

## **I-135 POWER CENTER ADDITION**

### **INTRODUCTION**

This site lies in the Northwest Quarter of Sec. 10, T-28-S, R-1E, being approximately located at the I-135 and Hydraulic intersection. The site contains 38.5 acres of undeveloped land with the exception of approximately 1.0 acres of development on Lot 5, being the McDonalds Restaurant. The rest of the site is planned to be developed as a concrete and asphalt plant now, and possibly as commercial properties in the future. Thusly, all drainage computations for this site have been separated into two stages of development: 1) a low-density, low impervious area condition associated with the concrete and asphalt plant, and 2) a high-density, high impervious area condition associated with commercial properties.

As development of this property takes place, the resultant storm discharge from this site will increase. In order to comply with the practice of limiting post-development discharges to those existing before development occurs, it will be necessary to perform detention on the site before allowing storm runoff to discharge from the site. All current storm runoff flows from this site are directed under I-135 through a 48" CMP and carried via a ditch to the Big Arkansas River.

### **HYDROLOGY**

Runoff occurring on this site is contributed by two separate drainage basins, hereinafter termed on-site and off-site. The off-site drainage basin consists of 17.0 acres of developed property lying north of the site. Runoff from the off-site basin is discharged to our site near the Northeast corner of the property via a 48" RCP storm sewer outlet. Off-site Q's are identical for pre- and post-developed conditions.

Runoff from on-site is assumed to flow overland for pre-developed conditions, and either overland or carried via storm sewers and other drainage devices to the proposed detention pond for post-developed conditions. Internal Drainage System shall be the responsibility of individual land owners as they develop the site. The on-site drainage basin is assumed to be 38.5 acres in size, meaning that all of the site is assumed to drain to the east and not into Hydraulic.

### **EXISTING DRAINAGE PLAN**

A drainage plan for this plat was developed by Kaw Valley Engineering in 1994. The existing plan had two alternatives to handle the increased storm runoff. Option 1 involved a new bore and installation of a 48" RCP under I-135. Option 2 involved a pump system to utilize the existing 48" CMP. The plat for this site designated approximately 4.5 acres along the North side as "Detention Area and Drainage Easement".

### **REVISED DRAINAGE PLAN**

The current owner of the Northern portion of the plat, Ritchie Corporation, has employed PEC to revise the existing drainage plan to incorporate their development plan for the site. Ritchie Corp.

would like to vacate the platted Drainage Easement so that they may build within that portion of the site. Doing so will permit Ritchie Corp. a site layout that will allow them more efficient use of the property. In exchange, a new drainage easement will be granted along the I-135 right-of-way for purpose of constructing a detention pond. The main differences between the proposed drainage plan and the existing one are as follows:

1. Proposed plan has a total drainage basin of 55.5 acres vs. 64.2 acres in the existing.
2. Ritchie property is separated from the other properties in the on-site basin for developed conditions because of its lower curve number. The existing plan treats the entire on-site basin as having similar drainage characteristics.
3. The pre-developed hydrology computations, although quite similar, 121 cfs vs. 119 cfs, were derived very differently.
  - a. The existing plan uses one curve number (C.N.) for the on-site and off-site basins, being 80. We used a separate C.N. for each basin to model their difference runoff potential. A weighted PEC C.N. of 69 results if both basins are combined.
  - b. The existing plan incorrectly used a value of 8.2 inches for the 100-year precipitation (P) in the SCS equation. Our revised plan uses a value of 7.8 inches, which is appropriate for Sedgwick County, as published in the City of Wichita Drainage Manual.
  - c. The existing plan used a combined basin time of concentration (tc) of 2.3 hours. The revised plan uses separate basins, and has a maximum tc of 1.0 hour.

Similar to the existing plan's Option 2, we proposed to install, by boring, a new 48" RCP under I-135. This pipe will have a flowline up of 80.0. The pond discharging to this pipe will be constructed in two phases. The first phase will construct a pond large enough to detain the 100-year storm runoff from the low-impervious area concrete and asphalt plant. Phase 2 construction will involve enlarging the pond to detain the additional runoff from the site being developed fully as high-density commercial property.

### **CONCLUSION**

The 100-year maximum stage (D.W.S.100) of the pond, for both Phase 1 and 2 construction, will not exceed 85.94 feet. Therefore, the platted minimum pad elevation of 87.00 will provide in excess of 1.0 feet of freeboard for the 100-year storm. Additionally, because the Base Flood Elevation for the Big Arkansas River adjacent to this site is 87.6, or 0.6 feet higher than minimum pad, a flapgate and sluice will be required at the outlet of the new 48" RCP to prevent flooding on this property by the river.

All pond sizes and approximate pond locations are shown on the attached drainage plan map.

CURRENT DATE: 12-19-1995  
CURRENT TIME: 10:43:44

FILE DATE: 12-19-1995  
FILE NAME: I135

-----  
FHWA CULVERT ANALYSIS  
HY-8, VERSION 3.2  
-----

C		SITE DATA		CULVERT SHAPE, MATERIAL, INLET					U
L	V	INLET ELEV. (FT)	OUTLET ELEV. (FT)	CULVERT LENGTH (FT)	BARRELS SHAPE MATERIAL	SPAN (FT)	RISE (FT)	MANNING n	INLET TYPE
1		80.00	79.00	350.00	1 RCP	4.00	4.00	.012	CONVENTIONAL
2									
3									
4									
5									
6									

-----  
SUMMARY OF CULVERT FLOWS (CFS) FILE: I135 DATE: 12-19-1995  
-----

ELEV (FT)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
82.95	40	40	0	0	0	0	0	0	1
83.28	48	48	0	0	0	0	0	0	1
83.59	56	56	0	0	0	0	0	0	1
83.88	64	64	0	0	0	0	0	0	1
84.17	72	72	0	0	0	0	0	0	1
84.47	80	80	0	0	0	0	0	0	1
84.78	88	88	0	0	0	0	0	0	1
85.15	96	96	0	0	0	0	0	0	1
85.65	104	104	0	0	0	0	0	0	1
86.25	112	112	0	0	0	0	0	0	1
86.87	120	120	0	0	0	0	0	0	1
100.00	242	242	0	0	0	0	0	0	OVERTOPPING

-----  
SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: I135 DATE: 12-19-1995  
-----

HEAD ELEV(FT)	HEAD ERROR(FT)	TOTAL FLOW(CFS)	FLOW ERROR(CFS)	% FLOW ERROR
82.95	0.00	40	0	0.00
83.28	0.00	48	0	0.00
83.59	0.00	56	0	0.00
83.88	0.00	64	0	0.00
84.17	0.00	72	0	0.00
84.47	0.00	80	0	0.00
84.78	0.00	88	0	0.00
85.15	0.00	96	0	0.00
85.65	0.00	104	0	0.00
86.25	0.00	112	0	0.00
86.87	0.00	120	0	0.00

<1> TOLERANCE (FT) = 0.010 <2> TOLERANCE (%) = 1.000  
-----

PRE-DEVELOPED

12-19-1995

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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
* Lahey F77L-EM/32 version 5.01 *
* Dodson & Associates, Inc. *
* RUN DATE 12/19/95 TIME 11:54:35 *
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*****
*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 551-1748 *
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X X XXXXXX XXXX X
X X X X X XX
X X X X X
XXXXXX XXXX X XXXX X
X X X X X
X X X X X
X X XXXXXX XXXX XXX

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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE.  
 THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION  
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,  
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION  
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

1

HEC-1 INPUT

PAGE 1

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

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1 ID I-135 POWER CENTER DRAINAGE STUDY
2 ID ON-SITE PRE-DEVELOPED CONDITIONS
3 ID 5-, 10-, 25-, & 100-Year Storms
4 ID Professional Engineering Consultants
5 ID Wichita, Ks
6 ID DRC 11/20/95
7 ID File: T:\DAR\HEC1\I135A.IH1
8 IT 6 01FEB95 0600 0 02FEB95 1154
9 IN 30 01FEB95 0600
10 IO 3 0
11 JR PREC 0.5902 0.6875 0.8125 1.000

```

\*DIAGRAM  
\*

```

12 KK UNDEV UNDEVELOPED BASIN
13 BA .06016
14 PB 7.8
15 PC 0.08 .09 .10 .11 .12 .133 .147 .163 .181 .204
16 PC .235 .283 .663 .735 .772 .799 .820 .835 .850 .865
17 PC .880 .890 .900 .910 .916 .925 .934 .943 .952 .958
18 PC .964 .970 .976 .982 .988 .994 1.000
19 LS 0 59 0
20 UD .6
*
*

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21 KK OFFSIT OFF-SITE DEVELOPED CONDITIONS
22 BA .02656
23 PB 7.8
24 PC 0.08 .09 .10 .11 .12 .133 .147 .163 .181 .204
25 PC .235 .283 .663 .735 .772 .799 .820 .835 .850 .865
26 PC .880 .890 .900 .910 .916 .925 .934 .943 .952 .958
27 PC .964 .970 .976 .982 .988 .994 1.000
28 LS 0 92 0
29 UD .17
*
*

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30 KK COMB2
31 HC 2
*
32 ZZ

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1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT  
LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW

NO. (.) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

12 UNDEV

21 OFFSIT

30 COMB2.....

(\*\*\*) RUNOFF ALSO COMPUTED AT THIS LOCATION

1\*\*\*\*\*

\* FLOOD HYDROGRAPH PACKAGE (HEC-1) \*

\* MAY 1991 \*

\* VERSION 4.0.1E \*

\* Lahey F77L-EM/32 version 5.01 \*

\* Dodson & Associates, Inc. \*

\* RUN DATE 12/19/95 TIME 11:54:35 \*

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\* U.S. ARMY CORPS OF ENGINEERS \*

\* HYDROLOGIC ENGINEERING CENTER \*

\* 609 SECOND STREET \*

\* DAVIS, CALIFORNIA 95616 \*

\* (916) 551-1748 \*

\*\*\*\*\*

I-135 POWER CENTER DRAINAGE STUDY  
ON-SITE PRE-DEVELOPED CONDITIONS  
5-, 10-, 25-, & 100-Year Storms  
Professional Engineering Consultants  
Wichita, Ks  
DRC 11/20/95  
File: T:\DAR\HEC1\I135A.IH1

10 IO OUTPUT CONTROL VARIABLES

IPRNT 3 PRINT CONTROL

IPLOT 0 PLOT CONTROL

QSCAL 0. HYDROGRAPH PLOT SCALE

IT HYDROGRAPH TIME DATA

NMIN 6 MINUTES IN COMPUTATION INTERVAL

IDATE 1FEB95 STARTING DATE

ITIME 0600 STARTING TIME

NQ 300 NUMBER OF HYDROGRAPH ORDINATES

NDDATE 2FEB95 ENDING DATE

NDTIME 1154 ENDING TIME

ICENT 19 CENTURY MARK

COMPUTATION INTERVAL 0.10 HOURS

TOTAL TIME BASE 29.90 HOURS

ENGLISH UNITS

DRAINAGE AREA SQUARE MILES

PRECIPITATION DEPTH INCHES

LENGTH, ELEVATION FEET

FLOW CUBIC FEET PER SECOND

STORAGE VOLUME ACRE-FEET

SURFACE AREA ACRES

TEMPERATURE DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION

NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION

RATIOS OF PRECIPITATION

0.59 0.69 0.81 1.00

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\*\*\*\*\*

\* UNDEV \* UNDEVELOPED BASIN \*

12 KK

\*\*\*\*\*







(INCHES) 3.621 4.444 4.444 4.444  
 (AC-FT) 5. 6. 6. 6.

CUMULATIVE AREA = 0.03 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION OFFSIT  
 FOR PLAN 1, RATIO = 0.81

TOTAL RAINFALL = 6.34, TOTAL LOSS = 0.94, TOTAL EXCESS = 5.40

+ (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 80.	6.00	13.	4.	3.	3.	
		(INCHES) 4.387	5.402	5.402	5.402	
		(AC-FT) 6.	8.	8.	8.	

CUMULATIVE AREA = 0.03 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION OFFSIT  
 FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 0.95, TOTAL EXCESS = 6.85

+ (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 100.	6.00	16.	5.	4.	4.	
		(INCHES) 5.533	6.846	6.846	6.846	
		(AC-FT) 8.	10.	10.	10.	

CUMULATIVE AREA = 0.03 SQ MI

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 \* \*  
 30 KK \* COMB2 \*  
 \* \*  
 \*\*\*\*\*

31 HC HYDROGRAPH COMBINATION  
 ICOMP 2 NUMBER OF HYDROGRAPHS TO COMBINE

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HYDROGRAPH AT STATION COMB2  
 FOR PLAN 1, RATIO = 0.59

+ (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 58.	6.00	13.	4.	3.	3.	
		(INCHES) 1.418	1.839	1.839	1.839	
		(AC-FT) 7.	9.	9.	9.	

CUMULATIVE AREA = 0.09 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION COMB2  
 FOR PLAN 1, RATIO = 0.69

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

			6-HR	24-HR	72-HR	29.90-HR
+	(CFS)	(HR)				
			(CFS)			
+	71.	6.00	17.	6.	4.	4.
			(INCHES)	1.829	2.363	2.363
			(AC-FT)	8.	11.	11.
			CUMULATIVE AREA = 0.09 SQ MI			

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION COMB2  
FOR PLAN 1, RATIO = 0.81

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR	29.90-HR
+	(CFS)	(HR)				
			(CFS)			
+	90.	6.10	22.	7.	6.	6.
			(INCHES)	2.395	3.082	3.082
			(AC-FT)	11.	14.	14.
			CUMULATIVE AREA = 0.09 SQ MI			

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HYDROGRAPH AT STATION COMB2  
FOR PLAN 1, RATIO = 1.00

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR	29.90-HR
+	(CFS)	(HR)				
			(CFS)			
+	121.	6.10	31.	10.	8.	8.
			(INCHES)	3.308	4.230	4.230
			(AC-FT)	15.	20.	20.
			CUMULATIVE AREA = 0.09 SQ MI			

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES  
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION				
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	
				0.59	0.69	0.81	1.00	
HYDROGRAPH AT								
+	UNDEV	0.06	1	FLOW	15.	23.	35.	56.
				TIME	6.60	6.60	6.50	6.50
HYDROGRAPH AT								
+	OFFSIT	0.03	1	FLOW	55.	66.	80.	100.
				TIME	6.00	6.00	6.00	6.00
2 COMBINED AT								
+	COMB2	0.09	1	FLOW	58.	71.	90.	121.
				TIME	6.00	6.00	6.10	6.10

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

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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* MAY 1991
* VERSION 4.0.1E
* Lahey F77L-EM/32 version 5.01
* Dodson & Associates, Inc.
* RUN DATE 12/19/95 TIME 11:54:44
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*****
*
* U.S. ARMY CORPS OF ENGINEERS
* HYDROLOGIC ENGINEERING CENTER
* 609 SECOND STREET
* DAVIS, CALIFORNIA 95616
* (916) 551-1748
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X X XXXXXX XXXX X
X X X X X XX
X X X X X X
XXXXXX XXXX X XXXX X
X X X X X X
X X X X X X
X X XXXXXX XXXX XXX
    
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION  
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY, DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION  
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID I-135 POWER CENTER DRAINAGE STUDY
2 ID DEVELOPED CONDITIONS FOR SAND PLANT (25% IMPERVIOUS)
3 ID 48" RCP AT ELEV. 80.0
4 ID 5-, 10-, 25-, & 100-Year Storms
5 ID Professional Engineering Consultants
6 ID Wichita, Ks
7 ID DRC 11/20/95
8 ID File: T:\DAR\HEC1\I135B.IH1
9 IT 6 01FEB95 0600 0 02FEB95 1154
10 IN 30 01FEB95 0600
11 IO 3 0
12 JR PREC 0.5902 0.6875 0.8125 1.000
*
*DIAGRAM
*
13 KK PLANT DEVELOPED SAND PLANT BASIN
14 BA .04687
15 FB 7.8
16 PC 0.08 .09 .10 .11 .12 .133 .147 .163 .181 .204
17 PC .235 .283 .663 .735 .772 .799 .820 .835 .850 .865
18 PC .880 .890 .900 .910 .916 .925 .934 .943 .952 .958
19 PC .964 .970 .976 .982 .988 .994 1.000
20 LS 0 67 0
21 UD .3
*
*
22 KK MCDS DEVELOPED BASIN IN SW COR. FOR COMMERCIAL CONDITIONS (MCDONALDS)
23 BA .01328
24 FB 7.8
25 PC 0.08 .09 .10 .11 .12 .133 .147 .163 .181 .204
26 PC .235 .283 .663 .735 .772 .799 .820 .835 .850 .865
27 PC .880 .890 .900 .910 .916 .925 .934 .943 .952 .958
28 PC .964 .970 .976 .982 .988 .994 1.000
29 LS 0 89 0
30 UD .15
*
*
31 KK OFFSIT OFF-SITE DEVELOPED CONDITIONS
32 BA .02656
33 PB 7.8
    
```

34	PC	0.08	.09	.10	.11	.12	.133	.147	.163	.181	.204
35	PC	.235	.283	.663	.735	.772	.799	.820	.835	.850	.865
36	PC	.880	.890	.900	.910	.916	.925	.934	.943	.952	.958
37	PC	.964	.970	.976	.982	.988	.994	1.000			
38	LS	0	92	0							
39	UD	.17									

1

HEC-1 INPUT

PAGE 2

LINE	ID	.....1	.....2	.....3	.....4	.....5	.....6	.....7	.....8	.....9	.....10
40	KK	COMB3									
41	HC	3									
	*										
	*	48" RCP OUTLET									
42	KK	POND									
43	RS	1	ELEV	80							
44	SA	1.0	1.5								
45	SE	80	87								
46	SQ	0	40	48	56	64	72	80	88	96	104
47	SQ	112	120								
48	SE	80	82.95	83.28	83.59	83.88	84.17	84.47	84.78	85.15	85.65
49	SE	86.25	86.87								
	*										
50	ZZ										

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

INPUT LINE (V) ROUTING (--->) DIVERSION OR PUMP FLOW  
 NO. (. ) CONNECTOR (<---) RETURN OF DIVERTED OR PUMPED FLOW

```

13 PLANT
   .
   .
22 . MCDS
   .
   .
31 . OFFSIT
   .
   .
40 COMB3.....
   V
   V
42 POND
    
```

(\*\*\*) RUNOFF ALSO COMPUTED AT THIS LOCATION

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1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
* Lahey F77L-EM/32 version 5.01 *
* Dodson & Associates, Inc. *
* RUN DATE 12/19/95 TIME 11:54:44 *
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*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 551-1748 *
*****
    
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I-135 POWER CENTER DRAINAGE STUDY  
 DEVELOPED CONDITIONS FOR SAND PLANT (25% IMPERVIOUS)  
 48" RCP AT ELEV. 80.0  
 5-, 10-, 25-, & 100-Year Storms  
 Professional Engineering Consultants  
 Wichita, Ks  
 DRC 11/20/95  
 File: T:\DAR\HEC1\I135B.IH1

11 IO

OUTPUT CONTROL VARIABLES

IPRNT 3 PRINT CONTROL  
 IPLOT 0 PLOT CONTROL  
 QSICAL 0. HYDROGRAPH PLOT SCALE

IT

HYDROGRAPH TIME DATA

NMIN 6 MINUTES IN COMPUTATION INTERVAL  
 IDATE 1FEB95 STARTING DATE

ITIME 0600 STARTING TIME
NQ 300 NUMBER OF HYDROGRAPH ORDINATES
NDDATE 2FEB95 ENDING DATE
NDTIME 1154 ENDING TIME
ICENT 19 CENTURY MARK

COMPUTATION INTERVAL 0.10 HOURS
TOTAL TIME BASE 29.90 HOURS

ENGLISH UNITS

DRAINAGE AREA SQUARE MILES
PRECIPITATION DEPTH INCHES
LENGTH, ELEVATION FEET
FLOW CUBIC FEET PER SECOND
STORAGE VOLUME ACRE-FEET
SURFACE AREA ACRES
TEMPERATURE DEGREES FAHRENHEIT

JP MULTI-PLAN OPTION
NPLAN 1 NUMBER OF PLANS

JR MULTI-RATIO OPTION
RATIOS OF PRECIPITATION
0.59 0.69 0.81 1.00

\*\*\* \*\*

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\* \*
13 KK \* PLANT \* DEVELOPED SAND PLANT BASIN
\* \*
\*\*\*\*\*

10 IN TIME DATA FOR INPUT TIME SERIES
JXMIN 30 TIME INTERVAL IN MINUTES
JXDATE 1FEB95 STARTING DATE
JXTIME 600 STARTING TIME

SUBBASIN RUNOFF DATA

14 BA SUBBASIN CHARACTERISTICS
TAREA 0.05 SUBBASIN AREA

PRECIPITATION DATA

15 PB STORM 7.80 BASIN TOTAL PRECIPITATION

16 PI INCREMENTAL PRECIPITATION PATTERN
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.01 0.01 0.01 0.01 0.01
0.01 0.01 0.01 0.01 0.01 0.01 0.08 0.08 0.08 0.08
0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01 0.01
0.01 0.01 0.01 0.01 0.01 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
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0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
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0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00
0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00

20 LS SCS LOSS RATE
STRFL 0.99 INITIAL ABSTRACTION
CRVNR 67.00 CURVE NUMBER
RTIMP 0.00 PERCENT IMPERVIOUS AREA

21 UD SCS DIMENSIONLESS UNITGRAPH
TLAG 0.30 LAG

\*\*\*

UNIT HYDROGRAPH  
17 END-OF-PERIOD ORDINATES

11. 39. 62. 62. 49. 29. 18. 12. 7. 5.  
3. 2. 1. 1. 0. 0. 0.

TOTAL RAINFALL = 7.80, TOTAL LOSS = 3.84, TOTAL EXCESS = 3.96

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	29.90-HR
+	85.	6.20	(CFS)			
			16.	5.	4.	4.
			(INCHES)	3.244	3.956	3.956
			(AC-FT)	8.	10.	10.

CUMULATIVE AREA = 0.05 SQ MI

\*\*\*

HYDROGRAPH AT STATION PLANT  
FOR PLAN 1, RATIO = 0.59

TOTAL RAINFALL = 4.60, TOTAL LOSS = 3.07, TOTAL EXCESS = 1.53

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	29.90-HR
+	30.	6.20	(CFS)			
			6.	2.	2.	2.
			(INCHES)	1.222	1.532	1.532
			(AC-FT)	3.	4.	4.

CUMULATIVE AREA = 0.05 SQ MI

\*\*\*

HYDROGRAPH AT STATION PLANT  
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.36, TOTAL LOSS = 3.30, TOTAL EXCESS = 2.06

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	29.90-HR
+	42.	6.20	(CFS)			
			8.	3.	2.	2.
			(INCHES)	1.664	2.060	2.060
			(AC-FT)	4.	5.	5.

CUMULATIVE AREA = 0.05 SQ MI

\*\*\*

HYDROGRAPH AT STATION PLANT  
FOR PLAN 1, RATIO = 0.81

TOTAL RAINFALL = 6.34, TOTAL LOSS = 3.55, TOTAL EXCESS = 2.79

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
(CFS)	(HR)		6-HR	24-HR	72-HR	29.90-HR
+	59.	6.20	(CFS)			
			11.	4.	3.	3.
			(INCHES)	2.273	2.787	2.787
			(AC-FT)	6.	7.	7.

CUMULATIVE AREA = 0.05 SQ MI

\*\*\*

HYDROGRAPH AT STATION PLANT  
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 3.84, TOTAL EXCESS = 3.96

PEAK FLOW TIME MAXIMUM AVERAGE FLOW



\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION    MCDS  
FOR PLAN 1, RATIO = 0.59

TOTAL RAINFALL = 4.60, TOTAL LOSS = 1.21, TOTAL EXCESS = 3.39

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 26.	6.00	4.	1.	1.	1.	
		(INCHES) 2.785	3.394	3.394	3.394	
		(AC-FT) 2.	2.	2.	2.	

CUMULATIVE AREA = 0.01 SQ MI

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION    MCDS  
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.36, TOTAL LOSS = 1.24, TOTAL EXCESS = 4.12

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 32.	6.00	5.	1.	1.	1.	
		(INCHES) 3.375	4.120	4.120	4.120	
		(AC-FT) 2.	3.	3.	3.	

CUMULATIVE AREA = 0.01 SQ MI

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION    MCDS  
FOR PLAN 1, RATIO = 0.81

TOTAL RAINFALL = 6.34, TOTAL LOSS = 1.27, TOTAL EXCESS = 5.06

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 39.	6.00	6.	2.	1.	1.	
		(INCHES) 4.139	5.063	5.063	5.063	
		(AC-FT) 3.	4.	4.	4.	

CUMULATIVE AREA = 0.01 SQ MI

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION    MCDS  
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 1.31, TOTAL EXCESS = 6.49

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 49.	6.00	8.	2.	2.	2.	
		(INCHES) 5.288	6.491	6.491	6.491	
		(AC-FT) 4.	5.	5.	5.	

CUMULATIVE AREA = 0.01 SQ MI

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CUMULATIVE AREA = 0.03 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION OFFSIT  
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.36, TOTAL LOSS = 0.92, TOTAL EXCESS = 4.44

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 66.	6.00	10.	3.	3.	3.	3.
		(INCHES) 3.621	4.444	4.444	4.444	4.444
		(AC-FT) 5.	6.	6.	6.	6.

CUMULATIVE AREA = 0.03 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION OFFSIT  
FOR PLAN 1, RATIO = 0.81

TOTAL RAINFALL = 6.34, TOTAL LOSS = 0.94, TOTAL EXCESS = 5.40

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 80.	6.00	13.	4.	3.	3.	3.
		(INCHES) 4.387	5.402	5.402	5.402	5.402
		(AC-FT) 6.	8.	8.	8.	8.

CUMULATIVE AREA = 0.03 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION OFFSIT  
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 0.95, TOTAL EXCESS = 6.85

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 100.	6.00	16.	5.	4.	4.	4.
		(INCHES) 5.533	6.846	6.846	6.846	6.846
		(AC-FT) 8.	10.	10.	10.	10.

CUMULATIVE AREA = 0.03 SQ MI

\*\*\* \*\*

\*\*\*\*\*  
\* \*  
40 KK \* COMB3 \*  
\* \*  
\*\*\*\*\*

41 HC HYDROGRAPH COMBINATION  
ICOMP 3 NUMBER OF HYDROGRAPHS TO COMBINE

\*\*\*

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION COMB3  
FOR PLAN 1, RATIO = 0.59

PEAK FLOW TIME MAXIMUM AVERAGE FLOW

			6-HR	24-HR	72-HR	29.90-HR
+	(CFS)	(HR)				
+	103.	6.10				
		(CFS)	18.	6.	5.	5.
		(INCHES)	1.981	2.482	2.482	2.482
		(AC-FT)	9.	11.	11.	11.

CUMULATIVE AREA = 0.09 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION COMB3  
FOR PLAN 1, RATIO = 0.69

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR	29.90-HR
+	(CFS)	(HR)				
+	130.	6.10				
		(CFS)	23.	7.	6.	6.
		(INCHES)	2.483	3.106	3.106	3.106
		(AC-FT)	11.	14.	14.	14.

CUMULATIVE AREA = 0.09 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION COMB3  
FOR PLAN 1, RATIO = 0.81

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR	29.90-HR
+	(CFS)	(HR)				
+	166.	6.10				
		(CFS)	29.	9.	7.	7.
		(INCHES)	3.154	3.937	3.937	3.937
		(AC-FT)	15.	18.	18.	18.

CUMULATIVE AREA = 0.09 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION COMB3  
FOR PLAN 1, RATIO = 1.00

	PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW		
			6-HR	24-HR	72-HR	29.90-HR
+	(CFS)	(HR)				
+	221.	6.00				
		(CFS)	39.	12.	10.	10.
		(INCHES)	4.200	5.229	5.229	5.229
		(AC-FT)	19.	24.	24.	24.

CUMULATIVE AREA = 0.09 SQ MI

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*****
*           *
42 KK      * POND *
*           *
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HYDROGRAPH ROUTING DATA

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43 RS      STORAGE ROUTING
           NSTPS          1 NUMBER OF SUBREACHES
           ITYP           ELEV TYPE OF INITIAL CONDITION
           RSVRIC        80.00 INITIAL CONDITION
           X             0.00 WORKING R AND D COEFFICIENT

44 SA      AREA          1.0      1.5

45 SE      ELEVATION     80.00    87.00
    
```

46 SQ	DISCHARGE	0. 112.	40. 120.	48.	56.	64.	72.	80.	88.	96.	104.
48 SE	ELEVATION	80.00 86.25	82.95 86.87	83.28	83.59	83.88	84.17	84.47	84.78	85.15	85.65

\*\*\*

COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	8.69
ELEVATION	80.00	87.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	3.24	3.64	4.02	4.38	4.75	5.14	5.55	6.05	6.74
OUTFLOW	0.00	40.00	48.00	56.00	64.00	72.00	80.00	88.00	96.00	104.00
ELEVATION	80.00	82.95	83.28	83.59	83.88	84.17	84.47	84.78	85.15	85.65
STORAGE	7.59	8.50	8.69							
OUTFLOW	112.00	120.00	121.68							
ELEVATION	86.25	86.87	87.00							

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION    POND  
FOR PLAN 1, RATIO = 0.59

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ (CFS)	(HR)	(CFS)				
+ 45.	6.40	(INCHES)	18.	6.	5.	5.
		(AC-FT)	1.941	2.482	2.482	2.482
			9.	11.	11.	11.
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
+ (AC-FT)	(HR)		6-HR	24-HR	72-HR	29.90-HR
+ 4.	6.40		1.	0.	0.	0.
PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
+ (FEET)	(HR)		6-HR	24-HR	72-HR	29.90-HR
+ 83.17	6.40		81.32	80.42	80.34	80.34

CUMULATIVE AREA = 0.09 SQ MI

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION    POND  
FOR PLAN 1, RATIO = 0.69

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ (CFS)	(HR)	(CFS)				
+ 62.	6.40	(INCHES)	23.	7.	6.	6.
		(AC-FT)	2.436	3.106	3.106	3.106
			11.	14.	14.	14.
PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
+ (AC-FT)	(HR)		6-HR	24-HR	72-HR	29.90-HR
+ 4.	6.40		2.	1.	0.	0.
PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
+ (FEET)	(HR)		6-HR	24-HR	72-HR	29.90-HR
+ 83.82	6.40		81.60	80.51	80.41	80.41

CUMULATIVE AREA = 0.09 SQ MI

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION    POND  
FOR PLAN 1, RATIO = 0.81

PEAK FLOW + (CFS)	TIME (HR)	(CFS) (INCHES) (AC-FT)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
84.	6.40	29. 3.096 14.	9. 3.937 18.	7. 3.937 18.	7. 3.937 18.	
PEAK STORAGE			MAXIMUM AVERAGE STORAGE			
+	(AC-FT)	TIME (HR)	6-HR	24-HR	72-HR	29.90-HR
	5.	6.40	2.	1.	1.	1.
PEAK STAGE			MAXIMUM AVERAGE STAGE			
+	(FEET)	TIME (HR)	6-HR	24-HR	72-HR	29.90-HR
	84.63	6.40	81.92	80.62	80.50	80.50
CUMULATIVE AREA =			0.09 SQ MI			

\*\*\*                    \*\*\*                    \*\*\*                    \*\*\*                    \*\*\*

HYDROGRAPH AT STATION    POND  
FOR PLAN 1, RATIO = 1.00

PEAK FLOW + (CFS)	TIME (HR)	(CFS) (INCHES) (AC-FT)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
108.	6.40	38. 4.123 19.	12. 5.229 24.	10. 5.229 24.	10. 5.229 24.	
PEAK STORAGE			MAXIMUM AVERAGE STORAGE			
+	(AC-FT)	TIME (HR)	6-HR	24-HR	72-HR	29.90-HR
	7.	6.40	3.	1.	1.	1.
PEAK STAGE			MAXIMUM AVERAGE STAGE			
+	(FEET)	TIME (HR)	6-HR	24-HR	72-HR	29.90-HR
	85.94	6.40	82.43	80.80	80.64	80.64
CUMULATIVE AREA =			0.09 SQ MI			

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES  
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION				
				RATIO 1 0.59	RATIO 2 0.69	RATIO 3 0.81	RATIO 4 1.00	
HYDROGRAPH AT								
+	PLANT	0.05	1	FLOW TIME	30. 6.20	42. 6.20	59. 6.20	85. 6.20
HYDROGRAPH AT								
+	MCDS	0.01	1	FLOW TIME	26. 6.00	32. 6.00	39. 6.00	49. 6.00
HYDROGRAPH AT								
+	OFFSIT	0.03	1	FLOW TIME	55. 6.00	66. 6.00	80. 6.00	100. 6.00
3 COMBINED AT								
+	COMB3	0.09	1	FLOW TIME	103. 6.10	130. 6.10	166. 6.10	221. 6.00
ROUTED TO								
+	POND	0.09	1	FLOW TIME	45. 6.40	62. 6.40	84. 6.40	108. 6.40
				** PEAK STAGES IN FEET **				
1				STAGE	83.17	83.82	84.63	85.94

12-19-1995

TIME 6.40 6.40 6.40 6.40

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

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
* MAY 1991 *
* VERSION 4.0.1E *
* Lahey F77L-EM/32 version 5.01 *
* Dodson & Associates, Inc. *
* RUN DATE 12/19/95 TIME 11:54:56 *
*****
    
```

```

*****
*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET *
* DAVIS, CALIFORNIA 95616 *
* (916) 551-1748 *
*****
    
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X X XXXXXX XXXX X
X X X X X XX
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XXXXXX XXXX X XXXX X
X X X X X X
X X X X X X
X X XXXXXX XXXX XXX
    
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THIS PROGRAM REPLACES ALL PREVIOUS VERSIONS OF HEC-1 KNOWN AS HEC1 (JAN 73), HEC1GS, HEC1DB, AND HEC1KW.

THE DEFINITIONS OF VARIABLES -RTIMP- AND -RTIOR- HAVE CHANGED FROM THOSE USED WITH THE 1973-STYLE INPUT STRUCTURE. THE DEFINITION OF -AMSKK- ON RM-CARD WAS CHANGED WITH REVISIONS DATED 28 SEP 81. THIS IS THE FORTRAN77 VERSION  
 NEW OPTIONS: DAMBREAK OUTFLOW SUBMERGENCE, SINGLE EVENT DAMAGE CALCULATION, DSS:WRITE STAGE FREQUENCY,  
 DSS:READ TIME SERIES AT DESIRED CALCULATION INTERVAL LOSS RATE:GREEN AND AMPT INFILTRATION  
 KINEMATIC WAVE: NEW FINITE DIFFERENCE ALGORITHM

```

LINE ID.....1.....2.....3.....4.....5.....6.....7.....8.....9.....10
1 ID I-135 POWER CENTER DRAINAGE STUDY
2 ID FULLY DEVELOPED COMMERCIAL CONDITIONS
3 ID 48" RCP AT ELEV. 80.0
4 ID 5-, 10-, 25-, & 100-Year Storms
5 ID Professional Engineering Consultants
6 ID Wichita, Ks
7 ID DRC 11/20/95
8 ID File: T:\DAR\HEC1\I135C.IH1
9 IT 6 01FEB95 0600 0 02FEB95 1154
10 IN 30 01FEB95 0600
11 IO 3 0
12 JR PREC 0.5902 0.6875 0.8125 1.000
*
*DIAGRAM
*
13 KK DEVEL FULLY DEVELOPED CONDITIONS
14 BA .06016
15 PB 7.8
16 PC 0.08 .09 .10 .11 .12 .133 .147 .163 .181 .204
17 PC .235 .283 .663 .735 .772 .799 .820 .835 .850 .865
18 PC .880 .890 .900 .910 .916 .925 .934 .943 .952 .958
19 PC .964 .970 .976 .982 .988 .994 1.000
20 LS 0 89 0
21 UD .15
*
*
22 KK OFFSIT OFF-SITE DEVELOPED CONDITIONS
23 BA .02656
24 PB 7.8
25 PC 0.08 .09 .10 .11 .12 .133 .147 .163 .181 .204
26 PC .235 .283 .663 .735 .772 .799 .820 .835 .850 .865
27 PC .880 .890 .900 .910 .916 .925 .934 .943 .952 .958
28 PC .964 .970 .976 .982 .988 .994 1.000
29 LS 0 92 0
30 UD .17
*
*
31 KK COMB2
32 HC 2
*
    
```

```

      *      48" RCP OUTLET
33      KK      POND
34      RS      1      ELEV      80
35      SA      1.9    2.4
36      SE      80     87
37      SQ      0      40      48      56      64      72      80      88      96      104
38      SQ      112    120
39      SE      80     82.95   83.28   83.59   83.88   84.17   84.47   84.78   85.15   85.65
40      SE      86.25   86.87
      *
41      ZZ
  
```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

INPUT
LINE (V) ROUTING      (--->) DIVERSION OR PUMP FLOW
NO.  (.) CONNECTOR   (<---) RETURN OF DIVERTED OR PUMPED FLOW

13    DEVEL
      .
22    .      OFFSIT
      .
31    COMB2.....
      V
      V
33    POND
  
```

(\*\*\*) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1) *
*   MAY 1991                  *
*   VERSION 4.0.1E           *
*   Lahey F77L-EM/32 version 5.01 *
*   Dodson & Associates, Inc. *
*   RUN DATE 12/19/95 TIME 11:54:56 *
*****
  
```

```

*****
*
* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
*   609 SECOND STREET          *
*   DAVIS, CALIFORNIA 95616    *
*   (916) 551-1748            *
*
*****
  
```

```

I-135 POWER CENTER DRAINAGE STUDY
FULLY DEVELOPED COMMERCIAL CONDITIONS
48" RCP AT ELEV. 80.0
5-, 10-, 25-, & 100-Year Storms
Professional Engineering Consultants
Wichita, Ks
DRC 11/20/95
File: T:\DAR\HEC1\I135C.IH1
  
```

```

11 IO      OUTPUT CONTROL VARIABLES
          IPRNT      3      PRINT CONTROL
          IPLOT      0      PLOT CONTROL
          QSCAL      0.    HYDROGRAPH PLOT SCALE

IT        HYDROGRAPH TIME DATA
          NMIN       6      MINUTES IN COMPUTATION INTERVAL
          IDATE      1FEB95  STARTING DATE
          ITIME      0600    STARTING TIME
          NQ         300     NUMBER OF HYDROGRAPH ORDINATES
          NDDATE     2FEB95  ENDING DATE
          NDTIME     1154    ENDING TIME
          ICENT      19      CENTURY MARK

          COMPUTATION INTERVAL  0.10 HOURS
          TOTAL TIME BASE      29.90 HOURS
  
```

```

ENGLISH UNITS
DRAINAGE AREA      SQUARE MILES
PRECIPITATION DEPTH  INCHES
LENGTH, ELEVATION  FEET
FLOW               CUBIC FEET PER SECOND
STORAGE VOLUME     ACRE-Feet
SURFACE AREA       ACRES
TEMPERATURE        DEGREES FAHRENHEIT
  
```



HYDROGRAPH AT STATION DEVEL  
FOR PLAN 1, RATIO = 0.59

TOTAL RAINFALL = 4.60, TOTAL LOSS = 1.21, TOTAL EXCESS = 3.39

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	29.90-HR
+ 120.	6.00	(CFS) 18.	5.	4.	4.
		(INCHES) 2.785	3.394	3.394	3.394
		(AC-FT) 9.	11.	11.	11.

CUMULATIVE AREA = 0.06 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION DEVEL  
FOR PLAN 1, RATIO = 0.69

TOTAL RAINFALL = 5.36, TOTAL LOSS = 1.24, TOTAL EXCESS = 4.12

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	29.90-HR
+ 144.	6.00	(CFS) 22.	7.	5.	5.
		(INCHES) 3.375	4.120	4.120	4.120
		(AC-FT) 11.	13.	13.	13.

CUMULATIVE AREA = 0.06 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION DEVEL  
FOR PLAN 1, RATIO = 0.81

TOTAL RAINFALL = 6.34, TOTAL LOSS = 1.27, TOTAL EXCESS = 5.06

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	29.90-HR
+ 176.	6.00	(CFS) 27.	8.	7.	7.
		(INCHES) 4.139	5.063	5.063	5.063
		(AC-FT) 13.	16.	16.	16.

CUMULATIVE AREA = 0.06 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION DEVEL  
FOR PLAN 1, RATIO = 1.00

TOTAL RAINFALL = 7.80, TOTAL LOSS = 1.31, TOTAL EXCESS = 6.49

PEAK FLOW + (CFS)	TIME (HR)	MAXIMUM AVERAGE FLOW			
		6-HR	24-HR	72-HR	29.90-HR
+ 224.	6.00	(CFS) 34.	10.	8.	8.
		(INCHES) 5.288	6.491	6.491	6.491
		(AC-FT) 17.	21.	21.	21.

CUMULATIVE AREA = 0.06 SQ MI

\*\*\* \*\*





+ 175. 6.00 (INCHES) 27. 8. 7. 7.  
 (AC-FT) 2.858 3.488 3.488 3.488  
 13. 16. 16. 16.

CUMULATIVE AREA = 0.09 SQ MI

\*\*\* \*\*\* \*\*\* \*\*\* \*\*\*

HYDROGRAPH AT STATION COMB2  
 FOR PLAN 1, RATIO = 0.69

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 211.	6.00	32.	10.	8.	8.	
		(INCHES) 3.450	4.219	4.219	4.219	
		(AC-FT) 16.	20.	20.	20.	

CUMULATIVE AREA = 0.09 SQ MI

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HYDROGRAPH AT STATION COMB2  
 FOR PLAN 1, RATIO = 0.81

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 256.	6.00	39.	12.	10.	10.	
		(INCHES) 4.214	5.167	5.167	5.167	
		(AC-FT) 19.	24.	24.	24.	

CUMULATIVE AREA = 0.09 SQ MI

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HYDROGRAPH AT STATION COMB2  
 FOR PLAN 1, RATIO = 1.00

PEAK FLOW + (CFS)	TIME (HR)	(CFS)	MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ 324.	6.00	50.	15.	12.	12.	
		(INCHES) 5.363	6.599	6.599	6.599	
		(AC-FT) 25.	31.	31.	31.	

CUMULATIVE AREA = 0.09 SQ MI

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 \* \*  
 33 KK \* POND \*  
 \* \*  
 \*\*\*\*\*

HYDROGRAPH ROUTING DATA

34 RS STORAGE ROUTING  
 NSTPS 1 NUMBER OF SUBREACHES  
 ITYP ELEV TYPE OF INITIAL CONDITION  
 RSVRIC 80.00 INITIAL CONDITION  
 X 0.00 WORKING R AND D COEFFICIENT

35 SA AREA 1.9 2.4

36 SE ELEVATION 80.00 87.00

37 SQ DISCHARGE 0. 40. 48. 56. 64. 72. 80. 88. 96. 104.  
 112. 120.

39 SE	ELEVATION	80.00	82.95	83.28	83.59	83.88	84.17	84.47	84.78	85.15	85.65
		86.25	86.87								

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COMPUTED STORAGE-ELEVATION DATA

STORAGE	0.00	15.02
ELEVATION	80.00	87.00

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

STORAGE	0.00	5.90	6.60	7.26	7.89	8.52	9.18	9.87	10.70	11.84
OUTFLOW	0.00	40.00	48.00	56.00	64.00	72.00	80.00	88.00	96.00	104.00
ELEVATION	80.00	82.95	83.28	83.59	83.88	84.17	84.47	84.78	85.15	85.65
STORAGE	13.24	14.70	15.02							
OUTFLOW	112.00	120.00	121.68							
ELEVATION	86.25	86.87	87.00							

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HYDROGRAPH AT STATION    POND  
FOR PLAN 1, RATIO = 0.59

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ (CFS)	(HR)	(CFS)				
+ 50.	6.40	25.	8.	7.	7.	
		(INCHES)	2.652	3.487	3.488	3.488
		(AC-FT)	12.	16.	16.	16.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	29.90-HR
+ (AC-FT)	(HR)					
+ 7.	6.40	4.	1.	1.	1.	

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	29.90-HR
+ (FEET)	(HR)					
+ 83.36	6.40	81.79	80.59	80.47	80.47	

CUMULATIVE AREA = 0.09 SQ MI

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HYDROGRAPH AT STATION    POND  
FOR PLAN 1, RATIO = 0.69

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR
+ (CFS)	(HR)	(CFS)				
+ 67.	6.40	30.	10.	8.	8.	
		(INCHES)	3.211	4.217	4.219	4.219
		(AC-FT)	15.	20.	20.	20.

PEAK STORAGE	TIME		MAXIMUM AVERAGE STORAGE			
			6-HR	24-HR	72-HR	29.90-HR
+ (AC-FT)	(HR)					
+ 8.	6.40	4.	1.	1.	1.	

PEAK STAGE	TIME		MAXIMUM AVERAGE STAGE			
			6-HR	24-HR	72-HR	29.90-HR
+ (FEET)	(HR)					
+ 83.97	6.40	82.08	80.69	80.56	80.56	

CUMULATIVE AREA = 0.09 SQ MI

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HYDROGRAPH AT STATION    POND  
FOR PLAN 1, RATIO = 0.81

PEAK FLOW	TIME		MAXIMUM AVERAGE FLOW			
			6-HR	24-HR	72-HR	29.90-HR

+	(CFS)	(HR)	(CFS)				
+	87.	6.30		37.	12.	10.	10.
			(INCHES)	3.938	5.164	5.166	5.166
			(AC-FT)	18.	24.	24.	24.

PEAK STORAGE	TIME			MAXIMUM AVERAGE STORAGE			
				6-HR	24-HR	72-HR	29.90-HR
+	(AC-FT)	(HR)					
	10.	6.30		5.	2.	1.	1.

PEAK STAGE	TIME			MAXIMUM AVERAGE STAGE			
				6-HR	24-HR	72-HR	29.90-HR
+	(FEET)	(HR)					
	84.72	6.30		82.42	80.82	80.66	80.66

CUMULATIVE AREA = 0.09 SQ MI

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HYDROGRAPH AT STATION POND  
FOR PLAN 1, RATIO = 1.00

PEAK FLOW	TIME			MAXIMUM AVERAGE FLOW			
				6-HR	24-HR	72-HR	29.90-HR
+	(CFS)	(HR)	(CFS)				
+	107.	6.40		47.	15.	12.	12.
			(INCHES)	5.032	6.596	6.599	6.599
			(AC-FT)	23.	31.	31.	31.

PEAK STORAGE	TIME			MAXIMUM AVERAGE STORAGE			
				6-HR	24-HR	72-HR	29.90-HR
+	(AC-FT)	(HR)					
	12.	6.30		6.	2.	2.	2.

PEAK STAGE	TIME			MAXIMUM AVERAGE STAGE			
				6-HR	24-HR	72-HR	29.90-HR
+	(FEET)	(HR)					
	85.88	6.40		82.95	81.01	80.81	80.81

CUMULATIVE AREA = 0.09 SQ MI

1

PEAK FLOW AND STAGE (END-OF-PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS  
FLOWS IN CUBIC FEET PER SECOND, AREA IN SQUARE MILES  
TIME TO PEAK IN HOURS

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO PRECIPITATION				
				RATIO 1	RATIO 2	RATIO 3	RATIO 4	
				0.59	0.69	0.81	1.00	
HYDROGRAPH AT								
+	DEVEL	0.06	1	FLOW	120.	144.	176.	224.
				TIME	6.00	6.00	6.00	6.00
HYDROGRAPH AT								
+	OFFSIT	0.03	1	FLOW	55.	66.	80.	100.
				TIME	6.00	6.00	6.00	6.00
2 COMBINED AT								
+	COMB2	0.09	1	FLOW	175.	211.	256.	324.
				TIME	6.00	6.00	6.00	6.00
ROUTED TO								
+	POND	0.09	1	FLOW	50.	67.	87.	107.
				TIME	6.40	6.40	6.30	6.40
				** PEAK STAGES IN FEET **				
			1	STAGE	83.36	83.97	84.72	85.88
				TIME	6.40	6.40	6.30	6.40

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

I, JOHN L. SHEETS, A CIVIL ENGINEER AND REGISTERED LAND SURVEYOR IN THE STATE OF KANSAS, DO HEREBY CERTIFY THAT I HAVE BEEN IN RESPONSIBLE CHARGE OF SURVEYING AND PLATTING OF "I-135 POWER CENTER", AN ADDITION TO THE CITY OF WICHITA, SEDGWICK COUNTY, KANSAS, INTO LOTS AND A BLOCK, THE SAME BEING ACCURATELY SET FORTH IN THE ACCOMPANYING PLAT AND DESCRIBED HEREIN:

A TRACT OF LAND LOCATED IN A PART OF GOVERNMENT LOTS 2 AND 3, SECTION 10, TOWNSHIP 28 SOUTH, RANGE 1 EAST OF THE 6TH PRINCIPAL MERIDIAN IN SEDGWICK COUNTY, KANSAS, AND DESCRIBED AS FOLLOWS: COMMENCING AT THE NORTHWEST CORNER OF SAID SECTION 10; THENCE N 89°46'40" E ON THE NORTH LINE OF SAID SECTION 10 A DISTANCE OF 50.00 FEET TO A POINT ON THE EAST RIGHT-OF-WAY LINE OF HYDRAULIC AVENUE, SAID POINT ALSO BEING THE SOUTHWEST CORNER OF SANTA FE MIDLAND INDUSTRIAL DISTRICT 2ND ADDITION TO WICHITA, KANSAS, AND BEING THE POINT OF BEGINNING OF THE TRACT TO BE DESCRIBED; THENCE N 89°46'40" E ON THE NORTH LINE OF SAID SECTION 10 A DISTANCE OF 1730.17 FEET TO THE SOUTHEAST CORNER OF RESERVE B, BLOCK 2, SANTA FE MIDLAND INDUSTRIAL DISTRICT, AN ADDITION TO WICHITA, KANSAS, SAID POINT ALSO BEING ON THE NORTHERLY RIGHT-OF-WAY LINE OF INTERSTATE HIGHWAY 135; THENCE S 40° 16'24" W ON SAID NORTHERLY RIGHT-OF-WAY LINE A DISTANCE OF 1667.38 FEET; THENCE CONTINUING ON SAID NORTHERLY RIGHT-OF-WAY LINE, S 50°09'54" W A DISTANCE OF 767.67 FEET TO THE POINT OF INTERSECTION OF SAID NORTHERLY RIGHT-OF-WAY LINE OF INTERSTATE HIGHWAY 135 WITH THE EAST RIGHT-OF-WAY LINE OF HYDRAULIC AVENUE; THENCE N 13°08'07" W ON SAID EAST RIGHT-OF-WAY LINE A DISTANCE OF 200.18 FEET; THENCE CONTINUING ON SAID EAST RIGHT-OF-WAY LINE, N 04°28'58" W A DISTANCE OF 221.68 FEET; THENCE CONTINUING ON SAID EAST RIGHT-OF-WAY LINE, N 00°00'00" E A DISTANCE OF 1341.25 FEET TO THE POINT OF BEGINNING. CONTAINS 38.47 ACRES, MORE OR LESS. SAID DESCRIBED TRACT ALSO BEING THE SAME AS DESCRIBED ON FILM 1367, PAGE 1507 IN THE OFFICE OF THE REGISTER OF DEEDS, SEDGWICK COUNTY, KANSAS

I HEREBY CERTIFY THAT THE DETAILS OF THIS PLAT ARE CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF THIS \_\_\_\_ DAY OF \_\_\_\_\_, 1994.

JOHN L. SHEETS, P.E., R.L.S. NO. 583  
KAW VALLEY ENGINEERING INC.  
PO BOX 1304, 2319 NORTH JACKSON  
JUNCTION CITY, KANSAS 66441

KNOW ALL MEN BY THESE PRESENTS THAT I, THE UNDERSIGNED PROPERTY OWNER OF THE LAND AS ABOVE SET FORTH IN THE CIVIL ENGINEER'S AND REGISTERED LAND SURVEYOR'S CERTIFICATE, HAVE CAUSED THE SAME TO BE SURVEYED AND PLATTED INTO LOTS, A BLOCK AND STREET, THE SAME TO BE KNOWN AS "I-135 POWER CENTER", AN ADDITION TO THE CITY OF WICHITA, SEDGWICK COUNTY, KANSAS. THE STREET IS DEDICATED TO AND FOR THE USE OF THE PUBLIC. EASEMENTS FOR THE CONSTRUCTION AND MAINTENANCE OF PUBLIC UTILITIES AND DRAINAGE, ARE HEREBY GRANTED TO THE CITY. ALL ABUTTERS RIGHT TO ACCESS TO OR FROM HYDRAULIC AVENUE OVER AND ACROSS THE WEST LINE OF I-135 POWER CENTER, ARE HEREBY GRANTED TO THE CITY OF WICHITA, PROVIDED HOWEVER THAT LOT 1 SHALL HAVE 2 OPENINGS AS INDICATED ON THE FACE OF THE PLAT, LOT 2 SHALL HAVE 2 OPENINGS AS INDICATED ON THE FACE OF THE PLAT, AND LOT 5 SHALL HAVE 1 OPENING AS INDICATED ON THE FACE OF THE PLAT. A CROSS LOT JOINT ACCESS AGREEMENT FOR LOTS 2, 3 AND 4 IS GRANTED ON FILM \_\_\_\_\_ PAGE \_\_\_\_\_

K.C.B.B., INC.  
THOMAS W. BOYD, PRESIDENT

STATE OF KANSAS }  
SEDGWICK COUNTY }  
SS

BE IT REMEMBERED, THAT ON THIS \_\_\_\_ DAY OF \_\_\_\_\_, 1994, BEFORE ME THE UNDERSIGNED, A NOTARY PUBLIC IN AND FOR THE COUNTY AND STATE AFORESAID CAME THOMAS W. BOYD, PRESIDENT OF K.C.B.B., INC., TO ME PERSONALLY KNOWN TO BE THE SAME PERSON WHO EXECUTED THE FOREGOING INSTRUMENT OF WRITING AND DULY ACKNOWLEDGED THE EXECUTION OF THE SAME. IN WITNESS WHEREOF, I HAVE HERETO SET MY HAND AND AFFIXED MY OFFICIAL SEAL, THE DAY AND YEAR LAST ABOVE WRITTEN.

TERESA J. ROUSHKOLB, NOTARY PUBLIC

MY COMMISSION EXPIRES: \_\_\_\_\_

KNOW ALL MEN BY THESE PRESENTS THAT WE, THE AMERICAN NATIONAL BANK OF WICHITA, AS MORTGAGE HOLDER OF THE LAND AS ABOVE SET FORTH IN THE CIVIL ENGINEER'S AND REGISTERED LAND SURVEYOR'S CERTIFICATE, DO HEREBY CONSENT TO THE PLATTING OF THE SAME TO BE KNOWN AS "I-135 POWER CENTER", AN ADDITION TO THE CITY OF WICHITA, SEDGWICK COUNTY, KANSAS.

AMERICAN NATIONAL BANK OF WICHITA  
H.C. STALKER, VICE PRESIDENT OF REAL ESTATE

STATE OF KANSAS }  
SEDGWICK COUNTY }  
SS

BE IT REMEMBERED, THAT ON THIS \_\_\_\_ DAY OF \_\_\_\_\_, 1994, BEFORE ME THE UNDERSIGNED, A NOTARY PUBLIC IN AND FOR THE COUNTY AND STATE AFORESAID CAME H.C. STALKER, VICE PRESIDENT OF REAL ESTATE FOR THE AMERICAN NATIONAL BANK OF WICHITA, TO ME PERSONALLY KNOWN TO BE THE SAME PERSON WHO EXECUTED THE FOREGOING INSTRUMENT OF WRITING AND DULY ACKNOWLEDGED THE EXECUTION OF THE SAME. IN WITNESS WHEREOF, I HAVE HERETO SET MY HAND AND AFFIXED MY OFFICIAL SEAL, THE DAY AND YEAR LAST ABOVE WRITTEN.

TERESA J. ROUSHKOLB, NOTARY PUBLIC

MY COMMISSION EXPIRES: \_\_\_\_\_

STATE OF KANSAS }  
SEDGWICK COUNTY }  
SS

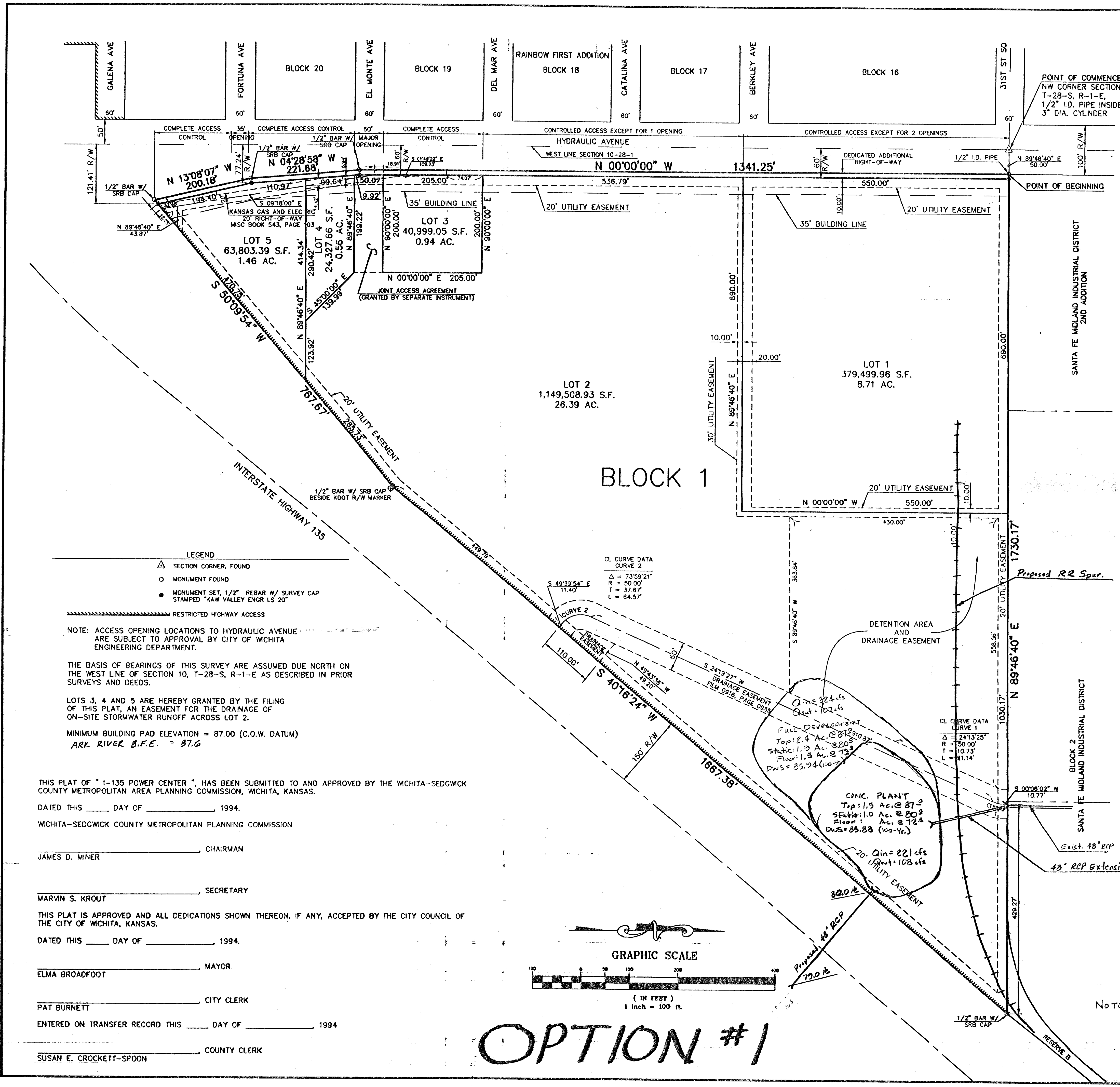
THIS IS TO CERTIFY THAT THIS INSTRUMENT WAS FILED FOR RECORD IN THE REGISTER OF DEEDS OFFICE AT \_\_\_\_\_ A.M.-P.M. THIS \_\_\_\_ DAY OF \_\_\_\_\_, 1994.

PAT KETTLER, REGISTER OF DEEDS

ED RESA, DEPUTY

FINAL PLAT  
**I-135 POWER CENTER**  
AN ADDITION TO THE CITY OF WICHITA,  
SEDGWICK COUNTY, KANSAS

NOTE: CONSTRUCTION OF POND AS A VEST-HOLE (INTO GROUND WATER OR BY PUMPING) SHALL BE AN ALTERNATE ONLY, AND SHALL NOT BE INCLUDED IN THE PETITIONS.



- LEGEND
- △ SECTION CORNER, FOUND
  - MONUMENT FOUND
  - MONUMENT SET, 1/2" REBAR W/ SURVEY CAP STAMPED "KAW VALLEY ENGR LS 20"
- ===== RESTRICTED HIGHWAY ACCESS

NOTE: ACCESS OPENING LOCATIONS TO HYDRAULIC AVENUE ARE SUBJECT TO APPROVAL BY CITY OF WICHITA ENGINEERING DEPARTMENT.

THE BASIS OF BEARINGS OF THIS SURVEY ARE ASSUMED DUE NORTH ON THE WEST LINE OF SECTION 10, T-28-S, R-1-E AS DESCRIBED IN PRIOR SURVEYS AND DEEDS.

LOTS 3, 4 AND 5 ARE HEREBY GRANTED BY THE FILING OF THIS PLAT, AN EASEMENT FOR THE DRAINAGE OF ON-SITE STORMWATER RUNOFF ACROSS LOT 2.

MINIMUM BUILDING PAD ELEVATION = 87.00 (C.O.W. DATUM)  
ARK. RIVER B.F.E. = 87.6

THIS PLAT OF "I-135 POWER CENTER", HAS BEEN SUBMITTED TO AND APPROVED BY THE WICHITA-SEDGWICK COUNTY METROPOLITAN AREA PLANNING COMMISSION, WICHITA, KANSAS.

DATED THIS \_\_\_\_ DAY OF \_\_\_\_\_, 1994.  
WICHITA-SEDGWICK COUNTY METROPOLITAN PLANNING COMMISSION

JAMES D. MINER, CHAIRMAN

MARVIN S. KROUT, SECRETARY

THIS PLAT IS APPROVED AND ALL DEDICATIONS SHOWN THEREON, IF ANY, ACCEPTED BY THE CITY COUNCIL OF THE CITY OF WICHITA, KANSAS.

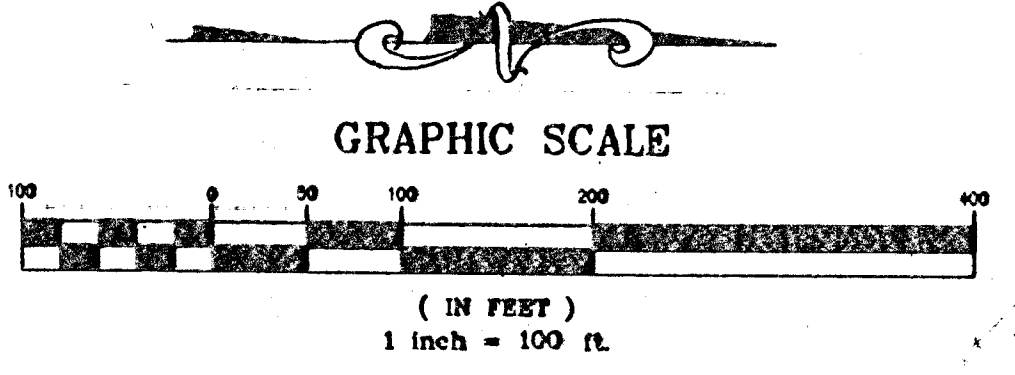
DATED THIS \_\_\_\_ DAY OF \_\_\_\_\_, 1994.

ELMA BROADFOOT, MAYOR

PAT BURNETT, CITY CLERK

ENTERED ON TRANSFER RECORD THIS \_\_\_\_ DAY OF \_\_\_\_\_, 1994

SUSAN E. CROCKETT-SPOON, COUNTY CLERK



**OPTION #1**