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SCANNED
Carmen Johnson 3/10/15

GREENE COUNTY LANDFILL CLOSURE SNOW HILL, NC G93026

NORTH CAROLINA PROFESSIONAL SEAL 6 ... 1/14/93 ... D. WOODIE

July, 1993

Municipal Engineering Services Co., PA
Garner and Boone, NC

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GREENE COUNTY LANDFILL CLOSURE

GENERAL:

Greene County is currently operating a sanitary landfill, north of Snow Hill on S.R. 1239, under Permit #40-02. The County is financially responsible for the site. The names, addresses and phone numbers of the responsible individuals are as follows:

Financially Responsible Party:

Allen M. Hardison, County Manager
229 Kingold Blvd. Suite A
Snow Hill, N.C. 28580

Operator:

Jesse Tyndall, Public Works Supervisor
P.O. Box 543
Snow Hill, N.C. 28580

OPERATIONAL PROCEDURE:

This Closure plan includes the completion of existing areas to present requirements, as per the County's agreement with the Solid Waste Division.

The County will begin by clearing areas necessary to construct the riser basin and diversion ditches. Then construct the riser basin and ditches. This prevent any concentrated flows from creating erosion problems on completed slopes. Filling will then proceed as shown on the Development Plan sheet, in a manner that will prevent ponding of stormwater on the top of sanitary waste. All cover material will come the borrow site, shown on the plans, adjacent to the fill area. This site has an adequate amount of material to complete the closure. Each area will be filled with a series of lifts until the proposed elevations are attained with the placement of the final cover.

The placement of the final cover shall be done in sections. Tie-ins to previously placed cover shall be accomplished by scarifying the existing cover and re compacting with the new cover. This procedure will ensure that a tight bond has been created and crevicing will be prevented.

PROJECTED USE AFTER COMPLETION:

At this time, the County has no projected use for the landfill after completion.

GREENE COUNTY LIFE EXPECTANCY

Given:	
Trash intake	= 1,000 tons/mo.
Assume:	
Compaction rate	= 800#/cy
Trash:dirt ratio	= 2:1
Therfore:	
Yearly trash intake	= 1,000t.(2,000#/t.)(12mo.) = 24,000,000#/yr. ÷ 800#/cy = 30,000 cy
Landfill volume required / yr. (2:1 trash:dirt ratio)	= 30,000 cy (1.5) = 45,000 cy
* Total landfill volume available	= 174,018 cy
Life expectancy	= 174,000 cy ÷ 45,000 cy/yr. = 3.87 years
Cover material required	= 174,000 cy (0.33) = 57,426 cy
* Cover material available	= 88,004 cy

* Determined by using Softdesk AdCadd Earthworks computer program.

EROSION CONTROL

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DRAINAGE AREA	ACRES	SLOPE (%)
DD1	4.93	4
DD1A	4.50	1.2
DI1	.93	4
DI2	1.50	4
DD2	1.77	4
DD2A	2.03	10
DD2B	.32	33
DD2C	2.51	10
DD2D	.40	4
B1	6.38	6.7
B2	9.43	.38
B3	.25	4.3
B4	.49	4
B5	.59	.5
B6	.34	60
B7	.40	33
B8	.77	.5
	37.54	

NATIONAL 42-182 100 SHEETS Made in U.S.A.

C = < 2% = .17 C = avg. 2-7% = .22 C = > 7% = .35

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AREAS DRAINING INTO DIVERSION DITCH #1

		A		I		C
DD1	=	4.93 acs.	-	7.0 in/hr.	-	.22
DI1	=	.93 acs.	-	7.0 in/hr.	-	.22
DD1A	=	4.50 acs	-	7.0 in/hr.	-	.22
		10.36 acs.		7.0 in/hr.		.22

TC = 5 min.

$Q_{10} = CIA = (.22)(7.0)(10.36) = \boxed{15.95 (cfs)}$

AREAS DRAINING INTO DIVERSION DITCH #2

		A	I	C
DD2	-	1.77 acs.	7.0	.22
DD2A	-	2.03 acs	7.0	.35
DI2	-	1.50 acs	7.0	~~.35~~ .22
DD2B	-	.32 acs.	7.0	.35
DD2C	-	2.51 acs	7.0	.35
DD2D	-	.40 acs	7.0	.22
		8.53 acs.	7.0	$\boxed{.29}$ see below

FIND COMPOSITE C

20.75%	x	.22	=	4.57
23.79%	x	.35	=	8.33
17.58%	x	.22	=	3.87
3.75%	x	.35	=	1.31
29.43%	x	.35	=	10.30
4.70%	x	.22	=	1.03
				29.41

$\frac{29.41}{100} = .29$ ~~ou~~ composite C =

$Q_{10} = CIA = (.29)(7.0)(8.53) = \boxed{17.32 \text{ cfs}}$

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C = < 2% = .17 C = 2-7% = .22 C = > 7% = .35

AREAS DRAINING INTO BISER BASIN

	A	I	Cc
~~DIV DITCH~~	~~#1~~		
~~" "~~	~~#2~~	7.0	.20
B1	6.38		
B2	9.43		
B3	.25		
B4	.49		
B5	.59		
B6	.34		
B7	.40		
B8	.77		
	18.65		

$Q_{10} = CIA = (.20)(7.0)(18.65) = \boxed{26.11 \text{ cfs}}$

FIND COMPOSITE C

B1	34.21	x	.22	=	7.53
B2	50.56	x	.17	=	8.60
B3	1.34	x	.22	=	.29
B4	2.63	x	.22	=	.58
B5	3.16	x	.17	=	.54
B6	1.82	x	.35	=	.64
B7	2.14	x	.35	=	.75
B8	4.14	x	.17	=	.70
	100.00 %				19.63

$\frac{19.63}{100} = .20$ Composite C

AREAS TO BASIN: from DITCHES =

$\underset{\text{BASIN}}{26.11 \text{ cfs}} + \underset{\text{DIV. DITCH \#1}}{15.95 \text{ cfs}} + \underset{\text{DIV. DITCH \#2}}{17.32 \text{ cfs}} = \underset{\text{total}}{\boxed{59.38 \text{ cfs}}}$

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Q_{10} for Drop inlet #1

$C = .22$ $I = 7.0$ in/hr. $A = .93$ acs.

$Q_{10} = C\ I\ A$

$Q_{10} = (.22)(7.0)(.93) = \boxed{1.43 \text{ cfs}}$

I = found by using fig. 8.03a & 8.03c

Q_{10} for Drop inlet #2

$C = .22$ $I = 7.0$ $A = 1.50$

$Q_{10} = C\ I\ A$

$Q_{10} = (.22)(7.0)(1.50) = \boxed{2.31 \text{ cfs}}$

PIPE SIZING FOR DROP INLET # 1

$D = 16 \left[\frac{Qn}{\sqrt{S}}\right]^{3/8}$

$Q_{10} = 1.43$ cfs
$n = .018$
$S = .33$

USING ADS CORRUGATED POLYETHYLENE PIPE

$D = 16 \left[\frac{(1.43)(.018)}{\sqrt{.33}}\right]^{.375} = 4.99'' = \boxed{\text{USE 12" ADS CPP}}$

OUTLET PROTECTION

L = 14' W = 15' d_{50} = 6" THK. = 13.25" MIN. 119.0' LG.

PIPE SIZING FOR DROP INLET #2

$D = 16 \left[\frac{(2.31)(.018)}{\sqrt{.33}}\right]^{.375} =$

$Q_{10} = 2.31$ cfs
$n = .018$
$S = .33$

$5.98'' = \boxed{\text{USE 12" ADS - CPP}}$

OUTLET PROTECTION

L = 15' W = 16' d_{50} = 9" THK. = 13.25" MIN. 150' LG.

CONSTRUCT 6" CONCRETE COLLAR AROUND OUTLET END OF PIPES (ADS-CPP) SEE DETAIL SHEET

*ADS - CPP = Advanced Drainage Systems, Inc. - CORRUGATED POLYETHYLENE PIPE

NATIONAL 42-182 100 SHEETS Made in U.S.A.

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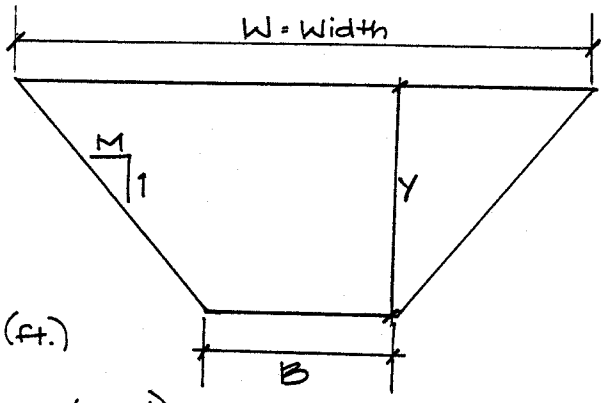
DESIGN DIVERSION DITCH #1



W = top width of channel (ft.)

B = bottom width of channel (ft.)

Y = depth of flow (ft.)

M = side slope (ft.hor./ft.vert)

$$Y = C_m \left[\frac{Q_n}{\sqrt{S}} \right]^{.375}$$

$C_m = 0.653$, $K = 0.325$ } TAKEN FROM CHART LABLED 'EXHIBIT 9' TYP.

$Q_{10} = 15.95$ cfs CALCULATED

$n = .030$ 6" RIP-RAP (EXHIBIT 8) TYP.

S = slope of ditch = .032

$M = 3$ (EXHIBIT 9 TYP.)

$$Y = 0.653 \left[\frac{(15.95)(.03)}{\sqrt{.032}} \right]^{.375}$$

$Y = .94 =$ **USE 1' depth**

$B = KY = (0.325)(.94) = .31'$ **USE .5' bottom width**

$$W = B + 2y\sqrt{1 + M^2}$$

$$W = .31 + 2(.94)\sqrt{1 + 3^2}$$

$W =$ **6.25' top width**

$$A = By + My^2 = (.31)(.94) + (3)(.94^2) = 2.94$$

$$V = \frac{Q}{A} = \frac{15.95 \text{ cfs}}{2.94} = 5.43 \text{ fps}$$

$V_{allowable} = 8.0$ fps (EXHIBIT 10 TYP.)

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DESIGN DIVERSION DITCH #2

USING SKETCH & DEFINITIONS & FORMULAS FROM PREVIOUS DITCH DESIGN.

$C_m = 0.653$
$K = 0.325$
$n = .030$ 6" RIP-RAP
$S = \cancel{.032}\ .02$
$Q_{10} = 17.32$ cfs
$M = 3$

$$y = C_m \left[\frac{Qn}{\sqrt{S}}\right]^{.375}$$

$$y = 0.653 \left[\frac{(17.32)(.03)}{\sqrt{.02}}\right]^{.375}$$

$y = 1.06'$ $\boxed{\text{USE } 1.25' \text{ depth}}$

$B = ky = (.325)(1.06') = .34'$ $\boxed{\text{USE } .5' \text{ bottom width}}$

$W = B + 2y\sqrt{1+M^2} = .34 + 2(1.25)\sqrt{10} = 8.24'$

$\boxed{\text{USE } 8.25' \text{ TOP WIDTH}}$

$A = By + My^2 = (.34)(1.06) + 3(1.06^2) = 3.73$

$V = \frac{Q}{A} = \frac{17.32}{3.73} = 4.64$ fps

$V_{allowable}$ for 6" RIP-RAP = 8.0 fps

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Design Riser Basin

Total Drainage Area = 37.54 Ac.
Volume Required = 37.54 Ac (1800 ft³/Ac.)
= ~~655~~ 67,572 ft³

SURFACE Area = (.01)(59.38) = .59 AC.

Use a 6' storage depth
∴ Bottom Area = 67572 ft³ ÷ 6' = 11262 ft²

Use a 2:1 l:w ratio
∴ Short side length = [11262 ft² ÷ 2]^½ = 75'

Bottom Size = 75' x 150'

Size Riser Pipe & Conduit

with outlet slope of 2% and a Q of 60cfs go chart labled Figure 3.21 'Flow for Circular Pipe Flow Full Based on MANNING EQUATION'

OUTLET PROTECTION
L=25' W= [redacted] d50 = 9" TH 12"
27.6'

You get a Riser Pipe size of 30" and a conduit size of the same. 60' LG.
USING ADS-CPP (ADVANCED DRAINAGE SYSTEM - CORRUGATED POLYETHYLENE PIPE)
(CONSTRUCT ~~6"~~ CONCRETE COLLAR AROUND OUTLET END OF CONDUIT ~~7~~ SEE DETAIL SHEET.)

Elevations

Top of Dam	~~109.0'~~	~~114.5'~~	115.0
Emerg. Spillway	~~107.0'~~	~~114.5~~ ~~112.5'~~	113.0
Riser Crest	~~106.5'~~	112.0'	112.5
Conduit inlet	~~100.5~~	106.0'	106.5
Conduit outlet		105.0'	
Bottom Elev.	~~100.5~~	~~106.0'~~	106.5

ANTI-FLOATATION

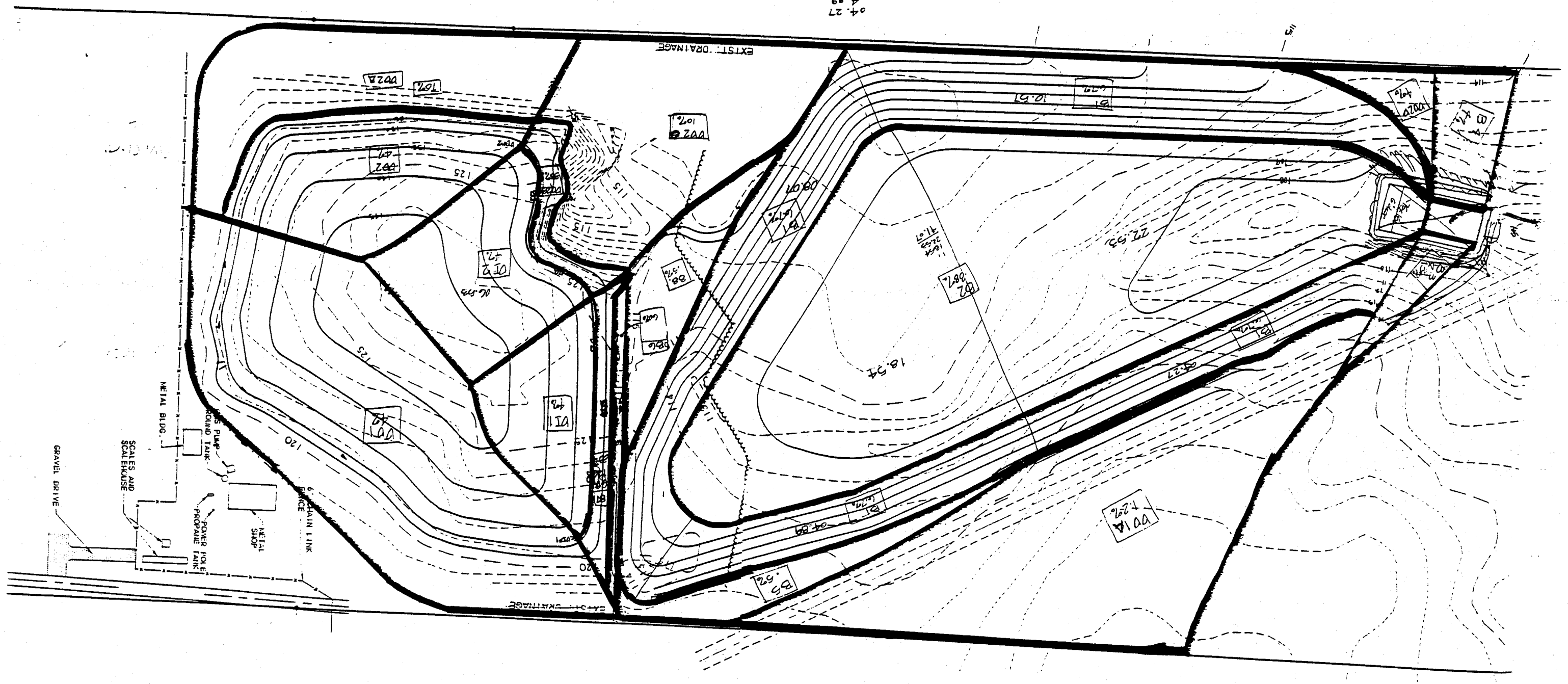
Weight of water displaced ..... 612.61 lbs
CONCRETE Required ..... 4.08 cu. ft.

SIZE OF CONCRETE FOOTING

l = 3.25' W = 3.0' d = 1.0'

SPILLWAY

24' Top Width & 12' Bottom Width


GRAVEL DRIVE
SCALES AND SCALEHOUSE
METAL BLDG.
GROUND TANK
POWER POLE
PROPANE TANK
METAL SHOP
6' CHAIN LINK FENCE
EXIST. DRAINAGE
EXIST. DRAINAGE
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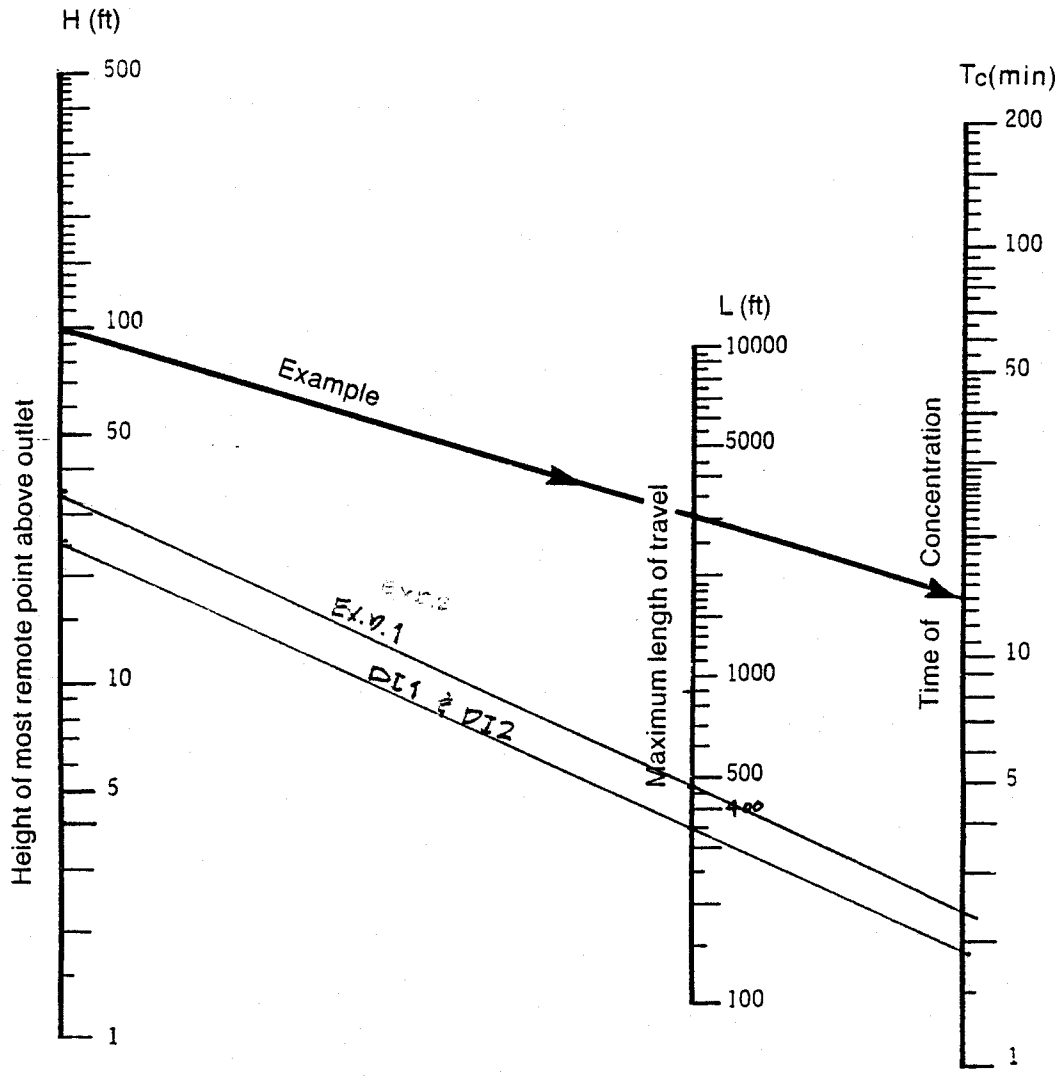
APPENDICES



Note:
Use nomograph Tc for natural basins with well-defined channels, for overland flow on bare earth, and for mowed-grass roadside channels.

For overland flow, grassed surfaces, multiply Tc by 2.

For overland flow, concrete or asphalt surfaces, multiply Tc by 0.4.

For concrete channels, multiply Tc by 0.2.

Figure 8.03a Time of concentration of small drainage basins.

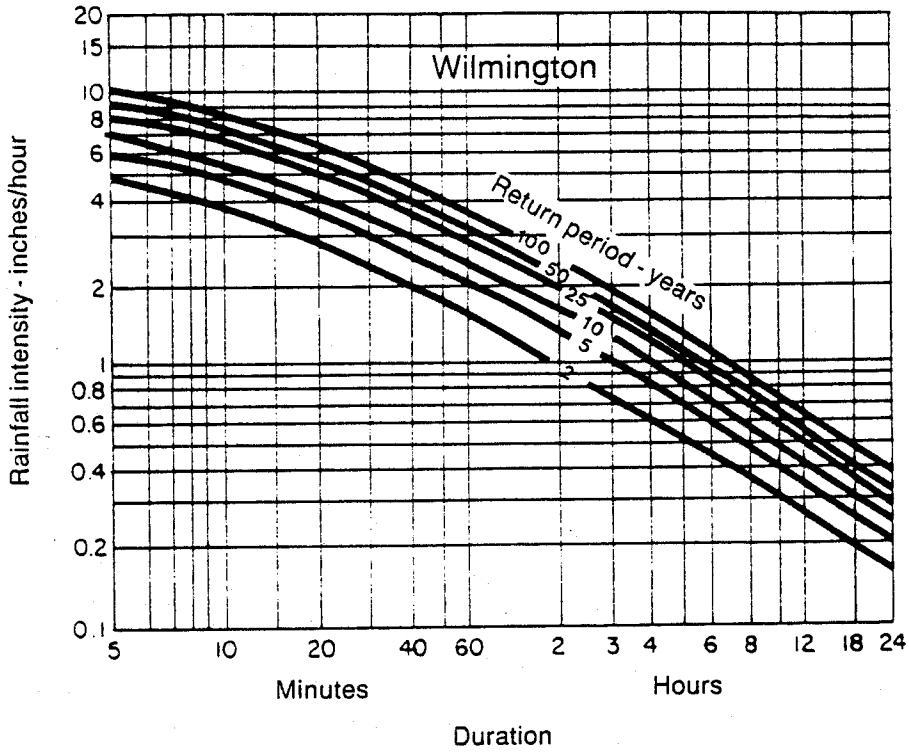


Figure 8.03b Rainfall intensity duration curves—Wilmington.

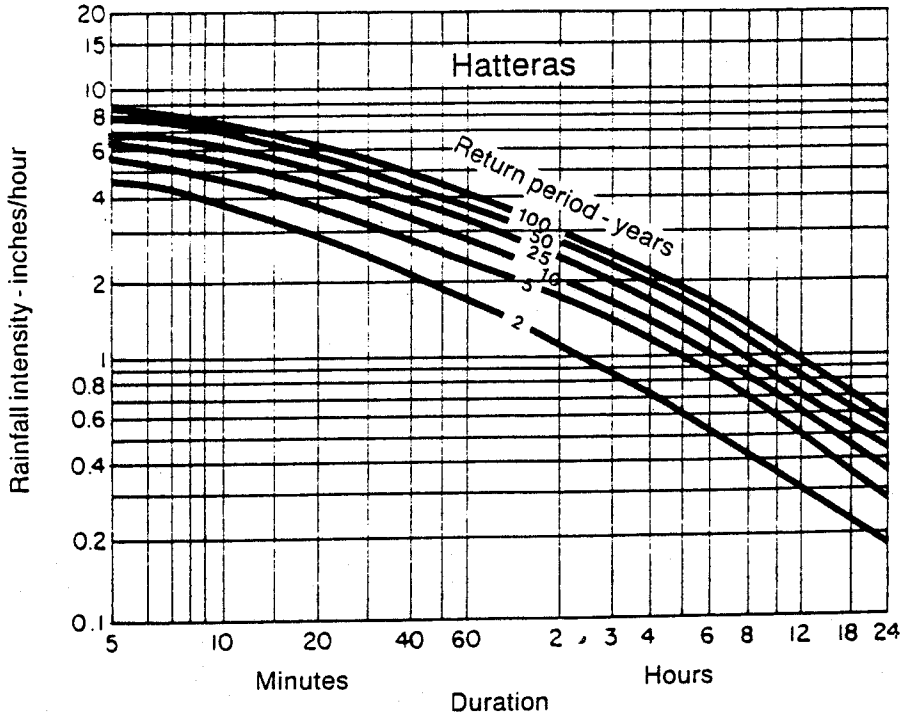


Figure 8.03c Rainfall intensity duration curves—Hatteras.

Exhibit 8

Abbreviated Table of Values of Manning Roughness Coefficients.

Description of Lining	n
Reinforced concrete pipe	0.013
Corrugated metal pipe	0.024
Concrete, trowelled finish	0.013
Concrete, float finish	0.015
Street gutter or paved channel	0.015
Earth, straight and uniform	0.022
Grass-lined swales	0.030
Unmaintained brushy channel	0.080
Stone-lined channel (4-inch)	0.028
Stone-lined channel (6-in)	0.030
Stone-lined channel (9-in)	0.032
Stone-lined channel (12-in)	0.034
Stone-lined channel (15-in)	0.035
Stone-lined channel (18-in)	0.036

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Exhibit 9

Best Hydraulic Section Coefficients

M	Cm	k	Comment
0 /1	0.790	2.000	Vertical sides
0.5 /1	0.833	1.236	
0.577 /1	0.833	1.155	60-degree sides
1 /1	0.817	0.828	45-degree sides
1.5 /1	0.775	0.606	
2 /1	0.729	0.472	
2.5 /1	0.688	0.385	
3 /1	0.653	0.325	Steepest to mow
3.5 /1	0.622	0.280	
4 /1	0.595	0.246	
5 /1	0.552	0.198	
6 /1	0.518	0.166	
7 /1	0.490	0.142	
8 /1	0.467	0.125	
9 /1	0.447	0.111	
10 /1	0.430	0.100	
11 /1	0.415	0.091	
12 /1	0.402	0.083	

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Exhibit 10

Suggested Maximum Velocities for Various Channel Linings

Description	Allowable Velocity (ft/sec)
Native linings	
Fine sand	2.5
Sandy loam	2.5
Silt loam	3.0
Ordinary firm loam	3.5
Fine gravel	5.0
Stiff clay	5.0
Grass	
Uncertain maintenance	4.0
Good cover, proper maintenance	5.0

Quarry Stone

Equivalent Spherical Diameter (inches)	Allowable Velocity (ft/sec) for stated sideslope					
	1/1	1.5/1	2/1	3/1	4/1	12/1
6	6.0	7.1	7.7	8.0	8.4	9.0
9	7.2	8.9	9.4	9.8	10.2	10.8
12	8.5	10.2	10.7	11.2	11.8	12.5
15	9.5	11.5	12.0	12.7	13.3	14.0
18	10.7	12.6	13.2	14.0	14.4	15.3
24	12.5	14.3	15.1	16.2	16.7	17.6
30	14.0	15.9	17.0	18.2	18.7	19.7
36	15.4	17.4	18.7	20.0	20.5	21.5

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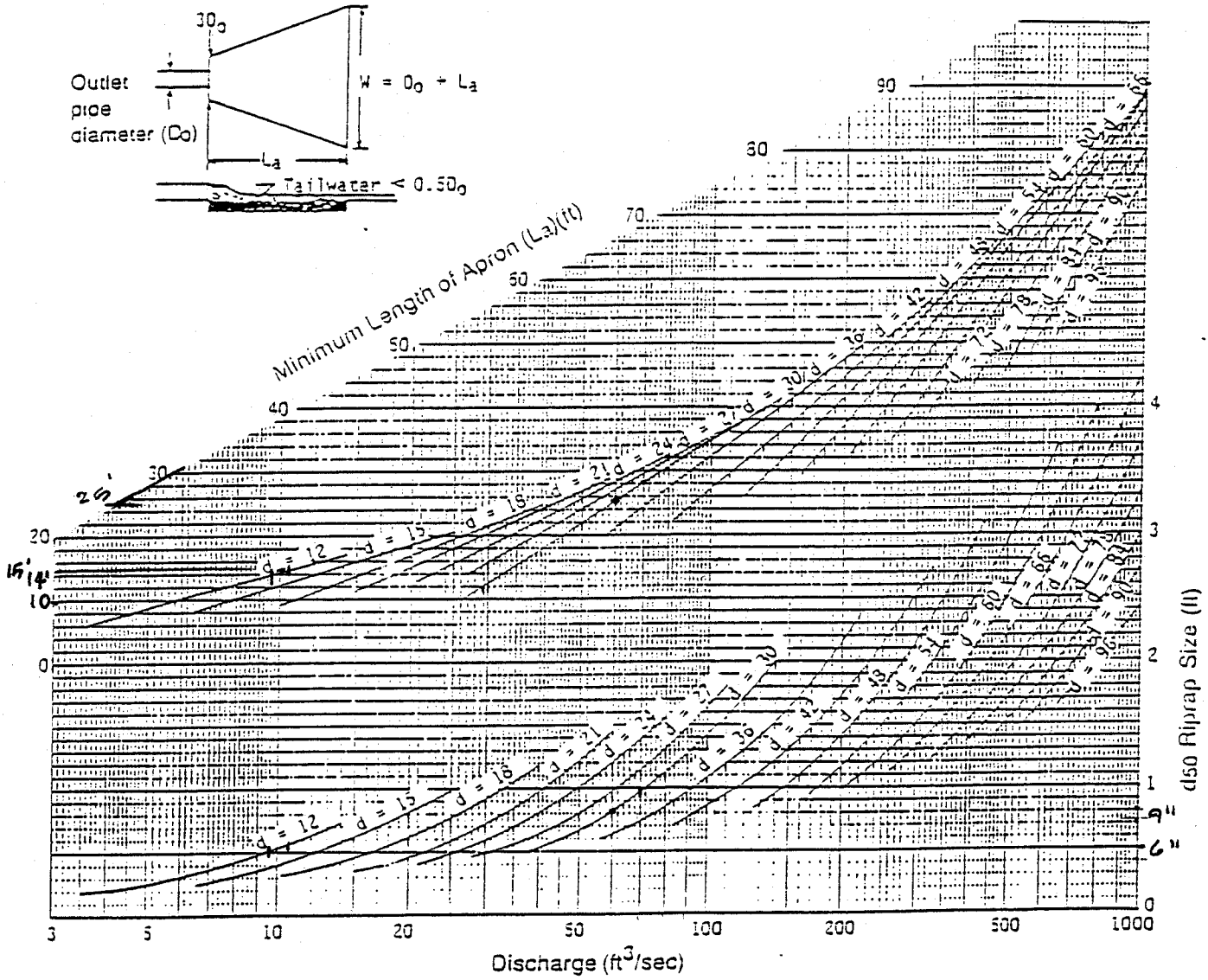


Curves may not be extrapolated.

Figure 8.06a Design of outlet protection protection from a round pipe flowing full, minimum tailwater condition (T_w < 0.5 diameter).

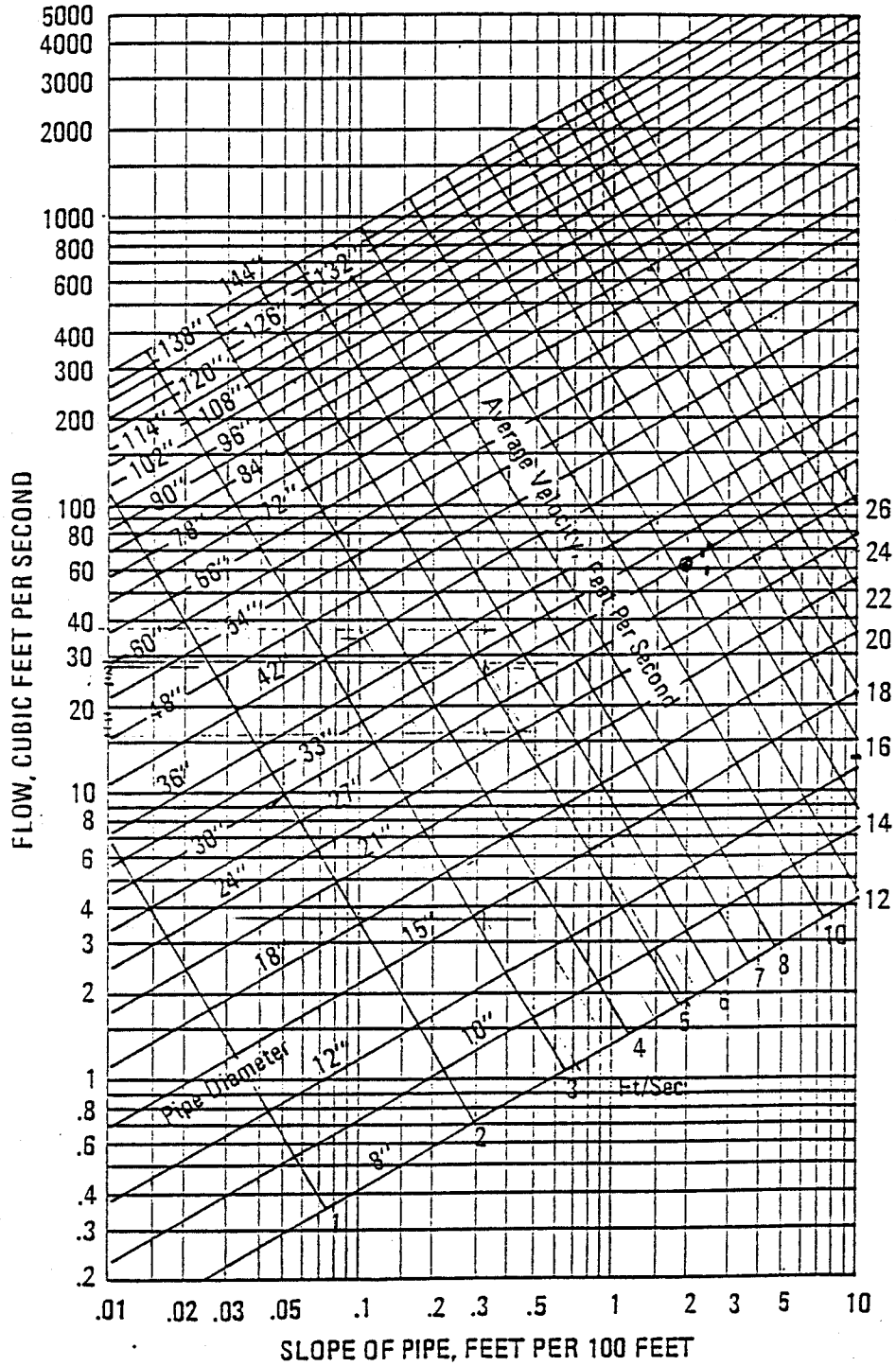


Figure 3.21. Flow for Circular Pipe Flowing Full Based on Manning's Equation, $n = 0.012$.

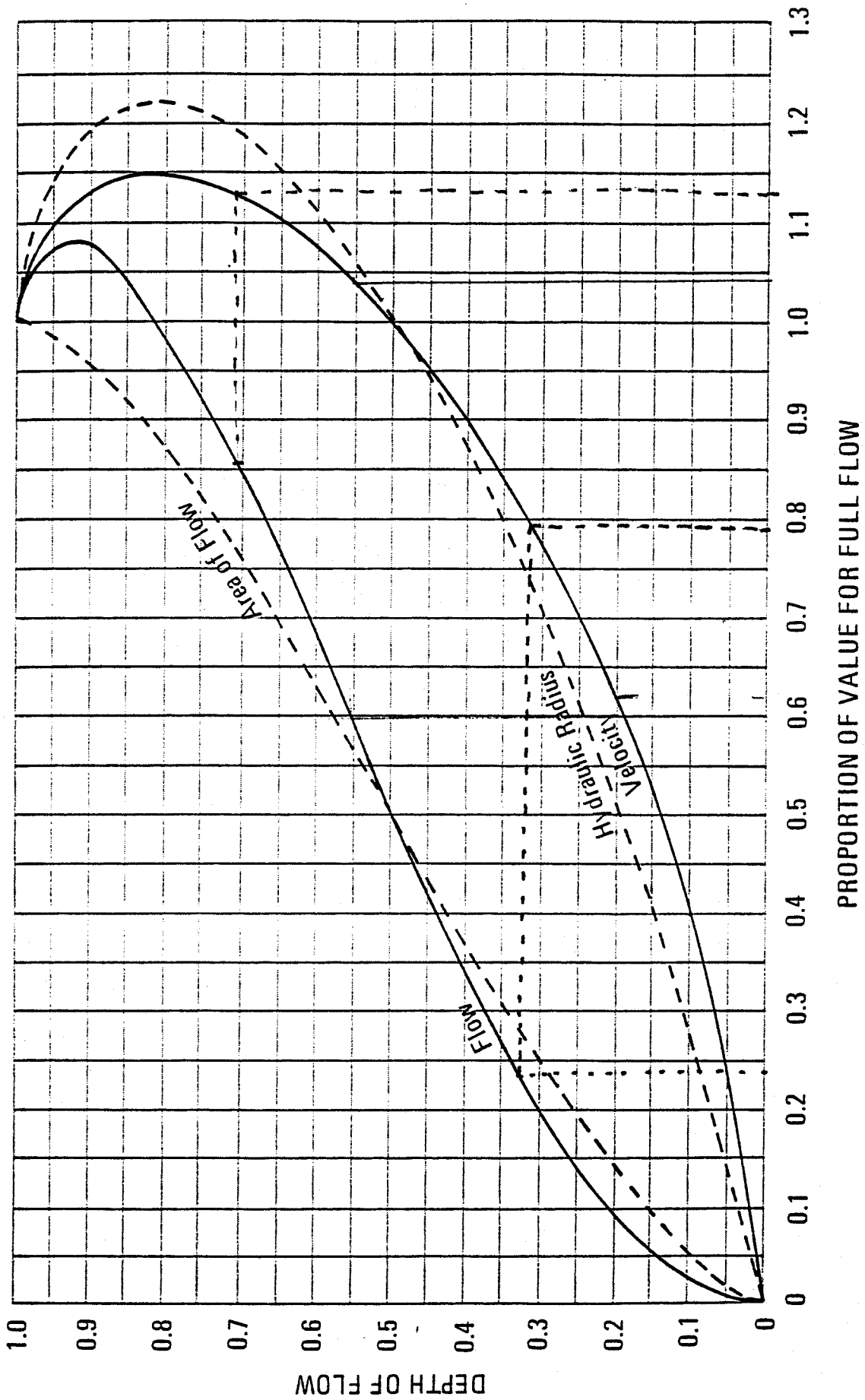
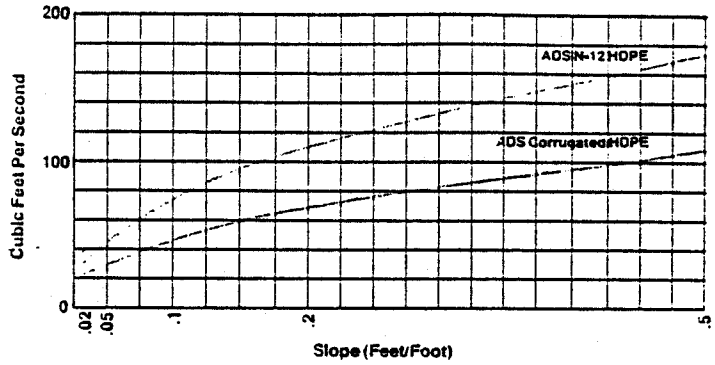


Figure 3.22. Relative Velocity and Flow in Circular Pipe for Any Depth of Flow.

ADS Pipe Hydraulics
24" Diameter



ADS Recommended Manning's "n" For Design

Pipe Diameter	ADS Corrugated Polyethylene	*ADS N-12 Polyethylene*	Concrete Pipe*	Corrugated Steel Pipe*
12"	.018	*.012*	.011-.015	.022-.026
15"	.018	*.012*	.011-.015	.022-.026
18"	.020	*.012*	.011-.015	.022-.026
24"	.020	*.012*	.011-.015	.022-.026

*ASCE Manual and Report on Engineering Practice #37

Height of Cover Table for ADS Pipe

—Depth of Cover for Corrugated Polyethylene Pipe
—H20 or E80 Live Load
—Pipe Manufactured to AASHTO M-294

Diameter (inches)	Minimum Cover H20 (inches)	Minimum Cover E80 (inches)	Maximum Cover (feet)
12"	12	24	58
15"	12	24	59
18"	12	24	62
24"	12	24	61

Notes:
1. Cover limitations calculated using load factor design per AASHTO procedures.
2. Soil density of 100#/cu. ft. is assumed.
3. Backfill around the pipe must be compacted to a density of 90% per AASHTO T-99.
4. Use reasonable care in handling and installation
5. Cover limitations are measured from the top of the pipe.

ADS N-12 Pipe Stiffness

Pipe Diameter	Minimum Pipe Stiffness Pounds/Inch/Inch
12 Inches	45
15 Inches	42
18 Inches	40
24 Inches	34