



Professional Engineering Consultants, P.A.

DRAINAGE STUDY
FOR
JABARA SOUTHWEST AREA

MARCH 2005

PREPARED BY

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.
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FOR

WICHITA AIRPORT AUTHORITY

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February 22, 2005

Wichita Airport Authority
Wichita Mid Continent
2173 Air Cargo Road
Wichita, KS 67209

Attention: Mr. John Oswald, P.E.

Reference: Jabara Southwest Area Drainage Study
PEC Project No. 32-04687-0019

Dear Mr. Oswald:

This letter presents a summary of the engineering analysis performed to determine the hydrologic and hydraulic effects the development of approximately 7.7 acres of land owned by the Wichita Airport Authority would have on downstream properties. The area of interest is located near the intersection of the K-96 Expressway and Webb Road in northeast Wichita, within the bounds of the Jabara Airport property. The project location is shown in Figure 1.

The purpose of this letter report is to provide supporting documentation to assure that the proposed development will be permissible by the City of Wichita with regard to drainage.

The hydrologic and hydraulic analyses focused on two major drainage structures:

1. An 8'x 3'x 378' reinforced concrete box culvert (RCB) located along the east ditch of Webb Road that crosses the K-96 Expressway.
2. A 10'x 3' x 350' RCB that crosses Webb Road south of the K-96 Expressway.

The total drainage area that contributes runoff to this location was estimated to be 78.3 acres. A map showing the overall drainage basin boundaries and the major drainage structures is shown in Figure 2.

PREVIOUS STUDIES AND OTHER INFORMATION SOURCES

Several parcels of land located downstream of the Jabara Airport have been developed in the last few years. Drainage plans and computations for the developments were typically submitted to the City of Wichita during the platting process. To strive for consistency with previous hydrology calculations, and to make use of available information sources, PEC reviewed drainage plans and computations submitted for nearby developments.

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Page 2

The construction plans for the K-96 Expressway, which include drainage and hydraulic design data for drainage structures crossing K-96 and Webb Road, were also used as a reference. PEC's study generally relied on plan or record information for hydraulic data such as culvert sizes, flowline elevations, street grades, etc. A detailed field survey was not conducted for this project.

More specifically, the following information was read from these sources:

1. Construction plans for the Webb Road Interchange at K-96, designed by MKEC, were reviewed. The following information was included in the plans.

For the 8'x 3'x 378' RCB crossing K-96:

- The upstream and downstream flowline elevations are 1405.16 and 1403.21, respectively.
- The approximate "overtopping" elevation for Webb Road north of K-96 is 1410.85.
- The drainage area contributing runoff to the RCB is 36.0 acres.
- The computed 100-year discharge at the RCB is 110 cfs.
- The computed 100-year highwater elevation at the upstream end of the RCB is 1408.26.

For the 10'x 3'x 350' RCB crossing Webb Road:

- The upstream and downstream flowline elevations are 1402.45 and 1401.93, respectively. (The original structure built with the Webb Road project was only 122 feet long. The RCB was later extended, and the downstream flowline used in all calculations was estimated to be 1401.47.)
- The approximate "overtopping" elevation for Webb Road south of K-96 is 1410.45.
- The drainage area contributing runoff to the RCB is 46.0 acres.
- The computed 100-year discharge at the RCB is 160 cfs.

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- The computed 100-year highwater elevation at the upstream end of the RCB is 1407.40.
2. Two detention ponds, located west of Webb Road and south of K-96, were constructed as part of the Fox Pointe residential development. The drainage plan for the Fox Pointe Addition was prepared by MKEC. The previously referenced 10'x 3'x 350' RCB crossing Webb Road south of K-96 outlets into the upper detention pond. Hydrologic and hydraulic data included on the Fox Pointe drainage plan for the 10'x3' RCB and the upper detention pond may be summarized as follows:
- The drainage area contributing runoff to the RCB is 58 acres.
 - The computed 100-year discharge at the RCB is 200 cfs.
 - The computed 100-year highwater elevation at the upstream end of the RCB is 1408.40.
 - The 100-year highwater elevation in the upper pond is 1404.10.
 - The 100-year highwater elevation in the lower pond is 1401.40.
3. The drainage plan for Shannon Woods Second at Tall Grass, a residential development was reviewed. The drainage plan was prepared by the Baughman Company. Hydrologic and hydraulic data included on the drainage plan for Shannon Woods Second may be summarized as follows:
- The computed 100-year discharge from the Fox Pointe development is 185 cfs.
 - The 100-year discharge from Fox Pointe is carried across a driveway in 2-48" RCP's, with a computed headwater depth of 5 feet.

The Fox Pointe drainage plan made available for PEC's review did not include detention storage computations or inflow/outflow values for the two detention ponds.

Computed highwater elevations were also not included in the Shannon Woods drainage plan reviewed by PEC.

HYDROLOGIC AND HYDRAULIC ANALYSES

The procedure used by PEC for the hydrologic and hydraulic analyses may be summarized as follows:

1. The overall basin boundaries were established, then sub-divided so that more detailed computations could be made. PEC first used record plan information to determine the boundaries; subsequent adjustments were made based on drainage patterns observed during a day when rain was falling.
2. The "Rational Method" was used in the initial effort to estimate peak 100-year flood discharges. These discharges were compared to 100-year discharges contained in other drainage plans.
3. Rating curves were developed for the culverts crossing the K-96 Expressway and Webb Road. The rating curves relate highwater elevations at the upstream end of the culverts to runoff rates.

The tailwater elevation for the culvert crossing Webb Road was based on the 100-year upper pond elevation read from the Fox Pointe drainage plan.

Two scenarios were considered to determine the appropriate tailwater elevation for the culvert crossing K-96:

- For the first assumption, tailwater elevations were estimated from the headwater computed at the culvert crossing Webb Road.
- For the second assumption, tailwater elevations were estimated from an open channel flow (at normal depth) for the east ditch along Webb Road between the two structures.)

The hydraulic analysis indicates that the second scenario noted above controlled for the 100-year storm.

4. As was noted, the Rational Method was used to initially estimate 100-year peak discharges. To further refine the analysis, the HEC-1 computer program was used to model the basin's response to rainfall, and to compute peak runoff rates and corresponding highwater elevations at the major drainage structures.

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HEC-1 models were developed to consider both "existing" and "proposed" basin topographic conditions. By comparing the results computed by the HEC-1 analysis for each condition, the effects upon flow rates and highwater elevations caused by proposed development may readily be determined.

SUMMARY OF RESULTS

The results of the hydrologic and hydraulic analyses performed by PEC may be summarized as follows:

1. Existing (Pre-Jabara Development) Conditions at the 8'x3'x378' RCB crossing the K-96 Expressway:
 - Drainage Area = 49.9 acres
 - Time of Concentration = 35 minutes
 - $C_{100} = 0.62$
 - 100-Year Rainfall Intensity = 5.07 inches per hour
 - $Q_{100} = 154$ cfs
 - Computed Highwater Elevation above the RCB = 1408.85
2. Proposed (Post-Jabara Development) Conditions at the 8'x3'x378' RCB crossing the K-96 Expressway:
 - Drainage Area = 49.9 acres
 - Time of Concentration = 35 minutes
 - $C_{100} = 0.65$
 - 100-Year Rainfall Intensity = 5.07 inches per hour
 - $Q_{100} = 164$ cfs
 - Computed Highwater Elevation above the RCB = 1408.99
3. Existing (Pre-Jabara Development) Conditions at the 10'x3'x350' RCB crossing Webb Road south of the K-96 Expressway (results computed by the HEC-1 analyses):
 - Drainage Area = 78.3 acres
 - $Q_{100} = 234$ cfs
 - High Water Elevation above the RCB = 1406.78
4. Proposed (Post-Jabara Development) Conditions at the 10'x3'x350' RCB crossing Webb Road south of the K-96 Expressway (results computed by the HEC-1 analyses):

- Drainage Area = 78.3 acres
- $Q_{100} = 242$ cfs
- High Water Elevation above the RCB = 1406.94

DISCUSSION

In reviewing the drainage plan submitted to the City for Fox Pointe, and the information included in the construction plans for the K-96/Webb Road Interchange, some inconsistencies between drainage data developed by PEC for the present study, and between the two plans themselves, were noted:

1. The contributing drainage area depicted on the K-96 plans for the 10'x3'x 350' RCB was 46.0 acres. The drainage area for the same structure noted in the Fox Pointe drainage plan was 58.0. These areas differed from that estimated by PEC, which was 78.3 acres.
2. A discrepancy between the drainage area depicted in the K-96 plans contributing runoff to the 8'x3'x 378' RCB crossing K-96 (and consequently the RCB crossing Webb Road downstream of this structure), and the area estimated by PEC was noted. The drainage area shown in the K-96 plans is 36.0 acres; PEC estimates the drainage area to be 49.9 acres. This difference is likely due to the PEC's inclusion of 11.2 acres northwest of the K-96/Webb Road intersection (see Figure 2). Inclusion of this area would account for most of the 13.9 acre difference. The drainage pattern for the 11.2 acre sub-area was verified by PEC by observing drainage patterns during a rainstorm.
3. The pre-developed conditions headwater elevation noted in the K-96 plans for the 10x'3'x350' RCB was 1407.40. The Fox Pointe drainage plan showed an elevation of 1408.40 for the same structure. The headwater elevation computed by PEC 1406.78. The difference between the computed elevations most likely may be attributed to a difference in assumed tailwater conditions for the RCB. The computations performed by PEC assume the tailwater elevation at the outlet end of the RCB to be the 100-year water surface elevation for the upper detention pond read in the Fox Pointe drainage plan (1404.10). Since the downstream flowline elevation for the 3' tall RCB is 1401.47, the outlet will be slightly submerged under this condition. The detention pond had not yet been constructed when the K-96 plans were designed; therefore, the highwater elevation for the pond would not have been available for the computations included in the K-96 plans.

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Differences between 100-year discharges computed by PEC, and those shown on previous studies or drainage plans may be attributed solely to differences in the drainage areas, not to the computational methods used for the analyses. In other words, if the drainage areas were identical, the computations by PEC would produce essentially the same discharges as those shown in the referenced drainage plans.

CONCLUSIONS

Based on PEC's analyses of the basin, the following conclusions may be reached:

1. The major drainage structures crossing Webb Road and K-96 both currently pass the 100-year storm discharge without overtopping the roadway. Development of the 7.7 acre-site on the Jabara property would not change this result.
2. Conveyance systems associated with downstream developments are adequate without modification to pass the 100-year storm discharge. Based on the drainage plans submitted to the City, all insurable structures within the referenced developments appear to have greater than 100-year flood protection for both the "existing" and "proposed" discharges considered in the hydrologic and hydraulic analysis.

As always, we have appreciated the opportunity to work with you and your staff on this project. If you have any questions regarding this project, or need additional information, please let me know.

Very truly yours,

PROFESSIONAL ENGINEERING CONSULTANTS, P.A.

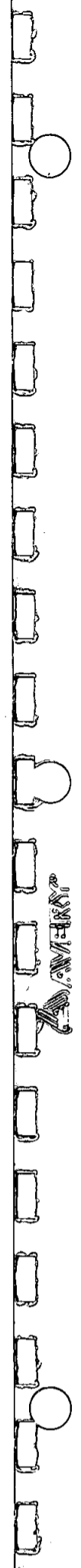


Darwin R. Cronk, P.E.
Project Engineer

DRC:amha

Encl: As noted

FIGURE #1



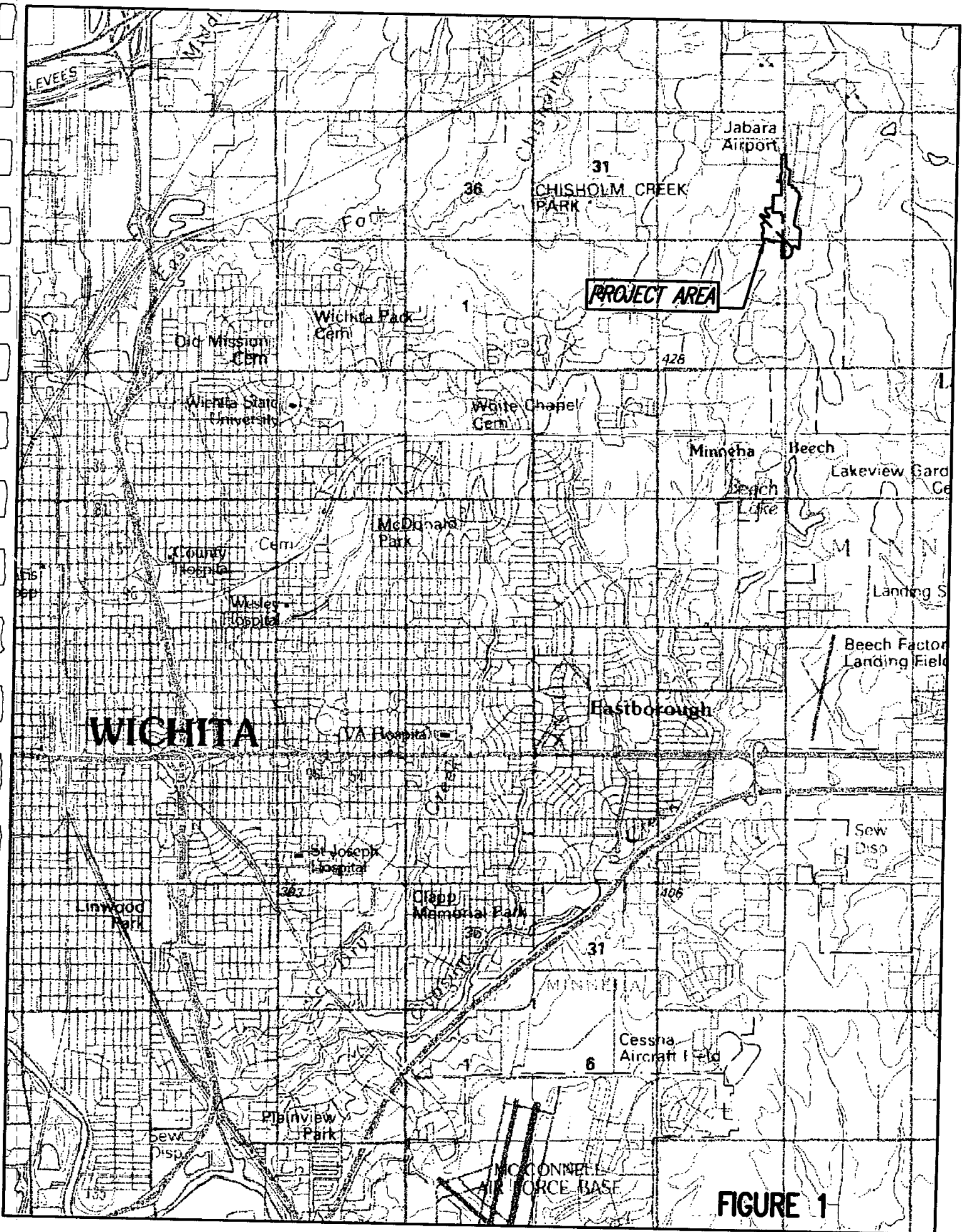
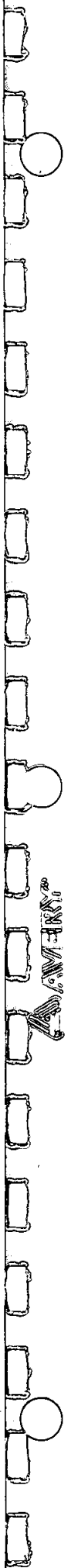


FIGURE 1

FIGURE # 2



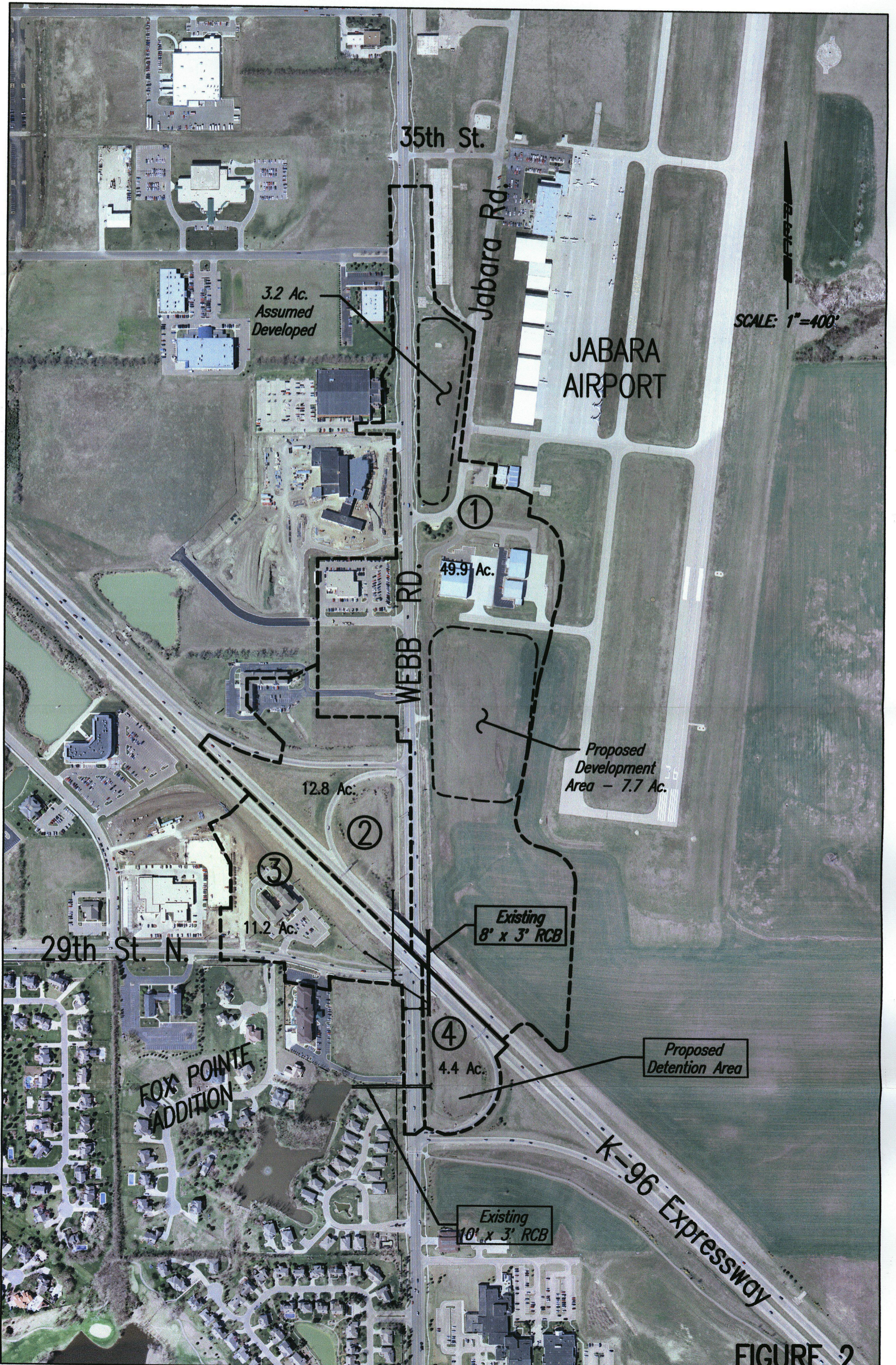


FIGURE 2

Rating Curves



8'x3' RCB
Across K-96

JAB8X3.LST

1

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CURRENT TIME: 09:44:04

FILE DATE: 01-06-2005
FILE NAME: JAB8X3

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3 C 3 SITE DATA 3 CULVERT SHAPE, MATERIAL, INLET 3
3 U 3 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA 3
3 L 3 INLET OUTLET CULVERT 3 BARRELS 3
3 V 3 ELEV. ELEV. LENGTH 3 SHAPE SPAN RISE MANNING INLET 3
3 NO. 3 (ft) (ft) (ft) 3 MATERIAL (ft) (ft) n TYPE 3
3 1 3 1405.16 1403.21 378.01 3 1 RCB 8.00 3.00 .013 CONVENTIONAL 3
3 2 3 3 3 3 3 3 3 3
3 3 3 3 3 3 3 3 3 3
3 4 3 3 3 3 3 3 3 3
3 5 3 3 3 3 3 3 3 3
3 6 3 3 3 3 3 3 3 3
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AA
SUMMARY OF CULVERT FLOWS (cfs) FILE: JAB8X3 DATE: 01-06-2005

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1407.01	60.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1407.21	70.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1407.41	80.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1407.59	90.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1407.78	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1407.96	110.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1408.14	120.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1408.32	130.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1408.51	140.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1408.61	145.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
1408.91	160.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00	0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING

AA
SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: JAB8X3 DATE: 01-06-2005

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1407.01	0.000	60.00	0.00	0.00
1407.21	0.000	70.00	0.00	0.00
1407.41	0.000	80.00	0.00	0.00
1407.59	0.000	90.00	0.00	0.00
1407.78	0.000	100.00	0.00	0.00
1407.96	0.000	110.00	0.00	0.00
1408.14	0.000	120.00	0.00	0.00
1408.32	0.000	130.00	0.00	0.00
1408.51	0.000	140.00	0.00	0.00
1408.61	0.000	145.00	0.00	0.00
1408.91	0.000	160.00	0.00	0.00

AA
<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000
AA

2

CURRENT DATE: 01-06-2005
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FILE DATE: 01-06-2005
FILE NAME: JAB8X3

AA
PERFORMANCE CURVE FOR CULVERT 1 - 1(8.00 (ft) BY 3.00 (ft)) RCB
AA

DIS-CHARGE FLOW (cfs)	HEAD- WATER CONTROL ELEV. (ft)	INLET CONTROL DEPTH (ft)	OUTLET CONTROL DEPTH (ft)	NORMAL FLOW TYPE <F4>	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)	
60.00	1407.01	1.85	1.85	1-S2n	1.03	1.21	0.91	1.92	8.27	1.75
70.00	1407.22	2.06	2.06	1-S2n	1.14	1.34	1.04	2.08	8.43	1.83
80.00	1407.41	2.25	2.25	1-S2n	1.25	1.46	1.16	2.22	8.61	1.89
90.00	1407.59	2.43	2.43	1-S2n	1.35	1.58	1.28	2.35	8.78	1.96
100.00	1407.78	2.62	2.62	1-S2n	1.45	1.70	1.40	2.48	8.95	2.01
110.00	1407.96	2.80	2.80	1-S2n	1.55	1.81	1.54	2.60	8.94	2.07
120.00	1408.14	2.98	2.98	1-S2n	1.64	1.92	1.52	2.71	9.90	2.12

JAB8X3.LST

130.00	1408.32	3.16	3.16	5-S2n	1.73	2.02	1.62	2.82	10.03	2.16
140.00	1408.51	3.35	3.35	5-S2n	1.82	2.12	1.72	2.92	10.16	2.20
145.00	1408.61	3.45	3.45	5-S2n	1.87	2.17	1.77	2.97	10.22	2.22
160.00	1408.91	3.75	3.25	4-FFT	2.00	2.32	2.00	3.11	10.01	2.28

El. inlet face invert 1405.16 ft El. outlet invert 1403.21 ft
 El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT *****

INLET STATION	0.00	ft
INLET ELEVATION	1405.16	ft
OUTLET STATION	378.00	ft
OUTLET ELEVATION	1403.21	ft
NUMBER OF BARRELS	1	
SLOPE (V/H)	0.0052	
CULVERT LENGTH ALONG SLOPE	378.01	ft

***** CULVERT DATA SUMMARY *****

BARREL SHAPE	BOX
BARREL SPAN	8.00 ft
BARREL RISE	3.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (30-75 DEG. FLARE)
INLET DEPRESSION	NONE

3
 CURRENT DATE: 01-06-2005 FILE DATE: 01-06-2005
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TAILWATER
 ROADWAY OVERTOPPING DATA

***** REGULAR CHANNEL CROSS SECTION *****

BOTTOM WIDTH	10.00	ft
SIDE SLOPE H/V (x:1)	4.0	
CHANNEL SLOPE V/H (ft/ft)	0.002	
MANNING'S n (.01-0.1)	0.050	
CHANNEL INVERT ELEVATION	1403.20	ft
CULVERT NO.1 OUTLET INVERT ELEVATION	1403.21	ft

***** UNIFORM FLOW RATING CURVE FOR DOWNSTREAM CHANNEL

FLOW (cfs)	W.S.E. (ft)	FROUDE NUMBER	DEPTH (ft)	VEL. (f/s)	SHEAR (psf)
60.00	1405.13	0.222	1.93	1.75	0.29
70.00	1405.29	0.223	2.09	1.83	0.31
80.00	1405.43	0.224	2.23	1.89	0.33
90.00	1405.56	0.224	2.36	1.96	0.35
100.00	1405.69	0.225	2.49	2.01	0.37
110.00	1405.81	0.226	2.61	2.07	0.39
120.00	1405.92	0.226	2.72	2.12	0.41
130.00	1406.03	0.227	2.83	2.16	0.42
140.00	1406.13	0.227	2.93	2.20	0.44
145.00	1406.18	0.227	2.98	2.22	0.45
160.00	1406.32	0.228	3.12	2.28	0.47

ROADWAY SURFACE PAVED
 EMBANKMENT TOP WIDTH 30.00 ft
 CREST LENGTH 20.00 ft
 OVERTOPPING CREST ELEVATION 1411.00 ft

10'x3' RCB Across
Webb Rd.

JAB10X3.LST

1

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CURRENT TIME: 09:06:37

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FILE NAME: JAB10X3

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3 C 3 SITE DATA 3 CULVERT SHAPE, MATERIAL, INLET 3
3 U 3 AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA 3
3 L 3 INLET OUTLET CULVERT 3 BARRELS 3
3 V 3 ELEV. ELEV. LENGTH 3 SHAPE SPAN RISE MANNING INLET 3
3 NO. 3 (ft) (ft) (ft) 3 MATERIAL (ft) (ft) n TYPE 3
3 1 3 1402.45 1401.47 350.00 3 1 RCB 10.00 3.00 .013 CONVENTIONAL 3
3 2 3 3 3 3 3 3 3 3
3 3 3 3 3 3 3 3 3 3
3 4 3 3 3 3 3 3 3 3
3 5 3 3 3 3 3 3 3 3
3 6 3 3 3 3 3 3 3 3
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AA
SUMMARY OF CULVERT FLOWS (cfs) FILE: JAB10X3 DATE: 01-06-2005

ELEV (ft)	TOTAL	1	2	3	4	5	6	ROADWAY	ITR
1405.68	150.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
1405.83	160.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
1405.96	170.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
1406.10	180.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
1406.22	190.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
1406.35	200.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
1406.48	210.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
1406.62	220.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
1406.74	230.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
1406.93	240.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
1407.13	250.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.00 0
0.00	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	OVERTOPPING

AA
SUMMARY OF ITERATIVE SOLUTION ERRORS FILE: JAB10X3 DATE: 01-06-2005

HEAD ELEV (ft)	HEAD ERROR (ft)	TOTAL FLOW (cfs)	FLOW ERROR (cfs)	% FLOW ERROR
1405.68	0.000	150.00	0.00	0.00
1405.83	0.000	160.00	0.00	0.00
1405.96	0.000	170.00	0.00	0.00
1406.10	0.000	180.00	0.00	0.00
1406.22	0.000	190.00	0.00	0.00
1406.35	0.000	200.00	0.00	0.00
1406.48	0.000	210.00	0.00	0.00
1406.62	0.000	220.00	0.00	0.00
1406.74	0.000	230.00	0.00	0.00
1406.93	0.000	240.00	0.00	0.00
1407.13	0.000	250.00	0.00	0.00

AA
<1> TOLERANCE (ft) = 0.010 <2> TOLERANCE (%) = 1.000
AA

2

CURRENT DATE: 01-06-2005
CURRENT TIME: 09:06:37

FILE DATE: 01-06-2005
FILE NAME: JAB10X3

AA
PERFORMANCE CURVE FOR CULVERT 1 - 1(10.00 (ft) BY 3.00 (ft)) RCB
AA

DIS-CHARGE FLOW (cfs)	HEAD- ELEV. (ft)	INLET DEPTH (ft)	OUTLET DEPTH (ft)	FLOW TYPE	NORMAL DEPTH (ft)	CRIT. DEPTH (ft)	OUTLET DEPTH (ft)	TW DEPTH (ft)	OUTLET VEL. (fps)	TW VEL. (fps)
150.00	1405.68	2.98	3.23	3-M1t	1.96	1.92	2.53	2.53	5.93	0.00
160.00	1405.83	3.13	3.38	3-M1t	2.05	2.00	2.53	2.53	6.32	0.00
170.00	1405.96	3.28	3.51	3-M1t	2.14	2.08	2.53	2.53	6.72	0.00
180.00	1406.10	3.43	3.65	3-M1t	2.22	2.16	2.53	2.53	7.11	0.00
190.00	1406.23	3.59	3.78	3-M1t	2.31	2.24	2.53	2.53	7.51	0.00
200.00	1406.35	3.76	3.90	3-M1t	2.39	2.32	2.53	2.53	7.91	0.00
210.00	1406.48	3.93	4.03	3-M1t	2.47	2.40	2.53	2.53	8.30	0.00

JAB10X3.LST

220.00	1406.62	4.10	4.17	3-M2t	2.56	2.47	2.53	2.53	8.70	0.00
230.00	1406.74	4.29	4.29	2-M2c	2.64	2.55	2.55	2.53	9.03	0.00
240.00	1406.93	4.48	4.41	2-M2c	3.00	2.62	2.62	2.53	9.16	0.00
250.00	1407.13	4.68	4.53	2-M2c	3.00	2.69	2.69	2.53	9.28	0.00

El. inlet face invert 1402.45 ft El. outlet invert 1401.47 ft
 El. inlet throat invert 0.00 ft El. inlet crest 0.00 ft

***** SITE DATA ***** CULVERT INVERT *****

INLET STATION	0.00 ft
INLET ELEVATION	1402.45 ft
OUTLET STATION	350.00 ft
OUTLET ELEVATION	1401.47 ft
NUMBER OF BARRELS	1
SLOPE (V/H)	0.0028
CULVERT LENGTH ALONG SLOPE	350.00 ft

***** CULVERT DATA SUMMARY *****

BARREL SHAPE	BOX
BARREL SPAN	10.00 ft
BARREL RISE	3.00 ft
BARREL MATERIAL	CONCRETE
BARREL MANNING'S n	0.013
INLET TYPE	CONVENTIONAL
INLET EDGE AND WALL	SQUARE EDGE (30-75 DEG. FLARE)
INLET DEPRESSION	NONE

3

CURRENT DATE: 01-06-2005	FILE DATE: 01-06-2005
CURRENT TIME: 09:06:37	FILE NAME: JAB10X3

***** TAILWATER *****

CONSTANT WATER SURFACE ELEVATION
1404.00

***** ROADWAY OVERTOPPING DATA *****

ROADWAY SURFACE	PAVED
EMBANKMENT TOP WIDTH	50.00 ft
CREST LENGTH	50.00 ft
OVERTOPPING CREST ELEVATION	1410.50 ft

Existing Conditions

HEC-1 MODEL

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* FEBRUARY 1981
* REVISED 02 AUG 88
*
* RUN DATE 02/12/2005 TIME 10:26:18
*
*****

```

```

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

```

```

X X XXXXXXX XXXXX X
X X X X X XX
X X X X X
XXXXXX XXXX X XXXXX X
X X X X X
X X X X X
X X XXXXXXX XXXXX XXX

```

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 JABARA AIRPORT DRAINAGE STUDY
2 ID 100-Year Storms
3 ID Professional Engineering Consultants
4 ID Wichita, Ks
5 ID DRC 1/5/05
6 ID File: T:\2004\04687\existing.ih1

*** LIST ***
*** FREE ***

*DIAGRAM
7 IT 05 27SEP99 1200 0 28SEP99 2000
8 IN 05 27SEP99 1200
9 IO 4 0
10 JR PREC 5.9

*
* EXISTING CONDITIONS
*
11 KK 1
12 KO 5
13 BA .07800
14 PB 1.00
15 PC 0.0000 0.1446 0.2449 0.3146 0.3741 0.4259 0.4694 0.5060 0.5363 0.5638
16 PC 0.5882 0.6096 0.6293 0.6485 0.6647 0.6803 0.6961 0.7107 0.7219 0.7351
17 PC 0.7455 0.7560 0.7670 0.7758 0.7823 0.7901 0.7959 0.8036 0.8095 0.8138
18 PC 0.8206 0.8260 0.8299 0.8372 0.8384 0.8433 0.8520 0.8582 0.8635 0.8678
19 PC 0.8730 0.8774 0.8810 0.8857 0.8896 0.8929 0.8997 0.9059 0.9116 0.9167
20 PC 0.9212 0.9252 0.9286 0.9314 0.9337 0.9380 0.9418 0.9452 0.9508 0.9560
21 PC 0.9609 0.9654 0.9695 0.9732 0.9766 0.9795 0.9821 0.9875 0.9926 0.9974
22 PC 0.9987 0.9995 1.0000
*
23 LS 0 86 40
24 UD .35
*
*
25 KK 2
26 KO 5
27 BA .02000
28 PB 1.00
29 PC 0.0000 0.1446 0.2449 0.3146 0.3741 0.4259 0.4694 0.5060 0.5363 0.5638
30 PC 0.5882 0.6096 0.6293 0.6485 0.6647 0.6803 0.6961 0.7107 0.7219 0.7351
31 PC 0.7455 0.7560 0.7670 0.7758 0.7823 0.7901 0.7959 0.8036 0.8095 0.8138
32 PC 0.8206 0.8260 0.8299 0.8372 0.8384 0.8433 0.8520 0.8582 0.8635 0.8678
33 PC 0.8730 0.8774 0.8810 0.8857 0.8896 0.8929 0.8997 0.9059 0.9116 0.9167
34 PC 0.9212 0.9252 0.9286 0.9314 0.9337 0.9380 0.9418 0.9452 0.9508 0.9560
35 PC 0.9609 0.9654 0.9695 0.9732 0.9766 0.9795 0.9821 0.9875 0.9926 0.9974
36 PC 0.9987 0.9995 1.0000
*
37 LS 0 82 35
38 UD .15
*

```

```

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

```

```

40      KO      5
41      BA .01750
42      PB      1.00
43      PC 0.0000 0.1446 0.2449 0.3146 0.3741 0.4259 0.4694 0.5060 0.5363 0.5638
44      PC 0.5882 0.6096 0.6293 0.6485 0.6647 0.6803 0.6961 0.7107 0.7219 0.7351
45      PC 0.7455 0.7560 0.7670 0.7758 0.7823 0.7901 0.7959 0.8036 0.8095 0.8138
46      PC 0.8206 0.8260 0.8299 0.8372 0.8384 0.8433 0.8520 0.8582 0.8635 0.8678
47      PC 0.8730 0.8774 0.8810 0.8857 0.8896 0.8929 0.8997 0.9059 0.9116 0.9167
48      PC 0.9212 0.9252 0.9286 0.9314 0.9337 0.9380 0.9418 0.9452 0.9508 0.9560
49      PC 0.9609 0.9654 0.9695 0.9732 0.9766 0.9795 0.9821 0.9875 0.9926 0.9974
50      PC 0.9987 0.9995 1.0000
*
51      LS      0      90      70
52      UD      .15
*
53      KK      4
54      KO      5
55      BA .00690
56      PB      1.00
57      PC 0.0000 0.1446 0.2449 0.3146 0.3741 0.4259 0.4694 0.5060 0.5363 0.5638
58      PC 0.5882 0.6096 0.6293 0.6485 0.6647 0.6803 0.6961 0.7107 0.7219 0.7351
59      PC 0.7455 0.7560 0.7670 0.7758 0.7823 0.7901 0.7959 0.8036 0.8095 0.8138
60      PC 0.8206 0.8260 0.8299 0.8372 0.8384 0.8433 0.8520 0.8582 0.8635 0.8678
61      PC 0.8730 0.8774 0.8810 0.8857 0.8896 0.8929 0.8997 0.9059 0.9116 0.9167
62      PC 0.9212 0.9252 0.9286 0.9314 0.9337 0.9380 0.9418 0.9452 0.9508 0.9560
63      PC 0.9609 0.9654 0.9695 0.9732 0.9766 0.9795 0.9821 0.9875 0.9926 0.9974
64      PC 0.9987 0.9995 1.0000
*
65      LS      0      77      15
66      UD      .10
*
*      COMBINE HYDROGRAPHS
*
67      KK IN10X3
68      HC      4
*
*      DETENTION AREA FOR FLOOD ROUTING
*
69      KK STORGE
70      RS      1      ELEV      1403
71      SA      0.08      0.32      0.57      1.20
72      SE 1403.0 1406.0 1407.0 1408.0
73      SQ      60      70      80      90      100      110      120      130      140      150
74      SQ      160      170      180      190      200      210      220      230      240      250
75      SE 1404.4 1404.5 1404.6 1404.8 1404.9 1405.1 1405.2 1405.4 1405.5 1405.7
76      SE 1405.8 1406.0 1406.1 1406.2 1406.4 1406.5 1406.6 1406.7 1406.9 1407.1
*
*
77      ZZ

```

1

SCHEMATIC DIAGRAM OF STREAM NETWORK

```

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

11      1
.
.
25      .      2
.
.
39      .      .      3
.
.
53      .      .      .      4
.
.
67      IN10X3.....
      V
      V
69      STORGE

```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION

```

*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* FEBRUARY 1981
* REVISED 02 AUG 88
*
* RUN DATE 02/12/2005 TIME 10:26:18
*
*****

```

```

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

```

Wichita, Ks
DRC 1/5/05
File: T:\2004\04687\existing.ih1

*** ERROR *** SPECIFIED START AND END DATES RESULT IN TOO MANY TIME PERIODS

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

IT HYDROGRAPH TIME DATA
 NMIN 5 MINUTES IN COMPUTATION INTERVAL
 IDATE 27SEP99 STARTING DATE
 ITIME 1200 STARTING TIME
 NQ 300 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 28SEP99 ENDING DATE
 NDTIME 1255 ENDING TIME
 ICENT 19 CENTURY MARK

 COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 24.92 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
 5.90

11 KK *****
 * *
 * 1 *
 * *

12 KO OUTPUT CONTROL VARIABLES
 IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

25 KK *****
 * *
 * 2 *
 * *

26 KO OUTPUT CONTROL VARIABLES
 IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

39 KK *****
 * *
 * 3 *
 * *

40 KO OUTPUT CONTROL VARIABLES
 IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

53 KK *****
 * *
 * 4 *
 * *

```

*****
54 KO      OUTPUT CONTROL VARIABLES
           IPRNT      5  PRINT CONTROL
           IPLOT      0  PLOT CONTROL
           QSCAL      0  HYDROGRAPH PLOT SCALE

```

```

*****
67 KK      *  IN10X3  *
           *      *
           *****

```

```

68 HC      HYDROGRAPH COMBINATION
           ICOMP      4  NUMBER OF HYDROGRAPHS TO COMBINE

```

```

*****
69 KK      *  STORGE  *
           *      *
           *****

```

HYDROGRAPH ROUTING DATA

```

70 RS      STORAGE ROUTING
           NSTPS      1  NUMBER OF SUBREACHES
           ITYP      ELEV TYPE OF INITIAL CONDITION
           RSVRIC    1403.00 INITIAL CONDITION
           X          .00 WORKING R AND D COEFFICIENT

71 SA      AREA          .1      .3      .6      1.2

72 SE      ELEVATION    1403.00  1406.00  1407.00  1408.00

73 SQ      DISCHARGE    60.      70.      80.      90.      100.      110.      120.      130.      140.      150.
           160.      170.      180.      190.      200.      210.      220.      230.      240.      250.

75 SE      ELEVATION    1404.40  1404.50  1404.60  1404.80  1404.90  1405.10  1405.20  1405.40  1405.50  1405.70
           1405.80  1406.00  1406.10  1406.20  1406.40  1406.50  1406.60  1406.70  1406.90  1407.10

```

COMPUTED STORAGE-ELEVATION DATA

```

STORAGE    .00      .56      1.00      1.86
ELEVATION  1403.00  1406.00  1407.00  1408.00

```

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

```

STORAGE    .00      .17      .19      .21      .25      .27      .31      .34      .39      .41
OUTFLOW    60.00    60.00    70.00    80.00    90.00    100.00   110.00   120.00   130.00   140.00
ELEVATION  1403.00    1404.40  1404.50  1404.60  1404.80  1404.90  1405.10  1405.20  1405.40  1405.50

```

```

STORAGE    .47      .50      .56      .59      .63      .71      .75      .79      .84      .94
OUTFLOW    150.00   160.00   170.00   180.00   190.00   200.00   210.00   220.00   230.00   240.00
ELEVATION  1405.70   1405.80  1406.00  1406.10  1406.20  1406.40  1406.50  1406.60  1406.70  1406.90

```

```

STORAGE    1.00      1.06      1.86
OUTFLOW    245.00   250.00   295.01
ELEVATION  1407.00   1407.10  1408.00

```

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 60. TO 180.
 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.)

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	5.90
HYDROGRAPH AT					
+	1	.08	1	FLOW	154.
				TIME	.67
HYDROGRAPH AT					
+	2	.02	1	FLOW	43.
				TIME	.33

HYDROGRAPH AT					
+	3	.02	1	FLOW	55.
				TIME	.33
HYDROGRAPH AT					
+	4	.01	1	FLOW	11.
				TIME	.42
4 COMBINED AT					
+	IN10X3	.12	1	FLOW	239.
				TIME	.58
ROUTED TO					
+	STORGE	.12	1	FLOW	234.
				TIME	.67

** PEAK STAGES IN FEET **
 1 STAGE 1406.78
 TIME .67

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

Proposed Conditions

HEC 1 - MODEL

```

1*****
*
* FLOOD HYDROGRAPH PACKAGE (HEC-1)
* FEBRUARY 1981
* REVISED 02 AUG 88
*
* RUN DATE 02/12/2005 TIME 11:28:13
*
*****

```

```

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

```

```

X X XXXXXXX XXXX X
X X X X X XX
X X X X X X
XXXXXXX XXXX X XXXXX X
X X X X X X
X X X X X X
X X XXXXXXX XXXX XXX

```

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
1 ID JABARA AIRPORT DRAINAGE STUDY
2 ID 100-Year Storms
3 ID Professional Engineering Consultants
4 ID Wichita, Ks
5 ID DRC 1/5/05
6 ID File: T:\2004\04687\proposed.txt

*** LIST ***
*** FREE ***

*DIAGRAM
7 IT 05 27SEP99 1200 0 28SEP99 2000
8 IN 05 27SEP99 1200
9 IO 4 0
10 JR PREC 5.9
*
* EXISTING CONDITIONS
*
11 KK 1
12 KO 5
13 BA .07800
14 PB 1.00
15 PC 0.0000 0.1446 0.2449 0.3146 0.3741 0.4259 0.4694 0.5060 0.5363 0.5638
16 PC 0.5882 0.6096 0.6293 0.6485 0.6647 0.6803 0.6961 0.7107 0.7219 0.7351
17 PC 0.7455 0.7560 0.7670 0.7758 0.7823 0.7901 0.7959 0.8036 0.8095 0.8138
18 PC 0.8206 0.8260 0.8299 0.8372 0.8384 0.8433 0.8520 0.8582 0.8635 0.8678
19 PC 0.8730 0.8774 0.8810 0.8857 0.8896 0.8929 0.8997 0.9059 0.9116 0.9167
20 PC 0.9212 0.9252 0.9286 0.9314 0.9337 0.9380 0.9418 0.9452 0.9508 0.9560
21 PC 0.9609 0.9654 0.9695 0.9732 0.9766 0.9795 0.9821 0.9875 0.9926 0.9974
22 PC 0.9987 0.9995 1.0000
*
23 LS 0 86 50
24 UD .35
*
*
25 KK 2
26 KO 5
27 BA .02000
28 PB 1.00
29 PC 0.0000 0.1446 0.2449 0.3146 0.3741 0.4259 0.4694 0.5060 0.5363 0.5638
30 PC 0.5882 0.6096 0.6293 0.6485 0.6647 0.6803 0.6961 0.7107 0.7219 0.7351
31 PC 0.7455 0.7560 0.7670 0.7758 0.7823 0.7901 0.7959 0.8036 0.8095 0.8138
32 PC 0.8206 0.8260 0.8299 0.8372 0.8384 0.8433 0.8520 0.8582 0.8635 0.8678
33 PC 0.8730 0.8774 0.8810 0.8857 0.8896 0.8929 0.8997 0.9059 0.9116 0.9167
34 PC 0.9212 0.9252 0.9286 0.9314 0.9337 0.9380 0.9418 0.9452 0.9508 0.9560
35 PC 0.9609 0.9654 0.9695 0.9732 0.9766 0.9795 0.9821 0.9875 0.9926 0.9974
36 PC 0.9987 0.9995 1.0000
*
37 LS 0 82 35
38 UD .15
*

```

1 HEC-1 INPUT PAGE 2

```

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

```

```

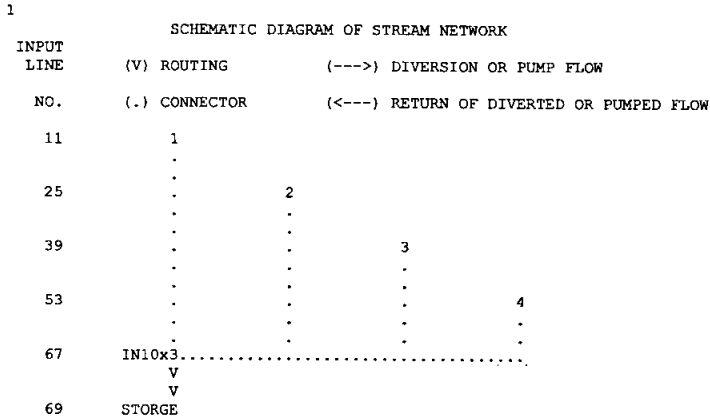
40      KO      5
41      BA      .01750
42      PB      1.00
43      PC      0.0000  0.1446  0.2449  0.3146  0.3741  0.4259  0.4694  0.5060  0.5363  0.5638
44      PC      0.5882  0.6096  0.6293  0.6485  0.6647  0.6803  0.6961  0.7107  0.7219  0.7351
45      PC      0.7455  0.7560  0.7670  0.7758  0.7823  0.7901  0.7959  0.8036  0.8095  0.8138
46      PC      0.8206  0.8260  0.8299  0.8372  0.8384  0.8433  0.8520  0.8582  0.8635  0.8678
47      PC      0.8730  0.8774  0.8810  0.8857  0.8896  0.8929  0.8997  0.9059  0.9116  0.9167
48      PC      0.9212  0.9252  0.9286  0.9314  0.9337  0.9380  0.9418  0.9452  0.9508  0.9560
49      PC      0.9609  0.9654  0.9695  0.9732  0.9766  0.9795  0.9821  0.9875  0.9926  0.9974
50      PC      0.9987  0.9995  1.0000
*
51      LS      0      90      70
52      UD      .15
*
53      KK      4
54      KO      5
55      BA      .00690
56      PB      1.00
57      PC      0.0000  0.1446  0.2449  0.3146  0.3741  0.4259  0.4694  0.5060  0.5363  0.5638
58      PC      0.5882  0.6096  0.6293  0.6485  0.6647  0.6803  0.6961  0.7107  0.7219  0.7351
59      PC      0.7455  0.7560  0.7670  0.7758  0.7823  0.7901  0.7959  0.8036  0.8095  0.8138
60      PC      0.8206  0.8260  0.8299  0.8372  0.8384  0.8433  0.8520  0.8582  0.8635  0.8678
61      PC      0.8730  0.8774  0.8810  0.8857  0.8896  0.8929  0.8997  0.9059  0.9116  0.9167
62      PC      0.9212  0.9252  0.9286  0.9314  0.9337  0.9380  0.9418  0.9452  0.9508  0.9560
63      PC      0.9609  0.9654  0.9695  0.9732  0.9766  0.9795  0.9821  0.9875  0.9926  0.9974
64      PC      0.9987  0.9995  1.0000
*
65      LS      0      77      15
66      UD      .10
*
*
*      COMBINE HYDROGRAPHS
*
67      KK      IN10x3
68      HC      4
*
*      DETENTION AREA FOR FLOOD ROUTING
*
69      KK      STORGE
70      RS      1      ELEV      1403
71      SA      0.08      .32      .57      1.2
72      SE      1403.0      1406      1407      1408
73      SQ      60      70      80      90      100      110      120      130      140      150
74      SQ      160      170      180      190      200      210      220      230      240      250
75      SE      1404.4      1404.5      1404.6      1404.8      1404.9      1405.1      1405.2      1405.4      1405.5      1405.7
76      SE      1405.8      1406.0      1406.1      1406.2      1406.4      1406.5      1406.6      1406.7      1406.9      1407.1
*
*
*

```

```

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

```



```

(***) RUNOFF ALSO COMPUTED AT THIS LOCATION
1*****
*
*      FLOOD HYDROGRAPH PACKAGE (HEC-1)
*      FEBRUARY 1981
*      REVISED 02 AUG 88
*
*      RUN DATE 02/12/2005 TIME 11:28:13
*
1*****

```

```

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

```

JABARA AIRPORT DRAINAGE STUDY
100-Year Storms
Professional Engineering Consultants
Wichita, Ks
DRC 1/5/05
File: T:\2004\04687\proposed.txt

*** ERROR *** SPECIFIED START AND END DATES RESULT IN TOO MANY TIME PERIODS

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

IT HYDROGRAPH TIME DATA
 NMIN 5 MINUTES IN COMPUTATION INTERVAL
 IDATE 27SEP99 STARTING DATE
 ITIME 1200 STARTING TIME
 NQ 300 NUMBER OF HYDROGRAPH ORDINATES
 NDDATE 28SEP99 ENDING DATE
 NDTIME 1255 ENDING TIME
 ICENT 19 CENTURY MARK

 COMPUTATION INTERVAL .08 HOURS
 TOTAL TIME BASE 24.92 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
 5.90

11 KK *****
 * *
 * 1 *
 * *

12 KO OUTPUT CONTROL VARIABLES
 IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

25 KK *****
 * *
 * 2 *
 * *

26 KO OUTPUT CONTROL VARIABLES
 IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

39 KK *****
 * *
 * 3 *
 * *

40 KO OUTPUT CONTROL VARIABLES
 IPRNT 5 PRINT CONTROL
 IPLOT 0 PLOT CONTROL
 QSCAL 0. HYDROGRAPH PLOT SCALE

```

*****
*           *
*           *
53 KK      * 4 *
*           *
*           *
*****

```

```

54 KO      OUTPUT CONTROL VARIABLES
           IPRNT      5  PRINT CONTROL
           IPLOT      0  PLOT CONTROL
           QSCAL      0. HYDROGRAPH PLOT SCALE

```

```

*****
*           *
*           *
67 KK      * IN10x3 *
*           *
*           *
*****

```

```

68 HC      HYDROGRAPH COMBINATION
           ICOMP      4  NUMBER OF HYDROGRAPHS TO COMBINE

```

```

*****
*           *
*           *
69 KK      * STORGE *
*           *
*           *
*****

```

HYDROGRAPH ROUTING DATA

```

70 RS      STORAGE ROUTING
           NSTPS      1  NUMBER OF SUBREACHES
           ITYP      ELEV TYPE OF INITIAL CONDITION
           RSVRIC    1403.00 INITIAL CONDITION
           X          .00 WORKING R AND D COEFFICIENT

71 SA      AREA          .1      .3      .6      1.2

72 SE      ELEVATION    1403.00 1406.00 1407.00 1408.00

73 SQ      DISCHARGE    60.     70.     80.     90.     100.    110.    120.    130.    140.    150.
           160.    170.    180.    190.    200.    210.    220.    230.    240.    250.

75 SE      ELEVATION    1404.40 1404.50 1404.60 1404.80 1404.90 1405.10 1405.20 1405.40 1405.70 1405.70
           1405.80 1406.00 1406.10 1406.20 1406.40 1406.50 1406.60 1406.70 1406.90 1407.10

```

COMPUTED STORAGE-ELEVATION DATA

```

STORAGE    .00    .56    1.00    1.86
ELEVATION  1403.00 1406.00 1407.00 1408.00

```

COMPUTED STORAGE-OUTFLOW-ELEVATION DATA

```

STORAGE    .00    .17    .19    .21    .25    .27    .31    .34    .39    .41
OUTFLOW    60.00  60.00  70.00  80.00  90.00  100.00 110.00 120.00 130.00 140.00
ELEVATION  1403.00 1404.40 1404.50 1404.60 1404.80 1404.90 1405.10 1405.20 1405.40 1405.50

```

```

STORAGE    .47    .50    .56    .59    .63    .71    .75    .79    .84    .94
OUTFLOW    150.00 160.00 170.00 180.00 190.00 200.00 210.00 220.00 230.00 240.00
ELEVATION  1405.70 1405.80 1406.00 1406.10 1406.20 1406.40 1406.50 1406.60 1406.70 1406.90

```

```

STORAGE    1.00    1.06    1.86
OUTFLOW    245.00 250.00 295.01
ELEVATION  1407.00 1407.10 1408.00

```

*** WARNING *** MODIFIED PULS ROUTING MAY BE NUMERICALLY UNSTABLE FOR OUTFLOWS BETWEEN 60. TO 180.
 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.)

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
           5.90

HYDROGRAPH AT
+          1      .08  1  FLOW  163.

```

				TIME	.58
HYDROGRAPH AT					
+	2	.02	1	FLOW	43.
				TIME	.33
HYDROGRAPH AT					
+	3	.02	1	FLOW	55.
				TIME	.33
HYDROGRAPH AT					
+	4	.01	1	FLOW	11.
				TIME	.42
4 COMBINED AT					
+	IN10x3	.12	1	FLOW	249.
				TIME	.58
ROUTED TO					
+	STORGE	.12	1	FLOW	242.
				TIME	.67

** PEAK STAGES IN FEET **

1	STAGE	1406.94
	TIME	.67

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