided that you describe all the activities at that site or location. If you conduct hazardous waste activity at more than one site or location, you must submit a separate form for each site or location.

If you transport hazardous waste, and do not generate, treat, store, or dispose of hazardous waste, you may submit one form which covers all the transportation activities your company conducts. This form should be submitted to the EPA Regional Office that serves the area where your company has its headquarters or principal place of business. However, if you are a transporter who generates, treats, stores or disposes of hazardous waste, you will have to complete and submit separate Notification Forms to cover each installation.

WHEN TO FILE

1. Within 90-days of Publication of Regulations Under Section 3001 of RCRA: Anyone who conducts hazardous waste activity must file a

notification within 90 days after EPA publishes regulations under Section 3001 of RCRA. These regulations define which solid wastes are hazardous wastes and are published under Title 40 of the Code of Federal Regulations, Part 261.

Owners or operators of facilities that treat, store or dispose of hazardous waste must submit a notification within 90 days after the 3001 regulations are published in order to qualify for "Interim Status"-that is, temporary authority to continue their operations until a final permit is issued.

2. Within 90-days of Any Amendments to the Section 3001 Regulations: From time to time, EPA may change its procedures for identifying hazardous waste, or may revise the list of hazardous waste which it has published. If you handle any wastes which are identified or listed as hazardous by an amendment to the Section 3001 regulations, you must file a notification covering these wastes within 90 days after the amendment is published.

3. New Generators and Transporters: If you begin to generate hazardous waste and have not previously filed a notification, you must comply with the regulations for obtaining an EPA Identification Number published under Section 3002 of RCRA (40 CFR Part 262) before you transport hazardous waste or offer your hazardous waste to a transporter.

Similarly, if you desire to transport hazardous waste and have not previously filed a notification, you must comply with the regulations for obtaining an EPA Identification Number published under section 3003 of RCRA (40 CFR Part 263) before you move any hazardous waste.

Persons applying for an EPA Identification Number under Section 3003 of RCRA need not complete the reverse side of the Notification Form as they may not know which wastes they will be handling.

4. Treatment, Storage and Disposal Facilities: If you own or operate a facility where hazardous waste is treated, stored, or disposed, and you do not file a notification during the 90-day period following the initial publication of the Section 3001 regulations, you will not be allowed to continued your hazardous waste activities until you obtain a hazardous waste permit. Similarly, if you plan to open a new hazardous

waste treatment, storage, or disposal facility, you must obtain a hazardous waste permit before commencing operations. Owners or operators of new facilities need not submit a notification, since your permit before commencing operations. Owners or operators of new facilities need not submit a notification, since your permit application will fulfill your notification requirements.

WHERE TO FILE

Notification should be sent to the EPA Regional Office that serves the area where your hazardous waste activity is located. If you received a notification packet from EPA that contains envelopes and pre-addressed mailing labels, you should use one of the envelopes and one of the mailing labels to send your notification to EPA. If you do not have a pre-addressed mailing label, mail your notification to the EPA Regional Office that serves the area where your hazardous waste activity is located. The mailing address for the EPA Regional Office for the Denver Area is:

Colorado

EPA Region VIII
8AM-WM
1860 Lincoln Street
Denver, CO 80295

Please print or type with ELITE type (12 characters/inch) in the unshaded areas only.



U.S. ENVIRONMENTAL PROTECTION AGENCY
NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

INSTRUCTIONS: If you received a preprinted label, affix it in the space at left. If any of the information on the label is incorrect, draw a line through it and supply the correct information in the appropriate section below. If the label is complete and correct, leave Items I, II, and III below blank. If you did not receive a preprinted label, complete all items. "Installation" means a single site where hazardous waste is generated, treated, stored and/or disposed of, or a transporter's principal place of business. Please refer to the INSTRUCTIONS FOR FILING NOTIFICATION before completing this form. The information requested herein is required by law (Section 3010 of the Resource Conservation and Recovery Act).

INSTALLATION'S EPA I.D. NO.

I. NAME OF INSTALLATION

II. INSTALLATION MAILING ADDRESS

III. LOCATION OF INSTALLATION

PLEASE PLACE LABEL IN THIS SPACE

FOR OFFICIAL USE ONLY

COMMENTS

INSTALLATION'S EPA I.D. NUMBER										APPROVED		DATE RECEIVED (yr., mo., & day)		

I. NAME OF INSTALLATION

II. INSTALLATION MAILING ADDRESS

STREET OR P.O. BOX

CITY OR TOWN										ST.		ZIP CODE		

III. LOCATION OF INSTALLATION

STREET OR ROUTE NUMBER

CITY OR TOWN										ST.		ZIP CODE		

IV. INSTALLATION CONTACT

NAME AND TITLE (last, first, & job title)										PHONE NO. (area code & no.)				

V. OWNERSHIP

A. NAME OF INSTALLATION'S LEGAL OWNER

VI. TYPE OF HAZARDOUS WASTE ACTIVITY (enter "X" in the appropriate box(es))

B. TYPE OF OWNERSHIP (enter the appropriate letter into box) F = FEDERAL M = NON-FEDERAL		<input type="checkbox"/> A. GENERATION		<input type="checkbox"/> B. TRANSPORTATION (complete item VII)	
		<input type="checkbox"/> C. TREAT/STORE/DISPOSE		<input type="checkbox"/> D. UNDERGROUND INJECTION	

VII. MODE OF TRANSPORTATION (transporters only - enter "X" in the appropriate box(es))

<input type="checkbox"/> A. AIR	<input type="checkbox"/> B. RAIL	<input type="checkbox"/> C. HIGHWAY	<input type="checkbox"/> D. WATER	<input type="checkbox"/> E. OTHER (specify):
--	---	--	--	---

VIII. FIRST OR SUBSEQUENT NOTIFICATION

Mark "X" in the appropriate box to indicate whether this is your installation's first notification of hazardous waste activity or a subsequent notification. If this is not your first notification, enter your Installation's EPA I.D. Number in the space provided below.

<input type="checkbox"/> A. FIRST NOTIFICATION	<input type="checkbox"/> B. SUBSEQUENT NOTIFICATION (complete item C)	C. INSTALLATION'S EPA I.D. NO. _____
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IX. DESCRIPTION OF HAZARDOUS WASTES

Please go to the reverse of this form and provide the requested information.

I.D. - FOR OFFICIAL USE ONLY													
5												T/A C	
W												1	
1	2										13	14	15

IX. DESCRIPTION OF HAZARDOUS WASTES (continued from front)

A. HAZARDOUS WASTES FROM NON-SPECIFIC SOURCES. Enter the four-digit number from 40 CFR Part 261.31 for each listed hazardous waste from non-specific sources your installation handles. Use additional sheets if necessary.

1	2	3	4	5	6
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26
7	8	9	10	11	12
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26

B. HAZARDOUS WASTES FROM SPECIFIC SOURCES. Enter the four-digit number from 40 CFR Part 261.32 for each listed hazardous waste from specific industrial sources your installation handles. Use additional sheets if necessary.

13	14	15	16	17	18
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26
19	20	21	22	23	24
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26
25	26	27	28	29	30
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26

C. COMMERCIAL CHEMICAL PRODUCT HAZARDOUS WASTES. Enter the four-digit number from 40 CFR Part 261.33 for each chemical substance your installation handles which may be a hazardous waste. Use additional sheets if necessary.

31	32	33	34	35	36
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26
37	38	39	40	41	42
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26
43	44	45	46	47	48
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26

D. LISTED INFECTIOUS WASTES. Enter the four-digit number from 40 CFR Part 261.34 for each listed hazardous waste from hospitals, veterinary hospitals, medical and research laboratories your installation handles. Use additional sheets if necessary.

49	50	51	52	53	54
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26

E. CHARACTERISTICS OF NON-LISTED HAZARDOUS WASTES. Mark "X" in the boxes corresponding to the characteristics of non-listed hazardous wastes your installation handles. (See 40 CFR Parts 261.2 - 261.24.)

1. IGNITABLE (D001)

2. CORROSIVE (D002)

3. REACTIVE (D003)

4. TOXIC (D000)

X. CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

SIGNATURE

NAME & OFFICIAL TITLE (type or print)

DATE SIGNED

Please print or type with ELITE type (12 characters/inch) in the unshaded areas only.



U.S. ENVIRONMENTAL PROTECTION AGENCY
NOTIFICATION OF HAZARDOUS WASTE ACTIVITY

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INSTALLATION'S EPA I.D. NO.
I. NAME OF INSTALLATION
II. INSTALLATION MAILING ADDRESS
III. LOCATION OF INSTALLATION

PLEASE PLACE LABEL IN THIS SPACE

FOR OFFICIAL USE ONLY

COMMENTS

C	
---	--

INSTALLATION'S EPA I.D. NUMBER	APPROVED	DATE RECEIVED (yr., mo., & day)
F		

I. NAME OF INSTALLATION

--

II. INSTALLATION MAILING ADDRESS

STREET OR P.O. BOX	
C	
3	
CITY OR TOWN	
C	
4	
ST. ZIP CODE	
C	
5	

III. LOCATION OF INSTALLATION

STREET OR ROUTE NUMBER	
C	
5	
CITY OR TOWN	
C	
6	
ST. ZIP CODE	
C	
7	

IV. INSTALLATION CONTACT

NAME AND TITLE (last, first, & job title)	PHONE NO. (area code & no.)
C	
2	

V. OWNERSHIP

A. NAME OF INSTALLATION'S LEGAL OWNER	
C	
8	

B. TYPE OF OWNERSHIP (enter the appropriate letter into box)

F = FEDERAL
M = NON-FEDERAL

VI. TYPE OF HAZARDOUS WASTE ACTIVITY (enter "X" in the appropriate box(es))

<input type="checkbox"/> A. GENERATION	<input type="checkbox"/> B. TRANSPORTATION (complete item VII)
<input type="checkbox"/> C. TREAT/STORE/DISPOSE	<input type="checkbox"/> D. UNDERGROUND INJECTION

VII. MODE OF TRANSPORTATION (transporters only - enter "X" in the appropriate box(es))

<input type="checkbox"/> A. AIR	<input type="checkbox"/> B. RAIL	<input type="checkbox"/> C. HIGHWAY	<input type="checkbox"/> D. WATER	<input type="checkbox"/> E. OTHER (specify):
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VIII. FIRST OR SUBSEQUENT NOTIFICATION

Mark "X" in the appropriate box to indicate whether this is your installation's first notification of hazardous waste activity or a subsequent notification. If this is not your first notification, enter your Installation's EPA I.D. Number in the space provided below.

<input type="checkbox"/> A. FIRST NOTIFICATION	<input type="checkbox"/> B. SUBSEQUENT NOTIFICATION (complete item C)
--	---

C. INSTALLATION'S EPA I.D. NO.

IX. DESCRIPTION OF HAZARDOUS WASTES

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I.D. - FOR OFFICIAL USE ONLY														
5												T/A	C	
W														
1	2											23	14	13

IX. DESCRIPTION OF HAZARDOUS WASTES (continued from front)

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7	8	9	10	11	12
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23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26
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25	26	27	28	29	30
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26

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31	32	33	34	35	36
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26
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43	44	45	46	47	48
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26

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49	50	51	52	53	54
23 - 26	23 - 26	23 - 26	23 - 26	23 - 26	23 - 26

E. CHARACTERISTICS OF NON-LISTED HAZARDOUS WASTES. Mark "X" in the boxes corresponding to the characteristics of non-listed hazardous wastes your installation handles. (See 40 CFR Parts 261.21 - 261.24.)

1. IGNITABLE (D001)
 2. CORROSIVE (D002)
 3. REACTIVE (D003)
 4. TOXIC (D000)

X. CERTIFICATION

I certify under penalty of law that I have personally examined and am familiar with the information submitted in this and all attached documents, and that based on my inquiry of those individuals immediately responsible for obtaining the information, I believe that the submitted information is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment.

SIGNATURE	NAME & OFFICIAL TITLE (type or print)	DATE SIGNED

GUIDELINES FOR THE REVIEW OF SOLID WASTE DISPOSAL FACILITIES

**GUIDELINES FOR THE REVIEW OF SOLID WASTE DISPOSAL
FACILITIES**

A Certificate of Designation is required before an applicant can dispose of any solid waste (as defined in the Solid Waste Act: 30-20-101 (6)) on any site. The following guidelines suggest the minimum technical information usually required for review by the Division of Radiation and Hazardous Waste Control.

- I. Alternative sites' feasibility
- II. Size and expected life of site
- III. Feasibility of resource recovery - technical and economic
- IV. Describe projected site use after closure
- V. Engineering geologic data (requires exploratory borings or trenches)
 - A. It is recommended that the following data be evaluated to a depth of ten feet beneath the deepest natural or excavated surface on site.
 - B. Unconsolidated overburden materials
 1. Soils classification - Unified Soils Classification System.
 2. Soil thickness and areal extent
 3. Pertinent engineering properties: grain size distribution, atterburg limits, moisture density and compaction characteristics, permeability, etc.
 4. Estimated volumes available for cover or liner material.
 - C. Bedrock Materials
 1. Rock type, strike, dip and thickness of bedding, joint or fracture size and spacing, fracture filling material, permeability, rippability, etc.
 2. Estimated volumes available for liner or cover material.
 - D. Geologic hazards on or adjacent to the site such as:
 1. rockfall, landslide or debris and mudflow hazards
 2. slope stability
 3. faulting and folding
 4. erosion potential
 5. mine subsidence

VI. Engineering Hydrologic Data

A. Surface waters

1. Proximate lakes, rivers, streams, springs or bogs.
2. Site location in relation to 100 year floodplain.
3. Size and slope of contributing drainage basins.
4. Design of diversion and catchment structures for a 25 year, 24 hour precipitation event.
5. Impoundment of contaminated runoff.
6. Background surface water samples.

B. Groundwaters

1. Depth to groundwater - seasonal variations.
2. Wells within one mile radius of site: depth of well, depth to water, yield, use, casing intervals.
3. Nearest points of groundwater discharge.
4. Background groundwater samples, as necessary.
5. Major aquifers beneath site.

C. Surface and groundwater monitoring; plans for leachate collection and treatment.

VII. Operational Data for Solid Waste Disposal

A. Landfills

1. Location and construction details for access roads.
2. Plans for waste recycling, as applicable.
3. Names of persons in charge of site; having authority to take corrective action.
4. Slope of fill surface must divert runoff from working face.
5. Refuse cell size, type of construction, location and arrangement.
6. Amount of cover and frequency of application to working face.
7. Direction of prevailing winds: maximum and average velocities.
8. Provisions for retrieval of windblown debris, on and off the site.

9. Equipment and manpower retained on site.
 10. Compactive effort to be applied to refuse and cover material.
 11. Types of waste received and their segregation.
 12. Provisions to ventilate methane gas from completed landfill.
 13. Measures to prevent or contain insect and rodent infestations.
 14. Measures and equipment to extinguish or prevent fires.
 15. Hours of operation.
 16. Final fill surface contours.
 17. Thickness and compaction of final cover.
 18. Provisions for maintenance after closure
 19. Program of records keeping.
- B. Potentially toxic industrial or mining solid waste disposal sites.
1. All previously listed criteria, as applicable.
 2. Chemical concentrations of processing and waste solvents.
 3. Chemical concentrations of solid waste.
 4. Engineering designs for diversion structures, dams, liners, dikes, tailings or dump sites.
 5. Engineering designs for holding ponds containing solvents and solutions.
 6. Plans for ground and surface water monitoring and long term site maintenance.
 7. Ultimate disposal of solid waste-recycling plans if applicable.

These criteria are applied on a site-to-site basis in the review process. Applications containing this information will be reviewed more quickly and efficiently. Four copies should be provided to this Division for review.

SOLID WASTES DISPOSAL SITES AND FACILITIES

Solid Wastes Disposal Sites and Facilities
Title 30, Article 20 - Part I
Colorado Department of Health

30-20-101. DEFINITIONS

- (1) "Person" means an individual, partnership, private or municipal corporation, firm or other association of persons.
- (2) "Recycling operation" means that part of a solid wastes disposal facility or a part of a general disposal facility at which recyclable materials may be separated from other materials for further processing.
- (3) "Solid Wastes" means garbage, refuse, sludge, or sewage disposal plants, and other discarded solid materials, including solid waste materials resulting from industrial, commercial, and community activities but does not include agricultural wastes.
- (4) "Solid wastes disposal" means the collection, storage, treatment, utilization, processing, or final disposal of solid wastes.
- (5) "Solid wastes disposal site and facility" which means the location and facility at which the deposit and final treatment of solid wastes occur.
- (6) "Transfer station" means a facility at which refuse, awaiting transportation to a disposal site, is transferred from one type of collection vehicle and placed into another.

30-20-102. UNLAWFUL TO OPERATE SITE AND FACILITY WITHOUT CERTIFICATE OF DESIGNATION EXCEPTION. (1) Except as provided in subsection (2) of this section, it is unlawful for any person to operate a solid wastes disposal site and facility in the unincorporated portion of any county without first having obtained therefore a certificate of designation from the board of county commissioners of the county in which such site and facility is located.

30-20-103. APPLICATION FOR CERTIFICATE. Any person desiring to operate a solid wastes disposal site and facility within the unincorporated portion of any county shall make application to the board of county commissioners of the county

in which such site and facility is or is proposed to be located for a certificate of designation. Such application shall be accompanied by a fee of twenty-five dollars which shall not be refundable, and it shall set forth the location of the site and facility; the type of site and facility; the type of processing to be used, such as sanitary landfill, composting, or incineration; the hours of operation; the method of supervision; the rates to be charged, if any; and such other information as may be required by the board of county commissioners. The application shall also contain such engineering, geological, hydrological, and operational data as may be required by the department by regulation. The application shall be referred to the department for review and for recommendation as to approval or disapproval, which shall be based upon criteria established by the state board of health, the water quality control commission, and the air quality control commission.

30-20-104.

FACTORS TO BE CONSIDERED. (1) In considering an application for a certificate of designation, the board of county commissioners shall take into account:

- (a) The effect that the solid wastes disposal site and facility will have on the surrounding property, taking into consideration the types of processing to be used, surrounding property uses and values, and wind and climatic conditions;
- (2) Prior to the issuance of a certificate of designation, the board of county commissioners shall require that the report which shall be submitted by the applicant under section 30-20-103 be reviewed and a recommendation as to approval or disapproval made by the department and shall be satisfied that the proposed solid wastes disposal site and facility conforms to the comprehensive county land use plan, if any. The

application, report of the department, comprehensive land use plan, and other pertinent information shall be presented to the board of county commissioners at a public hearing to be held after notice. Such notice shall contain the time and place of the hearing and shall state that the matter to be considered is the applicant's proposal for a solid waste disposal site and facility. The notice shall be published in a newspaper having general circulation in the county in which the proposed solid wastes disposal site and facility is located at least ten but not more than thirty days prior to the date of the hearing.

- 30-20-105. CERTIFICATE. If the board of county commissioners deems that a certificate of designation should be granted to the applicant, it shall issue the certificate, and such certificate shall be displayed in a prominent place at the site and facility.
- 30-20-106. PRIVATE DISPOSAL PROHIBITED - WHEN. No private dumping of solid wastes shall be made on any property within the unincorporated portion of any county except on or at an approved site and facility.
- 30-20-110. MINIMUM STANDARDS. (1) The rules and regulations promulgated by the department shall, subject to the provisions of section 30-20-106, contain the following minimum standards:
- (a) Such sites and facilities shall be located, operated, and maintained in a manner so as to control obnoxious odors and prevent rodent and insect breeding and infestation, and they shall be kept adequately covered during their use.
 - (b) Such sites and facilities shall comply with the health laws, standards, rules, and regulations of the department, the water quality control commission, and all applicable zoning laws and ordinances.

(c) A site and facility operated as a sanitary land-fill shall provide means of finally disposing of solid wastes on land in a manner to minimize nuisance conditions such as odors, windblown debris, insects, rodents, and smoke; and shall provide compacted fill material; shall provide adequate cover with suitable material and surface drainage designed to prevent ponding and water and wind erosion and prevent water and air pollution; and, upon being filled, shall be left in a condition of orderliness and good esthetic appearance and capable of blending with the surrounding area. In the operation of such a site and facility, the solid wastes shall be distributed in the smallest area consistent with handling traffic to be unloaded; shall be placed in the most dense volume practicable using moisture and compaction or other method approved by the department; shall be fire, insect, and rodent resistant through the application of an adequate layer of inert material at regular intervals, and shall have a minimum of windblown debris which shall be collected regularly and placed into the fill.

(d) Sites and facilities shall be adequately fenced so as to prevent waste material and debris from escaping therefrom, and material and debris shall not be allowed to accumulate along the fence line.

30-20-112.

REVOCATION OF CERTIFICATE. The board of county commissioners, after reasonable notice and public hearing, shall temporarily suspend or revoke a certificate of designation that has been granted by it for failure of a site and facility to comply with all applicable laws, resolutions, and ordinances or to comply with the provisions of this part 1 or any rule or regulation adopted pursuant thereto.

30-20-113.

FACILITIES DEEMED PUBLIC NUISANCE - WHEN. Any solid wastes disposal site and facility found to be abandoned or that is operated or maintained in a manner so as to violate any of the provisions of this part 1 or any rule or regulation adopted pursuant thereto shall be deemed a public nuisance, and such violation may be enjoined by a district court of competent jurisdiction in any action brought by the department, the board of county commissioners of the county wherein the violation occurred, or the governing body of the municipality wherein the violation occurred.

30-20-114.

VIOLATION - PENALTY. Any person who violates any provisions of this part 1 is guilty of a misdemeanor and, upon conviction thereof, shall be punished by a fine of one hundred dollars, or by imprisonment in the county jail for not more than thirty days, or by both such fine and imprisonment. Nothing in this part 1 shall preclude or preempt a city, a city and county, or an incorporated town from enforcement of its local ordinances. Each day of violation shall be deemed a separate offense under this section.

REGULATIONS: SOLID WASTES DISPOSAL SITES AND FACILITIES

Regulations: Solid Wastes Disposal Sites and Facilities
Adopted: February 16, 1972
Effective: April 1, 1972
Colorado Department of Health

Section 4. ENGINEERING REPORT DESIGN CRITERIA

- a. The design of a solid waste disposal facility hereinafter designated shall be such as to protect surface and subsurface waters from contamination. Surface water from outside the immediate working area of the disposal site shall not be allowed to flow into or through the active disposal area. The design shall provide for the deflection of rain or melting snow away from the active area where wastes are being deposited. As filling continues to completion, the surface shall be sloped so that water is diverted away from the area where refuse has been or is being deposited. The design shall include methods of keeping groundwater out of the area where refuse is deposited.
- b. The site shall be designed to protect the quality of water available in nearby wells. The necessary distance from the wells is dependent in part on the direction of flow of groundwater under the site and the means used in the design to prevent precipitation falling on the site from reaching the aquifer in question. Soil characteristics. The soil used for covering of landfill type operations shall have enough adhesive characteristics to permit a workable earth cover.
- c. The location of the solid waste site and facility should provide for convenient access from solid waste generation centers.
- d. The access routes shall be designed so as to permit the orderly and efficient flow of traffic to and from the site as well as on the site.

- e. Solid wastes deposited at disposal sites and facilities shall be compacted prior to covering. Use of moisture or change of particle size to aid in compaction is recommended.
- f. The design shall contemplate the location and construction of the disposal site and facility in such a manner as will eliminate the scattering of windblown debris. All solid wastes discharged at the site shall be confined to the site and any material escaping from the active discharge area shall be promptly retrieved and placed in the active discharge area.
- g. Final Closure. Prior to closing a solid waste disposal site except for cause as set forth in Section 36-23-13 CRS as amended*, the final cover of the deposited solid wastes shall be graded to the elevations which shall be shown in the initial design. The cover shall be of such thickness and material as will prevent the entrance or emergence of insects, rodents, or odors. Such closure elevations shall be such as will provide for the diversion of rainfall and runoff away from the fill area.
- h. A plan and method for protecting solid wastes disposal sites and facilities against damage from floods shall be a part of the engineering design.

Section 6.

OPERATION OF A SOLID WASTE DISPOSAL FACILITY

An operational plan for placing into operation the engineering design for the disposal site and facility is required. Such a plan shall include the following information:

- a. The name or titles of the person or persons who will be in charge of the disposal site and facility. Such name(s) shall be of person(s) having the responsibility for the operation as well as the authority to take all corrective action necessary to comply with the requirements of this Department.

- b. The list of equipment to be used at the disposal site.
- c. The hours of operation of the site.
- d. The frequency of cover of the deposited wastes.
- e. A contingency plan for eradication of rodents and insects.
- f. Procedures for implementing other aspects of the design.

Section 7.

RESTRICTIONS OF OPERATIONS, CLOSING SITES

If a person having a site officially designated wishes to close the site for any reason, he shall inform the county commissioners at least 60 days in advance of such closing and shall post a sign, readable from the seat of an entering motor vehicle, informing the public of his intent to close such site. Such site shall be considered officially closed upon receipt of an official notice from the county commissioners, provided such closing date shall be at least 60 days after the notice to the county commissioners and the posting as above set forth. Upon closing of the site, the owner shall post a notice that the site is closed and shall take reasonable precautions to prevent the further use of such site.

Section 8.

NOTIFICATION OF VIOLATIONS OF AN APPROVED ENGINEERING DESIGN REPORT

- a. Whenever the Department determines that a solid waste disposal site is not being operated substantially in accordance with the criteria provided in the Engineering Design Report or these regulations, the operator shall be informed of the nature of the alleged violation by certified mail and within ten days from and after receipt of the letter of citation, he may request a variance from the Engineering Design Report by making Written application to the Department stating the grounds for such request.

- b. The Department shall either approve such request or schedule the matter for an administrative hearing. If the operator fails to request a variance, or the Department refuses to grant a variance after the hearing, the operator shall be deemed to be in violation of the law and these regulations and the "Certificate of Designation" shall be subject to suspension, revocation or injunction.

AIR POLLUTION EMISSION NOTICE/PERMITS

Air Pollution Control Division

Air Pollution Emissions Notice - No apparent requirement for such a permit at RMA - BASIN F

Fugitive Dust: Released into air by natural forces or by milling etc. pg 0.12

Fugitive Dust: Opacity regulation - Unenclosed Operations Exceptions:

1. Unpaved roads, parking areas
2. Earth and Construction - material moving and excavating activity
3. Demolition, wrecking . . .

**Unpaved Roads and Unpaved Parking Areas pg 1.15 a-1. No person shall construct or operate a new unpaved road or new unpaved parking area unless a permit therefor has been granted by the Division pursuant to Section II, D.8.

Exception: Less than daily traffic of 165 vehicles.

Division may require traffic count to be submitted for unpaved roads. 165 vehicles per day averaged over any three day period is the key to traffic requirements.

Earth and Construction - Material Moving and Excavating. The working surface for the basin, chemical sewer and borrow area exceeds 160 acres. A permit is required, and abatement and preventive measures must be implemented Section II.D.9 pg. 1.20. A permit pursuant to Section II D.8 is required prior to ground breaking.

RMA is located in the Denver - Metro State Air Pollution Control Area.

Regulation Requiring An Air Contaminant Emissions Notice - Not required for Basin F.

Emission Permits Required

Applicant may request a planning meeting to discuss requirements associated with submission of a permit application.

Page 3.3

All earth moving, grading, or site preparation activities of a total size of twenty-five (25) acres or less, are exempt from requirement for an Emission Permit. The RMA Basin F project has an area in excess of 25 acres, therefore, permit required.

Permit Review Procedure

1. Division will review permit application for completeness and will advise applicant within 15 days of submittal. If the Division does not so advise, then permit shall be considered complete.
2. Within 20 days following a complete application has been filed, the Division shall prepare and make available a preliminary analysis of the effect of the proposed source on ambient air quality and the adequacy of emission control. Applicant will be provided a copy of analysis postmarked no later than 30 days after a complete application has been filed.
3. Public Notice - this does not appear to be required for North Boundary Project.
4. Within 15 days after preliminary analysis the Division will either accept or reject application.
5. Applicant has 20 days in which to respond to permit conditions imposed by the Division. Must be in writing. Refusal to accept condition shall be deemed a denial of the permit application.
6. Applicant has 60 days following written denial to request a conference with the Commission or a hearing before the Commission.
7. The Commission has 30 days to finalize permit status following applicants' conference/hearing. If applicant requested a conference and it proves unsatisfactory, he has 10 days in which to request a hearing.

Final Permit Approval

1. Applicant must give 15 days notice prior to commencing work - portable source.
2. Commission will visit site within 30 days to determine whether or not operating terms are being met.

Fees

1. Must be paid within 30 days from request.
2. Filing Fee \$40.00
3. Fee assessed to cover costs - Division will partially determine fee at the time it issues preliminary analysis. Not to exceed \$15,000 for a contiguous plant site.

ENDANGERED SPECIES ACT OF 1973

Endangered Species Act of 1973
As amended through 1978
Fish & Wildlife Service
Department of the Interior
Mr. Wayne J. Wathen

"Critical habitat":

(5) (A) The term "critical habitat" for a threatened or endangered species means -

(i) the specific areas within the geographical area occupied by the species, at the time it is listed in accordance with the provisions of section 4 of this Act, on which are found those physical or biological features (I) essential to the conservation of the species and (II) which may require special management considerations or protection; and

(ii) specific areas outside the geographical area occupied by the species at the time it is listed in accordance with the provisions of section 4 of this Act, upon a determination by the Secretary that such areas are essential for the conservation of the species.

(B) Critical habitat may be established for those species now listed as threatened or endangered species for which no critical habitat has heretofore been established as set forth in subparagraph (A) of this paragraph.

(C) Except in those circumstances determined by the Secretary, critical habitat shall not include the entire geographical area which can be occupied by the threatened or endangered species.

"Consultation": Sec. 7(a)

Each Federal agency shall, in consultation with and with assistance of the Secretary (Interior or Commerce), insure that any action authorized, funded, or carried out by such agency does not jeopardize the continued existence of any endangered species . . . or result in the destruction or adverse modification of habitat which is determined by the Secretary, after consultation as appropriate with the affected States, to be critical, unless an exemption has been granted.

Consultation shall be concluded within 90 days after the date on which initiated or within such other period of time is mutually agreeable to the Federal Agency and the Secretary.

Promptly after consultation, Secretary will issue a written opinion.

Sec. 7(c)

Federal agency with respect to action for which no construction has begun on date of Acts enactment shall request of Secretary information re. species on list or proposed to be on list which may be in area of proposal action. If Secretary says species may be present, then agency must conduct biological assessment for purposes of identifying any endangered species or threatened species. Assessment shall be completed within 180 days of initiation after date of initiation or mutually agreed upon time period and before any contract for construction is entered into or before construction is begun. Such assessment may be done as part of Federal Agency's compliance with Section 102 of the National Environmental Policy Act of 1969 (42U.S.C.4332).

Sec. 7(f)

Applications: Applications for an exemption for agency action follows

Secretary's opinion.

Application for exemption shall be submitted not later than 90 days after completion of consultation process to the Secretary. Sets forth reasons for exemption.

Review board has 60 days after its appointment or a mutually agreed upon time between Secretary and applicant to make a determination re. exemption application. If an irresolvable conflict exists, board has 180 days in which to submit a report to Committee.

Committee shall make determination on exemption within 90 days of receiving report from review board.

Sec. 7(k)

Special Provisions: An exemption decision by committee shall not be a major Federal Action provided an EIS discussing impact on endangered or threatened species or critical habitat shall have been prepared with respect to Agency action exempted by such order.

Provisions in Act for Judicial Review.