

MID-KANSAS ENGINEERING CONSULTANTS P.A.

3500 NORTH ROCK ROAD, BLDG. #800
WICHITA, KANSAS 67226 1-316-682-6561

CALCULATIONS & SKETCHES

Proj. No.			
By	FRN	Date	5/20/86
Chkd By		Date	
Sheet	1	Of	

Location Deer Run
Reference Drainage & Utility Plan
Drainage

Determine Street Slopes & Street Flows

Street	Areas	Min. Slope	Min Q_{LANE} *	Min Q_{STREET} *	Max Q_2 per lane
Lakepoint	C & F	0.004%	12.8 cfs	25.7 cfs	2.61 cfs
Lakepoint	D & G	0.006%	15.7 cfs	31.5 cfs	3.51 cfs
Lakepoint	E & H	0.006%	15.7 cfs	31.5 cfs	
Plumthicket	I & J	0.004%	12.8 cfs	25.7 cfs	
Deer Run	J & K	0.008%	12.16 cfs	36.3 cfs	

* Based on Flow to top of curb.

Determine Q_i @ Inlet W of Area C

For $Q_2 = 2.61$ cfs, $S_o = 0.006\%$, $S_x = 0.03125\%$, $n = 0.016$, $W = 2.1667'$, $EFF = .8$

$L_i = 5'$, $Q_i = 1.39$ cfs; for $Q_{100} = 5.76$ cfs, $Q_i = 2.19$ cfs

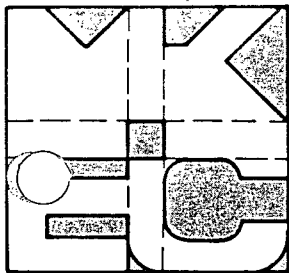
Total $Q_{100} = 32.42 + 2.19 = 34.60$ cfs for pipe design

Determine Q_i @ Inlet on E. side of Lakepoint

For $Q_2 = 3.38$ cfs, $S_o = 0.006\%$, $S_x = 0.03125\%$, $n = 0.016$, $W = 2.1667'$, $EFF = 0.80$

$L_i = 10'$, $Q_i = 2.27$ cfs; for $Q_{100} = 7.49$ cfs, $Q_i = 4.35$ cfs

Total $Q_{100} = 34.60 + 4.35 = 38.95$ cfs for pipe design



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Proj. No. _____
By FBN Date 3/20/86
Chkd By _____ Date _____
Sheet 2 Of _____

Location Deer Run
Reference Drainage & Utility Plan
Drainage

Determine Q_i for Inlet @ N. end of Lake point

$$\text{For } Q_2 = 9.14 - 2.27 = 6.87 \text{ cfs, } S_a = 0.006\%, L_i = 5', Q_i = 2.41 \text{ cfs}$$

$$\text{For } Q_{100} = 20.24 - 4.35 = 15.89 \text{ cfs, } Q_i = 3.82 \text{ cfs}$$

$$\text{Total } Q_{100} = 38.95 \left(\frac{3.82}{3.96} \right) + 3.82 = 41.79 \text{ cfs for pipe design}$$

Check Sump Condition on E. side of Lake point

$$Q_{100} = 38.95 - \left[(4.35 + 3.82) \left(\frac{8.37}{8.55} \right) \right] = 25.95 \text{ cfs}$$

$$\text{Try } L_i = 10', h = 0.7'; \text{ By orifice formula, } d = 1.18'$$

Check Sump Condition on W. side of Lake point

$$Q_{100} = 10.85 - \left[(2.19) \left(\frac{8.37}{8.55} \right) \right] = 8.71 \text{ cfs}$$

$$\text{Try } L_i = 10', h = 0.36'; d = 0.43'$$

$$\text{Check Combined Sump Condition} \Rightarrow Q_{100} = 25.95 + 8.71 = 34.66 \text{ cfs}$$

$$\text{Try } 2 L_i = 10' \text{ by orifice formula, } d_{\text{max}} = 0.67' < 0.80 \text{ R.O.W.}$$

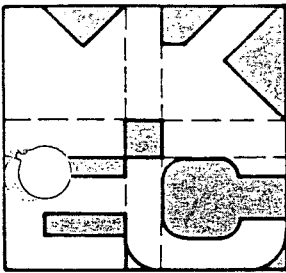
$$\text{For Pipe Design across Lake point, } Q_{100} = 41.79 + \frac{34.66}{2} = 59.12 \text{ cfs}$$

Determine Q_{100} thru Reservoirs H & J from offsite flow

$$\text{Drainage Area} = 127.20 \text{ acres} = 0.199 \text{ sq.mi.}; \text{ Present CN} = 80$$

$$\text{for open space w/ good grass cover; } L = 4400', Y = \frac{239 - 208}{4400} =$$

$$0.7\% \quad S = \frac{1000}{80} - 10 = 2.5$$



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By FBN Date 5/21/86
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Sheet 3 Of _____

Location Deer Run
Reference Drainage & Utility Plan

$$L = \frac{(4400)^{0.8} (2.5+1)^{-7}}{1900 (.7)^{-5}} = 1.24 \text{ hr} \quad HLM = 50\% \quad Imp = 3\%$$

$$F_{HLM} = 0.71 \quad F_{Imp} = .98$$

$$T_c = 1.24 (.71) (.98) \frac{60}{8.6} = 86.28 \text{ min} = 1.44 \text{ hr}$$

Estimate Q_{100} by Rational Formula $Q_{100} = 0.3 \times 2.99 \times 127.2 = 114.1 \text{ cfs}$

Design Ditch: Assume $S = 0.4\%$; To keep $V = 4 \text{ fps}$,

$$A_{reqd} = \frac{114.1}{4} = 28.53 \text{ sq. ft.} \quad \text{Try } B = 2', \text{ Side slopes} = 6:1$$

$$D = 2' \quad Q = 78.33; \quad \text{Try } B = 4', \quad Q = 93.19 \text{ cfs} < 114.1 \text{ cfs N.G.}$$

$$\text{Try } S = 0.5\%, \quad D = 2', \text{ Side Slope} = 6:1, \quad B = 4', \quad Q = 104.19 \text{ cfs}$$

$$\text{Try } S = 0.5\%, \quad D = 2.1', \text{ Side Slope} = 6:1, \quad B = 4', \quad Q = 116.85 \text{ cfs} > 114.1 \text{ cfs}^0$$

$$\text{Check } \checkmark: \quad V = \frac{116.85}{34.86} = 3.35 \text{ fps} < 4' \text{ OK}$$

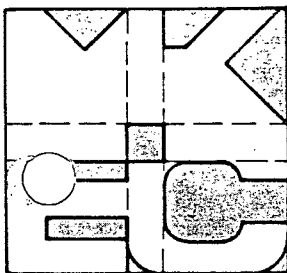
Bank full Elev. = 207

Elev	Q	A	Elev	Q	A
203.5	0	0	206.0	176.78	47.5
204.0	5.19	3.5	206.5	274.41	66.0
204.5	21.80	10.0	207.0	399.93	87.5
205.0	53.62	19.5	207.5	556.08	112.0
205.5	104.19	32.0			

Based on TR 20 Run DEERUN1 for 100 yr, 6 hr

rainfall, $Q_{Peak} = 174.91 \text{ cfs}$

Try 2 - 53" x 34" HERCP for culvert. Assume Top of Curb = 208



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Proj. No.

By FEN

Date 5/22/86

Chkd By

Date

Sheet

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Of

Location Deer Run

Reference Drainage & Utility Plan

$$HW = 2.42 + \frac{34+5}{12} - 1 = 4.67; \quad \frac{HW}{D} = \frac{4.67}{2.83} = 1.65$$

Assume Square Edge w/ headwall $Q = 85 \text{ cfs}$ $Q_{TOTAL} = 170 \text{ cfs} < 174.91$

$$\text{Try } 3 - 36" \text{ RCP's, } HW = 2.42 + \frac{36+4}{12} - 1 = 4.75; \quad \frac{HW}{D} = \frac{4.75}{3} = 1.58$$

$Q = 56 \text{ cfs}$; $Q_{TOTAL} = 168 \text{ cfs} < 174.91 \text{ cfs}$ N.G.

$$\text{Try } 2 - 60" \times 38" \text{ HERCP, } HW = 2.42 + \frac{38+5.5}{12} - 1 = 5.05$$

$$\frac{HW}{D} = \frac{5.05}{3.167} = 1.59$$

$Q = 110 \text{ cfs}$

$Q_{TOTAL} = 220 \text{ cfs} > 174.91$

$$\text{Try } 2 - 48" \text{ RCP's, } HW = 2.42 + \frac{48+5}{12} - 1 = 6.84; \quad \frac{HW}{D} = 1.71$$

$Q = 228 \text{ cfs}$; $Q_{TOTAL} = 254 \text{ cfs}$

$$\text{Try } 3 - 42" \text{ RCP's, } HW = 2.42 + \frac{42+5}{12} - 1 = 5.30; \quad \frac{HW}{D} = 1.51$$

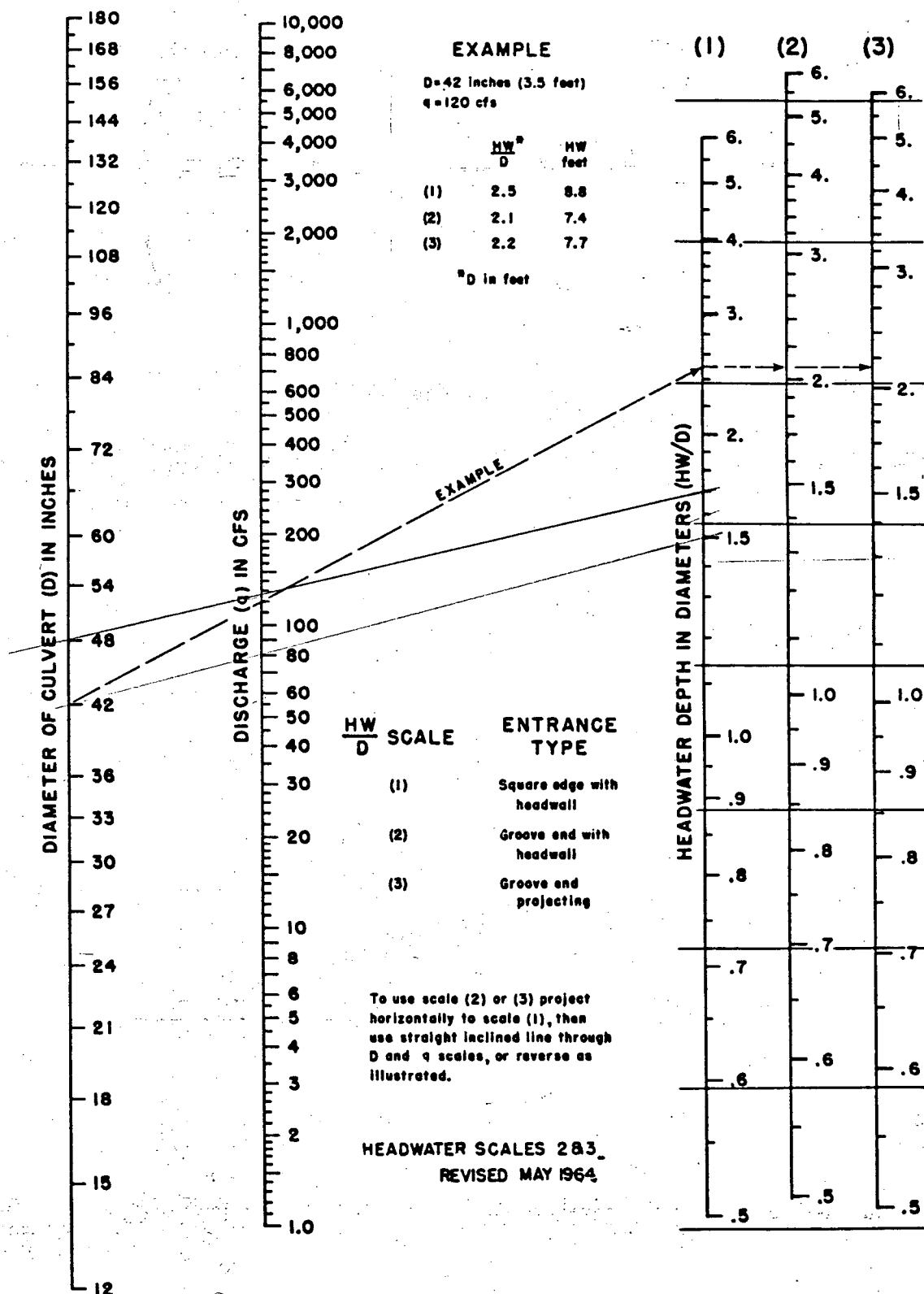
$Q = 80 \text{ cfs}$ $Q_{TOTAL} = 240 \text{ cfs}$

Use TR20 to add Q_{100} for Woodspring Blvd & Deer Run

$Q_{100} = 192.37 \text{ cfs}$

$Q_2 \approx (.43)(192.37) = 83 \text{ cfs}$

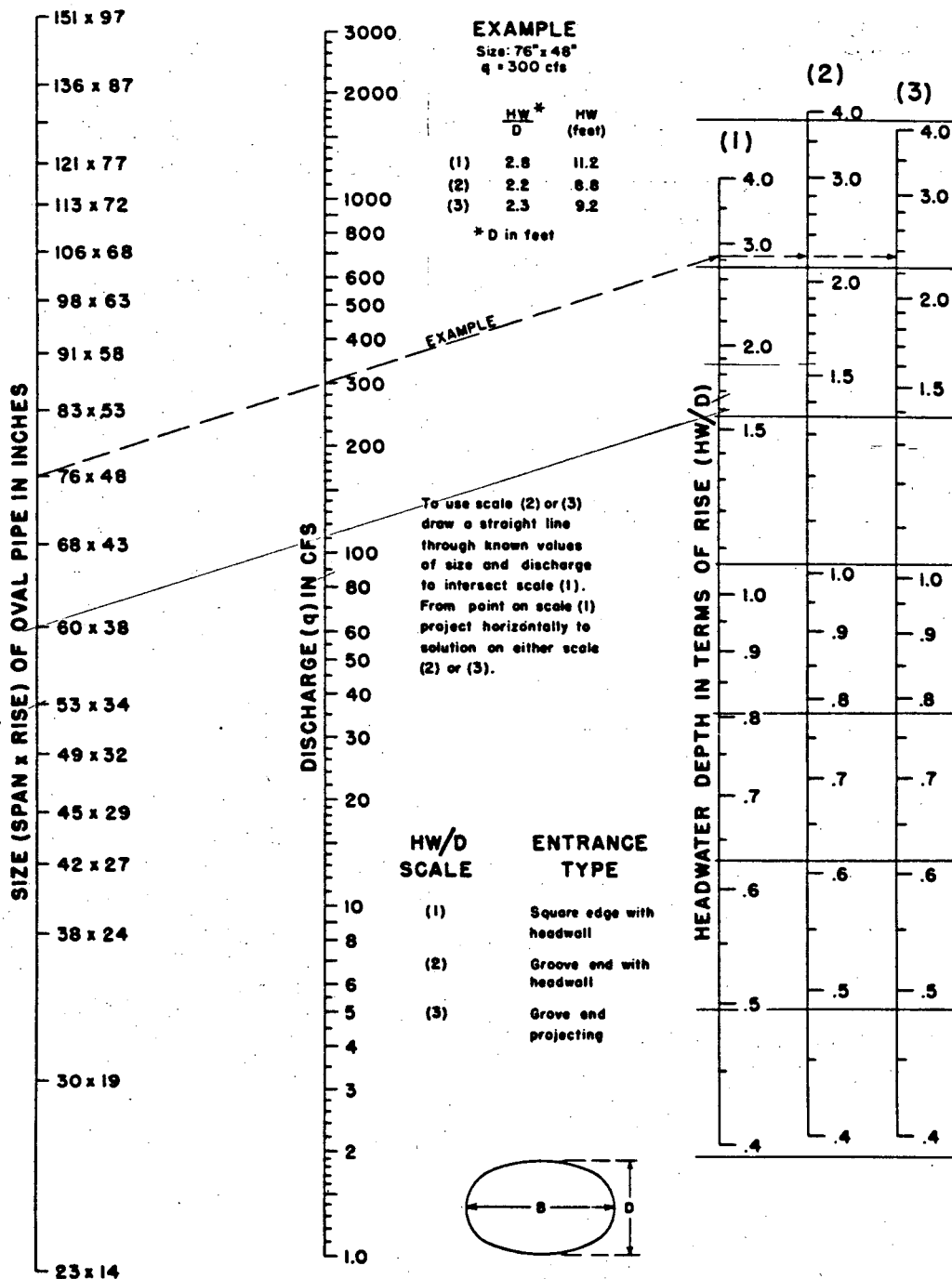
Use 2 - 36" RCPs



BUREAU OF PUBLIC ROADS JAN. 1963

Exhibit 14-7. Headwater depth for concrete pipe culverts with inlet control.

NEH Notice 4-102, August 1972



BUREAU OF PUBLIC ROADS JAN. 1963

Exhibit 14-8. Headwater depth for oval concrete pipe culverts long axis horizontal with inlet control.

TITLE 001 DEERUN1		FULLPRINT		SUMMARY				10
TITLE RAINFALL		DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 5 HR						20
5	RAINF 7		1.0					40
8		0.0	0.50	1.30	4.10	5.00		50
8		5.50	5.90	5.90	5.90	5.90		60
9	ENOTEL							70
2	XSECTN 001		1.00	207.00				80
8			203.50	0.00	0.00			90
8			204.00	5.19	3.50			100
8			204.50	21.85	10.00			110
8			205.00	53.62	19.50			120
8			205.50	104.19	32.00			130
8			206.00	175.73	47.50			140
8			206.50	274.41	65.00			150
8			207.00	399.93	87.50			160
8			207.50	556.08	112.00			170
9	ENOTEL							180
6	RUNOFF 1 001	6	0.199	50.0	1.44	1 1 1	1	190
6	REACH 3 001	6 5	4400.0			1 1 1	1	200
	ENDATA							210
7	INCRN 6		0.04					220
7	COMPUT 7 001 001			1.0	1.0	7 2 01 05		230
	ENDCMP 1							240
	ENDJOB 2							25

=====END OF MESSAGE=====

FILE NO. 1

COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "M" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINTABLES ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NE (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIMHYD

--- CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION

5/02/83 - CORRECT COMPUTATIONS FOR ---

1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTIPLE PEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH READHYD
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS

ENHANCEMENTS ---

1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S

09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS

CORRECT COMBINATION OF RATING TABLES FOR DIVERT

CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS

ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

TR20 REQ
REV 09/01/83

DEERUN: DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
RAINFALL

20

JOB 1 PAGE 1
PAGE 2

CUMULATIVE RAINFALL TABLE 7

TIME INCREMENT= 1.00

8	.0000	.5000	1.0000	4.1000	5.0000
8	5.5000	5.9000	5.9000	5.9000	5.9000
9	ENDTBL				

70

CROSS-SECTION DATA, CROSS-SECTION NO. 1 DRAINAGE AREA= 1.00 BANKFULL ELEV.= 207.00

	ELEVATION	DISCHARGE	END AREA
8	203.50	.00	.00
8	204.00	5.19	3.50
8	204.50	21.85	10.00
8	205.00	53.62	19.50
8	205.50	104.19	32.00
8	206.00	175.78	47.50
8	206.50	274.41	65.00
8	207.00	399.93	87.50
8	207.50	556.08	112.00

9 ENDTBL

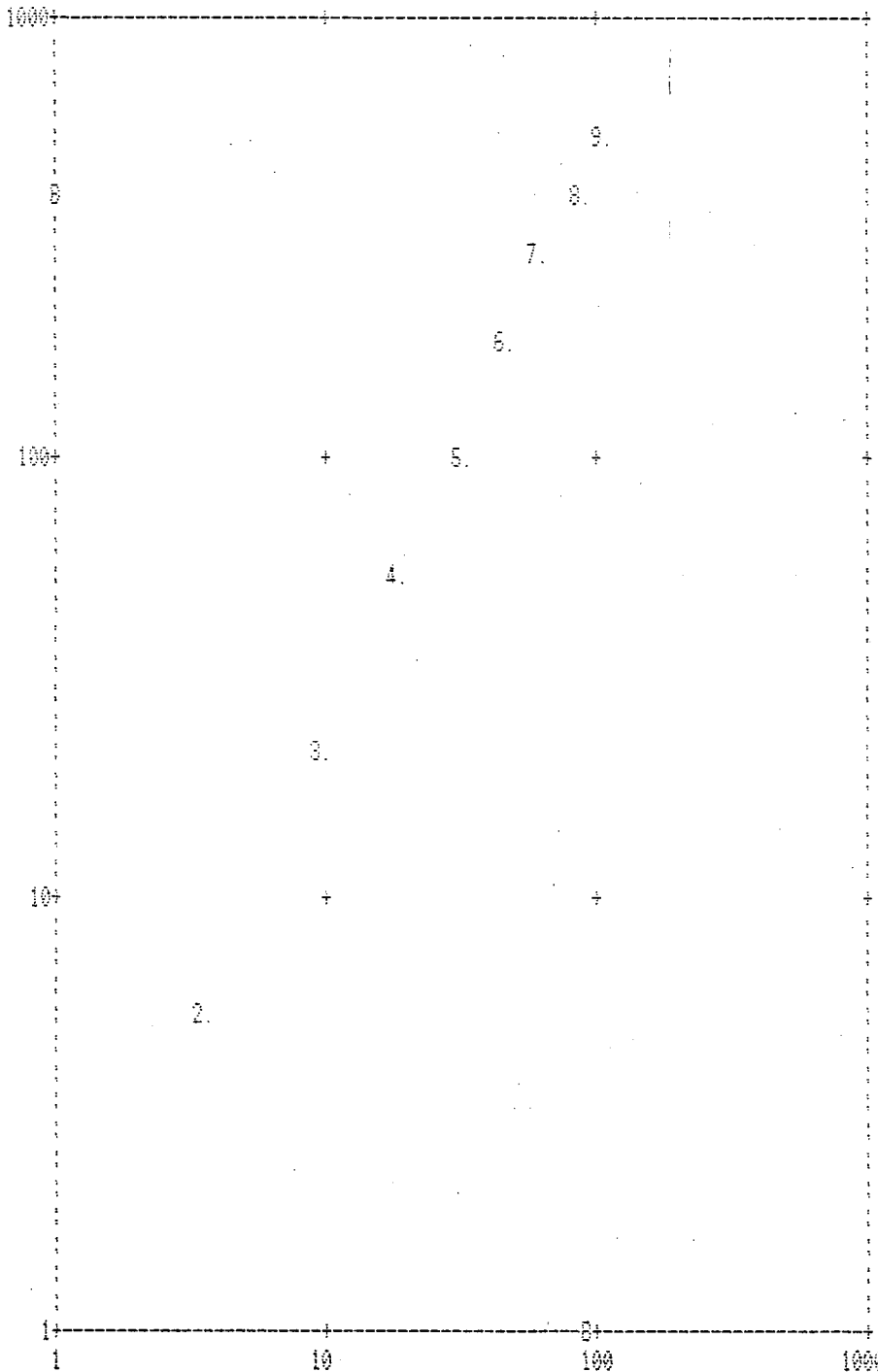
TR20 XEQ
REV 09/01/83

DEERUN1 DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
RAINFALL

20

JOB 1 PASS
PAGE 3

LOG
DISCHARGE
IN
CFS



CROSS SECTION 1 END AREA VS DISCHARGE

REFERENCE NO'S	DISCHARGE (CFS)	END AREA (SQ.FT.)	M
1	.00	.00	1.37
2	5.19	3.50	1.37
3	21.85	19.00	1.37
4	53.62	19.50	1.35
5	104.19	32.00	1.35
6	176.78	47.50	1.34
7	274.41	66.00	1.34
8	399.93	87.50	1.34
9	556.08	112.00	1.34

LEGEND

+ = GRID REFERENCE
 . = LOCATION OF PLOTTED VALUE
 3 = REFERENCE NO. OF PLOTTED VALUE
 X = MULTIPLE REFERENCE NUMBERS
 B = BANKFULL RELATION SHOWN ON AXIS
 AREA= 87.5 SQ FT DISCHARGE= 399.9 CFS

LOG CROSS SECTION END AREA IN SQ. FT.

STANDARD CONTROL OPERATION RUNOFF CROSS SECTION 1
 OUTPUT HYDROGRAPH = 6
 OUTPUT OPTIONS IN EFFECT PEAK HYD VOL SUM

DATA FIELD VALUES = .1990 RECORD ID 190
 80.0000 1.4400

STANDARD CONTROL OPERATION REACH CROSS SECTION 1
 INPUT HYDROGRAPH = 6 OUTPUT HYDROGRAPH = 5
 OUTPUT OPTIONS IN EFFECT PEAK HYD VOL SUM

DATA FIELD VALUES = 4400.0000 RECORD ID 200
 .0000 .0000

TR20 XEO
REV 09/01/83

DEERUN1 DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR. 6 HR
RAINFALL

20

JOB 1 PAGE 1
PAGE 4

EXECUTIVE CONTROL OPERATION INCREM MAIN TIME INCREMENT = .04 HOURS

RECORD ID 220

EXECUTIVE CONTROL OPERATION COMPUT FROM XSECTION 1 TO XSECTION 1

RECORD ID 230

STARTING TIME = .00 RAIN DEPTH = 1.00 RAIN DURATION = 1.00 RAIN TABLE NO. = 7 ANT. MOIST. COND = 2
ALTERNATE NO. = 1 STORM NO. = 6 MAIN TIME INCREMENT = .04 HOURS

OPERATION RUNOFF CROSS SECTION 1

OUTPUT HYDROGRAPH = 6

AREA = .20 SQ MI INPUT RUNOFF CURVE = 80 TIME OF CONCENTRATION = 1.44 HOURS

INTERNAL HYDROGRAPH TIME INCREMENT = .0400 HOURS

PEAK TIME(HRS)
3.55

PEAK DISCHARGE(CFS)
184.61

PEAK ELEVATION(FEET)
(RUNOFF)

TIME(HRS)	FIRST HYDROGRAPH POINT = .00 HOURS	TIME INCREMENT = .04 HOURS	DRAINAGE AREA = .20 SQ MI.
.00	DISCHG .00 .00 .00 .00 .00 .00 .00 .00 .01 .02		
1.20	DISCHG .03 .06 .10 .15 .22 .32 .44 .59 .78 1.01		
1.60	DISCHG 1.28 1.60 1.98 2.41 2.90 3.44 4.05 4.71 5.43 6.20		
2.00	DISCHG 7.03 7.95 8.93 10.13 11.46 12.95 14.65 16.56 18.73 21.16		
2.40	DISCHG 23.50 26.98 30.43 34.29 38.58 43.28 48.39 53.89 59.74 65.92		
2.80	DISCHG 72.39 79.11 86.05 93.15 100.41 107.77 115.15 122.50 129.69 136.67		
3.20	DISCHG 143.39 149.80 155.87 161.51 166.69 171.33 175.34 178.68 181.27 183.09		
3.60	DISCHG 184.19 184.61 184.39 183.65 182.38 180.70 178.64 176.26 173.64 170.80		
4.00	DISCHG 167.80 164.62 161.36 158.06 154.71 151.35 147.98 144.62 141.27 137.95		
4.40	DISCHG 134.71 131.53 128.47 125.51 122.65 119.86 117.14 114.45 111.81 109.20		
4.80	DISCHG 106.66 104.16 101.72 99.35 97.03 94.77 92.57 90.44 88.39 86.41		
5.20	DISCHG 84.52 82.70 80.95 79.27 77.65 76.11 74.62 73.21 71.87 70.59		
5.60	DISCHG 69.36 68.18 67.05 65.95 64.89 63.87 62.90 61.96 61.06 60.19		
6.00	DISCHG 59.35 58.54 57.74 56.94 56.14 55.34 54.51 53.66 52.77 51.84		
6.40	DISCHG 50.86 49.82 48.71 47.52 46.24 44.89 43.47 41.97 40.43 38.84		
6.80	DISCHG 37.22 35.58 33.94 32.30 30.67 29.05 27.45 25.89 24.37 22.90		
7.20	DISCHG 21.48 20.10 18.79 17.53 16.33 15.19 14.12 13.14 12.23 11.39		
7.60	DISCHG 10.61 9.90 9.24 8.62 8.05 7.52 7.02 6.56 6.13 5.72		
8.00	DISCHG 5.34 4.98 4.64 4.33 4.03 3.76 3.50 3.27 3.04 2.84		
8.40	DISCHG 2.64 2.46 2.29 2.13 1.98 1.85 1.72 1.60 1.49 1.39		
8.80	DISCHG 1.29 1.20 1.12 1.04 .97 .90 .84 .78 .72 .67		
9.20	DISCHG .62 .58 .53 .49 .45 .42 .39 .36 .33 .30		
9.60	DISCHG .28 .26 .24 .22 .20 .18 .17 .15 .14 .13		
10.00	DISCHG .11 .10 .09 .08 .07 .06 .05 .05 .04 .03		
10.40	DISCHG .03 .02 .02 .01 .01 .01 .00 .00 .00 .00		

RUNOFF VOLUME ABOVE BASEFLOW = 3.69 WATERSHED INCHES, 474.00 CFS-HRS, 39.17 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH CROSS SECTION 1

INPUT HYDROGRAPH = 6

OUTPUT HYDROGRAPH = 5

LENGTH = 4400.00 FEET

INPUT = RATING CURVE REPRESENTATIVE OF REACH

TR20 XEQ
REV 09/01/88

DEERUN1 DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
RAINFALL

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JOB 1 PASS 1
PAGE 5

COEFFICIENTS USED IN ROUTING RELATED TO CROSS SECTION AREA, $X = .99$ $K = 1.34$

MODIFIED ATT-KIN ROUTING COEFFICIENT = .15 PEAK TRAVEL TIME = .28 HOURS

PEAK TIME(HRS) 3.92
PEAK DISCHARGE(CFS) 174.91
PEAK ELEVATION(FEET) 205.99

TIME(HRS)	FIRST HYDROGRAPH POINT = .00 HOURS	TIME INCREMENT = .04 HOURS	DRAINAGE AREA = .20 SQ. MI.
1.20 DISCHG	.00 .00 .01 .03 .05 .07 .11 .15 .22 .31		
1.60 DISCHG	.41 .55 .71 .90 1.13 1.40 1.71 2.07 2.47 2.92		
2.00 DISCHG	3.42 3.97 4.58 5.25 6.00 6.83 7.77 8.82 10.00 11.34		
2.40 DISCHG	12.84 14.53 16.43 18.57 20.97 23.66 26.66 29.99 33.63 37.62		
2.80 DISCHG	41.95 46.60 51.57 56.83 62.38 68.19 74.24 80.50 86.91 93.45		
3.20 DISCHG	100.05 106.63 113.27 119.78 126.15 132.35 138.30 143.96 149.27 154.15		
3.60 DISCHG	158.59 162.49 165.87 168.70 170.99 172.73 173.95 174.66 174.90 174.71		
4.00 DISCHG	174.11 173.15 171.84 170.24 168.38 166.29 164.01 161.56 158.97 156.25		
4.40 DISCHG	153.46 150.60 147.68 144.74 141.80 138.88 135.97 133.09 130.24 127.43		
4.80 DISCHG	124.64 121.89 119.18 116.51 113.89 111.31 108.78 106.31 103.88 101.51		
5.20 DISCHG	99.20 96.96 94.78 92.67 90.62 88.64 86.72 84.87 83.09 81.37		
5.60 DISCHG	79.72 78.14 76.62 75.15 73.75 72.39 71.09 69.84 68.63 67.47		
6.00 DISCHG	65.35 65.29 64.26 63.26 62.29 61.35 60.43 59.53 58.63 57.73		
6.40 DISCHG	56.83 55.92 54.99 54.03 53.03 51.99 50.91 49.77 48.59 47.33		
6.80 DISCHG	46.03 44.69 43.29 41.86 40.40 38.91 37.41 35.88 34.36 32.83		
7.20 DISCHG	31.31 29.91 28.33 26.87 25.44 24.05 22.63 21.33 20.12 18.91		
7.60 DISCHG	17.76 16.67 15.64 14.66 13.73 12.96 12.35 11.78 10.55 9.88		
8.00 DISCHG	9.24 8.65 8.03 7.36 6.60 5.80 5.15 4.56 3.92 3.02		
8.40 DISCHG	4.68 4.37 4.08 3.81 3.55 3.31 3.09 2.88 2.68 2.50		
8.80 DISCHG	2.33 2.17 2.02 1.88 1.75 1.63 1.52 1.42 1.32 1.23		
9.20 DISCHG	1.14 1.06 .99 .92 .85 .79 .73 .68 .63 .59		
9.60 DISCHG	.54 .50 .46 .43 .40 .37 .34 .31 .28 .25		
10.00 DISCHG	.24 .22 .20 .19 .17 .15 .14 .13 .11 .10		
10.40 DISCHG	.09 .08 .07 .06 .05 .05 .04 .03 .03 .02		
10.80 DISCHG	.02 .01 .01 .01 .01 .01 .00 .00 .00 .00		

RUNOFF VOLUME ABOVE BASEFLOW = 3.69 WATERSHED INCHES, 473.96 CFS-HRS, 39.17 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS COMPLETED FOR PASS 1

RECORD ID 240

EXECUTIVE CONTROL OPERATION ENDJOB

RECORD ID 25

TR20 XEQ
REV 09/01/83

DEERUN1 DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
RAINFALL

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JOB 1 SUMMARY
PAGE 6

SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH.
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION			RUNOFF AMOUNT (IN)	PEAK DISCHARGE			
						BEGIN (HR)	AMOUNT (IN)	DURATION (HR)		ELEVATION (FT)	TIME (HR)	RATE (CFS)	RATE (CSM)
ALTERNATE 1 STORM 5													
XSECTION 1	RUNOFF	.20	7	2	.04	.0	5.90	6.00	3.69	---	3.65	184.61	927.7
XSECTION 1	REACH	.20	7	2	.04	.0	5.90	6.00	3.69	205.99	3.92	174.91	878.5

TR20 XEQ
REV 09/01/83

DEERUN1 DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
RAINFALL

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JOB 1 SUMMARY/
PAGE 7

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

HYDROGRAPH INFORMATION										ROUTING PARAMETERS							PEAK		
XSEC REACH		INFLOW		OUTFLOW		INTERV AREA		BASE-	VOLUME	MAIN	ITER-	Q AND A		PEAK	S/Q	ATT-	TRAVEL TIME		
ID	LENGTH	PEAK	TIME	PEAK	TIME	PEAK	TIME	FLOW	ABOVE	TIME	ATION	EQUATION	LENGTH	RATIO	%PEAK	KIN	STOR- KINE-		
(FT)	(CFS)	(HR)	(CFS)	(HR)	(CFS)	(HR)	(CFS)	(CFS)	(IN)	(HR)	#	COEFF	POWER	FACTOR	O/I	(K)	COEFF AGE MATIC		
												(X)	(M)	(K*)	(Q*)	(SEC)	(C)	(HR)	(HR)
ALTERNATE		1		STORM		5													
1	4400	185	3.6	175	3.9	---	---	0	3.69	.04	1	.987	1.34	.062	.947	870	.15	.28	.24

TR20 XEQ
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DEERUN1 DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
RAINFALL

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JOB 1 SUMMARY
PAGE 8

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS..... 6
------------------------------	-----------------------------	-------------------------

XSECTION	1	20
ALTERNATE	1	174.91

*****80-80 LIST OF INPUT DATA FOR TR-20 HYDROLOGY*****

TR-20		FULLPRINT		SUMMARY			
TITLE 001 DEERUN1		DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR				10	
TITLE RAINFALL						20	
5	RAINFL 7	1.0				40	
8		0.0	0.50	1.30	4.10	50	
8		5.50	5.90	5.90	5.90	60	
9	ENDTBL					70	
2	XSECTN 001	1.00	207.00			80	
8		203.50	0.00	0.00		90	
8		204.00	5.19	3.50		100	
8		204.50	21.85	10.00		110	
8		205.00	53.62	19.50		120	
8		205.50	104.19	32.00		130	
8		206.00	175.78	47.50		140	
8		206.50	274.41	66.00		150	
8		207.00	399.93	87.50		160	
8		207.50	556.08	112.00		170	
9	ENDTBL					180	
6	RUNOFF 1 001	6	0.199	80.0	1.44	1 1 1 1	190
6	RUNOFF 1 001	5	0.027	87.0	0.32	1 1 1 1	200
6	ADDDYD 4 001	6 5 7				1 1 1 1	210
6	REACH 3 001	7 5	4490.0			1 1 1 1	220
ENDATA							230
7	INCREM 6	0.04					240
7	COMPUT 7 001 001	1.0	1.0	7 2 01 06			250
ENDCMP 1							260
ENDJOB 2							270

*****END OF 80-80 LIST*****

FILE NO. 1

COMPUTER PROGRAM FOR PROJECT FORMULATION - HYDROLOGY USER NOTES

THE USERS MANUAL FOR THIS PROGRAM IS THE MAY 1982 DRAFT OF TR-20. CHANGES FROM THE 2/14/74 VERSION INCLUDE:

REACH ROUTING - THE MODIFIED ATT-KIN ROUTING PROCEDURE REPLACES THE CONVEX METHOD. INPUT DATA PREPARED FOR PREVIOUS PROGRAM VERSIONS USING CONVEX ROUTING COEFFICIENTS WILL NOT RUN ON THIS VERSION.

THE PREFERRED TYPE OF DATA ENTRY IS CROSS SECTION DATA REPRESENTATIVE OF A REACH. IT IS RECOMMENDED THAT THE OPTIONAL CROSS SECTION DISCHARGE-AREA PLOTS BE OBTAINED WHENEVER NEW CROSS SECTION DATA IS ENTERED. THE PLOTS SHOULD BE CHECKED FOR REASONABLENESS AND ADEQUACY OF INPUT DATA FOR THE COMPUTATION OF "K" VALUES USED IN THE ROUTING PROCEDURE.

GUIDELINES FOR DETERMINING OR ANALYZING REACH LENGTHS AND COEFFICIENTS (X,M) ARE AVAILABLE IN THE USERS MANUAL. SUMMARY TABLE 2 DISPLAYS REACH ROUTING RESULTS AND ROUTING PARAMETERS FOR COMPARISON AND CHECKING.

HYDROGRAPH GENERATION - THE PROCEDURE TO CALCULATE THE INTERNAL TIME INCREMENT AND PEAK TIME OF THE UNIT HYDROGRAPH HAVE BEEN IMPROVED. PEAK DISCHARGES AND TIMES MAY DIFFER FROM THE PREVIOUS VERSION. OUTPUT HYDROGRAPHS ARE STILL INTERPOLATED, PRINTED, AND ROUTED AT THE USER SELECTED MAIN TIME INCREMENT.

INTERMEDIATE PEAKS - METHOD ADDED TO PROVIDE DISCHARGES AT INTERMEDIATE POINTS WITHIN REACHES WITHOUT ROUTING.

OTHER - THIS VERSION CONTAINS SOME ADDITIONS TO THE INPUT AND NUMEROUS MODIFICATIONS TO THE OUTPUT. USER OPTIONS HAVE BEEN MODIFIED AND AUGMENTED ON THE JOB RECORD, RAINFALLS ADDED, ERROR AND WARNING MESSAGES EXPANDED, AND THE SUMMARY TABLES COMPLETELY REVISED. THE HOLDOUT OPTION IS NOT OPERATIONAL AT THIS TIME.

PROGRAM QUESTIONS OR PROBLEMS SHOULD BE DIRECTED TO HYDRAULIC ENGINEERS AT THE SCS NATIONAL TECHNICAL CENTERS:

CHESTER, PA (NORTHEAST) -- 215-499-3933, FORT WORTH, TX (SOUTH) -- 334-5242 (FTS)
LINCOLN, NE (MIDWEST) -- 541-5318 (FTS), PORTLAND, OR (WEST) -- 423-4099 (FTS)
OR HYDROLOGY UNIT, ENGINEERING DIVISION, LANHAM, MD -- 436-7383 (FTS).

PROGRAM CHANGES SINCE MAY 1982:

12/17/82 - CORRECT PEAK RATE FACTOR FOR USER ENTERED DIVHYO

CORRECT REACH ROUTING PEAK TRAVEL TIME PRINTED WITH FULLPRINT OPTION

5/02/83 - CORRECT COMPUTATIONS FOR ---

1. DIVISION OF BASEFLOW IN DIVERT OPERATION
2. HYDROGRAPH VOLUME SPLIT BETWEEN BASEFLOW AND ABOVE BASEFLOW
3. CROSS SECTION DATA PLOTTING POSITION
4. INTERMEDIATE PEAK WHEN "FROM" AREA IS LARGER THAN "THRU" AREA
5. STORAGE ROUTED REACH TRAVEL TIME FOR MULTYPEAK HYDROGRAPH
6. ORDERING "FLOW-FREQ" FILE FROM SUMMARY TABLE #3 DATA
7. BASEFLOW ENTERED WITH REACHYO
8. LOW FLOW SPLIT DURING DIVERT PROCEDURE #2 WHEN SECTION RATINGS START AT DIFFERENT ELEVATIONS

ENHANCEMENTS ---

1. REPLACE USER MANUAL ERROR CODES (PAGE 4-9 TO 4-11) WITH MESSAGES
2. LABEL OUTPUT HYDROGRAPH FILES WITH CROSS SECTION/STRUCTURE, ALTERNATE AND STORM NO'S

09/01/83 - CORRECT INPUT AND OUTPUT ERRORS FOR INTERMEDIATE PEAKS

CORRECT COMBINATION OF RATING TABLES FOR DIVERT

CHECK REACH ROUTING PARAMETERS FOR ACCEPTABLE LIMITS

ELIMINATE MINIMUM REACH TRAVEL TIME WHEN ATT-KIN COEFFICIENT EQUALS ONE

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DEERUN1 DEER RUN: XSECT. 1 WITH NO PONDS: 100 YR, 5 HR
RAINFALL

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CUMULATIVE RAINFALL TABLE 7 TIME INCREMENT= 1.00

8	.0000	.5000	1.0000	1.5000	2.0000
8	5.5000	5.9000	5.9000	5.9000	5.9000

9 ENDTBL

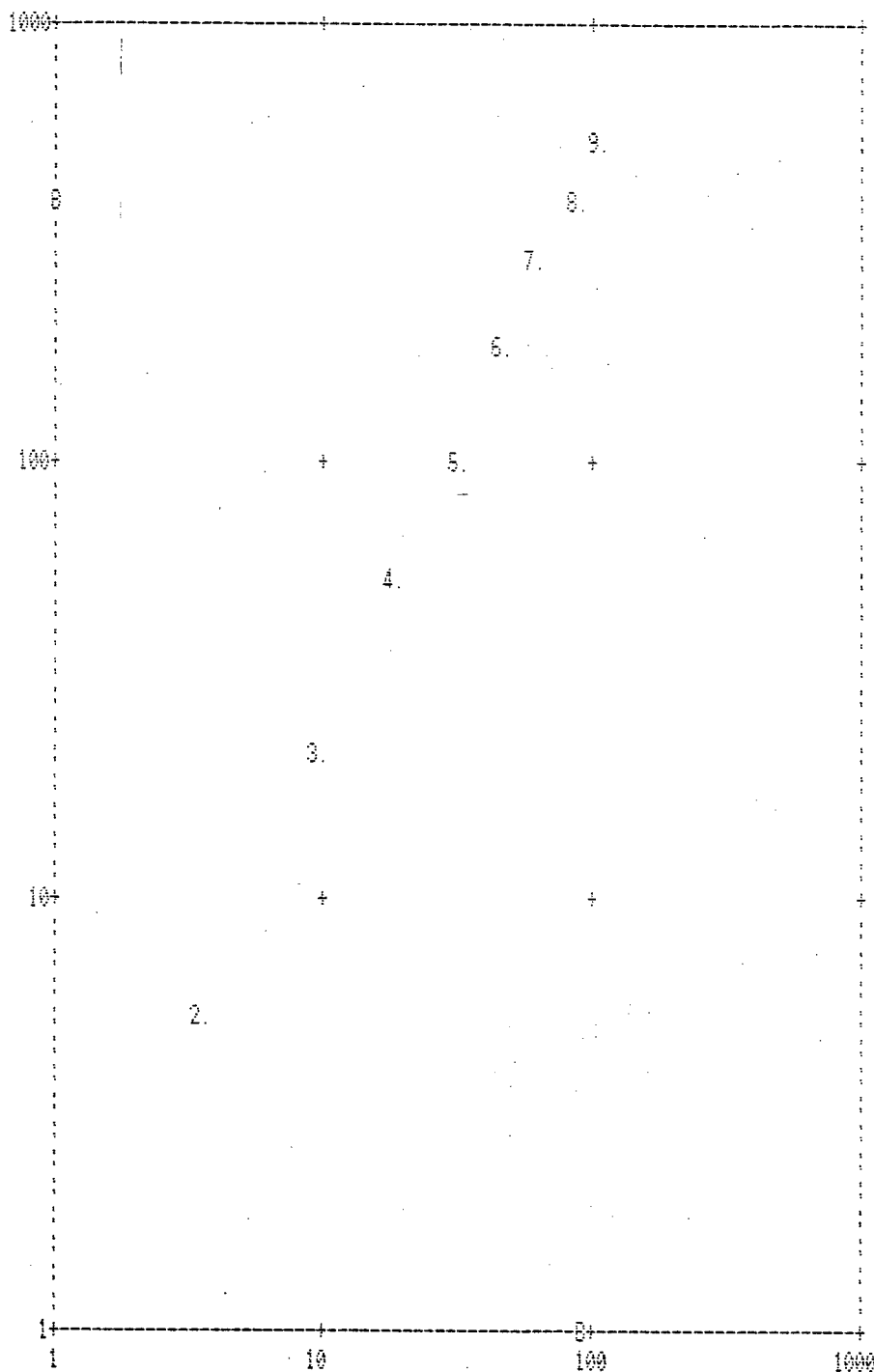
70

CROSS-SECTION DATA, CROSS-SECTION NO. 1 DRAINAGE AREA= 1.00 BANKFULL ELEV.= 207.00

	ELEVATION	DISCHARGE	END AREA
8	203.50	.00	.00
8	204.00	5.19	3.50
8	204.50	21.85	10.00
8	205.00	53.62	19.50
8	205.50	104.19	32.00
8	206.00	176.73	47.50
8	206.50	274.41	66.00
8	207.00	399.93	87.50
8	207.50	556.00	112.00

9 ENDTBL

LOG DISCHARGE
LINE



CROSS SECTION 1 END AREA VS DISCHARGE

REFERENCE NO'S	DISCHARGE (CFS)	END AREA (SQ. FT.)	M
1	.00	.00	1.37
2	5.19	3.50	1.37
3	21.85	10.00	1.37
4	53.62	19.50	1.35
5	104.19	32.00	1.35
6	175.78	47.50	1.34
7	274.41	66.00	1.34
8	399.93	87.50	1.34
9	556.08	112.00	1.34

LEGEND

+ = GRID REFERENCE
 . = LOCATION OF PLOTTED VALUE
 3 = REFERENCE NO. OF PLOTTED VALUE
 X = MULTIPLE REFERENCE NUMBERS
 B = BANKFULL RELATION SHOWN ON AXIS
 AREA= 87.5 SQ FT DISCHARGE= 399.9 CFS

LOG CROSS SECTION END AREA IN SQ. FT.

STANDARD CONTROL OPERATION RUNOFF CROSS SECTION 1
 OUTPUT HYDROGRAPH = 5
 OUTPUT OPTIONS IN EFFECT PEAK HYD VOL SUM

DATA FIELD VALUES = .1990 RECORD ID 190
 80.0000 1.4400

STANDARD CONTROL OPERATION RUNOFF CROSS SECTION 1
 OUTPUT HYDROGRAPH = 5
 OUTPUT OPTIONS IN EFFECT PEAK HYD VOL SUM

DATA FIELD VALUES = .0270 RECORD ID 200
 87.0000 .3200

STANDARD CONTROL OPERATION ADDHYD CROSS SECTION 1
INPUT HYDROGRAPHS = 6,5 OUTPUT HYDROGRAPH = 7
OUTPUT OPTIONS IN EFFECT PEAK HYD VOL SUM

DATA FIELD VALUES = .0000

RECORD ID 210
.0000 .0000

STANDARD CONTROL OPERATION REACH CROSS SECTION 1
INPUT HYDROGRAPH = 7 OUTPUT HYDROGRAPH = 5
OUTPUT OPTIONS IN EFFECT PEAK HYD VOL SUM

DATA FIELD VALUES = 4400.0000

RECORD ID 220
.0000 .0000

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DEERUN1 DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
RAINFALL

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JOB 1 PASS 1
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EXECUTIVE CONTROL OPERATION INCREM| MAIN TIME INCREMENT = .04 HOURS

RECORD ID 240

EXECUTIVE CONTROL OPERATION COMPUT FROM XSECTION 1 TO XSECTION 1

RECORD ID 250

STARTING TIME = .00 RAIN DEPTH = 1.00 RAIN DURATION = 1.00 RAIN TABLE NO. = 7 ANT. MOIST. COND = 2
ALTERNATE NO. = 1 STORM NO. = 6 MAIN TIME INCREMENT = .04 HOURS

OPERATION RUNOFF CROSS SECTION 1

OUTPUT HYDROGRAPH = 6

AREA = .20 SQ MI INPUT RUNOFF CURVE = 80. TIME OF CONCENTRATION = 1.44 HOURS

INTERNAL HYDROGRAPH TIME INCREMENT = .0400 HOURS

PEAK TIME(HRS) 3.65
PEAK DISCHARGE(CFS) 184.61
PEAK ELEVATION(Feet)
(RUNOFF)

TIME(HRS)	FIRST HYDROGRAPH POINT = .00 HOURS	TIME INCREMENT = .04 HOURS	DRAINAGE AREA = .20 SQ MI.
.00	DISCHG .00 .00 .00 .00 .00 .00 .00 .00 .01 .02		
1.20	DISCHG .03 .06 .10 .15 .22 .32 .44 .59 .78 1.01		
1.60	DISCHG 1.28 1.60 1.98 2.41 2.90 3.44 4.05 4.71 5.43 6.20		
2.00	DISCHG 7.03 7.95 8.98 10.13 11.46 12.95 14.65 16.55 18.73 21.16		
2.40	DISCHG 23.90 26.98 30.43 34.29 38.58 43.28 48.39 53.89 59.74 65.92		
2.80	DISCHG 72.39 79.11 86.05 93.15 100.41 107.77 115.16 122.50 129.69 136.67		
3.20	DISCHG 143.39 149.80 155.87 161.51 166.69 171.33 175.34 178.68 181.27 183.09		
3.60	DISCHG 184.19 184.61 184.39 183.65 182.38 180.70 178.64 176.26 173.64 170.80		
4.00	DISCHG 167.80 164.62 161.36 158.06 154.71 151.35 147.98 144.62 141.27 137.95		
4.40	DISCHG 134.71 131.53 128.47 125.51 122.65 119.86 117.14 114.45 111.81 109.20		
4.80	DISCHG 106.66 104.16 101.72 99.35 97.03 94.77 92.57 90.44 88.39 86.41		
5.20	DISCHG 84.52 82.70 80.95 79.27 77.65 76.11 74.62 73.21 71.87 70.59		
5.60	DISCHG 69.36 68.18 67.05 65.95 64.89 63.87 62.90 61.96 61.06 60.19		
6.00	DISCHG 59.36 58.54 57.74 56.94 56.14 55.34 54.51 53.66 52.77 51.84		
6.40	DISCHG 50.86 49.82 48.71 47.52 46.24 44.89 43.47 41.97 40.43 38.84		
6.80	DISCHG 37.22 35.58 33.94 32.30 30.67 29.05 27.45 25.89 24.37 22.90		
7.20	DISCHG 21.48 20.10 18.79 17.53 16.33 15.19 14.12 13.14 12.23 11.39		
7.60	DISCHG 10.61 9.90 9.24 8.62 8.05 7.52 7.02 6.55 6.13 5.72		
8.00	DISCHG 5.34 4.98 4.64 4.33 4.03 3.76 3.50 3.27 3.04 2.84		
8.40	DISCHG 2.64 2.46 2.29 2.13 1.98 1.85 1.72 1.60 1.49 1.39		
8.80	DISCHG 1.29 1.20 1.12 1.04 .97 .90 .84 .78 .72 .67		
9.20	DISCHG .62 .58 .53 .49 .46 .42 .39 .36 .33 .30		
9.60	DISCHG .28 .26 .24 .22 .20 .18 .17 .15 .14 .13		
10.00	DISCHG .11 .10 .09 .08 .07 .06 .05 .05 .04 .03		
10.40	DISCHG .03 .02 .02 .01 .01 .01 .00 .00 .00 .00		

RUNOFF VOLUME ABOVE BASEFLOW = 3.69 WATERSHED INCHES, 474.00 CFS-HRS, 39.17 ACRE-Feet; BASEFLOW = .00 CFS

OPERATION RUNOFF CROSS SECTION 1

OUTPUT HYDROGRAPH = 5

AREA = .03 SQ MI INPUT RUNOFF CURVE = 87. TIME OF CONCENTRATION = .32 HOURS

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DEERUNY DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
RAINFALL

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JOB 1 PASS 1
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INTERNAL HYDROGRAPH TIME INCREMENT= .0427 HOURS

PEAK TIME(HRS) PEAK DISCHARGE(CFS) PEAK ELEVATION(Feet)
3.00 43.32 (RUNOFF)
5.94 6.65 (RUNOFF)

TIME(HRS)	FIRST HYDROGRAPH POINT = .00 HOURS	TIME INCREMENT = .04 HOURS	DRAINAGE AREA = .03 SQ. MI.
.40	DISCHG .00 .00 .00 .00 .00 .00 .00 .01 .03 .08		
.80	DISCHG .16 .26 .39 .54 .69 .87 1.06 1.29 1.58 1.93		
1.20	DISCHG 2.33 2.74 3.17 3.57 3.95 4.31 4.64 4.96 5.27 5.56		
1.60	DISCHG 5.83 6.09 6.34 6.58 6.80 7.02 7.22 7.42 7.61 7.79		
2.00	DISCHG 8.00 8.52 9.70 11.87 14.96 18.54 22.18 25.57 28.49 30.85		
2.40	DISCHG 32.77 34.37 35.73 36.88 37.87 38.72 39.45 40.11 40.68 41.20		
2.80	DISCHG 41.66 42.08 42.46 42.81 43.13 43.32 43.08 42.01 39.70 36.22		
3.20	DISCHG 32.19 28.23 24.75 22.02 20.02 18.57 17.51 16.72 16.14 15.72		
3.60	DISCHG 15.42 15.19 15.03 14.92 14.84 14.78 14.74 14.72 14.70 14.69		
4.00	DISCHG 14.67 14.57 14.29 13.75 12.98 12.10 11.24 10.47 9.86 9.42		
4.40	DISCHG 9.10 8.86 8.63 8.57 8.48 8.41 8.36 8.33 8.30 8.29		
4.80	DISCHG 8.27 8.27 8.26 8.26 8.26 8.25 8.23 8.16 8.03 7.83		
5.20	DISCHG 7.60 7.38 7.19 7.04 6.93 6.85 6.79 6.75 6.72 6.69		
5.60	DISCHG 6.68 6.67 6.66 6.65 6.65 6.65 6.65 6.65 6.65 6.65		
6.00	DISCHG 6.62 6.61 6.61 6.61 6.61 6.61 6.61 6.61 6.61 6.61		
6.40	DISCHG .90 .67 .49 .36 .26 .19 .14 .10 .07 .05		
6.80	DISCHG .04 .02 .02 .01 .00 .00 .00 .00 .00 .00		

RUNOFF VOLUME ABOVE BASEFLOW = 4.42 WATERSHED INCHES, 75.98 CFS-HRS, 6.36 ACRE-Feet; BASEFLOW = .00 CFS

OPERATION ADDHYD CROSS SECTION 1
INPUT HYDROGRAPHS= 6,5 OUTPUT HYDROGRAPH= 7

PEAK TIME(HRS) PEAK DISCHARGE(CFS) PEAK ELEVATION(Feet)
3.63 199.81 206.12

TIME(HRS)	FIRST HYDROGRAPH POINT = .00 HOURS	TIME INCREMENT = .04 HOURS	DRAINAGE AREA = .23 SQ. MI.
.40	DISCHG .00 .00 .00 .00 .00 .00 .00 .01 .03 .08		
.80	DISCHG .16 .26 .39 .54 .69 .87 1.06 1.29 1.58 1.95		
1.20	DISCHG 2.36 2.80 3.26 3.72 4.17 4.63 5.08 5.56 6.05 6.56		
1.60	DISCHG 7.11 7.70 8.32 8.99 9.70 10.45 11.27 12.13 13.04 13.99		
2.00	DISCHG 15.03 16.47 18.67 22.01 26.42 31.50 36.84 42.14 47.21 52.01		
2.40	DISCHG 56.67 61.35 66.16 71.17 76.45 81.99 87.84 94.00 100.42 107.12		
2.80	DISCHG 114.05 121.19 128.51 135.96 143.53 151.09 158.24 164.51 169.38 172.89		
3.20	DISCHG 175.57 178.03 180.62 183.53 186.71 189.90 192.85 195.41 197.41 198.81		
3.60	DISCHG 199.60 199.80 199.43 199.57 197.22 195.48 193.38 190.97 188.34 185.49		
4.00	DISCHG 182.47 179.19 175.65 171.81 167.70 163.45 159.21 155.09 151.12 147.37		
4.40	DISCHG 143.81 140.39 137.16 134.08 131.12 128.27 125.51 122.78 120.11 117.49		
4.80	DISCHG 114.93 112.43 109.98 107.61 105.29 103.03 100.80 98.60 96.41 94.24		
5.20	DISCHG 92.12 90.08 88.14 86.31 84.58 82.96 81.41 79.96 78.59 77.28		
5.60	DISCHG 76.04 74.85 73.71 72.61 71.54 70.52 69.54 68.60 67.70 66.83		

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DEERUN1 DEER RUN: XSECT. 1 WITH NO PONDING; 100 YR, 6 HR
RAINFALL

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6.00	DISCHG	65.99	65.05	63.95	62.61	61.02	59.31	57.60	55.97	54.45	53.07
6.40	DISCHG	51.76	50.48	49.20	47.88	46.51	45.08	43.61	42.07	40.50	39.89
6.80	DISCHG	37.25	35.60	33.95	32.31	30.67	29.05	27.45	25.89	24.37	22.90
7.20	DISCHG	21.48	20.10	18.79	17.53	16.33	15.19	14.12	13.14	12.23	11.39
7.60	DISCHG	10.61	9.90	9.24	8.62	8.05	7.52	7.02	6.56	6.13	5.72
8.00	DISCHG	5.34	4.98	4.64	4.33	4.03	3.76	3.50	3.27	3.04	2.84
8.40	DISCHG	2.64	2.46	2.29	2.13	1.98	1.85	1.72	1.60	1.49	1.39
8.80	DISCHG	1.29	1.20	1.12	1.04	.97	.90	.84	.78	.72	.67
9.20	DISCHG	.62	.58	.53	.49	.45	.42	.39	.36	.33	.30
9.60	DISCHG	.28	.26	.24	.22	.20	.18	.17	.15	.14	.13
10.00	DISCHG	.11	.10	.09	.08	.07	.06	.05	.05	.04	.03
10.40	DISCHG	.03	.02	.02	.01	.01	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 3.78 WATERSHED INCHES, 550.97 CFS-HRS, 45.53 ACRE-FEET; BASEFLOW = .00 CFS

OPERATION REACH CROSS SECTION 1
INPUT HYDROGRAPH= 7 OUTPUT HYDROGRAPH= 5
LENGTH = 4400.00 FEET INPUT = RATING CURVE REPRESENTATIVE OF REACH

COEFFICIENTS USED IN ROUTING RELATED TO CROSS SECTION AREA, X= .99 M= 1.34

MODIFIED ATT-KIN ROUTING COEFFICIENT = .16 PEAK TRAVEL TIME = .24 HOURS

PEAK TIME(HRS) 3.88 PEAK DISCHARGE(CFS) 192.37 PEAK ELEVATION(FEET) 206.00

TIME(HRS)	FIRST HYDROGRAPH POINT = .00 HOURS				TIME INCREMENT = .04 HOURS				DRAINAGE AREA = .23 SQ.MI.		
.40	DISCHG	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
.80	DISCHG	.02	.04	.07	.12	.18	.26	.36	.47	.59	.75
1.20	DISCHG	.93	1.15	1.41	1.70	2.01	2.35	2.70	3.07	3.46	3.86
1.60	DISCHG	4.28	4.72	5.18	5.67	6.19	6.73	7.31	7.93	8.58	9.27
2.00	DISCHG	10.01	10.79	11.67	12.76	14.20	16.10	18.50	21.35	24.58	28.10
2.40	DISCHG	31.82	35.69	39.68	43.89	48.06	52.48	57.07	61.85	66.86	72.08
2.80	DISCHG	77.53	83.22	89.13	95.25	101.59	108.11	114.80	121.56	128.24	134.65
3.20	DISCHG	140.60	146.04	151.02	155.62	159.96	164.13	168.14	171.98	175.63	179.02
3.60	DISCHG	182.10	184.82	187.15	189.06	190.54	191.58	192.19	192.37	192.15	191.56
4.00	DISCHG	190.61	189.35	187.76	185.98	183.69	181.20	178.44	175.45	172.28	168.99
4.40	DISCHG	165.62	162.23	158.83	155.46	152.13	148.86	145.65	142.52	139.45	136.44
4.80	DISCHG	133.49	130.60	127.77	125.00	122.29	119.65	117.06	114.53	112.05	109.62
5.20	DISCHG	107.22	104.87	102.57	100.32	98.14	96.03	94.00	92.04	90.16	88.36
5.60	DISCHG	86.63	84.98	83.41	81.90	80.45	79.06	77.73	76.45	75.24	74.06
6.00	DISCHG	72.94	71.85	70.79	69.73	68.62	67.44	66.17	64.84	63.46	62.06
6.40	DISCHG	60.66	59.27	57.90	56.55	55.20	53.85	52.48	51.10	49.69	48.26
6.80	DISCHG	46.80	45.32	43.81	42.27	40.72	39.15	37.58	36.01	34.43	32.87
7.20	DISCHG	31.31	29.78	28.28	26.80	25.35	23.95	22.59	21.27	20.00	18.79
7.60	DISCHG	17.64	16.55	15.51	14.53	13.61	12.75	11.93	11.17	10.45	9.78
8.00	DISCHG	9.14	8.55	7.99	7.47	6.98	6.52	6.09	5.69	5.31	4.96
8.40	DISCHG	4.63	4.32	4.03	3.76	3.50	3.27	3.05	2.84	2.65	2.47
8.80	DISCHG	2.30	2.14	1.99	1.86	1.73	1.61	1.50	1.40	1.30	1.21
9.20	DISCHG	1.13	1.05	.97	.90	.84	.78	.72	.67	.62	.58
9.60	DISCHG	.53	.49	.46	.42	.39	.36	.33	.31	.28	.26

TR20 XEQ
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DEERUM: DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
RAINFALL

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JOB 1 PASS 1
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10.00	DISCHG	.24	.22	.20	.18	.17	.15	.14	.13	.11	.10
10.40	DISCHG	.09	.08	.07	.06	.05	.05	.04	.03	.03	.02
10.80	DISCHG	.02	.01	.01	.01	.01	.01	.00			

RUNOFF VOLUME ABOVE BASEFLOW = 3.78 WATERSHED INCHES, 550.94 CFS-HRS, 45.53 ACRE-FEET; BASEFLOW = .00 CFS

EXECUTIVE CONTROL OPERATION ENDCMP COMPUTATIONS COMPLETED FOR PASS 1

RECORD ID 260

EXECUTIVE CONTROL OPERATION ENDJOB

RECORD ID 270

TR20 XEQ
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DEERUN1 DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
RAINFALL

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JOB 1 SUMMARY
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SUMMARY TABLE 1 - SELECTED RESULTS OF STANDARD AND EXECUTIVE CONTROL INSTRUCTIONS IN THE ORDER PERFORMED
(A STAR(*) AFTER THE PEAK DISCHARGE TIME AND RATE (CFS) VALUES INDICATES A FLAT TOP HYDROGRAPH
A QUESTION MARK(?) INDICATES A HYDROGRAPH WITH PEAK AS LAST POINT.)

SECTION/ STRUCTURE ID	STANDARD CONTROL OPERATION	DRAINAGE AREA (SQ MI)	RAIN TABLE #	ANTEC MOIST COND	MAIN TIME INCREM (HR)	PRECIPITATION			RUNOFF AMOUNT (IN)	PEAK DISCHARGE				
						BEGIN (HR)	AMOUNT (IN)	DURATION (HR)		ELEVATION (FT)	TIME (HR)	RATE (CFS)	RATE (CSM)	
ALTERNATE 1 STORM 6														
XSECTION	1	RUNOFF	.20	7	2	.04	.0	5.90	6.00	3.69	---	3.65	104.61	927.7
XSECTION	1	RUNOFF	.03	7	2	.04	.0	5.90	6.00	4.42	---	3.00	43.32	1604.3
XSECTION	1	ADDHYD	.23	7	2	.04	.0	5.90	6.00	3.78	206.12	3.63	199.81	884.1
XSECTION	1	REACH	.23	7	2	.04	.0	5.90	6.00	3.78	206.08	3.88	192.37	851.2

TR20 XEQ
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DEERUN1 DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
RAINFALL

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JOB 1 SUMMARY
PAGE 3

SUMMARY TABLE 2 - SELECTED MODIFIED ATT-KIN REACH ROUTINGS IN ORDER OF STANDARD EXECUTIVE CONTROL INSTRUCTIONS
(A STAR(*) AFTER VOLUME ABOVE BASE(IN) INDICATES A HYDROGRAPH TRUNCATED AT A VALUE EXCEEDING BASE + 10% OF PEAK
A QUESTION MARK(?) AFTER COEFF.(C) INDICATES PARAMETERS OUTSIDE ACCEPTABLE LIMITS, SEE PREVIOUS WARNINGS)

HYDROGRAPH INFORMATION										ROUTING PARAMETERS						PEAK			
XSEC REACH		INFLOW		OUTFLOW		INTERV. AREA		BASE-	VOLUME	MAIN	ITER-	Q AND A		PEAK	S/Q	ATT-	TRAVEL TIME		
ID	LENGTH	PEAK	TIME	PEAK	TIME	PEAK	TIME	FLOW	ABOVE	TIME	ATION	EQUATION	LENGTH	RATIO	#PEAK	KIN	STOR- KINE-		
(FT)	(CFS)	(HR)	(CFS)	(HR)	(CFS)	(HR)	(CFS)	(CFS)	(IN)	(HR)	#	COEFF	POWER	FACTOR	O/I	(K)	COEFF	AGE	MATIC
												(X)	(M)	(K*)	(Q*)	(SEC)	(C)	(HR)	(HR)
ALTERNATE 1 STORM 6																			
1	4400	200	3.6	192	3.9	---	---	0	3.78	.04	1	.980	1.34	.055	.963	853	.16	.24	.24

TR20 XEQ
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DEERUN1 DEER RUN: XSECT. 1 WITH NO PONDS; 100 YR, 6 HR
RAINFALL

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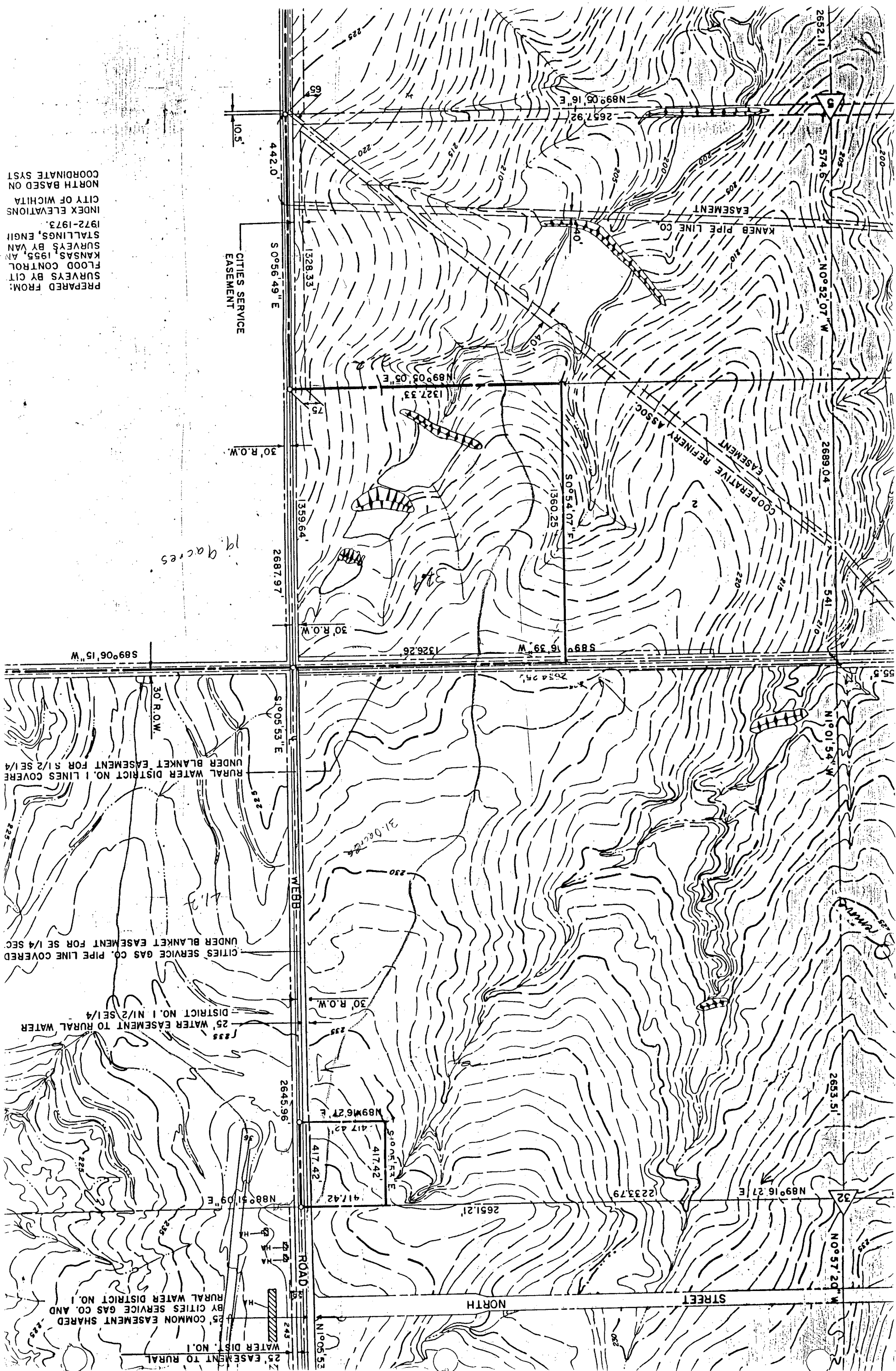
JOB 1 SUMMARY
PAGE 10

SUMMARY TABLE 3 - DISCHARGE (CFS) AT XSECTIONS AND STRUCTURES FOR ALL STORMS AND ALTERNATES

XSECTION/ STRUCTURE ID	DRAINAGE AREA (SQ MI)	STORM NUMBERS.....
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XSECTION 1	22	
ALTERNATE 1		192.37

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FLOOD CONTROL
KANSAS, 1955, AN
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STALLINGS, ENGI
1972-1973.
INDEX ELEVATIONS
CITY OF WICHITA
NORTH BASED ON
COORDINATE SYST



19.9 acres

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