PROJECT: DRAINAGE CONCEPT

LOCATION: J&P Industrial Add'n

CLIENT:

DATE August 1988

BY DCM CKD

JOB NO. SHEET NO. 1 OF 11

J&P Industrial Addition, is located in the Southerly part of the N.E.1/4 of Sec. 14-28-1W. The gross Area of the plat is 10.0 Ac., with 0.48 Ac dedicated for R/W of presently existing West Street. The resulting net area of the plat is 9.52 Acres.

As illustrated on the xerox reproduction of a portion of the Baneyville Quadrangle, published by the U.S.G.S., the plat lies in the flat terrace lands contributing to the Cowskin basin. The Cowskin Creek is intercepted by the Wichita-Valley Center Floodway, at a point approximately 1 1/4 miles South of the proposed plat.

From the enclosed print of a portion of the Sedgwick County Soils Survey, it has been determined that the soils are of the Tabler Group, which fall into the Hydrologic Soil Group "D".

A requirement of this plat is to detain the runoff excess attributable to the difference between existing and developed site conditions.

The general scheme for this plat will then be; (1) provide adequate channel capacity to convey the discharge from the 100yr. rainfall

PROJECT: DRAINAGE CONCEPT
LOCATION: J&P Industrial Add'n.
CLIENT:

DATE August 1988
BY DCH CKD
JOB NO. SHEET NO. 2 OF 11

event, from the contributing upstream drainage area, thru the property, based upon present conditions, and (2) to provide on-site detention for that volume and discharge resulting from the change in land use, within the site.

Presently the site of the proposed plat, as well as all of the contributing drainage area, are in agricultural use. The Public drainage system is presently, and for the forseeable future, limited to open channel or ditch flow, adjacent to presently paved section line Roads. Therefore, drainage relief from the site or the contributing drainage area can not feasibly be accomidated otherwise.

Evaluation of channel requirements, thru the property, will be based upon methodology from S.C.S. T.R. 55, Second Edition, 1986. The S.C.S. method was designed for, and is particularly directed toward urbanizing agricultural watersheds.

PROJECT: DRAINAGE CONCEPT
LOCATION: J&P Industrial Add'n
CLIENT:

DATE August 1988
BY DCM CKD
JOB NO. SHEET NO. 3 OF 11

1.- RUNOFF CURVE NUMBERS — Present Conditions

Soil Name & Hdro. Group	Cover Description (Cover type, Treatment, & Hydrologic condition)	CN Table 2-2	CN Fig. 2-3	CN Fig. 2-4	Area ☐ Acres ☐ Miles² ☒ %	Product of CN x Area
Tabler (D)	Pasture - Good Cond.	80			25	2,000
Tabler (D)	Small Grain - Poor Cond.	88			25	2,200
Tabler (D)	Pasture - Fair Cond.	84			50	4,200
				TOTALS →	100	8,400

⇒ CN (Weighted) = $\frac{8,400}{100}$ = 84 ; USE CN = 84

2.- RUNOFF

Storm Frequency ---------- 100yr -6hr.
Rainfall, P, ---------- 5.9 inches
Runoff, Q_{100} (From Fig. 2-1) --- 4.1 inches

3. - TIME OF CONCENTRATION

Evaluation of the enclosed D.A. Map, the flow consists of approximately 600 L.F. of overland flow to the point of beginning of shallow channel flow; and from that point, 2000 L.F. of channel flow, to the south line of the proposed plat and drainage area.

PROJECT: DRAINAGE CONCEPT
LOCATION: J&P Industrial Add'n
CLIENT:

DATE August 1988
BY DCM CKD
JOB NO. SHEET NO. 4 OF 11

a/ The overland flow time is estimated by means of the Kinematic Wave Equation, as follows:

$$T_o = \frac{0.93 (L)^{0.6} (n')^{0.6}}{(I_{100})^{0.4} (S)^{0.3}}$$

$S = H/L = 2/600 = 0.3\%$

"n" = $0.15 + 0.17/2 = 0.16$ (Table 3-1, TR-55)

$L = 600'$

$$T_o = \frac{0.93 (46.4398)(0.333)}{(I_{100})^{0.4} (0.175)} = \frac{82.1714}{(I_{100})^{0.4}}$$

with $T_c = 46$ min.; $I_{100} = 4.33$"/hr & $(I)^{0.4} = 1.7972$

$\Rightarrow$ $T_o = 45.72 \cong 46$ minutes

b/ Channel flow time (T_t) is estimated by averaging the velocities at the upper end, with that at the lower end. From Mannings, the flow velocity at the lower end of the D.A., is estimated at 2.0 fps. From TR-55, Fig. 3-1, the velocity of flow has been estimated at 0.59 fps. Average channel flow velocity is then, $2.0 + 0.59/2 = 1.3$ fps,

$T_t = 2,000/1.3 \times 60 = 26$ minutes

$\Rightarrow$ Then, $T_c = T_o + T_t = 46 + 26 = 72$ minutes

CITY BLUE PRINT

PROJECT: DRAINAGE CONCEPT
LOCATION: J&P Industrial Add'n
CLIENT:

DATE August 1988
BY DCM CKD
JOB NO. SHEET NO. 5 OF 11

4.- PEAK DISCHARGE

$$q_p = q_u \times A_m \times Q$$

Where A_m = Area in Miles^2 = 80.78/640 = .1262

Q_{100} = 4.1" runoff

q_u = unit peak discharge csm/in.
(from Fig. 3-7, enclosed
for 100yr-6hr storm, & T_c = 72/60 = 1.2 hrs

q_u = 230 cuft/sec/sq.mi./inch runoff

Then, q_p = 230 csm/in x 0.1262 x 4.1

$\Rightarrow$ q_p = 119 cfs.

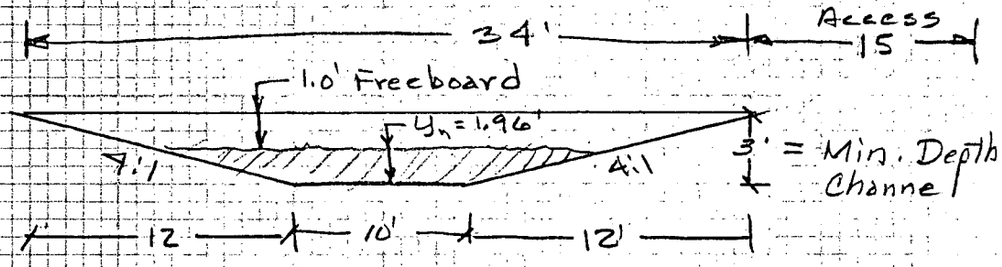
This peak discharge rate is to be used for determination of channel design, to convey flow of entire Drainage Area, thru the property, as follows

The existing channel elevation at the North side of plat = 1278.4, and 1276.4 at the South side of the plat, a difference of 2.0' in approximately 440 feet of length. This results in a gradient of 0.45%. The "n" value of the improved channel = 0.035,
With a planned bottom width = 10.0' & 4:1 side slopes, the normal flow depth = 1.96', with a velocity of 3.44 fps.

PROJECT: DRAINAGE CONCEPT
LOCATION: J & P Industrial Add'n
CLIENT:

DATE August 1988
BY DLM CKD
JOB NO. SHEET NO. 6 OF 11

Min. Channel Configuration — (Q_{100} = 119 cfs)



Along the West side of the channel, will be constructed a "V" bottom ditch, to intercept flow from the West, and divert the surface flow into a detention pond. The pond will be sized to contain the runoff volume attributable to the difference between present and developed conditions of runoff.

To evaluate the volumetric requirement, the following Data.

PRESENT CONDITIONS

Hydrologic Soil Group = D
Development Area = 9.5 Ac.
Land Use - Pasture, Fair Condition; CN = 84
Design Percipitation; 100yr - 6hr. = 5.9"
From $Q = \frac{(P-0.2S)^2}{(P+0.8S)}$ & $S = \frac{1000}{CN} - 10$
Direct Runoff; Q_{100} Present = 4.1"
Present Runoff Volume = A x Q/12 = 9.5 x 4.1/12
" " Volume = 3.25 Ac. Ft.

CITY BLUE PRINT

PROJECT: DRAINAGE CONCEPT
LOCATION: J&P Industrial Add'n
CLIENT:

DATE August 1988
BY DCM CKD
JOB NO. SHEET NO. 7 OF 11

DEVELOPED CONDITIONS

Weighted CN –

Soil Group	Land Use	Condition	Soil Complex Number	Area (Ac.)	Product
D	Buildings Drives Parking	Impervious	98	2.1	205.8
D	Open Space grass w/ 50% to 75% cover	Fair	84	7.42	623.28
			TOTALS	9.52	829.08

Then, Developed Condition's Weighted CN = $829.08/9.52 = 87$

Then from $Q = \frac{(P-0.25)^2}{(P+0.85)}$ & $S = \frac{1000}{CN} - 10$

Design Rainfall = 5.9"
Direct Runoff = 4.4" (Developed Conditions)

Then, Developed Cond. Runoff Volume = $A \times Q/12 = 9.5 \times 4.4/12$

$\Rightarrow$ " " Runoff Volume = 3.48 Ac. Ft.

$\Rightarrow$ Therefore Detention Volume = 3.48 - 3.25 = 0.23 Ac. Ft.

PROJECT: DRAINAGE CONCEPT
LOCATION: J&P INDUSTRIAL ADD'N.
CLIENT:

DATE August 1988
BY DCM CKD
JOB NO. SHEET NO. 8 OF 11

The peak rate of discharge is time dependendant. Therefore determine T_c for both present and developed conditions, and the corresponding peak discharge rates.

Under present site conditions, the hydraulicly longest flow path, is approximately 620' of overland flow to the existing natural channel, and then approximately 220 L.F. of channel flow to the South ℄.

From Kinematic Wave

$$T_c = \frac{0.93\,(L)^{0.6}\,(n)^{0.6}}{(I_{100})^{0.4}\,(S)^{0.3}} \qquad S = 6/620 = .97\%$$

$$T_c = \frac{0.93\,(47.3625)\,(0.333)}{(I_{100})^{0.4}\,(0.2487)}$$

$$T_c = \frac{58.9775}{(I_{100})^{0.4}}$$

Try 30 min.; $I_{100} = 5.40$

$$T_c = \frac{58.9775}{(5.4)^{0.4}} = 30.04 \text{ min} \quad OK$$

The hydraulicly longest flow path, will not change under developed conditions, then T_c present = T_c Developed = 0.5hrs.

Then, Unit Peak Discharge, $q_u = 335 \text{ cfs/mi}^2\text{/in}$

PRES. COND. PEAK DISCH. = $q_p = q_u \times A_m \times Q_{100}$

$\Rightarrow$ $q_p = 335 \times 9.5/640 \times 4.1" = 20.43 \text{ cfs}$

PROJECT: DRAINAGE CONCEPT
LOCATION: J&P Industrial Add'n
CLIENT:

DATE August 1988
BY DCM CKD
JOB NO. SHEET NO. 9 OF 11

The Developed Condition peak discharge from the East parcel, will not pass thru the detention pond. Therefore, that seperate discharge rate should be determined, and subtracted from the present condition rate, to determine the allowable rate of discharge from the detention pond.

Recompute the weighted C.N. & corresponding runoff, Q, from the 4.03 Acre parcel, East of the channel ℄, as follows

WEIGHTED CN

Soil Group	Land Use	Condition	Soil Complex Number	Area (Ac.)	Product
D	Buildings Drives & Parking	Impervious	98	2.1	205.8
D	Lawn Areas	Good Cond.; =>75% Cover Slopes ≥ 1%	80	1.93	154.4
			TOTALS	4.03	360.2

East Parcel - Developed Conditions

Weighted CN = 360.2/4.03 = 89

Then, from $Q = \frac{(P-0.2S)^2}{(P+0.8S)}$ & $S = \frac{1000}{CN} - 10$

Design Rainfall = 5.9"

Direct Runoff, Q, Developed Cond. = 4.65"

Then, Peak Discharge, $q_{dp} = q_u \times A_m \times Q = 335 \times \frac{4.03}{640} \times 4.65$

→ East Parcel
Peak Disch, q_{dp} = 9.8 cfs.

CITY BLUE PRINT

PROJECT: DRAINAGE CONCEPT
LOCATION: J&P Industrial Addn.
CLIENT:

DATE August 1988
BY DCM CKD
JOB NO. SHEET NO. 10 OF 11

Then, Peak Discharge from Detention Pond

⇒ = 20.4 cfs - 9.8 cfs = 10.6 cfs

∴ POND CONFIGURATION, VOLUME & DISCHARGE

Pond Bottom Elev. = 1277.0
Pond Side Slopes @ 4:1
Pond Bottom Area = 0.1224 Acres
Pond Area @ Elev. 1297.0 = 0.1822 Ac.
Ave. Pond Area = 0.1523 Ac.
POND VOLUME @ Elev. 1297.0 = 0.3046 Ac. Ft.
⇒ = 1.32% of Req'd Detention Volume (pg. 7)

The Peak Discharge, for the 100yr event, from the 5.49 Acre Parcel, lying West of proposed channel ℄, is determined as follows:

$q_p = q_u \times A_m \times Q_{100}$, where Q_{100} for Developed conditions of West parcel, is based upon CN = 80, & T_c = 30 min.

$q_p = 335 \times 5.49/640 \times 3.7$

$q_p = 10.6$ cfs

Therefore, peak $q_p \cong$ peak $q_{outflow}$, and the outlet pipe should be sized to restrict outflow to a max. of 10.6 cfs @ Head water depth of 2.0' above outlet pipe.

PROJECT: DRAINAGE CONCEPT
LOCATION: J&P Industrial Add'n.
CLIENT:

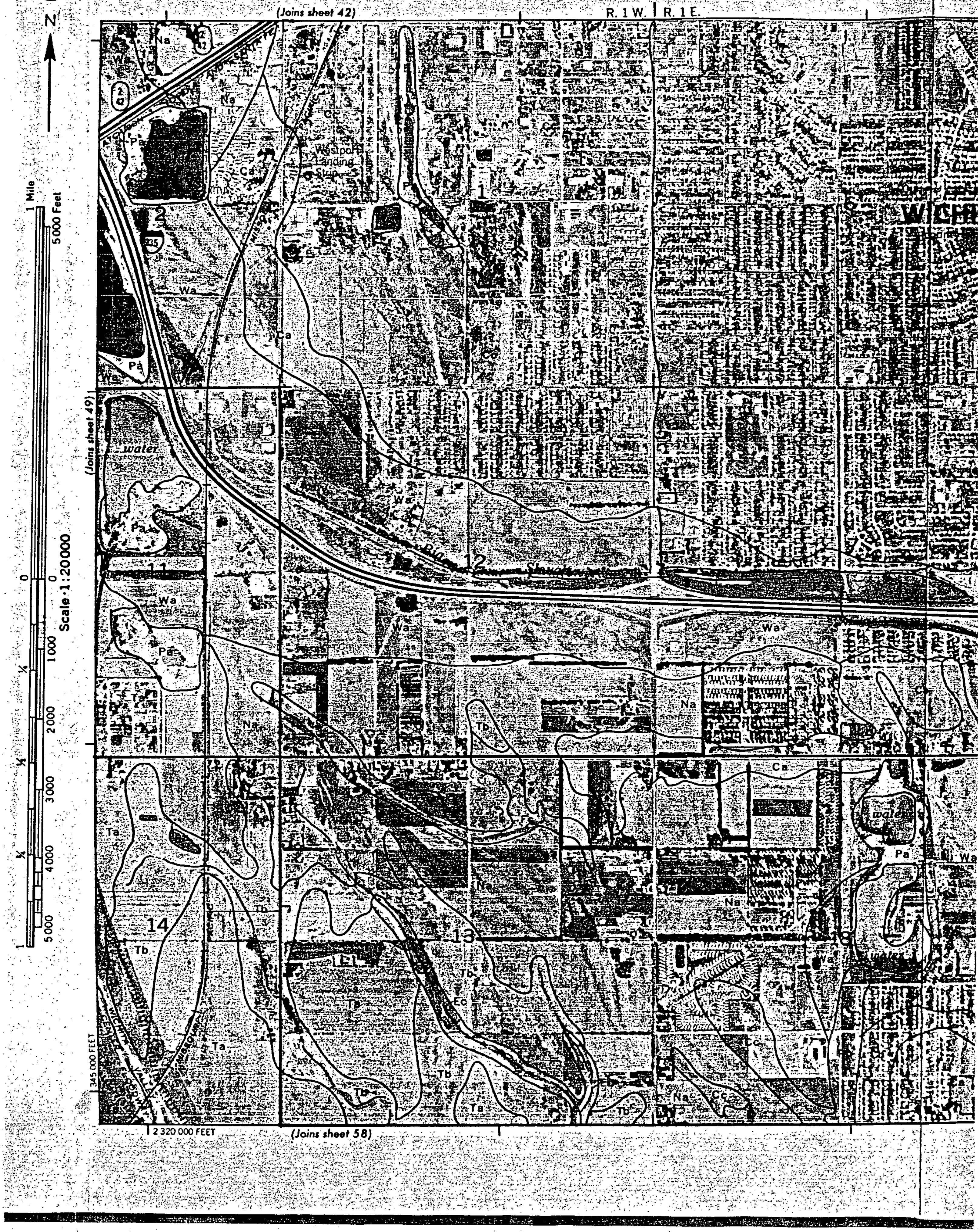
DATE August 1988
BY DCM CKD
JOB NO. SHEET NO. 11 OF 11

An 18" CMP, with a head water depth = 2.0', discharges 8.2 cfs.; and 9.8 cfs @ HWD = 2.5'. At HWD = 2.8' (Elev. = 1279.8), the 18" CMP will discharge 10.6 cfs = peak rate of inflow.

A concrete wier, 6 ft in width should be constructed, w/ F.L. Elev. = 1279.5 to function in case of obstruction or failure of the outflow pipe. With a head of 0.7' ±, the 6' wier would convey the design peak inflow rate, at Elev. 1280.3 ±

Accompanying this report, are prints from U.S.G.S Quadrangle (Baneyville), Sedgwick County Soils Map; Nomographs and charts, used in the evaluations, as well as a print of J&P Industrial Add'n Drainage Plan.

CITY BLUE PRINT


(Joins sheet 42)
R. 1 W.
R. 1 E.
N
1 Mile
5000 Feet
Scale 1:20000
(Joins sheet 49)
Westport Landing Strip
water
345 000 FEET
2 320 000 FEET
(Joins sheet 58)
Wa
Pa
Na
Ca
Tb
Ta
Cc
1
2
11
12
13
14

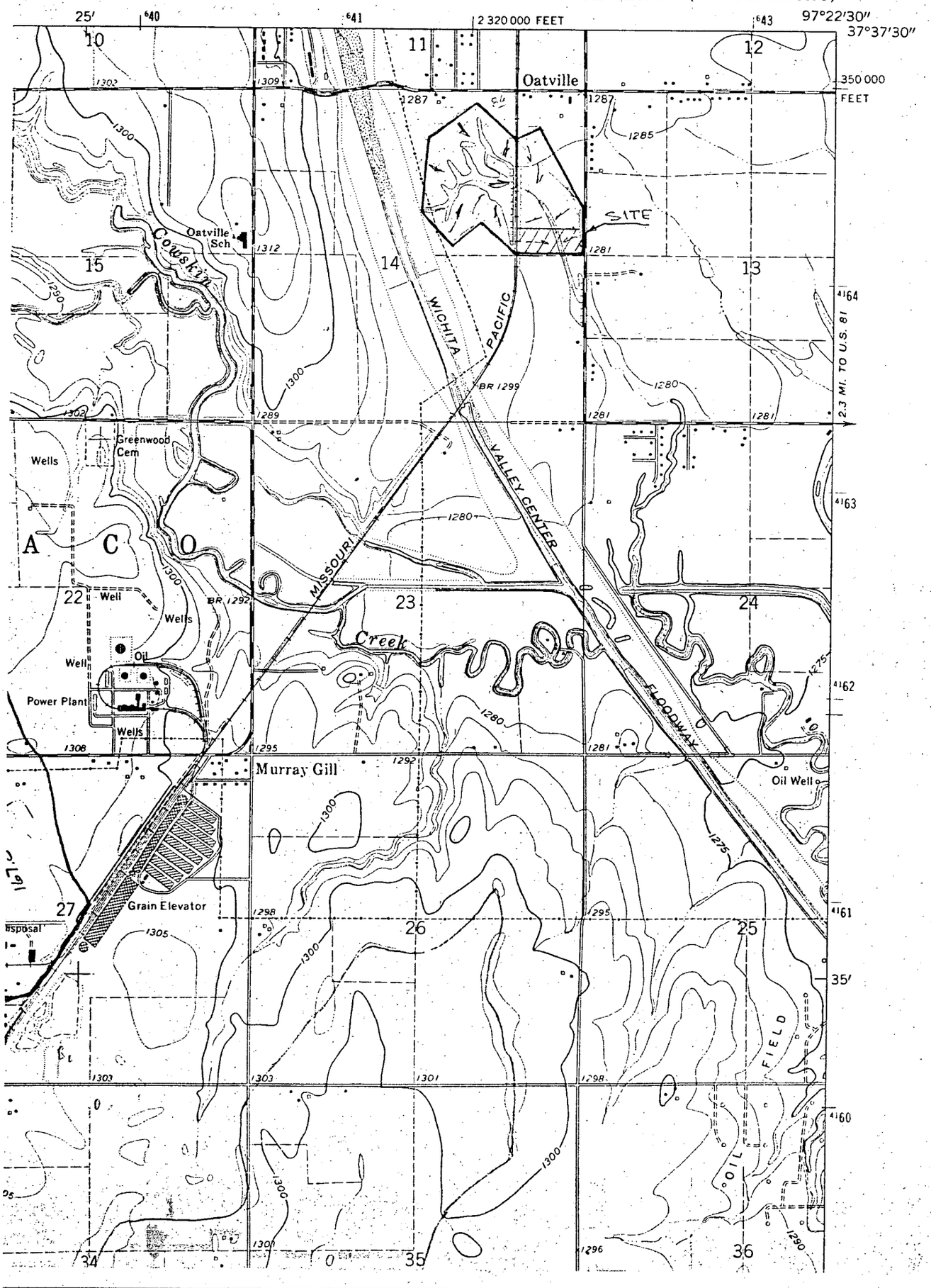
BAYNEVILLE QUADRANGLE

KANSAS—SEDGWICK CO.

7.5 MINUTE SERIES (TOPOGRAPHIC)

6559 III NE (WICHITA EAST)

11-01-1



EXISTING CONDITION

Table 2-2c.—Runoff curve numbers for other agricultural lands[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type	Hydrologic condition	A	B	C	D
Pasture, grassland, or range—continuous forage for grazing.[2]	Poor	68	79	86	89
	Fair	49	69	79	84
	Good	39	61	74	80
Meadow—continuous grass, protected from grazing and generally mowed for hay.	—	30	58	71	78
Brush—brush-weed-grass mixture with brush the major element.[3]	Poor	48	67	77	83
	Fair	35	56	70	77
	Good	[4]30	48	65	73
Woods—grass combination (orchard or tree farm).[5]	Poor	57	73	82	86
	Fair	43	65	76	82
	Good	32	58	72	79
Woods.[6]	Poor	45	66	77	83
	Fair	36	60	73	79
	Good	[4]30	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

[1]Average runoff condition, and $I_a = 0.2S$.

[2]*Poor:* <50% ground cover or heavily grazed with no mulch.
Fair: 50 to 75% ground cover and not heavily grazed.
Good: >75% ground cover and lightly or only occasionally grazed.

[3]*Poor:* <50% ground cover.
Fair: 50 to 75% ground cover.
Good: >75% ground cover.

[4]Actual curve number is less than 30: use CN = 30 for runoff computations.

[5]CN's shown were computed for areas with 50% woods and 50% grass (pasture) cover. Other combinations of conditions may be computed from the CN's for woods and pasture.

[6]*Poor:* Forest litter, small trees, and brush are destroyed by heavy grazing or regular burning.
Fair: Woods are grazed but not burned, and some forest litter covers the soil.
Good: Woods are protected from grazing, and litter and brush adequately cover the soil.

FUTURE CONDITIONS

Table 2-2a.—Runoff curve numbers for urban areas[1]

Cover description		Curve numbers for hydrologic soil group—			
Cover type and hydrologic condition	Average percent impervious area[2]	A	B	C	D
Fully developed urban areas (vegetation established)					
Open space (lawns, parks, golf courses, cemeteries, etc.)[3]:					
Poor condition (grass cover < 50%)		68	79	86	89
Fair condition (grass cover 50% to 75%)		49	69	79	84
Good condition (grass cover > 75%)		39	61	74	80
Impervious areas:					
Paved parking lots, roofs, driveways, etc. (excluding right-of-way)		98	98	98	98
Streets and roads:					
Paved; curbs and storm sewers (excluding right-of-way)		98	98	98	98
Paved; open ditches (including right-of-way)		83	89	92	93
Gravel (including right-of-way)		76	85	89	91
Dirt (including right-of-way)		72	82	87	89
Western desert urban areas:					
Natural desert landscaping (pervious areas only)[4]		63	77	85	88
Artificial desert landscaping (impervious weed barrier, desert shrub with 1- to 2-inch sand or gravel mulch and basin borders)		96	96	96	96
Urban districts:					
Commercial and business	85	89	92	94	95
Industrial	72	81	88	91	93
Residential districts by average lot size:					
1/8 acre or less (town houses)	65	77	85	90	92
1/4 acre	38	61	75	83	87
1/3 acre	30	57	72	81	86
1/2 acre	25	54	70	80	85
1 acre	20	51	68	79	84
2 acres	12	46	65	77	82
Developing urban areas					
Newly graded areas (pervious areas only, no vegetation)[5]		77	86	91	94
Idle lands (CN's are determined using cover types similar to those in table 2-2c).					

[1]Average runoff condition, and $I_a = 0.2S$.
[2]The average percent impervious area shown was used to develop the composite CN's. Other assumptions are as follows: impervious areas are directly connected to the drainage system, impervious areas have a CN of 98, and pervious areas are considered equivalent to open space in good hydrologic condition. CN's for other combinations of conditions may be computed using figure 2-3 or 2-4.
[3]CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.
[4]Composite CN's for natural desert landscaping should be computed using figures 2-3 or 2-4 based on the impervious area percentage (CN = 98) and the pervious area CN. The pervious area CN's are assumed equivalent to desert shrub in poor hydrologic condition.
[5]Composite CN's to use for the design of temporary measures during grading and construction should be computed using figure 2-3 or 2-4, based on the degree of development (impervious area percentage) and the CN's for the newly graded pervious areas.

4a

2. PEAK RATE (CONT'D)

100 Year - 6 hour Storm

Unit Peak Discharge Versus Time of Concentration, Zone 1

T_c (hours)	q cfs/(mi²)(in)[1/]	T_c (hours)	q cfs/(mi²)(in)[1/]
0.10	680	0.5	335
0.12	620	0.6	310
0.14	580	0.7	290
0.16	550	0.8	275
0.18	520	0.9	260
0.20	500	1.0	245
0.22	480	1.2	230
0.24	460	1.4	215
0.26	440	1.6	200
0.28	430	1.8	190
0.30	420	2.0	180
0.32	410	2.5	160
0.34	400		
0.36	390	3.0	145
0.38	380	3.5	130
0.40	370	4.0	120
0.42	360	4.5	110
0.44	350		
0.46	345	5.0	100
0.48	340	5.5	95
		6.0	90

[1/] (in) = acre inch runoff per acre.

Q = q × A. Sq.Mi. Runoff

Figure 3.7

J & P INDUSTRIAL ADDITION -
AMMENDMENT & SUPPLEMENT TO
DRAINAGE PLAN

The previously submitted Drainage Plan gave rise to the question of reduction of the velocity of flow from the improved channel section proposed for J & P Industrial Addition, into the existing natural channel on the property down stream. Also, the request was made to secure an offsite drainage easement from the property owner to the South.

Although the property owner to the South (Mr. Howard) refused to sign a drainage easement to the public, he has executed a private drainage easement in favor of S & S Leasing Co., the owner/applicant of J & P Industrial Addition.

Subsequently, we have taken five or six random x-sections of the natural channel through Mr. Howards property in the SE 1/4 of Sec. 14-28-1W, to and including the size and flow line elevation of the structure under West Street, at which point the natural drainage course leaves his property. The structure is a double 8' x 3' RCBC, located approximately 775' South of the NE Corner of the SE 1/4 of Sec. 14, and having a flow line elevation of 1276.34 M.S.L.

The flow line elevation of the natural channel at the North property line of J & P Industrial Addition is 1278.4 M.S.L., and the difference in elevation from that point, to the flow line of the R.C.B.C. under West St., is 2.06 feet. The distance between these points is approximately 1368', resulting in a gradient of 0.15%, for both the proposed improved channel and the natural channel to the South.

As previously reported, the Q_{100} discharge to be conveyed through the improved channel is 119 cfs. To minimize both the velocity of flow and the depth of normal flow, we have determined the improved channel configuration, based upon the following data -

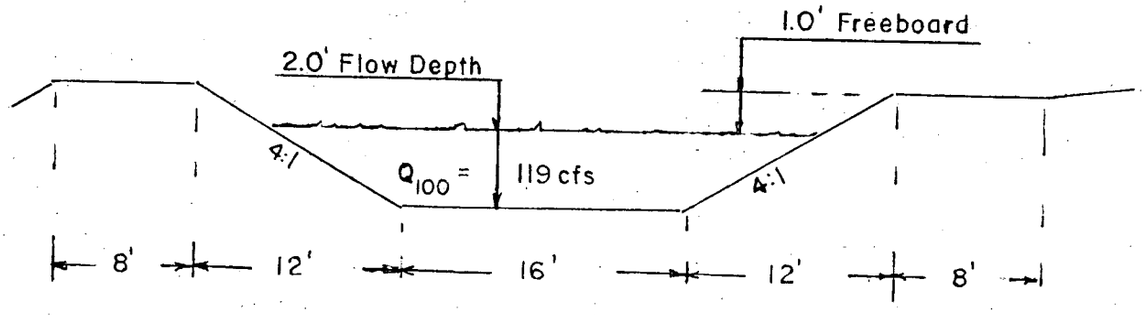
Maximum Flow Depeth = 2.0'; 4:1 slopes

Q_{100} = 119 cfs

S = 0.15%

"n" = 0.030 (City of Wichita Policy Statement)

From Mannings, the improved channel section would be as follows:



To evaluate the natural channel flow characteristics on the property to the South of J & P Industrial Addition, we have x-sectioned the existing channel and have applied Mannings Equation to determine an equivalent flow depth, necessary to convey design Q_{100} exiting from the improved channel.

From the enclosed tabulation, the Q_{100} discharge of 119 cfs will flow through the existing natural channel with a velocity of approximately 1.6 fps, and at a normal flow depth of approximately 2.15 feet.

In summary, the Q_{100} discharge from the improved channel will have a flow depth of 2.0 feet at a velocity of 2.49 fps; the corresponding flow in the natural channel to the South will have an approximate flow depth of 2.15 feet at a velocity of 1.6 fps.

Appreciable or significant erosion will not result from these velocities of flow. However, to maintain the design elevation of the channel bottom at the general location of the transition, we are recommending the placement of grouted light stone rip-rap across the channel bottom, extending both 8.0' upstream and 8.0' downstream from the South end of the improved channel.

The owner of J & P Industrial Addition has obtained a Private Drainage Easement from the down stream land owner for an area 20' on either side of the existing natural channel and for a length up to 100 feet, in which to grade, excavate, fill, drain and/or otherwise improve a transition section between the natural channel and the improved channel section. This transition will be constructed by and at the expense of the owner of J & P Industrial Addition.

The revised drainage plan, reflecting the revised bottom width, gradient and alignment of the improved channel and associated improvements, are enclosed.

Respectfully submitted,

MOEHRING & ASSOCIATES
CONSULTING ENGINEERS

Don C. Moehring II

$$Q = \frac{1.486}{n} S^{1/2} R^{2/3} A \qquad R = \frac{A}{P}$$

Elevation (MSL)	Area (Sq.Ft.)	Wetted Perimeter (ft.)	Hydraulic Radius (R)	$R^{2/3}$	S (%)	$S^{1/2}$	$\frac{1.486}{0.030}$	Q (cfs)	Velocity (fps)
1277.0	0.296	5.91	0.0501	0.1359	0.15	0.0387	49.533	0.08	0.26
1277.5	5.25	13.98	0.3755	0.5205	0.15	0.0387	49.533	5.24	1.0
1278.0	14.21	22.05	0.6444	0.7461	0.15	0.0387	49.533	20.32	1.43
1278.3	22.25	31.81	0.6995	0.7880	0.15	0.0387	49.533	33.61	1.51
1279.0	64.80	94.68	0.6844	0.7766	0.15	0.0387	49.533	96.47	1.49
1279.1	74.65	102.62	0.7274	0.8088	0.15	0.0387	49.533	115.74	1.55
1279.2	85.29	110.57	0.7714	0.8411	0.15	0.0387	49.533	137.52	1.61

⟸ Design Q_{100} = 119 cfs

NOTE: Evaluation of existing natural channel section, lying South of J & P Industrial Addition, indicates that Q_{100} design flow would have a flow depth of approximately 2.15' & velocity $\cong$ 1.6 fps.

PRIVATE DRAINAGE EASEMENT

The undersigned, being the Owner(s) of

The East 1/2 of the SE 1/4 of Sec. 14, T28S, R1W of the 6th P.M., Sedgwick County, Kansas, except the Wichita-Valley Center Flood Control R/W; and also except the Missouri-Pacific Railroad R/W; & also except a tract described as beginning at a point 1205.0' North of the Southeast Corner of said SE 1/4; thence West 275.0'; thence North 195.0'; thence East 275.0'; thence South 195.0' to the point of beginning,

does hereby grant to S & S Leasing, a Partnership by Andrew P. Selenke, Partner and James L. Selenke, Partner a drainage easement, hereinafter more specifically described, which easement shall run with the land.

The purpose of this easement is to grade, excavate, fill, drain and/or improve a transition section from an improved channel or drainageway into an existing natural channel or drainageway and in such a manner as to prevent undue erosion resulting from the transition from the improved channel to the existing natural channel. Unless otherwise mutually agreed, the proposed transition improvement shall not be more than 20.0' on either side of the centerline of the existing natural channel and extend no more than 100.0' South of the North line of the SE 1/4 of Sec. 14, T28S, R1W.

The costs associated with the construction of the above described transition section, shall be borne by S & S Leasing, a Partnership.

The drainage easement herein granted shall expire at such time in the future that the existing natural drainageway in the SE 1/4 of said Sec. 14, is constructed as an improved channel or drainageway.

For good and valuable considerations, the receipt of which is hereby acknowledged. Dated this 18th day of September, 1988.

William N. Howard

STATE OF KANSAS)
) SS
COUNTY OF SEDGWICK)

Be it remembered that on this 18 day of September, 19 88, before me a notary public in aforesaid County and State came William N. Howard to me personally known to be the same person(s) who executed the foregoing instrument of writing and duly acknowledged the execution of the same. In testimony whereof I have hereunto set my hand and affixed my notarial seal the day and year above written.

Richard C. Haywood
NOTARY PUBLIC

RICHARD C. HAYWORTH NOTARY PUBLIC SEDGWICK CO. KANS.

My Commission Expires: Dec 7, 1988

Loaned to Ben Gregan MKEC
2-25-93

DRAINAGE PLAN

AND

SUPPORTING CALCULATIONS

PROFESSIONAL
ENGINEERING
CONSULTANTS
PROFESSIONAL ASSOCIATION

FOR

COLONEL JAMES JABARA AIRPORT 2ND ADDITION

PREPARED BY

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

ENGINEERS

WICHITA, KANSAS

JULY 20, 1992

Loaned to Ben Gregan MKEC
2-25-93

303 S. TOPEKA
WICHITA, KANSAS 67202
(316) 262-2691
FAX (316) 262-3003