DRAINAGE DESIGN COMPUTATIONS
FLOYD BAILEY DRAINAGE
IMPROVEMENT PROJECT NO. 12

CITY OF WICHITA, KANSAS

Van Doren Hazard Stallings
Architects • Engineers • Planners

3401 Van Buren Street
P.O. Box 5166
Topeka, Kansas 66605
913/267-1414

April 27, 1987

Re: Floyd Bailey Addition
Drainage Improvement
Project No. 12
VHS No. 86-214-AO

Mr. Michael E. Lindebak, P.E.
City Engineer
City Engineer's Office
455 North Main Street
Wichita, KS 67202

Dear Mr. Lindebak:

We are submitting two (2) copies of the Phase I - Concept Development stage of the referenced project. The submittal includes the drainage design computation and preliminary construction estimate bound in this report. The submittal also includes a separate bound set of drawings showing the drainage plan, preliminary drainage plan & profiles and the proposed future street grades.

The concept design computations are based on our best interpretation of the City of Wichita "Interim Drainage and Storm Sewer Policy for Design Criteria and Documentation" adopted April 15, 1986.

Both Manual No. 1 and Manual No. 2 have been reviewed for use where most appropriate for the referenced project. We have had several telephone conversations and shared information with staff members of Booker/Freund Associates, Inc. concerning their Maple Street and Storm Water Sewer No. 325 plans. The benefit district boundary along Maple Street has been discussed with Mr. Don Schneider.

The concept development plan is based on a closed circuit system with area inlets that may be converted to curb inlets in the future and an initial design storm return period of 2 years. Runoff from the 100-year frequency major storm, including the one area between Robin Road and Evergreen Lane north of Maple Street, will overflow the 2 year return system without entering any existing houses and flow to the inlets at the low points on Topaz Lane and Hendryx Street.

The inlets at the two low points will allow the overflow to enter the 10' X 7' reinforced concrete box and flow southwesterly into the existing structure near Kellogg and Tyler Road. We discussed with Mr. Don Schneider the possibility of using City-at-Large funds to finance the reinforced concrete box portion of the project since this structure as sized is primarily required for the 100 year frequency storm design runoff.

The preliminary construction estimate is based on current costs of similar types of construction and from the bid tabulations of Storm Water Drain No. 60 and Storm Water Sewer No. 255 which are located in the immediate area of the referenced project. The cost estimate shows the items involved in three (3) separate areas of the proposed project. One subtotal is for the collection system for the addition, one subtotal is for the additional work to connect to the outlet pipe for Storm Water Sewer No. 325 and the final subtotal is for the Outfall Sewer from the existing reinforced concrete box near Kellogg and Tyler Road to the low points on Hendryx Street and Topaz Lane.

Please review this submittal and schedule a meeting for your comments from your staff. Please advise if additional information is required.

Very truly yours,

VAN DOREN-HAZARD-STALLINGS, INC.

Carroll L. Nelson

Carroll L. Nelson, P.E.

CLN/bj

ESTIMATED CONSTRUCTION COST

FLOYD BAILEY ADDITION

DRAINAGE IMPROVEMENT PROJECT NO. 12

Item No.	Item	Quantity	Unit	Unit Price	Total Est. Price
A.	Collection System for Floyd Bailey Addition				
1.	54" RCP, In Place	675	LF	65.00	43,875
2.	48" RCP, In Place	490	LF	55.00	26,950
3.	42" RCP, In Place	1,520	LF	45.00	68,400
4.	36" RCP, In Place	1,240	LF	40.00	49,600
5.	30" RCP, In Place	1,210	LF	35.00	42,350
6.	24" RCP, In Place	130	LF	30.00	3,900
7.	21" RCP, In Place	1,000	LF	25.00	25,000
8.	18" RCP, In Place	255	LF	22.00	5,610
9.	15" RCP, In Place	520	LF	20.00	10,400
10.	Reinforced Concrete Manhole	3	Ea	3,000.00	9,000
11.	Standard Type "A" MH 5' Diameter	7	Ea	2,000.00	14,000
12.	Type IA Inlet (L=6'4")	33	Ea	1,500.00	49,500
13.	Type IA Inlet (L=11'4")	4	Ea	2,500.00	10,000
14.	Type IA Inlet (L=16'8")	8	Ea	3,000.00	24,000
15.	Connect to Existing Structure	1	Ea	500.00	500
16.	Remove & Replace Concrete Drive	900	SF	6.00	5,400
17.	Remove & Replace Asphalt Pavement	600	LF	10.00	6,000
18.	Remove & Replace Gravel Surfacing	50	Ton	10.00	500
19.	8" D.I.P. Sanitary Sewer	80	LF	30.00	2,400
20.	Relocate Fire Hydrant	5	Ea	600.00	3,000
21.	Adjust Utility Lines	200	LF	10.00	2,000
24.	Site Restoration	--	LS	6,000.00	6,000
	SUB-TOTAL				$ 408,385
B.	Additional for Storm Water Sewer No. 325				
1.	21" RCP, In Place	740	LF	25.00	18,500
2.	Std. Type "A" MH 5' Diameter	1	Ea	2,000.00	2,000
3.	Site Restoration	--	LS	500.00	500
	SUBTOTAL				$ 21,000
C.	Outfall Sewer for 100yr frequency major storm				
1.	10' x 7' RCB, In Place	2,175	LF	250.00	543,750
2.	RCB Access Manhole	2	Ea	1,500.00	3,000
3.	Type IA Inlet (L=6'4")	2	Ea	1,500.00	3,000
4.	Remove and Replace Asphalt Pavement	1,400	LF	10.00	14,000
5.	Site Restoration	--	LS	1,000.00	1,000
	SUBTOTAL				$ 564,750

TOTAL FOR ITEMS A, B AND C =	$ 994,135
ADD 10% FOR CONTINGENCIES =	$ 99,414
TOTAL ESTIMATED CONSTRUCTION COST =	$1,093,549

C.I.P. $1,870

The typical overland flow in this area travels 150' at 1.0% slope as sheet flow before entering a swale or gutter.

Using the Kinematic Wave formula as described in Manual #2 (Drainage of Highway Pavements, p. 14) n = "0.50 for turf". T = 35 min and I_2 = 2.44 in./hr. The product of the rainfall intensity and length of slope equals 366 which is less than 500. According to Manual #2 this formula is used when "the product of rainfall intensity and length of slope is in excess of 500."

Using "Attachment E" (Interim Drainage and Storm Sewer Policy, City of Wichita) the average flow velocity is 0.28 ft/s for lawns at 1.0% slope. T = 9 min. and I_2 = 4.70 in/hr. The product of the rainfall intensity and length of slope equals 705 which is greater than 500.

According to the Interim Drainage and Storm Sewer Policy when the "product of rainfall intensity and length of flow channel is in excess of 500" the Kinematic formula is to be used.

Sheet flow at 1.0% slope and depth of 0.10 ft with an "n" value of 0.12 will give a velocity of 0.28 ft/s as indicated in "Attachment E". This "n" value appears to be low for the typical lawns in this area. According to Manual #2 (Drainage of Highway Pavements, p.15) "Manning (n) coefficients obtained from flow experiments on other surfaces are satisfactory for use." Table 3-1 (210-VI-TR55, Second Ed., June 1986) indicates that an "n" value between 0.15 and 0.24 would be more appropriate.

Van Doren Hazard Stallings
architects · engineers · planners
· Topeka
· Wichita
· Minneapolis
· Kansas City

Job No. 86-214
Date 4-87
Sheet 3 of 3
Project Floyd Bailey Drainage
By WV
Subject Time of Concentration
Ck'd.

Using n = 0.2 in the Kinematic wave formula T = 17 min. and I_2 = 3.61 in/hr. The product of rainfall intensity and flow length equals 542 which is greater than the 500 minimum. After adding the flow time in swales and gutters, typical inlet times will range between 20 to 30 minutes. Note according to Manual #1 (Design of Urban Highway Drainage, p. 3-10) "In very flat residential areas with widely spaced inlets, times of 20 to as much as 30 minutes are customary."

Based on the above considerations the time of overland flow has been calculated using the kinematic wave formula with an "n" value of 0.2 except in highly impervious areas where a lower "n" value may be utilized.

Rainfall Rate in./Hr.	Rainfall Rate mm/Hr.	Overland Flow Length Feet	Overland Flow Length Metres	Time to Reach Equilibrium, Minutes
1.5	38.1	24	7.315	1.5
1.5	38.1	36	10.973	2.0
8.0	203.2	36	10.973	3.9
1.5	38.1	48	14.630	2.4
8.0	203.2	48	14.630	4.6

The significance of these figures is that for highway pavement runoff, the overland flow portion of the time of concentration almost always will be less than 5 minutes. To this must usually be added the time of flow in the gutter or swale to the first inlet. Such gutter flow time generally will be at most, 1 to 2 minutes. It is recommended that a minimum inlet time of 5 minutes be used for the upper most inlet. The relatively small mass run-offs involved for times less than 5 minutes taken together with consideration of minimum pipe size make it inadvisable from practical considerations to design for shorter inlet times. Reported inlet times for municipal urban drainage design vary from 5 minutes in densely developed steep areas to 10 to 15 minutes in well developed districts with relatively flat slopes. In very flat residential areas with widely spaced inlets, times of 20 to as much as 30 minutes are customary.

Heretofore, various formulas and nomographs (Refs. 3-14 and 3-33) have been presented for total time of concentration or for the overland flow portion of the time of concentration. A thorough study by the University of Maryland (Ref. 3-11) found that the soundest, most realistic formula for overland flow time of concentration T_c was the following kinematic wave equation:

$$T_c = \frac{K\, L_o^{.6} n^{.6}}{i^{.4} S_o^{.3}} \qquad \text{..........(3-1)}$$

with T_c in seconds; L_o the overland flow length in feet or metres; n the Manning roughness coefficient of the pavement; i the rainfall rate in inches per hour or metres per hour; and S_o the overland flow slope in feet per foot or metres per metre. K is 56 for English units, 26.285 for metric units. Fig. 3-5 is a nomograph for the solution of the kinematic wave overland flow equation in English units.

The kinematic wave theory nomograph is consistent with the latest concepts of fluid mechanics and considers all those parameters found important in overland flow when the flow is turbulent (where the product of the rainfall intensity and length of the slope is in excess of 500).

When using the nomograph, the following Manning roughness coefficients are recommended: 0.013 for concrete and 0.50 for turf. Since these values are in close agreement with normal flow data, Manning coefficients obtained from normal flow experiments on other surfaces are probably satisfactory for use.

In using the nomograph the designer has two unknowns as the time of concentration and the associated rainfall computations are started. The problem is one of iteration or trial and error. A value for i must be

Manual #1

and a procedure for developing precipitation intensity-duration equations are included in Appendix A.

The 11 volumes of NOAA Atlas 2 replace TP-40 for the eleven western conterminous States. Investigations for the Atlas were undertaken to depict more accurately variations in the precipitation - frequency regime in mountainous regions.

It is impractical to include maps from the 11 volumes of NOAA Atlas 2 in this Circular because of the number and size of the maps. Differences in values from TP-40, particularly in areas of orographic influences on precipitation, make it advisable for agencies to develop new I-D-F curves based on information taken from the Atlas. An example development of an I-D-F curve and equations for the curves are included in Appendix A.

4.1.3 Time of Concentration

Time of concentration is defined as the time it takes for runoff to travel from the hydraulically most distant point in the watershed to the point of reference downstream. An assumption implicit to the Rational Method is that the peak runoff rate occurs when the rainfall intensity lasts as long or longer than the time of concentration. Therefore, the time of concentration for the drainage area must be estimated in order to select the appropriate value of rainfall intensity for use in the equation.

The time of concentration for inlets is comprised of at least two components. These are overland flow time and gutter flow time. If overland flow is channelized upstream of the location at which the flow enters the highway gutter, a third component is added.

A thorough study at the University of Maryland (13) found that the most realistic method for estimating overland flow time of concentration was the kinematic wave equation:

$$t_c = \frac{K\ L^{0.6} n^{0.6}}{i^{0.4} S^{0.3}} \qquad (2)$$

where: t_c = the time of overland flow in seconds
L = overland flow length, ft (m)
n = Manning roughness coefficient
i = rainfall rate, in/hr (m/hr)
S = the average slope of the overland area
K = 56 (26.285)

Manual No. 2

Chart 1 is a nomograph for the solution of the kinematic wave equation for overland flow.

The kinematic wave theory is consistent with the latest concepts of fluid mechanics and considers all those parameters found important in overland flow when the flow is turbulent (where the product of the rainfall intensity and length of the slope is in excess of 500).

When using the nomograph, Manning roughness coefficients of 0.013 for concrete and 0.50 for turf were reccommended. Since these values are in close agreement with normal flow data, Manning coefficients obtained from flow experiments on other surfaces are satisfactory for use.

In using the nomograph, the time of concentration and rainfall intensity are unknown. The solution is one of iteration or trial and error. A value for i is first assumed and the related time of concentration is read from Chart 1. The assumed rainfall intensity must then be checked against the I-D-F curve for the frequency of the event chosen for the particular design problem, and the procedure repeated until the assumed rainfall intensity is in agreement with the intensity associated with the time of concentration. Example 1 illustrates the procedure.

Example 1:

Given: L = 150 ft
S = 0.02
n = 0.4 (turf)
Design frequency - 10 yr
Location: Colorado Springs, Colorado

Find: Overland flow time, t_c

Solution:

(1) Assume i = 5 in/hr
t_c = 23 min (Chart 1)
i = 3.3 in/hr (figure 29)

(2) Try i = 3.5 in/hr
t_c = 20 min (Chart 1)
i = 3.6 in/hr (figure 29)

Since the trial rainfall intensity is in close agreement with the intensity read from figure 29, the time of concentration for overland flow is 20 min. Use of Chart 1 in this example requires that the second turning line be extended. A folded arrangement of the turning lines would eliminate the

Sheet flow

Sheet flow is flow over plane surfaces. It usually occurs in the headwater of streams. With sheet flow, the friction value (Manning's n) is an effective roughness coefficient that includes the effect of raindrop impact; drag over the plane surface; obstacles such as litter, crop ridges, and rocks; and erosion and transportation of sediment. These n values are for very shallow flow depths of about 0.1 foot or so. Table 3-1 gives Manning's n values for sheet flow for various surface conditions.

For sheet flow of less than 300 feet, use Manning's kinematic solution (Overton and Meadows 1976) to compute T_t:

$$T_t = \frac{0.007\,(nL)^{0.8}}{(P_2)^{0.5}\,s^{0.4}} \qquad \text{[Eq. 3-3]}$$

Table 3-1.—Roughness coefficients (Manning's n) for sheet flow

Surface description	n[1]
Smooth surfaces (concrete, asphalt, gravel, or bare soil)	0.011
Fallow (no residue)	0.05
Cultivated soils:	
Residue cover ≤20%	0.06
Residue cover >20%	0.17
Grass:	
Short grass prairie	0.15
Dense grasses[2]	0.24
Bermudagrass	0.41
Range (natural)	0.13
Woods:[3]	
Light underbrush	0.40
Dense underbrush	0.80

[1]The n values are a composite of information compiled by Engman (1986).
[2]Includes species such as weeping lovegrass, bluegrass, buffalo grass, blue grama grass, and native grass mixtures.
[3]When selecting n, consider cover to a height of about 0.1 ft. This is the only part of the plant cover that will obstruct sheet flow.

where

T_t = travel time (hr),
n = Manning's roughness coefficient (table 3-1),
L = flow length (ft),
P_2 = 2-year, 24-hour rainfall (in), and
s = slope of hydraulic grade line (land slope, ft/ft).

This simplified form of the Manning's kinematic solution is based on the following: (1) shallow steady uniform flow, (2) constant intensity of rainfall excess (that part of a rain available for runoff), (3) rainfall duration of 24 hours, and (4) minor effect of infiltration on travel time. Rainfall depth can be obtained from appendix B.

Shallow concentrated flow

After a maximum of 300 feet, sheet flow usually becomes shallow concentrated flow. The average velocity for this flow can be determined from figure 3-1, in which average velocity is a function of watercourse slope and type of channel. For slopes less than 0.005 ft/ft, use equations given in appendix F for figure 3-1. Tillage can affect the direction of shallow concentrated flow. Flow may not always be directly down the watershed slope if tillage runs across the slope.

After determining average velocity in figure 3-1, use equation 3-1 to estimate travel time for the shallow concentrated flow segment.

Open channels

Open channels are assumed to begin where surveyed cross section information has been obtained, where channels are visible on aerial photographs, or where blue lines (indicating streams) appear on United States Geological Survey (USGS) quadrangle sheets. Manning's equation or water surface profile information can be used to estimate average flow velocity. Average flow velocity is usually determined for bank-full elevation.

7. Coefficients of runoff used in the rational method shall be as indicated in the table attached to this document and identified as "Attachment D" for the storm frequencies shown. Development of composite runoff coefficients for drainage areas and/or sub-areas shall be documented and correlated with such areas shown on a drainage area map.

   Documentation of logic and computations for composite coefficients shall be provided in writing with the required drainage area map when final drainage computations are submitted to the City Engineer, or his authorized representative, for approval.

8. The minimum inlet time or time of concentration used shall be 15 minutes. When required to compute overland flow time to determine inlet time or time of concentration in situations where such times would exceed the above-stated minimums for those cases where the product of rainfall intensity and length of flow channel is less than 500, the overland flow time shall be computed using average flow velocities as determined from the attached table identified as "Attachment E" and the estimated flow lengths involved. Velocities for slopes not shown shall be computed as a straight line interpolation and/or extropolation within the ranges shown.

   When required to compute overland flow time to determine time of concentration for those circumstances where the product of rainfall intensity and length of flow channel is in excess of 500, such times of concentration shall be determined using the kinematic wave theory as presented in Section 4.1.3. of Manual No. 2. Travel time in street gutter sections shall be determined using the procedures identified in Section 4.1.3. of Manual No. 2.

   Logic and documentation of inlet time or time of concentration shall be provided in writing when final drainage computations are submitted to the City Engineer, or his authorized representative, for approval.

9. Composite infiltration rates for use with the S.C.S. dimensionless unit hydrograph method shall be based on procedures identified in Figure 3-9 of Section 3.3.5.2. of Manual No. 1. Logic and documentation of such composite infiltration rates shall be provided in writing when final drainage computations are submitted to the City Engineer, or his authorized representative, for approval. See Exhibit Nos. 1 and 2 showing general soil types in the Wichita area.

10. Format, computation, and documentation required for the S.C.S. dimensionless unit hydrograph shall be as shown in the example provided in Manual No. 1 beginning with Section 3.3.5.9. Documentation to be included in submittal to City Engineer, or his authorized representative, for approval shall include all computations in the order identified in the example, a tabulation of unit hydrograph coordinates, a plot of unit hydrograph, a tabulation of effective rainfall, a tabulation of storm hydrograph coordinates for the drainage area, a plot of the storm hydrograph for the drainage area, a map of the drainage area, and computations showing determination of the percentage of impervious surface. Locations of soil types involved shall be shown on the map of drainage area.

Interim Drainage and Stm. Swr Policy

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

Date 3/6/87 Project FLOYD BAILEY DRAINAGE By M.M. Job No. 86-214

Ck'd. WV Sheet 1 of 3

TIME OF CONCENTRATION

Design Storm Frequency 2 yr.

No.	Overland Flow				Shallow Flow					Gutter Flow				Tc (min)
	L (ft)	S (%)	n	t (min)	L (ft)	S (%)	Surface Type	V (ft/s)	t (min)	L (ft)	S (%)	V (ft/s)	t (min)	
1	200	1.0	0.2	23	400	0.5	grass	0.77	9					32
2	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
3	180	1.0	0.2	20						500	0.3	1.6	5	25
4	130	1.0	0.2	15						1360	0.2	1.2	19	34
5	70	0.8	0.2	11	130	0.8	grass	0.98	2	450	0.2	1.2	6	19
6	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
7	150	1.0	0.2	19						100	0.5	1.8	1	20
8	145	1.0	0.2	18						750	0.5	1.8	7	25
9	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
10	170	1.0	0.2	21						500	0.4	1.8	5	26
11	200	1.0	0.2	23						660	0.3	1.5	7	30
12	140	1.1	0.2	17	370	0.2	grass	0.48	13	130	0.3	1.9	1	31
13	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
14	130	1.4	0.2	15	200	0.2	grass	0.48	7	290	0.5	1.8	3	25
15	130	2.5	0.2	12						720	0.4	1.8	7	19
16	150	0.8	0.2	20	210	0.2	grass	0.48	7	330	0.3	1.6	3	30
17	130	1.3	0.2	15						390	0.3	1.6	4	19
18	110	3.0	0.2	10	450	0.2	grass	0.48	16	200	0.4	2.1	2	28
19	120	1.2	0.2	15	380	0.2	grass	0.48	13	230	0.4	1.6	2	30
20	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
21	150	1.1	0.2	18	220	0.2	grass	0.48	8	130	0.5	2.4	1	27
22	160	0.7	0.2	22	140	0.1	grass	0.35	7	180	0.5	2.3	1	30
23	120	2.1	0.2	12	600	0.3	grass	0.48	17	150	0.5	2.4	1	30
24	120	1.6	0.2	13						840	0.5	1.9	7	20

Date 3/6/87 Project FLOYD BAILEY DRAINAGE By M.M. Job No. 86-214

Ck'd. WV Sheet 2 of 3

TIME OF CONCENTRATION

Design Storm Frequency 2 yr.

No.	Overland Flow				Shallow Flow					Gutter Flow				Tc (min)
	L (ft)	S (%)	n	t (min)	L (ft)	S (%)	Surface Type	V (ft/s)	t (min)	L (ft)	S (%)	V (ft/s)	t (min)	
25	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
26	180	0.8	0.2	23	160	0.2	grass	0.48	5	240	0.6	2.1	2	30
27	130	1.4	0.2	15						170	0.5	2.1	1	16
28	120	2.2	0.2	12	440	0.1	grass	0.35	21	260	0.3	1.4	3	36
29	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
30	140	1.1	0.2	17						600	0.4	1.7	6	23
31	150	0.8	0.2	21	240	0.3	grass	0.58	7	320	0.4	1.6	3	31
32	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
33	140	1.4	0.2	16	300	0.2	grass	0.48	10	280	0.2	1.6	3	29
34	140	1.0	0.2	17						1100	0.6	2.8	9	26
35	120	1.6	0.2	13	260	0.3	grass	0.58	7					20
36	180	0.5	0.015	5						440	0.2	1.4	5	15
37	140	0.1	0.015	6						370	0.2	1.5	4	15
38	120	1.5	0.2	14	160	0.2	paved	0.62	4	120	0.9	2.3	1	19
39	15	1.5	0.2	17						100	0.9	2.8	1	18
40	120	1.5	0.2	14	160	0.2	paved	0.62	4	50	0.3	1.7	1	19
41	150	0.6	0.2	23						100	0.3	1.4	1	24
42	120	1.5	0.2	14	150	0.2	paved	0.62	4	200	0.3	1.8	2	20
43														15
44	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
45	140	0.9	0.2	19	210	0.2	grass	0.48	7	260	0.5	1.8	2	28
46	150	0.8	0.2	19	190	0.1	grass	0.35	9	300	0.5	2.1	2	30
47	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
48														15

Date 3/6/87 Project FLOYD BAILEY DRAINAGE By M.M. Job No. 86-214

Ck'd. WV Sheet 3 of 3

TIME OF CONCENTRATION

Design Storm Frequency 2 yr.

No.	Overland Flow				Shallow Flow					Gutter Flow				Tc (min)
	L (ft)	S (%)	n	t (min)	L (ft)	S (%)	Surface Type	V (ft/s)	t (min)	L (ft)	S (%)	V (ft/s)	t (min)	
49	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
50	250	0.7	0.015	5	200	0.3	paved	0.77	4	500	0.5	2.0	4	15
51	150	0.2	0.015	5	70	0.1	grass	0.35	3	700	0.4	2.3	5	15
52	140	0.5	0.015	<5	400 30	1.0 1.0	grass paved	1.12 1.40	6 1					15
53	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
54	170	0.7	0.015	<5	120 30	1.0 1.0	grass paved	1.12 1.40	2 1					15
55	—	—	—	—	—	—	—	—	—	—	—	—	—	Manhole
56														15
57														15

ON GRADE INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number

Design Storm Frequency 2 yr.

Gutter Depression at Inlets (Standard = 2")

Width of Gutter Depression of Inlets (Standard = 2'0")

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Upstream Inlets Qb	Total Flow to Inlet Qt	Inlet Intercept Flow Qi	Bypass Flow to Downstream Inlet Qb
							[illegible]			
3	139.60	1.7	25	0.40	2.96	2.0	[illegible]	2.0	1.8	0.2

Inlet Length Required	Inlet Length Provided	Computed Water Surface Elevation in Gutter	Computed Pavement Spread in Feet	Allowable Water Surface Elevation in Gutter	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Longitudinal Gutter Slope in Ft./Ft.	Street Classification
[illegible]	5	139.43	11.5	139.60	15+	31	0.021	0.0032	Local

NOTE: Inlet intercept flow (Qi) must be as required to limit pavement spread or ponding as allowed by criteria.

Fill in

ON GRADE INLETS DESIGN DATA TABULATION

Project Title *FLOYD BAILEY*

Project Number ______

Design Storm Frequency *2 yr.*

Gutter Depression at Inlets (Standard = 2") ______

Width of Gutter Depression of Inlets (Standard = 2'0") ______

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Upstream Inlets Qb	Total Flow to Inlet Qt	Inlet Intercept Flow Qi	Bypass Flow to Downstream Inlet Qb
4	140.90	7.6	34	0.60	2.48	11.3	—	7.1 *	3.7	3.4
5	140.90	2.0	19	0.43	3.42	2.9	4.2 ‡	7.1 *	3.7	3.4

Inlet Length Required	Inlet Length Provided	Computed Water Surface Elevation in Gutter	Computed Pavement Spread in Feet	Allowable Water Surface Elevation in Gutter	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Longitudinal Gutter Slope in Ft./Ft.	Street Classification
7	5	140.82	Over Crown	140.90	15+	31	0.021	0.0020	Local
	5	140.82	Over Crown	140.90	15+	31	0.021	0.0020	Local

NOTE: Inlet intercept flow (Qi) must be as required to limit pavement spread or ponding as allowed by criteria.

* Approx. Street Capacity at full depth. See Street Capacity sheets.

‡ Qb from No. 4 over crown

SUMP INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number ______

Design Storm Frequency 2 yr.

Gutter Depression at Inlets (Standard = 2") ______

Width of Gutter Depression at Inlets (Standard = 2'0") ______

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb	Inlet Capacity Required Qi
7	139.95	1.0	20	0.43	3.33	1.4	—	1.4
8	139.95	2.4	25	0.48	2.96	3.4	6.8	10.2
10	139.06	3.6	26	0.39	2.90	4.1	0.2	4.3

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
	15	139.63	4	139.95	15+	31	0.021	Local
	10	139.93	Over Crown	139.95	15+	31	0.021	Local
	5	138.93	13	139.06	15+	31	0.021	Local

Location	Approach Flow No. 1						Approach Flow No. 2					
	Q_1	Q_b	Q_t	S	S_x	T	Q_2	Q_b	Q_t	S	S_x	T
7	3.7	—	3.7	0.003	0.021	15	0.4	—	0.4	0.005	0.021	< 5
8	3.1	6.8	9.9	0.006	0.021	*	0.3	—	0.3	0.005	0.021	< 5
10	3.7	0.2	3.9	0.006	0.021	13	0.4	—	0.4	0.003	0.021	< 5

* Over Crown but below TC

ON GRADE INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number

Design Storm Frequency 2 yr.

Gutter Depression at Inlets (Standard = 2")

Width of Gutter Depression of Inlets (Standard = 2'0")

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Upstream Inlets Qb	Total Flow to Inlet Qt	Inlet Intercept Flow Qi	Bypass Flow to Downstream Inlet Qb
12	138.82	3.6	31	0.40	2.62	3.8	—	3.8	2.8	1.0

Inlet Length Required	Inlet Length Provided	Computed Water Surface Elevation in Gutter	Computed Pavement Spread in Feet	Allowable Water Surface Elevation in Gutter	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft. /Ft.	Longitudinal Gutter Slope in Ft. /Ft.	Street Classification
	5	138.72	15	138.82	15+	31	0.021	0.0032	Local

NOTE: Inlet intercept flow (Qi) must be as required to limit pavement spread or ponding as allowed by criteria.

SUMP INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number ______

Gutter Depression at Inlets (Standard = 2") ______

Design Storm Frequency 2 yr.

Width of Gutter Depression at Inlets (Standard = 2'0") ______

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb	Inlet Capacity Required Qi
11	139.06	4.2	30	0.43	2.67	4.8	—	4.8
14	138.22	3.2	25	0.40	2.96	3.8	—	3.8
15	138.22	3.3	19	0.40	3.42	4.5	1.0	5.5

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
	5	138.95	12	139.06	15+	31	0.021	Local
	5	138.06	12	138.22	15+	31	0.021	Local
	5	138.15	Over Crown	138.22	15+	31	0.021	Local

Location	Approach Flow No. 1						Approach Flow No. 2					
	Q_1	Q_b	Q_t	S	S_x	T	Q_2	Q_b	Q_t	S	S_x	T
11	4.4	—	4.4	0.006	0.021	14	0.4	—	0.4	0.003	0.021	6
14	3.3	—	3.3	0.006	0.021	12	0.5	—	0.5	0.004	0.021	5
15	4.1	1.0	5.1	0.006	0.021	14	0.4	—	0.4	0.004	0.021	< 5

SUMP INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number ______ Gutter Depression at Inlets (Standard = 2") ______

Design Storm Frequency 2 yr. Width of Gutter Depression at Inlets (Standard = 2'0") ______

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb	Inlet Capacity Required Qi
16	139.25	5.4	30	0.40	2.67	5.8	—	5.8
17	139.25	2.2	19	0.40	3.42	3.0	—	3.0
18	137.81	5.3	28	0.43	2.78	6.3	—	6.3

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
	5	139.20	Over Crown	139.25	15+	31	0.021	Local
	5	139.04	10	139.25	15+	31	0.021	Local
	5	137.78	Over Crown	137.81	15+	31	0.021	Local

Location	Approach Flow No. 1						Approach Flow No. 2					
	Q_1	Q_b	Q_t	S	S_x	T	Q_2	Q_b	Q_t	S	S_x	T
16	3.4	—	3.4	0.003	0.021	14	2.4	—	2.4	0.006	0.021	11
17	1.7	—	1.7	0.003	0.021	11	1.3	—	1.3	0.006	0.021	9
18	4.5	—	4.5	0.003	0.021	*	1.8	—	1.8	0.004	0.021	15

* Over Crown but below TC

SUMP INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number ______ Gutter Depression at Inlets (Standard = 2") ______

Design Storm Frequency 2 yr. Width of Gutter Depression at Inlets (Standard = 2'0") ______

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb	Inlet Capacity Required Qi
19	137.81	5.1	30	0.40	2.67	5.4	—	5.4
21	137.81	2.4	27	0.40	2.84	2.7	—	2.7
22	137.81	2.2	30	0.40	2.67	2.3	—	2.3

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
	5	137.74	Over Crown	137.81	15+	31	0.021	Local
	5	137.58	9	137.81	15+	31	0.021	Local
	5	137.55	7	137.81	15+	31	0.021	Local

Location	Approach Flow No. 1						Approach Flow No. 2					
	Q_1	Q_b	Q_t	S	S_x	T	Q_2	Q_b	Q_t	S	S_x	T
19	3.5	—	3.5	0.004	0.021	13	1.9	—	1.9	0.004	0.021	11
21	1.5	—	1.5	0.004	0.021	10	1.2	—	1.2	0.004	0.021	9
22	1.5	—	1.5	0.004	0.021	10	0.8	—	0.8	0.003	0.021	8

SUMP INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number

Gutter Depression at Inlets (Standard = 2")

Design Storm Frequency 2 yr.

Width of Gutter Depression at Inlets (Standard = 2'0")

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb	Inlet Capacity Required Qi
23	138.26	5.6	30	0.40	2.67	6.0	—	6.0
24	138.26	2.2	20	0.43	3.33	3.2	—	3.2
26	137.94	2.8	30	0.40	2.67	3.0	—	3.0

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
	5	138.21	Over Crown	138.26	15+	31	0.021	Local
	5	138.06	10	138.26	15+	31	0.021	Local
	5	137.73	10	137.94	15+	31	0.021	Local

Location	Approach Flow No. 1						Approach Flow No. 2					
	Q_1	Q_b	Q_t	S	S_x	T	Q_2	Q_b	Q_t	S	S_x	T
23	5.9	—	5.9	0.003	0.021	*	0.1	—	0.1	0.003	0.021	<5
24	3.1	—	3.1	0.003	0.021	14	0.1	—	0.1	0.003	0.021	< 5
26	2.4	—	2.4	0.006	0.021	11	0.6	—	0.6	0.002	0.021	8

* Over Crown but below TC

ON GRADE INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number

Design Storm Frequency 2 yr.

Gutter Depression at Inlets (Standard = 2")

Width of Gutter Depression of Inlets (Standard = 2'0")

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Upstream Inlets Qb	Total Flow to Inlet Qt	Inlet Intercept Flow Qi	Bypass Flow to Downstream Inlet Qb
28	137.52	3.7	36	0.40	2.39	3.5	—	3.5	2.7	0.8

Inlet Length Required	Inlet Length Provided	Computed Water Surface Elevation in Gutter	Computed Pavement Spread in Feet	Allowable Water Surface Elevation in Gutter	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Longitudinal Gutter Slope in Ft./Ft.	Street Classification
	5	137.40	14	137.52	15+	31	0.021	0.0020	Local

NOTE: Inlet intercept flow (Qi) must be as required to limit pavement spread or ponding as allowed by criteria.

SUMP INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number

Design Storm Frequency 2 yr.

Gutter Depression at Inlets (Standard = 2")

Width of Gutter Depression at Inlets (Standard = 2'0")

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb	Inlet Capacity Required Qi
27	137.94	0.9	16	0.43	3.72	1.4	—	1.4
30	136.99	2.5	23	0.40	3.10	3.1	0.8	3.9
31	136.99	3.8	31	0.40	2.62	4.0	—	4.0

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
	5	137.60	3	137.94	15+	31	0.021	Local
	5	136.84	12	136.99	15+	31	0.021	Local
	5	136.84	12	136.99	15+	31	0.021	Local

Location	Approach Flow No. 1						Approach Flow No. 2					
	Q_1	Q_b	Q_t	S	S_x	T	Q_2	Q_b	Q_t	S	S_x	T
27	0.8	—	0.8	0.006	0.021	7	0.6	—	0.6	0.002	0.021	8
30	2.5	0.8	3.3	0.007	0.021	12	0.6	—	0.6	0.005	0.021	< 5
31	3.5	—	3.5	0.006	0.021	12	0.5	—	0.5	0.005	0.021	< 5

SUMP INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number ______ Gutter Depression at Inlets (Standard = 2") ______

Design Storm Frequency 2 yr. Width of Gutter Depression at Inlets (Standard = 2'0") ______

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb	Inlet Capacity Required Qi
33	137.00	8.6	29	0.40	2.72	9.4	—	9.4
34	137.00	6.8	26	0.43	2.90	8.5	—	8.5
35	137.05	2.5	20	0.52	3.33	4.3	5.5	9.8

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
	2-15'	136.73	7	137.00	15+	31	0.021	Local
	2-15'	136.72	6	137.00	15+	31	0.021	Local
	2-15'	136.79	7	137.05	15+	31	0.021	Local

Location	Approach Flow No. 1						Approach Flow No. 2					
	Q_1	Q_b	Q_t	S	S_x	T	Q_2	Q_b	Q_t	S	S_x	T
33	4.9	—	4.9	0.004	0.021	*	4.5	—	4.5	0.002	0.021	*
34	7.6	—	7.6	0.004	0.021	*	1.0	—	1.0	0.002	0.021	10
35	2.9	5.5	8.5	‡0.005	0.021	*	1.4	—	1.4	‡0.002	0.021	11

‡ Grade 15' from sump.

* Over Crown but below TC

SUMP INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number

Design Storm Frequency 2 yr.

Gutter Depression at Inlets (Standard = 2")

Width of Gutter Depression at Inlets (Standard = 2'0")

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb	Inlet Capacity Required Qi
36	140.05	2.6	15	0.48	3.83	4.8	—	4.8
37	140.05	2.0	15	0.48	3.83	3.7	—	3.7
38	139.52	3.3	19	0.60	3.42	6.8	—	6.8

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
	5	139.94	14	140.05	18+	37	0.021	Local
	5	139.88	12	140.05	18+	37	0.021	Local
	5	139.51	Over Crown	139.52	18+	37	0.021	Local

Location	Approach Flow No. 1						Approach Flow No. 2					
	Q_1	Q_b	Q_t	S	S_x	T	Q_2	Q_b	Q_t	S	S_x	T
36	3.7	—	3.7	0.002	0.021	16	1.1	—	1.1	0.006	0.021	8
37	3.2	—	3.2	0.002	0.021	15	0.5	—	0.5	0.006	0.021	5
38	3.7	—	3.7	‡0.002	0.021	16	3.1	—	3.1	‡0.002	0.021	15

‡ Grade 5' from Sump.

SUMP INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number

Design Storm Frequency 2 yr.

Gutter Depression at Inlets (Standard = 2")

Width of Gutter Depression at Inlets (Standard = 2'0")

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb	Inlet Capacity Required Qi
39	139.52	1.1	18	0.43	3.51	1.7	—	1.7
40	139.75	2.2	19	0.63	3.42	4.7	—	4.7
41	139.75	1.1	24	0.43	3.03	1.4	—	1.4

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
	5	139.22	5	139.52	18+	37	0.021	Local
	5	139.57	14	139.68	18+	37	0.021	Local
	5	139.35	4	139.68	18+	37	0.021	Local

Location	Approach Flow No. 1						Approach Flow No. 2					
	Q_1	Q_b	Q_t	S	S_x	T	Q_2	Q_b	Q_t	S	S_x	T
39	0.9	–	0.9	≠0.006	0.021	7	0.8	–	0.8	≠0.002	0.021	9
40	2.4	–	2.4	0.003	0.021	12	2.3	–	2.3	0.002	0.021	14
41	0.7	–	0.7	0.003	0.021	7	0.7	–	0.7	0.002	0.021	8

≠ Grade 5' from Sump.

SUMP INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number

Design Storm Frequency 2 yr.

Gutter Depression at Inlets (Standard = 2")

Width of Gutter Depression at Inlets (Standard = 2'0")

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb	Inlet Capacity Required Qi
42	139.52	2.0	20	0.63	3.33	4.2	—	4.2
43	139.52	0.8	15	0.43	3.83	1.3	—	1.3
45	137.00	6.0	28	0.43	2.78	7.2	—	7.2

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
	5	139.38	13	139.52	18+	37	0.021	Local
	5	139.19	4	139.52	18+	37	0.021	Local
	10	136.88	14	137.00	15+	31	0.021	Local

Location	Approach Flow No. 1						Approach Flow No. 2					
	Q_1	Q_b	Q_t	S	S_x	T	Q_2	Q_b	Q_t	S	S_x	T
42	2.8	—	2.8	0.003	0.021	13	1.4	—	1.4	0.003	0.021	10
43	1.0	—	1.0	0.003	0.021	9	0.3	—	0.3	0.003	0.021	5
45	3.7	—	3.7	0.002	0.021	*	3.5	—	3.5	0.002	0.021	*

* Over Crown but below TC

SUMP INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number

Design Storm Frequency 2 yr.

Gutter Depression at Inlets (Standard = 2")

Width of Gutter Depression at Inlets (Standard = 2'0")

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb	Inlet Capacity Required Qi
46	137.00	3.4	30	0.52	2.67	4.7	—	4.7
~~48~~ 49	137.00	0.5	15	0.52	3.83	1.0	5.5	6.5

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
	5	136.88	14	137.00	15+	31	0.021	Local
	2 - 15'	136.66	3	137.00	15+	31	0.021	Local

Location	Approach Flow No. 1						Approach Flow No. 2					
	Q_1	Q_b	Q_t	S	S_x	T	Q_2	Q_b	Q_t	S	S_x	T
46	4.4	—	4.4	0.005	0.021	14	0.3	—	0.3	0.002	0.021	5
~~48~~ 49	0.5	5.5	6.0	≠0.005	0.021	*	0.5	—	0.5	≠0.002	0.021	7

≠ Grade 15' from Sump.

* Over Crown but below TC

ON GRADE INLETS DESIGN DATA TABULATION

Project Title *FLOYD BAILEY*

Project Number ______

Design Storm Frequency *2 yr.*

Gutter Depression at Inlets (Standard = 2") ______

Width of Gutter Depression of Inlets (Standard = 2'0") ______

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Upstream Inlets Qb	Total Flow to Inlet Qt	Inlet Intercept Flow Qi	Bypass Flow to Downstream Inlet Qb
50	140.30	6.7	15	0.52	3.83	13.3	—	9.8 *	4.3	5.5
51	140.30	2.4	15	0.68	3.83	6.3	3.5 ‡	9.8 *	4.3	5.5

Inlet Length Required	Inlet Length Provided	Computed Water Surface Elevation in Gutter	Computed Pavement Spread in Feet	Allowable Water Surface Elevation in Gutter	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Longitudinal Gutter Slope in Ft./Ft.	Street Classification
	5	~140.30	Over Crown	140.30	15+	31	0.021	~0.004	Local
	5	~140.30	Over Crown	140.30	15+	31	0.021	~0.004	Local

NOTE: Inlet intercept flow (Qi) must be as required to limit pavement spread or ponding as allowed by criteria.

* Approx. Street Capacity at full depth. See Street Capacity Sheets

‡ Q_b from No. 50 over crown

SUMP INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number

Design Storm Frequency 2 yr.

Gutter Depression at Inlets (Standard = 2")

Width of Gutter Depression at Inlets (Standard = 2'0")

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb	Inlet Capacity Required Qi
52	140.59	2.3	15	0.68	3.83	6.0	1.4	7.4

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
	10	140.47	12	140.59	21	26±	~0.02	Local

Location	Approach Flow No. 1						Approach Flow No. 2					
	Q_1	Q_b	Q_t	S	S_x	T	Q_2	Q_b	Q_t	S	S_x	T
52	4.8	1.4	6.2	0.002	~0.02	18	1.2	—	1.2	0.002	~0.02	9

ON GRADE INLETS DESIGN DATA TABULATION

Project Title FLOYD BAILEY

Project Number

Design Storm Frequency 2 yr.

Gutter Depression at Inlets (Standard = 2")

Width of Gutter Depression of Inlets (Standard = 2'0")

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Upstream Inlets Qb	Total Flow to Inlet Qt	Inlet Intercept Flow Qi	Bypass Flow to Downstream Inlet Qb
54	141.30	2.1	15	0.68	3.83	5.5	—	5.5	4.1	1.4
56	138.76	0.4	15	0.55	3.83	0.8	—	0.8	0.8	—
57	138.75	0.4	15	0.55	3.83	0.8	—	0.8	0.8	—

Inlet Length Required	Inlet Length Provided	Computed Water Surface Elevation in Gutter	Computed Pavement Spread in Feet	Allowable Water Surface Elevation in Gutter	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Longitudinal Gutter Slope in Ft./Ft.	Street Classification
	10	141.23	15	141.30	21	26±	~0.02	~0.002	Local
	5	138.52	8	138.76	18+	37	0.021	0.0034	Local
	5	138.51	8	138.75	18+	37	0.021	0.0035	Local

NOTE: Inlet intercept flow (Qi) must be as required to limit pavement spread or ponding as allowed by criteria.

Van Doren Hazard Stallings
architects · engineers · planners
· Topeka
· Wichita
· Minneapolis
· Kansas City

Date 3/87
Project Floyd Bailey Drainage
Subject "C" factors

Job No. 86-214
Sheet 1 of 5
By WV
Ck'd.

No.	Acres	% Imp.	Acres Imp.	2 Year C	2 Year CA	100 Year C	100 Year CA
1	1.0+7.4	30	2.5	0.43	3.6	0.65	5.5
2	M.H.	—	—	—	—	—	—
3	1.7	25	0.4	0.40	0.7	0.63	1.1
1-3	10.1	~29	2.9	~.43	4.3	~.65	6.6
4	7.6	60	4.6	0.60	4.6	0.77	5.9
5	2.0	30	0.6	0.43	0.9	0.65	1.3
4-5	9.6	~54	5.2	~57	5.5	~.75	7.2
6	M.H.	—	—	—	—	—	—
7	1.0	30	0.3	0.43	0.4	0.65	0.6
8	2.4	38	0.9	0.48	1.2	0.68	1.6
4-8	13.0	~49	6.4	~55	7.1	~.72	9.4
9	M.H.	—	—	—	—	—	—
1-9	23.1	~40	9.3	~.49	11.4	~.69	16.0
10	3.6	22	0.8	0.39	1.4	0.62	2.2
11	4.2	30	1.3	0.43	1.8	0.65	2.7
1-11	30.9	~37	11.4	~.47	14.6	~.68	20.9
12	3.6	25	0.9	0.40	1.4	0.63	2.3
13	M.H.	—	—	—	—	—	—
1-13	34.5	~36	12.3	~.46	16.0	~.67	23.2
14	3.2	25	0.8	0.40	1.3	0.63	2.0

Van Doren Hazard Stallings
architects - engineers - planners
Topeka
• Wichita
• Minneapolis
• Kansas City

Job No. 86-214
Date 3/87
Sheet 2 of 5
Project FLOYD BAILEY DRAINAGE
By WV
Subject "C" factors
Ck'd.

No.	Acres	% Imp.	Acres Imp.	2 Year C	2 Year CA	100 Year C	100 Year CA
15	3.3	25	0.8	0.40	1.3	0.63	2.1
1-15	41.0	~34	13.9	~.45	18.6	~.67	27.3
16	5.4	25	1.4	0.40	2.2	0.63	3.4
17	2.2	25	0.6	0.40	0.9	0.63	1.4
16-17	7.6	~26	2.0	~.41	3.1	~.63	4.8
18	5.3	30	1.6	0.43	2.3	0.65	3.4
19	5.1	25	1.3	0.40	2.0	0.63	3.2
18-19	10.4	~28	2.9	~.41	4.3	~.63	6.6
20	M.H.	—	—	—	—	—	—
16-20	18.0	~27	4.9	~.41	7.4	~.63	11.4
21	2.4	25	0.6	0.40	1.0	0.63	1.5
16-21	20.4	~27	5.5	~.41	8.4	~.64	13.0
22	2.2	25	0.6	0.40	0.9	0.63	1.4
16-22	22.6	~27	6.1	~.41	9.3	~.64	14.4
23	5.6	25	1.4	0.40	2.2	0.63	3.5
24	2.2	30	0.7	0.43	0.9	0.65	1.4
23-24	7.8	~27	2.1	~.40	3.1	~.63	4.9
25	M.H.	—	—	—	—	—	—
1-25	71.4	~31	22.1	~.43	31.0	~.65	46.6
26	2.8	25	0.7	0.40	1.1	0.63	1.8
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Van Doren Hazard Stallings
architects • engineers • planners
• Topeka
• Wichita
• Minneapolis
• Kansas City

Date 3/87

Job No. 86-214

Sheet 3 of 5

Project FLOYD BAILEY DRAINAGE

By WV

Subject "C" factors

Ck'd.

No.	Acres	% Imp.	Acres Imp.	2 Year		100 Year	
				C	CA	C	CA
1-27	75.1	~31	23.1	~.43	32.5	~.65	49.0
28	3.7	25	0.9	0.40	1.5	0.63	2.3
29	M.H.	—	—	—	—	—	—
1-29	78.8	~30	24.0	~.43	34.0	~.65	51.3
30	2.5	25	0.6	0.40	1.0	0.63	1.6
31	3.8	25	1.0	0.40	1.5	0.63	2.4
1-31	85.1	~30	25.6	~.43	36.5	~.65	55.3
32	M.H.	—	—	—	—	—	—
33	8.6	25	2.2	0.40	3.4	0.63	5.4
1-33	93.7	~30	27.8	~.43	39.9	~.64	60.7
34	6.8	30	2.0	0.43	2.9	0.65	4.4
1-34	100.5	~30	29.8	~.43	42.8	~.64	65.1
35	2.5	45	1.1	0.52	1.3	0.68	1.7
1-35	103.0	~30	30.9	~.43	44.1	~.65	66.8
36	2.6	38	1.0	0.48	1.2	0.68	1.8
37	2.0	38	0.8	0.48	1.0	0.68	1.4
36-37	4.6	~39	1.8	~.48	2.2	~.70	3.2
38	3.3	60	2.0	0.60	2.0	0.77	2.5
39	1.1	30	0.3	0.43	0.5	0.65	0.7
36-39	9.0	~46	4.1	~.52	4.7	~.71	6.4
40	2.2	65	1.4	0.63	1.4	0.79	1.7
41	1.1	30	0.3	0.43	0.5	[illegible]	[illegible]

Van Doren Hazard Stallings
architects · engineers · planners
· Topeka · Wichita · Minneapolis · Kansas City

Date: 3/87
Job No. 86-214
Sheet 4 of 5

Project: FLOYD BAILEY DRAINAGE
By:
Subject: "C" factors
Ck'd.:

No.	Acres	% Imp.	Acres Imp.	2 Year C	2 Year CA	100 Year C	100 Year CA
36-41	12.3	~47	5.8	~.55	6.6	~.73	8.8
42	2.0	65	1.3	0.63	1.3	0.79	1.6
43	0.8	30	0.2	0.43	0.3	0.65	0.5
36-43	15.1	~48	7.3	~.55	8.2	~.73	10.9
44	M.H.	—	—	—	—	—	—
45	6.0	30	1.8	0.43	2.6	0.65	3.9
46	3.4	45	1.5	0.52	1.8	0.68	2.3
36-46	24.5	~43	10.6	~.52	12.6	~.70	17.1
47	M.H.	—	—	—	—	—	—
~~48~~ (49 →)	0.5 + 6.7	45	3.2	0.52	3.7	0.68	4.9
49	M.H.	—	—	—	—	—	—
1-49	134.7	~33	44.7	~.46	60.4	~.66	88.8
50	6.7	45	3.0	0.52	3.5	0.68	4.6
51	2.4	70	1.7	0.68	1.6	0.80	1.9
1-51	143.8	~34	49.4	~.46	65.5	~.66	95.3
52	2.3	70	1.6	0.68	1.6	0.80	1.8
53	M.H.	—	—	—	—	—	—
1-53	146.1	~35	51.0	~.46	67.1	~.66	97.1
54	2.1	70	1.5	0.68	1.4	0.80	1.7
55	M.H.	—	—	—	—	—	—
1-55	148.2	~35	52.5	~.46	[illegible]	[illegible]	[illegible]

Van Doren Hazard Stallings
architects · engineers · planners
Topeka · Wichita · Minneapolis · Kansas City

Date 3/87
Project FLOYD BAILEY DRAINAGE
Subject "C" factors
Job No. 86-214
Sheet 5 of 5
By WV
Ck'd.

No.	Acres	% Imp.	Acres Imp.	2 Year		100 Year	
				C	CA	C	CA
56	0.4	50	0.2	0.55	0.2	.73	0.3
57	0.4	50	0.2	0.55	0.2	.73	0.3
56-57	0.8	~50	0.4	~.50	0.4	~.75	0.6

Van Doren Hazard Stallings
architects · engineers · planners
Topeka
Wichita
· Minneapolis
· Kansas City

Date 3/87

Job No. 86 - 214

Sheet 1 of 6

Project Floyd Bailey

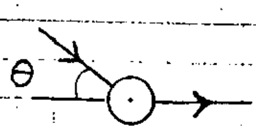
By WV

Subject Head Loss - 2 yr

Ck'd.

No.	Outflow Q_o	Outflow $\frac{V_o^2}{2g}$	Inflow: Inlet $\frac{Q_i}{Q_o}$	Inflow: Upper $\frac{Q_u}{Q_o}$	Upper K_u	Upper $\frac{V_u^2}{2g}$	Inflow: Lateral $\frac{Q_L}{Q_o}$	Lateral K_L	Lateral $\frac{V_L^2}{2g}$	H
1	9.3	0.23					~ 1	0.3	0.23	0.16
2	9.3	0.23		1.0	0.53	0.23				0.11
3	10.3	0.17	0.10	0.90	0.46	0.17				0.12
4	3.7	0.14	1.0							0.21
5	7.4	0.15	0.50	0.50	0.30	0.14				0.17
6	7.4	0.15		1.0	0.30	0.15				0.10
7	1.5	0.02	1.0							0.03
8	17.8	0.20	0.55	0.40	1.0	0.15	0.05	0.30	0.02	0.19
9	27.6	0.24		0.65	0.30	0.15	0.35	0.44	0.17	0.18
10	4.3	0.19	1.0							0.28

$$H = \frac{V_o^2}{2g} + \frac{Q_i}{Q_o}(0.5)\left(\frac{V_o^2}{2g}\right) - \frac{Q_u}{Q_o}(K_u)\left(\frac{V_u^2}{2g}\right) - \frac{Q_L}{Q_o}(K_L)\left(\frac{V_L^2}{2g}\right)$$



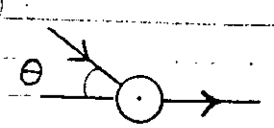
θ	0°	15°	30°	45°	60°	75°	90°
K	1.0	0.81	0.65	0.53	0.44	0.37	0.30

Van Doren Hazard Stallings
architects · engineers · planners
Topeka
Wichita
• Minneapolis
• Kansas City

Date 3/87 | Job No. 86-214
Sheet 2 of 6
Project Floyd Bailey | By WV
Subject Head Loss - 2yr. | Ck'd.

No.	Outflow		Inflow							H
			Inlet	Upper			Lateral			
	Q_o	$\frac{V_o^2}{2g}$	$\frac{Q_i}{Q_o}$	$\frac{Q_u}{Q_o}$	K_u	$\frac{V_u^2}{2g}$	$\frac{Q_L}{Q_o}$	K_L	$\frac{V_L^2}{2g}$	
11	35.1	0.21	0.11	0.78	1.0	0.20	0.11	0.30	0.19	0.06
12	2.8	0.08	1.0							0.12
13	37.5	0.24		0.92	1.0	0.21	0.08	0.30	0.08	0.05
14	2.3	0.05	1.0							0.08
15	43.6	0.32	0.10	0.85	1.0	0.24	0.05	0.30	0.05	0.13
16	5.8	0.17	1.0							0.25
17	8.2	0.18	0.32	0.68	0.30	0.17				0.17
18	6.4	0.20	1.0							0.30
19	12.0	0.19	0.45	0.55	0.30	0.20				0.20
20	18.8	0.23		0.60	1.0	0.19	0.40	0.30	0.18	0.09

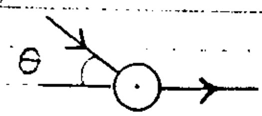
$$H = \frac{V_o^2}{2g} + \frac{Q_i}{Q_o}(0.5)\left(\frac{V_o^2}{2g}\right) - \frac{Q_u}{Q_o}(K_u)\left(\frac{V_u^2}{2g}\right) - \frac{Q_L}{Q_o}(K_L)\left(\frac{V_L^2}{2g}\right)$$



θ	0°	15°	30°	45°	60°	75°	90°
K	1.0	0.81	0.65	0.53	0.44	0.37	0.30

No.	Outflow		Inflow							H
			Inlet	Upper			Lateral			
	Q_o	$\frac{V_o^2}{2g}$	$\frac{Q_i}{Q_o}$	$\frac{Q_u}{Q_o}$	K_u	$\frac{V_u^2}{2g}$	$\frac{Q_L}{Q_o}$	K_L	$\frac{V_L^2}{2g}$	
21	21.3	0.29	0.12	0.88	0.30	0.23				0.25
22	23.4	0.17	0.09	0.91	0.30	0.17				0.13
23	5.9	0.17	1.0							0.25
24	8.5	0.19	0.35	0.65	0.30	0.17				0.19
25	70.9	0.31 0.49		0.60	1.0	0.31 0.32	0.30	0.30	0.17	
							0.10	0.30	0.19	0.10 0.29
26	2.9	0.09	1.0							0.13
27	73.6	0.33 0.53	0.02	0.95	1.0	0.31 0.49	0.03	0.30	0.09	0.04 0.07
28	3.5	0.13								0.19
29	75.3	0.35 0.56		0.97	0.30	0.33 0.53	0.03	0.37	0.13	0.25 0.40

$$H = \frac{V_o^2}{2g} + \frac{Q_i}{Q_o}(0.5)\left(\frac{V_o^2}{2g}\right) - \frac{Q_u}{Q_o}(K_u)\left(\frac{V_u^2}{2g}\right) - \frac{Q_L}{Q_o}(K_L)\left(\frac{V_L^2}{2g}\right)$$



θ	0°	15°	30°	45°	60°	75°	90°
K	1.0	0.81	0.65	0.53	0.44	0.37	0.30

Van Doren Hazard Stallings
architects · engineers · planners
· Topeka
· Wichita
· Minneapolis
· Kansas City

Date 4/87

Project Floyd Bailey

Subject Head Loss - 2yr.

Job No. 86-214

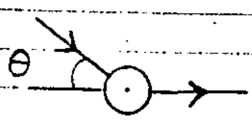
Sheet 4 of 6

By WV

Ck'd.

No.	Outflow		Inflow							H
			Inlet	Upper			Lateral			
	Q_o	$\frac{V_o^2}{2g}$	$\frac{Q_i}{Q_o}$	$\frac{Q_u}{Q_o}$	K_u	$\frac{V_u^2}{2g}$	$\frac{Q_L}{Q_o}$	K_L	$\frac{V_L^2}{2g}$	
30	3.0	0.09	1.0							0.13
31	80.7	0.40	0.04	0.93	1.0	0.35	0.03	0.30	0.09	0.08
						0.40				0.04
32	80.7	0.40		1.0	0.65	0.40				0.14
33-35	See	100yr	Storm							
36	4.8	0.11	1.0							0.16
37	8.5	0.19	0.46	0.56	0.30	0.11				0.22
38	7.1	0.25	1.0							0.37
39	16.1	0.17	0.10	0.48	1.0	0.17	0.42	0.30	0.17	0.08
40	4.2	0.18	1.0							0.27
41	20.0	0.26	0.06	0.77	1.0	0.17	0.17	0.30	0.18	0.13

$$H = \frac{V_o^2}{2g} + \frac{Q_i}{Q_o}(0.5)\left(\frac{V_o^2}{2g}\right) - \frac{Q_u}{Q_o}(K_u)\left(\frac{V_u^2}{2g}\right) - \frac{Q_L}{Q_o}(K_L)\left(\frac{V_L^2}{2g}\right)$$



θ	0°	15°	30°	45°	60°	75°	90°
K	1.0	0.81	0.65	0.53	0.44	0.37	0.30

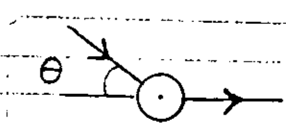
Van Doren Hazard Stallings
architects · engineers · planners
· Topeka
· Wichita
· Minneapolis
· Kansas City

Date 4/87
Project Floyd Bailey
Subject Head Loss – 2 yr.

Job No. 86-214
Sheet 5 of 6
By WV
Ck'd.

No.	Outflow Q_o	Outflow $\frac{V_o^2}{2g}$	Inflow: Inlet $\frac{Q_i}{Q_o}$	Inflow: Upper $\frac{Q_u}{Q_o}$	Upper K_u	Upper $\frac{V_u^2}{2g}$	Inflow: Lateral $\frac{Q_L}{Q_o}$	Lateral K_L	Lateral $\frac{V_L^2}{2g}$	H
42	4.4	0.20	1.0							0.30
43	23.9	0.18	0.04	0.80	1.0	0.18	0.16	0.30	0.18	0.03
44	23.9	0.18		1.0	0.30	0.18				0.13
45	7.2	0.26	1.0							0.39
46	34.1	0.36	0.12	0.68	1.0	0.18	0.20	0.30	0.26	0.24
47	34.1	0.36		1.0	0.65	0.36				0.13
48	Omit									
49	See	100 yr	Storm							
50	3.1	0.15	1.0							0.22
51	See	100 yr	Storm							

$$H = \frac{V_o^2}{2g} + \frac{Q_i}{Q_o}(0.5)\left(\frac{V_o^2}{2g}\right) - \frac{Q_u}{Q_o}(K_u)\left(\frac{V_u^2}{2g}\right) - \frac{Q_L}{Q_o}(K_L)\left(\frac{V_L^2}{2g}\right)$$



θ	0°	15°	30°	45°	60°	75°	90°
K	1.0	0.81	0.65	0.53	0.44	0.37	0.30

Van Doren Hazard Stallings
architects - engineers - planners
Topeka
Wichita
• Minneapolis
• Kansas City

Date 4/87

Project Floyd Bailey

Subject Head Loss

Job No. 86-214

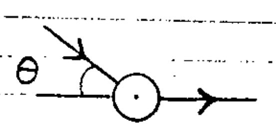
Sheet 6 of 6

By WV

Ck'd.

No.	Outflow		Inflow							H
			Inlet	Upper			Lateral			
	Q_o	$\frac{V_o^2}{2g}$	$\frac{Q_i}{Q_o}$	$\frac{Q_u}{Q_o}$	K_u	$\frac{V_u^2}{2g}$	$\frac{Q_L}{Q_o}$	K_L	$\frac{V_L^2}{2g}$	
52	5.9	0.17	1.0							0.25
53	See	100 yr	Storm							
54	5.6	0.16	1.0							0.24
55	See	100 yr	Storm							
56	0.9	—								minor
57	1.7	—								minor

$$H = \frac{V_o^2}{2g} + \frac{Q_i}{Q_o}(0.5)\left(\frac{V_2^2}{2g}\right) - \frac{Q_u}{Q_o}(K_u)\left(\frac{V_u^2}{2g}\right) - \frac{Q_L}{Q_o}(K_L)\left(\frac{V_L^2}{2g}\right)$$



θ	0°	15°	30°	45°	60°	75°	90°
K	1.0	0.81	0.65	0.53	0.44	0.37	0.30

DESIGN COMPUTATIONS FOR STORM DRAINAGE

PROJECT: Floyd Bailey

DISTRICT:

SUBDISTRICT:

STORM FREQ: 2 YR. PLACE: Wichita, Ks.

MANNING "n": 0.013

REFERENCE PLAN:

HYDRAULIC PROFILE:

SHEET 1 OF 3

COMPUTED BY: WV DATE: 3/87

CHECKED BY: DATE:

≠ Top of Manhole or 1.0 ft. below Inlet T.C.

	LINE		LENGTH	STRUCT.	TRIBUTARY ACREAGE PERVIOUS		TRIBUTARY ACREAGE IMPERV.		UNIT RUNOFF CFS/ACRE		TOTAL RUNOFF			PIPE SIZE	FRICT. HEAD	V	$\frac{V^2}{2g}$	TIME IN MINUTES		CONST. SLOPE	REQD. HYDR. SLOPE	HEAD LOSS	HYDRA. ELEV.		F.L. ELEV.		UPPER STREET ELEV.	REMARKS
	UPP.	LOW.			ADD.	TOT.	ADD.	TOT.	PERV.	IMPV.	PERV.	IMPV.	TOTAL					t	Σ t	%	%		UPPER	LOWER	UPPER	LOWER	≠	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	0.24 (9)	0.87 (10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
1	1	2	390	M.H.	5.9	5.9	2.5	2.5	0.62	2.24	3.7	5.6	9.3	21	1.40	3.9	0.23	1.6	32	0.37	0.36	0.16	138.48 139.40	137.08 138.00	137.34	135.89	140.50	
2	2	3	310	M.H.	—	5.9	—	2.5	"	"	3.7	5.6	9.3	21	1.10	3.9	0.23	1.3	33.6	0.38	0.36	0.11	136.97 137.89	135.86 136.78	135.79	134.60	140.4±	
3	3	9	50	Inlet	1.3	7.2	0.4	2.9	0.59	2.12	4.2	6.1	10.3	24	0.10	3.3	0.17	0.3	34.9	0.20	0.20	0.12	135.74 136.66	135.64 136.56	134.35	134.25	138.60	
4	4	5	35	Inlet	3.0	*	4.6	*	—	—	—	—	3.7	15	0.11	3.0	0.14	0.2	34	0.32	0.32	0.21	136.76 137.68	136.65 137.57	135.76	135.65	140.1±	* See Inlet Data
5	5	6	25	Inlet	1.4	*	0.6	*	—	—	—	—	7.4	21	0.05	3.1	0.15	0.1	34.2	0.21	0.21	0.17	136.48 137.40	136.43 137.35	135.15	135.10	140.1±	* See Inlet Data
6	6	8	30	MH	—	*	—	*	—	—	—	—	7.4	21	0.06	3.1	0.15	0.1	34.3	0.21	0.21	0.10	136.33 137.25	136.27 137.19	135.00	134.94	140.2±	* See Inlet Data
7	7	8	35	Inlet	0.7	0.7	0.3	0.3	0.80	2.90	0.6	0.9	1.5	15	0.02	1.2	0.02	0.5	20	0.20	0.05	0.03	136.29 137.21	136.27 137.19	135.51	135.44	138.95	
8	8	9	230	Inlet	1.5	6.6	0.9	6.4	0.60	2.16	4.0	13.8	17.8	30	0.44	3.6	0.20	1.1	34.4	0.19	0.19	0.19	136.08 137.00	135.64 136.56	134.19	133.75	138.95	
9	9	11	70	MH	—	13.8	—	9.3	0.58	2.11	8.0	19.6	27.6	36	0.11	3.9	0.24	0.3	35.5	0.16	0.16	0.18	135.46 136.38	135.35 136.27	132.45	132.34	139.5±	
10	10	11	35	Inlet	2.8	*	0.8	*	—	—	—	—	4.3	15	0.15	3.5	0.19	0.2	26	0.42	0.42	0.28	135.50 136.42	135.35 136.27	134.24	134.09	138.06	* See Inlet Data
11	11	13	395	Inlet	2.9	19.5	1.3	11.4	0.58	2.09	11.3	23.8	35.4	42	0.47	3.6	0.21	1.3	35.8	0.12	0.12	0.06	135.29 136.21	134.82 135.74	131.84	131.37	138.06	
12	12	13	25	Inlet	2.7	*	0.9	*	—	—	—	—	2.8	15	0.05	2.3	0.08	0.2	31	0.20	0.18	0.12	134.87 135.79	134.82 135.74	133.67	133.62	137.32	* See Inlet Data
13	13	15	70	MH	—	22.2	—	12.3	0.56	2.04	12.4	25.1	37.5	42	0.10	3.9	0.24	0.3	37.1	0.14	0.14	0.05	134.77 135.69	134.67 135.59	131.17	131.07	138.7±	
14	14	15	35	Inlet	2.4	2.4	0.8	0.8	0.71	2.58	1.7	0.6	2.3	15	0.04	1.9	0.05	0.3	25	0.20	0.12	0.08	134.71 135.63	134.67 135.59	133.39	133.32	137.22	
15	15	25	435	Inlet	2.5	27.1	0.8	13.9	0.56	2.04	15.2	28.4	43.6	42	0.78	4.5	0.32	1.6	37.4	0.18	0.18	0.13	134.54 135.46	133.76 134.68	130.87	130.09	137.22	
16	16	17	35	Inlet	4.0	4.0	1.4	1.4	0.64	2.32	2.6	3.2	5.8	18	0.11	3.3	0.17	0.2	30	0.31	0.30	0.25	136.57 137.49	136.46 137.38	134.34	134.23	138.25	
17	17	20	490	Inlet	1.6	5.6	0.6	2.0	0.64	2.32	3.6	4.6	8.2	21	1.27	3.4	0.18	2.4	30.2	0.26	0.26	0.17	136.29 137.21	135.02 135.94	133.98	132.71	138.25	
18	18	19	35	Inlet	3.7	3.7	1.6	1.6	0.67	2.42	2.5	3.9	6.4	18	0.12	3.6	0.20	0.2	28	0.20	0.35	0.30	135.53 136.45	135.41 136.33	133.10	133.03	136.81	
19	19	20	70	Inlet	3.8	7.5	1.3	2.9	0.67	2.42	5.0	7.0	12.0	24	0.19	3.8	0.23	0.3	28.2	0.10	0.27	0.20	135.21 136.13	135.02 135.94	132.53	132.46	136.81	
20	20	21	30	MH	—	13.1	—	4.9	0.61	2.21	8.0	10.8	18.8	30	0.06	3.8	0.23	0.1	32.6	0.20	0.20	0.09	134.93 135.85	134.87 135.79	131.96	131.90	137.7±	
21	21	22	35	Inlet	1.8	14.9	0.6	5.5	0.61	2.21	9.1	12.2	21.3	30	0.09	4.3	0.29	0.1	32.7	0.20	0.26	0.25	134.62 135.54	134.53 135.45	131.80	131.73	136.81	
22	22	22a	280	Inlet	1.6	16.5	0.6	6.1	0.61	2.20	10.0	13.4	23.4	36	0.34	3.3	0.17	1.4	32.8	0.12	0.12	0.13	134.40 135.32	134.06 134.98	131.23	130.89	136.81	
	22a	25	250	MH	—								23.4	"	0.30			1.3	34.1	0.12	0.12	0	134.06 134.98	133.76 134.68	130.89	130.59	138.88	

TABLE 5-7

DESIGN COMPUTATIONS FOR STORM DRAINAGE

STORM FREQ: 2 YR. PLACE: Wichita, Ks.

PROJECT: Floyd Bailey

MANNING "n": 0.013

SHEET 2 OF 3

DISTRICT:

REFERENCE PLAN:

COMPUTED BY: WV DATE: 3/87

SUBDISTRICT:

HYDRAULIC PROFILE:

CHECKED BY: DATE:

‡ Top of Manhole or 1.0 ft. below Inlet TC

	LINE UPP. (1)	LINE LOW. (2)	LENGTH (3)	STRUCT. (4)	TRIBUTARY ACREAGE PERVIOUS ADD. (5)	PERVIOUS TOT. (6)	IMPERV. ADD. (7)	IMPERV. TOT. (8)	UNIT RUNOFF CFS/ACRE PERV. 0.24 (9)	IMPV. 0.87 (10)	TOTAL RUNOFF PERV. (11)	IMPV. (12)	TOTAL (13)	PIPE SIZE (14)	FRICT. HEAD (15)	V (16)	$V^2/2g$ (17)	TIME IN MINUTES t (18)	Σ t (19)	CONST. SLOPE % (20)	REQD. HYDR. SLOPE % (21)	HEAD LOSS (22)	HYDRA. ELEV. UPPER (23)	HYDRA. ELEV. LOWER (24)	F.L. ELEV. UPPER (25)	F.L. ELEV. LOWER (26)	UPPER STREET ELEV. ‡ (27)	REMARKS (28)
1	23	24	35	Inlet	4.2	4.2	1.4	1.4	0.64	2.32	2.7	3.2	5.9	18	0.11	3.3	0.17	0.2	30	0.30	0.30	0.25	134.33	134.22	132.47	132.36	137.26	
																							135.25	135.14				
2	24	25	95	Inlet	1.5	5.7	0.7	2.1	0.64	2.32	3.6	4.9	8.5	21	0.27	3.5	0.19	0.4	30.2	0.28	0.28	0.19	134.03	133.76	132.11	131.84	137.26	
																							134.95	134.68				
3	25	27	30	MH	—	49.3	—	22.1	0.55	1.98	27.1	43.8	70.9	54	0.04	4.5	0.31	0.1	39.0	0.13	0.12	0.10	133.66	133.62	129.59	129.55	137.9±	
														48	0.07	5.6	0.49				0.24	0.29	134.39	134.32				
4	26	27	35	Inlet	2.1	2.1	0.7	0.7	0.64	2.32	1.3	1.6	2.9	15	0.07	2.4	0.09	0.2	30	0.20	0.20	0.13	133.69	133.62	132.24	132.31	136.94	
																							134.39	134.32				
5	27	29	380	Inlet	0.6	52.0	0.3	23.1	0.54	1.97	28.1	45.5	73.6	54	0.53	4.6	0.33	1.4	39.1	0.15	0.14	0.04	133.58	133.05	129.35	128.78	136.94	
														48	0.99	5.9	0.53				0.26	0.17	134.25	133.26				
6	28	29	70	Inlet	2.8	2.8	0.9	0.9	0.57	2.08	1.6	1.9	3.5	15	0.20	2.8	0.13	0.3	36	0.28	0.28	0.19	133.25	133.05	131.73	131.53	136.53	
																							133.46	133.26				
7	29	31	80	MH	—	54.8	—	24.0	0.53	1.93	29.0	46.3	75.3	54	0.12	4.7	0.35	0.3	40.5	0.15	0.15	0.25	132.80	132.68	128.58	128.46	137.6±	
														48	0.22	6.0	0.56				0.28	0.40	132.86	132.64				
8	30	31	35	Inlet	1.9	1.9	0.6	0.6	0.74	2.70	1.4	1.6	3.0	15	0.07	2.4	0.09	0.2	23	0.21	0.21	0.13	132.75	132.68	131.28	131.21	135.99	
																							132.71	132.64				
9	31	32	355	Inlet	2.8	59.5	1.0	25.6	0.53	1.92	31.5	49.2	80.7	54	0.57	5.1	0.40	1.2	40.8	0.16	0.16	0.08	132.60	132.03	127.96	127.39	135.99	
																						0.04						
10	32	33	320	MH	—	59.5	—	25.6	"	"	"	"	80.7	54	0.51	5.1	0.40	1.0	42.0	0.16	0.16	0.14	131.89	131.38	127.39	126.88	137.7±	
11	33	34	35	Inlet	6.4	65.9	2.2	27.8	0.51	1.85	33.6	51.4	85.0	10x7	—	4.5	0.30	0.1	43.0	0.10	—	See	100 yr		126.73	126.69	136.00	d ~ 1.9'
12	34	35	270	Inlet	4.8	70.7	2.0	29.8	0.51	1.84	36.1	54.8	90.9	10x7	—	4.5	0.31	1.0	43.1	0.10	—	See	100 yr		126.69	126.42	136.00	d ~ 2.0'
13	35	49	40	Inlet	1.4	72.1	1.1	30.9	0.50	1.83	36.1	56.5	92.6	10x7	—	4.6	0.33	0.1	44.1	0.10	—	See	100 yr		126.42	126.38	136.05	d ~ 2.0
14	36	37	40	Inlet	1.6	1.6	1.0	1.0	0.92	3.33	1.5	3.3	4.8	18	0.08	2.7	0.11	0.2	15	0.20	0.20	0.16	137.31	137.23	135.33	135.25	139.05	
15	37	39	505	Inlet	1.2	2.8	0.8	1.8	0.91	3.31	2.5	6.0	8.5	21	1.41	3.5	0.19	2.3	15.2	0.27	0.28	0.22	137.01	135.60	135.00	133.64	139.05	
16	38	39	40	Inlet	1.3	1.3	2.0	2.0	0.82	2.98	1.1	6.0	7.1	18	0.17	4.0	0.25	0.2	19	0.43	0.43	0.37	135.77	135.60	134.06	133.39	138.41	
17	39	41	460	Inlet	0.8	4.9	0.3	4.1	0.82	2.96	4.0	12.1	16.1	30	0.69	3.3	0.17	2.4	19.2	0.15	0.15	0.08	135.52	134.83	132.89	132.20	138.41	
18	40	41	40	Inlet	0.8	0.8	1.4	1.4	0.73	2.64	0.6	3.7	4.2	15	0.16	3.4	0.18	0.2	24	0.40	0.40	0.27	134.99	134.83	133.61	133.45	138.75	
19	41	43	435	Inlet	0.8	6.5	0.3	5.8	0.72	2.63	4.7	15.3	20.0	30	1.00	4.1	0.26	1.8	24.2	0.23	0.23	0.13	134.70	133.70	132.00	131.00	138.75	
20	42	43	40	Inlet	0.7	0.7	1.3	1.3	0.80	2.90	0.6	3.8	4.4	15	0.18	3.6	0.20	0.2	20	0.45	0.45	0.30	133.88	133.70	132.43	132.25	138.52	
21	43	44	125	Inlet	0.6	7.8	0.2	7.3	0.70	2.52	5.5	18.4	23.9	36	0.16	3.4	0.18	0.6	26.0	0.13	0.13	0.03	133.67	133.51	130.50	130.34	138.52	
22	44	46	520	MH	—	"	—	"	"	"	"	"	23.9	36	0.68	3.4	0.18	2.5	26.6	0.13	0.13	0.13	133.38	132.70	130.21	129.53	139.5±	

TABLE 5-7

DESIGN COMPUTATIONS FOR STORM DRAINAGE

STORM FREQ: 2 YR. PLACE: Wichita, Ks.

PROJECT: Floyd Bailey

MANNING "n": 0.013

SHEET 3 OF 3

DISTRICT:

REFERENCE PLAN:

COMPUTED BY: WV DATE: 3/87

SUBDISTRICT:

HYDRAULIC PROFILE:

CHECKED BY: DATE:

≠ Top of Manhole or 1.0 ft. below Inlet TC

	LINE UPP. (1)	LINE LOW. (2)	LENGTH (3)	STRUCT. (4)	TRIBUTARY ACREAGE PERVIOUS ADD. (5)	PERVIOUS TOT. (6)	IMPERV. ADD. (7)	IMPERV. TOT. (8)	UNIT RUNOFF CFS/ACRE PERV. 0.24 (9)	IMPV. 0.87 (10)	TOTAL RUNOFF PERV. (11)	IMPV. (12)	TOTAL (13)	PIPE SIZE (14)	FRICT. HEAD (15)	V (16)	$\frac{V^2}{2g}$ (17)	TIME IN MINUTES t (18)	Σ t (19)	CONST. SLOPE % (20)	REQD. HYDR. SLOPE % (21)	HEAD LOSS (22)	HYDRA. ELEV. UPPER (23)	HYDRA. ELEV. LOWER (24)	F.L. ELEV. UPPER (25)	F.L. ELEV. LOWER (26)	UPPER STREET ELEV. ≠ (27)	REMARKS (28)
1	45	46	35	Inlet	4.2	4.2	1.8	1.8	0.67	2.42	2.8	4.4	7.2	18	0.16	4.1	0.26	0.1	28	0.45	0.45	0.39	132.86	132.70	131.19	131.03	136.00	
2	46	47	350	Inlet	1.9	13.9	1.5	10.6	0.65	2.37	9.0	25.1	34.1	36	0.91	4.8	0.36	1.2	29.1	0.26	0.26	0.24	132.46	131.55	129.33	128.42	136.00	
3	47	49	240	MH	—	"	—	"	"	"	"	"	34.1	36	0.62	4.8	0.36	0.8	30.3	0.26	0.26	0.13	131.42	130.80	128.42	127.80	137.45	
4	48	Omit																										
5	49	51	320	Inlet/MH	4.0	90.0	3.2	44.7	0.50	1.82	45.0	81.4	126	10x7	—	5.0	0.39	1.1	44.2	0.10	—	See	100yr		126.38	126.06	136.05	d ~ 2.5'
6	50	51	35	Inlet	3.7	*	3.0	*	—	—	—	—	5.4	18	0.09	3.1	0.15	0.2	15	0.26	0.26	0.22			135.59	135.50	139.30	* See Inlet Data
7																												
8	51	53	340	Inlet/MH	—	94.4	—	49.4	0.49	1.79	46.3	88.4	135	10x7	—	5.2	0.42	1.1	45.3	0.10	—	See	100yr		126.06	125.72	139.30	d ~ 2.6'
9	52	53	20	Inlet	0.7	0.7	1.6	1.6	0.92	3.33	0.6	5.3	5.9	18	0.06	3.3	0.17	0.1	15	0.30	0.30	0.25			135.06	135.00	139.59	
10	53	55	510	MH	—	95.1	—	51.0	0.49	1.77	46.6	90.3	137	10x7	—	5.3	0.43	1.6	46.4	0.10	—	See	100yr		125.72	125.21	140.48	d ~ 2.6'
11	54	55	20	Inlet	0.6	0.6	1.5	1.5	0.92	3.33	0.6	5.0	5.6	18	0.05	3.2	0.16	0.1	15	0.27	0.27	0.24			135.55	135.50	140.30	
12	55	Exist	660	MH	—	95.7	—	52.5	0.48	1.73	45.9	90.8	137	10x7	—	5.3	0.43	2.1	48.0	0.10	—	See	100yr		125.21	124.55	141.25	d ~ 2.6'
13																												
14	56	57	40	Inlet	0.2	0.2	0.2	0.2	0.92	3.33	0.2	0.7	0.9	15					15	0.40	<0.1		Pt. Full		133.66	133.50	137.76	
15	57	Exist	60	Inlet	0.2	0.4	0.2	0.4	0.92	3.33	0.4	1.3	1.7	15					15	0.50	<0.1		Pt. Full		133.30	133.00	137.76	
16																												
17																												
18																												
19																												
20																												
21																												
22																												

TABLE 5-7

Van Doren Hazard Stallings
architects · engineers · planners
Topeka
Wichita
• Minneapolis
• Kansas City

Job No. 86-214
Date 3/87
Sheet 1 of 1
Project Floyd Bailey Drainage
By WV
Subject 100 yr. Storm Work sheet
Ck'd.

No.	Acres	C	T_c	I	Q	Q_b	Q_T	Swr	Bypass
1	8.4	0.65	32	5.22	28	–	28	9 *	(19)
3	1.7	0.63	35	5.00	(5)	(19)	24	10 *	14
4-8	13.0	0.72	34	5.07	47	–	47	18 *	29
1-11	30.9	0.68	36	4.93	104	–	104	35 *	69
1-15	41.0	0.67	38	4.79	132	–	132	44 *	88
16-17	7.6	0.63	30	5.40	26	–	26	8 *	18
36-39	9.0	0.71	19	6.68	43	–	43	16 *	27
16-22	22.6	0.64	33	5.14	74	1/2 (27)	88	23 *	65
[illegible]-27	75.1	0.65	39	4.73	231	1/2 (27)	244	74 *	170
1-31	85.1	0.65	41	4.60	254	27	281	81 *	200 ≠
1-34	100.5	0.64	43	4.49	289	27	316	216	100 ≠≠
40-43	6.1	0.73	26	5.79	26	16	42	24 *	18
40-46	15.5	0.73	29	5.49	62	115	177	34 *	(143) ø
1-35	103.0	0.65	45	4.38	(293)	1/2 (ø)	365	365	–
1-51	143.8	0.66	45	4.38	416	–	416	416	–
1-53	146.1	0.66	47	4.28	413	–	~~use~~	416	–
1-55	148.2	0.67	48	4.23	420	–	420	420	–

ø 143 cfs to No. 35 & ~~48~~ 49 = 114 cfs @ 45 min T_c

≠ 100 cfs to No. 33 & 34, ≠≠ 99 cfs to No. 35 & 49

* 2 yr. Storm Capacity

SUMP INLETS DESIGN DATA TABULATION

Project Title Floyd Bailey

Project Number ______ **Gutter Depression at Inlets (Standard = 2")** ______

Design Storm Frequency 100 yr. **Width of Gutter Depression at Inlets (Standard = 2'0")** ______

Inlet Location	Top of Inlet Elevation	Inlet Drainage Area Size in Acres	Time of Concentration	Composite Runoff Coefficient	Rainfall Intensity	Inlet Drainage Area Q	Carry Over Flow From Other Inlets Qb ≠	Inlet Capacity Required Qi
33 & 34	137.00	15.4	43	0.63	4.49	44	100	144
35 & 48 / 49	137.05	12.1 *	45	0.70	4.23	36	114	150

Inlet Length Required	Inlet Length Provided	Computed Ponded Water Surface Elevation	Computed Pavement Spread in Feet	Allowable Ponded Water Surface Elevation	Allowable Pavement Spread in Feet	Pavement Width Bk. - Bk. in Feet	Pavement Cross-Slope in Ft./Ft.	Street Classification
40-45?	4-15=60	137.60	NA	R/W	NA	31'	0.021	Local
"	4-15'	137.75	NA	R/W	NA	31'	0.021	Local

* Incl. No. 50 & 51

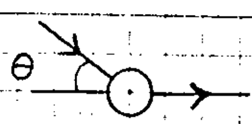
≠ See 100 yr Storm Work sheet

Van Doren Hazard Stallings
architects · engineers · planners
Topeka · Wichita · Minneapolis · Kansas City

Job No. 86-214
Sheet 1 of 1
Date 3/87
Project Floyd Bailey Drainage
By WV
Subject Head Loss - 100 yr.
Ck'd.

No.	Out flow: Q_o	Out flow: $\frac{V_o^2}{2g}$	Inflow – Inlet: $\frac{Q_i}{Q_o}$	Inflow – Upper: $\frac{Q_u}{Q_o}$	Inflow – Upper: K_u	Inflow – Upper: $\frac{V_u^2}{2g}$	Inflow – Lateral: $\frac{Q_L}{Q_o}$	Inflow – Lateral: K_L	Inflow – Lateral: $\frac{V_L^2}{2g}$	H
33	142	0.06	0.50	0.50	0.37	0.06				0.06
34	214	0.23	0.34	0.66	1.0	0.06				0.23
35	340	0.37	0.37	0.63	1.0	0.23				0.29
49	413	0.54	0.15	0.80	0.44	0.37	0.05	0.90	0.25	0.44
51	413	0.54	0.01	0.98	0.50	0.54	0.01	0.60	0.15	0.28
53	413	0.54	—	0.99	0.37	0.54	0.01	0.30	0.17	0.34
55	417	0.55	—	0.99	0.90	0.54	0.01	0.30	0.16	0.06

$$H = \frac{V_o^2}{2g} + \frac{Q_i}{Q_o}(0.5)\left(\frac{V_o^2}{2g}\right) - \frac{Q_u}{Q_o}(K_u)\left(\frac{V_u^2}{2g}\right) - \frac{Q_L}{Q_o}(K_L)\left(\frac{V_L^2}{2g}\right)$$



θ	0°	15°	30°	45°	60°	75°	90°
K	1.0	0.81	0.65	0.53	0.44	0.37	0.30

See 100 yr Storm Worksheet & Inlet Data

* Top of M.H. or 1 ft. below Inlet TC

DESIGN COMPUTATIONS FOR STORM DRAINAGE

STORM FREQ: 100 YR. PLACE: Wichita ks.

PROJECT: Floyd Bailey

MANNING "n": 0.013

SHEET 1 OF 1

DISTRICT:

REFERENCE PLAN:

COMPUTED BY: WV DATE: 3/87

SUBDISTRICT:

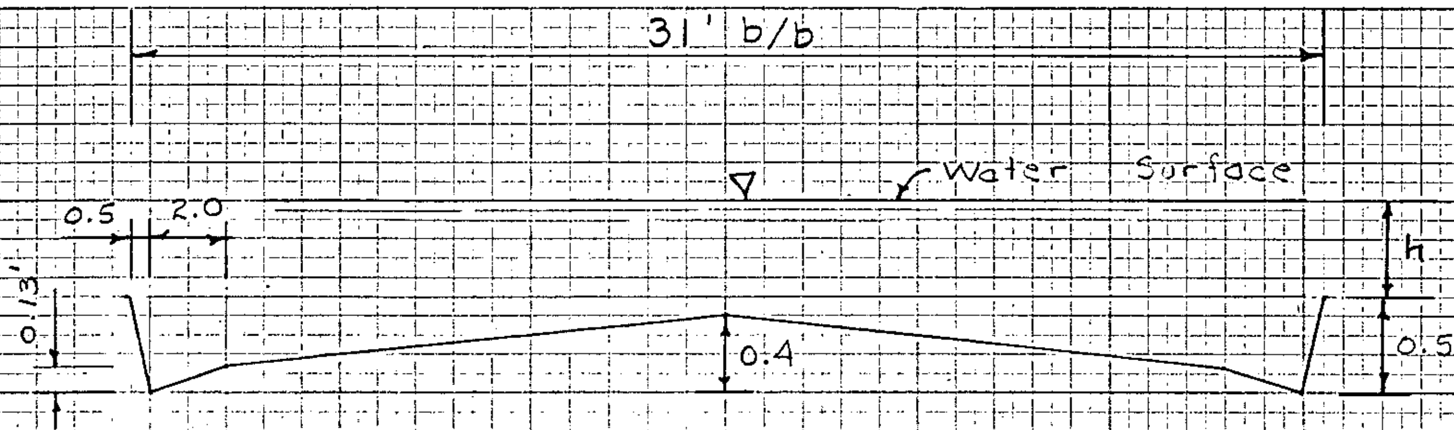
HYDRAULIC PROFILE:

CHECKED BY: DATE:

	LINE UPP.	LINE LOW.	LENGTH	STRUCT.	# RUNOFF TOTAL	PIPE SIZE	FRICT. HEAD	V	$\frac{V^2}{2g}$	CONST. SLOPE %	REQD. HYDR. SLOPE %	HEAD LOSS	HYDRA. ELEV. UPPER	HYDRA. ELEV. LOWER	F.L. ELEV. UPPER	F.L. ELEV. LOWER	UPPER STREET ELEV. *	REMARKS
	(1)	(2)	(3)	(4)	(13)	(14)	(15)	(16)	(17)	(20)	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)
1	33	34	35	Inlet	153	10x7	<0.01	2.2	0.07	0.10	0.01	0.06	136.02	136.02	126.73	126.69	136.00	HG = 136.08
2	34	35	270	Inlet	216	10x7	0.08	3.1	0.14	0.10	0.03	0.23	135.79	135.71	126.69	126.42	136.00	
3	35	49	40	Inlet	365	10x7	0.03	5.2	0.42	0.10	0.08	0.17	135.54	135.51	126.42	126.38	136.00	
4																		
5	49	51	320	Inlet/MH	416	10x7	0.32	5.9	0.54	0.10	0.10	0.44	135.07	134.75	126.38	126.06	136.00	
6	51	53	340	Inlet/MH	416	10x7	0.34	5.9	0.54	0.10	0.10	0.28	134.47	134.13	126.06	125.72	139.30	
7	53	55	510	MH	416	10x7	0.51	5.9	0.54	0.10	0.10	0.34	133.79	133.28	125.72	125.21	140.48	
8	55	Exist	660	MH	420	10x7	0.66	6.0	0.55	0.10	0.10	0.06	133.22	132.56	125.21	124.55	141.25	
9																		
10																		
11																		
12																		
13																		
14																		
15																		

Van Doren Hazard Stallings
architects · engineers · planners
· Topeka
· Wichita
· Minneapolis
· Kansas City

Job No. 86-214
Date 3/87
Sheet 1 of 3
Project Floyd Bailey Drainage
By WV
Subject Street Capacity - 31' b/b
Ck'd.



h = 0 (Top of Curb)

$$A = 2\left[\tfrac{1}{2}(0.5 \times 0.5) + (2 \times 0.435) + (13 \times 0.235)\right] = 8.1 \text{ sf}$$

$$K = \frac{1.49}{n} A \left(\frac{A}{P}\right)^{2/3} = \frac{1.49}{0.013}(8.1)\left(\frac{8.1}{16}\right)^{2/3} = 590$$

h = -0.1 (below T.C)

$$A = 8.1 - 0.1(31) = 5.0$$

$$K = \frac{1.49}{0.013}(5.0)\left(\frac{5.0}{16}\right)^{2/3} = 264$$

h = 0.1 (above TC)

$$A = 8.1 + 0.1(31) = 11.2$$

$$K = \frac{1.49}{0.013}(11.2)\left(\frac{11.2}{16}\right)^{2/3} = 1012$$

h = 0.2

$$A = 8.1 + 0.2(31) = 14.3$$

$$K = \frac{1.49}{0.013}(14.3)\left(\frac{14.3}{16}\right)^{2/3} = 1521$$

h = 0.3

$$A = 8.1 + 0.3(31) = 17.4$$

$$K = \frac{1.49}{0.013}(17.4)\left(\frac{17.4}{16}\right)^{2/3} = 2109$$

Van Doren Hazard Stallings

architects · engineers · planners

· Topeka · Wichita · Minneapolis · Kansas City

Date 3/87

Project Floyd Bailey Drainage

Subject Street Capacity - 31' b/b

Job No. 86-214

Sheet 2 of 3

By WV

Ck'd.

h = 0.4

$A = 8.1 + 0.4(31) = 20.5$

$K = \frac{1.49}{0.013}(20.5)\left(\frac{20.5}{16}\right)^{2/3} = 2772$

h = 0.5

$A = 8.1 + 0.5(31) = 23.6$

$K = \frac{1.49}{0.013}(23.6)\left(\frac{23.6}{16}\right)^{2/3} = 3505$

h = 1.0

$A = 8.1 + 1.0(31) = 39.1$

$K = \frac{1.49}{0.013}(39.1)\left(\frac{39.1}{16}\right)^{2/3} = 8131$

h = 1.5

$A = 8.1 + 1.5(31) = 54.6$

$K = \frac{1.49}{0.013}(54.6)\left(\frac{54.6}{16}\right)^{2/3} = 14{,}185$

h = 2.0

$A = 8.1 + 2.0(31) = 70.1$

$K = \frac{1.49}{0.013}(70.1)\left(\frac{70.1}{16}\right)^{2/3} = 21{,}513$

h = 0.7

$A = 8.1 + 0.7(31) = 29.8$

$K = \frac{1.49}{0.013}(29.8)\left(\frac{29.8}{16}\right)^{2/3} = 5170$

Job No. 86-2K
Date 3/87
Sheet 3 of 3
Project Floyd Bailey Drainage
By WV
Subject Street Capacity - 31' b/b
Ck'd.

h	Slope (s)						
	0.02%	0.05%	0.10%	0.15%	0.20%	0.30%	0.40%
-0.1	4	6	8	10	12	14	17
0	8	13	19	23	26	32	37
0.1	14	23	32	39	45	55	64
0.2	22	34	48	59	68	83	96
0.3	30	47	67	82	94	115	133
0.4	39	62	88	107	124	152	175
0.5	50	78	111	135	157	192	222
0.7	73	116	163	200	231	283	327
1.0	115	182	260	315	364	445	514
1.5	200	317	450	550	634	777	897
2.0	300	481	680	833	962	1178	1360

$Q = KS^{1/2}$