P.E. & Associates of Kansas Inc.
1720 East Morris
WICHITA, KANSAS 67211

(316) 262-1497

LETTER OF TRANSMITTAL

DATE 1-3-93 | JOB NO 1296

ATTENTION

RE Burlington Northern Industrial Center - Drainage Plan

TO Mr. Chris Breitenstein
Drainage and Flood Control Engineer
City of Wichita, 455 North Main
Wichita, Kansas 67202

GENTLEMEN:

WE ARE SENDING YOU [X] Attached [ ] Under separate cover via _____ the following items:

[ ] Shop drawings [ ] Prints [ ] Plans [ ] Samples [X] Specifications
[ ] Copy of letter [ ] Change order [X] Design Calculations

COPIES	DATE	NO	DESCRIPTION
1	12-23	1	Drainage Plan
1	12-12	2	
1	12-23	1	Design Calculations

THESE ARE TRANSMITTED as checked below:

[X] For approval [ ] Approved as submitted [ ] Resubmit ___ copies for approval
[ ] For your use [ ] Approved as noted [ ] Submit ___ copies for distribution
[ ] As requested [ ] Returned for corrections [ ] Return ___ corrected prints
[ ] For review and comment
[ ] FOR BIDS DUE _____ 19 ___ [ ] PRINTS RETURNED AFTER LOAN TO US

REMARKS

Please call as soon as you have reviewed this plan.

COPY TO

SIGNED:

If enclosures are not as noted, kindly notify us at once.

12-23-92

REVISED DRAINAGE PLAN

REVISE DRAINAGE AREA 7 (STREET SPLIT) SPLIVER TO INCLUDE 150' D.A. WEST OF ST 2/W AS SHOWN ON PLAN

D.A. 5-A 6.5± AC — TRY T_C = 15 MIN — i_5 = 6.21 — CN = 93
50% IMPERVIOUS — C = .58 (SCHAMILLER) — OVERLAND S = 0.003'

Q_5 = 0.55 x .58 x 5.21 = 19.8 cfs — ALLOWABLE DEPTH DIS Q = 10.0 cfs PER SIDE STREET. FLOW 3.0032 OK.

CHECK T_C — a = 4.0 @ 0.5' DEEP

$V = \frac{Q}{A} = \frac{19.8/2}{4} = 2.48$ cfs — 1.24 fps AVERAGE

220' @ 1.24 fps = 177 sec = 2.9 min — USE T_C = 15 ABOVE

i_{100} = 8.98

Q_{100} = 2.61 x .58 x 8.98 = 13.1 cfs — D = .72' OK

D.A. 7 — 3.5 AC — C = .58 — i_5 = 6.21 — i_{100} = 8.98

Q_5 = (3.5 + 6.5) x .58 x 6.21 = 20.2 cfs

Q_{100} = 2.61 x .58 x 8.98 = 13.6 cfs — STREET FLOW OK.

Q_{in} = (2.65 - 1.55) x .58 x 8.98 = 5.73 cfs

STREET + INLET + PIPE = 27.3 cfs — 100' WIDE FL - 22' FLOW T.C. OK.

[DRAINAGE]

12-14-92

Burlington Drainage Plan

D.A. 1 = 10.2 AC

$T_C = 1.5 \sqrt{\frac{nL}{4\sqrt{s}}}$

WEST LOT LINE — L = 600 — n = .02 — s = $\frac{2.22}{600}$ = .0037

$T_C = 1.5 \sqrt{\frac{.02 \times 600}{4\sqrt{.0037}}}$ = 10.2 MIN

SOUTH LINE — L = 600 — n = 0.4 — s = .0015

$T_C = 1.5 \sqrt{\frac{.02 \times 600}{4\sqrt{.0015}}}$ = 12.0 MIN

TOTAL T_C = 22.4 MIN. — i_2 = 3.4 — i_{100} = 7.7

CN = .71 (SEE PFEIL. DESIGN) — AVERAGE C = .604 — 0% IMP.

C_{100} = 0.35 — POMMERLEN NOMOGRAPH
C_2 = 0.23

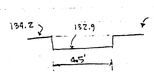
Q_{100} = 7.42 x 0.35 x 7.7 = 20.0 cfs (EXIST. CONDITIONS)

Q_2 = 7.42 x 0.23 x 3.4 = 5.8 cfs

CONST. WEIR W/ F.L. = 132.9 DISCHARGING 20.0 cfs WHEN W.S. IS AT 134.2.

$Q = 3.087 L H^{3/2}$ — $3.087 L (1.3)^{3/2}$ = 20 — L = 4.4' USE 4.5'

$6.8 = 3.087 \times 4.5 \times H^{3/2}$ — H = 0.58' FOR 2 YR STORM



DA # 12 — 8.54 Ac

V = 1.0 fps @ 40 cfs (SEE CHART) — 1.2

670' @ 1.2 fps = 11.2 MIN.

T_C = 22.4 + 11.2 = 33.6 MIN — i_2 = 2.7 — i_{100} = 6.2

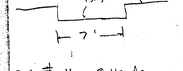
C_{100} = 0.36 — USE SAME AS DA # 13 FOR SAFTY FACTOR
C_2 = 0.25

Q_{100} = 15.96 x .35 x 6.2 = 34.6 cfs

Q_2 = 15.96 x .23 x 2.7 = 9.9 cfs

$Q = 3.087 L H^{3/2}$ — $3.087 L (1.6)^{3/2}$ = 38.6 cfs — L = 6.8' USE 7'

9.9 = $3.087 \times 7.0 \times H^{3/2}$ — H = 0.59' FOR 2YR STORM



Q_{100} UPSTREAM MAX CHANNEL DEPTH 0.75' USE 0.8'

STORAGE = CHANNEL 0.98 AC/FT

DA # 11 — 3.16 Ac

V = 1.2 fps @ 60 cfs

660' @ 1.2 = 9.2 MIN — T_C = 33.6 - 9.2 = 42.8

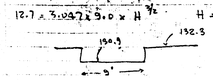
i_{100} = 5.2 — i_2 = 2.2 — C_{100} = .35 — C_2 = .23

Q_{100} = 35.12 x .35 x 5.2 = 45.7 cfs

Q_2 = 35.12 x .23 x 2.2 = 17.7 cfs

$Q = 3.087 L H^{3/2}$ — $3.087 L (1.6)^{3/2}$ = 45.7 — L = 8.9 USE 9'

$12.7 = 3.087 \times 9.0 \times H^{3/2}$ — H = 0.59' FOR 2 YR STORM



Q_{100} UPSTREAM MAX CHANNEL DEPTH 0.5'

STORAGE 1.08 AC/FT

L = ± 10 — 10.0 AC

V = 1.7 fps @ 100 cfs

690' @ 1.2 = 9.6 MIN — T_C = 42.8 + 9.6 = 52.4 MIN

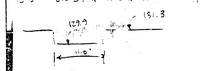
i_2 = 1.9 — i_{100} = 4.4 — C_2 = .23 — C_{100} = .35

Q_{100} = 35.12 x .35 x 4.4 = 54.1 cfs

Q_2 = 35.12 x .23 x 1.9 = 15.3 cfs

$Q = 3.087 L H^{3/2}$ — $3.087 L (1.6)^{3/2}$ = 54.1 — L = 12.6

$5.3 = 3.087 \times 11.0 \times H^{3/2}$ — H = 0.59' FOR 2 YEAR STORM



Q_{100} UP STREAM MAX CHANNEL DEPTH 0.95

STORAGE 1.10 AC/FT

DA # 7A — 8.65 Ac

V = 1.2 @ 70 cfs (SEE GRADED CHANNEL B)

730' @ 1.2 = 10.1 MIN — T_C = 52.4 + 10.1 = 62.5 MIN.

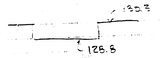
i_2 = 1.65 — i_{100} = 3.85

Q_{100} = 43.77 x 0.35 x 3.85 = 59.0 cfs

Q_2 = 43.77 x 0.23 x 1.65 = 16.6 cfs

$Q = 3.087 L H^{3/2}$ — $3.087 L (1.5^{3/2})$ = 59 — L = 10.4' USE 11.0'

$26 = 3.087 \times 11.0 \times H^{3/2}$ — H = 0.62'



Q_{100} UPSTREAM MAX CHANNEL DEPTH 0.75'

STORAGE 1.2 AC/FT

DA # 7B — 11.92 Ac

V = 1.2 @ 70 cfs

730' @ 1.2 = 10.1 MIN — T_C = 62.5 + 10.1 = 72.6 MIN

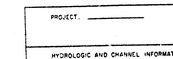
i_2 = 1.5 — i_{100} = 3.6

Q_{100} = 55.65 x 0.35 x 3.6 = 70.2 cfs

Q_2 = 55.65 x 0.23 x 1.5 = 19.2 cfs

$T = 3.087 L H^{3/2}$ — $36.2 = 3.087 L (1.5^{3/2})$ — L = 11.07 USE 12'

$7.7 = 3.087 \times 12.0 \times H^{3/2}$ — H = 0.65' FOR 2 YR STORM



Q_{100} UPSTREAM MAX CHANNEL DEPTH 1.05'

STORAGE 1.25 AC FT

D.A. # 7C — 35 Ac

USE 12 fps V TO OUTLET NEAREST 04+10

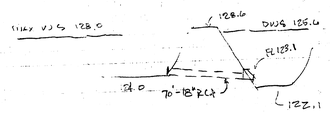
1350' @ 1.2 fps = 25.7 MIN. T_C = 72.6 + 25.7 = 98.3 MIN.

i_2 = 1.2 — i_{100} = 2.7

Q_{100} = 90.65 x 0.35 x 2.7 = 85.7 cfs

Q_2 = 90.65 x 0.23 x 1.2 = 25.0 cfs

CHECK CAPACITY OF OUTLET STRUCTURES — REVISED 05.7

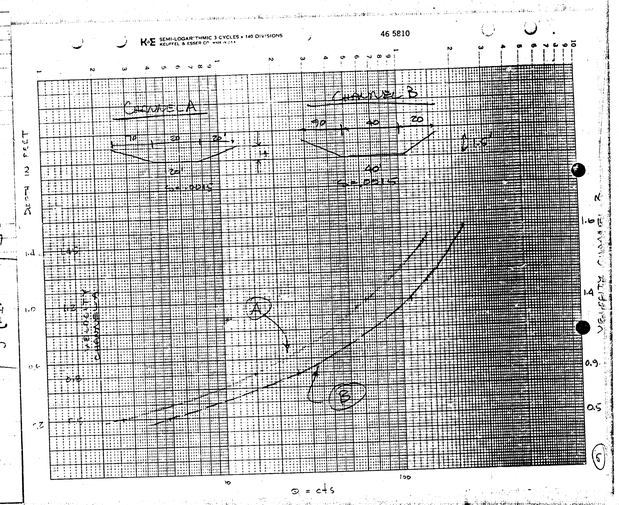


12 cfs TOTAL OUT WITH CHANNEL @ DWG AND UPSTREAM ELEV 126

@ STA 127+50 CHANNEL PLANS

@ STA 123+00 → DWG = 125.4 — H = 2.6 — 2-24" RCP x 32'
Q = 50 cfs EA.

@ STA 140+00 DWG = 125.4 — H = 2.6 — 2-24" RCP x 32'
Q = 50 cfs EA



DA # 9 — 5.25 Ac

$T_C = 1.5 \sqrt{\frac{nL}{4\sqrt{s}}}$ = $1.5 \sqrt{\frac{.02 \times 960}{4\sqrt{.008}}}$ = 8.8 MIN.

TRY V = 1.2 IN DITCH FOR 950' = 13.2 MIN — 50% IMP. CN = 93

TOTAL T_C = 22 MIN. — i_2 = 3.9 — i_{100} = 7.74

C_2 = 0.43 — C_{100} = 0.70

Q_{100} = 5.25 x 10.7 x 7.74 = 28.4 cfs

Q_2 = 5.25 x .68 x 3.9 = 11.5 cfs

DITCH FLOW 2' DEEP — 4' — 2:1 — Q = 31.8 — V = 2.0

AVERAGE V = 1.0 ABOVE 1.2 OK.

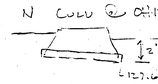
ADD 1.0 AC TO D.A. W OF OHIO TOTAL DA = 6.25

550' @ 2.0 fps = 4.6 MIN — T_C = 26.6

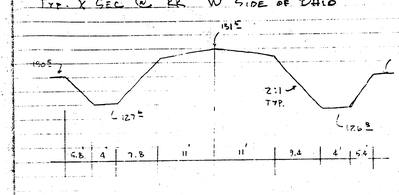
i_2 = 2.2 — i_{100} = 7.2

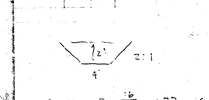
Q_{100} = 6.25 x 0.7 x 7.2 = 31.5 cfs

N CULV @ OHIO



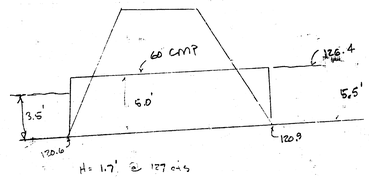
TYP. X SEC @ RR W SIDE OF OHIO





Q = 16 — $R = \frac{12}{12}$ = 1.33 — S = .0015

$Q = 1.486 \frac{1}{.035} 1.33^{2/3} .0015^{1/2}$ = 31.8 cfs — V = 2.0 fps



DA 4-B — 4.28 Ac

T_C = 26.6 MIN. FROM DA # 9 + LAKE

i_2 = 3.2 — i_{100} = 7.2

INCLUDE DA # 9 TO STRUCTURE AT W. CHANNEL

4.28 + 5.25 = 9.53 Ac. TOTAL

Q_{100} = 9.53 x 0.7 x 7.2 = 48 cfs

H = 1.7' ON 24" RCP EXIST. — DWS = 126.4 + 1.5 — HW = 127.9

RAISE TOP OF DIKE TO 129.0

DA # 8 — 5.53 Ac

$T_C = 1.5 \frac{.05 \times 200}{4\sqrt{.002}}$ = 11.2 MIN.

950 @ 1.5 fps = 10.9 MIN

TOTAL T_C = 22.1 — i_2 = 3.19 — i_{100} = 7.74

Q_{100} = 5.53 x 0.7 x 7.74 = 30.0 cfs

Q_2 = 5.53 x 0.63 x 3.19 = 12.2 cfs

MIN HW = 130.0 (SEE DA # 9 PIPE SIZE ADDED 0.3')

DA # 3 — 5.95 Ac

USE 750' @ 2 fps TO DA # 4 T_C = 6.25 + 22.1 = 28.4 MIN.

i_{100} = 7.0

Q_{100} = 11.84 x 0.7 x 7.0 = 56.3 cfs — CHANNEL 120.5 DWS @ 251 cfs = 124.0

USE SAME STRUCTURE AS AT 149+00

2-24" RCP x 22' H = 3' Q = 20 cfs EA. HW 127.0

DA # 2 — 4.75 Ac — L = 900

$T_C = 1.5 \frac{.05 \times 200}{4\sqrt{.002}}$ = 11.2 MIN.

900 @ 1.5 fps = 10.0 MIN

TOTAL T_C = 21.2 — i_2 = 3.3 — i_{100} = 7.4

Q_{100} = 4.75 x 0.7 x 7.4 = 24.6 cfs

Q_2 = 4.75 x 0.63 x 3.3 = 9.9 cfs

MIN HW = 130.0 (SEE DA # 9 PIPE SIZE ADDED 0.3')

DA # 1 — 2.64 Ac — L = 500

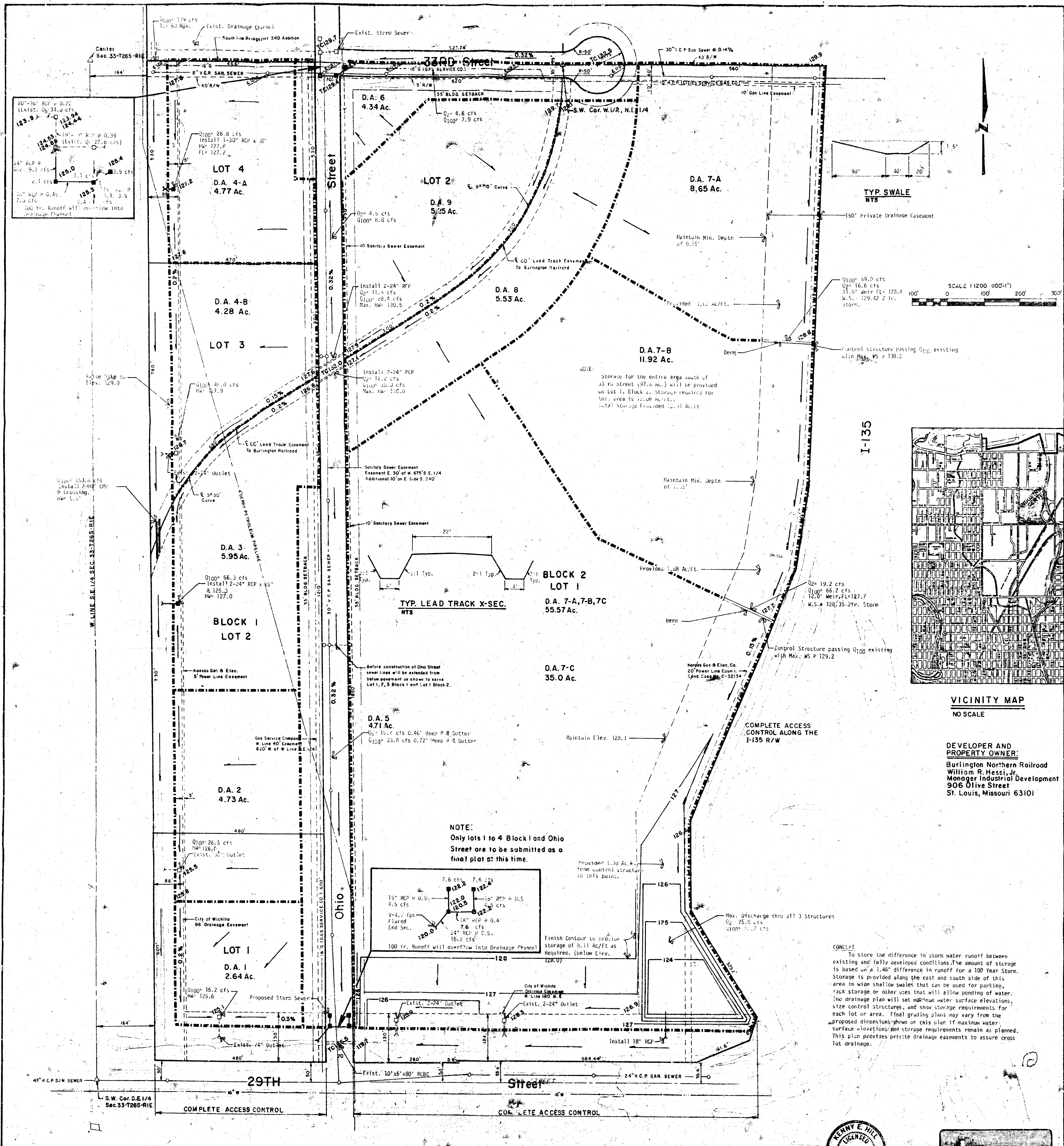
$T_C = 1.5 \frac{.05 \times 500}{4\sqrt{.005}}$ = 7.50 MIN — i_{100} = 8.76

Q_{100} = 2.64 x 0.7 x 8.76 = 16.2 cfs

MAX DWS = 124.6 — EL INLET = 125.1 — L = 36'

H = 0.8' REQ'D @ 16.2 cfs — 24" RCP EXIST

HW = 125.4 — HW = 125.6 TO GET 0.5' ABOVE INLET



DRAINAGE PLAN

BURLINGTON NORTHERN INDUSTRIAL CENTER

KENNY E. HILL LICENSED 7690 KANSAS PROFESSIONAL ENGINEER

POE & ASSOCIATES OF KANSAS, INC.

DA # 5 4.71 Ac

Assume Average Flow 1.5 fps

1730' @ 1.5 fps = 19.2 min

Use 15 min $I_5 = 5.21$ $I_{100} = 8.95$ CN = 93, 80% imp

$C_5 = 0.62$ $C_{100} = 0.80$ (Bellmiller)

$Q_5 = 4.71 \times .62 \times 5.21 = 15.2$ cfs

$Q_{100} = 4.71 \times .80 \times 8.98 = 33.8$ cfs

DA # 6 4.34 Ac

Use Tc = 42 min from previous Storm Sewer

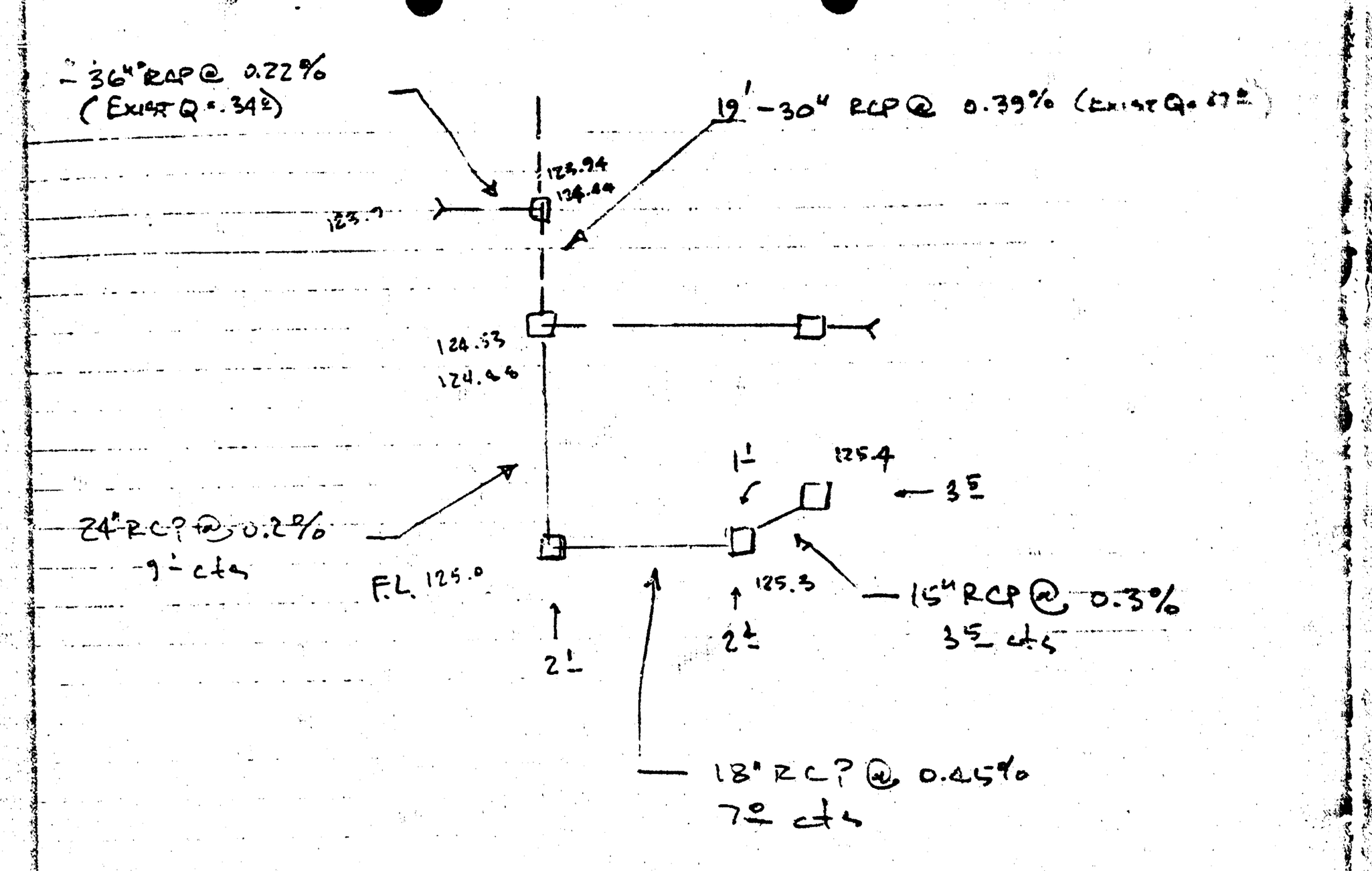
$I_5 = 3.01$ $I_{100} = 5.22$ C = 0.7

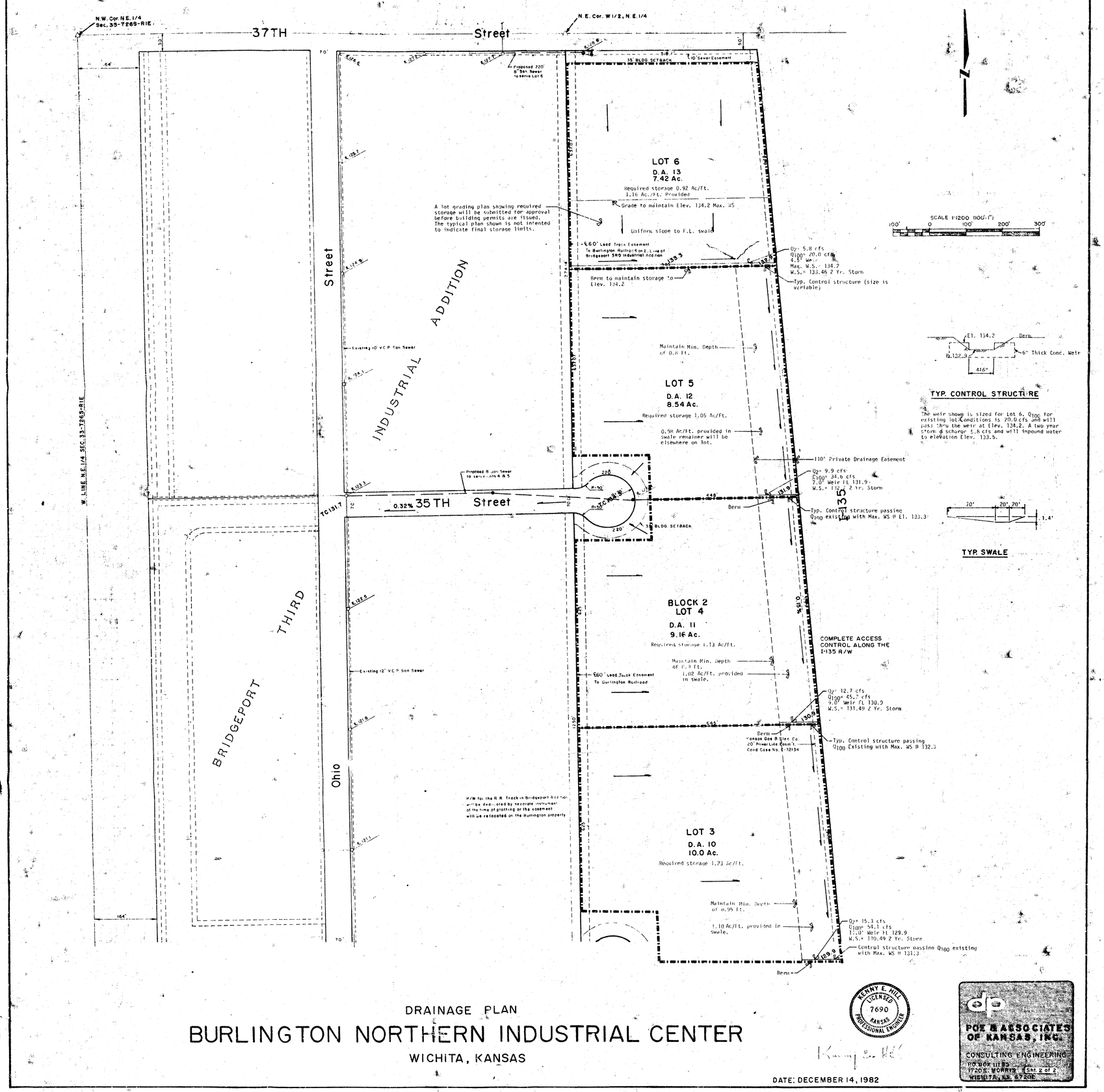
$Q_5 = 4.34 \times 0.7 \times 3.01 = 9.1$ cfs

$Q_{100} = 4.34 \times 0.7 \times 5.22 = 15.9$ cfs

DA 4-A 4.77 Ac

$Q = 4.77 \times 0.7 \times 8.03 = 26.8$ cfs





DRAINAGE PLAN

BURLINGTON NORTHERN INDUSTRIAL CENTER

WICHITA, KANSAS

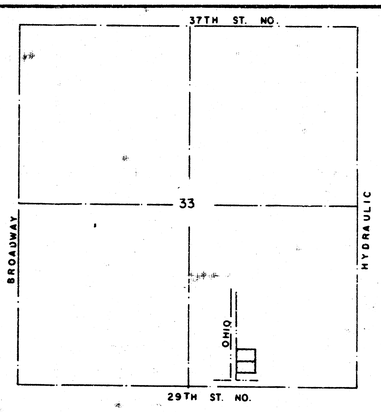
DATE: DECEMBER 14, 1982

KENNY E. HILL LICENSED 7690 KANSAS PROFESSIONAL ENGINEER

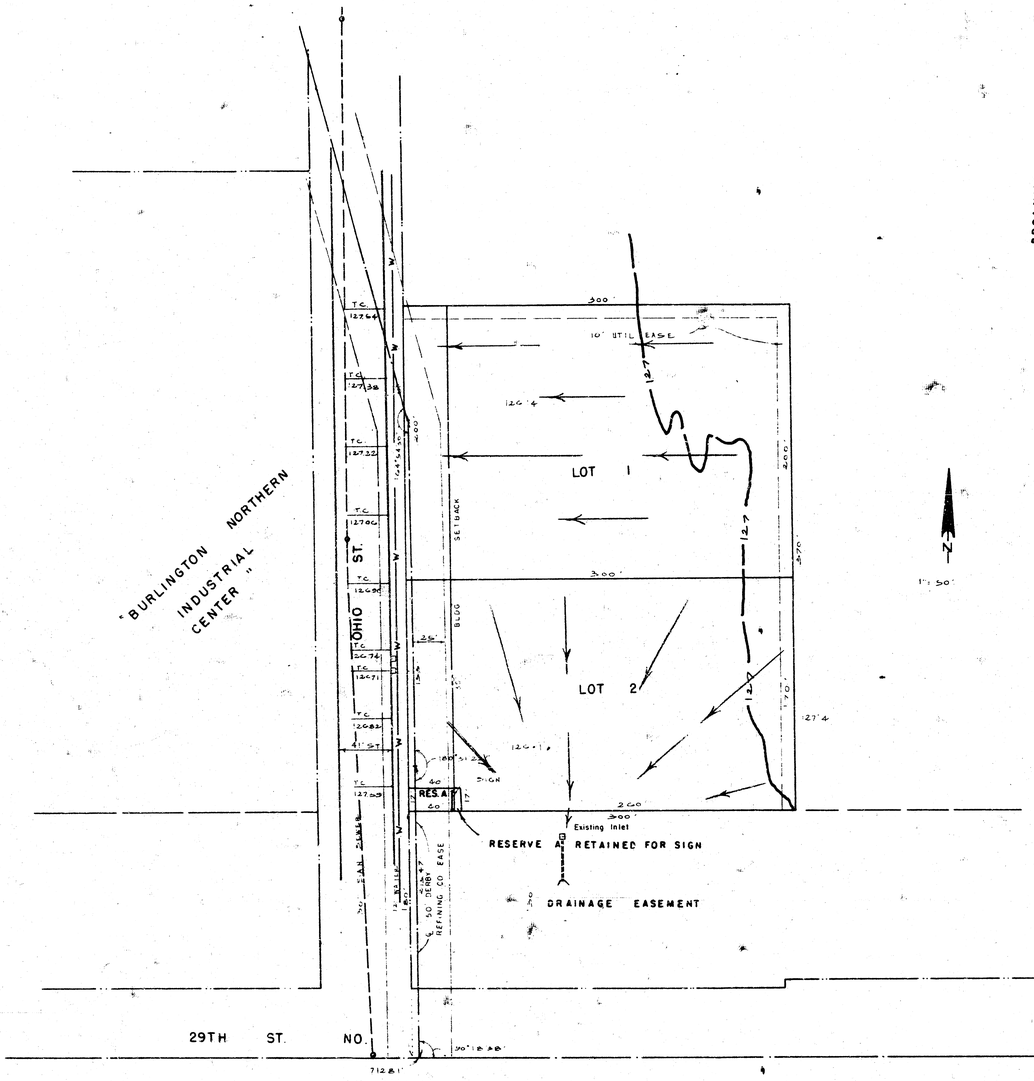
Kenny E. Hill

POE & ASSOCIATES OF KANSAS, INC.
CONSULTING ENGINEERING
PO Box 11129
1720 S. HOWARD (Shi. 2 of 2)
WICHITA, KS. 67211

BURLINGTON NOETHERN INDUSTRIAL CENTER
SECOND ADDITION
(Drainage)



VICINITY MAP



DRAINAGE PLAN
BURLINGTON NORTHERN INDUSTRIAL CENTER, SECOND ADDITION

FOR:
CLARKLAND, INC.

LOWELL D. HIGH, L.S.
APRIL 24, 1986