OPERATION/CONSTRUCTION MANAGERS

Municipal Services

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393

CIVIL/SANITARY ENGINEERS

Engineering Company, P.A.

P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

January 16, 1995

Fac/Perm/Co ID #	Date	Doc ID#
mining 9601	87/15/2011	DIN 1407

Mr. Edward F. Mussler III. E.I.T.
Environmental Engineer
Solid Waste Section
P.O. Box 27687
Raleigh, NC 27611-7687

Re: Technical Review - Wayne County Transition Plan, Permit No. 96-01.
Erosion Control Approval letter
Project No. G93121.

Dear Mr. Mussler:

Enclosed you will find two (2) copies of a revised Erosion Control Plan for the twenty-four (24) hour twenty-five (25) year storm event.

If you have any questions, please advise.

Very truly yours,
MUNICIPAL ENGINEERING SERVICES CO., PA

D. Wayne Sull.

D. Wayne Sullivan
Project Manager

DWS:cd

Enclosures

cc: Mr. Lloyd Cook, Solid Waste Director

State of North Carolina
Department of Environment,
Health and Natural Resources
Washington Regional Office

James B. Hunt, Jr., Governor
Jonathan B. Howes, Secretary
Nancy W. Smith, Regional Manager

DEHNR

DIVISION OF LAND RESOURCES
LAND QUALITY SECTION

MUNICIPAL ENGINEERING
RECEIVED
JAN 13 1995
SERVICES COMPANY

January 12, 1995

County of Lenoir
ATTN: Mr. Bob I. Snapp, Manager
P.O. Box 3289
Kinston, North Carolina 28501

RE: Revised Erosion and Sedimentation Control Plan
Landfill Vertical Expansion
SR 1524 - Lenoir County
Date Received: December 19, 1994
Responsible Party: County of Lenoir

Dear Mr. Snapp:

The reference revised erosion and sedimentation control plan is deemed approved because the statutory 15 day review period has been exceeded. The revision appears to be a change in the grading resulting from a change in the design storm event.

Feel free to contract this office if we can be of further assistance.

Sincerely,

Patrick H. McClain, P.E.
Assistant Regional Engineer

cc: Charles Seymour, Municipal Engineering Services

1424 Carolina Avenue, Washington, North Carolina 27889 Telephone 919-946-6481 FAX 919-975-3716
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REVISED EROSION CONTROL PLAN

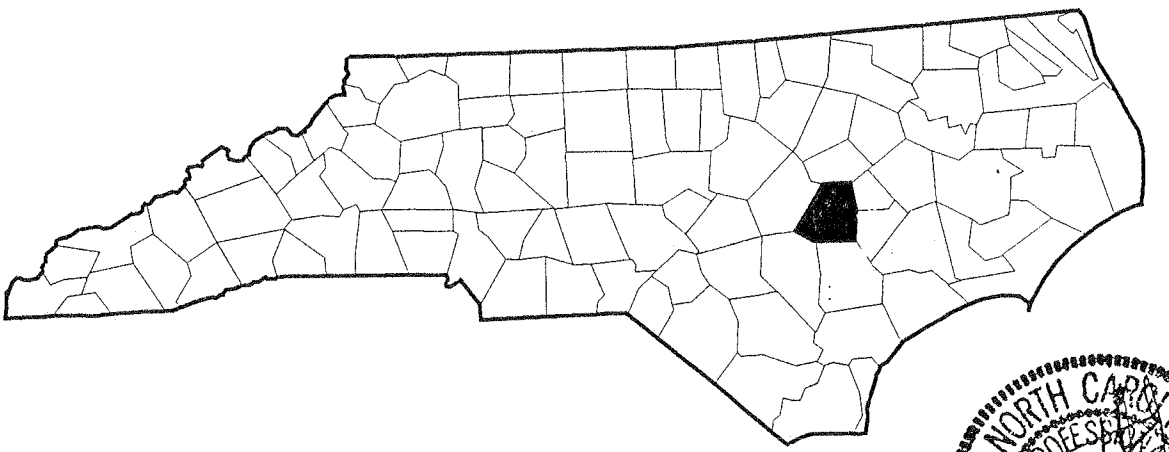
(24 HOUR 25 YEAR STORM)

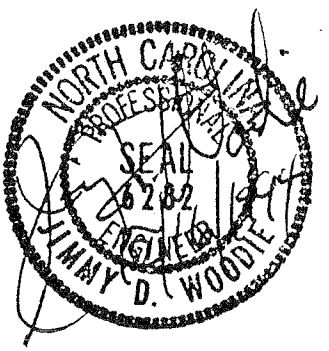
FOR

COUNTY OF: WAYNE

NORTH CAROLINA

G93121





December, 1994

Municipal Engineering Services Co., PA
Garner and Boone, North Carolina

Drainage Areas

Area Design	Area (ac.)
DD1A	2.76
DD1B	6.38
DD1C	0.57
DD1D	3.47
DD1E	8.34
DD1F	2.77
DD2A	5.67
DD3A	2.66
DD3B	2.29
DD3C	2.06
DD4A	1.08
DD5A	6.53
DD5B	4.26

Areas Draining Into Diversion Ditch #1 (BEG. TO F.E.S. #1)

Area	A	I	C
DD1A	= 2.76 acs.	7.1 in/hr.	.30
DD1C	= 0.57 acs.	7.1 in/hr.	.30
	= 3.33 acs.	7.1 in/hr	.30

$Q_{(25)}$ = CIA = (.30)(7.1)(3.33) = 7.09 cfs.

Areas Draining Into Diversion Ditch #1 (F.E.S. #1 TO F.E.S. #2)

Area	A	I	C
DD1A	= 2.76 acs.	7.1 in/hr.	.30
DD1B	= 6.38 acs.	7.1 in/hr.	.30
DD1C	= 0.57 acs.	7.1 in/hr.	.30
DD1D	= 3.47 acs.	7.1 in/hr.	.30
	= 13.18 acs.	7.1 in/hr	.30

$Q_{(25)}$ = CIA= (.30)(7.1)(13.18) = 28.07 cfs

Areas Draining Into Diversion Ditch #1 (F.E.S. #2 TO SILT BASIN)

Area	A	I	C
DD1A	= 2.76 acs.	7.1 in/hr.	.30
DD1B	= 6.38 acs.	7.1 in/hr.	.30
DD1C	= 0.57 acs.	7.1 in/hr.	.30
DD1D	= 3.47 acs.	7.1 in/hr.	.30
DD1E	= 8.34 acs.	7.1 in/hr.	.30
DD1F	= 2.77 acs.	7.1 in/hr.	.30
	= 24.29 acs.	7.1 in/hr	.30

$Q_{(25)}$ = CIA= (.30)(7.1)(24.29) = 51.74 cfs

Areas Draining Into Diversion Ditch #2

Area	A	I	C
DD2A	= 5.67 acs.	8.3 in/hr.	.30
	= 5.67 acs.	8.3 in/hr	.30

$Q_{(25)}$ = CIA = (.30)(8.3)(5.67) = 14.12 cfs.

Areas Draining Into Diversion Ditch #3(BEG. TO F.E.S. #3)

Area	A	I	C
DD3A	= 2.66 acs.	8.3 in/hr.	.30
	= 2.66 acs.	8.3 in/hr	.30

$Q_{(25)}$ = CIA = (.30)(8.3)(2.66) = 6.62 cfs.

Areas Draining Into Diversion Ditch #3(F.E.S. #3 TO R.C.P.)

Area	A	I	C
DD3A	= 2.66 acs.	8.3 in/hr.	.30
DD3B	= 2.29 acs.	8.3 in/hr.	.30
DD3C	= 2.06 acs.	8.3 in/hr	.30
	= 7.01 acs.	8.3 in/hr	.30 composite C

$Q_{(25)}$ = CIA = (.30)(8.3)(7.01) = 17.45 cfs.

Areas Draining Into Diversion Ditch #4

Area	A	I	C
DD4A	= 1.08 acs.	8.3 in/hr.	.30
	= 1.08 acs.	8.3 in/hr	.30 composite C

$Q_{(25)}$ = CIA = (.30)(8.3)(1.08) = 2.69 cfs.

Areas Draining Into Diversion Ditch #5

Area	A	I	C
DD3A	= 2.07 acs.	8.3 in/hr.	.30
DD3B	= 2.29 acs.	8.3 in/hr.	.30
DD3C	= 2.06 acs.	8.3 in/hr.	.30
DD4A	= 1.08 acs	8.3 in/hr.	.30
DD5A	= 6.53 acs.	8.3 in/hr.	.30
DD5B	= 4.26 acs.	8.3 in/hr.	.30
	= 18.88 acs.	8.3 in/hr	.30 composite C

$Q_{(25)}$ = CIA = (.30)(8.3)(18.88) = 47.01 cfs.

Q for Drop Inlet #1

$Q_{(25)}$ = CIA C = .30 I = 8.3 in/hr A = 6.38 acs.

$Q_{(25)}$ = (.30)(8.3)(6.38) = 15.89 cfs.

Pipe Sizing for Drop Outlet #1

$D = 16\,(Qn \div \sqrt{s})^{.375}$ corrugated polyethylene pipe

$Q_{(25)}$ = 15.89 cfs n = .018 s = .08

$D = 16[(15.89)(.018) \div \sqrt{.08}]^{.375} = 16.07''$ Use 24" CPP

Outlet Protection Outlet #1

L = 11' W = 6.5' d_{50} = 6" Depth 1.0' min.

Q for Drop Inlet #2

$Q_{(25)}$ = CIA C = .30 I = 8.3 in/hr A = 8.34 acs.

$Q_{(25)}$ = (.30)(8.3)(8.34) = 20.77 cfs.

Pipe Sizing for Drop Outlet #2

$D = 16\ (Qn \div \sqrt{s})^{.375}$ corrugated polyethylene pipe

$Q_{(25)}$ = 20.77 cfs n = .018 s = .09

$D = 16[(20.77)(.018) \div \sqrt{.09}]^{.375} = 17.38"$ Use 24" CPP

Outlet Protection Outlet #2

L = 10' W = 6.5' d_{50} = 6" Depth 1.0' min.

Q for Drop Inlet #3

$Q_{(25)}$ = CIA C = .30 I = 8.3 in/hr A = 2.29 acs.

$Q_{(25)}$ = (.30)(8.3)(2.29) = 5.70 cfs.

Pipe Sizing for Drop Outlet #3

$D = 16\ (Qn \div \sqrt{s})^{.375}$ corrugated polyethylene pipe

$Q_{(25)}$ = 5.70 cfs n = .018 s = .15

$D = 16[(5.70)(.018) \div \sqrt{.15}]^{.375} = 9.72"$ Use 18" CPP

Outlet Protection Outlet #3

L = 10' W = 5.5' d_{50} = 6" Depth 1.0'

Q for Drop Inlet #4

$Q_{(25)} = CIA$ C = .30 I = 8.3 in/hr A = 6.53 acs.

$Q_{(25)} = (.30)(8.3)(6.53) = 16.26$ cfs.

Pipe Sizing for Drop Outlet #4

$D = 16\ (Qn \div \sqrt{s})^{.375}$ corrugated polyethylene pipe

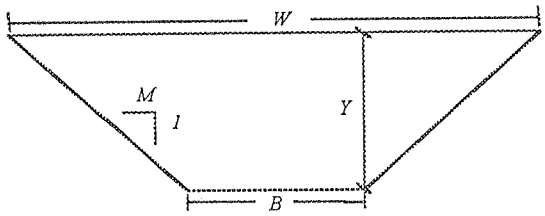
$Q_{(25)} = 16.26$ cfs n = .018 s = .09

$D = 16[(16.26)(.018) \div \sqrt{.09}]^{.375} = 15.85"$ Use 24" CPP

Outlet Protection Outlet #4

L = 13' W = 7.2' d_{50} = 6" Depth 1.0'

Design Diversion Ditch #1(BEG. TO F.E.S. #1)



$Q_{(25)}$ = 7.09 cfs

B = 1 ft
n = 0.104
s = .10 ft/ft
y = 0.895 ft
d = 1.0'

M = 2
-Mannings 15"stone coeficient (depth 0.5' to 1.0')

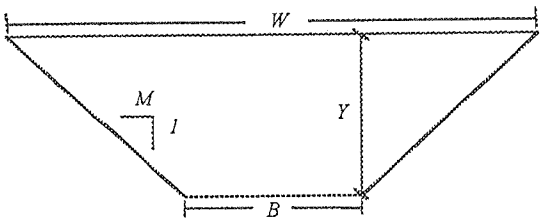
R = A÷P
P = B + 2MY
A = BY + MY^2
V = Q÷A

Crossectional area (A) = 2.50 sq ft
Wetted perimeter (p) = 5.00 ft
Area/ Wetted perimeter = 0.499
Velocity (V) = 2.84 ft per sec
Lining shear stress (T) = 5.58
Top Width (W) = 5.0'

15" riprap shear stress (max) = 5.99'

Ditch #1 : Riprap-lined channel 15" stone.

Design Diversion Ditch #1(F.E.S. #1 TO F.E.S. #2)



$Q_{(25)}$ = 28.07 cfs

B = 6 ft
n = 0.033
s = .005 ft/ft
y = 1.166 ft
d = 1.5'

M = 2
-Mannings Straw with net coefficient (depth 0.5' to 2.0')

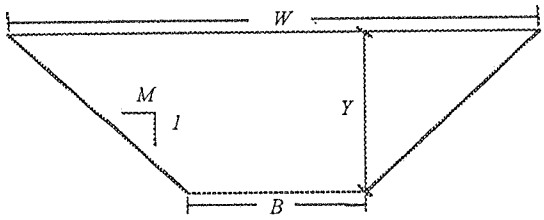
$R = A \div P$
$P = B + 2MY$
$A = BY + MY^2$
$V = Q \div A$

Crossectional area (A) =9.72 sq ft
Wetted perimeter (p) = 11.21 ft
Area/ Wetted perimeter = 0.866
Velocity (V) = 2.89 ft per sec
Lining shear stress (T) = 0.36
Top Width (W) = 12.0'

Straw with net shear stress (max) = 1.45

Ditch #1 (F.E.S. #1 TO F.E.S. #2): Grass-lined channel with Straw with net.

Design Diversion Ditch #1(F.E.S. #2 TO SILT BASIN)



$Q_{(25)}$ = 51.74 cfs

B = 6 ft
n = 0.044
s = .0277 ft/ft
y = 1.193 ft
d = 2

M = 2
-Mannings 6" riprap coeficient (depth 1.0' to 2.0')

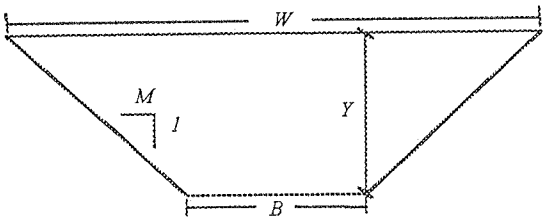
R = A÷P
P = B + 2MY
A = BY + MY^2
V = Q÷A

Crossectional area (A) =10.00 sq ft
Wetted perimeter (p) = 11.34 ft
Area/ Wetted perimeter = 0.88
Velocity (V) = 5.17 ft per sec
Lining shear stress (T) = 2.06
Top Width (W) = 14.0'

6" riprap shear stress (max) = 2.99

Ditch #1 (F.E.S. #2 TO SILT BASIN) : Riprap-lined channel with 6" riprap

Design Diversion Ditch #2



$Q_{(25)}$ = 14.12 cfs

B = 2 ft
n = 0.033
s = .0136 ft/ft
y = 0.964 ft
d = 1.5'

M = 2
-Mannings Straw with net coefficient (depth 0.5' to 2.0')

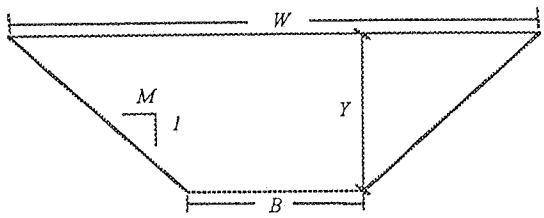
R = A÷P
P = B + 2MY
$A = BY + MY^2$
V = Q÷A

Crossectional area (A) =3.79 sq ft
Wetted perimeter (p) = 6.31 ft
Area/ Wetted perimeter = 0.60
Velocity (V) = 3.73 ft per sec
Lining shear stress (T) = 0.818
Top Width (W) = 8.0'

Straw with net shear stress (max) = 1.45

Ditch #2 : Grass-lined channel with Straw with net.

Design Diversion Ditch #3(BEG. TO F.E.S. #3)



$Q_{(25)}$ = 6.62 cfs

B = 1 ft
n = 0.084
s = .1 ft/ft
y = 0.713 ft
d = 0.75'

M = 2
-Mannings 12" riprap coefficient (depth 0.5' to 1.0')

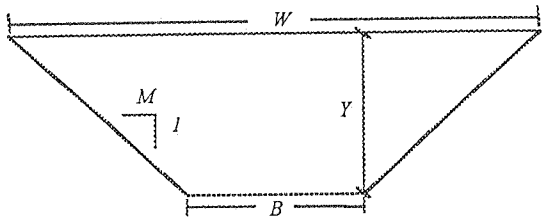
R = A÷P
P = B + 2MY
$A = BY + MY^2$
V = Q÷A

Crossectional area (A) =1.73 sq ft
Wetted perimeter (p) = 4.19 ft
Area/ Wetted perimeter = 0.41
Velocity (V) = 3.83 ft per sec
Lining shear stress (T) = 4.45
Top Width (W) = 4.0'

12" riprap shear stress (max) = 4.99

Ditch #3(Beg to F.E.S. #3) : Riprap-lined channel with 12" riprap.

Design Diversion Ditch #3(F.E.S. #3 TO R.C.P.)



$Q_{(25)}$ = 17.45 cfs

B = 4 ft
n = 0.033
s = .0156 ft/ft
y = 0.793 ft
d = 1.5'

M = 2
-Mannings Straw with net coefficient (depth 0.5' to 2.0')

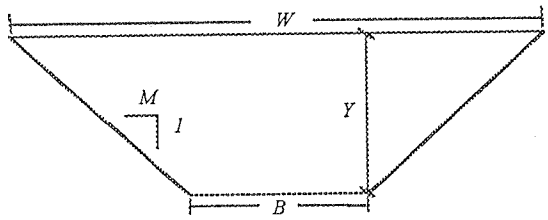
$R = A \div P$
$P = B + 2MY$
$A = BY + MY^2$
$V = Q \div A$

Crossectional area (A) = 4.43 sq ft
Wetted perimeter (p) = 7.55 ft
Area/ Wetted perimeter = 0.59
Velocity (V) = 3.94 ft per sec
Lining shear stress (T) = 0.772
Top Width (W) = 10.0'

Straw with net shear stress (max) = 1.45

Ditch #3(F.E.S. #3 TO R.C.P.): Grass-lined channel with Straw with net.

Design Diversion Ditch #4



$Q_{(25)} = 2.69$ cfs

B = 2 ft
n = 0.028
s = .0136 ft/ft
y = 0.358 ft
d = 1.0'

M = 2
-Mannings Jute netting coefficient (depth 0.0' to 0.5')

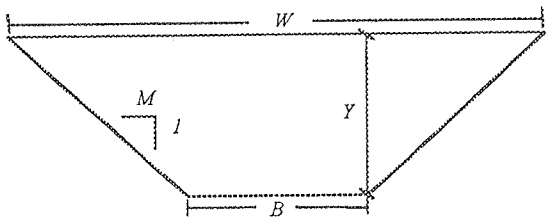
$R = A \div P$
$P = B + 2MY$
$A = BY + MY^2$
$V = Q \div A$

Crossectional area (A) = 0.97 sq ft
Wetted perimeter (p) = 3.60 ft
Area/ Wetted perimeter = 0..27
Velocity (V) = 2.77 ft per sec
Lining shear stress (T) = 0.35
Top Width (W) = 6.0'

Straw with net shear stress (max) = 0.45

Ditch #4 : Grass-lined channel with Jute netting.

Design Diversion Ditch #5



$Q_{(25)} = 47.01$ cfs

B = 6 ft
n = 0.044
s = .0185 ft/ft
y = 1.265 ft
d = 2.0'

M = 2
-Mannings 6" Riprap coefficient (depth 0.5' to 2.0')

$R = A \div P$
$P = B + 2MY$
$A = BY + MY^2$
$V = Q \div A$

Crossectional area (A) = 10.79 sq ft
Wetted perimeter (p) = 11.66 ft
Area/ Wetted perimeter = 0.93
Velocity (V) = 4.36 ft per sec
Lining shear stress (T) = 1.46
Top Width (W) = 14.0'

6" rip-rap shear stress (max) = 2.99

Ditch #5 : Riprap-lined channel with 6" Riprap.

DESIGN RISER BASIN #2

Runoff Coefficient C computation

Consider Design as 2 seperate Basins for Bottom sizing

Area (DD#1) = 24.29 acs
Area (DD#5) = 18.88 acs.

$Q_{(25)}$(DD#1) = CIA (.30)(8.3)(24.29) = 60.48
$Q_{(25)}$(DD#5) = CIA (.30)(8.3)(18.88) = 47.01

Surface area of riser basin:

Surface area $S_{(DD\#1)} = .01Q$ $S_{(DD\#1)} = .6048$ csf
$S_{(DD\#1)} = .6048 \times 43560\ ft^2 = 26{,}345.09\ ft^2$

Surface area $S_{(DD\#5)} = .01Q$ $S_{(DD\#5)} = .4701$ csf
$S_{(DD\#5)} = .4701 \times 43560\ ft^2 = 20{,}477.56\ ft^2$

Depth of riser basin:

Depth = Capacity/surface area

$(53' \times 46') \div 2 = 1219\ ft^2$
Capacity needed is 1800 ft^3/acre.
$Capacity_{(DD\#1)} = \{[(900)(24.29) \div 4] - 1219\} \div 53' = 80' + 46' = 126' > 2(53')$.
$Capacity_{(DD\#5)} = \{[(900)(18.88) \div 4] - 1219\} \div 46' = 66' + 53' = 119' > 2(46')$.

Use a depth of 3'

Principal spillway barrel size:

Q = 107.49 cfs
10% grade

$D = 16\ (Q_{(25)} n \div \sqrt{s})^{.375}$ Use corrugated metal pipe

$Q_{(25)} = 107.49$ cfs n = .024 s = .02

$D = 16[(107.49)(.024) \div \sqrt{.1}]^{.375} = 35.15''$ Use 36"

Outlet Protection

$L = 36'$ $W = 39'$ $d_{50} = 15''$ 22.5" min. thickness

Riser pipe for Principal spillway:

48" pipe diameter

Footing for riser pipe:

Weight of water: $\pi r^2 h(62.4) = 2{,}351$
Concrete: 150 lbs per ft^3
15.67 ft^3 of concrete needed
use 46.8.0 ft^3 of concrete

1.56'x5'x6' footing.

Emergency Spillway:

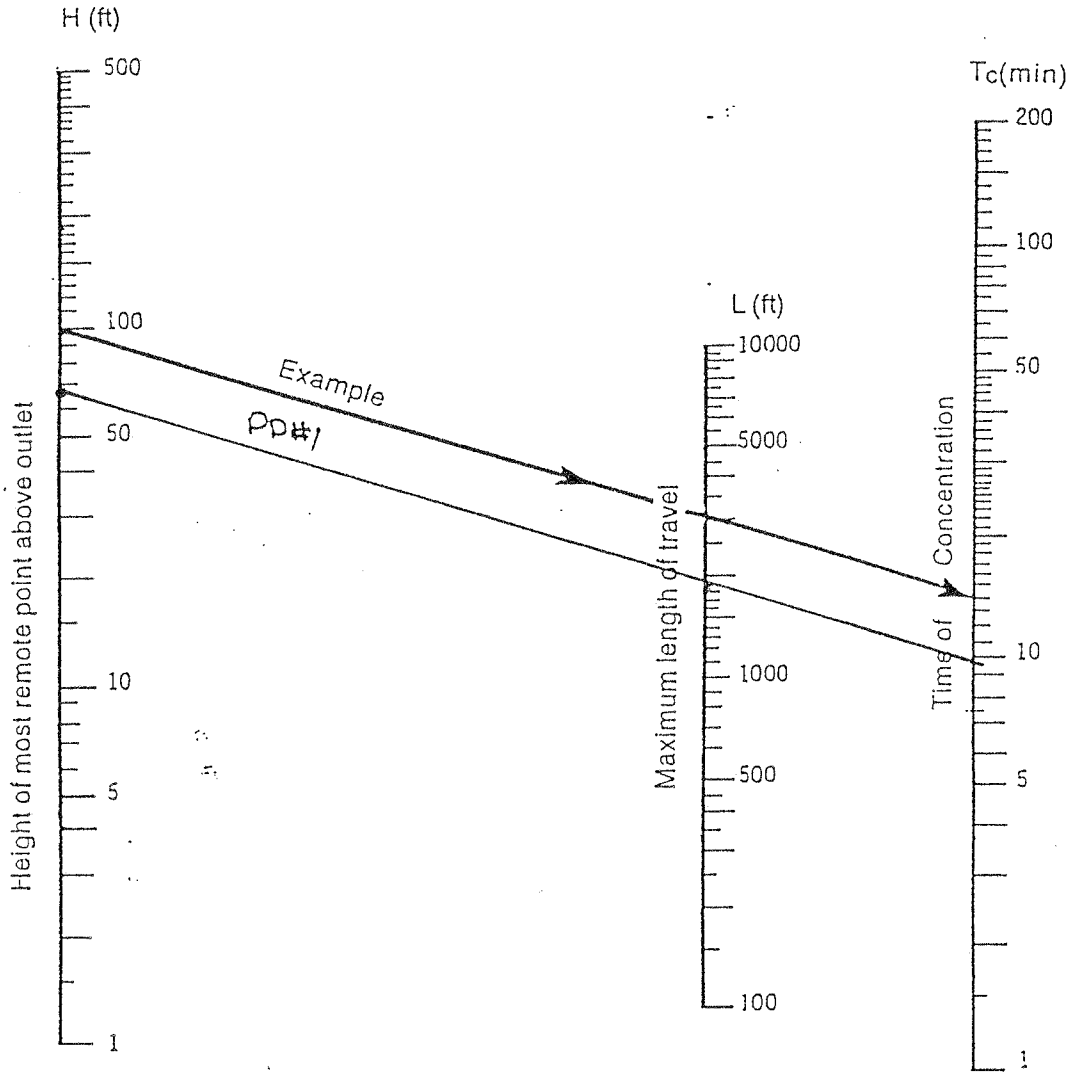
$Q = C_W L H^{3/2}$ $C_W = 3.0$ $H = 1$ $Q = 107.49$

Bottom of Weir = 20'
Top of Weir = 24'
Velocity = 5.5 ft/sec
10 % slope
Line with 15" Rip Rap

$A = Q/V$ $(107.49 \div 5.5) = 19.54$
$H = A/L$ $(19.54' \div 20') = .98'$

Elevations:

Top of Dam	77.0'
Emergency Spillway	75.0'
Riser Crest	74.0'
Conduit Inlet	69.0'
Conduit Outlet	68.0'
Bottom Elevation	69.0'



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.

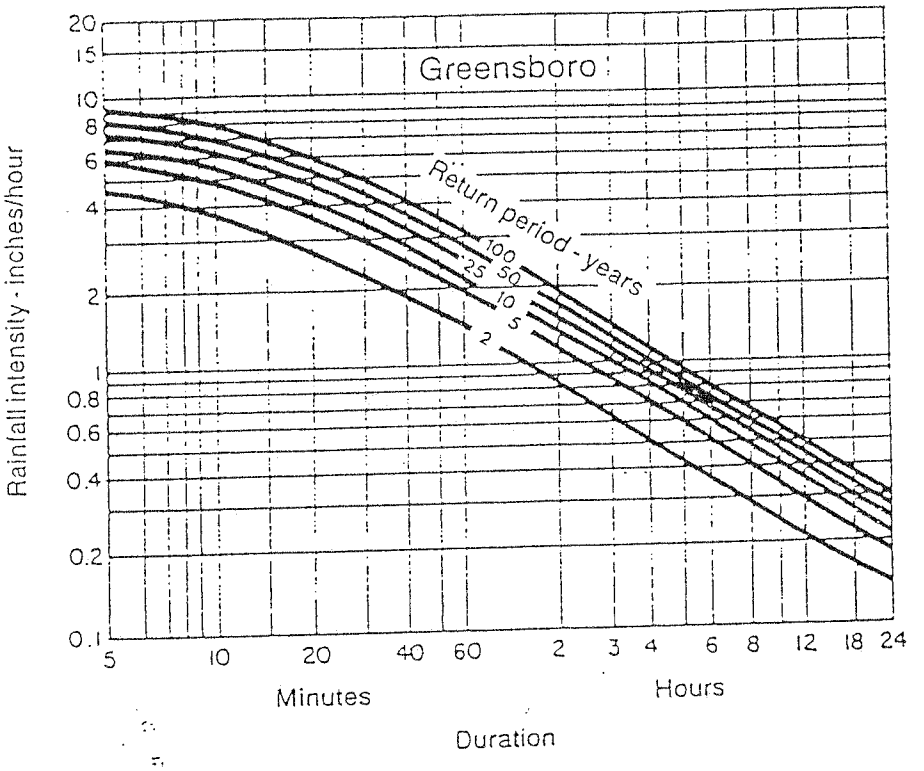


Figure 8.03d Rainfall intensity duration curves—Greensboro.

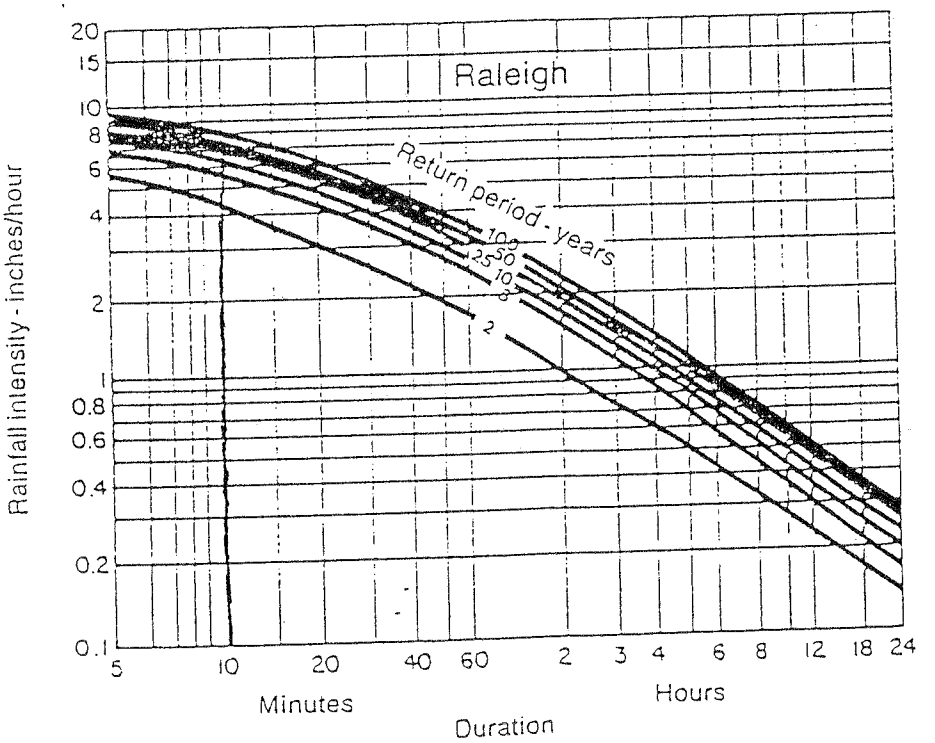


Figure 8.03e Rainfall intensity duration curves—Raleigh.

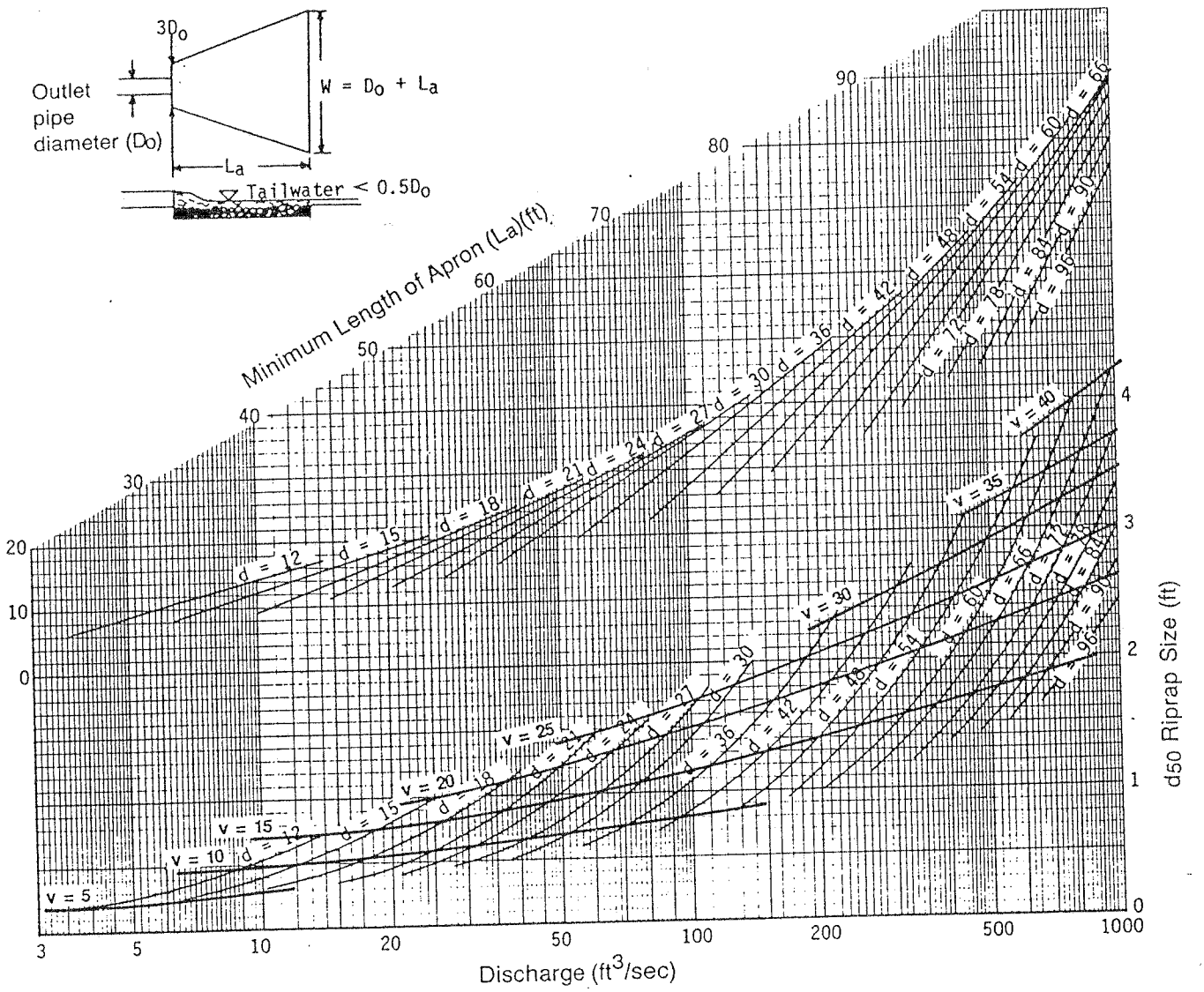
Exhibit 9

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	

CHART TAKEN FROM "ELEMENTS OF URBAN STORMWATER DESIGN"

BY: H. ROONEY MALCOM, PE
NORTH CAROLINA STATE UNIVERSITY



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).

Table 8.05a
Maximum Allowable Design Velocities[1]
for Vegetated Channels

Typical Channel Slope Application	Soil Characteristics[2]	Grass Lining	Permissible Velocity[3] for Established Grass Lining (ft/sec)
0-5%	Easily Erodible Non-plastic (Sands & Silts)	Bermudagrass	5.0
		Tall fescue	4.5
		Bahiagrass	4.5
		Kentucky bluegrass	4.5
		Grass-legume mixture	3.5
	Erosion Resistant Plastic (Clay mixes)	Bermudagrass	6.0
		Tall fescue	5.5
		Bahiagrass	5.5
		Kentucky bluegrass	5.5
		Grass-legume mixture	4.5
5-10%	Easily Erodible Non-plastic (Sands & Silts)	Bermudagrass	4.5
		Tall fescue	4.0
		Bahiagrass	4.0
		Kentucky bluegrass	4.0
		Grass-legume mixture	3.0
	Erosion Resistant Plastic (Clay Mixes)	Bermudagrass	5.5
		Tall fescue	5.0
		Bahiagrass	5.0
		Kentucky bluegrass	5.0
		Grass-legume mixture	3.5
>10%	Easily Erodible Non-plastic (Sands & Silts)	Bermudagrass	3.5
		Tall fescue	2.5
		Bahiagrass	2.5
		Kentucky bluegrass	2.5
	Erosion Resistant Plastic (Clay Mixes)	Bermudagrass	4.5
		Tall fescue	3.5
		Bahiagrass	3.5
		Kentucky bluegrass	3.5

Source: USDA-SCS Modified

NOTE: [1]Permissible Velocity based on 10-yr storm peak runoff
[2]Soil erodibility based on resistance to soil movement from concentrated flowing water.
[3]Before grass is established, permissible velocity is determined by the type of temporary liner used.

Selecting Channel Cross-Section Geometry

To calculate the required size of an open channel, assume the design flow is uniform and does not vary with time. Since actual flow conditions change throughout the length of a channel, subdivide the channel into design reaches, and design each reach to carry the appropriate capacity.

The three most commonly used channel cross-sections are "V"-shaped, parabolic, and trapezoidal. Figure 8.05b gives mathematical formulas for the area, hydraulic radius and top width of each of these shapes.

Table 8.03a
Value of Runoff Coefficient (C) for Rational Formula

Land Use	C	Land Use	C
Business:		Lawns:	
Downtown areas	0.70-0.95	Sandy soil, flat, 2%	0.05-0.10
Neighborhood areas	0.50-0.70	Sandy soil, ave., 2-7%	0.10-0.15
		Sandy soil, steep, 7%	0.15-0.20
Residential:		Heavy soil, flat, 2%	0.13-0.17
Single-family areas	0.30-0.50	Heavy soil, ave., 2-7%	0.18-0.22
Multi units, detached	0.40-0.60	Heavy soil, steep, 7%	0.25-0.35
Multi units, attached	0.60-0.75		
Suburban	0.25-0.40	Agricultural land:	
		Bare packed soil	
Industrial:		Smooth	0.30-0.60
Light areas	0.50-0.80	Rough	0.20-0.50
Heavy areas	0.60-0.90	Cultivated rows	
		Heavy soil no crop	0.30-0.60
Parks, cemeteries	0.10-0.25	Heavy soil with crop	0.20-0.50
		Sandy soil no crop	0.20-0.40
Playgrounds	0.20-0.35	Sandy soil with crop	0.10-0.25
		Pasture	
Railroad yard areas	0.20-0.40	Heavy soil	0.15-0.45
		Sandy soil	0.05-0.25
Unimproved areas	0.10-0.30	Woodlands	0.05-0.25
Streets:			
Asphalt	0.70-0.95		
Concrete	0.80-0.95		
Brick	0.70-0.85		
Drives and walks	0.75-0.85		
Roofs	0.75-0.85		

NOTE: The designer must use judgment to select the appropriate C value within the range for the appropriate land use. Generally, larger areas with permeable soils, flat slopes, and dense vegetation should have lowest C values. Smaller areas with slowly permeable soils, steep slopes, and sparse vegetation should be assigned highest C values.

Source: American Society of Civil Engineers

The overland flow portion of flow time may be determined from Figure 8.03a. The flow time (in minutes) in the channel can be estimated by calculating the average velocity in feet per minute and dividing the length (in feet) by the average velocity.

Step 4. Determine the rainfall intensity, frequency, and duration (Figures 8.03b through 8.03g—source: North Carolina State Highway Commission; Jan. 1973). Select the chart for the locality closest to your location. Enter the "duration" axis of the chart with the calculated time of concentration, Tc. Move vertically until you intersect the curve of the appropriate design storm, then move horizontally to read the rainfall intensity factor, i, in inches per hour.

Step 5. Determine peak discharge, Q (ft^3/sec), by multiplying the previously determined factors using the rational formula (Sample Problem 8.03a).

Table 8.05e
Manning's Roughness Coefficients for Temporary Lining Materials

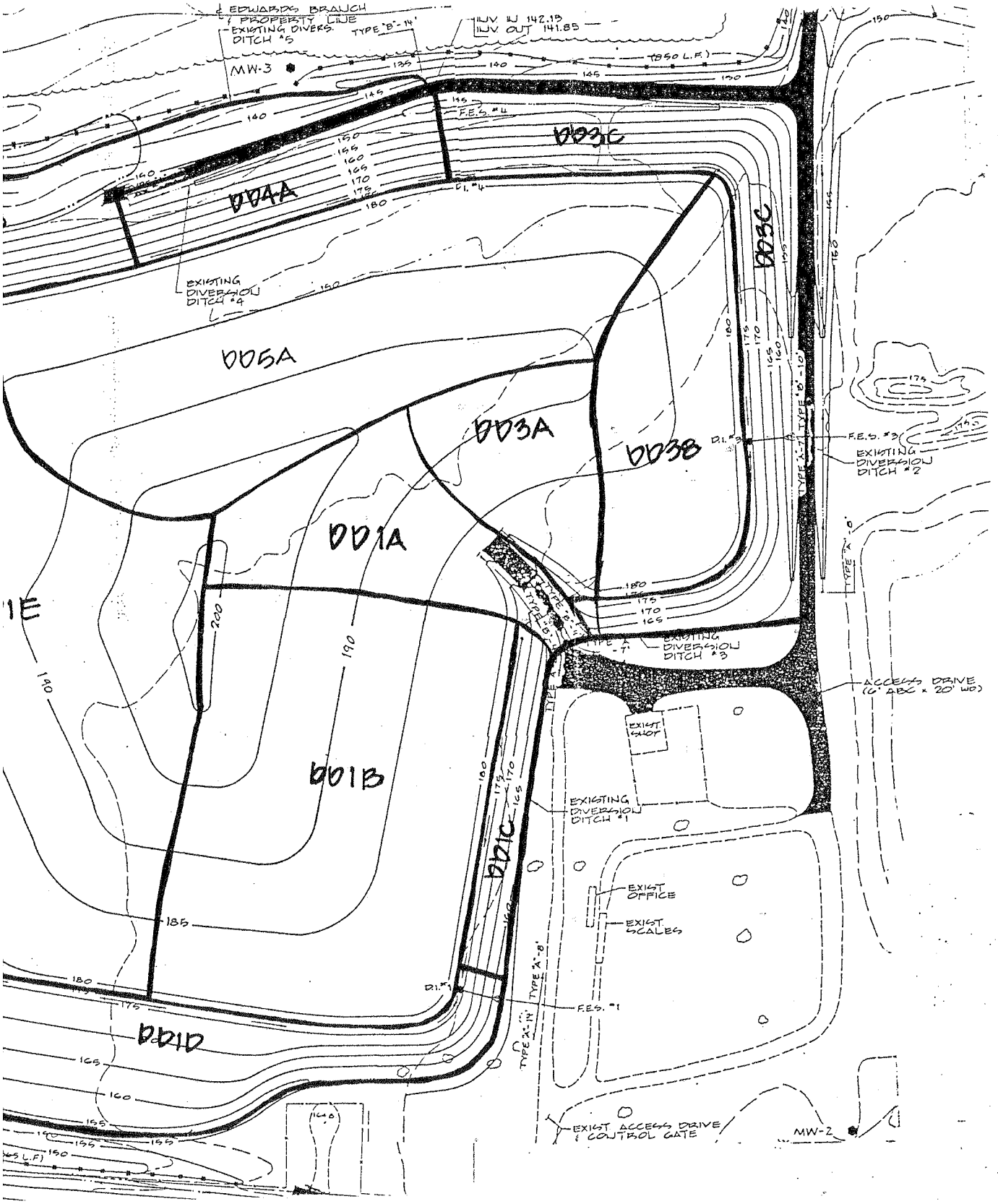
Lining Type	*n* value for Depth Ranges* 0-0.5 ft	0.5-2.0 ft	>2.0 ft
Woven Paper Net	0.016	0.015	0.015
Jute Net	0.028	0.022	0.019
Fiberglass Roving	0.028	0.021	0.019
Straw with Net	0.065	0.033	0.025
Curled Wood Mat	0.066	0.035	0.028
Synthetic Mat	0.036	0.025	0.021

* Adapted from: FHWA-HEC 15, Pg. 37 - April 1988

Table 8.05f
Manning's Roughness Coefficient for Riprap and Gravel

Material	d_{50} (inches)	*n* value for Depth Ranges 0-0.5 ft	0.5-1.0 ft	1.0-2.0 ft	> 2.0 ft
Gravel	1	0.033	0.028	0.026	0.025
	2	0.045	0.034	0.034	0.031
Riprap	6	0.106	0.054	0.044	0.041
	9	0.215	0.068	0.062	0.047
	12	0.797	0.084	0.060	0.053
	15	—	0.104	0.068	0.059
	18	—	0.127	0.076	0.064
	21	—	0.158	0.085	0.070
	24	—	0.199	0.095	0.076

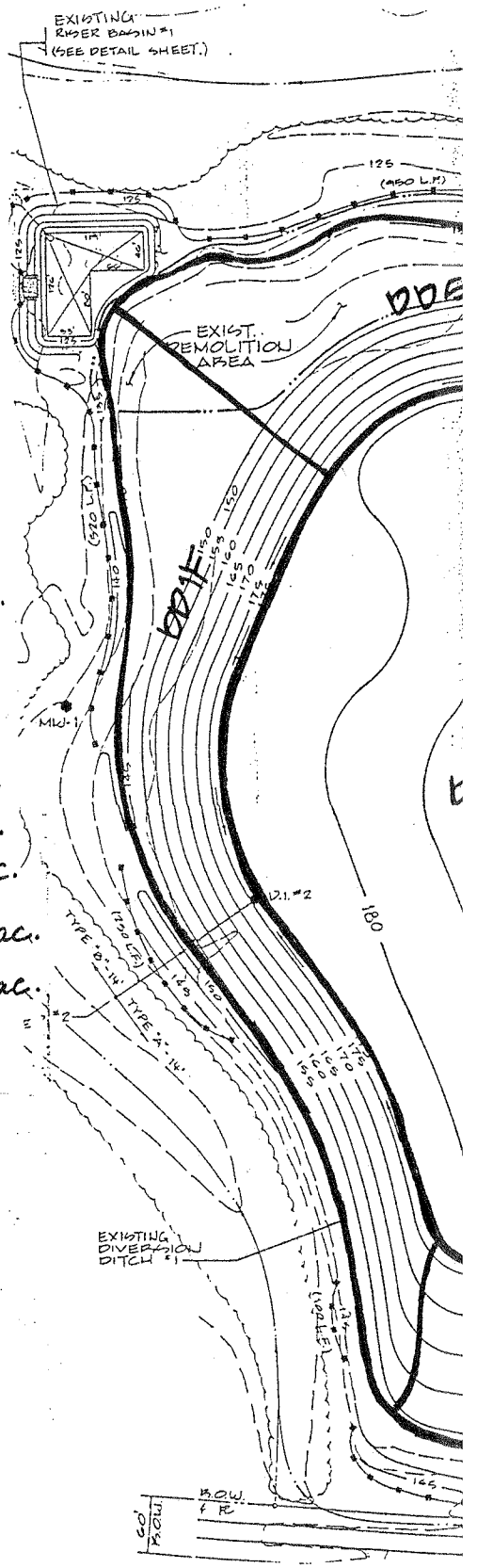
.0452 X


EDWARDS BRANCH
PROPERTY LINE
EXISTING DIVERS. DITCH #5
TYPE 'B'-14'
INV IN 142.13
INV OUT 141.85
(850 L.F.)
MW-3
F.E.S. #4
D.I. #4
D03C
D04A
EXISTING DIVERSION DITCH #4
D05A
D03A
D03B
D.I. #3
F.E.S. #3
EXISTING DIVERSION DITCH #2
TYPE 'A'-7'
TYPE 'B'-10'
D01A
D01B
D01C
D01D
EXISTING DIVERSION DITCH #3
ACCESS DRIVE (6" ABC x 20' WD)
EXIST SHOP
EXISTING DIVERSION DITCH #1
EXIST OFFICE
EXIST SCALES
D.I. #1
F.E.S. #1
TYPE 'A'-8'
TYPE 'A'-14'
EXIST ACCESS DRIVE & CONTROL GATE
MW-2

DD1A = 2.76 ac.
DD1B = 6.38 ac.
DD1C = 0.57 ac.
DD1D = 3.47 ac.
DD1E = 8.34 ac.
DD1F = 2.77 ac.

DD3A = 2.66 ac.
DD3B = 2.29 ac.
DD3C = 2.06 ac.
DD4A = 1.08 ac.

DD5A = 6.53 ac.
DD5B = 4.26 ac.



MUNICIPAL ENGINEERING
RECEIVED
NOV 25 1991
SERVICES COMPANY

State of North Carolina
Department of Environment, Health and Natural Resources
Northeastern Region
1424 Carolina Avenue, Washington, North Carolina 27889-1424

James G. Martin, Governor
William W. Cobey, Jr., Secretary

Lorraine G. Shinn
Regional Manager

DIVISION OF LAND RESOURCES
LAND QUALITY SECTION
November 22, 1991

LETTER OF APPROVAL WITH CONDITION

County of Wayne
Attention: Mr. Will R. Sullivan, Manager
P.O. Box 227
Goldsboro, North Carolina 27530

RE: Erosion and Sedimentation Control Plan
Landfill Borrow Area, Phase II
Dudley - Wayne County
Date Received: September 9, 1991
Start Review Period: October 25, 1991
Responsible Party: County of Wayne

Gentlemen:

This office has reviewed the erosion and sedimentation control plan submitted for the project as referenced above. The purpose of this project is to provide cover material for the landfill from an approximate twelve-acre site. We find the plan to be acceptable and hereby issue this letter of approval with condition as follows:

The inflow/outflow hydrograph for the sediment basin must be provided prior to initiation of land-disturbing activities associated with this project.

Please be advised of the following minimal mandatory standards of N.C.G.S. 113A-50 through 71, and N.C.A.C. Title 15, Chapter 4: a) 15 N.C.A.C. 4B.0017(a) requires that a copy of the

approved soil erosion control plan be on file at the job site; b) N.C.G.S. 113A-57(2) requires that slopes left exposed will, within 30 working days of completion of any phase of grading, be planted or otherwise provided with ground cover, devices or structures sufficient to restrain erosion; c) N.C.G.S. 113A-57(3) and 15 N.C.A.C. 4B.0007(b) require that a permanent ground cover, sufficient to restrain erosion, be provided within 30 working or 120 calendar days, whichever period is shorter, after completion of construction or development; and that inspections over the life of the project will be made to ensure compliance with the approved plan.

The state's sedimentation pollution control program is performance oriented and requires protection of adjoining natural resources and properties. If, following commencement of this project, it is determined that the plan and/or its implementation is inadequate to meet the requirements of G.S. 113A 51-66, this office may require revisions in the plan and/or its implementation so as to comply with the state law.

Be advised that it is your responsibility to understand and comply with the requirements of the Act. Failure to properly implement the approved plan, or to comply with the requirements of this program, could result in a civil penalty assessment against the financially responsible party of up to $500 per day for each day the site is out of compliance.

In recognizing the desirability of early coordination of sedimentation control, we believe that it would be beneficial if a pre-construction conference can be arranged to discuss the approved erosion and sedimentation control plan for this project. It would be appreciated if you would contact this office and let me know the date of construction start-up and date of the pre-construction conference.

Sincerely,

Patrick H. McClain, P.E.
Assistant Regional Engineer

PHMcC:mr

Enclosure

cc: Lisa Hampton, Municipal Engineering Services
Bill Morris, Division of Solid Waste Management

CALCULATION

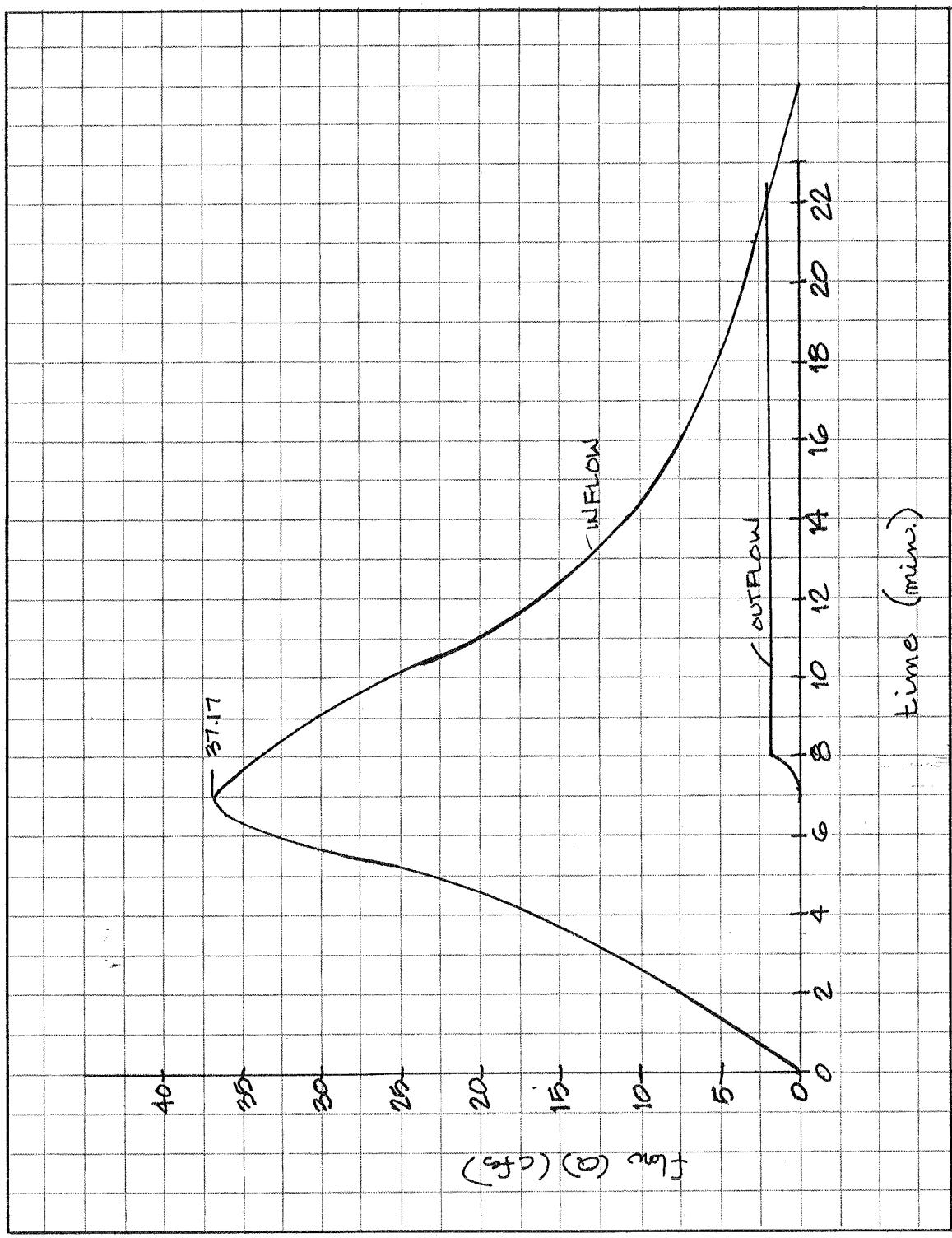
PROJECT Wayne Co. Borrow Areas PROJ. NO. G91024

CLIENT Basin Calcs. Inflow Hydrograph DATE 11-22-91

SUBJECT _____ DES. BY LCH

CHK. BY DWS

REMARKS



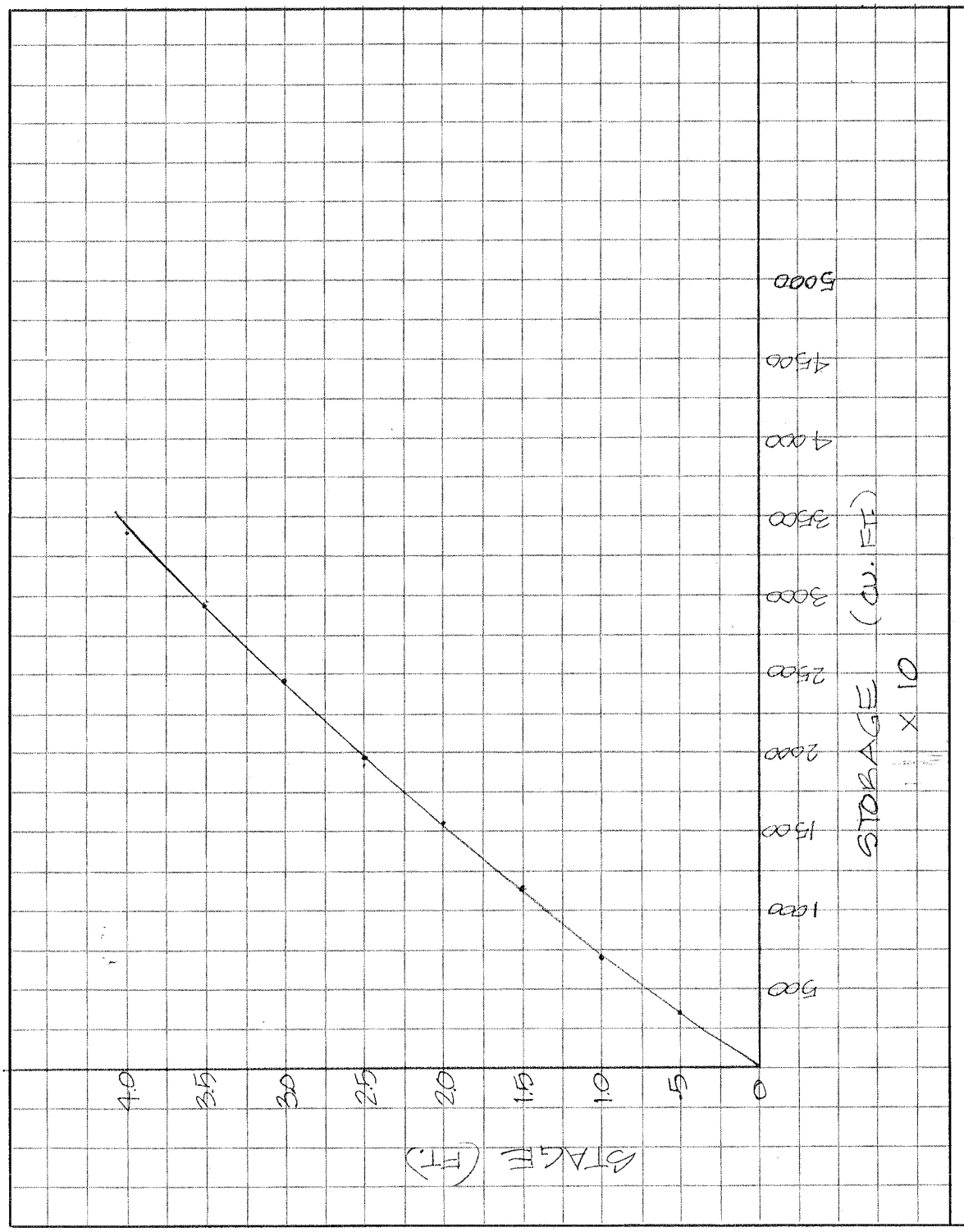
Municipal Engineering Services Company, P.A.

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393 P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

CALCULATION

PROJECT Wayne Co. Borrow Area
PROJ. NO. G91024
CLIENT Basin Calcs.
DATE 11-22-91
SUBJECT Stage - Storage Graph
DES. BY LCH
CHK. BY DWS

REMARKS



Municipal Engineering
Services Company, P.A.

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393
P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

CALCULATION

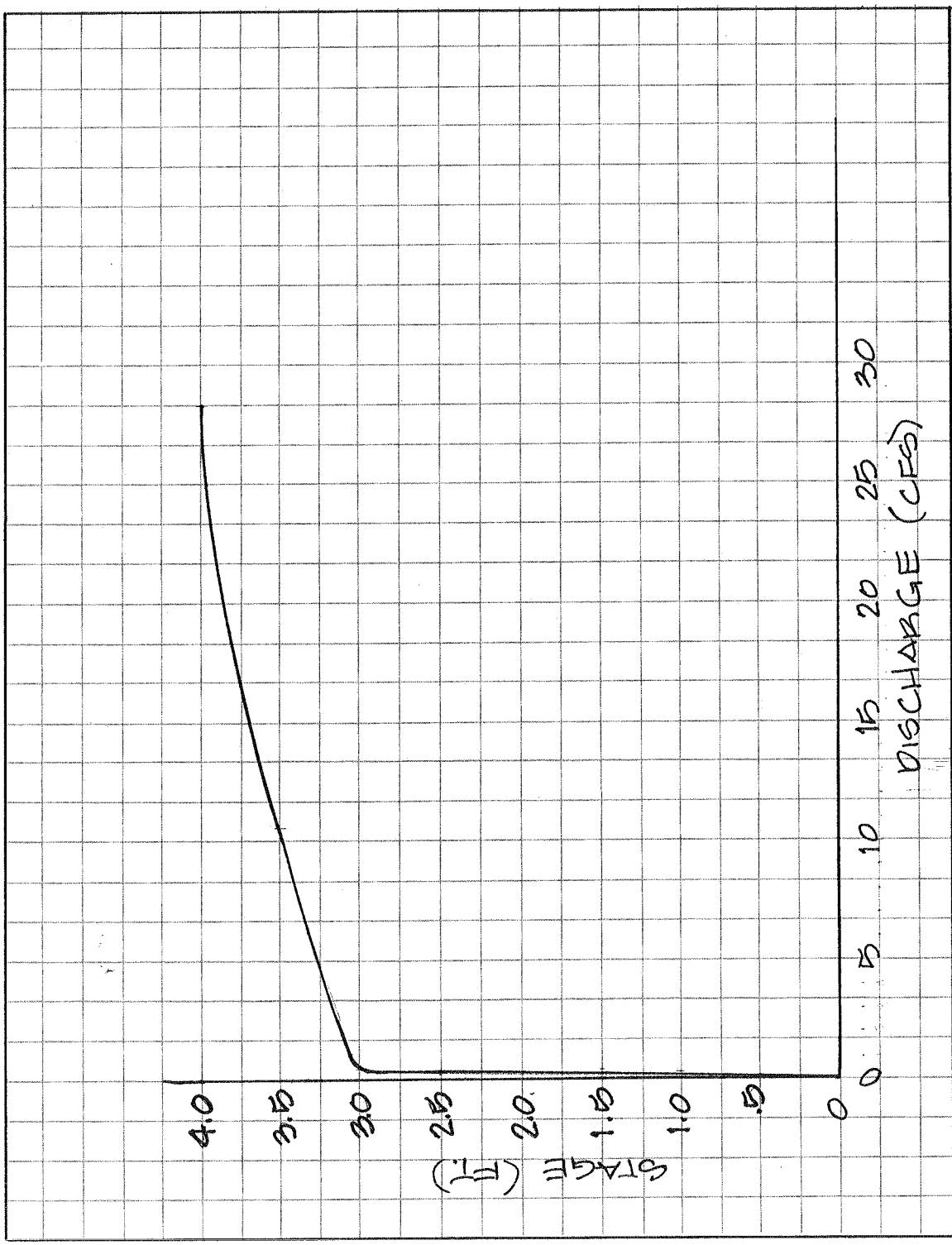
PROJECT Wayne Co. Borrow Area PROJ. NO. G91024

CLIENT _____ DATE 11-22-91

SUBJECT STAGE - DISCHARGE GRAPH DES. BY LCH.

CHK. BY D.W.S.

REMARKS



Municipal Engineering
Services Company, P.A.

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393 P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

CALCULATION

PROJECT Wayne Co. Boone Area PROJ. NO. G91024

CLIENT Basin Cates. DATE 11-21-91

SUBJECT STAGE STORAGE DES. BY LCH

CHK. BY DWS

REMARKS

STAGE	STORAGE	AVG. x DIST.	
0.0	6,962 (SQFT.)		
0.5	7,320	7,141 x .5 =	3570.5
1.0	7,886	7,603 x .5 =	7,372.0
1.5	8,060	7,973 x .5 =	11,358.5
2.0	8,442	8,251 x .5 =	15,484.0
2.5	9,230	8,637 x .5 =	19,802.5
3.0	9,636	9,031 x .5 =	24,318.0
3.5	10,050	9,433 x .5 =	29,034.5
4.0		9,843 x .5 =	33,956.0

Q_p = 37.17

T_c = 7 min

t/t_p	Q/Q_p	t (min)	Q (cfs)
0.5	0.4	3.5	14.87
1.0	1.0	7.0	37.17
1.5	0.6	10.5	22.30
2.0	0.3	14.0	11.15
3.0	0.07	21.0	2.60

Municipal Engineering
Services Company, P.A.

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393 P.O. Box 349, Boone, North Carolina 28607 (704)262-1767

Wayne Co. | $\Delta S = (I - O)\Delta t$ | 1

Time (min)	Inflow (cfs)	Storage (1000 ft³)	Outflow (cfs)
0	0	0	0
		$\Delta S = 0$	
1	2.5	$\Sigma S = 0$	0
		0.15	
2	7.5	0.15	0
		0.45	
3	11.5	0.60	0
		0.69	
4	17.0	1.29	0
		1.02	
5	22.5	2.31	0
		1.35	
6	32.5	3.66	0
		1.95	
7	37.0	5.61	0
		2.22	
8	34.0	7.83	1
		1.98	
9	30.0	9.81	1
		1.74	
10	26.0	11.6	1
		1.50	
11	20.0	13.1	1
		1.14	
12	16.5	14.24	1
		0.93	
13	13.0	15.17	1
		0.72	
14	10.5	15.89	1
		0.57	
15	8.0	16.46	1
		0.42	
16	7.5	16.88	1
		0.39	
17	6.0	17.27	1
		0.30	
18	5.0	17.57	1
		0.24	
19	4.0	17.81	1
		0.18	
20	3.0	17.99	1
		0.12	
21	2.5	18.11	1

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

WAYNE Co. (Cont.) $\Delta S = (I - O)\Delta t$

Time (min)	Inflow (cfs)	Storage (1000 ft³)	Outflow (cfs)
		0.09	
22	2.0	18.20	1
		0.06	
23	1.5	18.26	1
		0.01	
24	1.0	18.27	1
		0.00	
25	0.0	18.27	1 ← Peak Storage
26			

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

CALCULATION

PROJECT Wayne Co. Borrow Area PROJ. NO. G91024

CLIENT _____ DATE 11-22-91

SUBJECT CALCS FOR STAGE-DISCHG. GRAPH DES. BY LCH

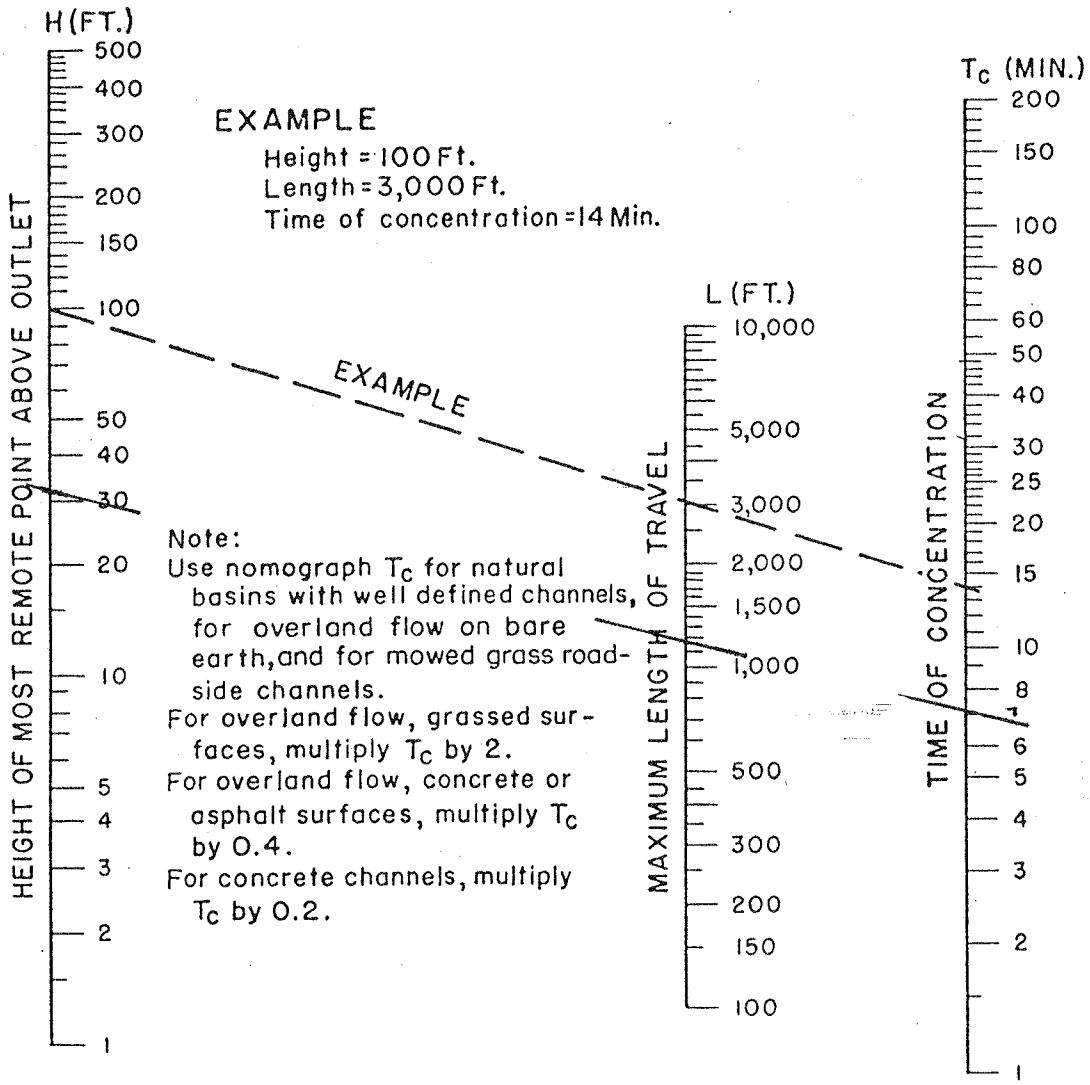
CHK. BY DWS

REMARKS

h (FT.)	No. Holes	Q	Q	
0				
.5	11	.05	.05	
1.0	11	.07		
.17	11	.03	.10	
1.5	11	.09		
.67	11	.06	.12	
2.0	11	.10		
1.17	11	.08		
.33	11	.04	.22	
2.5	11	.11		
1.67	11	.09		
.83	11	.07		
.04	11	.01	.28	
3.0	11	.12		
2.17	11	.11		
1.33	11	.08		
.54	11	.05	.36	
3.5	11	.13		ADD THIS
2.67	11	.12		$3 \times 9.42 \times (.5)^{3/2} =$
1.83	11	.10		10.0 cfs
1.04	11	.07	10.42	
4.0	11	.14		
3.17	11	.13		$3 \times 9.42 \times (1.0)^{3/2} =$
2.33	11	.11		28 cfs
1.09	11	.07		
			28.45	

Municipal Engineering Services Company, P.A.

P.O. Box 97, Garner, North Carolina 27529 (919)772-5393 P.O. Box 349, Boone, North Carolina 28607 (704)262-1767



Based on study by P.Z. Kirpich,
Civil Engineering, Vol. 10, No. 6, June 1940, p. 362

CHART 2

CALCULATIONS:

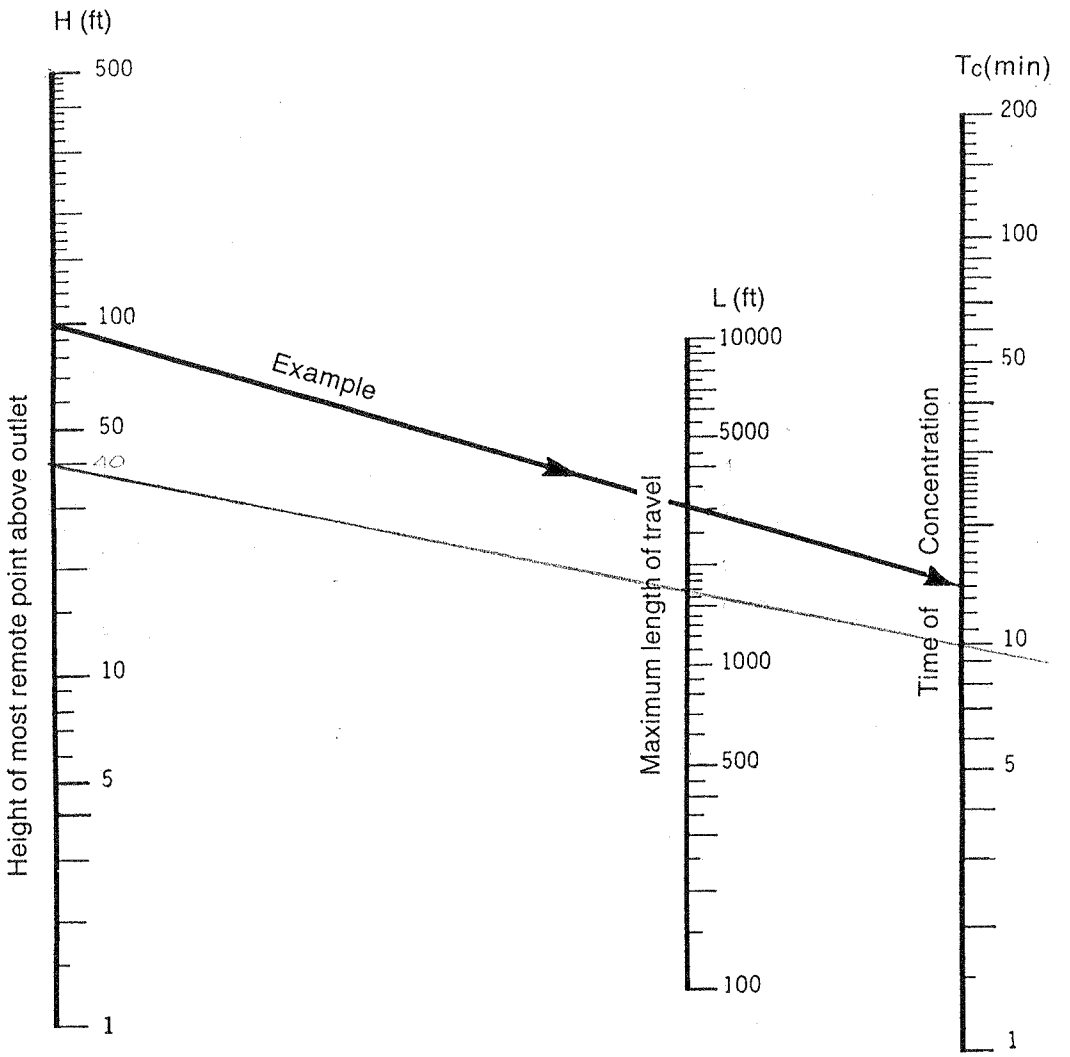
DRAINAGE AREAS = 11.8 acs.

$Q_2 = CiA$ $C = 0.45$ $i = 4.3$ $A = 11.8$

$Q_2 = (.45)(4.3)(11.8) = 22.83$ cfs

$Q_{25} = CiA$ $C = 0.45$ $i = 7.0$ $A = 11.8$

$Q_{25} = (.45)(7.0)(11.8) = 37.17$ cfs



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.

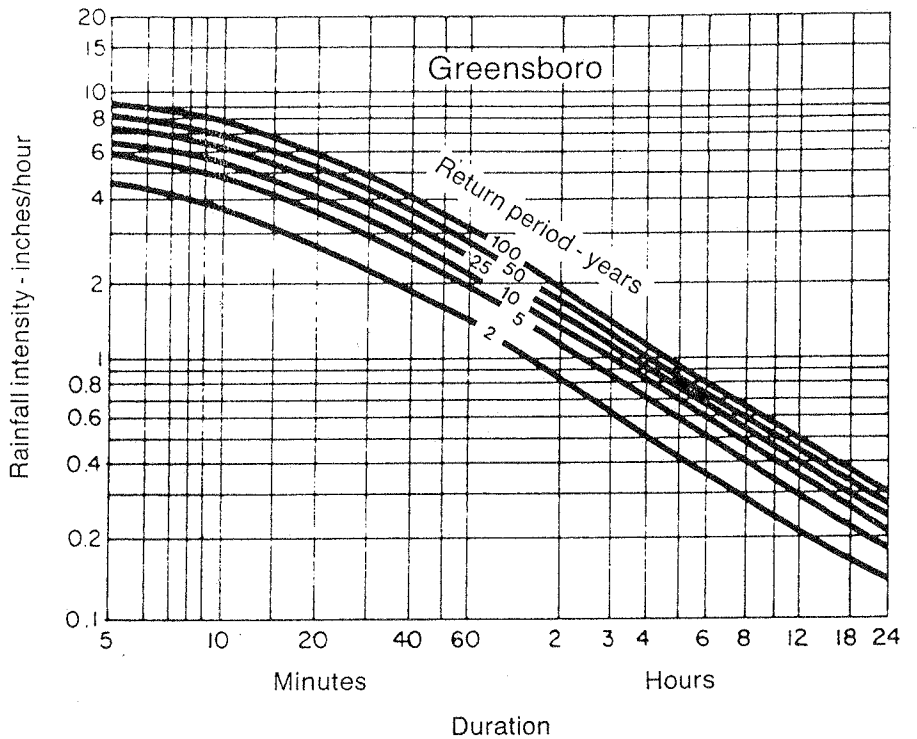


Figure 8.03d Rainfall intensity duration curves—Greensboro.

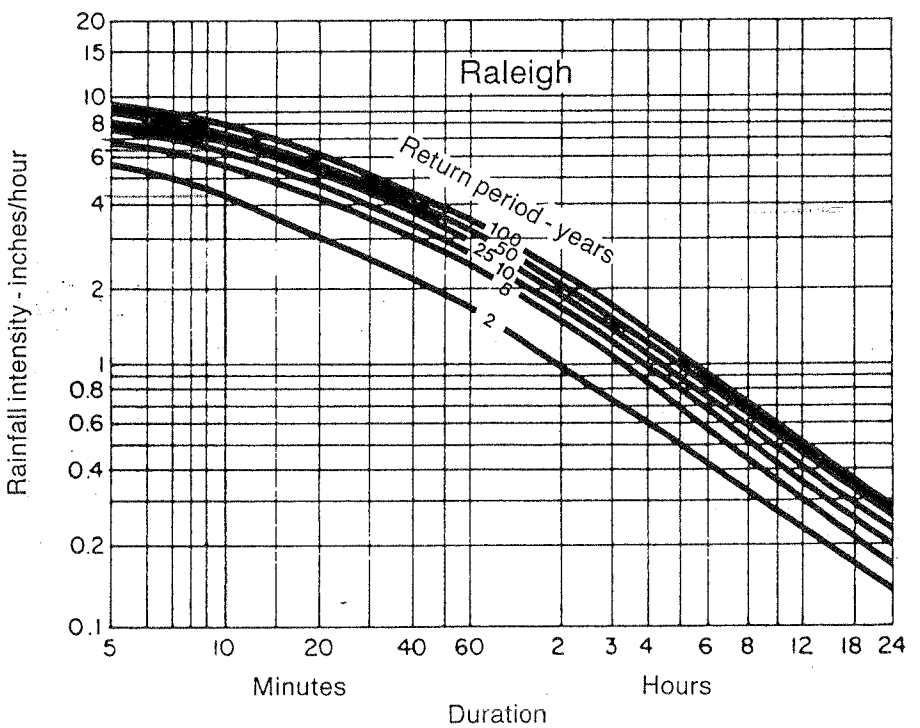
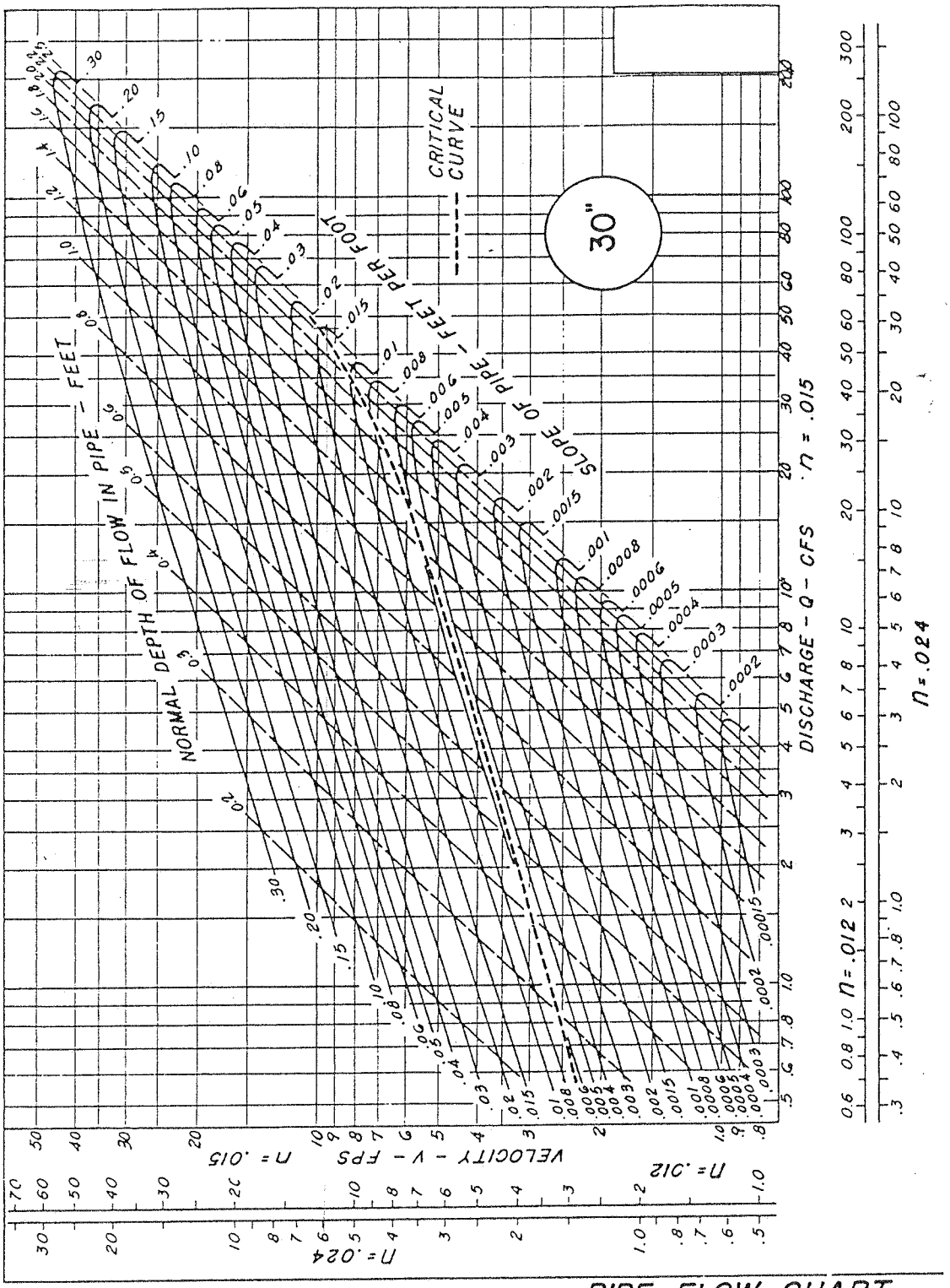


Figure 8.03e Rainfall intensity duration curves—Raleigh.



PIPE FLOW CHART
30-INCH DIAMETER

PROJECT No. G91024
NAME: LCHampton
DATE: 9-3-91
SHT.

3-Sep-91

****
* VOLUMES *
****

MODEL: DATA1: 91024EC

STATION	END-AREA		Incremental VOLUME		Cumulative VOLUME		MASS HAUL
*******	**********		**********		**********		*******
	CUT	FILL	CUT	FILL	CUT	FILL	
0+00	.8	1.7					
1+00	71.5	1.4	133.8	5.6	133.8	5.6	128.2
2+00	433.3	107.5	934.8	201.6	1068.6	207.2	861.4
3+00	1758.2	1.1	4058.4	201.1	5127.0	408.3	4718.6
4+00	2007.9	.8	6974.2	3.6	12101.2	411.9	11689.3
5+00	432.7	.0	4519.6	1.6	16620.8	413.5	16207.3
6+00	171.8	.0	1119.4	.0	17740.1	413.5	17326.7
7+00	611.9	.0	1451.2	.0	19191.3	413.5	18777.9
8+00	1046.7	.0	3071.5	.0	22262.8	413.5	21849.3
9+00	279.0	.0	2455.1	.0	24717.9	413.5	24304.4
10+00	1195.9	.0	2731.3	.0	27449.2	413.5	27035.7
11+00	.3	.3	2215.1	.5	29664.3	414.0	29250.3
12+00	278.7	1.0	516.7	2.4	30180.9	416.4	29764.5
13+00	.0	6.4	516.2	13.7	30697.1	430.1	30267.0

RISER BASIN CALCULATIONS

PROJECT: WAYNE CO. BORROW AREA
NAME: LCHAMPTON
DATE: 8/9/91

AREA: RISER BASIN

ENTER TOTAL AREA IN ACRES: 11.8 L:W RATIO 2
REQUIRED STORAGE AREA IS: 21240 cu.ft.
ENTER AN ARBITRARY STORAGE DEPTH--> 3 ft (less than 8')
BOTTOM SIZE: 59 BY 118

DETERMINE FLOWS

ENTER SLOPE CORRECTION FACTOR----->
DRAINAGE AREA IS-> 11.8
ENTER Q2-----> 22.83 ENTER Q10----->
ENTER Q5-----> ENTER Q25-----> 37.17

SIZE PRINCIPAL SPILLWAY

YOUR CONDUIT DIAMETER IS-----> 30 (in)
YOUR CONDUIT FLOW, Qcon, IS---> 29.322 (cfs)
LENGTH OF SPILLWAY IS-----> 100 '
PIPE RISER DIAMETER IS-> 36 (in)
ENTER HEAD---> 1 '

OUTLET PROTECTION

ENTER "n" FACTOR-> 0.024
ENTER SLOPE------> 1.5
FROM PIPE FLOW CHART, ENTER VELOCITY-------> 6
ENTER MINIMUM APRON LENGTH: 10 '
ENTER d50------> 0.5 '
YOUR WIDTH IS---> 6.5 '
YOUR THICKNESS IS 1.125 ' OR 13.5 " (min of 13.5")

SIZE EMERGENCY SPILLWAY

Qemergency=====> 7.848 (cfs) ENTER EXIT SLOPE-> 0.05 (decimal)
MIN % IS 3.3 BOTTOM b: 8 (feet)
MAX % IS 12.2 STAGE IS: 0.83 (feet)
AREA IS: 8.71 HYD RAD: 0.66 VELOCITY: 6.31
LINE SPILLWAY AND DOWNSLOPE OF SPILLWAY WITH RIP-RAP.

ELEVATIONS

TOP OF DAM----------> 129.5 '
EMERGENCY SPILLWAY-------> 127.5 '
RISER CREST----------> 126.5 '
CONDUIT INLET--------> 123.5 '
CONDUIT OUTLET-------> 122 '
BOTTOM ELEVATION-----> 123.5 '

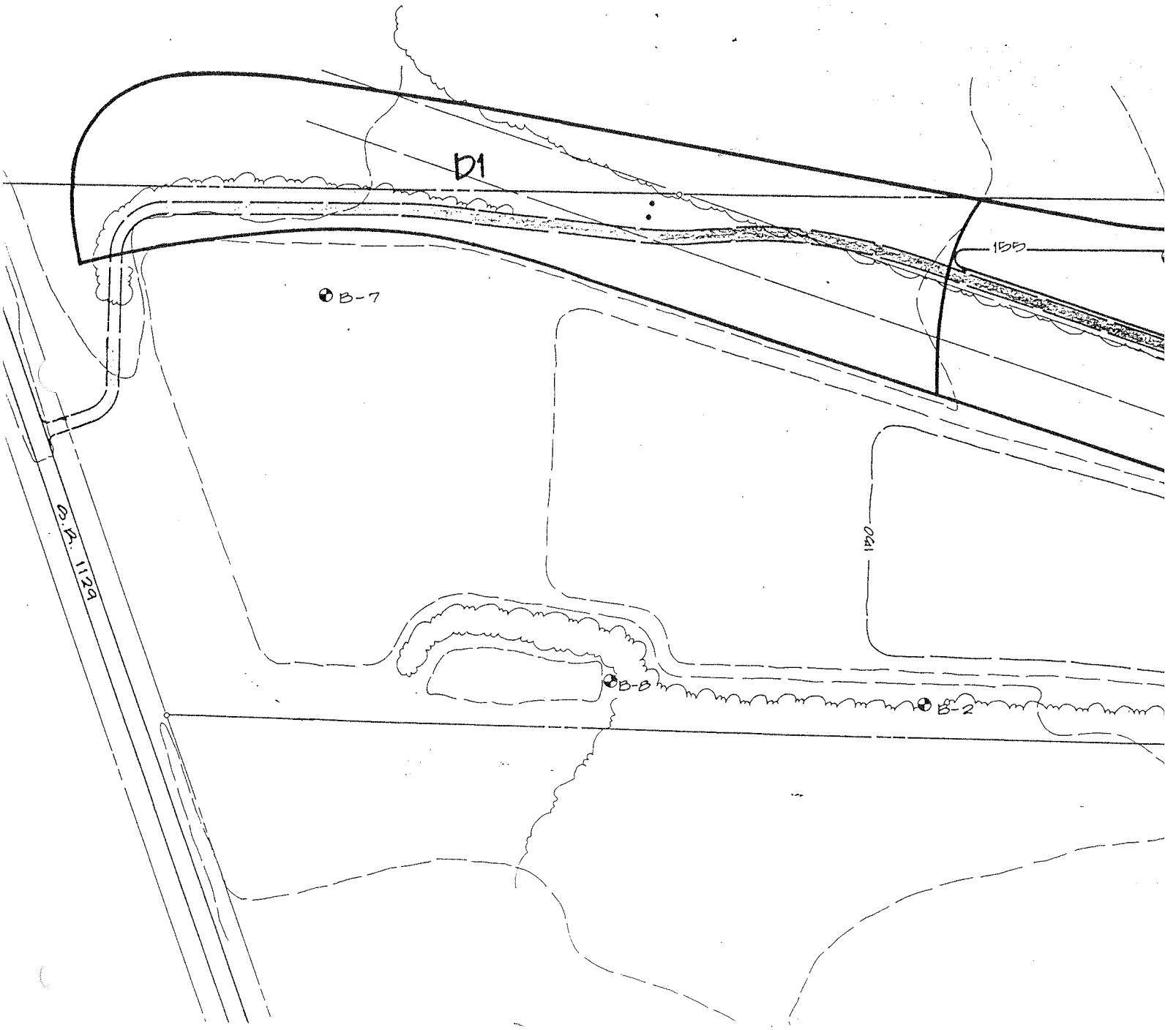
ANTI-FLOTATION CONCRETE

WEIGHT OF WATER DISPLACED----> 1940.75 (lbs)
CONCRETE REQUIRED---> 22.15 (cu.ft.)

PAD

PAD DIMENSIONS ARE 3.5 ' X 4 '
DEPTH OF PAD IS--> 1.58 '

150
125
3-5
150
B-3
145
D2
B-4
140
135
D3
130
B-6
EXISTING SILT BASIN
130

DRAINAGE AREA

AREA #	ACRES
D1	3.04
D2	5.06
D3	3.70