THE CITY OF WICHITA

DEPARTMENT OF PUBLIC WORKS
ENGINEERING DIVISION
CITY HALL — SEVENTH FLOOR
455 NORTH MAIN STREET
WICHITA, KANSAS 67202
(316) 268-4501

November 19, 1979

Professional Engineering Consultants
1440 East English
Wichita, KS 67211

ATTENTION CHRIS BRENENSTUHL

Gentlemen:

Re: Drainage Plan: David's East 2nd Addition

This letter varifies the various points discussed in the telephone conversation last October about the drainage plan of the subject plat. In order to satisfactorily drain the plat, please submit the following additional information:

1. The plan shows 50 feet and 40 feet additional Drainage Easements north and west of the plat to be acquired by separate instrument. These easements shall be obtained prior to recording of this plat.

2. The plan shows a "temporary channel" that spreads out into the wide low area in the tract immediately to the south of the plat. The only access to the David's store off Kellogg Avenue is a road through the unplatted tract. The subdivision regulations do not permit drainage of public water across private property, therefore, in order to use the "temporary channel" as shown, a temporary drainage easement sufficiently wide to contain the runoff, shall be provided along the "temporary channel" alignment shown and then south along west line of the access road. The structure under access road shall be redesigned if necessary and complete design of this structure should be submitted. The potential flood water elevation in the area upstream from the structure under Kellogg is 1350.0 ft. Hence the access road shall be filled to elevation 1351.0. The minimum pad elevation for the south 100 feet of the plat shall be 1353.0 feet. The west bank of the proposed ditch west of the access road shall be at elevation 1351.0 feet or higher.

3. The ditch along north line of Kellogg Drive shall be constructed to contain the 100 year runoff in the "temporary ditch", and a sufficiently wide drainage easement to construct the ditch shall be obtained at the time of recording this plat.

THE CITY OF WICHITA

4. The proposed building floor elevation shall be 1355.5 feet.

5. The developer shall guarantee the construction of the proposed channel and the installation of new structure under the access road if required.

6. Permanent drainage easement of sufficient width shall be provided and construction of such ditch guaranteed by the developer for draining the west roadside ditch along west line of Webb Road.

The above information should be submitted to the Engineering Department and Flood Control Office before final drainage plan can be approved. It is also strongly recommended to provide on site detention. By constructing a detention storage pond in the unplatted tract south of the plat. The existing structure under Kellogg flowing south is a 3-6 x 3 box having capacity of approximately 175 cfs for 1.0 ft. head above the box. It has also been established that the capacity of the existing channel south of Kellogg Avenue is very limited and flood damage to property is frequent in the area. The 100 year flow to box is estimated at 525 cfs.

Please feel free to call me at (316)268-4235, if you need additional information.

Very truly yours,

Yash D. Desai, P.E.
Drainage Chief Engineer

YDD/dla

cc: Jack Galbraith, Chief Planner - City of Wichita
Max Greene, Flood Control & Landfill Director - City of Wichita
Don Anderson, Director of Economic Development - City of Wichita

David's East 2nd Addition

1. Building floor Elevation should be 1355.50

2. Total drainage area at Box = 250 Ac
   $Q_{100} = 525$ cfs
   Existing RCB size — 3 - 6'x3' Ft = 1343.8
   HW/Rise = 1.85
   HW = 5.55
   Flood water elev = 1349.35'
   Shaded area will be flooded.

3. East portion of lot and parking area drain south across property line to the unplatted area with no drainage easement. It will surface drain toward channel. Although the unplatted area is owned by the same owner.

MEMO

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ZIP CODE 67211

TO: Max Greene, P. E.
Director of Land Fill
and Flood Control
City Hall - 455 N. Main
Wichita, Kansas 67202

ATTN: Paul Johnston, P. E.

PROJECT NO. 30-78000-254

PROJECT: David's Replat

DATE: October 4, 1979

COPIES TO:

Yash Desai, P. E. ✓

Louise Olivarez

FROM: John E. Scott

REFERENCE: David's Replat
Revised Drainage Plan

PLEASE ADVISE IMMEDIATELY OF ANY MISCONCEPTIONS OR OMISSIONS YOU BELIEVE TO BE CONTAINED HEREIN.

Transmitted herewith is the Revised Drainage Plan for David's Replat. The added channel and Section 'BB' is as per plans previously approved by the City of Wichita Engineering Department. The design data for the channel has been already transmitted to Paul Johnston by Ron Pletcher of this office. The Final Plat will be filed October 22 and will be heard by the Subcommittee November 1, 1979.

If any additional information is required, please contact me as soon as possible.

MEMO

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TO: Mr. Michael E. Lindebak, P.E.
City Engineer
7th Floor - City Hall
455 North Main
Wichita, Kansas 67202

ATTN:

PROJECT NO. 36-84019-2-177

PROJECT: Chelsea Brooke
Addition S/D 84116

DATE: December 21, 1984

COPIES TO:

Mr. Jeff Greenberg

Mr. Jim Beckett

FROM: Dick Linn

REFERENCE: Drainage problem at US-54 box culvert

PLEASE ADVISE IMMEDIATELY OF ANY MISCONCEPTIONS OR OMISSIONS YOU BELIEVE TO BE CONTAINED HEREIN.

The preliminary plat of Chelsea Brooke Addition was approved by the Subdivision Committee on December 6, 1984, subject to several conditions. One of the requirements is to submit a drainage plan to the City Engineer for review and approval. It was suggested by the Subdivision Committee that the City Engineer meet with representatives of Beech Aircraft Corporation to discuss the possibility of a detention system to minimize the downstream drainage problems.

The box culvert under Kellogg (US-54) has a limited capacity as well as the downstream drainage channel.

The drainage concept submitted with the preliminary plat provided for an open channel system along the north, west, and south perimeter of the Chelsea Brooke Addition. The channel would be sized to carry the 100-year storm runoff (without detention) from the 138-acre drainage basin on the Beech property, as well as the 19.2-acre Addition.

The 100-year storm runoff from the total drainage basin (247 acres) upstream from the box culvert is a total of 537 cfs (without detention). This runoff volume exceeds the capacity of the existing box culvert. If a 5-acre detention pond ? (area ? were constructed at the outlet to the 138-acre Beech drainage basin, the total runoff at the US-54 box culvert could be reduced to 450 cfs. The box culvert can pass this volume at HW elevation of 1348.5.

Storage Volume in Ac-ft

Attached is a summary of the drainage study data.

Please contact me if additional information is desired.

1. Need calculation to show a 5-acre detention pond has the storage capacity to reduce the peak run-off of the 138-Acre Beech drainage basin from 286 cfs to 40 cfs.
2. Is Beech agreeable to have the detention pond on their property?

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Date 12/20/1984 Page _____ of _____

Project Chelsea Brooke Addn.

Item Summary of drainage study

I. Drainage to U.S.-54 Box Culvert

1. Drainage Area #1 (Beech)
   - D.A. = 138 acres (assumed 20% developed)
   - Q_{100} = 286 cfs
2. Drainage Area #2A (Beech)
   - D.A. = 27 Acres
   - Q_{100} = 61 cfs
3. Drainage Area #2B (Chelsea Brooke Addn.)
   - D.A. = 19.2 Acres
   - Q_{100} = 121 cfs
4. Drainage Area #3W (part of David's site)
   - D.A. = 6 Acres
   - Q_{100} = 51 cfs
5. Drainage Area #3 (easterly portion of area)
   - D.A. = 68 acres
   - Q_{100} = 250 cfs

Total runoff at culvert (undetained) = 537 cfs

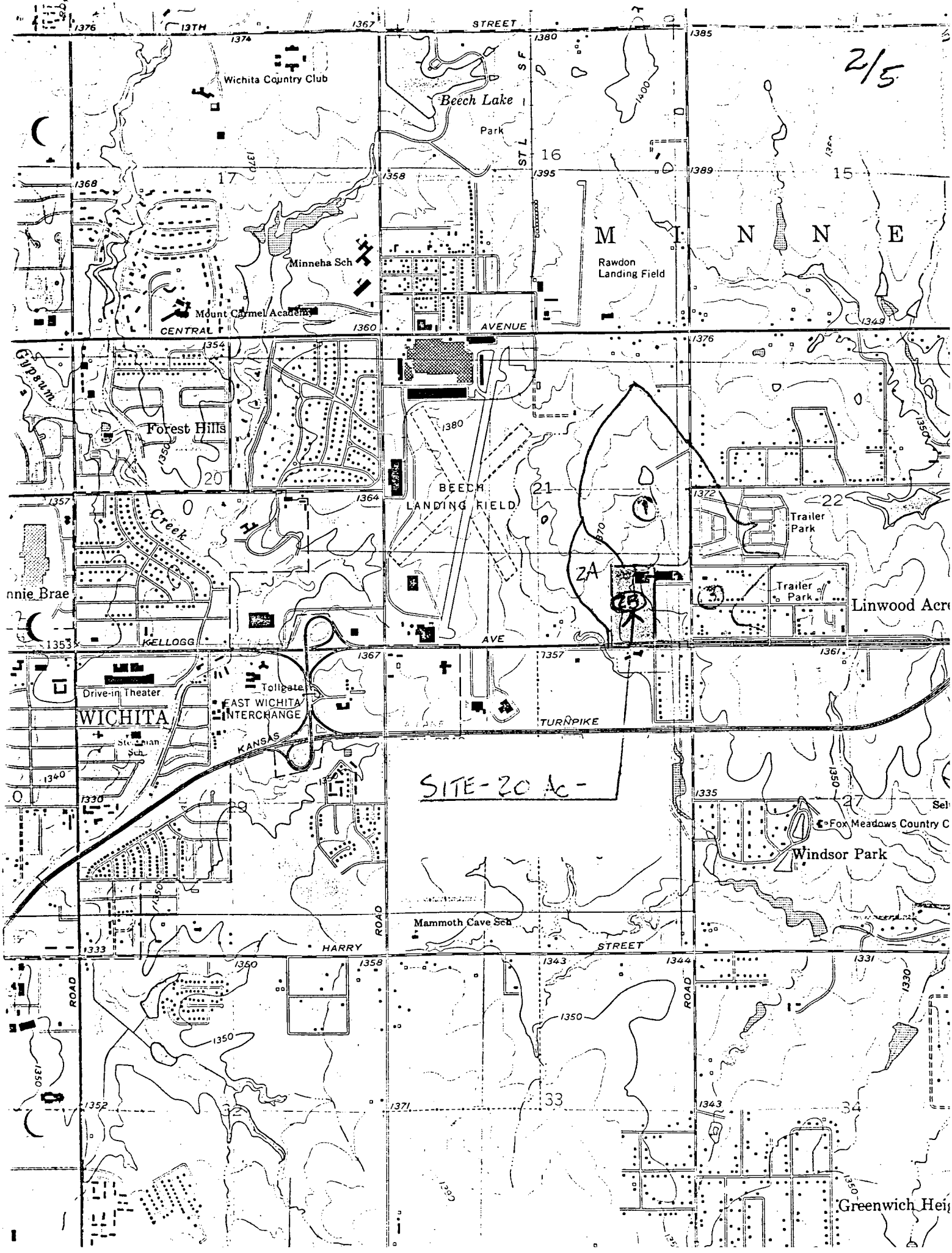
HW = 5.7' = elevation 1349.5

II. Drainage to Culvert with 5 acre detention pon

Beech outflow (D.A. #1) = 40 cfs

Q_{100} @ box culvert = 450 cfs

HW = 4.65' = elevation 1348.45


2/5
Wichita Country Club
Beech Lake
Park
Minneha Sch
Mount Carmel Academy
Rawdon
Landing Field
M I N N E
CENTRAL AVENUE
Forest Hills
BEECH
LANDING FIELD
Trailer
Park
Trailer
Park
Linwood Acre
KELLOGG AVE
Drive-in Theater
Tollgate
EAST WICHITA
INTERCHANGE
WICHITA
TURNPIKE
KANSAS
SITE-20 Ac-
Fox Meadows Country C
Windsor Park
Mammoth Cave Sch
HARRY STREET
ROAD
Greenwich Hei

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Date 12/11/84 MMB Page 1 of

Project CHELSEA BROOKE ADD'N 36-84019-2

Item DESIGN FLOW FOR EXISTING 6x3 RCB

Assumptions

1) Inlet control governs. Outlet channel is assumed to have sufficient capacity to preclude a high tailwater condition.

2)

DA #1

Ref: Notes 11/16/84, Sh 3 of 5

DA = 138 Ac
20% Imp. (Present condition)
D Soil
CN = 84
ℓ = 4600'
Slope Y = 2%
25% H.L.M.
T_c = 53 min.
C = 0.47 (Rossmiller)
Q_{100} = 286 cfs

From Rating Curve attached

$V \cong 3.7$ ft/s
ℓ = 2000' ±
T_t = 9 min

$T_c + T_t$ = 62 min
Q_{100} = 286 cfs

DA #2A

DA = 27 Ac
0% Imp
D Soil
CN = 80
ℓ = 2000'
Y = 2% H.L.M = 0%
Lag = 0.39 hr
T_c = 39 min
i_{100} = 5.53 in/hr
C = 0.41 (Rossmiller)
Q_{100} = 61. cfs
$T_t = \frac{1000'}{3.5 \text{ ft/s}}$ = 5 min $T_c + T_t$ = 44 min.

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Date 12-11-84 MWB Page 2 of

Project Chelsea Brooke Add 36-84019-2

Item Design Flow for Exist 3-6'x3' RCB

DA #2B

From notes of 11-16-84, as revised.

DA = 19.2 Ac
CN = 90
D Soil
ℓ = 1300'
Y = 1%
Assume 100% HSM
56% Imp (Composite)
S = 1.11
Lag = 0.27 hr
T_c = 12 min → USE 15 min

C = 0.70 (Rossmiller)

Q_{100} = 121 cfs (T_t = 0)

DA #3

Q_{100} = 250 cfs } From notes
$T_c + T_t$ = 24 min. } 12/7/84 Sh 1.

DA #3W

Q_{100} = 51 cfs @ T_c = 15 min

(From notes 12/7/84, Sh 1)

Combine Q_{100}'s

$$286 + 3.85\left(\frac{61}{5.03} + \frac{121}{8.98} + \frac{250}{7.48} + \frac{51}{8.98}\right) = 535$$

$$61 + 39\left(\frac{286}{62}\right) + 5.03\left(\frac{121}{8.98} + \frac{250}{7.48} + \frac{51}{8.98}\right) = 505$$

$$121 + 15\left(\frac{286}{62} + \frac{61}{44} + \frac{250}{24}\right) + 51 = 418$$

$$250 + 24\left(\frac{286}{62} + \frac{61}{44}\right) + \frac{7.48}{8.98}(121 + 51) = 537$$

ΣQ_{100} = 537 cfs @ 6x3 RCB
w/ NO DETENTION

Q/B = 30
HW = 5.7' = elev 1349.5

(- only 0.2' below shoulder elev.

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Project Chelsea Brooke Add 36-84019-2

Item Design Flow at 3-6'x3' RCB

If detention by Beech is constructed, with 36" RCP outfall @ approx 40 cfs, find Q_{100}

Substitute 40 cfs @ T_c = 24 min ?
for 286 cfs @ 62 min

$$Q_{100} = 250 + 24 + \frac{24}{44}(61) + \frac{7.48}{8.98}(121+51)$$

$$= 450 \text{ cfs} \quad 466 \text{ cfs}$$

HW = 4.65' = elev = 1348.45

Would flood grassed area south of exist parking lot, but would not flood parking lot itself

Shld El @ RCB = 49.7

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Project Chelsea Brooke Addition

Item

From DA #3

From Sh No 7 of calc's dated 6/28/83, which referenced US54-Greenwich calc's.

$Q_{100} = 250$ cfs
$Q_{10} = 169$ cfs
$Q_5 = 145$ cfs
} $T_c = 20$ min $T_f = 4$ min $T_c + T_f = 24$ min @ 6x3 RCB

From DA #31

From Sh No 8 dated 6/28/83
$Q_{100} = 51$ cfs @ $T_c = 15$ min (By Rossmiller)
$Q_{10} = 35$ cfs $Q_5 = 30$ cfs

From DA #28

From Sh No 3 dated 11/16/84 (Revised)
$Q_{100} = 121$ cfs @ $T_c = 15$ min,
$Q_{10} = 81$ cfs $Q_5 = 69$ cfs

Estimate 36" RCP from Beech @ 0.30%
$K = 666$ ($n = 0.013$)
$Q = K\sqrt{S} = 666\sqrt{.003} = 36$ cfs $\Rightarrow$ use 40

Combine Q at 6'x3' RCB entrance

15 min $i_5 = 5.21$ in/hr $i_{10} = 6.08$ in/hr $i_{100} = 8.98$ in/hr
24 min $i_5 = 4.34$ in/hr $i_{10} = 5.07$ in/hr $i_{100} = 7.48$ in/hr

* HW for 6x3 RCB (Inlet control)

$\Sigma Q_5 = 145 + 40 + \frac{4.34}{5.21}(30+69) = 267$ cfs HW/D = 0.98' HW = 2.94'

$\Sigma Q_{10} = 169 + 40 + \frac{5.07}{6.08}(35+81) = 306$ cfs HW/D = 1.1' HW = 3.3'

$\Sigma Q_{100} = 250 + 40 + \frac{7.48}{8.98}(51+121) = 433$ cfs HW/D = 1.5' HW = 4.5'

* The HW elev assumes Inlet Control, i.e., the downstream channel & structures do not cause sufficient Tailwater to force outlet control operation.

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Project Chelsea Brooke Addition

Item

Estimate H.G.L. slope

$l = 1600'$

H.E. @ Box = 1343.6
+ 4.5
1348.1

Est 3 structes w/ 0.25' head loss each

H.E. @ outlet of pond = 1349
H.G.L. @ pond = elev 1353.5

$$\frac{1353.5 - 3@0.25' - 1348.1}{1600} = 0.0029 \text{ ft/ft}$$

$K = 666$ ($n = 0.013$, 36" ϕ RCP)

$Q = K\sqrt{S} = 666\sqrt{.003} = 36.5$ cfs

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Project _____

Item _____

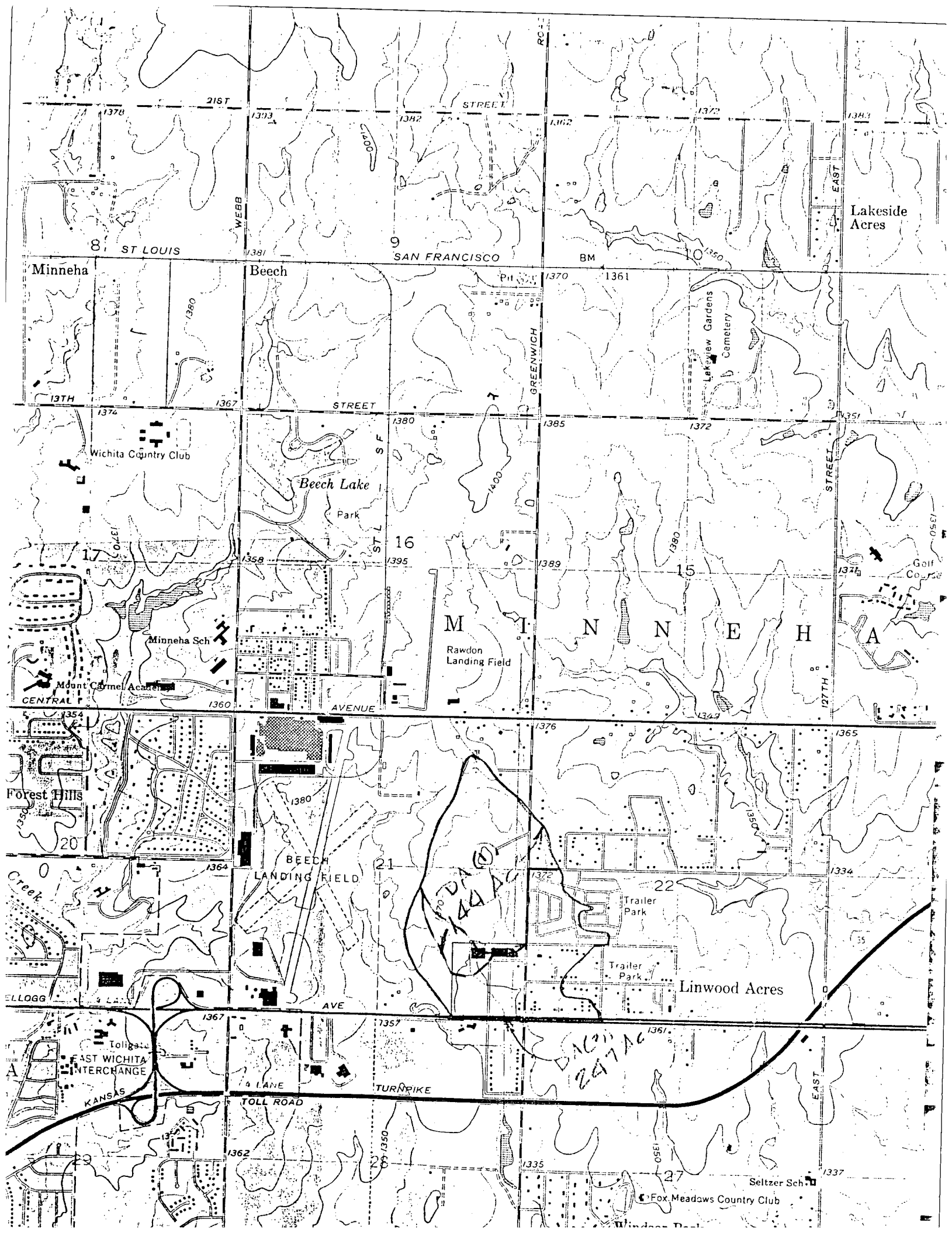
ALTERNATE II : CHANNEL DESIGN FOR SIMILAR DEVELOPMENT

DRAINAGE AREA	DA (Ac.)	C	L (MI)	H (FT)	t_c (MIN)	i_{100} (IN/HR)	Q_{100} (CFS)
→ 1	138	0.42	0.87	40	32.1	6.44	368
2	185	0.40	0.98	42	36.3	5.85	432
→ 3	250	0.40	1.14	45	41.7	5.25	525
4	255	0.37	1.42	47	53.0	4.35	412

CHANNEL DESIGN

B = 50.00'
n = 0.030
z = 4

S =	0.10%	0.15%	0.20%	0.25%	0.30%	0.35%	0.4
Q_{DES} = 368	2.42'	(2.15')	1.99'	1.85'	1.75'	1.68'	1.61
	2.54 FPS	2.90 FPS	3.20 FPS	3.43 FPS	3.63 FPS	3.82 FPS	3.99
	366 CFS	365 CFS	368 CFS	364 CFS	363 CFS	363 CFS	364 CF
	(-0.44%)	(-0.76%)	(-0.09%)	(-0.90%)	(-1.32%)	(-1.32%)	(-1.11%)
Q_{DES} = 432	2.65'	(2.36')	2.17'	2.04'	1.93'	1.84'	1.7
	2.68 FPS	3.06 FPS	3.37 FPS	3.63 FPS	3.85 FPS	4.04 FPS	4.2
	429 CFS	429 CFS	429 CFS	431 CFS	430 CFS	428 CFS	426 CF
	(-0.65%)	(-0.66%)	(-0.80%)	(-0.27%)	(-0.50%)	(-1.03%)	(-1.2


21ST STREET
WEBB
EAST
Lakeside Acres
8
ST LOUIS
9
SAN FRANCISCO
BM
10
Minneha
Beech
Lakeview Gardens Cemetery
GREENWICH
13TH STREET
Wichita Country Club
Beech Lake
Park
ST L S F
16
17
15
STREET
Golf Course
Minneha Sch
M I N N E H A
Rawdon Landing Field
Mount Carmel Academy
CENTRAL AVENUE
127TH
Forest Hills
20
BEECH LANDING FIELD
21
22
Trailer Park
Trailer Park
Linwood Acres
ELLOGG AVE
Toll gate
EAST WICHITA INTERCHANGE
KANSAS TURNPIKE
4 LANE TOLL ROAD
EAST
29
27
Seltzer Sch
Fox Meadows Country Club

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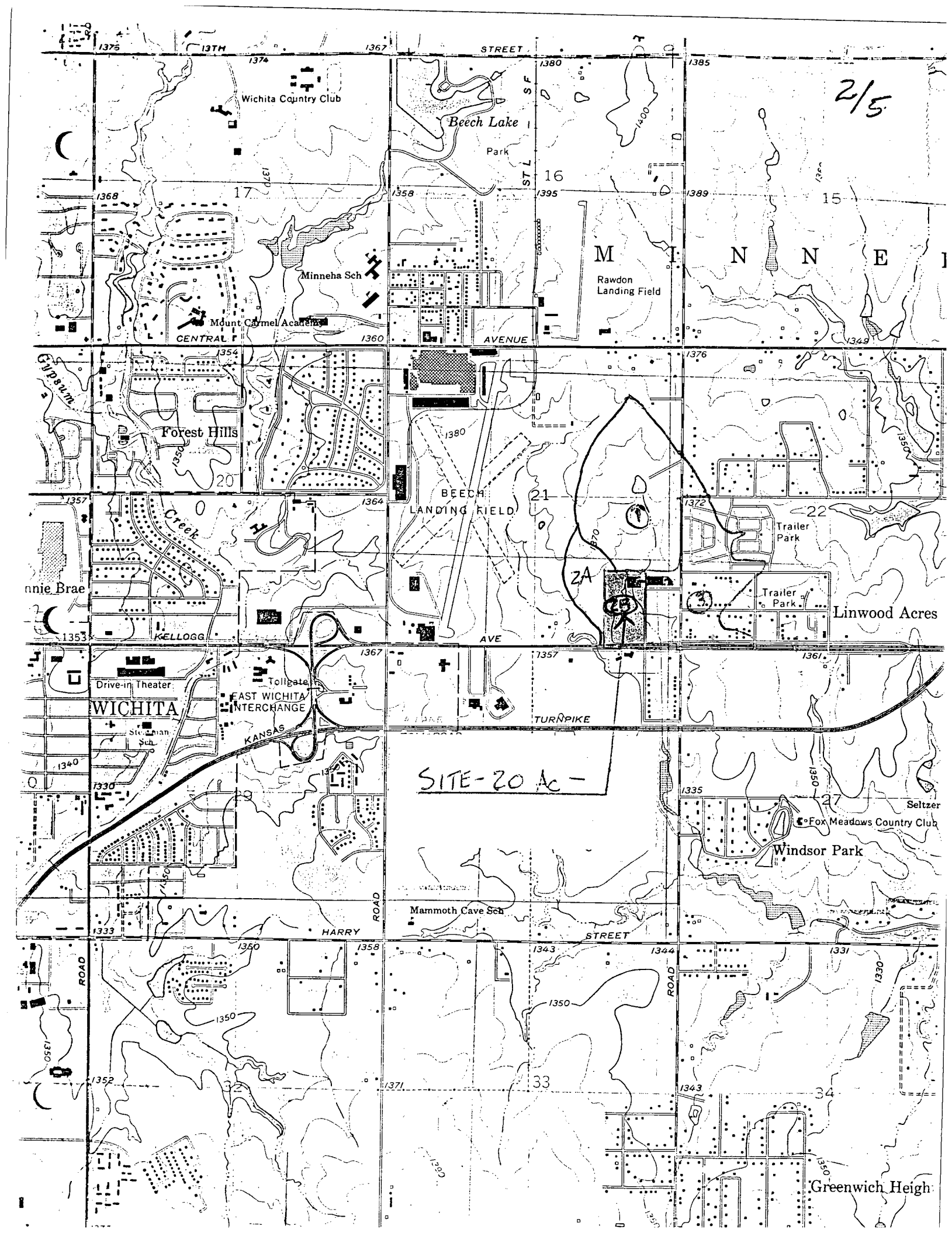
Project CHELSEA BROOKE 36-84019-2

Item DRAINAGE MAIN CALC'S

ASSUMPTIONS & METHODOLOGY

1. Undeveloped runoff (Q_{UNDEV}) from Beech DA #1 will be carried along the north & west sides of the plat (DA = 132 Ac. Assume 20% Impervious (Present cond.)
2. Developed runoff (Q_{DEV}) from plat will be added in ditch along South side of plat. (DA #2B) (Assume industrial development, 72% Imp.)
3. Hydrology will be by Rossmiller Modified Rational Method with T_c by Modified Curve No. Method (Eq. 3-2, TR-55 by SCS)
4. West berm of ditch along west side of property is assumed to divert Beech drainage from west. (DA #2A)
5. Adequate outfall capacity at Kellogg is assumed. (Existing 6x3 RCB & outfall channel are presently undersized)


2/5
13TH
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Mount Carmel Academy
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AVENUE
Gypsum
Forest Hills
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BEECH
LANDING FIELD
Trailer
Park
Creek
ZA
2B
Linwood Acres
KELLOGG
AVE
Drive-in Theater
Tollgate
EAST WICHITA
INTERCHANGE
WICHITA
TURNPIKE
KANSAS
SITE-20 Ac-
27
Seltzer
Fox Meadows Country Club
Windsor Park
ROAD
Mammoth Cave Sch
HARRY
STREET
33
34
Greenwich Heigh

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Project CHELSEA BROOKE

Item DRAINAGE MAP

DA #1

DA = 138 Ac
20% Imp
D Soil

CN = 0.2 x 98 + 0.8 x 80 = 84

ℓ = 4600'
slope (Y) = 2%
Assume 25% H.L.M.

$S = \frac{1000}{CN} - 10 = 1.96$

$L = \frac{\ell^{0.8}(S+1)^{0.7}}{1900\sqrt{Y}} = 0.68$ hr

$F_{imp} = 0.89$ $F_{H.L.M.} = 0.87$

$T_c = \frac{60}{0.6} F_i F_{H.L.M.} L = 53$ min

$i_{100} = 4.35$ in/hr

C = 0.47 (By Rossmiller Nomograph)

$Q_{100} = 286$ cfs

DESIGN Q_{100} FOR REACH 1 = 286 cfs

DA #2B

DA = ~~20~~ 15 Ac
72% Imp
D Soil

D.A. = 4.2 Ac. Eldwy
0% Imp.

CN = 0.72 x 98 + 0.28 x 80 = 93
[0.72 x 98 + 0.28 x 80] 15 + 80(4.2)/19.2 = 90

ℓ = 1300'
slope = 1% = Y
Assume 100% H.L.M.
56% overall imp.

$S = \frac{1000}{CN} - 10 = 0.76$

$L = \frac{\ell^{0.8}(S+1)^{0.7}}{1900\sqrt{Y}} = \frac{0.27}{0.24}$ hr

$F_{imp} = \frac{0.78}{0.77}$ $F_{H.L.M.} = \frac{0.58}{0.57}$

$T_c = \frac{60}{0.6} F_i F_{H.L.M.} L = \frac{12.2}{1.2}$ min.

USE T_c = 15 min. ✓

~~(APPARENTLY METHOD NOT TOO ACCURATE FOR HIGHLY IMPERVIOUS AREAS)~~

$i_{100} = 6.98$ in/hr

$C = \frac{0.79}{0.70}$

$Q_{100} = \frac{142}{121}$ cfs

Combine for Q_{100}

$Q_{100} = \frac{121}{142} + \frac{15}{53}(286) = \frac{202}{273}$ cfs

OR

$286 + \frac{4.35}{6.98}\left(\frac{121}{142}\right) = \frac{344}{354}$ cfs

DESIGN Q_{100} FOR REACH 2 IS $\frac{344}{354}$ cfs

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Project CHELSEA Brooks

Item Ditch size

Choose 10' bottom w/ 4:1 side slopes
n=0.035 s=0.002 ft/ft

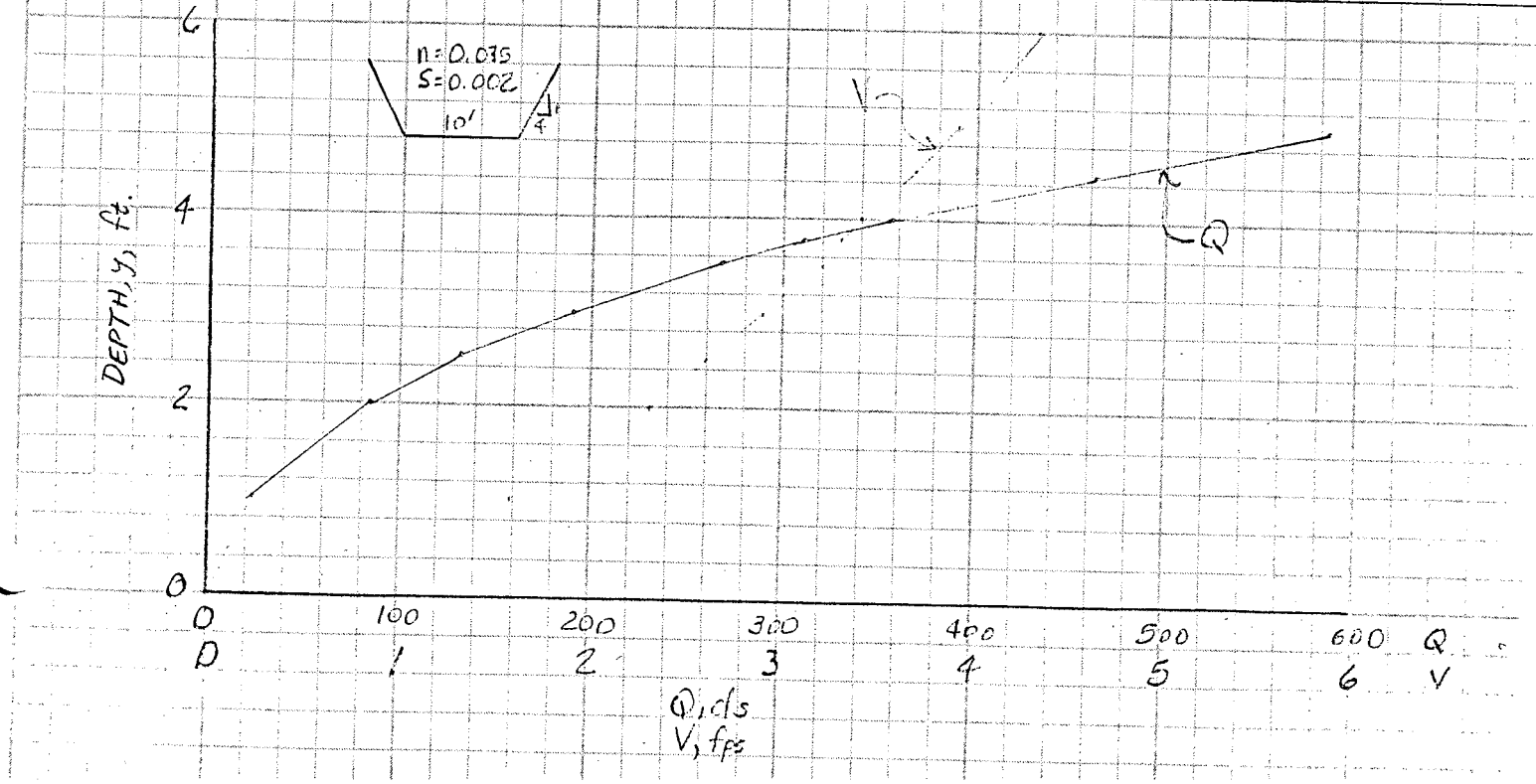
y, ft	A, ft²	Q, ft³/sec	V, ft/sec
1	14	22	1.6
2	36	84	2.3
2.5	50	132	2.6
3	66	192	2.9
3.5	84	267	3.2
3.75	94	310	3.3
4	104	357	3.4
4.5	126	462	3.7
5	150	584	3.9
6	204	883	4.3

For Reach 1:

Q_{100} = 286 cfs, y = 3.7 ft V = 3.2 ft/sec

For Reach 2

Q_{100} = 344 354 cfs: y = 4.0 ft, V = 3.4 ft/sec



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Project CHELSEA BRIDGE

Item SELECT R.C. Box SIZE

Ref: HEC-5 Hydraulic Charts for the Selection of Highway Culverts

Inlet control Chart 1

Let HW depth = 5'
Assume K_e = 0.2 (45° wings, rounded top)
Q = ~~354~~ 344 cfs

D	HW/D	Q/B	B req'd	
3	1.67	24	13.6	14 x 3
4	1.25	30	11.8	12 x 4
5	1.00	33	10.7	11 x 5

Outlet control

Assume Total available head would be 1' surcharge + (300' @ 0.5% = 1.5') = 1.6'

L = 300'
K_e = 0.2
Chart 8

A = 48 ft²

Use 2-6x4 x 300' R.C.B

Cost estimate

Walls		8.3	C.Y.	
Barrel	300 x	0.81	243	CY
		≈ 250	CY	

@ $310/CY for slant cone

= $77,500

USE $80 K