

PRELIMINARY DRAINAGE REPORT

CRYSTAL LAKES ADDITION

TO

CITY OF WICHITA

October 1992

Poe and Associates of Kansas, Inc.

October 1, 1992

Department of Public Works
Engineering Division
City Hall-Seventh Floor
455 North Main Street
Wichita, Kansas 67202

Attn: Michael E. Lindebak, P.E.

Dear Mr. Lindebak:

The purpose of this report is to provide drainage design criteria for the future development within the drainage basin which is delineated herein.

Crystal Lakes Addition is a proposed residential subdivision which is to be developed around the lake located on the Miles Sand Co. property. This property is that part of the S1/2 of Section 19-26-1E which is west of the Little Arkansas River. Development of Crystal Lakes to provide for storage of drainage runoff as proposed in this report is the basis of the concept herein presented.

We are requesting that the City Engineering Department review and approve the methods and procedures presented in this report.

Information contained in this report has been prepared by M.S Mitchell and Poe and Associates.

Please contact us if we can provide any additional information.

Yours Truly,
Poe and Associates of Kansas, Inc.

Kenny E. Hill, P.E.
Project Manager

DRAINAGE CONCEPT

1. The area north of Miles Sand Co. and east of Meridian will not be allowed to drain into the lake.
2. Design flows are based on existing conditions and do not allow for increased runoff from future development.
3. Future development within this basin will not be allowed to increase runoff. (Storm water detention will be required)
4. The area north of The Moorings, south of 53rd Street and west of the existing Aqua Duct will drain into the existing lake to the west.
5. The two lakes east of Meridian as proposed on the Miles Sand Co. operational plan for sand extraction will not be connected as originally proposed.

M. S. Mitchell Prepared Information as Follows:

1. The drainage area to the northwest corner of the Crystal Lakes property is 1203 Acres.
2. The above concepts were assumed for all calculations.
3. Curve numbers and areas for each sub-basin were prepared as shown on the following pages 1-6.
4. HEC-1 Flood Routing of sub areas to provide peak flows and the maximum water surface elevation in the storage lake.

PLEASANT VALLEY TRIBUTARY
 DRAINAGE BASIN AREA & SCS CN Determination
 Sub AREA 1 (All Hydrologic Group B w/CN=75)

5619 5651

5585 5619

0.34 0.327 $0.33 \times 63.769 = 21 \text{ acres} / 640 = 0.03 \text{ sq. miles}$

Sub AREA 2 (All hydrologic Group B w/CN=75)

4212 4253

4170 4212

0.42 0.41 $0.41 \times 63.769 = 26 \text{ acres} / 640 = 0.04 \text{ Sq. miles}$

Sub Area 3

Cc Part in NW corner (Hydrologic Group D w/CN=87)

4449 4452 4457 (0.04 x 87 = 3.48)

~~4441~~ 4449 4452

~~08~~ 03 05 $0.04 \times 63.769 = 2.55 \text{ acres}$

Cc Part in South Central portion (Hydrologic Group D w/CN=85)

5043 5132 (Product = 58.67 x 85 = 4987)

4948 5043

95 89 $0.92 \times 63.769 = 58.67 \text{ acres}$

Tb Part in SW Corner (Hydrologic Group D w/CN=85)

4899 4909 (Product = 6.38 x 85 = 541)

4889 4899

11 10 $0.10 \times 63.769 = 6.38 \text{ acres}$

Gb & Tb Part in NE portion (Hydrologic Group D w/CN=83)

5260 5325 (Product = 42.73 x 83) = 3547

5190 5260

70 65 $0.67 \times 63.769 = 42.73 \text{ acres}$

Tb Part in SE portion (Hydrologic Group D w/CN=84)

5989 6010 (Product = 13.39 x 84 = 1125)

5967 5989

22 21 $0.21 \times 63.769 = 13.39 \text{ acres}$

PLEASANT VALLEY TRIBUTARY
DRAINAGE BASIN AREA & SCS CN Determination Continued

Sub Area 3 Continued

Total Area (All Hydrologic Soil Groups)

$$\begin{array}{r}
 \cancel{6539} \quad 7130 \quad 7727 \\
 \cancel{5989} \quad \underline{6535} \quad \underline{7130} \\
 \hline
 546 \quad 595 \quad 597
 \end{array}
 \left. \vphantom{\begin{array}{r} \cancel{6539} \\ \cancel{5989} \\ \hline \end{array}} \right\} 5.96 \times 63.769 = 380 \text{ acres} / 640 = 0.59 \text{ Sq. Miles}$$

Portion of Sub Area 3 which is Hydrologic Soil Group D

$$\Sigma = 58.67 + 6.37 + 42.73 + 13.39 = 121.16 \text{ acres}$$

Balance of Sub Area 3 is Hydrologic Group Bw / CN = 77

$$(\text{Product} = 380 - 121 = 259 \times 77 = 19,943)$$

$$\Sigma \text{ Product for Soil Group D} = \underline{10,200}$$

$$\text{Sum of Product of Area} \times \text{CN} = 30,143$$

$$\text{CN} = \Sigma \text{ Products} / \text{Area} = 30,143 / 380 = \underline{79}$$

Sub Area 4

Cc Part in North portion (Hydrologic Group D w/ CN = 87)

$$5769 \quad 5827 \quad (\text{Product} = 36.99 \times 87 = 3218)$$

$$\underline{5710} \quad \underline{5769}$$

$$59 \quad 58 \left. \vphantom{\begin{array}{r} 5710 \\ 5769 \end{array}} \right\} 0.58 \times 63.769 = 37 \text{ acres}$$

Total Area (All Hydrologic Soil Groups)

$$6093 \quad 6320$$

$$\underline{5860} \quad \underline{6093}$$

$$233 \quad 227 \left. \vphantom{\begin{array}{r} 5860 \\ 6093 \end{array}} \right\} 2.30 \times 63.769 = 147 \text{ acres} / 640 = 0.23 \text{ Sq. Miles}$$

Balance of Sub Area 4 which is Hydrologic Soil Group Bw / CN = 73

$$147 - 37 = 110 \text{ acres}$$

$$(\text{Product} = 110 \times 73 = 8030)$$

$$\Sigma \text{ of Products for Sub Area 4} \quad 8030 + 3218 = 11,248$$

$$\text{CN} = \Sigma \text{ Products} / \text{Area} = 11,248 / 147 = \underline{77}$$

PLEASANT VALLEY TRIBUTARY
Drainage Basin Area & SCS CN Determination Continued

Sub Area 5

Ce Part in E 1/2 (Hydrologic Soil Group D w/ CN = 86)

$$\begin{array}{r} 5965 \\ \hline 5955 \end{array} \quad \begin{array}{r} 5973 \\ \hline 5967 \end{array} \quad \begin{array}{r} 5980 \\ \hline 5973 \end{array} \quad (\text{Product} = 3.83 \times 86 = 329)$$

$$06 \quad 07 \quad > .06 \times 63.769 = \underline{3.83} \text{ acres}$$

Tb Part in SW Corner (Hydrologic Soil Group D w/ CN = 88)

$$\begin{array}{r} 6056 \\ \hline 6038 \end{array} \quad \begin{array}{r} 6065 \\ \hline 6060 \end{array} \quad \begin{array}{r} 6074 \\ \hline 6065 \end{array} \quad \begin{array}{r} 6090 \\ \hline 6074 \end{array} \quad (\text{Product} = 6.38 \times 88 = 561)$$

$$18 \quad 05 \quad 09 \quad 16 \quad > 0.10 \times 63.769 = \underline{6.38} \text{ acres}$$

Total Area (All Hydrologic Soil Groups)

$$\begin{array}{r} 6108 \\ \hline 6435 \end{array} \quad \begin{array}{r} 6980 \\ \hline 6108 \end{array}$$

$$273 \quad 212 \quad > 2.12 \times 63.769 = 173 \text{ acres} / 640 = 0.27$$

Balance of Sub Area 5 which is Hydrologic Soil Group B w/ CN = 73

$$173 - 10 = 163 \text{ acres}$$

$$(\text{Product} = 163 \times 73 = 11,899)$$

$$\Sigma \text{ Products for Sub Area 5} = 329 + 561 + 11,899 = 12,789$$

$$\text{CN} = \Sigma \text{ Products} / \text{Area} = 12,789 / 173 = \underline{74}$$

Sub Basin 6

Ea Part in NW portion (Hydrologic Soil Group B w/ CN = 75)

$$\begin{array}{r} 7723 \\ \hline 7673 \end{array} \quad \begin{array}{r} 7782 \\ \hline 7723 \end{array} \quad (\text{Product} = 35.07 \times 75 = 2630)$$

$$50 \quad 60 \quad > 0.55 \times 63.769 = 35.07 \text{ acres}$$

Total Sub Basin Area (All Hydrologic Soil Groups)

$$\begin{array}{r} 8110 \\ \hline 7950 \end{array} \quad \begin{array}{r} 8273 \\ \hline 8110 \end{array}$$

$$160 \quad 163 \quad > 1.62 \times 63.769 = 104 \text{ acres} / 640 = 0.16 \text{ Sq. Miles}$$

Balance of Sub Area 6 which is Hydrologic Soil Group D w/ CN = 86

$$104 - 35 = 69 \text{ acres}$$

$$(\text{Product} = 69 \times 86 = 5934)$$

PLEASANT VALLEY TRIBUTARY
DRAINAGE BASIN & SCS CU DETERMINATION CONTINUED
Sub Basin 6 Continued

$$\Sigma \text{ Products for SubArea 6} = 2630 + 5934 = 8564$$

$$CU = \Sigma \text{ Products} / \text{Area} = 8564 / 104 = \underline{82}$$

Sub Basin 7

Ea Part (Hydrologic Soil Group B w/CU=75)

1648	1700	1749	(Product = 3188 x 75 = 2391)
1610	1648	1700	
38	52	49	> 0.50 x 63.769 = 31.88 acres

Total Sub Basin Area (All Hydrologic Soil Groups)

$$0956 \quad 1068$$

$$\underline{0850} \quad \underline{0956}$$

$$106 \quad 112 > 1.09 \times 63.769 = 69 \text{ acres} / 640 = 0.11 \text{ Sq Miles}$$

Balance of SubArea 7 which is Hydrologic Soil Group D w/CU=86

$$69 - 32 = 37 \text{ acres}$$

$$(\text{Product} = 37 \times 86 = 3182)$$

$$\Sigma \text{ Products for SubArea 7} = 2391 + 3182 = 5573$$

$$CU = \Sigma \text{ Products} / \text{Area} = 5573 / 69 = \underline{81}$$

Sub Basin 8

Ea Part in SW Corner (Hydrologic Soil Group B w/CU=75)

1808	1814	(Product = 4.46 x 75 = 335)
1800	1808	
08	06	> 0.07 x 63.769 = 4.46 acres

$$\underline{1800} \quad \underline{1808}$$

$$08 \quad 06 > 0.07 \times 63.769 = 4.46 \text{ acres}$$

La Part in SW Corner (Hydrologic Soil Group C w/CU=83)

1820	1838	1850	(Product = 9.57 x 83 = 794)
1814	1820	1838	
06	18	12	> 0.15 x 63.769 = 9.57 acres

$$\underline{1814} \quad \underline{1820}$$

$$06 \quad 18 \quad 12 > 0.15 \times 63.769 = 9.57 \text{ acres}$$

PLEASANT VALLEY TRIBUTARY
DRAINAGE BASIN AREA & SCS CN DETERMINATION CONTINUED

SubArea 8 Continued (Total Basin Area (All Soil Groups))

2105 2258

1957 2105

148

1.53

$$1.50 \times 63.769 = 96 \text{ acres} / 640 = \underline{0.15 \text{ Sq Miles}}$$

Balance of SubBasin 8 which is Hydrologic Soil Group D w/CN=86

$$96 - 14 = 82 \text{ acres}$$

$$(\text{Product} = 82 \times 86 = 7052)$$

$$\Sigma \text{ Products for SubArea 8} = 335 + 794 + 7052 = 8181$$

$$\text{CN} = \Sigma \text{ Products} / \text{Area} = 8181 / 96 = 85$$

SubArea 9

East & West Parts in E 1/2 (Hydrologic Soil Group B w/CN=75)

~~294~~ / 8

3014

3080

$$(\text{Product} = 42 \times 75 = 3150)$$

2890

2948

3014

~~58~~

66

66

$$1.66 \times 63.769 = 42 \text{ acres}$$

Total Basin Area (All Soil Groups)

2400 2514

2284 2400

116

114

$$1.15 \times 63.769 = 73 \text{ acres} / 640 = \underline{0.11 \text{ Sq Miles}}$$

Balance of SubArea 9 which is Hydrologic Soil Group D w/CN=86

$$73 - 42 = 31 \text{ acres}$$

$$(\text{Product } 31 \times 86 = 2666)$$

$$\Sigma \text{ Products for SubArea 9} = 3150 + 2666 = 5816$$

$$\text{CN} = \Sigma \text{ Products} / \text{Area} = 5816 / 73 = 80$$

PLEASANT VALLEY TRIBUTARY
DRAINAGE BASIN AREA & SCS CN DETERMINATION CONTINUED

SubArea 10

Ea Part in NW Corner (Hydrologic Soil Group B w/CN=75)

$$\begin{array}{r} 0780 \\ \hline 0773 \\ \hline .07 \end{array} \quad \begin{array}{r} 0788 \\ \hline 0780 \\ \hline .08 \end{array} \quad \text{(Product } 5.10 \times 75 = 383)$$

$$\begin{array}{r} 0773 \\ \hline 0780 \\ \hline .07 \end{array} \quad \begin{array}{r} 0780 \\ \hline 0780 \\ \hline .08 \end{array} \quad \text{)} .08 \times 63.769 = 5.10 \text{ acres}$$

Ea Part in NE Portion (Hydrologic Soil Group w/CN=75)

$$\begin{array}{r} 0780 \\ \hline 0720 \\ \hline .60 \end{array} \quad \begin{array}{r} 0840 \\ \hline 0780 \\ \hline .60 \end{array} \quad \text{(Product } = 38.26 \times 75 = 2870)$$

$$\begin{array}{r} 0780 \\ \hline 0720 \\ \hline .60 \end{array} \quad \begin{array}{r} 0840 \\ \hline 0780 \\ \hline .60 \end{array} \quad \text{)} .60 \times 63.769 = 38.26 \text{ acres}$$

La Part in Central Strip (Hydrologic Soil Group C w/CN=88)

$$\begin{array}{r} 0893 \\ \hline 0840 \\ \hline .53 \end{array} \quad \begin{array}{r} 0948 \\ \hline 0893 \\ \hline .55 \end{array} \quad \text{(Product } = 34.44 \text{ Acres} \times 88 = 3030)$$

$$\begin{array}{r} 0840 \\ \hline 0893 \\ \hline .53 \end{array} \quad \begin{array}{r} 0893 \\ \hline 0893 \\ \hline .55 \end{array} \quad \text{)} 0.54 \times 63.769 = 34.44 \text{ acres}$$

Total Basin Area (All Soil Groups)

$$\begin{array}{r} 1077 \\ \hline 0887 \\ \hline 190 \end{array} \quad \begin{array}{r} 1264 \\ \hline 1077 \\ \hline 187 \end{array} \quad \text{)} 1.88 \times 63.769 = 120 \text{ acres} / 640 = 0.19 \text{ Sq. Miles}$$

$$\begin{array}{r} 1077 \\ \hline 0887 \\ \hline 190 \end{array} \quad \begin{array}{r} 1264 \\ \hline 1077 \\ \hline 187 \end{array} \quad \text{)} 1.88 \times 63.769 = 120 \text{ acres} / 640 = 0.19 \text{ Sq. Miles}$$

Balance of SubArea 10 which is Hydrologic Soil Group D w/CN=86

$$120 - (5.10 + 38.26 + 34.44) = 42.20 \text{ acres}$$

$$\text{(Product } = 42.20 \times 86 = 3629)$$

$$\Sigma \text{ Products for SubArea 10} = 383 + 2870 + 3030 + 3629 = 9912$$

$$\text{CN} = \Sigma \text{ Products} / \text{Area} = 9912 / 120 = 83$$

Table 2-2b.—Runoff curve numbers for cultivated agricultural lands¹

Cover description			Curve numbers for hydrologic soil group—			
Cover type	Treatment ²	Hydrologic condition ³	A	B	C	D
Fallow	Bare soil	—	77	86	91	94
	Crop residue cover (CR)	Poor	76	85	90	93
		Good	74	83	88	90
Row crops	Straight row (SR)	Poor	72	81	88	91
		Good	67	78	85	89
	SR + CR	Poor	71	80	87	90
		Good	64	75	82	85
	Contoured (C)	Poor	70	79	84	88
		Good	65	75	82	86
	C + CR	Poor	69	78	83	87
		Good	64	74	81	85
	Contoured & terraced (C&T)	Poor	66	74	80	82
		Good	62	71	78	81
C&T + CR	Poor	65	73	79	81	
	Good	61	70	77	80	
Small grain	SR	Poor	65	76	84	88
		Good	63	75	83	87
	SR + CR	Poor	64	75	83	86
		Good	60	72	80	84
	C	Poor	63	74	82	85
		Good	61	73	81	84
	C + CR	Poor	62	73	81	84
		Good	60	72	80	83
	C&T	Poor	61	72	79	82
		Good	59	70	78	81
	C&T + CR	Poor	60	71	78	81
		Good	58	69	77	80
Close-seeded or broadcast legumes or rotation meadow	SR	Poor	66	77	85	89
		Good	58	72	81	85
	C	Poor	64	75	83	85
		Good	55	69	78	83
	C&T	Poor	63	73	80	83
		Good	51	67	76	80

¹Average runoff condition, and $I_n = 0.2S$.

²Crop residue cover applies only if residue is on at least 5% of the surface throughout the year.

³Hydrologic condition is based on combination of factors that affect infiltration and runoff, including (a) density and canopy of vegetative areas, (b) amount of year-round cover, (c) amount of grass or close-seeded legumes in rotations, (d) percent of residue cover on the land surface (good $\geq 20\%$), and (e) degree of surface roughness.

Poor: Factors impair infiltration and tend to increase runoff.

Good: Factors encourage average and better than average infiltration and tend to decrease runoff.

Table 2-2c.—Runoff curve numbers for other agricultural lands¹

Cover description		Curve numbers for hydrologic soil group—			
		A	B	C	D
Cover type	Hydrologic condition				
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	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	30	55	70	77
Farmsteads—buildings, lanes, driveways, and surrounding lots.	—	59	74	82	86

¹Average 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.

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

⁵CN'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.

Table 2-2d.—Runoff curve numbers for arid and semiarid rangelands¹

Cover description		Curve numbers for hydrologic soil group--			
Cover type	Hydrologic condition ²	A ³	B	C	D
Herbaceous—mixture of grass, weeds, and low-growing brush, with brush the minor element.	Poor		80	87	93
	Fair		71	81	89
	Good		62	74	85
Oak-aspen—mountain brush mixture of oak brush, aspen, mountain mahogany, bitter brush, maple, and other brush.	Poor		66	74	79
	Fair		48	57	63
	Good		30	41	48
Pinyon-juniper—pinyon, juniper, or both; grass understory.	Poor		75	85	89
	Fair		58	73	80
	Good		41	61	71
Sagebrush with grass understory.	Poor		67	80	85
	Fair		51	63	70
	Good		35	47	55
Desert shrub—major plants include saltbush, greasewood, creosotebush, blackbrush, bursage, palo verde, mesquite, and cactus.	Poor	63	77	85	88
	Fair	55	72	81	86
	Good	49	68	79	84

¹Average runoff condition, and $I_a = 0.2S$. For range in humid regions, use table 2-2c.

²Poor: < 30% ground cover (litter, grass, and brush overstory).
 Fair: 30 to 70% ground cover.
 Good: > 70% ground cover.

³Curve numbers for group A have been developed only for desert shrub.

Table 2-2a.—Runoff curve numbers for urban areas¹

Cover description	Average percent impervious area ²	Curve numbers for hydrologic soil group—			
		A	B	C	D
<i>Fully developed urban areas (vegetation established)</i>					
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
<i>Developing urban areas</i>					
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).					

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

²The 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.

³CN's shown are equivalent to those of pasture. Composite CN's may be computed for other combinations of open space cover type.

⁴Composite 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.

⁵Composite 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.

PLEASANT VALLEY TRIBUTARY

DRAINAGE BASIN CHARACTERISTICS

OVERLAND FLOW REGIME

SubArea Data	Flow Length (FT)	Flow Slope (FT/FT)	Roughness Factor	%Sub-Area	Basin Area (Sq.Mi.)	SCS CN
SubArea 1	550	.001	.30	100	.03	75
SubArea 2	750	.001	.30	100	.04	75
SubArea 3	1050	.001	.30	100	.59	79
SubArea 4	850	.001	.30	100	.23	77
SubArea 5	1100	.001	.30	100	.27	74
SubArea 6	600	.001	.30	100	.16	82
SubArea 7	500	.001	.30	100	.11	86
SubArea 8	750	.001	.30	100	.15	85
SubArea 9	730	.001	.30	100	.11	80
SubArea 10	750	.001	.30	100	.19	83

PLEASANT VALLEY TRIBUTARY

DRAINAGE BASIN CHARACTERISTICS

CHANNEL FLOW REGIME

SubArea Data	CHANNEL LENGTH (FT)	CHANNEL SLOPE (FT/FT)	MANNING'S N	AREA (Sq.M.)	Shape	Bottom Width (FT)	Side Slope (ft/ft)	Upstream Inflow (Yes/No)
SubArea 1								
Collector	930	.001	.040	.01	TRAP	50	2	-
Main	500	.001	.060	-	TRAP	10	5	No
SubArea 2								
Collector	860	.001	.040	.01	TRAP	50	2	-
Main	250	.001	.060	-	TRAP	10	5	No
SubArea 3								
Collector	4600	.0011	.040	.02		50	2	
Main	3100	.0018	.060		TRAP	10	5	No
SubArea 4								
Main	4920	.0019	.040		TRAP	50	5	No
SubArea 5								
Collector	1200	.0042	.040	.01	TRAP	50	2	
Main	1050	.0014	.060	-	TRAP	10	5	No
SubArea 6								
Main	5200	.0011	.060	.01	TRAP	50	2	YES
SubArea 7								
Main	4200	.0012	.060	.01	TRAP	50	2	No

PLEASANT VALLEY TRIBUTARY

DRAINAGE BASIN CHARACTERISTICS

CHANNEL FLOW REGIME CONTINUED

SubArea Data	CHANNEL LENGTH (FT)	CHANNEL SLOPE (FT/FT)	MANNING'S n	AREA (sq mi)	SHAPE	BOTTOM WIDTH (FT)	SIDE SLOPE (FT/FT)	UPSTREAM FLOW (YES/NO)
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SubArea 8

collector	1300	.0013	.040	.01	TRAP	50	2	—
Main	1740	.0029	.060	—	TRAP	50	10	YES

SubArea 9

collector	1640	.0012	.040	.01	TRAP	50	2	
Main	600	.0050	.060	—	TRAP	10	5	No

SubArea 10

Main	3600	.0003	.060	—	TRAP	50	10	YES
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PLEASANT VALLEY TRIBUTARY

STORAGE TABLE OF SAND PIT # 1

Elevation (MSL)	Surface Area (ACRES)	Depth (FT)	VOLUME	
			Incremental ACRE FT	Accumulated ACRE FT
1315	58	0	0	0
1316	58	1	58	58
1317	58	2	58	116
1318	58	3	58	174
1319	58	4	58	232
1320	58	5	58	290
1321	58	6	58	348
1322	58	7	58	406
1323	58	8	58	464
1324	58	9	58	522
1325	58	10	58	580

```
*****
* FLOOD HYDROGRAPH PACKAGE *
* ALL OPTIONS EXCEPT ECONOMICS *
* THE NUMBER OF PLANS IS REDUCED TO 3 *
* MSDOS VERSION JANUARY 1988 *
* RUN DATE 01-01-1980 TIME 02:34:13.13 *
*****
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*****
* DEVELOPED BY COE-HEC *
* REVISED BY DODSON & ASSOCIATES INC *
* 7015 W TIDWELL SUITE 107 *
* HOUSTON TEXAS 77092 *
* PHONE (713) 895-8322 *
*****
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X X XXXXXXXX XXXXX XXX
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LINE	ID	1	2	3	4	5	6	7	8	9	10
1	ID	PLEASANT VALLEY TRIBUTARY WICHITA, KANSAS									
2	ID	15 MINUTE DISTRIBUTION OF 6 HOUR STORM BASED ON SCS CURVE									
3	ID	100-YEAR FREQUENCY STORM									
		FILE PVTRIB1.HC1									
4	IT	15	0	0	60						
5	IQ	4	1								
6	KK	RQHD1									
7	KM	RUNOFF HYDROGRAPH FROM SUBAREA 1									
8	PR	5.9									
9	PI	.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
10	PI	.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
11	PI	.12	.15	.09	.12						
12	BA	.03									
13	LS	0 75									
14	UK	550	.001	.30	100						
15	RK	900	.001	.040	.45	TRAP	50	2			
16	RK	500	.001	.060		TRAP	10	5			
17	KK	RQHD2									
18	KM	RUNOFF HYDROGRAPH FROM SUBAREA 2									
19	BA	.04									
20	LS	0 75									
21	UK	750	.001	.30	100						
22	RK	860	.001	.040	.39	TRAP	50	2			
23	RK	250	.001	.060		TRAP	10	5			
24	KK	COMB1									
25	KM	COMBINE RUNOFF HYDROGRAPH FROM SUBAREA 2 W/ROUTED HYDROGRAPH FROM SUBAREA 1									
26	HC	2									
27	KK	RQHD3									
28	KM	RUNOFF HYDROGRAPH FROM SUBAREA 3									
29	BA	0.59									
30	LS	0 79									
31	UK	1050	.001	.30	100						
32	RK	4600	.0011	.040	.02	TRAP	50	2			
33	RK	3100	.0018	.060		TRAP	10	5			
34	KK	COMB2									
35	KM	COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 1 WITH ROUTED HYDROGRAPH									
36	KM	FROM SUBAREA 3									
37	HC	2									
38	KK	RQHD4									
39	KM	RUNOFF HYDROGRAPH FROM SUBAREA 4									
40	BA	.23									
41	LS	0 77									
42	UK	850	.001	.30	100						
43	RK	4920	.0019	.040	.01	TRAP	50	5			

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

44 KK COMB3
 45 KM COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 2 WITH ROUTED HYDROGRAPH
 46 KM FROM SUBAREA 4
 47 HC 2

48 KK ROHD5
 49 KM RUNOFF HYDROGRAPH FROM SUBAREA 5
 50 BA .27
 51 LS 0 74
 52 UK 1100 .001 .30 100
 53 RK 1200 .0042 .040 .01 TRAP 50 2
 54 RK 1050 .0014 .060 TRAP 10 5

55 KK COMB4
 56 KM COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 3 WITH ROUTED HYDROGRAPH
 57 KM FROM SUBAREA 5
 58 HC 2

59 KK ROHD6
 60 KM RUNOFF HYDROGRAPH FROM SUBAREA 6 WITH RESULTANT HYDROGRAPH FROM
 61 KM COMBINATION 4 ROUTED THROUGH MAIN CHANNEL
 62 BA .16
 63 LS 0 82
 64 UK 600 .001 .30 100
 65 RK 5200 .0011 .060 .01 TRAP 50 2 YES

66 KK ROHD7
 67 KM RUNOFF HYDROGRAPH FROM SUBAREA 7
 68 BA .11
 69 LS 0 86
 70 UK 500 .001 .30 100
 71 RK 4200 .0012 .060 .01 TRAP 50 2

72 KK COMB5
 73 KM COMBINE ROUTED HYDROGRAPH FROM SUBAREA 7 AND UPSTREAM SUBAREAS WITH
 74 KM ROUTED HYDROGRAPH FROM SUBAREA 7
 75 HC 2

76 KK ROHD8
 77 KM RUNOFF HYDROGRAPH FROM SUBAREA 8
 78 BA .15
 79 LS 0 85
 80 UK 750 .001 .30 100
 81 RK 1300 .0013 .040 .01 TRAP 50 2
 82 RK 1740 .0029 .060 TRAP 50 10 YES

83 KK ROHD9
 84 KM RUNOFF HYDROGRAPH FROM SUBAREA 9
 85 BA .11
 86 LS 0 80
 87 UK 730 .001 .30 100
 88 RK 1640 .0012 .040 .01 TRAP 50 2

 FLOOD HYDROGRAPH PACKAGE HEC-1 (MSDOS VERSION) - JANUARY 1988
 DODSON AND ASSOCIATES, INC. 7015 W TIDWELL, HOUSTON TEXAS 77092, PHONE (713)895-8322

PLEASANT VALLEY TRIBUTARY WICHITA, KANSAS
 15 MINUTE DISTRIBUTION OF 6 HOUR STORM BASED ON SCS CURVE
 100-YEAR FREQUENCY STORM FILE PVTRIB1.HC1

5 ID OUTPUT CONTROL VARIABLES
 IPRNT 4 PRINT CONTROL
 IPLOT 1 PLOT CONTROL
 GSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
 NMIN 15 MINUTES IN COMPUTATION INTERVAL
 IDATE 1 0 STARTING DATE
 ITIME 0000 STARTING TIME
 NQ 60 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 1 0 ENDING DATE
 NOTIME 1445 ENDING TIME

 COMPUTATION INTERVAL .25 HOURS
 TOTAL TIME BASE 14.75 HOURS

ENGLISH UNITS

*** **

6 KK *****
 * *
 * R0HD1 *
 * *

 RUNOFF HYDROGRAPH FROM SUBAREA 1

SUBBASIN RUNOFF DATA

12 BA SUBBASIN CHARACTERISTICS
 TAREA .03 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

13 LS SCS LOSS RATE
 STRTL .67 INITIAL ABSTRACTION
 CURVE 05.00 CURVE NUMBER

RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

14 UK OVERLAND-FLOW ELEMENT NO. 1
 L 550. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

15 RK COLLECTOR CHANNEL
 L 900. CHANNEL LENGTH
 S .0010 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .45 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE

16 RK MAIN CHANNEL
 L 500. CHANNEL LENGTH
 S .0010 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .03 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 10.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	78.57
3	.1121	1.579	15.00	450.00
4	.2145	1.387	15.00	250.00

*** **

17 KK

* *
 * R0HD2 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 2

SUBBASIN RUNOFF DATA

19 BA

SUBBASIN CHARACTERISTICS
 TAREA .04 SUBBASIN AREA

PRECIPITATION DATA

9 PB

STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI

INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

20 LS

SCS LOSS RATE
 STRTL .67 INITIAL ABSTRACTION
 CRVNB 75.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

21 UK OVERLAND FLOW ELEMENT NO. 1
 L 750. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

22 RK COLLECTOR CHANNEL
 L 860. CHANNEL LENGTH
 S .0010 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .39 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE

23 RK MAIN CHANNEL
 L 250. CHANNEL LENGTH
 S .0010 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .04 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 10.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	93.75
3	.1121	1.579	15.00	430.00
4	.2145	1.387	15.00	125.00

*** ** ** ** **

24 KK

 * *
 * COMB1 *
 * *

COMBINE RUNOFF HYDROGRAPH FROM SUBAREA 2 W/ROUTED HYDROGRAPH FROM SUBAREA 1

26 HC HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** ** ** ** * * * * *

27 KK

 * *
 * ROHD3 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 3

SUBBASIN RUNOFF DATA

29 BA SUBBASIN CHARACTERISTICS
 TAREA .59 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

30 LS SCS LOSS RATE

STRTL .53 INITIAL ABSTRACTION

CRVNBR 79.00 CURVE NUMBER

RTIMP .00 PERCENT IMPERVIOUS AREA

31 UK KINEMATIC WAVE

OVERLAND-FLOW ELEMENT NO. 1

L 1050. OVERLAND FLOW LENGTH

S .0010 SLOPE

N .300 ROUGHNESS COEFFICIENT

PA 100.0 PERCENT OF SUBBASIN

32 RK COLLECTOR CHANNEL

L 4600. CHANNEL LENGTH

S .0011 SLOPE

N .040 CHANNEL ROUGHNESS COEFFICIENT

CA .02 CONTRIBUTING AREA

SHAPE TRAP CHANNEL SHAPE

WD 50.00 BOTTOM WIDTH OR DIAMETER

Z 2.00 SIDE SLOPE

33 RK MAIN CHANNEL

L 3100. CHANNEL LENGTH

S .0018 SLOPE

N .060 CHANNEL ROUGHNESS COEFFICIENT

CA .59 CONTRIBUTING AREA

SHAPE TRAP CHANNEL SHAPE

WD 10.00 BOTTOM WIDTH OR DIAMETER

Z 5.00 SIDE SLOPE

RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	116.67
3	.1176	1.579	15.00	1150.00
4	.2877	1.387	15.00	1550.00

*** **

34 KK *****

* * *

* COMB2 *

* * *

COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 1 WITH ROUTED HYDROGRAPH FROM SUBAREA 3

37 HC HYDROGRAPH COMBINATION

ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

 * *
 38 KK * RQHD4 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 4

SUBBASIN RUNOFF DATA

40 BA SUBBASIN CHARACTERISTICS
 TAREA .23 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

41 LS SCS LOSS RATE
 STRTL .60 INITIAL ABSTRACTION
 CRVNR 77.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

42 UK OVERLAND-FLOW ELEMENT NO. 1
 L 850. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

43 RK MAIN CHANNEL
 L 4920. CHANNEL LENGTH
 S .0019 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .23 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	94.44
3	.1842	1.515	15.00	2460.00

*** **

 * *
 44 KK * COMB3 *
 * *

COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 2 WITH ROUTED HYDROGRAPH FROM SUBAREA 4

47 HC HYDROGRAPH COMBINATION
 ICNMB 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

 * *
 48 KK * ROHDS *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 5

SUBBASIN RUNOFF DATA

50 BA SUBBASIN CHARACTERISTICS
 TAREA .27 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

51 LS SCS LOSS RATE
 STRTL .70 INITIAL ABSTRACTION
 CRVNBR 74.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

52 UK OVERLAND-FLOW ELEMENT NO. 1
 L 1100. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

53 RK COLLECTOR CHANNEL
 L 1200. CHANNEL LENGTH
 S .0042 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .01 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE

54 RK MAIN CHANNEL
 L 1050. CHANNEL LENGTH
 S .0014 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .27 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 10.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	100.00
3	.2298	1.579	15.00	600.00
4	.2538	1.387	15.00	525.00

*** **

55 KK *****
* *
* COMB4 *
* *

COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 3 WITH ROUTED HYDROGRAPH FROM SUBAREA 5

58 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

59 KK *****
* *
* ROKD6 *
* *

RUNOFF HYDROGRAPH FROM SUBAREA 6 WITH RESULTANT HYDROGRAPH FROM COMBINATION 4 ROUTED THROUGH MAIN CHANNEL

SUBBASIN RUNOFF DATA

62 BA SUBBASIN CHARACTERISTICS
TAREA .16 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

63 LS SCS LOSS RATE
STRTL .44 INITIAL ABSTRACTION
CRVNBR 82.00 CURVE NUMBER
RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

64 UK OVERLAND-FLOW ELEMENT NO. 1
L 600. OVERLAND FLOW LENGTH
S .0010 SLOPE
N .300 ROUGHNESS COEFFICIENT
PA 100.0 PERCENT OF SUBBASIN

65 RK MAIN CHANNEL
L 5200. CHANNEL LENGTH
S .0011 SLOPE
N .060 CHANNEL ROUGHNESS COEFFICIENT
CA .16 CONTRIBUTING AREA
SHAPE TRAP CHANNEL SHAPE
WD 50.00 BOTTOM WIDTH OR DIAMETER
Z 2.00 SIDE SLOPE
RUPSTQ YES ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	100.00
3	.0784	1.579	15.00	2600.00

*** **

 * *
 * ROHD7 *
 * *

66 KK

RUNOFF HYDROGRAPH FROM SUBAREA 7

SUBBASIN RUNOFF DATA

68 BA

SUBBASIN CHARACTERISTICS

TAREA .11 SUBBASIN AREA

PRECIPITATION DATA

9 PB

STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI

INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

69 LS

SCS LOSS RATE

STRTL .33 INITIAL ABSTRACTION
 CRVNB 86.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

70 UK

KINEMATIC WAVE

OVERLAND-FLOW ELEMENT NO. 1

L 500. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

71 RK

MAIN CHANNEL

L 4200. CHANNEL LENGTH
 S .0012 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .11 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE
 RUFSTG NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	83.33
3	.0819	1.579	15.00	2100.00

*** **

72 KK

* *
* COMB5 *
* *

COMBINE ROUTED HYDROGRAPH FROM SUBAREA 7 AND UPSTREAM SUBAREAS WITH
ROUTED HYDROGRAPH FROM SUBAREA 7

75 HC

HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

76 KK

* *
* ROHDS *
* *

RUNOFF HYDROGRAPH FROM SUBAREA 8

SUBBASIN RUNOFF DATA

78 BA

SUBBASIN CHARACTERISTICS
TAREA .15 SUBBASIN AREA

PRECIPITATION DATA

9 PB

STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI

INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

79 LS

SCS LOSS RATE
STRFL .35 INITIAL ABSTRACTION
CRVNBR 85.00 CURVE NUMBER
RTIMP .00 PERCENT IMPERVIOUS AREA

80 UK

KINEMATIC WAVE
OVERLAND-FLOW ELEMENT NO. 1
L 750. OVERLAND FLOW LENGTH
S .0010 SLOPE
N .300 ROUGHNESS COEFFICIENT
PA 100.0 PERCENT OF SUBBASIN

81 RK

COLLECTOR CHANNEL
L 1300. CHANNEL LENGTH
S .0013 SLOPE
N .040 CHANNEL ROUGHNESS COEFFICIENT
CA .01 CONTRIBUTING AREA
SHAPE TRAP CHANNEL SHAPE
WD 50.00 BOTTOM WIDTH OR DIAMETER
Z 2.00 SIDE SLOPE

82 RK

MAIN CHANNEL
L 1740. CHANNEL LENGTH
S .0029 SLOPE
N .060 CHANNEL ROUGHNESS COEFFICIENT
CA .15 CONTRIBUTING AREA
SHAPE TRAP CHANNEL SHAPE
WD 50.00 BOTTOM WIDTH OR DIAMETER
Z 10.00 SIDE SLOPE

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	107.14
3	.1279	1.579	15.00	650.00
4	.1756	1.456	15.00	870.00

*** **

 * *
 83 KK * RQHD9 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 9

SUBBASIN RUNOFF DATA

85 BA SUBBASIN CHARACTERISTICS
 TAREA .11 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

86 LS SCS LOSS RATE
 STRL .50 INITIAL ABSTRACTION
 CRVNR 80.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

87 UK OVERLAND-FLOW ELEMENT NO. 1
 L 730. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

88 RK COLLECTOR CHANNEL
 L 1640. CHANNEL LENGTH
 S .0012 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .01 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE

89 RK MAIN CHANNEL
 L 600. CHANNEL LENGTH
 S .0050 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .11 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 10.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	104.29
3	.1228	1.579	15.00	820.00
4	.4796	1.387	15.00	300.00

*** **

 * *
 90 KK * COMB6 *
 * *

COMBINE ROUTED HYDROGRAPH FROM SUBAREA 8 AND UPSTREAM AREAS WITH
 ROUTED HYDROGRAPH FROM SUBAREA 9

93 HC HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

 * *
 94 KK * RCHD10 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 10

SUBBASIN RUNOFF DATA

96 BA SUBBASIN CHARACTERISTICS
 TAREA .19 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

97 LS SCS LOSS RATE
 STRTL .41 INITIAL ABSTRACTION
 CRVNB 83.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

98 UK OVERLAND-FLOW ELEMENT NO. 1
 L 750. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

99 RK MAIN CHANNEL
 L 3600. CHANNEL LENGTH
 S .0003 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT

LN 117 CONTRASTING BLEN
SHAPE TRAP CHANNEL SHAPE
WD 50.00 BOTTOM WIDTH OR DIAMETER
Z 10.00 SIDE SLOPE
RUPSTQ YES ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	107.14
3	.0565	1.456	15.00	1800.00

RUNOFF SUMMARY
 FLOW IN CUBIC FEET PER SECOND
 TIME IN HOURS, AREA IN SQUARE MILES

OPERATION	STATION	PEAK FLOW	TIME OF PEAK	AVERAGE FLOW FOR MAXIMUM PERIOD			BASIN AREA	MAXIMUM STAGE	TIME OF MAX STAGE
				6-HOUR	24-HOUR	72-HOUR			
HYDROGRAPH AT	ROHD1	15.	4.25	9.	4.	4.	.03		
HYDROGRAPH AT	ROHD2	17.	4.75	11.	5.	5.	.04		
2 COMBINED AT	COMB1	31.	4.50	20.	9.	9.	.07		
HYDROGRAPH AT	ROHD3	222.	6.25	152.	77.	77.	.59		
2 COMBINED AT	COMB2	244.	6.25	168.	86.	86.	.66		
HYDROGRAPH AT	ROHD4	97.	5.25	63.	30.	30.	.23		
2 COMBINED AT	COMB3	325.	6.00	227.	117.	117.	.89		
HYDROGRAPH AT	ROHD5	96.	6.00	65.	32.	32.	.27		
2 COMBINED AT	COMB4	421.	6.00	291.	149.	149.	1.16		
HYDROGRAPH AT	ROHD6	471.	6.50	336.	171.	171.	1.32		
HYDROGRAPH AT	ROHD7	79.	4.00	41.	19.	19.	.11		
2 COMBINED AT	COMB5	511.	6.25	372.	190.	190.	1.43		
HYDROGRAPH AT	ROHD8	560.	6.50	419.	214.	214.	1.58		
HYDROGRAPH AT	ROHD9	54.	4.75	33.	16.	16.	.11		
2 COMBINED AT	COMB6	599.	6.25	451.	230.	230.	1.69		
HYDROGRAPH AT	ROHD10	666.	6.00	499.	253.	253.	1.88		

*** NORMAL END OF HEC-1 ***

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*****
* FLOOD HYDROGRAPH PACKAGE *
* ALL OPTIONS EXCEPT ECONOMICS *
* THE NUMBER OF PLANS IS REDUCED TO 3 *
* MSDOS VERSION JANUARY 1988 *
* RUN DATE 01-01-1980 TIME 05:18:04.35 *
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*****
* DEVELOPED BY CGE-HEC *
* REVISED BY DODSON & ASSOCIATES INC *
* 7015 W TIDWELL SUITE 107 *
* HOUSTON TEXAS 77092 *
* PHONE (713) 895-8322 *
*****
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X X XXXXXXXX XXXXX XXX
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LINE	ID	1	2	3	4	5	6	7	8	9	10
1	ID	PLEASANT VALLEY TRIBUTARY WICHITA, KANSAS									
2	ID	15 MINUTE DISTRIBUTION OF 6 HOUR STORM BASED ON SCS CURVE									
3	ID	100-YEAR FREQUENCY STORM									
4	IT	15	0	0	60						
5	ID	4	1								
6	KK	ROHD1									
7	KM	RUNOFF HYDROGRAPH FROM SUBAREA 1									
8	PR	5.9									
9	PI	.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
10	PI	.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
11	PI	.12	.15	.09	.12						
12	BA	.03									
13	LS	0	75								
14	UK	550	.001	.30	100						
15	RK	900	.001	.040	.45	TRAP	50	2			
16	RK	500	.001	.060		TRAP	10	5			
17	KK	ROHD2									
18	KM	RUNOFF HYDROGRAPH FROM SUBAREA 2									
19	BA	.04									
20	LS	0	75								
21	UK	750	.001	.30	100						
22	RK	860	.001	.040	.39	TRAP	50	2			
23	RK	250	.001	.060		TRAP	10	5			
24	KK	COMB1									
25	KM	COMBINE RUNOFF HYDROGRAPH FROM SUBAREA 2 W/ROUTED HYDROGRAPH FROM SUBAREA 1									
26	HC	2									
27	KK	ROHD3									
28	KM	RUNOFF HYDROGRAPH FROM SUBAREA 3									
29	BA	0.59									
30	LS	0	79								
31	UK	1050	.001	.30	100						
32	RK	4600	.0011	.040	.02	TRAP	50	2			
33	RK	3100	.0018	.060		TRAP	10	5			
34	KK	COMB2									
35	KM	COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 1 WITH ROUTED HYDROGRAPH									
36	KM	FROM SUBAREA 3									
37	HC	2									
38	KK	ROHD4									
39	KM	RUNOFF HYDROGRAPH FROM SUBAREA 4									
40	BA	.23									
41	LS	0	77								
42	UK	850	.001	.30	100						
43	RK	4920	.0019	.040	.01	TRAP	50	5			

01-01-1980

05:18:54.11

HEC-1 INPUT

PAGE 2

LINE	ID	1	2	3	4	5	6	7	8	9	10	
44	KK	COMB3										
45	KM	COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 2 WITH ROUTED HYDROGRAPH										
46	KM	FROM SUBAREA 4										
47	HC	2										
48	KK	ROHD5										
49	KM	RUNOFF HYDROGRAPH FROM SUBAREA 5										
50	BA	.27										
51	LS	0 74										
52	UK	1100	.001	.30	100							
53	RK	1200	.0042	.040	.01	TRAP	50	2				
54	RK	1050	.0014	.060		TRAP	10	5				
55	KK	COMB4										
56	KM	COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 3 WITH ROUTED HYDROGRAPH										
57	KM	FROM SUBAREA 5										
58	HC	2										
59	KK	ROHD6										
60	KM	RUNOFF HYDROGRAPH FROM SUBAREA 6 WITH RESULTANT HYDROGRAPH FROM										
61	KM	COMBINATION 4 ROUTED THROUGH MAIN CHANNEL										
62	BA	.16										
63	LS	0 82										
64	UK	600	.001	.30	100							
65	RK	5200	.0011	.060	.01	TRAP	50	2	YES			
66	KK	ROHD7										
67	KM	RUNOFF HYDROGRAPH FROM SUBAREA 7										
68	BA	.11										
69	LS	0 86										
70	UK	500	.001	.30	100							
71	RK	4200	.0012	.060	.01	TRAP	50	2				
72	KK	COMB5										
73	KM	COMBINE ROUTED HYDROGRAPH FROM SUBAREA 7 AND UPSTREAM SUBAREAS WITH										
74	KM	ROUTED HYDROGRAPH FROM SUBAREA 7										
75	HC	2										
76	KK	ROHD8										
77	KM	RUNOFF HYDROGRAPH FROM SUBAREA 8										
78	BA	.15										
79	LS	0 85										
80	UK	750	.001	.30	100							
81	RK	1300	.0013	.040	.01	TRAP	50	2				
82	RK	1740	.0029	.060		TRAP	50	10	YES			
83	KK	ROHD9										
84	KM	RUNOFF HYDROGRAPH FROM SUBAREA 9										
85	BA	.11										
86	LS	0 80										
87	UK	730	.001	.30	100							
88	RK	1640	.0012	.040	.01	TRAP	50	2				
89	RK	600	.0050	.060		TRAP	10	5				

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

90 KK COMB6
 91 KM COMBINE ROUTED HYDROGRAPH FROM SUBAREA 8 AND UPSTREAM AREAS WITH
 92 KM ROUTED HYDROGRAPH FROM SUBAREA 9
 93 HC 2

94 KK R0HD10
 95 KM RUNOFF HYDROGRAPH FROM SUBAREA 10
 96 BA .19
 97 LS 0 83
 98 UK 750 .001 .30 100
 99 RK 3600 .0003 .060 TRAP 50 10 YES

100 KK RTE1
 101 KO 1 2
 102 KM ROUTE OUTFLOW FROM TOTAL DRAINAGE BASIN UPSTREAM FROM NE CORNER THE MOORINGS
 103 KM THROUGH SAND PIT 1
 104 RS 1 ELEV 1315
 105 SV 1 116 232 348 464 580
 106 SE 1315 1317 1319 1321 1323 1325
 107 SS 1322.4 50 2.7 1.5
 108 ZZ

 FLOOD HYDROGRAPH PACKAGE HEC-1 (MSDOS VERSION) - JANUARY 1988
 DODSON AND ASSOCIATES, INC. 7015 W TIDWELL, HOUSTON TEXAS 77092, PHONE (713)895-8322

PLEASANT VALLEY TRIBUTARY WICHITA, KANSAS
 15 MINUTE DISTRIBUTION OF 6 HOUR STORM BASED ON SCS CURVE
 100-YEAR FREQUENCY STORM FILE PVTRIB1.HCI

5 IO OUTPUT CONTROL VARIABLES

 IPRNT 4 PRINT CONTROL
 IPLST 1 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

 NMIN 15 MINUTES IN COMPUTATION INTERVAL
 IDATE 1 0 STARTING DATE
 ITIME 0000 STARTING TIME
 NQ 60 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 1 0 ENDING DATE
 NDTIME 1445 ENDING TIME

 COMPUTATION INTERVAL .25 HOURS
 TOTAL TIME BASE 14.75 HOURS

ENGLISH UNITS

*** **

6 KK

 * *
 * ROHD1 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 1

SUBBASIN RUNOFF DATA

12 BA

SUBBASIN CHARACTERISTICS
 TAREA .03 SUBBASIN AREA

PRECIPITATION DATA

9 PB

 STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI

 INCREMENTAL PRECIPITATION PATTERN
 .09 .13 .13 .09 .18 .18 .23 .38 .94 1.12
 .35 .30 .21 .23 .15 .15 .17 .15 .12 .12
 .12 .15 .09 .12

13 LS

SCS LOSS RATE
 STRTL .67 INITIAL ABSTRACTION
 CRVNBR 75.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

14 UK OVERLAND-FLOW ELEMENT NO. 1
 L 550. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

15 RK COLLECTOR CHANNEL
 L 900. CHANNEL LENGTH
 S .0010 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .45 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE

16 RK MAIN CHANNEL
 L 500. CHANNEL LENGTH
 S .0010 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .03 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 10.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	78.57
3	.1121	1.579	15.00	450.00
4	.2145	1.387	15.00	250.00

*** **

 * *
 * RQHD2 *
 * *

17 KK

RUNOFF HYDROGRAPH FROM SUBAREA 2

SUBBASIN RUNOFF DATA

19 BA SUBBASIN CHARACTERISTICS
 TAREA .04 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN
 .09 .13 .13 .09 .18 .18 .23 .38 .74 1.12
 .35 .30 .21 .23 .15 .15 .17 .15 .12 .12
 .12 .15 .09 .12

20 LS SCS LOSS RATE
 STRL .67 INITIAL ABSTRACTION
 CRVNBR 75.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

21 UK KINEMATIC WAVE
 OVERLAND-FLOW ELEMENT NO. 1
 L 750. OVERLAND FLOW LENGTH

22 RK N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN
 COLLECTOR CHANNEL
 L 860. CHANNEL LENGTH
 S .0010 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .39 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE

23 RK MAIN CHANNEL
 L 250. CHANNEL LENGTH
 S .0010 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .04 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 10.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	93.75
3	.1121	1.579	15.00	430.00
4	.2145	1.387	15.00	125.00

*** **

24 KK *****
 * *
 * COMB1 *
 * *

COMBINE RUNOFF HYDROGRAPH FROM SUBAREA 2 W/ROUTED HYDROGRAPH FROM SUBAREA 1

26 HC HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

27 KK *****
 * *
 * ROHD3 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 3

SUBBASIN RUNOFF DATA

29 BA SUBBASIN CHARACTERISTICS
 TAREA .59 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

30 LS SCS LOSS RATE

STRTL .53 INITIAL ABSTRACTION

CRVNBR 79.00 CURVE NUMBER

RTIMP .00 PERCENT IMPERVIOUS AREA

31 UK KINEMATIC WAVE

OVERLAND-FLOW ELEMENT NO. 1

L 1050. OVERLAND FLOW LENGTH

S .0010 SLOPE

N .300 ROUGHNESS COEFFICIENT

PA 100.0 PERCENT OF SUBBASIN

32 RK COLLECTOR CHANNEL

L 4600. CHANNEL LENGTH

S .0011 SLOPE

N .040 CHANNEL ROUGHNESS COEFFICIENT

CA .02 CONTRIBUTING AREA

SHAPE TRAP CHANNEL SHAPE

WD 50.00 BOTTOM WIDTH OR DIAMETER

Z 2.00 SIDE SLOPE

33 RK MAIN CHANNEL

L 3100. CHANNEL LENGTH

S .0018 SLOPE

N .060 CHANNEL ROUGHNESS COEFFICIENT

CA .59 CONTRIBUTING AREA

SHAPE TRAP CHANNEL SHAPE

WD 10.00 BOTTOM WIDTH OR DIAMETER

Z 5.00 SIDE SLOPE

RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	116.67
3	.1176	1.579	15.00	1150.00
4	.2877	1.387	15.00	1550.00

*** **

34 KK

* * *

* COMB2 *

* * *

COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 1 WITH ROUTED HYDROGRAPH FROM SUBAREA 3

37 HC

HYDROGRAPH COMBINATION

ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

38 KK * *
* RQHD4 *
* *

RUNOFF HYDROGRAPH FROM SUBAREA 4

SUBBASIN RUNOFF DATA

40 BA SUBBASIN CHARACTERISTICS
TAREA .23 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN
.09 .13 .13 .09 .18 .18 .23 .38 .94 1.12
.35 .30 .21 .23 .15 .15 .17 .15 .12 .12
.12 .15 .09 .12

41 LS SCS LOSS RATE
STRTL .60 INITIAL ABSTRACTION
CRVNR 77.00 CURVE NUMBER
RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

42 UK OVERLAND-FLOW ELEMENT NO. 1
L 850. OVERLAND FLOW LENGTH
S .0010 SLOPE
N .300 ROUGHNESS COEFFICIENT
PA 100.0 PERCENT OF SUBBASIN

43 RK MAIN CHANNEL
L 4920. CHANNEL LENGTH
S .0019 SLOPE
N .040 CHANNEL ROUGHNESS COEFFICIENT
CA .23 CONTRIBUTING AREA
SHAPE TRAP CHANNEL SHAPE
WD 50.00 BOTTOM WIDTH OR DIAMETER
Z 5.00 SIDE SLOPE
RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	94.44
3	.1842	1.515	15.00	2460.00

*** **

* *
44 KK * COMB3 *
* *

COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 2 WITH ROUTED HYDROGRAPH
FROM SUBAREA 4

47 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** ** ** ** **

48 KK

* *
* ROHD5 *
* *

RUNOFF HYDROGRAPH FROM SUBAREA 5

SUBBASIN RUNOFF DATA

50 BA

SUBBASIN CHARACTERISTICS

TAREA .27 SUBBASIN AREA

PRECIPITATION DATA

9 PB

STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI

INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

51 LS

SCS LOSS RATE

STRTL .70 INITIAL ABSTRACTION
 CRVNBR 74.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

52 UK

OVERLAND-FLOW ELEMENT NO. 1

L 1100. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

53 RK

COLLECTOR CHANNEL

L 1200. CHANNEL LENGTH
 S .0042 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .01 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE

54 RK

MAIN CHANNEL

L 1050. CHANNEL LENGTH
 S .0014 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .27 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 10.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	100.00
3	.2298	1.579	15.00	600.00
4	.2538	1.387	15.00	525.00

 * *
 55 KK * COMB4 *
 * *

COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 3 WITH ROUTED HYDROGRAPH FROM SUBAREA 5

58 HC HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** ** ** ** **

 * *
 59 KK * ROHD6 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 6 WITH RESULTANT HYDROGRAPH FROM COMBINATION 4 ROUTED THROUGH MAIN CHANNEL

SUBBASIN RUNOFF DATA

62 BA SUBBASIN CHARACTERISTICS
 TAREA .16 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

63 LS SCS LOSS RATE
 STRTL .44 INITIAL ABSTRACTION
 CRVNBR 82.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

64 UK KINEMATIC WAVE
 OVERLAND-FLOW ELEMENT NO. 1
 L 600. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

65 RK MAIN CHANNEL
 L 5200. CHANNEL LENGTH
 S .0011 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .16 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE
 RUPSTQ YES ROUTE UPSTREAM HYDROGRAPH

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	100.00
3	.0784	1.579	15.00	2600.00

*** **

 * *
 66 KK * ROHD7 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 7

SUBBASIN RUNOFF DATA

68 BA SUBBASIN CHARACTERISTICS
 TAREA .11 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

69 LS SCS LOSS RATE
 STRL .33 INITIAL ABSTRACTION
 CRVNBR 86.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

70 UK OVERLAND-FLOW ELEMENT NO. 1
 L 500. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

71 RK MAIN CHANNEL
 L 4200. CHANNEL LENGTH
 S .0012 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .11 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	83.33
3	.0819	1.579	15.00	2100.00

*** **

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* *

COMBINE ROUTED HYDROGRAPH FROM SUBAREA 7 AND UPSTREAM SUBAREAS WITH
ROUTED HYDROGRAPH FROM SUBAREA 7

75 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** ** ** ** **

* *
* ROHDB *
* *

76 KK

RUNOFF HYDROGRAPH FROM SUBAREA 8

SUBBASIN RUNOFF DATA

78 BA SUBBASIN CHARACTERISTICS
TAREA .15 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN
.09 .13 .13 .09 .18 .18 .23 .38 .94 1.12
.35 .30 .21 .23 .15 .15 .17 .15 .12 .12
.12 .15 .09 .12

79 LS SCS LOSS RATE
STRTL .35 INITIAL ABSTRACTION
CRVNBR 85.00 CURVE NUMBER
RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

80 UK OVERLAND-FLOW ELEMENT NO. 1
L 750. OVERLAND FLOW LENGTH
S .0010 SLOPE
N .300 ROUGHNESS COEFFICIENT
PA 100.0 PERCENT OF SUBBASIN

81 RK COLLECTOR CHANNEL
L 1300. CHANNEL LENGTH
S .0013 SLOPE
N .040 CHANNEL ROUGHNESS COEFFICIENT
CA .01 CONTRIBUTING AREA
SHAPE TRAP CHANNEL SHAPE
WD 50.00 BOTTOM WIDTH OR DIAMETER
Z 2.00 SIDE SLOPE

82 RK MAIN CHANNEL
L 1740. CHANNEL LENGTH
S .0029 SLOPE
N .060 CHANNEL ROUGHNESS COEFFICIENT
CA .15 CONTRIBUTING AREA
SHAPE TRAP CHANNEL SHAPE
WD 50.00 BOTTOM WIDTH OR DIAMETER
Z 10.00 SIDE SLOPE
RUPSTQ YES ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	107.14
3	.1279	1.579	15.00	650.00
4	.1756	1.456	15.00	870.00

*** ** ** ** **

 * *
 * ROHD9 *
 * *

83 KK

RUNOFF HYDROGRAPH FROM SUBAREA 9

SUBBASIN RUNOFF DATA

85 BA

SUBBASIN CHARACTERISTICS

TAREA .11 SUBBASIN AREA

PRECIPITATION DATA

9 PB

STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI

INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	.12
.12	.15	.09	.12						

86 LS

SCS LOSS RATE

STRTL .50 INITIAL ABSTRACTION
 CRVNBR 80.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

87 UK

OVERLAND-FLOW ELEMENT NO. 1

L 730. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

88 RK

COLLECTOR CHANNEL

L 1640. CHANNEL LENGTH
 S .0012 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .01 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE

89 RK

MAIN CHANNEL

L 600. CHANNEL LENGTH
 S .0050 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .11 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 10.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

1	.1571	1.667	15.00	104.29
3	.1228	1.579	15.00	820.00
4	.4776	1.387	15.00	300.00

*** **

90 KK

 * *
 * COMB6 *
 * *

COMBINE ROUTED HYDROGRAPH FROM SUBAREA 8 AND UPSTREAM AREAS WITH
 ROUTED HYDROGRAPH FROM SUBAREA 9

93 HC HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

94 KK

 * *
 * ROHD10 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 10

SUBBASIN RUNOFF DATA

96 BA SUBBASIN CHARACTERISTICS
 TAREA .19 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

.09	.13	.13	.09	.18	.18	.23	.38	.94	1.12
.35	.30	.21	.23	.15	.15	.17	.15	.12	1.12
.12	.15	.09	.12						

97 LS SCS LOSS RATE
 STRL .41 INITIAL ABSTRACTION
 CRVNBR 83.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

98 UK OVERLAND-FLOW ELEMENT NO. 1
 L 750. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

99 RK MAIN CHANNEL
 L 3600. CHANNEL LENGTH
 S .0003 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .19 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE

Z 10.00 SIDE SLOPE
 RUPSTQ YES ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

ELEMENT	ALPHA	M	DT (MIN)	DX (FT)
1	.1571	1.667	15.00	107.14
3	.0565	1.456	15.00	1800.00

*** **

 * *
 100 KK * RTE1 *
 * *

101 KD OUTPUT CONTROL VARIABLES

IPRNT 1 PRINT CONTROL
 IPLOT 2 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE
 ROUTE OUTFLOW FROM TOTAL DRAINAGE BASIN UPSTREAM FROM NE CORNER THE MOORINGS
 THROUGH SAND PIT 1

HYDROGRAPH ROUTING DATA

104 RS STORAGE ROUTING
 NSTPS 1 NUMBER OF SUBREACHES
 ITYP ELEV TYPE OF INITIAL CONDITION
 RSVRVC 1315.00 INITIAL CONDITION
 X .00 WORKING R AND D COEFFICIENT

105 SV STORAGE 1.0 116.0 232.0 348.0 464.0 580.0
 106 SE ELEVATION 1315.00 1317.00 1319.00 1321.00 1323.00 1325.00

107 SS SPILLWAY
 CREL 1322.40 SPILLWAY CREST ELEVATION
 SPWID 50.00 SPILLWAY WIDTH
 COQW 2.70 WEIR COEFFICIENT
 EXPW 1.50 EXPONENT OF HEAD

COMPUTED OUTFLOW-ELEVATION DATA

OUTFLOW	.00	.00	.10	.78	2.62	6.21	12.13	20.97	33.28	49.68
ELEVATION	1315.00	1322.40	1322.41	1322.43	1322.47	1322.53	1322.60	1322.69	1322.79	1322.91
OUTFLOW	70.75	97.05	129.16	167.69	213.22	266.30	327.53	397.50	476.77	565.96
ELEVATION	1323.05	1323.20	1323.37	1323.56	1323.76	1323.97	1324.21	1324.45	1324.72	1325.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	1.00	116.00	232.00	348.00	429.20	431.06	433.39	436.65	440.83	445.96
OUTFLOW	.00	.00	.00	.00	.00	.78	2.62	6.21	12.13	20.97
ELEVATION	1315.00	1317.00	1319.00	1321.00	1322.40	1322.43	1322.47	1322.53	1322.60	1322.69
STORAGE	452.01	458.99	464.00	466.90	475.75	485.52	496.22	507.86	520.43	533.92
OUTFLOW	33.28	49.68	62.74	70.75	97.05	129.16	167.69	213.22	266.30	327.53

STORAGE 548.35 563.71 580.00
 OUTFLOW 397.50 476.77 565.96
 ELEVATION 1324.45 1324.72 1325.00

HYDROGRAPH AT STATION RTE1

				*				*				*										
DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE	*	DA	MON	HRMN	ORD	OUTFLOW	STORAGE	STAGE
1	0000	1		0.	1.0	1315.0	*	1	0500	21		0.	36.5	1315.6	*	1	1000	41		0.	251.9	1319.3
1	0015	2		0.	1.0	1315.0	*	1	0515	22		0.	48.7	1315.8	*	1	1015	42		0.	257.1	1319.4
1	0030	3		0.	1.0	1315.0	*	1	0530	23		0.	61.8	1316.1	*	1	1030	43		0.	262.0	1319.5
1	0045	4		0.	1.0	1315.0	*	1	0545	24		0.	75.2	1316.3	*	1	1045	44		0.	266.5	1319.6
1	0100	5		0.	1.0	1315.0	*	1	0600	25		0.	89.0	1316.5	*	1	1100	45		0.	270.7	1319.7
1	0115	6		0.	1.0	1315.0	*	1	0615	26		0.	102.7	1316.8	*	1	1115	46		0.	274.6	1319.7
1	0130	7		0.	1.0	1315.0	*	1	0630	27		0.	116.4	1317.0	*	1	1130	47		0.	278.3	1319.8
1	0145	8		0.	1.0	1315.0	*	1	0645	28		0.	130.0	1317.2	*	1	1145	48		0.	281.7	1319.9
1	0200	9		0.	1.0	1315.0	*	1	0700	29		0.	143.4	1317.5	*	1	1200	49		0.	284.9	1319.9
1	0215	10		0.	1.0	1315.0	*	1	0715	30		0.	156.4	1317.7	*	1	1215	50		0.	288.0	1320.0
1	0230	11		0.	1.0	1315.0	*	1	0730	31		0.	168.8	1317.9	*	1	1230	51		0.	290.8	1320.0
1	0245	12		0.	1.0	1315.0	*	1	0745	32		0.	180.5	1318.1	*	1	1245	52		0.	293.4	1320.1
1	0300	13		0.	1.2	1315.0	*	1	0800	33		0.	191.3	1318.3	*	1	1300	53		0.	295.9	1320.1
1	0315	14		0.	1.5	1315.0	*	1	0815	34		0.	201.2	1318.5	*	1	1315	54		0.	298.2	1320.1
1	0330	15		0.	2.1	1315.0	*	1	0830	35		0.	210.3	1318.6	*	1	1330	55		0.	300.4	1320.2
1	0345	16		0.	3.3	1315.0	*	1	0845	36		0.	218.7	1318.8	*	1	1345	56		0.	302.5	1320.2
1	0400	17		0.	5.7	1315.1	*	1	0900	37		0.	226.4	1318.9	*	1	1400	57		0.	304.5	1320.2
1	0415	18		0.	9.9	1315.2	*	1	0915	38		0.	233.6	1319.0	*	1	1415	58		0.	306.3	1320.3
1	0430	19		0.	16.4	1315.3	*	1	0930	39		0.	240.1	1319.1	*	1	1430	59		0.	308.1	1320.3
1	0445	20		0.	25.5	1315.4	*	1	0945	40		0.	246.2	1319.2	*	1	1445	60		0.	309.7	1320.3

PEAK FLOW	TIME	MAXIMUM AVERAGE FLOW			
0.	.25	(CFS)	0.	0.	0.
		(INCHES)	.000	.000	.000
		(AC-FT)	0.	0.	0.

PEAK STORAGE	TIME	MAXIMUM AVERAGE STORAGE			
(AC-FT)	(HR)	6-HR	24-HR	72-HR	14.75-HR
310.	14.75	276.	148.	148.	148.

PEAK STAGE	TIME	MAXIMUM AVERAGE STAGE			
(FEET)	(HR)	6-HR	24-HR	72-HR	14.75-HR
1320.34	14.75	1319.76	1317.54	1317.54	1317.54

CUMULATIVE AREA = 1.88 SQ MI

STATION RTE1

(I) INFLOW, (O) OUTFLOW

0. 100. 200. 300. 400. 500. 600. 700. 0. 0. 0. 0. 0.
 (S) STORAGE
 0. 0. 0. 0. 0. 0. 0. 100. 200. 300. 400. 0. 0.

DAHRMN PER

| STATION | RTE1 | (I) INFLOW | (O) OUTFLOW | (S) STORAGE |
|---------|---------|------------|-------------|-------------|
| 10000 | 11 | | | S |
| 10015 | 21 | | | S |
| 10030 | 31 | | | S |
| 10045 | 41 | | | S |
| 10100 | 51 | | | S |
| 10115 | 61 | | | S |
| 10130 | 71 | | | S |
| 10145 | 81 | | | S |
| 10200 | 91 | | | S |
| 10215 | 101 | | | S |
| 10230 | 111 | | | S |
| 10245 | 121 | | | S |
| 10300 | 1301 | | | S |
| 10315 | 140 I | | | S |
| 10330 | 150 I | | | S |
| 10345 | 160 I | | | S |
| 10400 | 170 I | | | S |
| 10415 | 180 I | | | S |
| 10430 | 190 I | | | S |
| 10445 | 200 I | | | S |
| 10500 | 210 I | | | S |
| 10515 | 220 I S | | | S |
| 10530 | 230 I S | | | S |
| 10545 | 240 I S | | | S |
| 10600 | 250 I S | | | S |
| 10615 | 260 I S | | | S |
| 10630 | 270 I S | | | S |
| 10645 | 280 I S | | | S |
| 10700 | 290 I S | | | S |
| 10715 | 300 I S | | | S |
| 10730 | 310 I S | | | S |
| 10745 | 320 I S | | | S |
| 10800 | 330 I S | | | S |
| 10815 | 340 I S | | | S |
| 10830 | 350 I S | | | S |
| 10845 | 360 I S | | | S |
| 10900 | 370 I S | | | S |
| 10915 | 380 I S | | | S |
| 10930 | 390 I S | | | S |
| 10945 | 400 I S | | | S |
| 11000 | 410 I S | | | S |
| 11015 | 420 I S | | | S |
| 11030 | 430 I S | | | S |
| 11045 | 440 I S | | | S |
| 11100 | 450 I S | | | S |
| 11115 | 460 I S | | | S |
| 11130 | 470 I S | | | S |
| 11145 | 480 I S | | | S |
| 11200 | 490 I S | | | S |
| 11215 | 500 I S | | | S |
| 11230 | 510 I S | | | S |
| 11245 | 520 I S | | | S |
| 11300 | 530 I S | | | S |
| 11315 | 540 I S | | | S |

RUNOFF SUMMARY
 FLOW IN CUBIC FEET PER SECOND
 TIME IN HOURS, AREA IN SQUARE MILES

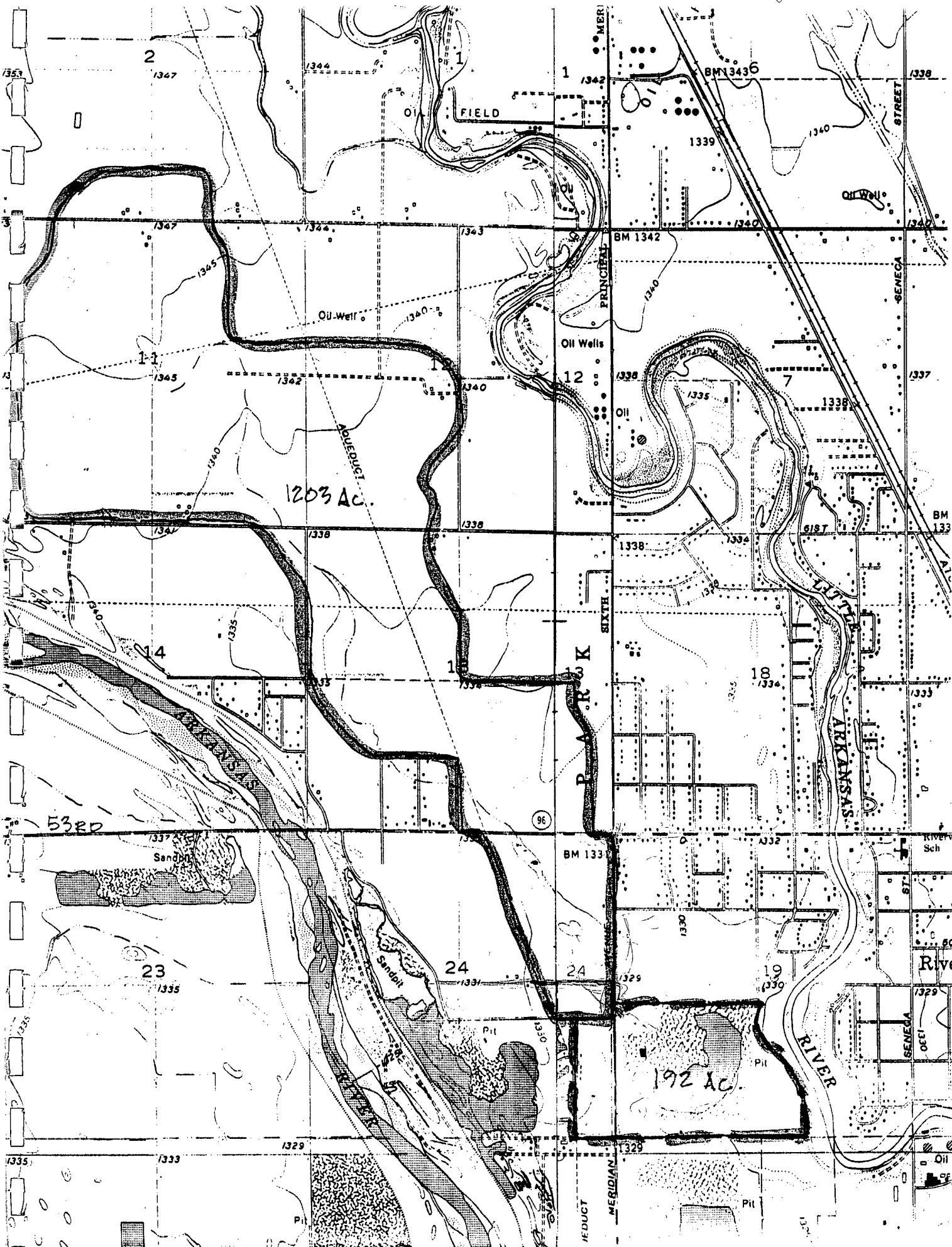
| OPERATION | STATION | PEAK FLOW | TIME OF PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD | | | BASIN AREA | MAXIMUM STAGE | TIME OF MAX STAGE |
|---------------|---------|-----------|--------------|---------------------------------|---------|---------|------------|---------------|-------------------|
| | | | | 6-HOUR | 24-HOUR | 72-HOUR | | | |
| HYDROGRAPH AT | ROHD1 | 15. | 4.25 | 9. | 4. | 4. | .03 | | |
| HYDROGRAPH AT | ROHD2 | 17. | 4.75 | 11. | 5. | 5. | .04 | | |
| 2 COMBINED AT | COMB1 | 31. | 4.50 | 20. | 9. | 9. | .07 | | |
| HYDROGRAPH AT | ROHD3 | 222. | 6.25 | 152. | 77. | 77. | .59 | | |
| 2 COMBINED AT | COMB2 | 244. | 6.25 | 168. | 86. | 86. | .66 | | |
| HYDROGRAPH AT | ROHD4 | 97. | 5.25 | 63. | 30. | 30. | .23 | | |
| 2 COMBINED AT | COMB3 | 325. | 6.00 | 227. | 117. | 117. | .89 | | |
| HYDROGRAPH AT | ROHD5 | 96. | 6.00 | 65. | 32. | 32. | .27 | | |
| 2 COMBINED AT | COMB4 | 421. | 6.00 | 291. | 149. | 149. | 1.16 | | |
| HYDROGRAPH AT | ROHD6 | 471. | 6.50 | 336. | 171. | 171. | 1.32 | | |
| HYDROGRAPH AT | ROHD7 | 79. | 4.00 | 41. | 19. | 19. | .11 | | |
| 2 COMBINED AT | COMB5 | 511. | 6.25 | 372. | 190. | 190. | 1.43 | | |
| HYDROGRAPH AT | ROHD8 | 560. | 6.50 | 419. | 214. | 214. | 1.58 | | |
| HYDROGRAPH AT | ROHD9 | 54. | 4.75 | 33. | 16. | 16. | .11 | | |
| 2 COMBINED AT | COMB6 | 599. | 6.25 | 451. | 230. | 230. | 1.69 | | |
| HYDROGRAPH AT | ROHD10 | 666. | 6.00 | 499. | 253. | 253. | 1.88 | | |
| ROUTED TO | RTE1 | 0. | .25 | 0. | 0. | 0. | 1.88 | 1320.34 | 14.75 |

132.94

*** NORMAL END OF HEC-1 ***

Information prepared by Poe and Associates

1. Used Mitchell's drainage area to NW corner of property (1203 acres) and added 192 acres for pond storage calculations.
2. Calculated the current pond water surface area to be 88.9 acres. Storage is based on 88.9 acre feet per foot of rise.
3. Computed peak flow to the NW property corner using the TR-55 method.
4. Computed a composite CN for the total area including the additional 192 acres.
5. Computed total runoff and maximum pool elevation.
6. Determined approximate discharge rates into the river through a 36" pipe.
7. Determined the approximate time to return to normal pool after storing runoff from a 100 yr. storm.



URBAN HYDROLOGY FOR SMALL WATERSHEDS (TR-55)
 PEAK DISCHARGE WORKSHEET
 FOR CHAPTER 4 (APPENDICES D & E)

Project CRYSTAL LAKE By K. Hill Date 9-30-92
(MILES SAND CO.) Checked _____ Date _____

Steps Peak Discharge Computations for up to 3 Storms: Type II, Duration 24 hours.

1. Data: Watershed Condition = _____ (present or future).

Drainage Area (DA) = 1203 acres. Ave. Watershed Slope (S) = 0.12 %.

2. Runoff Curve Number (CN)

| Hydrologic Soil Group (Appendix B) | Land Use Description Include Treatment, Practice & Condition (Table 2-2) | CN (Table 2-2) (3) | % or Area (acres) (4) | Product (3)x(4) (5) |
|------------------------------------|--|--------------------|-----------------------|---------------------|
| | SEE ATTACHED SHEET | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| | | | | |
| Totals = | | | | |

CN (weighted) = $\frac{\text{total col. (5)}}{\text{total col. (4)}}$ [_____] = 79; use CN = 80

3. Rainfall Frequency (F)

Rainfall Depth (P)

| 1st Storm | 2nd Storm | 3rd Storm | |
|-----------|-----------|-----------|--------|
| | | 100 | yrs. |
| | | 8.0 | inches |

4. Runoff Depth (Q)

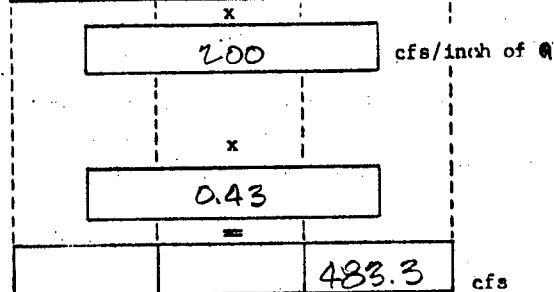
Use P, CN, and Table 2-1.

| | | | |
|--|--|------|--------|
| | | 5.62 | inches |
|--|--|------|--------|

5. Basic Peak Discharge (q)

Use S, DA, CN, and Figure D-2.

For graph labeled: Flat (S = less than 3%)
 Moderate (S = 3% to 7.9%)
 Steep (S = 8% & greater)



*6. Watershed Slope Factor

Use S, DA, and Table E-1.

7. Peak Discharge (q_p)

where q_p = Steps #4 x 5 x 6

See Steps 8 to 13 for adjustments that may be applicable.

TR-55, CHAPTER 4 (APPENDICES D & E), PEAK DISCHARGE WORKSHEET (CONT.)

Steps Peak Discharge Computations with Adjustments

8. Data: Obtain if Adjustments are Applicable

Ponding and Swamy areas (PND) = _____ acres, _____ % of DA
 Impervious Area (IMP) = _____ acres, _____ % of DA
 Total Hydraulic Length (HL) = 17000 feet
 Hydraulic Length Modified (HLM) = 5600 feet, 33 % of HL

Rainfall Frequency (F) from Step 3

Peak Discharge (q_p) from Step 7

| 1st Storm | 2nd Storm | 3rd Storm |
|-----------|-----------|-----------|
| | | 100 |

yrs.

| | | |
|--|--|-------|
| | | 483.3 |
|--|--|-------|

cfs

| | | |
|---|---|---|
| X | X | X |
| | | - |

*9. Ponding and Swamy Area Peak Factor

Use % PND, F, and Tables E-2, 3 or 4.
 Location in } at Design Point (E-2)
 Watershed: } Center or Spreadout (E-3)
 (check one) } Upper Reaches (E-4)

*10. Watershed Shape Peak Factor

Use HL with Figure E-1 and read;
 Equiv. Drainage Area (EDA) = 1500 acres.

Use Figure D-2 graph from Step 5, CN, and EDA for;
 Equiv. Peak/Inch Runoff (q_e) = 215 cfs/in.

$$\text{Factor} = \left[\frac{q_e}{q \text{ from Step 5}} \right] \times \left[\frac{DA}{EDA} \right]$$

$$\text{Factor} = \left[\frac{215}{200} \right] \times \left[\frac{1203}{1500} \right] =$$

0.86

X

X

*11. Impervious Area Peak Factor

Use % IMP, CN and Figure 4-1.

-

X

* *12. Hydraulic Length Modified Peak Factor

Use % HLM, CN and Figure 4-2.

1.18

-

13. Adjusted Peak Discharge (q_p)

$$q_p = q_p \text{ (from Step 7) } \times \text{Steps \#9} \times 10 \times 11 \times 12$$

| | | |
|--|--|-------|
| | | 490.5 |
|--|--|-------|

cfs

* If the adjustment is not applicable, enter a Factor of 1.0

* 600' ACROSS MERIDIAN AND INTO POND
 1500' THROUGH ADDN. N. OF 53RD.
 3500' FROM 53RD TO MERIDIAN
 5600'

CRYSTAL LAKE

9-18-92

DA = 1203 AC

CN 75

CN 79

CN 77

CN 74

CN 42

.03

0.59

0.23

0.27

0.16

.04

.07

CN 41

CN 45

CN 40

CN 43

0.11

0.15

0.11

0.19

$$75 \times .07 = 5.25$$

$$79 \times .59 = 46.61$$

$$77 \times .23 = 17.71$$

$$74 \times .27 = 19.98$$

$$42 \times .16 = 6.72$$

$$41 \times .11 = 4.51$$

$$45 \times .15 = 6.75$$

$$40 \times .11 = 4.40$$

$$43 \times .19 = 8.17$$

$$\underline{146.90} \div 146 = 99.2 \text{ COMPOSITE CN.}$$

COMPOSITE CN FOR POND STORAGE

CN TO MERIDIAN 79.2

ADD 192 AC. AT POND SITE AND FROM MUDCRINGS

WS OF POND 88.9 AC CN 100 8890

GROUP B 1/4 AC LOTS 77.3 AC CN 75 5798

" C " 15.5 CN 83 1287

" D " 10.3 CN 87 896

TO MERIDIAN 1203 CN 79.2 95278

1395

112149

COMPOSITE CN = 824

100 YR 6 HR STORM = 6.0" RUNOFF = 3.82"

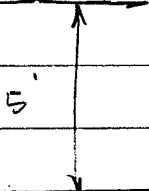
6 HR 3.82 x 1395 ÷ 12 = 444.1 AC.FT.

NORMAL W.S. 127.5 @ 88.9 AC

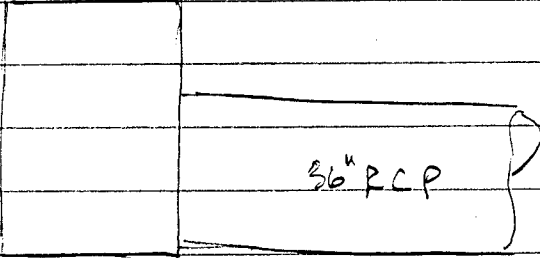
MAY POOL ELEV. 132.5

ROUGH CALC. FOR OUTFLOW

132.5 MAX



127.5



124.2

123.0 FL OUT

ASSUME INLET CONTROL

HW 8.3 MIN. 40 cfs

HW 8.3 MAX. 85 cfs

AVERAGE 62.5 cfs

$$444.1 \text{ AC FT} \times 435 \text{ GPD} \div 62.5 \div 60 \div 60 \div 24 = 3.6 \text{ DAYS}$$

SUMMARY OF CALCULATIONS

| | Mitchell | Poe |
|-------------------------------|----------|----------|
| 100 Yr. Peak flow into pond | 670cfs | 490cfs |
| Maximum water surface in pond | 132.9 | 132.5 |
| Time to return to normal pool | | 3.6 days |

RECOMMENDATIONS

The structure at the northwest corner of the proposed addition should be designed using a peak discharge rate of 670 cfs. If this results in a reduction in the estimated cost of this structure, then a new petition should be filed with the city to replace the original guarantee.

Minimum basement floor elevations in the proposed Crystal Lakes Addition should be at elevation 134.0.

A structure should be constructed to discharge into the Little River which would keep the maximum pond water surface at 133.0 using the runoff volumes contained in this report.

The lake to the south should not be connected as originally proposed in sand extraction permit applications.

Permit applications to the Corp of Engineers for discharging into the Little Arkansas River should be made by the City of Wichita.

TO: KENNY HILL, P. E.
FROM: M. S. MITCHELL
DATE: OCTOBER 9, 1972

M.S.M.

I routed the calculated discharge west of Meridian through the 2-10x5 RCBC as you suggested, estimating that the channel leading to the Meridian crossing would be have a 22 foot wide bottom, 4:1 side slopes and that the box flowline would be at 1320. I used a channel length of 1000 feet upstream from Meridian to account for channel storage for the routing. Note that the channel storage reduced the calculated peak discharge by only one cubic feet per second (666 to 665). Note also that the headwater depth on the 2-10x5 RCBC is only 4.49 feet. You may want to consider a smaller crossing structure.

I then used your drainage area of 31 acres for the Moorings and assumed the length and size of street culverts serving that area to its collection and discharge through the 48 inch culvert across Meridian. I also had to assume slopes for the curb and gutter (collector) portion of the conveyance and for the storm drains in the streets and across Meridian. From experience, I doubt that discreet data taken from the paving plans would make much difference in the peak discharge from the Moorings, but someone may want a more exact input.

I next made several more assumptions to calculate the peak discharge from Crystal Lakes Addition including the 89 acre lake. Again, working from street plans may make minor differences in the input but probably very little in the peak discharge from Crystal Lakes Addition.

Finally, all of the SubArea hydrographs are summed and routed through the 89 acre Crystal Lake II and its ^{36"}48 inch diameter outlet into the Little Arkansas River. I had this hydrograph plotted to show the relationship between inflow, outflow and storage. All the hydrographs used in this analysis are set for a 15 minute tabulation interval, and 60 hydrograph ordinates. By the end of 60 fifteen minute intervals (15 hours) the inflow and outflow are near zero and equal, but the storage has peaked (at 314 acre feet) but has not recovered its full volume. HEC-1 permits up to 300 time intervals. To check the length of time to restore full storage, I ran the same input using the 300 fifteen minute time intervals. The plotted hydrograph indicates that at the end of the 300 fifteen minute time intervals (3.125 days) the storage was almost back to full volume available. This verifies your calculation of 3.26 days and is close enough to the recommended three days to restore full storage volume.

* FLOOD HYDROGRAPH PACKAGE *
* ALL OPTIONS EXCEPT ECONOMICS *
* THE NUMBER OF PLANS IS REDUCED TO 3 *
* MSDOS VERSION JANUARY 1988 *
* RUN DATE 10-09-1992 TIME 21:25:05.34 *

* DEVELOPED BY COE-HEC *
* REVISED BY DODGSON & ASSOCIATES INC *
* 7015 W TIDWELL SUITE 107 *
* HOUSTON TEXAS 77092 *
* PHONE (713) 895-8322 *

```

X   X   XXXXXXXX  XXXXX           XXX
X   X   X         X   X           X   X
X   X   X         X             X
XXXXXXXX XXXX   X             XXXXX   X
X   X   X         X             X
X   X   X         X   X           X
X   X   XXXXXXXX  XXXXX           XXXXXX
```

| LINE | ID | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|------|----|---|-------|------|-----|------|-----|-----|-----|-----|------|
| 1 | ID | PLEASANT VALLEY TRIBUTARY WICHITA, KANSAS | | | | | | | | | |
| 2 | ID | 15 MINUTE DISTRIBUTION OF 6 HOUR STORM BASED ON SCS CURVE | | | | | | | | | |
| 3 | ID | 100-YEAR FREQUENCY STORM | | | | | | | | | |
| | | FILE PVTRIB2.HC1 | | | | | | | | | |
| 4 | IT | 15 | 0 | 0 | 300 | | | | | | |
| 5 | IO | 4 | 1 | | | | | | | | |
| 6 | KK | ROND1 | | | | | | | | | |
| 7 | KM | RUNOFF HYDROGRAPH FROM SUBAREA 1 | | | | | | | | | |
| 8 | PR | 5.9 | | | | | | | | | |
| 9 | PI | .09 | .13 | .13 | .09 | .18 | .18 | .23 | .38 | .94 | 1.12 |
| 10 | PI | .35 | .30 | .21 | .23 | .15 | .15 | .17 | .15 | .12 | .12 |
| 11 | PI | .12 | .15 | .09 | .12 | | | | | | |
| 12 | BA | .03 | | | | | | | | | |
| 13 | LS | 0 | 75 | | | | | | | | |
| 14 | UK | 550 | .001 | .30 | 100 | | | | | | |
| 15 | RK | 900 | .001 | .040 | .45 | TRAP | 50 | 2 | | | |
| 16 | RK | 500 | .001 | .060 | | TRAP | 10 | 5 | | | |
| 17 | KK | ROND2 | | | | | | | | | |
| 18 | KM | RUNOFF HYDROGRAPH FROM SUBAREA 2 | | | | | | | | | |
| 19 | BA | .04 | | | | | | | | | |
| 20 | LS | 0 | 75 | | | | | | | | |
| 21 | UK | 750 | .001 | .30 | 100 | | | | | | |
| 22 | RK | 860 | .001 | .040 | .39 | TRAP | 50 | 2 | | | |
| 23 | RK | 250 | .001 | .060 | | TRAP | 10 | 5 | | | |
| 24 | KK | COMB1 | | | | | | | | | |
| 25 | KM | COMBINE RUNOFF HYDROGRAPH FROM SUBAREA 2 W/ROUTED HYDROGRAPH FROM SUBAREA 1 | | | | | | | | | |
| 26 | HC | 2 | | | | | | | | | |
| 27 | KK | ROND3 | | | | | | | | | |
| 28 | KM | RUNOFF HYDROGRAPH FROM SUBAREA 3 | | | | | | | | | |
| 29 | BA | 0.59 | | | | | | | | | |
| 30 | LS | 0 | 79 | | | | | | | | |
| 31 | UK | 1050 | .001 | .30 | 100 | | | | | | |
| 32 | RK | 4600 | .0011 | .040 | .02 | TRAP | 50 | 2 | | | |
| 33 | RK | 3100 | .0018 | .060 | | TRAP | 10 | 5 | | | |
| 34 | KK | COMB2 | | | | | | | | | |
| 35 | KM | COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 1 WITH ROUTED HYDROGRAPH | | | | | | | | | |
| 36 | KM | FROM SUBAREA 3 | | | | | | | | | |
| 37 | HC | 2 | | | | | | | | | |
| 38 | KK | ROND4 | | | | | | | | | |
| 39 | KM | RUNOFF HYDROGRAPH FROM SUBAREA 4 | | | | | | | | | |
| 40 | BA | .23 | | | | | | | | | |
| 41 | LS | 0 | 77 | | | | | | | | |
| 42 | UK | 850 | .001 | .30 | 100 | | | | | | |
| 43 | RK | 4920 | .0019 | .040 | .01 | TRAP | 50 | 5 | | | |

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

44 KK COMB3
 45 KM COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 2 WITH ROUTED HYDROGRAPH
 46 KM FROM SUBAREA 4
 47 HC 2

48 KK RQHD5
 49 KM RUNOFF HYDROGRAPH FROM SUBAREA 5
 50 BA .27

51 LS 0 74
 52 UK 1100 .001 .30 100
 53 RK 1200 .0042 .040 .01 TRAP 50 2
 54 RK 1050 .0014 .060 TRAP 10 5

55 KK COMB4
 56 KM COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 3 WITH ROUTED HYDROGRAPH
 57 KM FROM SUBAREA 5
 58 HC 2

59 KK RQHD6
 60 KM RUNOFF HYDROGRAPH FROM SUBAREA 6 WITH RESULTANT HYDROGRAPH FROM
 61 KM COMBINATION 4 ROUTED THROUGH MAIN CHANNEL

62 BA .16
 63 LS 0 82
 64 UK 600 .001 .30 100
 65 RK 5200 .0011 .060 .01 TRAP 50 2 YES

66 KK RQHD7
 67 KM RUNOFF HYDROGRAPH FROM SUBAREA 7
 68 BA .11

69 LS 0 86
 70 UK 500 .001 .30 100
 71 RK 4200 .0012 .060 .01 TRAP 50 2

72 KK COMB5
 73 KM COMBINE ROUTED HYDROGRAPH FROM SUBAREA 6 AND UPSTREAM SUBAREAS WITH
 74 KM ROUTED HYDROGRAPH FROM SUBAREA 7
 75 HC 2

76 KK RQHD8
 77 KM RUNOFF HYDROGRAPH FROM SUBAREA 8
 78 BA .15

79 LS 0 85
 80 UK 750 .001 .30 100
 81 RK 1300 .0013 .040 .01 TRAP 50 2
 82 RK 1740 .0029 .060 TRAP 50 10 YES

83 KK RQHD9
 84 KM RUNOFF HYDROGRAPH FROM SUBAREA 9
 85 BA .11

86 LS 0 80
 87 UK 730 .001 .30 100
 88 RK 1640 .0012 .040 .01 TRAP 50 2
 89 RK 600 .0050 .060 TRAP 10 5

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10

| | | | | | | | | | | | |
|-----|----|--|-------|------|------|------|-------|----|-----|--|--|
| 90 | KK | COMB6 | | | | | | | | | |
| 91 | KM | COMBINE ROUTED HYDROGRAPH FROM SUBAREA E AND UPSTREAM AREAS WITH | | | | | | | | | |
| 92 | KM | ROUTED HYDROGRAPH FROM SUBAREA 9 | | | | | | | | | |
| 93 | HC | 2 | | | | | | | | | |
| 94 | KK | ROHD10 | | | | | | | | | |
| 95 | KM | RUNOFF HYDROGRAPH FROM SUBAREA 10 | | | | | | | | | |
| 96 | BA | .19 | | | | | | | | | |
| 97 | LS | 0 | 83 | | | | | | | | |
| 98 | UK | 750 | .001 | .30 | 100 | | | | | | |
| 99 | RK | 3600 | .0003 | .060 | | TRAP | 50 | 10 | YES | | |
| 100 | KK | RTE1 | | | | | | | | | |
| 101 | KM | ROUTE OUTFLOW FROM TOTAL DRAINAGE BASIN UPSTREAM FROM NE CORNER THE MOORINGS | | | | | | | | | |
| 102 | KM | THROUGH 2-10X5 RCBC @ MERIDIAN AVENUE | | | | | | | | | |
| 103 | RS | 1 | ELEV | 1320 | | | | | | | |
| 104 | SV | 1 | 1.37 | 3.49 | 6.34 | 9.92 | 14.23 | | | | |
| 105 | SE | 1320 | 1322 | 1324 | 1326 | 1328 | 1330 | | | | |
| 106 | SL | 1322.5 | 100 | .6 | .5 | | | | | | |
| 107 | SS | 1329 | 500 | 3 | 1.5 | | | | | | |
| 108 | KK | ROHD11 | | | | | | | | | |
| 109 | KM | RUNOFF HYDROGRAPH FROM SUBAREA 11 | | | | | | | | | |
| 110 | BA | .05 | | | | | | | | | |
| 111 | LS | 0 | 90 | | | | | | | | |
| 112 | UK | 150 | .005 | .25 | 100 | | | | | | |
| 113 | RK | 300 | .0032 | .050 | | TRAP | 0 | 20 | | | |
| 114 | RK | 200 | .0050 | .020 | | CIRC | 3 | | | | |
| 115 | RK | 350 | .0050 | .020 | | CIRC | 4 | | | | |
| 116 | KK | ROHD12 | | | | | | | | | |
| 117 | KM | RUNOFF HYDROGRAPH FROM CRYSTAL LAKES ADDITION FULLY DEVELOPED | | | | | | | | | |
| 118 | BA | 0.25 | | | | | | | | | |
| 119 | LS | 0 | 96 | | | | | | | | |
| 120 | UD | .20 | | | | | | | | | |
| 121 | KK | COMB7 | | | | | | | | | |
| 122 | KM | COMBINE ROUTED HYDROGRAPHS FROM WEST OF MERIDIAN AND NORTH OF THE MOORINGS | | | | | | | | | |
| 123 | KM | WITH ROUTED HYDROGRAPH FROM SUBAREA 11 (THE MOORINGS) AND RUNOFF HYDROGRAPH | | | | | | | | | |
| 124 | KM | FROM CRYSTAL LAKES ADDITION | | | | | | | | | |
| 125 | HC | 3 | | | | | | | | | |
| 126 | KK | RTE2 | | | | | | | | | |
| 127 | KD | 1 | 2 | | | | | | | | |
| 128 | KM | ROUTE OUTFLOW FROM TOTAL DRAINAGE BASIN UPSTREAM FROM NE CORNER THE MOORINGS | | | | | | | | | |
| 129 | KM | THROUGH CRYSTAL LAKE II | | | | | | | | | |
| 130 | RS | 1 | ELEV | 1315 | | | | | | | |
| 131 | SV | 1 | 178 | 356 | 534 | 712 | 890 | | | | |
| 132 | SE | 1315 | 1317 | 1319 | 1321 | 1323 | 1325 | | | | |
| 133 | SS | 1322 | 50 | 3 | 1.5 | | | | | | |
| 134 | SL | 1313.1 | 7.07 | 0.6 | 0.5 | | | | | | |
| 135 | ZZ | | | | | | | | | | |

PLEASANT VALLEY TRIBUTARY WICHITA, KANSAS
 15 MINUTE DISTRIBUTION OF 6 HOUR STORM BASED ON SCS CURVE
 100-YEAR FREQUENCY STORM FILE PVTRIB2.HC1

5 IO OUTPUT CONTROL VARIABLES
 IPRNT 4 PRINT CONTROL
 IPLOT 1 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA
 NMIN 15 MINUTES IN COMPUTATION INTERVAL
 IDATE 1 0 STARTING DATE
 ITIME 0000 STARTING TIME
 NQ 300 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 4 0 ENDING DATE
 NDTIME 0245 ENDING TIME

 COMPUTATION INTERVAL .25 HOURS
 TOTAL TIME BASE 74.75 HOURS

ENGLISH UNITS

*** **

6 KK *****
 * *
 * ROHD1 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 1

SUBBASIN RUNOFF DATA

12 BA SUBBASIN CHARACTERISTICS
 TAREA .03 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| .09 | .13 | .13 | .09 | .18 | .18 | .23 | .38 | .94 | 1.12 |
| .35 | .30 | .21 | .23 | .15 | .15 | .17 | .15 | .12 | .12 |
| .12 | .15 | .09 | .12 | | | | | | |

13 LS SCS LOSS RATE
 STRTL .67 INITIAL ABSTRACTION
 CRVNR 75.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

L 550. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN
 15 RK COLLECTOR CHANNEL
 L 900. CHANNEL LENGTH
 S .0010 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .45 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE
 16 RK MAIN CHANNEL
 L 500. CHANNEL LENGTH
 S .0010 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .03 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 10.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

| ELEMENT | ALPHA | M | DT (MIN) | DX (FT) |
|---------|-------|-------|----------|---------|
| 1 | .1571 | 1.667 | 15.00 | 78.57 |
| 3 | .1121 | 1.579 | 15.00 | 450.00 |
| 4 | .2145 | 1.387 | 15.00 | 250.00 |

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 * *
 17 KK * ROHD2 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 2

SUBBASIN RUNOFF DATA

19 BA SUBBASIN CHARACTERISTICS
 TAREA .04 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| .09 | .13 | .13 | .09 | .18 | .18 | .23 | .38 | .94 | 1.12 |
| .35 | .30 | .21 | .23 | .15 | .15 | .17 | .15 | .12 | .12 |
| .12 | .15 | .09 | .12 | | | | | | |

20 LS SCS LOSS RATE
 STRTL .67 INITIAL ABSTRACTION
 CRVNR 75.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

21 UK KINEMATIC WAVE
 OVERLAND-FLOW ELEMENT NO. 1
 L 750. OVERLAND FLOW LENGTH
 S .0010 SLOPE

22 RK PA 100.0 PERCENT OF SUBBASIN
 COLLECTOR CHANNEL
 L 860. CHANNEL LENGTH
 S .0010 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .39 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE

23 RK MAIN CHANNEL
 L 250. CHANNEL LENGTH
 S .0010 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .04 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 10.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

| ELEMENT | ALPHA | M | DT (MIN) | DX (FT) |
|---------|-------|-------|----------|---------|
| 1 | .1571 | 1.667 | 15.00 | 93.75 |
| 3 | .1121 | 1.579 | 15.00 | 430.00 |
| 4 | .2145 | 1.387 | 15.00 | 125.00 |

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 * *
 24 KK * COMB1 *
 * *

COMBINE RUNOFF HYDROGRAPH FROM SUBAREA 2 W/ROUTED HYDROGRAPH FROM SUBAREA 1

26 HC HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

 * *
 27 KK * ROKD3 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 3

SUBBASIN RUNOFF DATA

29 BA SUBBASIN CHARACTERISTICS
 TAREA .59 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| .09 | .13 | .13 | .09 | .18 | .18 | .23 | .38 | .94 | 1.12 |
| .35 | .30 | .21 | .23 | .15 | .15 | .17 | .15 | .12 | .12 |
| .12 | .15 | .09 | .12 | | | | | | |

30 LS SCS LOSS RATE
 STRTL .53 INITIAL ABSTRACTION
 CRVNR 79.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

31 UK KINEMATIC WAVE
 OVERLAND-FLOW ELEMENT NO. 1
 L 1050. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

32 RK COLLECTOR CHANNEL
 L 4600. CHANNEL LENGTH
 S .0011 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .02 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE

33 RK MAIN CHANNEL
 L 3100. CHANNEL LENGTH
 S .0018 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .59 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 10.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTG NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

| ELEMENT | ALPHA | M | DT (MIN) | DX (FT) |
|---------|-------|-------|----------|---------|
| 1 | .1571 | 1.667 | 15.00 | 116.67 |
| 3 | .1176 | 1.579 | 15.00 | 920.00 |
| 4 | .2877 | 1.387 | 15.00 | 1550.00 |

*** **

34 KK

 * *
 * COMB2 *
 * *

COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 1 WITH ROUTED HYDROGRAPH
 FROM SUBAREA 3

37 HC

HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

38 KK * R0HD4 *
* *

RUNOFF HYDROGRAPH FROM SUBAREA 4

SUBBASIN RUNOFF DATA

40 BA SUBBASIN CHARACTERISTICS
TAREA .23 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN
.09 .13 .13 .09 .19 .19 .23 .38 .94 1.12
.35 .30 .21 .23 .15 .15 .17 .15 .12 .12
.12 .15 .09 .12

41 LS SCS LOSS RATE
STRTL .60 INITIAL ABSTRACTION
CRVNBR 77.00 CURVE NUMBER
RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

42 UK OVERLAND-FLOW ELEMENT NO. 1
L 850. OVERLAND FLOW LENGTH
S .0010 SLOPE
N .300 ROUGHNESS COEFFICIENT
PA 100.0 PERCENT OF SUBBASIN

43 RK MAIN CHANNEL
L 4920. CHANNEL LENGTH
S .0019 SLOPE
N .040 CHANNEL ROUGHNESS COEFFICIENT
CA .23 CONTRIBUTING AREA
SHAPE TRAP CHANNEL SHAPE
WD 50.00 BOTTOM WIDTH OR DIAMETER
Z 5.00 SIDE SLOPE
RUFSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

| ELEMENT | ALPHA | M | DT (MIN) | DX (FT) |
|---------|-------|-------|----------|---------|
| 1 | .1571 | 1.667 | 15.00 | 94.44 |
| 3 | .1842 | 1.515 | 15.00 | 2460.00 |

*** **

* *
44 KK * COMB3 *
* *

COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 2 WITH ROUTED HYDROGRAPH
FROM SUBAREA 4

47 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

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* *
* ROHDS *
* *

48 KK

RUNOFF HYDROGRAPH FROM SUBAREA 5

SUBBASIN RUNOFF DATA

50 BA

SUBBASIN CHARACTERISTICS

TAREA .27 SUBBASIN AREA

PRECIPITATION DATA

9 PB

STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI

INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| .09 | .13 | .13 | .09 | .18 | .18 | .23 | .38 | .94 | 1.12 |
| .35 | .30 | .21 | .23 | .15 | .15 | .17 | .15 | .12 | .12 |
| .12 | .15 | .09 | .12 | | | | | | |

51 LS

SCS LOSS RATE

STRTL .70 INITIAL ABSTRACTION
 CRVNBR 74.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

52 UK

OVERLAND-FLOW ELEMENT NO. 1

L 1100. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

53 RK

COLLECTOR CHANNEL

L 1200. CHANNEL LENGTH
 S .0042 SLOPE
 N .040 CHANNEL ROUGHNESS COEFFICIENT
 CA .01 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE

54 RK

MAIN CHANNEL

L 1050. CHANNEL LENGTH
 S .0014 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .27 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 10.00 BOTTOM WIDTH OR DIAMETER
 Z 5.00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

| ELEMENT | ALPHA | M | DT (MIN) | DX (FT) |
|---------|-------|-------|----------|---------|
| 1 | .1571 | 1.667 | 15.00 | 100.00 |
| 3 | .2298 | 1.579 | 15.00 | 600.00 |
| 4 | .2538 | 1.387 | 15.00 | 525.00 |

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 * *
 * COMB4 *
 * *

55 KK

COMBINE RESULTANT HYDROGRAPH FROM COMBINATION 3 WITH ROUTED HYDROGRAPH
 FROM SUBAREA 5

58 HC

HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

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 * *
 * RORD6 *
 * *

59 KK

RUNOFF HYDROGRAPH FROM SUBAREA 6 WITH RESULTANT HYDROGRAPH FROM
 COMBINATION 4 ROUTED THROUGH MAIN CHANNEL

SUBBASIN RUNOFF DATA

62 BA

SUBBASIN CHARACTERISTICS
 TAREA .16 SUBBASIN AREA

PRECIPITATION DATA

9 PB

STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI

INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| .09 | .13 | .13 | .09 | .18 | .18 | .23 | .38 | .94 | 1.12 |
| .35 | .30 | .21 | .23 | .15 | .15 | .17 | .15 | .12 | .12 |
| .12 | .15 | .09 | .12 | | | | | | |

63 LS

SCS LOSS RATE
 STRTL .44 INITIAL ABSTRACTION
 CRVNR 82.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

64 UK

OVERLAND-FLOW ELEMENT NO. 1
 L 600. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

65 RK

MAIN CHANNEL
 L 5200. CHANNEL LENGTH
 S .0011 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .16 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER
 Z 2.00 SIDE SLOPE
 RUFSTQ YES ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

| | | | | |
|---|-------|-------|-------|---------|
| 1 | .1571 | 1.667 | 15.00 | -100.00 |
| 3 | .0784 | 1.579 | 15.00 | 2600.00 |

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*      *
66 KK *  ROHD7 *
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RUNOFF HYDROGRAPH FROM SUBAREA 7

SUBBASIN RUNOFF DATA

68 BA SUBBASIN CHARACTERISTICS
TAREA .11 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| .09 | .13 | .13 | .09 | .18 | .18 | .23 | .38 | .94 | 1.12 |
| .35 | .30 | .21 | .23 | .15 | .15 | .17 | .15 | .12 | .12 |
| .12 | .15 | .09 | .12 | | | | | | |

69 LS SCS LOSS RATE
STRTL .33 INITIAL ABSTRACTION
CRVNR 86.00 CURVE NUMBER
RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

70 UK OVERLAND-FLOW ELEMENT NO. 1
L 500. OVERLAND FLOW LENGTH
S .0010 SLOPE
N .300 ROUGHNESS COEFFICIENT
PA 100.0 PERCENT OF SUBBASIN

71 RK MAIN CHANNEL
L 4200. CHANNEL LENGTH
S .0012 SLOPE
N .060 CHANNEL ROUGHNESS COEFFICIENT
CA .11 CONTRIBUTING AREA
SHAPE TRAP CHANNEL SHAPE
WD 50.00 BOTTOM WIDTH OR DIAMETER
Z 2.00 SIDE SLOPE
RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

| ELEMENT | ALPHA | M | DT (MIN) | DX (FT) |
|---------|-------|-------|----------|---------|
| 1 | .1571 | 1.667 | 15.00 | 83.33 |
| 3 | .0819 | 1.579 | 15.00 | 2100.00 |

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*      *
72 KK *  COMB5 *

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COMBINE ROUTED HYDROGRAPH FROM SUBAREA 6 AND UPSTREAM SUBAREAS WITH
ROUTED HYDROGRAPH FROM SUBAREA 7

75 HC HYDROGRAPH COMBINATION
ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

*** **

76 KK * RCHDS *

RUNOFF HYDROGRAPH FROM SUBAREA 8

SUBBASIN RUNOFF DATA

78 BA SUBBASIN CHARACTERISTICS
TAREA .15 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| .09 | .13 | .13 | .09 | .18 | .18 | .23 | .38 | .94 | 1.12 |
| .35 | .30 | .21 | .23 | .15 | .15 | .17 | .15 | .12 | .12 |
| .12 | .15 | .09 | .12 | | | | | | |

79 LS SCS LOSS RATE
STRTL .35 INITIAL ABSTRACTION
CRVNB 85.00 CURVE NUMBER
RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

80 UK OVERLAND-FLOW ELEMENT NO. 1
L 750. OVERLAND FLOW LENGTH
S .0010 SLOPE
N .300 ROUGHNESS COEFFICIENT
PA 100.0 PERCENT OF SUBBASIN

81 RK COLLECTOR CHANNEL
L 1300. CHANNEL LENGTH
S .0013 SLOPE
N .040 CHANNEL ROUGHNESS COEFFICIENT
CA .01 CONTRIBUTING AREA
SHAPE TRAP CHANNEL SHAPE
WD 50.00 BOTTOM WIDTH OR DIAMETER
Z 2.00 SIDE SLOPE

82 RK MAIN CHANNEL
L 1740. CHANNEL LENGTH
S .0029 SLOPE
N .060 CHANNEL ROUGHNESS COEFFICIENT
CA .15 CONTRIBUTING AREA
SHAPE TRAP CHANNEL SHAPE
WD 50.00 BOTTOM WIDTH OR DIAMETER
Z 10.00 SIDE SLOPE
RUPSTQ YES ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

| ELEMENT | ALPHA | M | DT (MIN) | DX (FT) |
|---------|-------|-------|----------|---------|
| 1 | .1571 | 1.667 | 15.00 | 107.14 |
| 3 | .1279 | 1.579 | 15.00 | 650.00 |
| 4 | .1756 | 1.456 | 15.00 | 870.00 |

*** ** ** ** **

* *
83 KK * ROHD9 *
* *

RUNOFF HYDROGRAPH FROM SUBAREA 9

SUBBASIN RUNOFF DATA

85 BA SUBBASIN CHARACTERISTICS
TAREA .11 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| .09 | .13 | .13 | .09 | .18 | .18 | .23 | .38 | .94 | 1.12 |
| .35 | .30 | .21 | .23 | .15 | .15 | .17 | .15 | .12 | .12 |
| .12 | .15 | .09 | .12 | | | | | | |

86 LS SCS LOSS RATE
STRTL .50 INITIAL ABSTRACTION
CRVNR 80.00 CURVE NUMBER
RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

87 UK OVERLAND-FLOW ELEMENT NO. 1
L 730. OVERLAND FLOW LENGTH
S .0010 SLOPE
N .300 ROUGHNESS COEFFICIENT
PA 100.0 PERCENT OF SUBBASIN

88 RK COLLECTOR CHANNEL
L 1640. CHANNEL LENGTH
S .0012 SLOPE
N .040 CHANNEL ROUGHNESS COEFFICIENT
CA .01 CONTRIBUTING AREA
SHAPE TRAP CHANNEL SHAPE
WD 50.00 BOTTOM WIDTH OR DIAMETER
Z 2.00 SIDE SLOPE

89 RK MAIN CHANNEL
L 600. CHANNEL LENGTH
S .0050 SLOPE
N .060 CHANNEL ROUGHNESS COEFFICIENT
CA .11 CONTRIBUTING AREA
SHAPE TRAP CHANNEL SHAPE
WD 10.00 BOTTOM WIDTH OR DIAMETER
Z 5.00 SIDE SLOPE
RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

| ELEMENT | ALPHA | M | DT (MIN) | DX (FT) |
|---------|-------|---|----------|---------|
|---------|-------|---|----------|---------|

| | | | | |
|---|-------|-------|-------|--------|
| 3 | .1228 | 1.579 | 15.00 | 546.67 |
| 4 | .4796 | 1.387 | 15.00 | 300.00 |

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 * *
 90 KK * COMB6 *
 * *

COMBINE ROUTED HYDROGRAPH FROM SUBAREA E AND UPSTREAM AREAS WITH
 ROUTED HYDROGRAPH FROM SUBAREA 9

93 HC HYDROGRAPH COMBINATION
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

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 * *
 94 KK * RQHD10 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 10

SUBBASIN RUNOFF DATA

96 BA SUBBASIN CHARACTERISTICS
 TAREA .19 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| .09 | .13 | .13 | .09 | .18 | .18 | .23 | .38 | .94 | 1.12 |
| .35 | .30 | .21 | .23 | .15 | .15 | .17 | .15 | .12 | .12 |
| .12 | .15 | .09 | .12 | | | | | | |

97 LS SCS LOSS RATE
 STRTL .41 INITIAL ABSTRACTION
 CRVNBR 83.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

98 UK OVERLAND-FLOW ELEMENT NO. 1
 L 750. OVERLAND FLOW LENGTH
 S .0010 SLOPE
 N .300 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

99 RK MAIN CHANNEL
 L 3600. CHANNEL LENGTH
 S .0003 SLOPE
 N .060 CHANNEL ROUGHNESS COEFFICIENT
 CA .19 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD 50.00 BOTTOM WIDTH OR DIAMETER

RUPSTQ YES ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

| ELEMENT | ALPHA | M | DT (MIN) | DX (FT) |
|---------|-------|-------|----------|---------|
| 1 | .1571 | 1.667 | 15.00 | 107.14 |
| 3 | .0565 | 1.456 | 15.00 | 1800.00 |

*** **

100 KK

* *
 * RTE1 *
 * *

ROUTE OUTFLOW FROM TOTAL DRAINAGE BASIN UPSTREAM FROM NE CORNER THE MOORINGS
 THROUGH 2-10X5 RCBC @ MERIDIAN AVENUE

HYDROGRAPH ROUTING DATA

103 RS

STORAGE ROUTING

NSTPS 1 NUMBER OF SUBREACHES
 ITYP ELEV TYPE OF INITIAL CONDITION
 RSVRIC 1320.00 INITIAL CONDITION
 X .00 WORKING R AND D COEFFICIENT

104 SV

STORAGE 1.0 1.4 3.5 6.3 9.9 14.2

105 SE

ELEVATION 1320.00 1322.00 1324.00 1326.00 1328.00 1330.00

106 SL

LOW-LEVEL OUTLET

ELEVL 1322.50 ELEVATION AT CENTER OF OUTLET
 CAREA 100.00 CROSS-SECTIONAL AREA
 COOL .60 COEFFICIENT
 EXPL .50 EXPONENT OF HEAD

107 SS

SPILLWAY

CREL 1329.00 SPILLWAY CREST ELEVATION
 SPWID 500.00 SPILLWAY WIDTH
 COOW 3.00 WEIR COEFFICIENT
 EXPW 1.50 EXPONENT OF HEAD

COMPUTED OUTFLOW-ELEVATION DATA

| | | | | | | | | | | |
|-----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| OUTFLOW | .00 | .00 | 1070.14 | 1090.02 | 1110.66 | 1132.10 | 1154.38 | 1177.57 | 1201.68 | 1226.82 |
| ELEVATION | 1320.00 | 1322.50 | 1327.45 | 1327.63 | 1327.83 | 1328.04 | 1328.26 | 1328.49 | 1328.74 | 1329.00 |
| OUTFLOW | 1232.51 | 1251.08 | 1290.65 | 1359.07 | 1464.21 | 1614.10 | 1816.65 | 2079.34 | 2410.68 | 2817.82 |
| ELEVATION | 1329.02 | 1329.05 | 1329.11 | 1329.18 | 1329.27 | 1329.38 | 1329.51 | 1329.65 | 1329.82 | 1330.00 |

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

| | | | | | | | | | | |
|-----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| STORAGE | 1.00 | 1.37 | 1.90 | 3.49 | 6.34 | 8.93 | 9.26 | 9.61 | 9.92 | 10.00 |
| OUTFLOW | .00 | .00 | .00 | 589.35 | 900.24 | 1070.14 | 1090.02 | 1110.66 | 1128.51 | 1132.10 |
| ELEVATION | 1320.00 | 1322.00 | 1322.50 | 1324.00 | 1326.00 | 1327.45 | 1327.63 | 1327.83 | 1328.00 | 1328.04 |
| STORAGE | 10.47 | 10.97 | 11.51 | 12.07 | 12.12 | 12.19 | 12.31 | 12.46 | 12.66 | 12.89 |
| OUTFLOW | 1154.38 | 1177.57 | 1201.68 | 1226.82 | 1232.51 | 1251.08 | 1290.65 | 1359.07 | 1464.21 | 1614.10 |

| | | | | |
|-----------|---------|---------|---------|---------|
| STORAGE | 13.17 | 13.48 | 13.84 | 14.23 |
| OUTFLOW | 1816.65 | 2079.34 | 2410.68 | 2817.82 |
| ELEVATION | 1329.51 | 1329.65 | 1329.82 | 1330.00 |

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 0. TO 2818.
 THE ROUTED HYDROGRAPH SHOULD BE EXAMINED FOR OSCILLATIONS OR OUTFLOWS GREATER THAN PEAK INFLOWS.
 THIS CAN BE CORRECTED BY DECREASING THE TIME INTERVAL OR INCREASING STORAGE (USE A LONGER REACH.)

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 108 KK * ROHD11 *
 * *

RUNOFF HYDROGRAPH FROM SUBAREA 11

SUBBASIN RUNOFF DATA

110 BA SUBBASIN CHARACTERISTICS
 TAREA .05 SUBBASIN AREA

PRECIPITATION DATA

9 PB STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| .09 | .13 | .13 | .09 | .18 | .18 | .23 | .38 | .94 | 1.12 |
| .35 | .30 | .21 | .23 | .15 | .15 | .17 | .15 | .12 | .12 |
| .12 | .15 | .09 | .12 | | | | | | |

111 LS SCS LOSS RATE
 STRTL .22 INITIAL ABSTRACTION
 CRVNR 90.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

KINEMATIC WAVE

112 UK OVERLAND-FLOW ELEMENT NO. 1
 L 150. OVERLAND FLOW LENGTH
 S .0050 SLOPE
 N .250 ROUGHNESS COEFFICIENT
 PA 100.0 PERCENT OF SUBBASIN

113 RK COLLECTOR CHANNEL
 L 300. CHANNEL LENGTH
 S .0032 SLOPE
 N .050 CHANNEL ROUGHNESS COEFFICIENT
 CA .00 CONTRIBUTING AREA
 SHAPE TRAP CHANNEL SHAPE
 WD .00 BOTTOM WIDTH OR DIAMETER
 Z 20.00 SIDE SLOPE

114 RK COLLECTOR CHANNEL
 L 200. CHANNEL LENGTH
 S .0050 SLOPE
 N .020 CHANNEL ROUGHNESS COEFFICIENT
 CA .00 CONTRIBUTING AREA
 SHAPE CIRC CHANNEL SHAPE
 WD 3.00 BGTOM WIDTH OR DIAMETER
 Z .00 SIDE SLOPE

115 RK MAIN CHANNEL
 L 350. CHANNEL LENGTH
 S .0050 SLOPE

CA .05 CONTRIBUTING AREA
 SHAPE CIRC CHANNEL SHAPE
 WD 4.00 BOTTOM WIDTH OR DIAMETER
 Z .00 SIDE SLOPE
 RUPSTQ NO ROUTE UPSTREAM HYDROGRAPH

COMPUTED KINEMATIC PARAMETERS

| ELEMENT | ALPHA | M | DT (MIN) | DX (FT) |
|---------|--------|-------|----------|---------|
| 1 | .4214 | 1.667 | 15.00 | 75.00 |
| 3 | .3915 | 1.333 | 15.00 | 150.00 |
| 4 | 3.4137 | 1.250 | 15.00 | 100.00 |
| 5 | 3.5814 | 1.250 | 15.00 | 175.00 |

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 * *
 * RDHD12 *
 * *

116 KK

RUNOFF HYDROGRAPH FROM CRYSTAL LAKES ADDITION FULLY DEVELOPED

SUBBASIN RUNOFF DATA

118 BA

SUBBASIN CHARACTERISTICS
 TAREA .25 SUBBASIN AREA

PRECIPITATION DATA

9 PB

STORM 5.90 BASIN TOTAL PRECIPITATION

9 PI

INCREMENTAL PRECIPITATION PATTERN

| | | | | | | | | | |
|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
| .09 | .13 | .13 | .09 | .18 | .18 | .23 | .38 | .94 | 1.12 |
| .35 | .30 | .21 | .23 | .15 | .15 | .17 | .15 | .12 | .12 |
| .12 | .15 | .09 | .12 | | | | | | |

119 LS

SCS LOSS RATE
 STRTL .08 INITIAL ABSTRACTION
 CRVNR 96.00 CURVE NUMBER
 RTIMP .00 PERCENT IMPERVIOUS AREA

120 UD

SCS DIMENSIONLESS UNITGRAPH
 TLAG .20 LAG

WARNING *** TIME INTERVAL IS GREATER THAN .29*LAG

UNIT HYDROGRAPH
 6 END-OF-PERIOD ORDINATES

326. 231. 64. 18. 5. 1.

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 * COMB7 *

121 KK

COMBINE ROUTED HYDROGRAPHS FROM WEST OF MERIDIAN AND NORTH OF THE MOORINGS
WITH ROUTED HYDROGRAPH FROM SUBAREA 11 (THE MOORINGS) AND RUNOFF HYDROGRAPH
FROM CRYSTAL LAKES ADDITION

125 HC HYDROGRAPH COMBINATION
ICOMP 3 NUMBER OF HYDROGRAPHS TO COMBINE

*** ** ** ** **

126 KK * RTE2 *
* *

127 KD OUTPUT CONTROL VARIABLES
IPRNT 1 PRINT CONTROL
IPLOT 2 PLOT CONTROL
QSCAL 0. HYDROGRAPH PLOT SCALE
ROUTE OUTFLOW FROM TOTAL DRAINAGE BASIN UPSTREAM FROM NE CORNER THE MOORINGS
THROUGH CRYSTAL LAKE II

HYDROGRAPH ROUTING DATA

130 RS STORAGE ROUTING
NSTPS 1 NUMBER OF SUBREACHES
ITYP ELEV TYPE OF INITIAL CONDITION
RSVRIC 1315.00 INITIAL CONDITION
X .00 WORKING R AND D COEFFICIENT

131 SV STORAGE 1.0 178.0 356.0 534.0 712.0 890.0

132 SE ELEVATION 1315.00 1317.00 1319.00 1321.00 1323.00 1325.00

134 SL LOW-LEVEL OUTLET
ELEV 1313.10 ELEVATION AT CENTER OF OUTLET
CAREA 7.07 CROSS-SECTIONAL AREA
COOL .60 COEFFICIENT
EXPL .50 EXPONENT OF HEAD

133 SS SPILLWAY
CREL 1322.00 SPILLWAY CREST ELEVATION
SPWID 50.00 SPILLWAY WIDTH
COOW 3.00 WEIR COEFFICIENT
EXPW 1.50 EXPONENT OF HEAD

COMPUTED OUTFLOW-ELEVATION DATA

| | | | | | | | | | | |
|-----------|---------|---------|---------|---------|---------|---------|---------|---------|---------|---------|
| OUTFLOW | .00 | 49.68 | 53.26 | 57.14 | 61.63 | 66.88 | 73.12 | 80.63 | 89.87 | 101.49 |
| ELEVATION | 1315.00 | 1315.25 | 1315.55 | 1315.92 | 1316.38 | 1316.96 | 1317.72 | 1318.72 | 1320.08 | 1322.00 |
| OUTFLOW | 102.84 | 109.65 | 126.39 | 157.56 | 207.57 | 280.93 | 382.07 | 515.44 | 685.51 | 896.78 |
| ELEVATION | 1322.04 | 1322.13 | 1322.29 | 1322.50 | 1322.77 | 1323.10 | 1323.49 | 1323.93 | 1324.44 | 1325.00 |

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

| | | | | | | | | | | | | | | | | | |
|---|------|-----|-----|-------|--------|-----|------|-----|-----|-------|--------|-----|------|-----|-----|------|--------|
| 1 | 1145 | 48 | 79. | 306.9 | 1318.4 | * 2 | 1245 | 148 | 71. | 217.2 | 1317.4 | * 3 | 1345 | 248 | 58. | 89.4 | 1316.0 |
| 1 | 1200 | 49 | 79. | 308.4 | 1318.5 | * 2 | 1300 | 149 | 71. | 215.8 | 1317.4 | * 3 | 1400 | 249 | 58. | 88.2 | 1316.0 |
| 1 | 1215 | 50 | 79. | 309.8 | 1318.5 | * 2 | 1315 | 150 | 71. | 214.4 | 1317.4 | * 3 | 1415 | 250 | 58. | 87.0 | 1316.0 |
| 1 | 1230 | 51 | 79. | 311.0 | 1318.5 | * 2 | 1330 | 151 | 70. | 213.1 | 1317.4 | * 3 | 1430 | 251 | 58. | 85.9 | 1316.0 |
| 1 | 1245 | 52 | 79. | 312.0 | 1318.5 | * 2 | 1345 | 152 | 70. | 211.7 | 1317.4 | * 3 | 1445 | 252 | 57. | 84.7 | 1315.9 |
| 1 | 1300 | 53 | 79. | 312.9 | 1318.5 | * 2 | 1400 | 153 | 70. | 210.4 | 1317.4 | * 3 | 1500 | 253 | 57. | 83.5 | 1315.9 |
| 1 | 1315 | 54 | 79. | 313.6 | 1318.5 | * 2 | 1415 | 154 | 70. | 209.0 | 1317.3 | * 3 | 1515 | 254 | 57. | 82.4 | 1315.9 |
| 1 | 1330 | 55 | 79. | 314.2 | 1318.5 | * 2 | 1430 | 155 | 70. | 207.7 | 1317.3 | * 3 | 1530 | 255 | 57. | 81.2 | 1315.9 |
| 1 | 1345 | 56 | 79. | 314.6 | 1318.5 | * 2 | 1445 | 156 | 70. | 206.3 | 1317.3 | * 3 | 1545 | 256 | 57. | 80.1 | 1315.9 |
| 1 | 1400 | 57 | 79. | 314.9 | 1318.5 | * 2 | 1500 | 157 | 70. | 205.0 | 1317.3 | * 3 | 1600 | 257 | 57. | 78.9 | 1315.9 |
| 1 | 1415 | 58 | 79. | 315.1 | 1318.5 | * 2 | 1515 | 158 | 70. | 203.6 | 1317.3 | * 3 | 1615 | 258 | 57. | 77.8 | 1315.9 |
| 1 | 1430 | 59 | 79. | 315.3 | 1318.5 | * 2 | 1530 | 159 | 69. | 202.3 | 1317.3 | * 3 | 1630 | 259 | 56. | 76.6 | 1315.9 |
| 1 | 1445 | 60 | 79. | 315.3 | 1318.5 | * 2 | 1545 | 160 | 69. | 200.9 | 1317.3 | * 3 | 1645 | 260 | 56. | 75.5 | 1315.8 |
| 1 | 1500 | 61 | 79. | 315.2 | 1318.5 | * 2 | 1600 | 161 | 69. | 199.6 | 1317.2 | * 3 | 1700 | 261 | 56. | 74.4 | 1315.8 |
| 1 | 1515 | 62 | 79. | 315.1 | 1318.5 | * 2 | 1615 | 162 | 69. | 198.2 | 1317.2 | * 3 | 1715 | 262 | 56. | 73.2 | 1315.8 |
| 1 | 1530 | 63 | 79. | 314.9 | 1318.5 | * 2 | 1630 | 163 | 69. | 196.9 | 1317.2 | * 3 | 1730 | 263 | 56. | 72.1 | 1315.8 |
| 1 | 1545 | 64 | 79. | 314.6 | 1318.5 | * 2 | 1645 | 164 | 69. | 195.6 | 1317.2 | * 3 | 1745 | 264 | 56. | 70.9 | 1315.8 |
| 1 | 1600 | 65 | 79. | 314.2 | 1318.5 | * 2 | 1700 | 165 | 69. | 194.2 | 1317.2 | * 3 | 1800 | 265 | 56. | 69.8 | 1315.8 |
| 1 | 1615 | 66 | 79. | 313.8 | 1318.5 | * 2 | 1715 | 166 | 69. | 192.9 | 1317.2 | * 3 | 1815 | 266 | 56. | 68.7 | 1315.8 |
| 1 | 1630 | 67 | 79. | 313.4 | 1318.5 | * 2 | 1730 | 167 | 68. | 191.5 | 1317.2 | * 3 | 1830 | 267 | 55. | 67.6 | 1315.8 |
| 1 | 1645 | 68 | 79. | 312.8 | 1318.5 | * 2 | 1745 | 168 | 68. | 190.2 | 1317.1 | * 3 | 1845 | 268 | 55. | 66.4 | 1315.7 |
| 1 | 1700 | 69 | 79. | 312.3 | 1318.5 | * 2 | 1800 | 169 | 68. | 188.9 | 1317.1 | * 3 | 1900 | 269 | 55. | 65.3 | 1315.7 |
| 1 | 1715 | 70 | 79. | 311.7 | 1318.5 | * 2 | 1815 | 170 | 68. | 187.5 | 1317.1 | * 3 | 1915 | 270 | 55. | 64.2 | 1315.7 |
| 1 | 1730 | 71 | 79. | 311.0 | 1318.5 | * 2 | 1830 | 171 | 68. | 186.2 | 1317.1 | * 3 | 1930 | 271 | 55. | 63.1 | 1315.7 |
| 1 | 1745 | 72 | 79. | 310.3 | 1318.5 | * 2 | 1845 | 172 | 68. | 184.9 | 1317.1 | * 3 | 1945 | 272 | 55. | 62.0 | 1315.7 |
| 1 | 1800 | 73 | 79. | 309.6 | 1318.5 | * 2 | 1900 | 173 | 68. | 183.5 | 1317.1 | * 3 | 2000 | 273 | 55. | 60.9 | 1315.7 |
| 1 | 1815 | 74 | 79. | 308.8 | 1318.5 | * 2 | 1915 | 174 | 68. | 182.2 | 1317.0 | * 3 | 2015 | 274 | 54. | 59.8 | 1315.7 |
| 1 | 1830 | 75 | 79. | 308.0 | 1318.5 | * 2 | 1930 | 175 | 67. | 180.9 | 1317.0 | * 3 | 2030 | 275 | 54. | 58.7 | 1315.7 |
| 1 | 1845 | 76 | 79. | 307.2 | 1318.5 | * 2 | 1945 | 176 | 67. | 179.5 | 1317.0 | * 3 | 2045 | 276 | 54. | 57.6 | 1315.6 |
| 1 | 1900 | 77 | 79. | 306.3 | 1318.4 | * 2 | 2000 | 177 | 67. | 178.2 | 1317.0 | * 3 | 2100 | 277 | 54. | 56.5 | 1315.6 |
| 1 | 1915 | 78 | 78. | 305.4 | 1318.4 | * 2 | 2015 | 178 | 67. | 176.9 | 1317.0 | * 3 | 2115 | 278 | 54. | 55.4 | 1315.6 |
| 1 | 1930 | 79 | 78. | 304.5 | 1318.4 | * 2 | 2030 | 179 | 67. | 175.6 | 1317.0 | * 3 | 2130 | 279 | 54. | 54.3 | 1315.6 |
| 1 | 1945 | 80 | 78. | 303.6 | 1318.4 | * 2 | 2045 | 180 | 67. | 174.3 | 1317.0 | * 3 | 2145 | 280 | 54. | 53.2 | 1315.6 |
| 1 | 2000 | 81 | 78. | 302.6 | 1318.4 | * 2 | 2100 | 181 | 67. | 172.9 | 1316.9 | * 3 | 2200 | 281 | 54. | 52.1 | 1315.6 |
| 1 | 2015 | 82 | 78. | 301.6 | 1318.4 | * 2 | 2115 | 182 | 67. | 171.6 | 1316.9 | * 3 | 2215 | 282 | 53. | 51.0 | 1315.6 |
| 1 | 2030 | 83 | 78. | 300.6 | 1318.4 | * 2 | 2130 | 183 | 66. | 170.3 | 1316.9 | * 3 | 2230 | 283 | 53. | 49.9 | 1315.6 |
| 1 | 2045 | 84 | 78. | 299.6 | 1318.4 | * 2 | 2145 | 184 | 66. | 169.0 | 1316.9 | * 3 | 2245 | 284 | 53. | 48.8 | 1315.5 |
| 1 | 2100 | 85 | 78. | 298.5 | 1318.4 | * 2 | 2200 | 185 | 66. | 167.7 | 1316.9 | * 3 | 2300 | 285 | 53. | 47.8 | 1315.5 |
| 1 | 2115 | 86 | 78. | 297.5 | 1318.3 | * 2 | 2215 | 186 | 66. | 166.4 | 1316.9 | * 3 | 2315 | 286 | 53. | 46.7 | 1315.5 |
| 1 | 2130 | 87 | 78. | 296.4 | 1318.3 | * 2 | 2230 | 187 | 66. | 165.1 | 1316.9 | * 3 | 2330 | 287 | 53. | 45.6 | 1315.5 |
| 1 | 2145 | 88 | 78. | 295.3 | 1318.3 | * 2 | 2245 | 188 | 66. | 163.8 | 1316.8 | * 3 | 2345 | 288 | 53. | 44.5 | 1315.5 |
| 1 | 2200 | 89 | 78. | 294.2 | 1318.3 | * 2 | 2300 | 189 | 66. | 162.5 | 1316.8 | * 4 | 0000 | 289 | 52. | 43.5 | 1315.5 |
| 1 | 2215 | 90 | 77. | 293.0 | 1318.3 | * 2 | 2315 | 190 | 65. | 161.2 | 1316.8 | * 4 | 0015 | 290 | 52. | 42.4 | 1315.5 |
| 1 | 2230 | 91 | 77. | 291.9 | 1318.3 | * 2 | 2330 | 191 | 65. | 159.9 | 1316.8 | * 4 | 0030 | 291 | 52. | 41.3 | 1315.5 |
| 1 | 2245 | 92 | 77. | 290.7 | 1318.3 | * 2 | 2345 | 192 | 65. | 158.6 | 1316.8 | * 4 | 0045 | 292 | 52. | 40.3 | 1315.4 |
| 1 | 2300 | 93 | 77. | 289.6 | 1318.3 | * 3 | 0000 | 193 | 65. | 157.3 | 1316.8 | * 4 | 0100 | 293 | 52. | 39.2 | 1315.4 |
| 1 | 2315 | 94 | 77. | 288.4 | 1318.2 | * 3 | 0015 | 194 | 65. | 156.0 | 1316.8 | * 4 | 0115 | 294 | 52. | 38.2 | 1315.4 |
| 1 | 2330 | 95 | 77. | 287.2 | 1318.2 | * 3 | 0030 | 195 | 65. | 154.7 | 1316.7 | * 4 | 0130 | 295 | 52. | 37.1 | 1315.4 |
| 1 | 2345 | 96 | 77. | 286.0 | 1318.2 | * 3 | 0045 | 196 | 65. | 153.4 | 1316.7 | * 4 | 0145 | 296 | 52. | 36.1 | 1315.4 |
| 2 | 0000 | 97 | 77. | 284.8 | 1318.2 | * 3 | 0100 | 197 | 65. | 152.1 | 1316.7 | * 4 | 0200 | 297 | 51. | 35.0 | 1315.4 |
| 2 | 0015 | 98 | 77. | 283.6 | 1318.2 | * 3 | 0115 | 198 | 64. | 150.8 | 1316.7 | * 4 | 0215 | 298 | 51. | 34.0 | 1315.4 |
| 2 | 0030 | 99 | 77. | 282.3 | 1318.2 | * 3 | 0130 | 199 | 64. | 149.5 | 1316.7 | * 4 | 0230 | 299 | 51. | 32.9 | 1315.4 |
| 2 | 0045 | 100 | 76. | 281.1 | 1318.2 | * 3 | 0145 | 200 | 64. | 148.3 | 1316.7 | * 4 | 0245 | 300 | 51. | 31.9 | 1315.3 |

| PEAK FLOW | TIME | MAXIMUM AVERAGE FLOW | | | | |
|-----------|-------|----------------------|------|-------|-------|-------|
| 79. | 14.75 | (CFS) | 79. | 77. | 67. | 66. |
| | | (INCHES) | .338 | 1.314 | 3.432 | 3.525 |
| | | (AC-FT) | 39. | 153. | 399. | 410. |

| PEAK STORAGE | TIME | MAXIMUM AVERAGE STORAGE | | | |
|--------------|-------|-------------------------|-------|-------|----------|
| (AC-FT) | (HR) | 6-HR | 24-HR | 72-HR | 74.75-HR |
| 315. | 14.75 | 313. | 288. | 183. | 177. |

| (FEET) | (HR) | 6-HR | 24-HR | 72-HR | 74.75-HR |
|---------|-------|---------|---------|---------|----------|
| 1318.54 | 14.75 | 1318.52 | 1318.24 | 1317.06 | 1316.98 |

CUMULATIVE AREA = 2.18 SQ MI

RUNOFF SUMMARY
 FLOW IN CUBIC FEET PER SECOND
 TIME IN HOURS, AREA IN SQUARE MILES

| OPERATION | STATION | PEAK FLOW | TIME OF PEAK | AVERAGE FLOW FOR MAXIMUM PERIOD | | | BASIN AREA | MAXIMUM STAGE | TIME OF MAX STAGE |
|---------------|---------|-----------|--------------|---------------------------------|---------|---------|------------|---------------|-------------------|
| | | | | 6-HOUR | 24-HOUR | 72-HOUR | | | |
| HYDROGRAPH AT | ROHD1 | 15. | 4.25 | 9. | 3. | 1. | .03 | | |
| HYDROGRAPH AT | ROHD2 | 17. | 4.75 | 11. | 3. | 1. | .04 | | |
| 2 COMBINED AT | COMB1 | 31. | 4.50 | 20. | 6. | 2. | .07 | | |
| HYDROGRAPH AT | ROHD3 | 227. | 6.25 | 154. | 53. | 18. | .59 | | |
| 2 COMBINED AT | COMB2 | 249. | 6.25 | 170. | 59. | 20. | .66 | | |
| HYDROGRAPH AT | ROHD4 | 97. | 5.25 | 63. | 20. | 7. | .23 | | |
| 2 COMBINED AT | COMB3 | 331. | 6.00 | 229. | 78. | 27. | .89 | | |
| HYDROGRAPH AT | ROHD5 | 96. | 6.00 | 65. | 21. | 7. | .27 | | |
| 2 COMBINED AT | COMB4 | 427. | 6.00 | 293. | 100. | 34. | 1.16 | | |
| HYDROGRAPH AT | ROHD6 | 477. | 6.25 | 338. | 116. | 40. | 1.32 | | |
| HYDROGRAPH AT | ROHD7 | 79. | 4.00 | 41. | 12. | 4. | .11 | | |
| 2 COMBINED AT | COMB5 | 517. | 6.25 | 374. | 128. | 44. | 1.43 | | |
| HYDROGRAPH AT | ROHD8 | 566. | 6.25 | 421. | 144. | 50. | 1.58 | | |
| HYDROGRAPH AT | ROHD9 | 56. | 4.75 | 34. | 10. | 4. | .11 | | |
| 2 COMBINED AT | COMB6 | 606. | 6.25 | 454. | 154. | 53. | 1.69 | | |
| HYDROGRAPH AT | ROHD10 | 673. | 6.00 | 501. | 173. | 60. | 1.88 | | |
| ROUTED TO | RTE1 | 672. | 6.25 | 501. | 173. | 60. | 1.88 | 1324.53 | 6.25 |
| HYDROGRAPH AT | ROHD11 | 119. | 2.75 | 25. | 6. | 2. | .05 | | |
| HYDROGRAPH AT | ROHD12 | 595. | 2.50 | 145. | 36. | 12. | .25 | | |
| 3 COMBINED AT | COMB7 | 757. | 6.00 | 543. | 214. | 74. | 2.18 | | |
| ROUTED TO | RTE2 | 79. | 14.75 | 79. | 77. | 67. | 2.18 | 1318.54 | 14.75 |

*** NORMAL END OF HEC-1 ***

PLEASANT VALLEY TRIBUTARY
DRAINAGE BASIN AREA & SCS CN DETERMINATION CONTINUED

SubArea 10

Ea Part in NW Corner (Hydrologic Soil Group B w/CN=75)

$$0780 \quad 0788 \quad (\text{Product } 5.10 \times 75 = 383)$$

$$\begin{array}{r} 0773 \\ \hline 0780 \end{array}$$

$$.07 \quad .08 \quad \rangle .08 \times 63.769 = 5.10 \text{ acres}$$

Ea Part in NE Portion (Hydrologic Soil Group w/CN=75)

$$0780 \quad 0840 \quad (\text{Product} = 38.26 \times 75 = 2870)$$

$$\begin{array}{r} 0720 \\ \hline 0780 \end{array}$$

$$.60 \quad .60 \quad \rangle .60 \times 63.769 = 38.26 \text{ acres}$$

La Part in Central Strip (Hydrologic Soil Group C w/CN=88)

$$0893 \quad 0948 \quad (\text{Product} = 34.44 \text{ Acres} \times 88 = 3030)$$

$$\begin{array}{r} 0840 \\ \hline 0893 \end{array}$$

$$.53 \quad .55 \quad \rangle 0.54 \times 63.769 = 34.44 \text{ acres}$$

Total Basin Area (All Soil Groups)

$$1077 \quad 1264$$

$$\begin{array}{r} 0887 \\ \hline 1077 \end{array}$$

$$1.90 \quad 1.87 \quad \rangle 1.88 \times 63.769 = 120 \text{ acres} / 640 = 0.19 \text{ Sq. Miles}$$

Balance of SubArea 10 which is Hydrologic Soil Group D w/CN=86

$$120 - (5.10 + 38.26 + 34.44) = 42.20 \text{ acres}$$

$$(\text{Product} = 42.20 \times 86 = 3629)$$

$$\Sigma \text{ Products for SubArea 10} = 383 + 2870 + 3030 + 3629 = 9912$$

$$\text{CN} = \Sigma \text{ Products} / \text{Area} = 9912 / 120 = 83$$

SubArea 11

Portion of The Moorings which drains east across Meridian to Crystal Lake II. - 31 acres determined by K. Hill from street drainage plans. Average CN=90

PLEASANT VALLEY TRIBUTARY
DRAINAGE BASIN AREA & SCS CN DETERMINATION

CRYSTAL LAKES ADDITION (FULLY DEVELOPED)

All of the SW 1/4 of Section 19 - 160 acres determined
by K. Hill.

89 acres Crystal Lake w/CN=100 Product = $89 \times 100 = 8900$

71 acres residential w/CN=90 Product = $71 \times 90 = \underline{6390}$

Sum 160 15,290

$$CN = 15,290 / 160 = 96$$

PLEASANT VALLEY TRIBUTARY

DRAINAGE BASIN CHARACTERISTICS

OVERLAND FLOW REGIME

| Area Data | Flow Length (Ft) | Flow Slope (Ft/Ft) | Roughness Factor | % Sub-Area | Basin Area (Sq. Mi.) | SCS CN | Lag (hours) |
|------------------------|------------------|--------------------|------------------|------------|----------------------|--------|-------------|
| Area 1 | 550 | .001 | .30 | 100 | .03 | 75 | |
| Area 2 | 750 | .001 | .30 | 100 | .04 | 75 | |
| Area 3 | 1050 | .001 | .30 | 100 | .59 | 79 | |
| Area 4 | 850 | .001 | .30 | 100 | .23 | 77 | |
| Area 5 | 1100 | .001 | .30 | 100 | .27 | 74 | |
| Area 6 | 600 | .001 | .30 | 100 | .16 | 82 | |
| Area 7 | 500 | .001 | .30 | 100 | .11 | 86 | |
| Area 8 | 750 | .001 | .30 | 100 | .15 | 85 | |
| Area 9 | 730 | .001 | .30 | 100 | .11 | 80 | |
| Area 10 | 750 | .001 | .30 | 100 | .19 | 83 | |
| Area 11 | 150 | .005 | .250 | 100 | .05 | 90 | |
| Crystal Lakes Addition | - | - | - | - | .25 | 96 | .20 |

PLEASANT VALLEY TRIBUTARY

DRAINAGE BASIN CHARACTERISTICS

CHANNEL FLOW REGIME CONTINUED

| SubArea
Data | CHANNEL
LENGTH
(FT) | CHANNEL
SLOPE
(FT/FT) | MANNINGS
N | AREA
(SQ MI) | SHAPE | BOTTOM
WIDTH
(FT) | SIDE
SLOPE
(FT/FT) | UPSTREAM
FLOW
(YES/NO) |
|-----------------|---------------------------|-----------------------------|---------------|-----------------|-------|-------------------------|--------------------------|------------------------------|
|-----------------|---------------------------|-----------------------------|---------------|-----------------|-------|-------------------------|--------------------------|------------------------------|

Sub Area 8

| | | | | | | | | |
|-----------|------|-------|------|-----|------|----|----|-----|
| collector | 1300 | .0013 | .040 | .01 | TRAP | 50 | 2 | — |
| Main | 1740 | .0029 | .060 | — | TRAP | 50 | 10 | YES |

Sub Area 9

| | | | | | | | | |
|-----------|------|-------|------|-----|------|----|---|----|
| collector | 1640 | .0012 | .040 | .01 | TRAP | 50 | 2 | |
| Main | 600 | .0050 | .060 | — | TRAP | 10 | 5 | No |

Sub Area 10

| | | | | | | | | |
|------|------|-------|------|---|------|----|----|-----|
| Main | 3600 | .0003 | .060 | — | TRAP | 50 | 10 | YES |
|------|------|-------|------|---|------|----|----|-----|

Sub Area 11

| | | | | | | | | |
|-------------|-----|-------|------|---|--------|-------------|----|--|
| Collector 1 | 300 | .0032 | .050 | — | TRAP | 0 | 20 | |
| Collector 2 | 200 | .0050 | .020 | — | CIRCLE | 3' diameter | | |
| Main | 350 | .0050 | .020 | — | CIRCLE | 4' diameter | | |

PLEASANT VALLEY TRIBUTARY STORAGE TABLE - CRYSTAL LAKE II

| Elevation
(MSL) | Surface
Area
(Acres) | Depth
(Feet) | VOLUME
Incremental
(Acre Feet) | Accumulated
(Acre Feet) |
|--------------------|----------------------------|-----------------|--------------------------------------|----------------------------|
| 1315 | 89 | 0 | 0 | 0 — |
| 1316 | 89 | 1 | 89 | 89 |
| 1317 | 89 | 2 | 89 | 178 — |
| 1318 | 89 | 3 | 89 | 267 |
| 1319 | 89 | 4 | 89 | 356 — |
| 1320 | 89 | 5 | 89 | 445 |
| 1321 | 89 | 6 | 89 | 534 — |
| 1322 | 89 | 7 | 89 | 623 |
| 1323 | 89 | 8 | 89 | 712 — |
| 1324 | 89 | 9 | 89 | 801 |
| 1325 | 89 | 10 | 89 | 890 — |