SUNRIDGE 2ND ADDITION - SYSTEM 400

A. HYDROLOGY - Use Rational Method, Q = CIA

1. Determine "C" Factors for sub-basins, System 400

Node	Land Use	Weighted Rational "C" C_2	C_{100}
472	Res.1/4 Ac.	.49	.73
471	Res.1/4 Ac.	.49	.73
470	End System 400 - Outlet to Pond		

2. Determine T_c & I for each sub-basin contributing to each node.

Node	T_1	I_2	I_{100}
472	15	3.83	7.37
471	15	3.83	7.37
470	End System 400		

3. Determine area "A" for sub-basin surface contribution to each inlet.

Node	Surface Drainage Area (Acres)
472	0.63
471	0.46
470	End System 400

4. Determine Q_2 contribution to each node

Node	C_2	I_2	A	Q_2
472	0.49	3.83	0.63	1.18
471	0.49	3.83	0.46	0.86
470	End System 400			

5. Flood Routing/Inlet Sizing - 2 Yr. Design

Node	Inlet Condition	Inlet Length	Q_2 Approach	Q_2 Intercept	Q_2 By-Pass	By-Pass to Node
472	Sump	5	1.18	1.18	0	-
471	Sump	5	0.86	0.86	0	-
470	End System 400					

6. Street Flow Depths - 2 Yr. Design

Node	Q_2 Approach	Flow Distribution	Street Slope	Flow Depth	Allowable Depth	Comment
472	1.18	80% (E) = 0.94	0.34	0.20	0.30	Use roll curb
		20% (W) = 0.24	0.34	0.12	0.30	" " "
471	0.86	80% (E) = 0.69	0.34	0.18	0.30	" " "
		20% (W) = 0.17	0.34	0.11	0.30	" " "
470	End System 400					

EVALUATION OF 100 YR. FLOW IN STREET R/W'S

1. Check Street Flow approaching Nodes 472 - 471.

Contributing Area

Node	Acres
472	0.63
471	0.46
	1.09 Ac.

$T_c(Q_2)$	C	I_{100}	A	Q_{100}
15.72	0.73	7.23	1.09	5.75

Q_2 (pipe) 471 - 470 = 2.03

Street Q = 5.75 - 2.03

= 3.72 cfs

Street Slope = 0.34%

Allowable Q (0.3' Wlk.Gr.) = 51.78 cfs

Actual Q street < Q actual

STRUCTURE HEAD LOSS COMPUTATIONS - SYSTEM 400 - 2 Yr.

Node 472 - Curb Inlet, Q_o only

Q_o = 1.13 cfs; V_o = 0.92 fps; $V_o^2/2g$ = 0.013; D_o = 15"

Initial Velocity, H_v = 0.013

Entrance Loss = 0.5 H_v = 0.007

Total Loss = 0.02

Node 471 - Curb Inlet + Upstream

Q_u = 1.13; V_u = 0.92; $V_u^2/2g$ = 0.013; D_u = 15"

Q_g = 0.81;

Q_o = 1.94; V_o = 1.58; V_o^2/qg = 0.04; D_o = 15"

$H_u - H_o = V_o^2/2g - Q_u/Q_o\ (V_u^2/2g)$

$= 0.04 - 0.58\ (0.013) = 0.03$

SUNRIDGE 2ND ADDITION HYDROLOGY SYSTEM 400 2 YR. FREQUENCY

TRIBUTARY AREA						SUMMATION				CONDUIT DATA				
Node to Node	"C"	Area Ac.	Tc Min.	I_2	Q_2 cfs	Tc Min.	I_2	Q_2 cfs	ΣQ_2	Pipe Size	Vel. fps	Length	T.T.	T.T. + Tc
472 - 471	0.49	0.63	15	3.83	1.18	15	3.83	1.18	1.18	15"	0.96	40	0.69	15.69
471 - 470	0.49	0.46	15	3.83	0.86	15.69	3.75	0.84	2.03	15"	11.65	50	0.50	16.19

STORM DRAINAGE – DESIGN COMPUTATIONS

Project – SUNRIDGE 2ND ADDITION
SYSTEM 400

Design Storm Frequency – 2 Yr.
Mannings "n" = 0.015
Plan –
Profile –

Sheet 1 of 1
Computed By –
Checked By –

	Line		Length	Struct.	Contrib. Drg. Area (Ac.)	Runoff "C"	I For Σt (in/hr.)	ΣQ Pipe (CFS)	Pipe Size	Pipe Friction Head	V.	$\frac{V^2}{2g}$	Time in Minutes		Constr. Slope %	Req'd Hydr. Slope %	Struct. Head Loss	Hydraulic Grade Elevation		Structure Flowline Elevation		T.C. Upper Street Elev.	Remarks
	Upper	Lower											t	Σt				Upper	Lower	Upper	Lower		
1	472	471	40	Sump	0.63	0.49	3.83	1.18	15"	0.012	0.96	0.01	0.69	15.69	0.38	0.33	0.02	155.68	155.65	154.40	154.24	159.40	Hydr. Grade Elev.=3.17 Below FL Gutter
2	471	470	50	Sump	0.46	0.49	3.75	2.03	15"	0.05	1.65	0.04	0.50	16.19	0.38	0.10	0.03	155.55	155.50	154.24	154.05	159.40	Ditto = 3.30' Below FL
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							
13																							

#33

SEDGWICK COUNTY, KANSAS

EXHIBIT NO. 1

SOIL LEGEND

SYMBOL	HYDROLOGIC GROUP	NAME
Aa	B	Albion-Shellabarger sandy loams, 1 to 4 percent slopes
Ab	B	Albion and Shellabarger sandy loans, 7 to 15 percent slopes
Ba	C	Blanket silt loam, 0 to 1 percent slopes
Bb	C	Blanket silt loan, 1 to 3 percent slopes
Ca	B	Canadian fine sandy loan
Cb	B	Canadian-Waldeck fine sandy loams
Cc	D	Carwile fine sandy loam
Cd	B	Clark-Ost clay loams, 1 to 4 percent slopes
Ce	C	Clime silty clay, 3 to 6 percent slopes
Ea	B	Elandco silt loam
Eb	B	Elandco silt loam, occasionally flooded
Ec	B	Elandco silt loam, frequently flooded
Fa	B	Farnum loam, 0 to 1 percent slopes
Fb	B	Farnum loam, 1 to 3 percent slopes
Fc	B	Farnum loam, sandy substratum, 0 to 1 percent slopes
Ga	D	Goessel silty clay, 0 to 1 percent slopes
Gb	D	Goessel silty clay, 1 to 2 percent slopes
Ia	D	Irwin silty clay loam, 1 to 3 percent slopes
Ib	D	Irwin silty clay loam, 3 to 6 percent slopes
Ic	D	Irwin silty clay loam, 2 to 6 percent slopes, eroded
La	C	Lesho loam
Lb	A	Lincoln soils
Ma	B	Milan loam, 1 to 3 percent slopes
Mb	B	Milan form, 3 to 6 percent slopes
Mc	B	Milan clay loam, 2 to 6 percent slopes, eroded
Na	B	Naron fine sandy loam
Oc	D	Owens clay loam, 1 to 3 percent slopes
Od	D	Owens-Rock outcrop complex, 3 to 10 percent slopes
Pa		Pits
Pb	D	Plevna fine sandy loam
Pc	A	Pratt loamy fine sand, undulating
Pd	A	Pratt-Tivoli complex, rolling
Ra	D	Renfrow silty clay loam, 1 to 3 percent slopes
Rb	D	Renfrow silty clay loam, 3 to 6 percent slopes
Rc	D	Renfrow-Owens clay loams, 1 to 4 percent slopes
Rd	D	Rosehill silty clay, 1 to 3 percent slopes
Sa	B	Shellabarger sandy loam, 1 to 3 percent slopes
Sb	B	Shellabarger sandy loam, 3 to 6 percent slopes
Sc	B	Shellabarger sandy loam, 3 to 6 percent slopes, eroded
Ta	D	Tabler silty clay loam
Tb	D	Tabler-Drummond complex
Ua	B	Urban land-Canadian complex
Ub	B	Urban land-Elandco complex
Uc	B	Urban land-Farnum complex, 0 to 3 percent slopes
Ud	D	Urban land-Irwin complex, 1 to 3 percent slopes
Ue	D	Urban land-Tabler complex
×Va	B	Vanoss silt loam, 0 to 1 percent slopes
×Vb	B	Vanoss silt loam, 1 to 3 percent slopes
Vc	B	Vanoss silt loam, 3 to 6 percent slopes
Vd	B	Vanoss silt loam, 3 to 6 percent slopes, eroded
Ve	D	Vernon sandy loam, 1 to 3 percent slopes
Vf	D	Vernon sandy loam, 3 to 6 percent lopes
Wa	C	Waldeck sandy loam
Wb	D	Waurika silt loam

ATTACHMENT D

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

RECOMMENDED RUNOFF COEFFICIENTS FOR RATIONAL METHOD AND PERCENT IMPERVIOUS FOR UNIT HYDROGRAPH METHOD

Land Use or Surface Characteristics	Percent Impervious	Frequency			
		2	5	10	100
1. Business:					
Downtown Areas	95	0.84	0.85	0.87	0.91
Neighborhood Areas	70	0.68	0.69	0.73	0.80
2. Residential:					
Single Family (Soil Group D)					
1/8 Acre	50	0.57	0.61	0.66	0.79
1/4 Acre	38	0.50	0.54	0.62	0.76
1/3 Acre	30	0.46	0.50	0.59	0.73
1/2 Acre	25	0.42	0.48	0.56	0.72
3/4 Acre	22	0.42	0.46	0.55	0.71
1 Acre	20	0.41	0.45	0.54	0.71
Multi-Family (Soil Group D)					
Multi-Unit (detached)	60	0.62	0.66	0.72	0.82
Multi-Unit (attached)	65	0.64	0.68	0.73	0.83
Apartments	75	0.70	0.73	0.79	0.86
Single Family (Soil Group C)					
1/8 Acre	50	0.55	0.58	0.64	0.73
1/4 Acre	38	0.48	0.51	0.57	0.68
1/3 Acre	30	0.43	0.46	0.53	0.65
1/2 Acre	25	0.40	0.43	0.50	0.63
3/4 Acre	22	0.39	0.42	0.49	0.62
1 Acre	20	0.37	0.40	0.48	0.61
Multi-Family (Soil Group C)					
Multi-Unit (detached)	60	0.60	0.63	0.69	0.77
Multi-Unit (attached)	65	0.63	0.66	0.71	0.79
Apartments	75	0.68	0.72	0.77	0.83
Single-Family (Soil Group B)					
1/8 Acre	50	0.52	0.54	0.59	0.67
1/4 Acre	38	0.44	0.46	0.52	0.61
1/3 Acre	30	0.39	0.41	0.47	0.57
1/2 Acre	25	0.36	0.38	0.44	0.54
3/4 Acre	22	0.34	0.36	0.42	0.52
1 Acre	20	0.33	0.35	0.40	0.51
Multi-Family (Soil Group B)					
Multi-Unit (detached)	60	0.58	0.60	0.65	0.72
Multi-Unit (attached)	65	0.61	0.64	0.68	0.75
Apartments	75	0.67	0.70	0.74	0.80

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
Single Family (Soil Group A)					
1/8 Acre	50	0.47	0.50	0.54	0.60
1/4 Acre	38	0.39	0.41	0.45	0.52
1/3 Acre	30	0.33	0.35	0.39	0.47
1/2 Acre	25	0.30	0.31	0.35	0.44
3/4 Acre	22	0.28	0.29	0.33	0.42
1 Acre	20	0.26	0.28	0.32	0.40
Multi-Family (Soil Group A)					
Multi-Unit (detached)	60	0.55	0.57	0.61	0.67
Multi-Unit (attached)	65	0.58	0.60	0.64	0.70
Apartments	75	0.65	0.68	0.72	0.77
3. Industrial:					
Light Areas	70	0.68	0.69	0.73	0.80
Heavy Areas	80	0.74	0.76	0.79	0.84
4. Playgrounds:	15	0.33	0.35	0.42	0.55
5. Schools:	40	0.49	0.51	0.56	0.66
6. Railroad Yard Areas:	30	0.43	0.45	0.50	0.62
7. Undeveloped Urban Areas:					
Offsite Flow Analysis (when land use not defined)	45	0.52	0.54	0.59	0.68
8. Streets:					
Paved	99	0.87	0.88	0.90	0.93
Gravel	00	0.24	0.26	0.33	0.48
9. Drive, Parking Lots and Walks:	96	0.87	0.87	0.88	0.89
10. Roofs:	90	0.80	0.85	0.90	0.93
11. Urban Lawn Areas (See Note No. 1 below):					
Soil Group A					
Slope less than 1%	00	0.08	0.09	0.13	0.23
Slope 1% to 4%	00	0.12	0.13	0.17	0.27
Slope more than 4%	00	0.16	0.17	0.21	0.31
Soil Group B					
Slope less than 1%	00	0.16	0.18	0.24	0.37
Slope 1% to 4%	00	0.20	0.22	0.28	0.41
Slope more than 4%	00	0.24	0.26	0.32	0.45
Soil Group C					
Slope less than 1%	00	0.24	0.27	0.35	0.51
Slope 1% to 4%	00	0.26	0.29	0.37	0.53
Slope more than 4%	00	0.28	0.31	0.39	0.55

Land Use or Surface Characteristics	Percent Impervious	Frequency 2	5	10	100
Soil Group D					
Slope less than 1%	00	0.28	0.33	0.43	0.63
Slope 1% to 4%	00	0.30	0.35	0.45	0.65
Slope more than 4%	00	0.32	0.37	0.47	0.67

Note No. 1: Coefficients shown in the above table are for pervious open space areas with thick turf which includes pervious areas in parks and cemeteries. Coefficients shown above must be increased 0.02 for use with agricultural pasture areas. Coefficients shown above must be reduced by 0.04 for use with agricultural cultivated areas. Group A soils are well-drained, coarse textured sands with high infiltration rates. Group B soils are moderately well-drained, moderately coarse textured soils with moderate infiltration rates. Group C soils are moderately poor-drained, moderately fine textured soils with slow infiltration rates. Group D soils are poor-drained, fine textured soils with very slow infiltration rates.

GENERAL NOTE: These Rational Formula Coefficients may not be valid for basins 320 acres or larger.

April 15, 1986

ATTACHMENT A
DRAINAGE CRITERIA MANUAL

CITY OF WICHITA, KANSAS

RAINFALL INTENSITY TABLE FOR SEDGWICK COUNTY, KANSAS

The following tabulation contains rainfall intensity in inches per hour as derived from ESSA Weather Bureau Technical Paper 40 Modified to NWS Hydro-35, 1977 During First Hour

DURATION IN MINUTES	RETURN PERIODS OF 1-YR	2-YR	5-YR	10-YR	25-YR	50-YR	100-YR
5	4.18	5.57	6.53	7.41	8.52	9.48	10.32
6	3.99	5.32	6.25	7.09	8.16	9.09	9.89
7	3.81	5.09	5.99	6.81	7.84	8.74	9.50
8	3.66	4.89	5.75	6.55	7.55	8.42	9.15
9	3.52	4.70	5.54	6.31	7.28	8.13	8.83
10	3.39	4.52	5.34	6.09	7.04	7.86	8.54
11	3.27	4.36	5.16	5.89	6.81	7.61	8.27
12	3.18	4.21	4.99	5.71	6.60	7.38	8.02
13	3.05	4.08	4.84	5.53	6.41	7.17	7.79
14	2.96	3.95	4.69	5.37	6.23	6.97	7.57
15	2.87	3.83	4.56	5.22	6.06	6.78	7.37
16	2.78	3.72	4.43	5.08	5.90	6.60	7.18
17	2.71	3.61	4.31	4.95	5.75	6.44	7.00
18	2.63	3.51	4.20	4.83	5.61	6.29	6.84
19	2.56	3.42	4.10	4.71	5.47	6.14	6.68
20	2.50	3.33	4.00	4.60	5.35	6.00	6.53
21	2.44	3.25	3.90	4.50	5.23	5.87	6.39
22	2.38	3.17	3.81	4.40	5.12	5.75	6.26
23	2.32	3.10	3.73	4.31	5.01	5.63	6.13
24	2.27	3.03	3.65	4.22	4.91	5.52	6.01
25	2.22	2.96	3.57	4.13	4.81	5.41	5.90
26	2.20	2.90	3.50	4.05	4.72	5.31	5.79
27	2.16	2.84	3.43	3.98	4.63	5.21	5.69
28	2.14	2.78	3.37	3.90	4.55	5.12	5.59
29	2.11	2.72	3.30	3.83	4.47	5.03	5.49
30	2.08	2.67	3.24	3.76	4.39	4.94	5.40
31	2.05	2.62	3.19	3.70	4.32	4.86	5.32
32	2.02	2.57	3.10	3.63	4.25	4.79	5.22
33	1.99	2.52	3.05	3.57	4.18	4.71	5.14
34	1.96	2.48	3.01	3.51	4.11	4.63	5.07
35	1.93	2.44	2.98	3.46	4.05	4.56	5.00
36	1.91	2.39	2.93	3.41	3.99	4.50	4.93
37	1.89	2.35	2.88	3.36	3.93	4.43	4.86
38	1.87	2.32	2.84	3.31	3.87	4.37	4.79
39	1.85	2.28	2.80	3.26	3.82	4.31	4.73
40	1.83	2.24	2.76	3.22	3.76	4.25	4.66
41	1.81	2.21	2.72	3.17	3.71	4.19	4.60
42	1.79	2.18	2.68	3.13	3.66	4.13	4.54
43	1.77	2.14	2.64	3.09	3.61	4.08	4.49
44	1.75	2.11	2.61	3.05	3.57	4.03	4.43
45	1.73	2.08	2.57	3.01	3.52	3.98	4.38

ATTACHMENT E

DRAINAGE CRITERIA

CITY OF WICHITA, KANSAS

AVERAGE OVERLAND FLOW VELOCITY FOR USE WITH URBANIZED AREAS

Surface Type	VELOCITY IN FEET/SECOND FOR SLOPES IN PERCENT SHOWN																			
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	20.0
Forest with Heavy Ground Litter or Meadow	0.03	0.04	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.16	0.21	0.28	0.33	0.39	0.46	0.53	0.60	0.72	1.10
Fallow or Minimum Tillage Cultivation	0.06	0.08	0.10	0.12	0.13	0.14	0.16	0.17	0.18	0.19	0.29	0.40	0.51	0.66	0.78	0.91	1.05	1.20	1.44	2.10
Short Grass Pasture or Lawns	0.09	0.13	0.15	0.18	0.20	0.21	0.23	0.25	0.26	0.28	0.45	0.60	0.77	0.96	1.17	1.33	1.50	1.68	1.98	3.20
Almost Bare Ground	0.16	0.22	0.28	0.31	0.35	0.38	0.41	0.44	0.46	0.49	0.70	0.85	1.05	1.26	1.50	1.75	2.03	2.32	2.79	4.40
Grassed Waterway	0.35	0.48	0.58	0.67	0.77	0.84	0.91	0.98	1.05	1.12	1.54	1.82	2.10	2.38	2.78	3.20	3.66	4.14	4.56	7.00
Paved Areas (Sheet Flow) or Shallow Gutter Flow	0.44	0.62	0.77	0.91	1.05	1.12	1.19	1.26	1.33	1.40	2.00	2.55	3.20	3.83	4.41	5.04	5.70	6.00	6.20	9.00

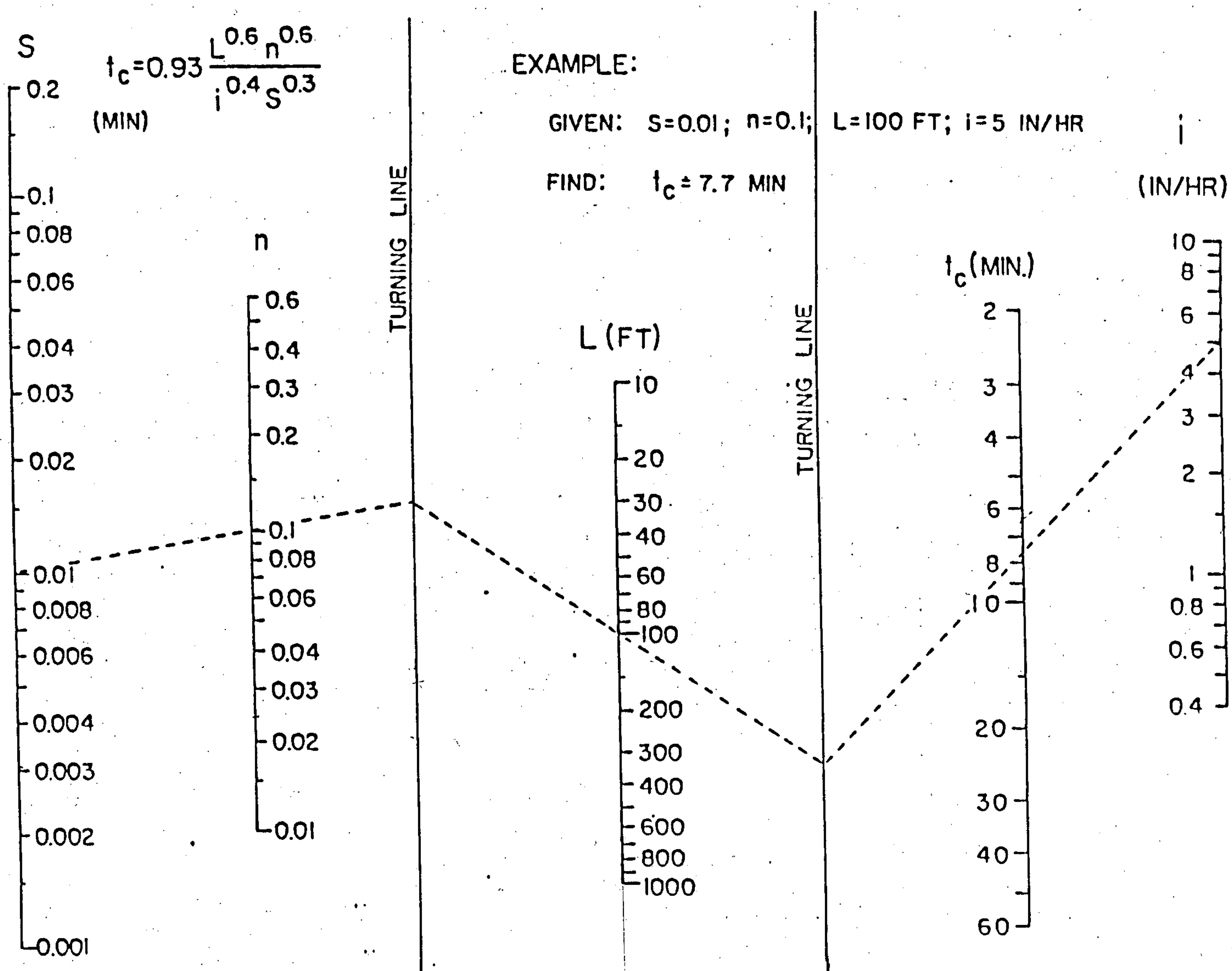


CHART 1. Kinematic wave formulation for determining time of concentration.

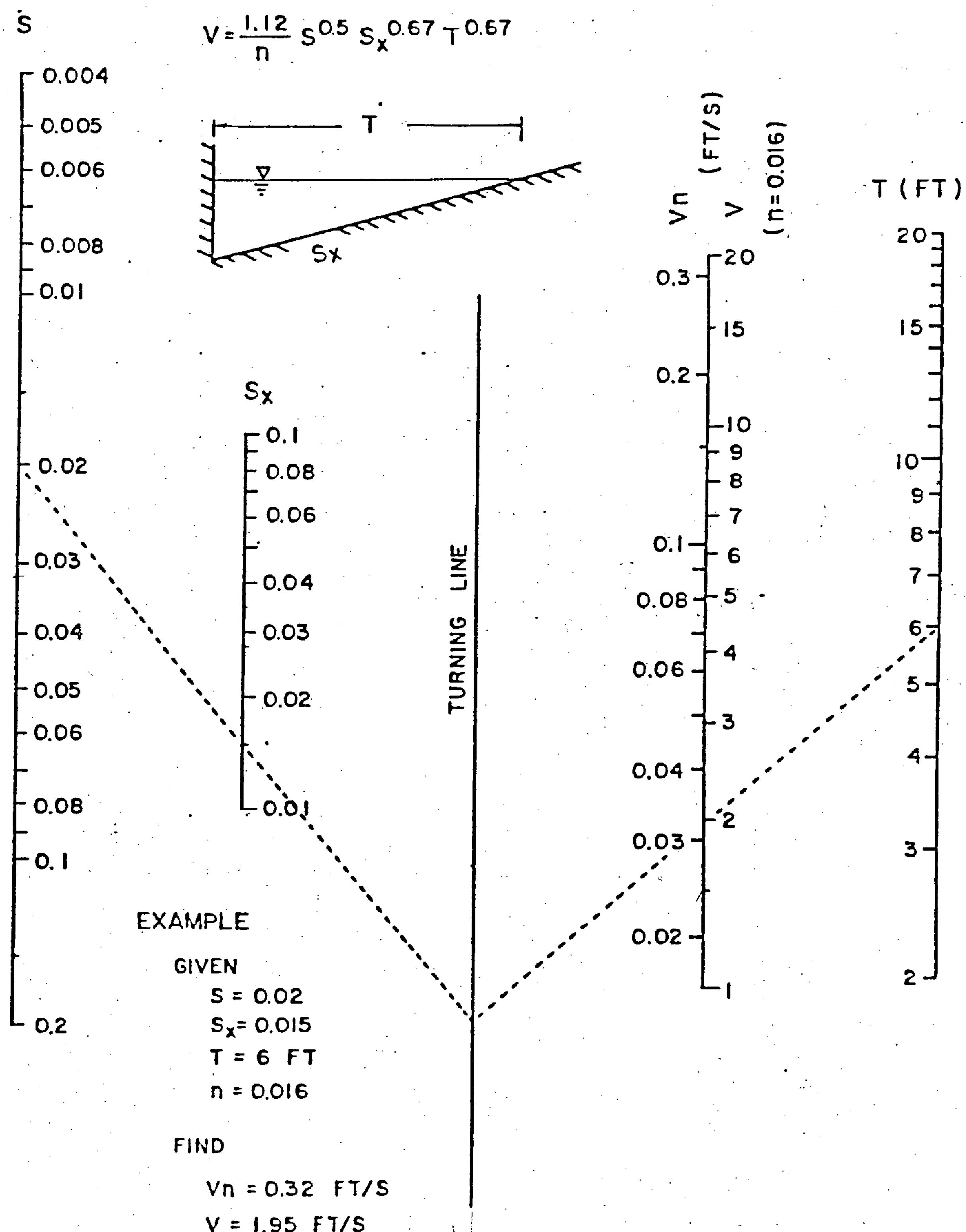


CHART 2. Velocity in triangular gutter sections.

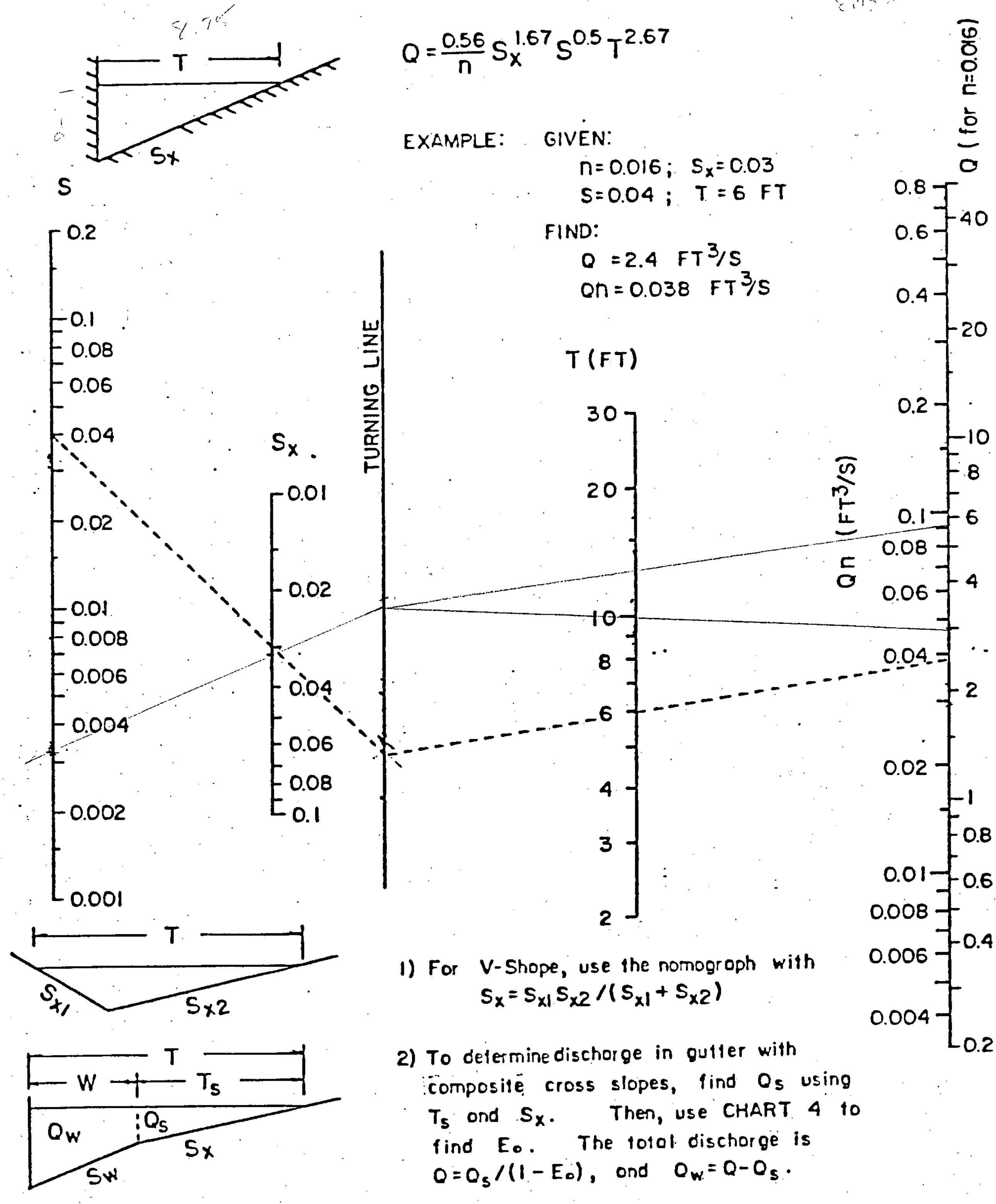


CHART 3. Flow in triangular gutter sections.

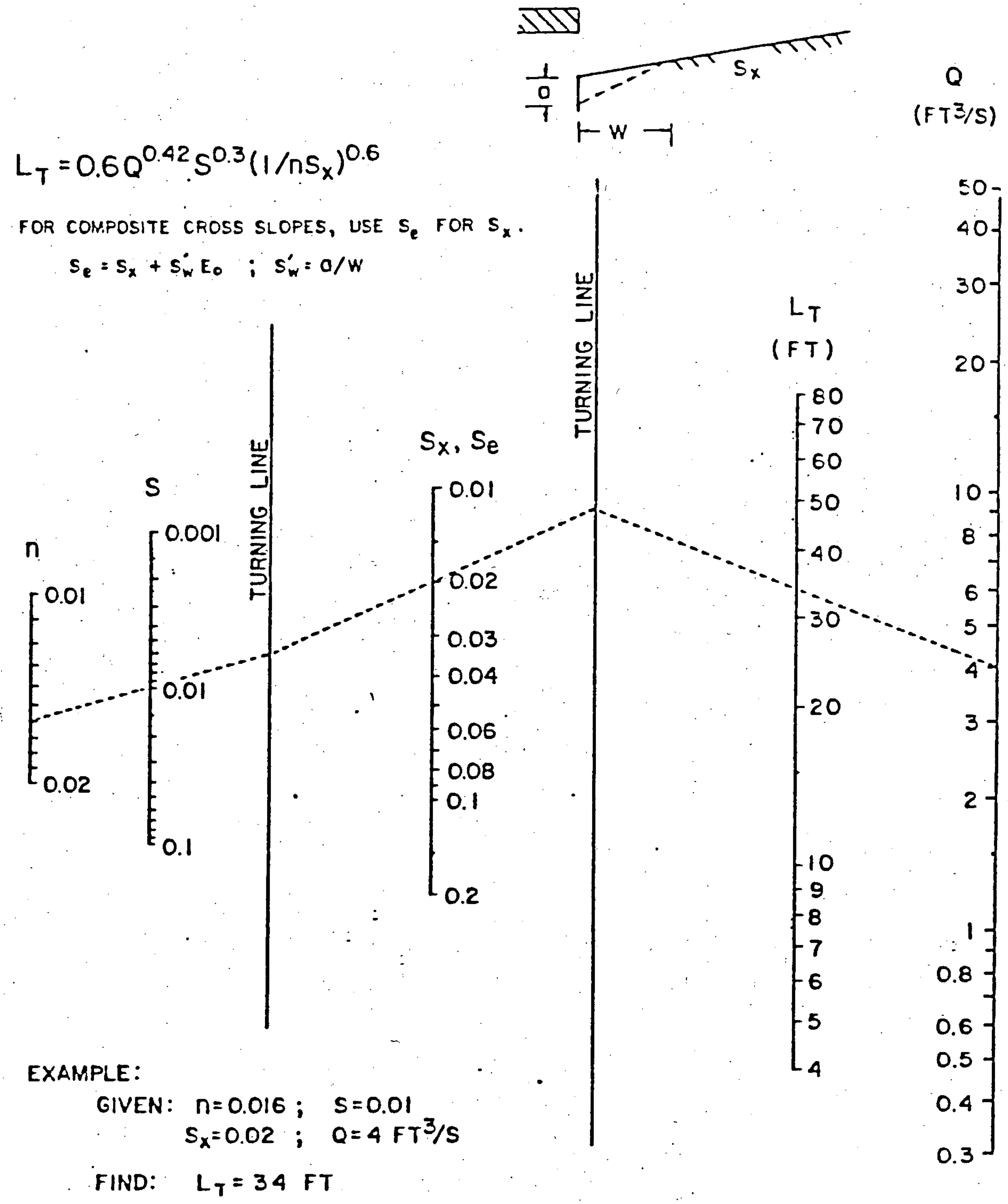


CHART 9. Curb-opening and slotted drain inlet length for total interception.

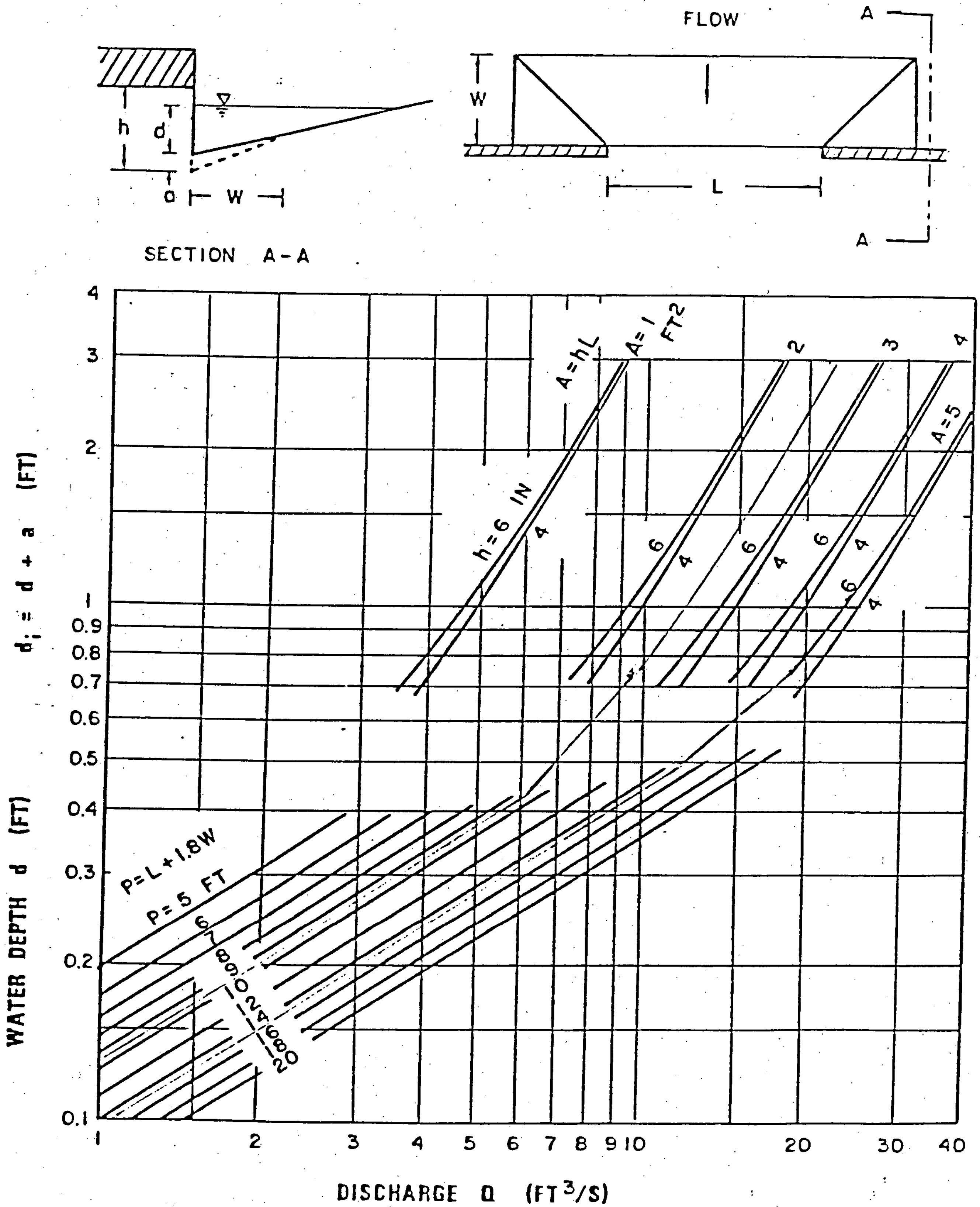
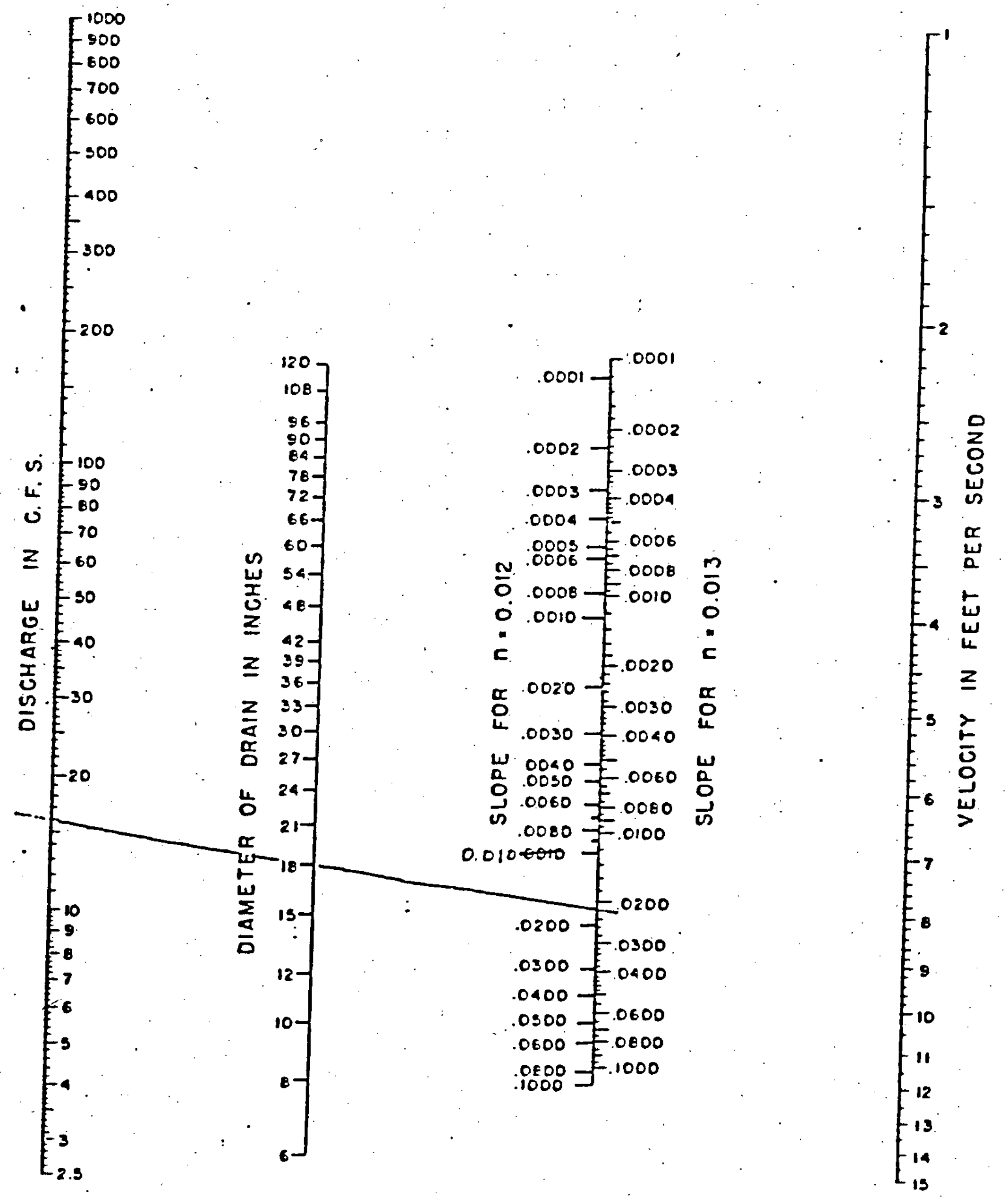


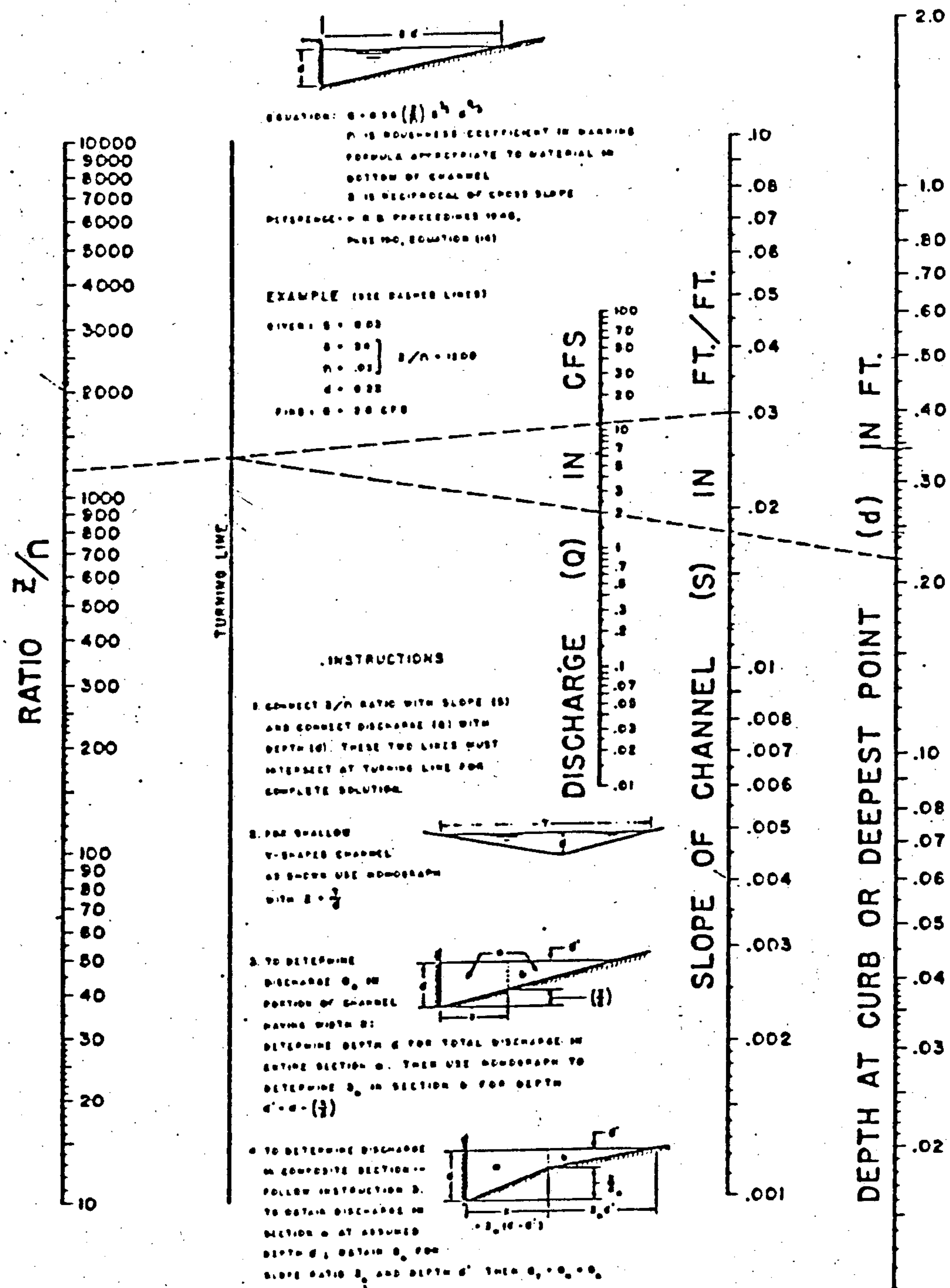
CHART 12. Depressed curb-opening inlet capacity in sump locations.



Nomograph for computing required size of circular drain, flowing full - n = 0.012 OR 0.013

NOMOGRAPH FOR FLOW IN TRIANGULAR CHANNELS

"n" = 0.016
Z = 1/3.125'' = 32
Z/n = 2,000



One foot is 0.3048m
One cubic foot is 0.0283m^3

FIG. 5-1 *(After FHWA)*

MOEHRING & ASSOCIATES — CONSULTING ENGINEERS

DRAINAGE PLAN
AND
SUPPORTING CALCULATIONS

SUNRIDGE 2ND ADDITION
SEDGWICK COUNTY, KANSAS

PREPARED BY

MOEHRING & ASSOCIATES
CONSULTING ENGINEERS

MARCH 1991

433 S. HYDRAULIC — WICHITA, KANSAS 67211 — 263-8291

PREFACE

Attached hereto are the computations for the referenced drainage plan.

The publication "Interim Drainage and Storm Sewer Policy for Design Criteria and Documentations, City of Wichita," revised 7/1/87, was used as a guide for the hydrologic and hydraulic computations. This publication is hereinafter referred to as the "Policy Manual".

Manual #1, as referenced therein, refers to "Design of Urban Highway Drainage - The State of the Art", by Reitz & Jens, Inc., April, 1980. Manual #2 refers to "Drainage of Highway Pavements, Hydraulic Engineering Circular #12", by Tye Engineering, Inc., March, 1984.

HYDROLOGY METHODS

The rational method was used for hydrologic analysis. Runoff coefficients were based on the table provided in Attachment D, of the "Policy Manual".

The time of concentration for overland flow was determined by either the velocities given in Attachment E, of the "Policy Manual" or by the Kinematic Wave Theory, as presented in Section 4.1.3, of Manual #2. Time of travel in street gutters was determined by the method used in Section 4.1.3, of Manual #2. The minimum time of concentration for design purposes was taken to be 15 minutes.

The two-year return period storm was used as the basis of design, per Table 1 of the "Policy Manual". Also, a check was made that the 100-year runoff was confined to the right-of-way.

HYDRAULIC DESIGN

For each inlet, street flooding and inlet capacity was checked for the minor storm. Conveyance in the street was based on the modified Manning Equation:

$$Q = 0.56/n(S_x)^{5/3}(T)^{8/3}\ S^{1/2} \qquad \text{(Eq. 4, Manual \#2)}$$

It is assumed that t_c, for street flow, was equal to t_c, for pipe flow. This should be a conservative assumption.

For local streets, curb-deep flow is tolerable for the minor storm. For collectors, a single eight-foot center lane should remain unflooded for the minor storm.

Inlet capacities were determined by the methods presented in Manual #2, using charts 9, 10 and 12. Carryover flows were added to the next inlet downstream.

In this analysis, City of Wichita Type 1A Inlets, 3/8 in/ft street cross-slope, and 6-5/8 Std. curb and gutter were assumed to be utilized.

Pipe systems were designed using the calculated capacity of each inlet, on the basis of a two-year storm.

Preliminary pipe sizes were estimated and tabulated under "Conduit Data". Manning's Equation was used to calculate friction losses in pipes flowing full. Minor losses are accounted for using conservation of momentum principles. It is desirable to keep the hydraulic grade line approximately 6 inches below the curb flowline elevations.

MAJOR STORM OVERFLOW

For each sub-area, a check was made for conveyance capacity of the major storm. To simplify analysis, the following assumptions were made:

1. The time of concentration is identical for both the major and minor storm. Thus, a ratio of rainfall intensities is used to determine Q_{100} @ each point.

2. The pipe system capacity during the major storm is assumed to be the same as during the minor storm. This is a conservative assumption, because increased ponding depths during the major storm event will increase the available head on the inlet/pipe system, thus increasing the capacity.

3. The conveyance capacity of the street R/W's was calculated for several gradients, and used as a check against tabulated discharges for the 100 yr. event.

In general, the minimum grade at the right-of-way line is 0.3' above the top of the curb. If walk grades higher than minimum are required to confine the major storm overflow, such walk elevations will be noted and identified.

SUNRIDGE 2ND ADDITION -

DRAINAGE PLAN HYDROLOGY

A. INITIAL DATA

1. Drainage Areas

System 100	=	34.37 Ac.
System 200	=	5.85 Ac.
System 300	=	6.27 Ac.
System 400	=	1.09 Ac.
Flow Offsite to 119th St.	=	2.09 Ac.
Flow Directly to Detention Pond	=	4.14 Ac.
Flow to Echo Hills	=	0.91 Ac.

2. S.C.S. Hydrologic Soil Groups & Runoff Coefficients

In the drainage basins contributing to Systems 100 & 200 there are 22.61 Ac. of Vanoss and Waurika soils, in Hydrologic Group "B", and 17.62 Ac. of Tabler soils, in Hydrologic Group "D".

Contributing to System 300, are 4.17 Ac. of Group "B" Soils and 3.01 Ac. of Group "D" Soils.

Contributing to System 400, are 0.22 Ac. of Group "B" Soils and 0.87 Ac. of Group "D" Soils.

Following, are determinations of Weighted Rational "C" values for the respective Systems. Rational "C" Values are from Attachment "D" of the City Policy Manual.

Soil Group	Soil Area	Land Use	% Imperv.	Rational "C"	% Total Area		Product (C x %)
Weighted "C" Values - Systems 100 & 200 - 2 Yr. Frequency							
B	22.61	Res.-1/4 Ac.	38	.44	56.2		24.728
D	17.62	Res.-1/4 Ac.	38	.50	43.8		21.900
					100 %	=	46.628

Use Weighted "C"=.47 for Systems 100 & 200 - 2 Yr. Frequency.

Soil Group	Soil Area	Land Use	% Imperv.	Rational "C"	% Total Area		Product (C x %)
Weighted "C" Values - Systems 100 & 200 - 100 Yr. Frenquency							
B	22.61	Res.1/4 Ac.	38	.61	56.2		34.282
D	17.62	Res.1/4 Ac.	38	.76	43.8		33.288
					100 %	=	67.570

Use Weighted "C"=.68 for Systems 100 & 200 - 100 Yr. Frequency.

Soil Group	Soil Area	Land Use	% Imperv.	Rational "C"	% Total Area	Product (C x %)

Weighted "C" Value - System 300 - 2 Yr. Frequency

B	4.17	Res.1/4 Ac.	38	.44	58.08	25.555
D	3.01	Res.1/4 Ac.	38	.50	41.92	20.960
					100 % =	46.515

Use Weighted "C"=.47 for System 300 - 2 Yr. Frequency

Weighted "C" Value - System 300 - 100 Yr. Frequency

B	4.17	Res.1/4 Ac.	38	.61	58.08	35.429
D	3.01	Res.1/4 Ac.	38	.76	41.92	31.859
					100% =	67.288

Use Weighted "C"=.68 for System 300 - 100 Yr. Frequency

Weighted "C" Value - System 400 - 2 Yr. Frequency

B	0.22	Res.1/4 Ac.	38	.44	20.18	8.88
D	0.87	Res.1/4 Ac.	38	.50	79.82	39.91
					100 % =	48.79

Use Weighted "C"=.49 for System 400 - 2 Yr. Frequency

Weighted "C" Value - System 400 - 100 Yr. Frequency

B	0.22	Res.1/4 Ac.	38	.61	20.18	12.31
D	0.87	Res.1/4 Ac.	38	.76	79.82	60.66
					100 % =	72.97

Use Weighted "C"=.73 for System 400 - 100 Yr. Frequency

SUNRIDGE 2ND ADDITION - System 100

A. HYDROLOGY - Use rational Method, Q=CIA

1. Determine "C" factors for sub-basins.

Node		Land Use	Weighted Rational "C" C_2	C_{100}
119		Res.1/4 Ac.	0.47	0.68
118		Res.1/4 Ac.	0.47	0.68
117		Res.1/4 Ac.	0.47	0.68
116		Res.1/4 Ac.	0.47	0.68
115		Res.1/4 Ac.	0.47	0.68
114		Res.1/4 Ac.	0.47	0.68
113		Res.1/4 Ac.	0.47	0.68
112		Res.1/4 Ac.	0.47	0.68
111		Res.1/4 Ac.	0.47	0.68
110		Res.1/4 Ac.	0.47	0.68
109		Res.1/4 Ac.	0.47	0.68
108		Res.1/4 Ac.	0.47	0.68
107		Res.1/4 Ac.	0.47	0.68
106		Res.1/4 Ac.	0.47	0.68
105	MH	Res.1/4 Ac.	0.47	0.68
104		Res.1/4 Ac.	0.47	0.68
103	MH	Res.1/4 Ac.	0.47	0.68
102		Res.1/4 Ac.	0.47	0.68
101		Res.1/4 Ac.	0.47	0.68

100 End System

SUNRIDGE 2ND ADDITION - System 100

2. Determine T_c & I for each sub-basin contributing to each Node

Node	T_c	I_2	I_{100}
119	15 min.	3.83"/hr.	7.37"/hr.
118	15 min.	3.83"/hr.	7.37"/hr.
117	T_o = 18 min. T_g = 7.17 min. T_c - 25.17	2.95"/hr.	5.90"/hr.
116	15 min.	3.83"/hr.	7.37"/hr.
115	15 min.	3.83"/hr.	7.37"/hr.
114	15 min.	3.83"/hr.	7.37"/hr.
113	15 min.	3.83"/hr.	7.37"/hr.
112	15 min.	3.83"/hr.	7.37"/hr.
111	15 min.	3.83"/hr.	7.37"/hr.
110	15 min.	3.83"/hr.	7.37"/hr.
109	15 min.	3.83"/hr.	7.37"/hr.
108	15 min.	3.83"/hr.	7.37"/hr.
107	T_o = 22 min. T_g = 6.83 min. T_c = 28.83	2.73"/hr.	5.51"/hr.
106	15 min.	3.83"/hr.	7.37"/hr.
105 MH	-	-	-
104	15 min.	3.83"/hr.	7.37"/hr.
103 MH	-	-	-
102	15 min.	3.83"/hr.	7.37"/hr.
101	15 min.	3.83"/hr.	7.37"/hr.

100 End System

NOTE: T_o = overland flow time by Kinematic Wave

T_g = street gutter flow time, computed at velocity with maximum spread of 17 feet, for respective street gradients

T_c = minimum 15 minutes, or $T_o + T_g$

SUNRIDGE 2ND ADDITION - System 100

3. Determine Area, "A", of surface contribution to each inlet.

Node		Surface Drainage Area (Acres)
119		1.21
118		2.59
117		7.35
116		2.74
115		2.72
114		1.39
113		1.14
112		0.49
111		0.60
110		0.89
109		2.57
108		1.15
107		4.37
106		3.47
105	MH	-
104		0.47
103	MH	-
102		0.58
101		0.65
100	End System	

SUNRIDGE 2ND ADDITION - System 100

4. Determine Surface Contributions, Q_2 to each Node

Node	C_2	I_2	A	Q_2
119	0.47	3.83	1.21	2.18 cfs
118	0.47	3.83	2.59	4.66 cfs
117	0.47	2.95	7.35	10.19 cfs
116	0.47	3.83	2.74	4.93 cfs
115	0.47	3.83	2.72	4.90 cfs
114	0.47	3.83	1.39	2.50 cfs
113	0.47	3.83	1.14	2.05 cfs
112	0.47	3.83	0.49	0.88 cfs
111	0.47	3.83	0.60	1.08 cfs
110	0.47	3.83	0.89	1.60 cfs
109	0.47	3.83	2.57	4.63 cfs
108	0.47	3.83	1.15	2.07 cfs
107	0.47	2.73	4.37	5.61 cfs
106	0.47	3.83	3.47	6.25 cfs
105 MH	-	-	-	-
104	0.47	3.83	0.47	0.85 cfs
103 MH	-	-	-	-
102	0.47	3.83	0.58	1.04 cfs
101	0.47	3.83	0.65	1.17 cfs

100 End System

5. Flood Routing/Inlet Sizing - 2 Yr. Design - System 100

Node		Inlet Condition	Inlet Length	Q_2 Approach	Q_2 Intercept	Q_2 By-Pass	By-Pass To Node
119		Sump	5	2.18	2.18	0	-
118		Sump	5	4.66	4.66	0	-
117		On Grade	10	10.19	5.30	4.89	116
116		Sump	10	9.82	9.82	0	-
115		Sump	5	4.90	4.90	0	-
114		Sump	5	2.50	2.50	0	-
113		Sump	5	2.05	2.05	0	-
112		Sump	5	0.88	0.88	0	-
111		Sump	5	1.08	1.08	0	-
110		Sump	5	1.60	1.60	0	-
109		Sump	5	4.63	4.63	0	-
108		Sump	5	2.07	2.07	0	-
107		Sump	5	5.61	5.61	0	-
106		Sump	5	6.25	6.25	0	-
105	MH	-	-	-	-	-	-
104		Sump	5	0.85	0.85	0	-
103	MH	-	-	-	-	-	-
102		Sump	5	1.04	1.04	0	-
101		Sump	10	0.65	1.17	0	-

100 End System

6. Street Flow Depths - 2 Yr. Design Storm - System 100

Node	Q_2 Approach	Flow Distribution	Street Slope %	Flow Depth	Allowable Depth	Comment
119	2.18	80% (N) = 1.74	0.34	0.25	0.30	OK
		20% (S) = 0.44	0.34	0.14	0.30	OK
118	4.66	40% (W) = 1.86	0.34	0.26	0.30	OK
		60% (E) = 2.80	0.34	0.31	0.30	OK
117	10.19	100% (N) = 10.19	0.34	0.50	0.55	OK
116	9.82	20% (N) = 1.96	0.34	0.27	0.55	OK
		80% (W) = 7.86	0.34	0.47	0.55	OK
115	4.90	90% (W) = 4.41	0.34	0.37	0.55	OK
		10% (E) = 0.49	0.34	0.16	0.55	OK
114	2.50	50% (W) = 1.25	0.34	0.23	0.30	OK
		50% (E) = 1.25	0.34	0.23	0.30	OK
113	2.05	50% (E) = 1.025	0.34	0.21	0.30	OK
		50% (W) = 1.025	0.34	0.21	0.30	OK
112	0.88	65% (E) = 0.57	0.34	0.17	0.30	OK
		35% (N) = 0.31	0.34	0.13	0.30	OK
111	1.08	45% (E) = 0.49	0.34	0.16	0.30	OK
		55% (W) = 0.59	0.34	0.17	0.30	OK
110	1.60	95% (S) = 1.52	0.34	0.24	0.55	OK
		5% (N) = 0.08	0.34	0.08	0.55	OK
109	4.63	25% (N) = 1.16	0.34	0.21	0.55	OK
		75% (S) = 3.47	0.34	0.34	0.55	OK
108	2.07	70% (W) = 1.45	0.34	0.24	0.55	OK
		30% (N) = 0.62	0.34	0.17	0.55	OK
107	5.61	90% (S) = 5.05	0.34	0.38	0.55	OK
		10% (N) = 0.56	0.34	0.17	0.55	OK
106	6.25	100% (W) = 6.25	0.34	0.40	0.55	OK
105	-	-	-	-	-	-
104	0.85	50% (E) = 0.425	0.34	0.15	0.30	OK
		50% (W) = 0.425	0.34	0.15	0.30	OK
103	-	-	-	-	-	-
102	1.04	33% (S) = 0.34	0.34	0.14	0.30	OK
		67% (N) = 0.70	0.34	0.18	0.30	OK
101	1.17	72% (N) = 0.84	0.34	0.19	0.30	OK
		28% (S) = 0.33	0.34	0.30	0.30	OK
100	End System					

EVALUATION OF 100 YR. FLOW IN STREET R/W'S

1. Check flow approaching West side intersection 18th St. & Chambers.

   $Q = CIA$; $T_c = 23.84$; $C = 0.68$; $A = 7.35$; $I_{100} = 6.03$

   $Q_{100} = 30.14$ cfs

   Q pipe = 0

   Q street = Q_{100} - Q pipe

   = 30.14 - 0

   = 30.14 cfs

   Street Slope = 0.34%

   Allowable Q (0.3' wlk.gr.) = 51.78 cfs

   Actual Q street < Q allowable

2. Check Street Flow Approaching Nodes 115 - 116.

   Contributing Area

Node	Acres
117	7.35
116	2.74
115	2.72
	12.81 Ac.

$T_c(Q_2)$	C	I_{100}	A	Q_{100}
25.49	0.68	5.85	12.81	50.96

   Q_2 (pipe) 115 to 114 = 17.72 cfs

   Street Q = 50.96 - 17.72

   = 33.24 cfs

   Street Slope = 0.34%

   Allowable Q (0.3' wlk.gr.) = 51.78 cfs

   Actual Q street < Q allowable

3. Check Street Flow Approaching Nodes 119 - 112.

Contributing Areas

Node	Acres
117	7.35
116	2.74
115	2.72
118	2.59
114	1.39
113	1.14
119	1.21
112	0.49
	19.63 Ac.

$T_c(Q_2)$	C	I_{100}	A	Q_{100}
29.56	0.68	5.44	19.63	72.62

Q_2 (pipe) 112 to 101 = 28.47 cfs

Street Q = 72.62 - 28.47

= 44.15 cfs

Allowable Q (0.3' wlk.gr.) = 51.78 cfs

Actual Q street < Q allowable

4. Check Street Flow Approaching Nodes 108 - 106

Contributing Area

Node	Acres
107	4.37
108	1.15
106	3.47
	8.99 Ac.

$T_c(Q_2)$	C	I_{100}	A	Q_{100}
30.01	0.68	5.40	8.99	33.01

(Continued)

4. (Continued)

Q_2 (pipe) 106 to 105 = 12.03 cfs

Street Q = 33.01 - 12.03

= 20.98 cfs

Street Slope = 0.34%

Allowable Q (0.3' walk gr.) = 51.78 cfs

Actual Q street < Q allowable

5. Check Street Flow Approaching Nodes 102 - 101

Contributing Areas

Node	Area	Node	Area
117	7.35	107	4.37
116	2.74	108	1.15
115	2.72	106	3.47
118	2.59	110	0.89
114	1.39	109	2.57
113	1.14	111	0.60
119	1.21	104	0.47
112	0.49	102	0.58
		101	0.65
	19.63		14.75

Total Acres = 19.63 + 14.75 = 34.38

$T_c(Q_2)$	C	I_{100}	A	Q_{100}
33.58	0.68	5.10	34.38	119.23

Q_2 (pipe) = 49.76

Street Q = 119.23 - 49.76

= 69.47 cfs

(continued)

5. (Continued)

Street Slope = 0.34% (worst condition)

Allowable Q (0.4' wlk.gr.) = 69.99 cfs

Actual Q street < Q allowable

6. Check Discharge of Q_{100} Street Flow into pond @ 40' Wide Reserve

Walk grade on East side, 40' reserve = 0.3'

Walk grade on West side street = 0.7'

Available head on each 10' wide curb inlets (Node 101, 102)
= 0.55' + 0.7' = 1.25'

From Chart 12, discharge into each inlet = 27 cfs
Total Q = 54 cfs

Q_{100} in pipe, 101 - 100 = 54 + 49.76 (Q_2 in pipe) = 103.76 cfs

Street Q = 119.23 - 103.76
= 15.47 cfs to overlow into Res."A" over walk grade of 0.3' above top curb.

$Q = CLH^{3/2}$

$3.0 \times 30 \times H^{3/2} = 15.47$cfs

$H^{3/2} = 0.1719$

H = 0.309 deep

Allowable depth = walk grade on West side - walk grade on East side.
= 0.7' - 0.3' = 0.4'

Allowable depth < required head.

STRUCTURE HEAD LOSS COMPUTATIONS - SYSTEM 100 - 2 Yr.

Node 117 - Curb Inlet - Q_o only

Q_o = 5.30 cfs; V_o = 3.0 fps; $V_o^2/2g$ = 0.14; D_o = 18"

Initial velocity, H_v = 0.14

Entrance loss = 0.5 H_v = 0.07

Total loss = 0.21

Node 116 - Curb Inlet + Lateral Flow

Q_1 = 5.30; V_1 = 3.0; $V_1^2/2g$ = 0.14; D_1 = 18"

Q_g = 4.89 + 3.78 = 8.67;

Q_o = 13.97; V_o = 4.45; $V_o^2/2g$ = 0.307; D_o = 24"

$H_1 - H_o = V_o^2/2g - Q_1/Q_o\ [0.53\ V_1^2/2_g]$

$= 0.307 - 0.38\ (0.074) = 0.307 - 0.028 = 0.28$

Node 115 - Curb Inlet + Lateral Flow

Q_1 = 13.97; V_1 = 4.45; $V_1^2/2g$ = 0.307; D_1 = 24"

Q_g = 3.75

Q_o = 17.72; V_o = 3.61; $V_o^2/2g$ = 0.202; D_o = 30"

$H_1 - H_o = V_o^2/2g - Q_1/Q_o\ (0.3\ V_1^2/2g)$

$= 0.202 - 0.788(0.092) = 0.13$

Node 118 - Curb Inlet, Q_o only

Q_o = 4.66; V_o = 3.80; $V_o^2/2g$ = 0.224; D_o = 15"

Initial Velocity, H_v = 0.224

Entrance loss = 0.5 H_v = 0.112

Total loss = 0.34

Node 114 - Curb Inlet + Upstream + Lateral

Q_u = 17.72; V_u = 3.61; $V_u^2/2g$ = 0.202; D_u = 30"

Q_1 = 4.66; V_1 = 3.80; $V_1^2/2g$ = 0.224; D_o = 15"

Q_g = 1.84; Q_o = 24.22; V_o = 3.43; $V_o^2/2g$ = 0.183; D_o = 36"

$H_u - H_o = V_o^2/2g - (Q_1/Q_o)\ (0.3\ V_1^2/2g) - (Q_u/Q_o)(V_u^2/2g)$

$= 0.183 - 0.012 - 0.148 = 0.02$

Node 113 - Curb Inlet + Lateral

$Q_u = 24.22$; $V_u = 3.43$; $V_u^2/2g = 0.183$; $D_u = 36"$; $Q_g = 1.45$

$Q_o = 25.67$; $V_o = 3.63$; $V_o^2/2g = 0.205$; $D_o = 36"$

$H_u - H_o = V_o^2/2g - Q_u/Q_o\ [0.533\ V_u^2/2g] = 0.205 - 0.945\ (0.098) = 0.112$

Node 119 - Curb Inlet, Q_o only

$Q_o = 2.18$ cfs; $V_o = 1.78$ fps; $V_o^2/2g = 0.049$; $D_o = 15"$

Initial Velocity, $H_v = 0.049$

Entrance Loss = $0.5\ H_v = 0.0246$

Total Loss = 0.074

Node 112 - Curb Inlet + Upstream + Lateral

$Q_1 = 2.18$; $V_1 = 1.78$; $V_1^2/2g = 0.049$; $D_1 = 15"$

$Q_u = 25.67$; $V_u = 3.63$; $V_u^2/2g = 0.205$; $D_u = 36"$; $Q_g = 0.62$

$Q_o = 28.47$; $V_o = 2.96$; $V_o^2/2g = 0.136$; $D_o = 42"$

$H_u - H_o = V_o^2/2g = Q_1/Q_o\ (0.3\ V_1^2/2g) - Q_u/Q_o\ (0.39\ V_u^2/2g)$

$= 0.136 - 0.075\ (0.015) - 0.904\ (0.080)$

$= 0.136 - 0.001 - 0.072 = 0.063$

Node 107 - Curb Inlet, Q_o only

$Q_o = 5.61$; $V_o = 3.17$; $V_o^2/2g = 0.156$; $D_o = 18"$

Initial Velocity, $H_v = 0.156$

Entrance Loss = $0.5\ H_v = 0.078$

Total Loss = 0.234

Node 108 - Curb Inlet, Q_o only

$Q_o = 2.07$; $V_o = 1.68$; $V_o^2/2g = 0.044$; $D_o = 15"$

Initial Velocity, $H_v = 0.044$

Entrance Loss = $0.5\ H_v = 0.022$

Total Loss = 0.066

Node 106 - Curb Inlet + Upstream + Lateral

$Q_u = 5.61$; $V_u = 3.17$; $V_u^2/2g = 0.156$; $D_u = 18"$

$Q_l = 2.07$; $V_l = 1.68$; $V_l^2/2g = 0.044$; $D_l = 15"$

$Q_g = 4.35$;

$Q_o = 12.03$; $V_o = 3.82$; $V_o^2/2g = 0.227$; $D_o = 24"$

$$H_u - H_o = V_o^2/2g - Q_l/Q_o\ (0.3\ V_l^2/2g) - Q_u/Q_o\ (V_u^2/2g)$$
$$= 0.227 - 0.172\ (0.013) - 0.467\ (0.156)$$
$$= 0.227 - 0.002 - 0.073 = 0.152$$

Node 110 - Curb Inlet, Q_o only

$Q_o = 1.60$; $V_o = 1.30$; $V_o^2/2g = 0.026$; $D_o = 15"$

Initial Velocity, $H_V = 0.026$

Entrance Loss = $0.5\ H_V = 0.013$

Total Loss = 0.039

Node 109 - Curb Inlet + Lateral

$Q_l = 1.60$; $V_l = 1.30$; $V_l^2/2g = 0.026$; $D_l = 15"$

$Q_g = 4.56$

$Q_o = 6.16$; $V_o = 3.48$; $V_o^2/2g = 0.188$; $D_o = 18"$

$$H_l = H_o = V_o^2/2g - Q_l/Q_o\ (0.3\ V_l^2/2g)$$
$$= 0.188 - 0.260\ (0.008) = 0.186$$

Node 105 - Manhole + Lateral + Upstream

$Q_l = 6.16$; $V_l = 3.48$; $V_l^2/2g = 0.188$; $D_l = 18"$

$Q_u = 12.03$; $V_u = 3.82$; $V_u^2/2g = 0.227$; $D_u = 24"$

$Q_o = 18.19$; $V_o = 3.70$; $V_o^2/2g = 0.213$; $D_o = 30"$

$$H_u - H_o = V_o^2/2g - Q_l/Q_o\ (0.3\ V_l^2/2g) - Q_u/Q_o\ (V_u^2/2g)$$
$$= 0.213 - 0.339\ (0.056) - 0.66\ (0.227)$$
$$= 0.213 - 0.019 - 0.150 = 0.044$$

Node 111 - Curb Inlet, Q_o only

$Q_o = 1.08$; $V_o = 0.88$; $V_o^2/2g = 0.012$; $D_o = 15"$

Initial Velocity, H_v - 0.012

Entrance Loss = $0.5\ H_v = 0.006$

Total Loss = 0.018

Node 104 - Curb Inlet + Upstream + Lateral

$Q_1 = 1.08$; $V_1 = 0.88$; $V_1^2/2g = 0.012$; $D_1 = 15"$

$Q_u = 18.19$; $V_u = 3.70$; $V_u^2/2g = 0.213$; $D_u = 30"$

$Q_g = 0.58$

$Q_o = 19.85$; $V_o = 2.81$; $V_o^2/2g = 0.123$; $D_o = 36"$

$$H_u - H_o = V_o^2/2g - Q_1/Q_u\ (0.3\ V_1^2/2g) - Q_u/Q_o\ (V_u^2/2g)$$

$$= 0.123 - 0.054\ (0.004) - 0.916\ (0.213)$$

$$= 0.123 - 0.0002 - 0.195 = -0.07$$

Node 103 - Manhole + Lateral

$Q_1 = 19.85$; $V_1 = 2.81$; $V_1^2/2g = 0.123$; $D_1 = 36"$

$Q_o = 19.85$; $V_o = 2.81$; $V_o^2/2g = 0.123$; $D_o = 36"$

$$H_1 - H_o = V_o^2/2g - Q_1/Q_o\ (0.56\ V_1^2/2g)$$

$$= 0.123 - 1\ (0.069) = 0.054$$

Node 102 - Curb Inlet + Lateral

$Q_1 = 19.85$; $V_1 = 2.81$; $V_1^2.2g = 0.123$; $D_1 = 36"$

$Q_g = 0.68$

$Q_o = 20.53$; $V_o = 1.63$; $V_o^2/2g = 0.041$; $D_o = 48"$

$$H_1 - H_o = V_o^2/2g - Q_1/Q_o\ (0.56\ V_1^2/2g)$$

$$= 0.041 - 0.967\ (0.069) = -0.026$$

Node 101 - Curb Inlet + Lateral + Upstream

Q_l = 28.47 cfs; V_l = 2.96 fps; $V_l^2/2g$ = 0.136; D_l = 42"

Q_u = 20.53; V_u = 1.63; $V_u^2.2g$ = 0.041; D_u = 48"

Q_g = 0.76

Q_o = 49.76; V_o = 3.96; $V_o^2/2g$ = 0.24; D_o = 48"

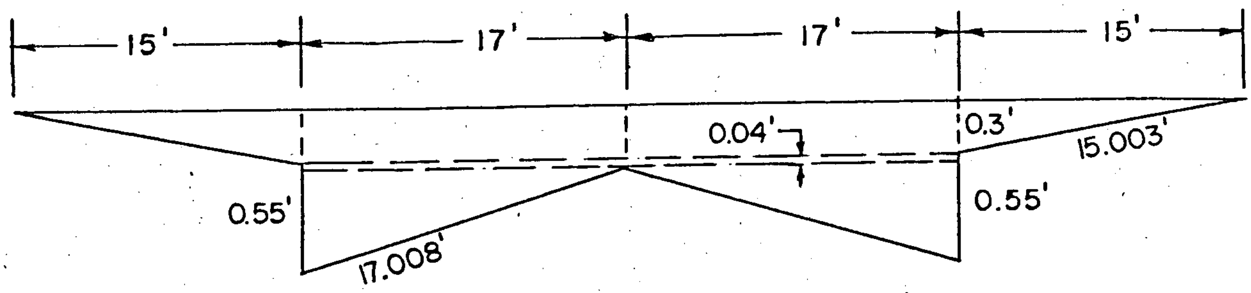
$$H_u - H_o = V_o^2/2g - Q_l/Q_o\ (0.3\ V_l^2/2g) - Q_u/Q_o\ (V_u^2/2g)$$

$$= 0.24 - 0.572\ (0.041) - 0.412\ (0.041)$$

$$= 0.24 - 0.023 - 0.017 = 0.20$$

Turn losses for Q_u = 0.35 x 0.041 = 0.0143

0.20 + 0.014 = 0.21



"N" = 0.030 Grass

"N" = 0.013 Conc. C & G

"N" = 0.016 Asph. Pvm't

64' R/W

0.3' Min. Walk Gr.

34' Fc. to Fc. Pvm't.

$$Q = \frac{1.486}{N} AR^{2/3}S^{1/2}$$

$$\text{Weighted, "N"} = \frac{2(14.5 \times 0.030) + 2(2.5 \times 0.013) + 2(15 \times 0.016)}{65.12}$$

$$\text{"N"} = \frac{1.415}{65.12} = 0.0217$$

Wetted Perimeter, "P" = 65.12

$$\text{Area, "A"} = 2\left[\frac{0.3 \times 15}{2} + \frac{0.51 \times 17}{2} + (0.04 \times 17) + (0.3 \times 17)\right]$$

$$= 2(2.25 + 4.335 + 0.68 + 5.1)$$

"A" = 24.73 sq.ft.

$$R_h = \frac{A}{P} = \frac{24.73}{65.12} = 0.3798; \quad R^{2/3} = 0.5244$$

$$\therefore Q = \frac{1.486}{0.0217} (24.73)(0.5244)\ S^{1/2}$$

$$Q = 888.07\ (S^{1/2})$$

Then, Q = 51.78 @ 0.34%

53.28 @ 0.36%

54.74 @ 0.38%

SUNRIDGE 2ND ADDITION HYDROLOGY - SYSTEM 100 2 YR. FREQ.

TRIBUTARY AREA						SUMMATION				CONDUIT DATA				
Node to Node	"C"	Area Ac.	Tc Min.	I_2	Q_2 cfs	Tc Min.	I_2	Q_2 cfs	ΣQ_2	Pipe Size	Vel. fps	Length	T.T.	T.T. + Tc
117 - 116	0.47	7.35	25.17	2.95	10.19	25.17	2.95	10.19	= 5.30 By Pass=4.89	18"	3.00	30	0.17	25.34
116 - 115	0.47	2.74	15	3.83	4.93	25.34	2.94	3.78	13.97	24"	4.45	40	0.15	25.49
115 - 114	0.47	2.72	15	3.83	4.90	25.49	2.93	3.75	17.72	30"	3.61	380	1.75	27.24
118 - 114	0.47	2.59	15	3.83	4.66	15	3.83	4.66	4.66	15"	3.80	40	0.18	-
114 - 113	0.47	1.39	15	3.83	2.50	27.24	2.82	1.84	24.22	36"	3.43	415	2.02	29.26
113 - 112	0.47	1.14	15	3.83	2.05	29.26	2.70	1.45	25.67	36"	3.63	65	0.30	29.56
119 - 112	0.47	1.21	15	3.83	2.18	15	3.83	2.18	2.18	15"	1.78	40	0.38	-
112 - 101	0.47	0.49	15	3.83	0.88	29.56	2.68	0.62	28.47	42"	2.96	195	1.10	30.66
107 - 106	0.47	4.37	28.83	2.73	5.61	28.83	2.73	5.61	5.61	18"	3.17	225	1.18	30.01
108 - 106	0.47	1.15	15	3.83	2.07	15	3.83	2.07	2.07	15"	1.69	40	0.40	-
106 - 105	0.47	3.47	15	3.83	6.25	30.01	2.67	4.35	12.03	24"	3.83	70	0.30	30.31
110 - 109	0.47	0.89	15	3.83	1.60	15	3.83	1.60	1.60	15"	1.30	40	0.51	15.51
109 - 105	0.47	2.57	15	3.83	4.63	15.51	3.78	4.57	6.17	18"	3.49	15	0.07	-
105 - 104	-	-	-	-	-	30.31	-	-	18.20	30"	3.71	157.50	0.71	31.02
111 - 104	0.47	0.60	15	3.83	1.08	15	3.83	1.08	1.08	15"	0.88	40	0.76	-
104 - 103	0.47	0.47	15	3.83	0.85	31.02	2.62	0.58	19.86	36"	2.81	167.50	0.99	32.01
103 - 102	-	-	-	-	-	32.01	-	-	19.86	36"	2.81	195	1.16	33.17
102 - 101	0.47	0.58	15	3.83	1.04	33.17	2.51	0.68	20.54	48"	1.63	40	0.41	33.58
101 - 100	0.47	0.65	15	3.83	1.17	33.58	2.50	0.76	49.76	48"	3.96	170	0.71	-

STORM DRAINAGE – DESIGN COMPUTATIONS

Project - SUNRIDGE 2ND ADDITION
SYSTEM 100

Design Storm Frequency - 2 Yr.
Mannings "n" = 0.015
Plan -
Profile -

Sheet 1 of 2
Computed By -
Checked By -

	Line Upper	Line Lower	Length	Struct.	Contrib. Drg. Area (Ac.)	Runoff "C"	I For Σt (in/hr.)	ΣQ Pipe (CFS)	Pipe Size	Pipe Friction Head	V.	$\frac{V^2}{2g}$	Time in Minutes t	Time in Minutes Σt	Constr. Slope %	Req'd Hydr. Slope %	Struct. Head Loss	Hydraulic Grade Elevation Upper	Hydraulic Grade Elevation Lower	Structure Flowline Elevation Upper	Structure Flowline Elevation Lower	T.C. Upper Street Elev.	Remarks
1	117	116	30	curb inlet	7.35	0.47	2.95	5.30	18"	0.08	3.00	0.14	0.17	25.34	0.30	0.25	0.21	158.47	158.18	154.80	154.71	160.11	Hydr.Grade Elev. 1.09' below FL Gutter
2	116	115	40	"	2.74	0.47	2.94	13.97	24"	0.15	4.45	0.31	0.15	25.49	0.20	0.38	0.28	157.90	157.75	154.21	154.13	159.74	Ditto = 1.29' below
3	115	114	380	"	2.72	0.47	2.93	17.72	30"	0.71	3.61	0.20	1.75	27.24	0.15	0.18	0.13	157.62	156.91	153.63	153.06	159.74	Ditto = 1.57' below
4	118	114	40	"	2.59	0.47	3.83	4.66	15"	0.21	3.80	0.22	0.18	15.18	0.38	0.52	0.34	157.46	156.91	154.46	154.31	159.26	Ditto = 1.25' below
5	114	113	415	"	1.39	0.47	2.83	24.22	36"	0.55	3.43	0.18	2.02	29.26	0.12	0.13	0.02	156.89	156.34	152.56	152.06	159.26	Ditto = 1.82' below
6	113	112	65	"	1.14	0.47	2.70	25.67	36"	0.10	3.72	0.21	0.29	29.49	0.12	0.16	0.11	156.23	156.13	151.96	151.88	159.29	Ditto = 2.51' below
7	119	112	40	"	1.21	0.47	3.83	2.18	15"	0.05	1.78	0.05	0.37	15.37	0.38	0.11	0.07	156.25	156.13	153.78	153.63	159.22	Ditto = 2.42' below
8	112	101	195	"	0.49	0.47	2.68	28.47	42"	0.16	2.96	0.14	1.10	30.66	0.10	0.08	0.06	156.07	155.91	151.38	151.18	159.22	Ditto = 2.60' below
9	107	106	225	"	4.37	0.47	2.73	5.61	18"	0.64	3.17	0.16	1.18	30.01	0.30	0.28	0.23	157.90	157.03	154.80	154.12	160.27	Ditto = 1.82' below
10	108	106	40	"	1.15	0.47	3.83	2.07	15"	0.04	1.69	0.04	0.40	15.40	0.38	0.10	0.07	157.14	157.03	154.52	154.37	159.46	Ditto = 1.77' below
11	106	105	70	"	3.47	0.47	2.67	12.03	24"	0.20	3.83	0.23	0.30	30.31	0.20	0.28	0.15	156.88	156.68	153.62	153.48	159.46	Ditto = 2.03' below
12	110	109	40	"	0.89	0.47	3.83	1.60	15"	0.02	1.30	0.03	0.51	15.51	0.38	0.06	0.04	156.98	156.92	154.43	154.28	159.46	Ditto = 1.93' below
13	109	105	15	"	2.57	0.47	3.78	6.17	18"	0.05	3.49	0.19	0.07	15.58	0.30	0.34	0.19	156.73	156.68	154.03	153.98	159.46	Ditto = 2.18 below

STORM DRAINAGE – DESIGN COMPUTATIONS

Project – SUNRIDGE 2ND ADDITION
SYSTEM 100

Design Storm Frequency – 2 Yr.
Mannings "n" = 0.015
Plan –
Profile –

Sheet 2 of 2
Computed By –
Checked By –

T.C.

	Line Upper	Line Lower	Length	Struct.	Contrib. Drg. Area (Ac.)	Runoff "C"	I For Σt (in/hr.)	ΣQ Pipe (CFS)	Pipe Size	Pipe Friction Head	V.	$\frac{V^2}{2g}$	Time in Minutes t	Time in Minutes Σt	Constr. Slope %	Req'd Hydr. Slope %	Struct. Head Loss	Hydraulic Grade Elevation Upper	Hydraulic Grade Elevation Lower	Structure Flowline Elevation Upper	Structure Flowline Elevation Lower	Upper Street Elev.	Remarks
1	105	104	157.50	MH	-	0.47	-	18.20	30"	0.31	3.71	0.21	0.71	31.02	0.15	0.20	0.04	156.64	156.33	152.98	152.74	159.87	Ditto= 2.68' below
2	111	104	40	Curb Inlet	0.60	0.47	3.83	1.08	15"	0.01	0.88	0.01	0.76	15.76	0.38	0.03	0.02	156.29	156.26	154.14	153.99	159.39	Ditto= 2.55' below
3	104	103	167.50	"	0.47	0.47	2.65	19.86	36"	0.15	2.81	0.12	0.99	32.01	0.12	0.09	-0.07	156.33	156.18	152.24	152.04	159.39	Ditto = 2.51' below
4	103	102	195	MH	-	-	-	19.86	36"	0.17	2.81	0.12	1.16	33.17	0.12	0.09	0.05	156.13	155.96	151.94	151.71	159.72	Ditto = 3.04' below
5	102	101	40	Curb Inlet	0.58	0.47	2.51	20.54	48"	0.08	1.63	0.04	0.41	33.58	0.08	0.02	-0.03	155.99	155.91	150.71	150.68	159.00	Ditto = 2.46' below
6	101	100	170	"	0.65	0.47	2.50	49.76	48"	0.20	3.96	0.25	0.71	-	0.08	0.12	0.21	155.70	155.50	150.68	150.54	159.00	Ditto = 2.75' below
7																							
8																							
9																							
10																							
11																							
12																							
13																							

SUNRIDGE 2ND ADDITION - System 200

A. HYDROLOGY - Use rational Method, Q=CIA

1. Determine "C" factors for sub-basins.

Node	Land Use	Weighted Rational "C" C_2	C_{100}
256	Res.1/4 Ac.	0.47	0.68
255	Res.1/4 Ac.	0.47	0.68
254	Res.1/4 Ac.	0.47	0.68
253	Res.1/4 Ac.	0.47	0.68
252	Res.1/4 Ac.	0.47	0.68
251	MH		
250	Outlet to Detention Pond		

2. Determine T_c & I for each sub-basin contributing to each Node

Node	T_c	I_2	I_{100}
256	15 min.	3.83	7.37
255	15 min.	3.83	7.37
254	15 min.	3.83	7.37
253	15 min.	3.83	7.37
252	15 min.	3.83	7.37
251	MH		
250	Outlet to Detention Pond		

SUNRIDGE 2ND ADDITION - System 200

3. Determine Area, "A", of surface contribution to each inlet.

Node	Area
256	0.69
255	1.07
254	0.91
253	1.12
252	2.06
251	MH
250	Outlet to Detention Pond

4. Determine Surface Contributions, Q_2 to each Node

Node	C_2	I_2	A	Q_2
256	0.47	3.83	0.69	1.24
255	0.47	3.83	1.07	1.93
254	0.47	3.83	0.91	1.64
253	0.47	3.83	1.12	2.02
252	0.47	3.83	2.06	3.71
251	-	-	-	-
250	Outlet to Detention Pond			

SUNRIDGE 2ND ADDITION - System 200

6. Flood Routing/Inlet Sizing - 2 Yr. Design -

Node	Inlet Type	Inlet Length	Q_2 Approach	Q_2 Intercept	Q_2 By Pass	By Pass to Node
256	Sump	5	1.32	1.32	0	-
255	Sump	5	1.93	1.93	0	-
254	Sump	5	1.64	1.64	0	-
253	Sump	5	2.02	2.02	0	-
252	Sump	5	3.94	3.94	0	-
251	MH	-	-	-	-	-
250	Outlet to Detention Pond					

7. Street Flow Depths - 2 Yr. Design

Node	Q_2 Approach	Flow Disbribution	Street Slope %	Flow Depth	Allowable Depth	Comment
256	1.32	50% (E) = 0.66	0.34	0.17	.30	Use Roll Curb
		50% (W) = 0.66	0.34	0.17	.30	" " "
255	1.93	50% (E) = 0.96	0.34	0.21	.30	" " "
		50% (W) = 0.96	0.34	0.21	.30	" " "
254	1.64	70% (W) = 1.15	0.34	0.21	.30	" " "
		30% (E) = 0.49	0.34	0.16	.30	" " "
253	2.02	70% (W) = 1.41	0.34	0.24	.30	" " "
		30% (E) = 0.61	0.34	0.17	.30	" " "
252	3.94	70% (W) = 2.76	0.34	0.30	.30	" " "
		30% (E) = 1.18	0.34	0.22	.30	" " "
251	MH	-	-	-	-	
250	Outlet to Detention Pond					

EVALUATION OF 100 YR. FLOW IN STREET R/W'S

1. Check Street Flow Approaching Nodes 255 - 253.

Contributing Area

Node	Acres
254	0.91
255	1.07
253	1.12
From Woodbridge 5th	16.78
	19.88 Ac.

$T_c(Q_2)$	C	I_{100}	A	Q_{100}
16.89	0.68	6.86	19.88	92.74

Q_2 (pipe 253 - 252)= 37.49 cfs

Street Q = 92.74 - 37.49

= 55.25 cfs

Street Slope = 0.34%

Allowable Q (0.4' Wlk.Gr.) = 69.99 cfs

Actual Q street < Q allowable

2. Check Street Flow Approaching Nodes 256 - 252.

Contributing Area

Node	Acres
254	0.91
255	1.07
253	1.12
256	0.69
252	2.06
From Woodbridge 5th	16.78
	22.63 Ac.

$T_c(Q_2)$	C	I_{100}	A	Q_{100}
18.78	0.68	6.72	22.63	103.41

(continued)

2. (Continued)

Q_2 (pipe) = 42.13

Street Q = 103.41 = 42.13

= 61.28 cfs

Street Slope = 0.34%

Allowable Q (0.4' Wlk.Gr.) = 69.99 cfs

Actual Q street < Q allowable

STRUCTURE HEAD LOSS COMPUTATIONS - SYSTEM 200 - 2 Yr.

Node 254 - Curb Inlet, Q_o only

Q_o = 33.66 cfs; V_o = 4.76 fps; $V_o^2/2g$ = 0.352; D_o = 35"

Initial Velocity, H_v = 0.352

Entrance Loss = 0.5 H_v = 0.176

Total Loss = 0.528

Node 255 - Curb Inlet, Q_o only

Q_o = 1.93; V_o = 1.57; $V_o^2/2g$ = 0.038; D_o = 15"

Initial Velocity, H_v = 0.04

Entrance Loss = 0.5 H_v = 0.02

Total Loss - 0.06

Node 253 = Curb Inlet + Upstream + Lateral

Q_u = 33.66; V_u = 4.76; $V_u^2/2g$ = 0.352; D_u = 36"

Q_1 = 1.93; V_1 = 1.57; $V_1^2/2g$ = 0.04; D_1 = 15"

Q_g = 1.90

Q_o = 37.49; V_o = 5.30; $V_o^2/2g$ = 0.44 ; D_o = 36"

$H_u - H_o = V_o^2/2g - Q_1/Q_o\ (0.3\ V_1^2/2g) - Q_u/Q_o\ (V_u^2/qg)$

= 0.44 - 0.05 (0.012) - 0.90 (0.04)

= 0.44 - 0.00 - 0.04 = 0.04

Node 256 - Curb Inlet, Q_o only

Q_o = 1.24; V_o = 1.01; $V_o^2/2g$ = 0.016; D_o = 15"

Initial Velocity, H_v = 0.016

Entrance Loss = 0.5 H_v = 0.008

Total Loss = 0.024

Node 252 - Curb Inlet + Upstream + Lateral

Q_u = 37.49; V_u = 5.30 ; $V_u^2/2g$ = 0.44 ; D_u = 36"

Q_1 = 1.24; V_1 = 1.01; $V_1^2/2g$ = 0.016; D_1 = 15"

Q_g = 3.43

(Continued)

Node 252 - (Continued)

$Q_o = 42.16$; $V_o = 4.38$; $V_o^2/2g = 0.30$; $D_o = 42"$

$H_u - H_o = V_o^2/2g - Q_1/Q_o\ (0.3\ V_1^2/2g) - Q_u/Q_o\ (V_u^2/2g)$

$= 0.30 - 0.03\ (0.005) - 0.89\ (0.44)$

$= 0.30 - 0.00 - 0.39 = -0.09$

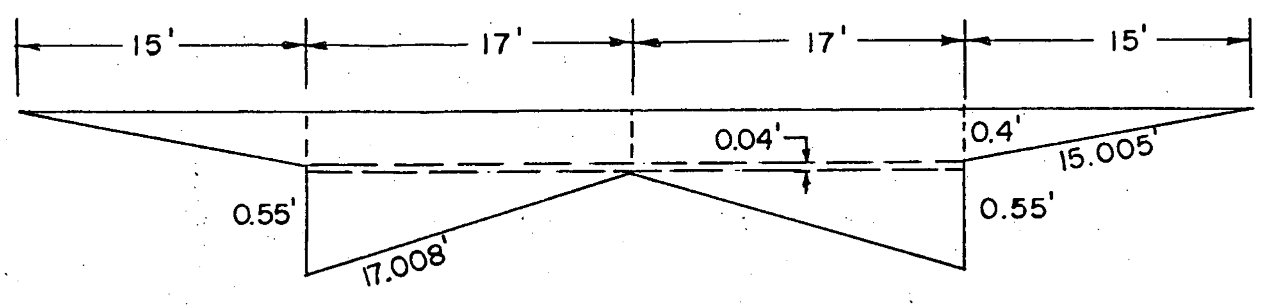
Node 251 - Manhole + Upstream

$Q_u = 42.16$; $V_u = 4.38$; $V_u^2/2g = 0.30$; $D_u = 42"$

$Q_o = 42.16$; $V_o = 4.38$; $V_o^2/2g = 0.30$; $D_o = 42"$

$H_u - H_o = V_o^2/2g - Q_u/Q_o\ (0.3\ V_u^2/2g)$

$= 0.30 - 1\ (0.09) = 0.21$



"N" = 0.030 Grass

"N" - 0.013 Conc. C & G

"N" = 0.016 Asph. Pvm't.

64' R/W

0.4' Min. Walk Gr.

34' Fc. to Fc. Pvm't

$Q = \frac{1.486}{N} AR^{2/3}S^{1/2}$

Weighted "N" = $\frac{2(14.5 \times 0.030) + 2(2.5 \times 0.013) + 2(15 \times 0.016)}{65.12}$

"N" = $\frac{1.415}{65.12} = 0.0217$

Wetted Perimeter, "P" = 65.12

Area "A" = $2\left[\frac{0.4 \times 15}{2} + \frac{0.51 \times 17}{2} + (0.4 \times 17) + (0.04 \times 17)\right]$

$= 2(3.00 + 4.335 + 6.8 + 0.68)$

Area = 29.63 sq. ft.

$R_h = \frac{A}{P} = \frac{29.63}{65.12} = 0.4550;\ R^{2/3} = 0.5916$

$\therefore Q = \frac{1.486}{0.0217} \times 29.63 \times 0.5916 \times S^{1/2}$

$Q = 1200.38\ (S^{1/2})$

Then, Q = 69.99 @ 0.34%

Q = 72.02 @ 0.36%

Q = 74.00 @ 0.38%

SUNRIDGE 2ND ADDITION — HYDROLOGY SYSTEM 200 — 2 YR. FREQUENCY

TRIBUTARY AREA						SUMMATION				CONDUIT DATA				
Node to Node	"C"	Area Ac.	Tc Min.	I2	Q2 cfs	Tc Min.	I2	Q2 cfs	Σ Q2	Pipe Size	Vel. fps	Length	T.T.	T.T. + Tc
254 - 253	0.47	0.91	15	3.83	1.64	16.63	3.65	1.56	Supply=32.10 33.66	36"	4.76	74	0.26	16.89
255 - 253	0.47	1.07	15	3.83	1.93	15	3.83	1.93	1.93	15"	1.57	40	0.42	-
253 - 252	0.47	1.12	15	3.83	2.02	16.89	3.62	1.90	37.49	36"	5.30	255	0.80	17.69
256 - 252	0.47	0.69	15	3.83	1.24	15	3.83	1.24	1.24	15"	1.01	40	0.66	-
252 - 251	0.47	2.06	15	3.83	3.71	17.69	3.54	3.43	42.16	42"	4.38	210	0.80	18.49
251 - 250	-	-	-	-	-	18.49	-	-	42.16	42"	4.38	40	0.15	-

STORM DRAINAGE – DESIGN COMPUTATIONS

Project – SUNRIDGE 2ND ADDITION
SYSTEM 200

Design Storm Frequency – 2 Yr.
Mannings "n" = 0.015
Plan –
Profile –

Sheet 1 of 1
Computed By –
Checked By –
T.C.

	Line Upper	Line Lower	Length	Struct.	Contrib. Drg. Area (Ac.)	Runoff "C"	I For Σt (in/hr.)	ΣQ Pipe (CFS)	Pipe Size	Pipe Friction Head	V.	$\frac{V^2}{2g}$	Time in Minutes t	Time in Minutes Σt	Constr. Slope %	Req'd Hydr. Slope %	Struct. Head Loss	Hydraulic Grade Elevation Upper	Hydraulic Grade Elevation Lower	Structure Flowline Elevation Upper	Structure Flowline Elevation Lower	Upper Street Elev.	Remarks
1	254	253	74	Sump	0.91	0.47	3.65	33.66	36"	0.19	4.76	0.35	0.26	16.89	0.12	0.25	0.53	158.07	157.35	152.87	152.79	159.70	Hydr. Grade Elev. = 1.08' below FL gutter
2	255	253	40	Sump	1.07	0.47	3.83	1.93	15"	0.04	1.57	0.04	0.42	-	0.38	0.09	0.06	157.45	157.35	154.70	154.54	159.45	Ditto = 1.45'
3	253	252	255	Sump	1.12	0.47	3.62	37.49	36"	0.80	5.30	0.44	0.80	17.69	0.12	0.32	0.40	156.95	156.15	152.59	152.28	159.45	Ditto = 1.95'
4	256	252	40	Sump	0.69	0.47	3.83	1.24	15"	0.01	1.01	0.02	0.66	-	0.38	0.04	0.02	156.09	156.06	154.18	154.03	159.23	Ditto = 2.59'
5	252	251	210	Sump	2.06	0.47	3.54	42.16	42"	0.37	4.38	0.30	0.80	18.49	0.10	0.18	-0.09	156.15	155.78	151.78	151.57	159.23	Ditto = 2.53'
6	251	250	40	-	-	-	-	42.16	42"	0.07	4.38	0.30	0.15	-	0.10	0.18	0.21	155.57	155.50	151.47	151.43	159.78	Ditto = 3.66'
7																							
8																							
9																							
10																							
11																							
12																							
13																							

SUNRIDGE 2ND ADDITION - System 300

A. HYDROLOGY - Use Rational Method, Q = CIA

1. Determine "C" factors for sub-basins, System 300

Node	Land Use	Weighted Rational "C" C_2	C_{100}
362	Res.1/4 Ac.	0.47	0.68
361	Res.1/4 Ac.	0.47	0.68
360	End System 300 - Outlet to Detention Pond		

2. Determine T_c & I for each sub-basin contributing to each Node.

Node	T_c	I_2	I_{100}
362	15	3.83	7.37
361	15	3.83	7.37
360	End System 300		

3. Determine Area, "A" for sub-basin surface contribution to each inlet.

Node	Surface Drainage Area (Acres)
362	4.66
361	1.61
360	End System 300

4. Determine Q_2 contribution to each Node.

Node	T_c	C_2	I_2	A	Q_2
362	23	0.47	3.10	4.66	6.79
361	23.2	0.47	3.33	1.61	2.52
360	End System 300				

5. Flood Routing/Inlet Sizing - 2 Yr. design

Node	Inlet Condition	Inlet Length	Q_2 Approach	Q_2 Intercept	Q_2 By-Pass	By-Pass to Node
362	Sump	5	8.39	8.39	0	-
361	Sump	5	2.90	2.90	0	-
360	End of System 300					

6. Street Flow Depths - 2 yr. Design

Node	Q_2 Approach	Flow Distribution	Street Slope %	Flow Depth	Allowable Depth	Comment
362	8.39	65% (S) = 5.45	0.34	0.35	0.55	Use Std. C&G
		35% (N) = 2.94	0.34	0.30	0.55	"
361	2.90	50% (N) = 1.45	0.34	0.24	0.55	"
		50% (S) = 1.45	0.34	0.24	0.55	"

360 End System 300

EVALUATION OF 100 YR. FLOW IN STREET R/W'S

1. Check Street Flow Approaching 362 - 361.

Contributing Area

Node	Acres
362	4.66
361	1.61
	6.27 Ac.

T (Q_2)	C	I_{100}	A	Q_{100}
23.20	0.68	6.11	6.27	26.05

Q_2 (pipe) 361 - 360 = 9.12

Street Q = 25.05 - 9.12

= 16.93 cfs

Street Slope = 0.34%

Allowable Q (0.3' Wlk.Gr.) = 51.78 cfs

Actual Q street $<$ Q allowable

STRUCTURE HEAD LOSS COMPUTATIONS - SYSTEM 300 - 2 Yr.

Node 362 - Curb Inlet, Q_o only

Q_o = 6.79 cfs; V_o = 3.84 fps; $V_o^2/2g$ = 0.23; D_o = 18"

Initial Velocity, H_v = 0.23

Entrance Loss = 0.5 H_v = 0.115

Total Loss = 0.345

Node 361 - Curb Inlet + Upstream

Q_u = 6.79; V_u = 3.84; $V_u^2/2g$ = 0.23; D_u = 18"

Q_g = 2.33

Q_o = 9.12; V_o = 1.86; $V_o^2/2g$ = 0.054; D_o = 30"

$H_u - H_o = V_o^2/2g - Q_u/Q_o\ (0.395\ V_u^2/2g)$

$= 0.054 - 0.74\ (0.09) = -0.01$

SUNRIDGE 2ND ADDITION — HYDROLOGY SYSTEM 300 — 2 YR. FREQUENCY

	TRIBUTARY AREA					SUMMATION				CONDUIT DATA				
Node to Node	"C"	Area Ac.	Tc Min.	I_2	Q_2 cfs	Tc Min.	I_2	Q_2 cfs	ΣQ_2	Pipe Size	Vel. fps	Length	T.T.	T.T. + Tc
362 - 361	0.47	4.66	23	3.10	6.79	23	3.10	6.79	6.79	18"	3.84	45	0.20	23.20
361 - 360	0.47	1.61	20	3.33	2.52	23.20	3.08	2.33	9.12	30"	1.86	195	1.75	24.95

STORM DRAINAGE – DESIGN COMPUTATIONS

Project – SUNRIDGE 2ND ADDITION
SYSTEM 300

Design Storm Frequency – 2 Yr.
Mannings "n" = 0.015
Plan –
Profile –

Sheet 1 of 1
Computed By –
Checked By –

	Line Upper	Line Lower	Length	Struct.	Contrib. Drg. Area (Ac.)	Runoff "C"	I For Σt (in/hr.)	ΣQ Pipe (CFS)	Pipe Size	Pipe Friction Head	V.	$\frac{V^2}{2g}$	Time in Minutes t	Time in Minutes Σt	Constr. Slope %	Req'd Hydr. Slope %	Struct. Head Loss	Hydraulic Grade Elevation Upper	Hydraulic Grade Elevation Lower	Structure Flowline Elevation Upper	Structure Flowline Elevation Lower	T.C. Upper Street Elev.	Remarks Hyd. Grade Elev =
1	362	361	45	Sump	4.66	0.47	3.10	6.79	18"	0.18	3.84	0.23	0.20	23.20	0.30	0.42	0.42	157.06	156.46	153.40	153.26	159.00	1.39' below F.L.
2	361	360	195	Sump	1.61	0.47	3.33	9.12	30"	0.97	1.86	0.05	1.75	24.95	0.15	0.05	-0.01	156.47	155.50	152.26	151.96	159.00	1.98' below F.L.
3																							
4																							
5																							
6																							
7																							
8																							
9																							
10																							
11																							
12																							
13																							