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DIVISION OF
OIL, GAS & MINING

SURFACE DRAINAGE FOR DES-BEE MINE

INTRODUCTION

In response to the Notice of Area of Concern (NAOC 81-4-4) received in regards to erosion occurring on the down slope between the upper coal stockpile pad and the tipple pad, the following solution is presented which will completely and adequately rectify the problem.

A system of catch basins, culverts, and ditches will be used to collect the surface runoff before it reaches the point where erosion has taken place, and convey this water in pipes to a discharge point where it can flow freely without causing erosion.

SURFACE RUNOFF QUANTITY

The areas which contribute runoff that is of concern are shown on UP&L map CM-10391-DS (Attached). The areas were scaled and found to be 0.9 and 9.0 acres for areas I and II, respectively. A subsequent check by planimeter resulted in the same values.

A runoff curve number was selected for the drainage basin based on criteria found on Table 2.20, Page 68, Chapter Two of Hydrology And Sedimentology Of Surface Mined Lands by C.T. Haan and B.J. Barfield (Appendix I).

The CN used was 85, which was assumed adequate for the steep slopes and sparsely vegetated lands in the drainage area.

The design precipitation was a 10 year, 24 hour storm which would yield 2.2 inches at the Des-Bee Mine Portals, according to U.S. Weather Bureau Isohyetal Map Of Utah (Appendix II).

The peak discharge rate was determined by using a relationship between drainage area, curve number, precipitation, and peak discharge developed by the Soil Conservation Service for small watersheds (SCS STD. DWG. NO. ES-1027, Sheet 20 - Appendix III).

The total discharge for the combined areas I and II was found to be 12.5 cubic feet per second.

CULVERT DESIGN

A minimum slope of 1% will be used to carry the runoff underneath roads and under the coal stockpile. Using the Manning Equation $Q - \frac{1.49}{N} AR^{2/3} S^{1/2}$ and a variable value of N for different diameters of corrugated pipe, the minimum diameter required to convey 12.5 cfs was found to be 24 inches. (Mannings N = 0.016).

The capacity of the 24 inch CMP flowing full at a 1% slope is 18.4 cfs which is greater than the design flow of 12.5 cfs. The velocity of the water in the pipe should be kept above 5 feet per second to avoid deposition of soil and gravel in the pipes. The velocity may be determined from graphical relationships taken from the Concrete Pipe Design Manual, American Concrete Pipe Association (Appendix IV). Q/Q Full = 0.68, which corresponds to V/V Full = 1.07. The full flowing velocity for 24 inch diameter CMP with a slope of 1% is 5.85 fps, which yields an actual velocity of 6.26 fps for the design flow.

The facilities and structures designed to handle this design flow are shown on Drawing CS 576 D and CS 577 C, and CM-10391-DS.

Table 2.20 Runoff Curve Numbers for Selected Agricultural, Suburban, and Urban Land Use. (Antecedent Moisture Condition II).

LAND USE DESCRIPTION	HYDROLOGIC SOIL GROUP			
	A	B	C	D
Cultivated land[1]: without conservation treatment	72	81	88	91
: with conservation treatment	62	71	78	81
Pasture or range land: poor condition	68	79	86	89
good condition	39	61	74	80
Meadow: good condition	30	58	71	78
Wood or Forest land: thin stand, poor cover, no mulch	45	66	77	83
good cover[2]	25	55	70	77
Open Spaces, lawns, parks, golf courses, cemeteries, etc.				
good condition: grass cover on 75% or more of the area	39	61	74	80
fair condition: grass cover on 50% to 75% of the area	49	69	79	84
Commercial and business areas (85% impervious)	89	92	94	95
Industrial districts (72% impervious).	81	88	91	93
Residential:[3] Average lot size / Average % Impervious[4]				
1/8 acre or less — 65	77	85	90	92
1/4 acre — 38	61	75	83	87
1/3 acre — 30	57	72	81	86
1/2 acre — 25	54	70	80	85
1 acre — 20	51	68	79	84
Paved parking lots, roofs, driveways, etc.[5]	98	98	98	98
Streets and roads:				
paved with curbs and storm sewers[5]	98	98	98	98
gravel	76	85	89	91
dirt	72	82	87	89

USE 85

[1] For a more detailed description of agricultural land use curve numbers refer to National Engineering Handbook, Section 4, Hydrology, Chapter 9, Aug. 1972.

[2] Good cover is protected from grazing and litter and brush cover soil.

[3] Curve numbers are computed assuming the runoff from the house and driveway is directed towards the street with a minimum of roof water directed to lawns where additional infiltration could occur.

[4] The remaining pervious areas (lawn) are considered to be in good pasture condition for these curve numbers.

[5] In some warmer climates of the country a curve number of 95 may be used.

Table 2.22 Factors for Converting CN's to Antecedent C

Curve Number for Condition II	Factor to Convert Curv for Condition II Condition I
10	0.40
20	0.45
30	0.50
40	0.55
50	0.62
60	0.67
70	0.73
80	0.79
90	0.87
100	1.00

mate the accumulated rainfall excess as a function of total acc Figure 2.26 has been prepared to simplify the solution of equ numbers for complex areas can be calculated by a weighting p weighting factor being the proportion of the total area represente curve numbers.

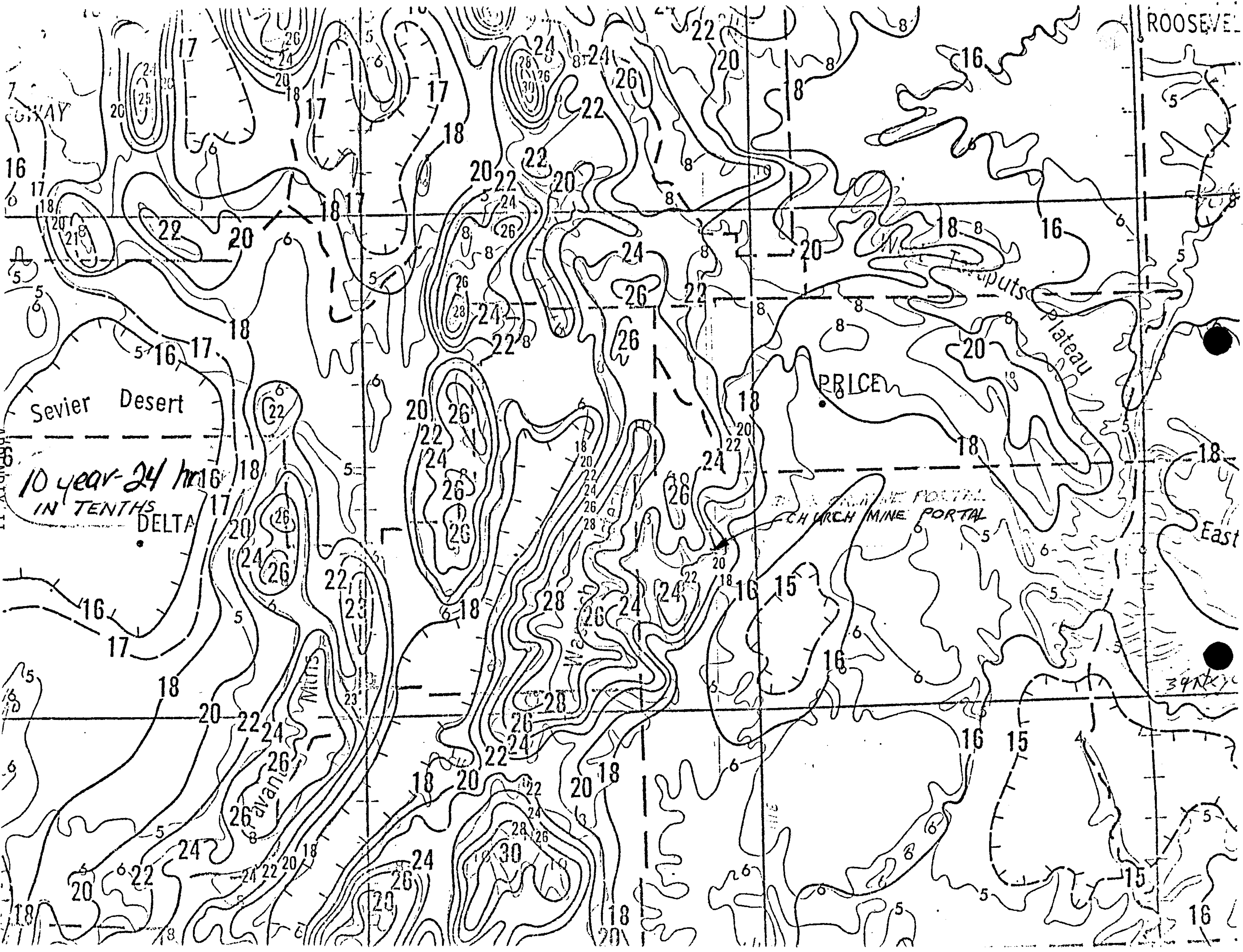
As an example of computing rainfall excess, assume the r 2.13 falls on a watershed that is 35 percent bare spoil in hydrologi has 35 percent of its remaining soils in hydrologic soil group C unde cent in hydrologic soil group B under forest. The appropriate CN lated by noting the spoil area has a CN of 91, the B soil has a CN of a CN of 77. Thus, the weighted CN is

$$CN = .35(91) + .35(77) + .30(58) = 77$$

In this example, it is assumed that the various soils are randomly a formly scattered throughout the watershed and an unknown ant exists. Considering that the 25-year, 3-hour rain is likely to be a part it is assumed that antecedent condition III applies. The CN of 77 antecedent condition of II so a conversion is required. Selecting the Table 2.22, the final CN is 1.16(77) or 89. Table 2.23 shows th quired to arrive at the effective rainfall pattern.

In some cases the weighting of infiltration indices whether i indices or some other index may be inappropriate. For instance, if the above example was connected directly to an efficient channel of the rainfall on this area would run off. The resulting total runo computed as 2.70 inches from the area with a CN of 1.06(91) = 96 area would have an average CN of

APPENDIX II


ROOSEVEL
Sevier Desert
10 year-24 hr
IN TENTHS
DELTA
PRICE
CHURCH MINE PORTAL
Plateau
East

PEAK RATES OF DISCHARGE FOR SMALL WATERSHEDS
TYPE II STORM DISTRIBUTION

SLOPES - STEEP
CURVE NUMBER - 85

24 HOUR RAINFALL FROM US WB TP-40

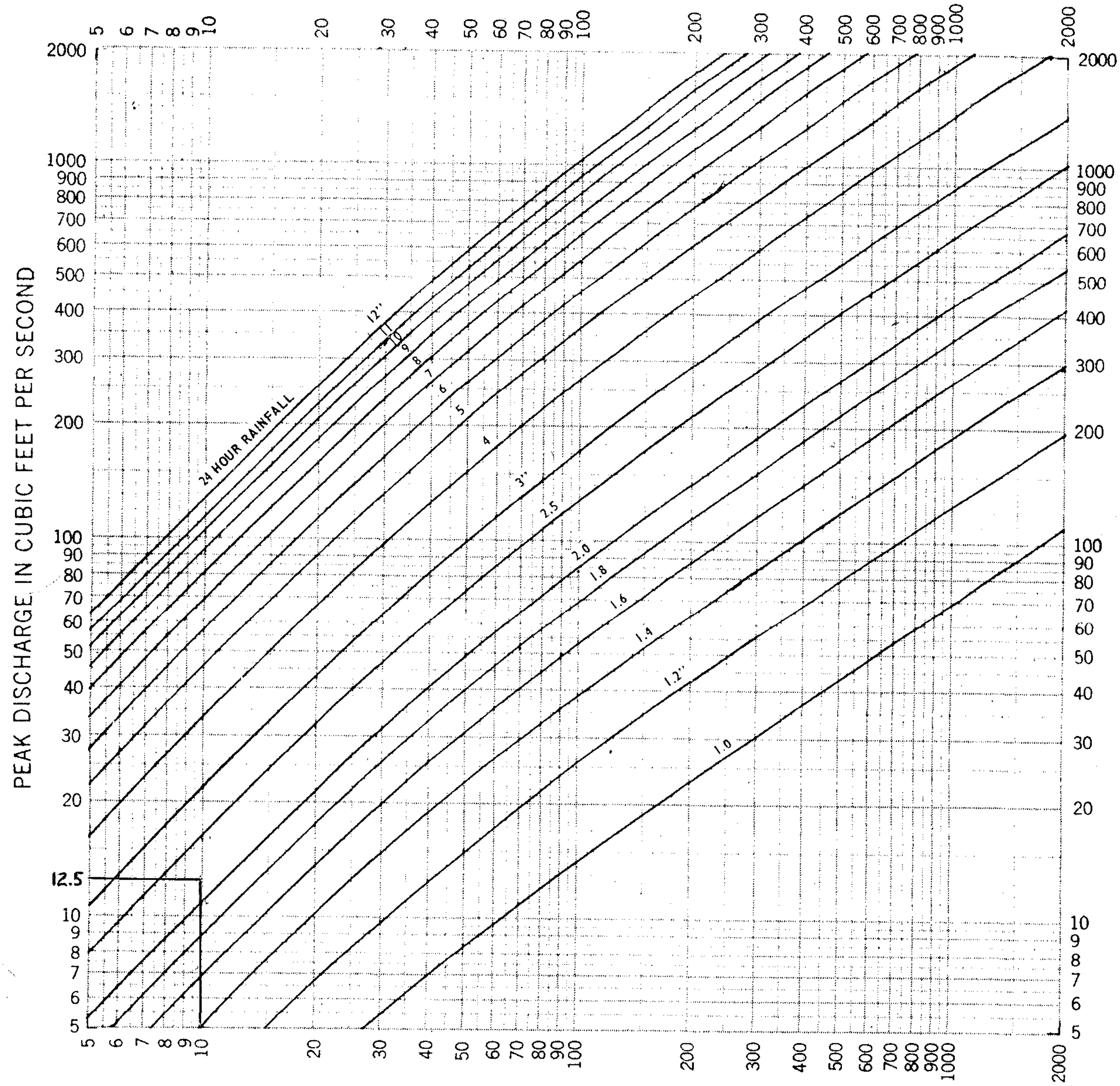


Exhibit 2-10

EFM Notice-4, 5/71

REFERENCE		STANDARD DWG. NO.
"Chapter 2, Engineering Field Manual for Conservation Practices"	U. S. DEPARTMENT OF AGRICULTURE SOIL CONSERVATION SERVICE ENGINEERING DIVISION - HYDROLOGY BRANCH	ES-1027 SHEET 20 OF 21 DATE 2-15-71

FLOWING FULL
QUATION n=0.013

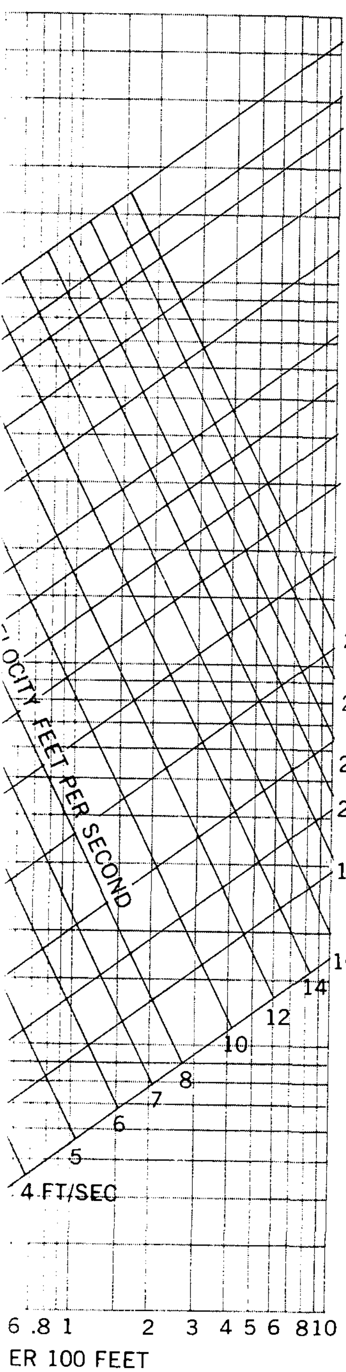
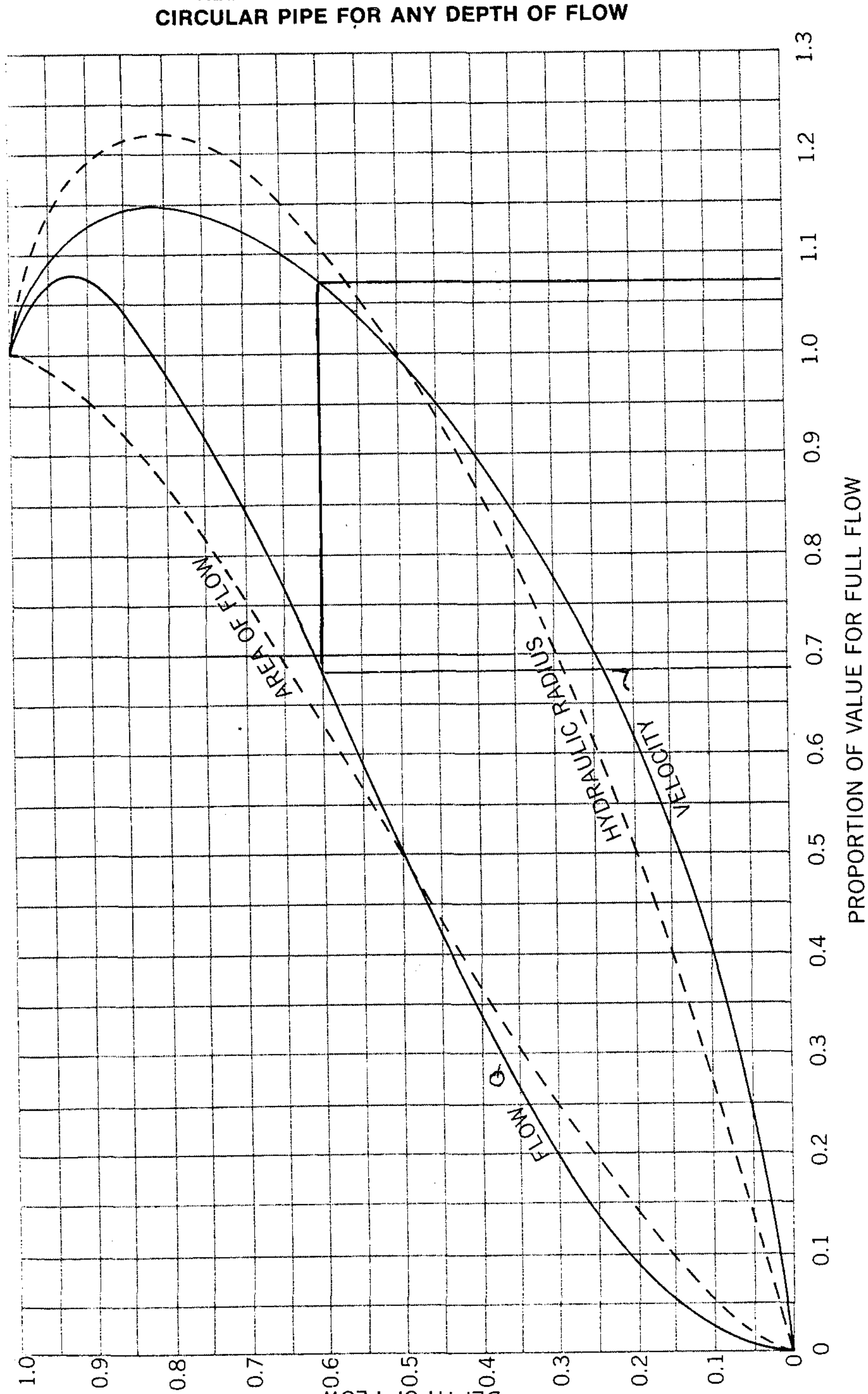


FIGURE 18

RELATIVE VELOCITY AND FLOW IN CIRCULAR PIPE FOR ANY DEPTH OF FLOW



COST ESTIMATE

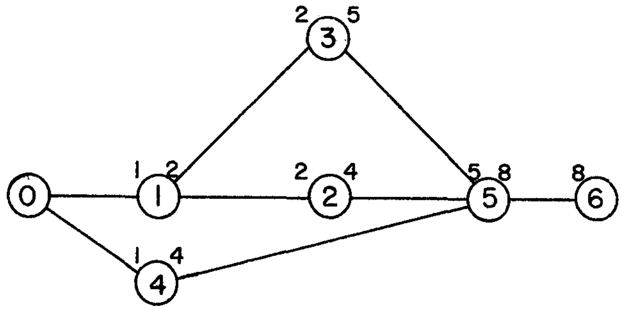
Materials	$ 7,616
Labor	$ 5,767
Equipment	$ 3,479
TOTAL	$16,862

WORK SCHEDULE

Excavation	3 Men & Equip.	3 Days	Crew 1
Form Work	3 Men	3 Days	Crew 2
Fabrication	3 Men	3 Days	Crew 2
Installation	3 Men & Equip.	3 Days	Crew 1
Transporting	1 Man	1 Day	
TOTAL		37 Mandays	

2 Three Man Crews

CRITICAL PATH NETWORK



	Duration	Early Start (Morning)	Early Finish (Morning)
0 - Begin Project			
1 - 1st Day Excavation	1	1	2
2 - 2nd & 3rd Day Excavation	2	2	4
3 - Form Work	3	2	5
4 - Fabrication	3	1	4
5 - Installation	3	5	8
6 - Completion	-	-	8

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