

CHANNEL ANALYSIS AND PROPOSED BOX CULVERT  
FOR UNIVERSITY (TAFT) AVENUE ADJACENT TO  
RIDGE PLAZA 11TH ADDITION, WICHITA, KS.

AUGUST 19, 1991

EXISTING CONDITIONS - METHOD OF ANALYSIS

The purpose of this report is to size a box culvert under University Avenue (Taft Street) west of Mid-Continent Road located near the west line of Ridge Plaza 11th Addition. This box culvert will be located in an existing channel section, which is located in a 110 foot drainage dedication.

The existing drainage channel is controlled on the south by an existing triple 9' x 6' R.C.B.C. located under Mid-Continent Road. The channel downstream of this box has been the subject of a Federal Flood Insurance Study which ended just downstream of the box culvert. The channel upstream of this box has been the subject of a flood study titled "DRAINAGE PLAN ELEMENT FOR ASHLEY PARK AND BRISTOL PARK ADDITIONS", submitted 25 March, 1989 by M.S. Mitchell. The channel flow rate and downstream starting flood elevation for this box culvert have been taken from this report.

The channel analysis in this report is based upon current topographic information for the channel upstream of the Mid-Continent box culvert.

The Army Corps of Engineers "HEC-2" program is used to model the existing channel based on the current topographic information for the existing condition, results of which are included in this report as Exhibit A. A second channel model has been run with the addition of a proposed triple 4' x 9' R.C.B.C. under University Avenue, results of which are included in this report as Exhibit B. A base map of the drainage dedication has been included as Exhibit C, which includes the locations of the model cross sections.

MODEL INPUT DATA

The following data has been taken from "DRAINAGE PLAN ELEMENT FOR ASHLEY PARK AND BRISTOL PARK ADDITIONS":

1. Channel Flow Rate (100 year storm) = 494 c.f.s.
2. Starting Water Surface Elevation (Downstream of Existing triple 6' x 9' R.C.B.C. under Mid-Continent Road) = 131.30 City Datum.

Note that the 494 c.f.s. flow rate has been used for the entire reach of the drainage channel. This represents a conservative analysis of this reach due to a channel

branching to the west from the subject channel, located approximately 160 feet north of the north face of the Mid-Continent R.C.B.C.

#### RESULTS

Results of this analysis are based on analysis of Summary Printout Table 150, located on Page 11 of Exhibit A and Page 12 of Exhibit B. Comparison of the channel water surface elevations for each station indicate no significant rise in water surface elevation for the channel in the existing condition and with the addition of the proposed box culvert. Note that the upstream water surface elevations from station 2369 to station 2719 (upstream of the proposed box) for the improved condition are raised no more than 0.2 feet.

For a complete listing of input and output data for this analysis, see the HEC-2 model runs (Exhibits A and B).



THIS RUN EXECUTED 19AUG91 7:27:53

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 EC-2 WATER SURFACE PROFILES

ersion 4.6.0; February 1991  
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CHANNEL ANALYSIS FOR DUGAN TRIBUTARY FROM RIDGE RCBC TO NORTH OF  
 PROPOSED BOX LOCATION AT TAFT AVENUE WITH NEW BOX CROSSING TAFT STREET  
 EXISTING CHANNEL PROFILE

ICHECK	INQ	NINV	IDIR	STRT	METRIC	HVINS	Q	WSEL	FG
0	2	0	0	0	0	0	0	131.30	0
NPROF	IPLT	PRFVS	XSECV	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
-1	0	-1	0	0	0	0	0	0	0

VARIABLE CODES FOR SUMMARY PRINTOUT

150	0	0	0	0	0	0	0	0	0
0.03	0.03	0.03	0.1	0.3					
1	494								
1000	6	30	75	0.	0	0	0	0	0
136.5	15	132	30	126.9	50	126.9	62	132	75
136.5	91								
3	0.03	41	0.014	0.5					
1036	6	41	69	69	0.03	120			
10			36	36		36			
133.8	0	133.8	14	127.08	41	127.08	135.6	135.6	
133.8	120						69	133.8	96
3	0.03	41	0.02	69	0.03	120			
3.013	0.4	3	0	6	9	360	8.1	127.44	127.08
1396	6	41	69	360	360	360			
10		2	133.44	136.0					
133.8	0	133.8	14	127.44	41	127.44	135.6	135.6	
133.8	120						69	133.8	96
0.03	0.03	0.02							
1401	5	24.5	94	5	5	5			
133.8	14	133.8	24.5	127.45	38.8	127.45	82.8	133.8	94





SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK	ELEV
Q	GLOB	QCH	QROB	ALOB	ACH	AROB	UOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	MTN	ELMIN	SSTA	
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST	

ROF 1

HV= .100 CEHV= .300  
 ECNO 1000.000  
 1000.000 4.40 131.30 .00 131.30 131.58 .28 .00 .00 132.00  
 494.0 .0 494.0 .0 .0 115.4 .0 .0 .0 132.00  
 .00 .00 4.28 .00 .000 .030 .000 .000 126.90 32.75  
 .001930 0. 0. 0. 0 0 0 .00 40.47 73.22

HV= .030 CEHV= .500  
 30 NH CARD USED  
 ECNO 1036.000

? WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.95

?5 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 135.60 ELREA= 135.60  
 036.000 4.26 131.34 .00 .00 131.60 .27 .02 .00 127.08  
 494.0 .0 494.0 .0 .0 119.2 .0 .1 .0 127.08  
 .00 .00 4.15 .00 .000 .014 .000 .000 127.08 41.00  
 .000221 36. 36. 36. 2 0 0 .00 28.00 69.00

0 NH CARD USED

PIAL CULVERT

CUND	CUNV	ENTLC	COFQ	RDLEN	RISE	SPAN	CULVLN	CHRT	SCL	ELCHU	ELCHD
3	.013	.40	3.00	.00	6.00	9.00	360.00	8	1	127.44	127.08

RT 8 - BOX CULVERT WITH FLARED WINGWALLS; NO INLET TOP EDGE BEVEL  
 LE 1 - WINGWALLS FLARED 30 TO 75 DEGREES

ECNO 1396.000

PIAL CULVERT OUTLET CONTROL  
 : = 130.905 EGOC = 131.941 PCWSE= 131.336 ELTRD= 136.000

? WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .69

SECNO	DEPTH	CWSEL	CRISW	WSELK	EG	HV	HL	OLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA	
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST	

SPECIAL CULVERT

EGIC	EGOC	H4	QWEIR	QCULV	VCH	ACULV	ELTRD	WEIRLN
130.90	131.94	.34	0.	494.	4.169	162.0	136.00	0.

15 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 135.60 ELREA= 135.60

1396.000	4.23	131.67	.00	.00	131.94	.27	.34	.00	127.44
494.0	.0	494.0	.0	.0	118.5	.0	1.1	.3	127.44
.03	.00	4.17	.00	.000	.020	.000	.000	127.44	41.00
.000460	360.	360.	360.	2	0	0	.00	28.00	69.00

CNO 1401.000

2 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.80

401.000	4.43	131.88	.00	.00	131.95	.07	.00	.01	133.80
494.0	.0	494.0	.0	.0	234.3	.0	1.1	.3	133.80
.03	.00	2.11	.00	.000	.020	.000	.000	127.45	28.83
.000142	5.	5.	5.	2	0	0	.00	61.79	90.61

CNO 1406.000

406.000	4.38	131.88	.00	.00	131.95	.07	.00	.00	127.50
494.0	1.6	490.3	2.1	3.7	230.4	4.3	1.1	.3	127.50
.03	.45	2.13	.49	.030	.020	.030	.000	127.50	36.33
.000114	5.	5.	5.	0	0	0	.00	56.22	92.55

J= .100 CEHV= .300

CNO 1440.000

2 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .32

140.000	3.83	131.83	.00	.00	131.99	.16	.01	.03	134.00
494.0	.0	494.0	.0	.0	155.4	.0	1.3	.3	134.00
.03	.00	3.18	.00	.000	.030	.000	.000	128.00	27.92
001129	21.	48.	34.	2	0	0	.00	58.06	85.98

SECNO Q TIME SLOPE	DEPTH QLOB VLOB XLOBL	CWSEL QCH VCH XLCH	CRISW QROB UROB XLOBR	WSELK ALOB XNL ITRIAL	EG ACH XNCH IDC	HV AROB XNR ICONT	HL VOL WTN CORAR	GLOSS TWA ELMIN TOPWID	L-BANK R-BANK SSTA ENDST	ELEV
ECNO 1475.000										
1475.000	3.70	131.80	.00	.00	132.07	.26	.05	.03	128.30	
494.0	70.5	306.3	117.2	24.8	65.2	39.3	1.5	.4	128.10	
.03	2.85	4.70	2.98	.030	.030	.030	.000	128.10	31.06	
.001628	35.	35.	35.	2	0	0	.00	53.45	84.51	
ECNO 1659.000										
1659.000	4.34	132.14	.00	.00	132.34	.20	.27	.01	132.00	
494.0	.0	492.3	1.7	.0	137.0	1.6	2.0	.6	131.20	
.05	.02	3.59	1.07	.030	.030	.030	.000	127.80	28.99	
.001328	184.	184.	184.	2	0	0	.00	51.85	80.84	
ECNO 1754.000										
1754.000	4.28	132.28	.00	.00	132.50	.22	.15	.01	131.70	
494.0	.5	491.0	2.5	.6	130.0	2.1	2.3	.7	131.20	
.06	.81	3.78	1.23	.030	.030	.030	.000	128.00	29.76	
.001475	105.	105.	105.	2	0	0	.00	51.78	81.54	
ECNO 1874.000										
1874.000	3.83	132.43	.00	.00	132.70	.27	.19	.01	132.50	
494.0	.0	491.7	2.3	.0	117.8	1.7	2.7	.9	131.50	
.06	.00	4.17	1.34	.000	.030	.030	.000	128.60	30.47	
.002111	110.	110.	110.	0	0	0	.00	50.48	80.95	
ECNO 1982.000										
1982.000	3.85	132.65	.00	.00	132.93	.28	.22	.00	131.80	
494.0	1.5	488.6	3.9	1.3	114.5	2.5	3.0	1.0	131.40	
.07	1.21	4.27	1.56	.030	.030	.030	.000	128.80	30.41	
.001991	108.	108.	108.	2	0	0	.00	49.16	79.56	
ECNO 2094.000										
2094.000	3.57	132.87	.00	.00	133.16	.29	.23	.00	131.70	
494.0	3.8	478.5	11.7	2.4	109.6	5.9	3.3	1.1	131.20	
.08	1.55	4.36	1.98	.030	.030	.030	.000	129.30	30.06	
002091	112.	112.	112.	0	0	0	.00	51.89	81.95	

SECNO Q TIME SLOPE	DEPTH GLOB ULOB XLOBL	CWSEL QCH VCH XLCH	CRISW QROB UROB XLOBR	WSELK ALOB XNL ITRIAL	EG ACH XNCH IDC	HV AROB XNR ICONT	HL VOL WTN CORAR	LOSS TWA ELMIN TOPWID	L-BANK ELEV R-BANK ELEV SSTA ENDST
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ECNO 2237.000

2237.000	3.50	133.20	.00	.00	133.43	.23	.27	.01	132.00
494.0	3.2	483.0	7.8	2.3	123.7	4.3	3.7	1.3	131.40
.09	1.39	3.90	1.81	.030	.030	.030	.000	129.70	29.19
.001670	143.	143.	143.	2	0	0	.00	54.64	83.82

ECNO 2319.000

2319.000	3.53	133.33	.00	.00	133.58	.25	.15	.01	131.50
494.0	13.3	467.6	13.1	7.2	113.5	6.9	3.9	1.4	131.40
.09	1.85	4.12	1.91	.030	.030	.030	.000	129.80	29.87
.001636	88.	88.	88.	2	0	0	.00	53.25	83.12

ECNO 2369.000

02 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .52

2369.000	3.32	133.19	.00	.00	133.85	.66	.14	.12	135.87
494.0	.0	494.0	.0	.0	75.7	.0	4.1	1.4	135.87
.10	.00	6.53	.00	.000	.030	.000	.000	129.87	36.16
.006124	50.	50.	50.	2	0	0	.00	33.59	69.75

ECNO 2419.000

02 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.52

2419.000	3.82	133.76	.00	.00	134.07	.32	.19	.03	135.44
494.0	.0	494.0	.0	.0	109.3	.0	4.2	1.5	135.44
.10	.00	4.52	.00	.000	.030	.000	.000	129.94	32.35
.002637	50.	50.	50.	3	0	0	.00	45.30	77.65

ECNO 2519.000

2519.000	3.93	134.01	.00	.00	134.33	.32	.26	.00	136.08
494.0	.0	494.0	.0	.0	109.1	.0	4.4	1.6	136.08
.11	.00	4.53	.00	.000	.030	.000	.000	130.08	33.26
.002521	100.	100.	100.	2	0	0	.00	43.47	76.74

ECNO 2619.000

2619.000	4.06	134.28	.00	.00	134.57	.29	.24	.00	136.22
494.0	.0	494.0	.0	.0	114.3	.0	4.7	1.7	136.22
.11	.00	4.32	.00	.000	-.030	.000	.000	130.22	32.80
.002226	100.	100.	100.	0	0	0	.00	44.41	77.20

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	QLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	UOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA	
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST	
SECNO 2719.000										
2719.000	4.16	134.52	.00	.00	134.78	.27	.21	.00	136.36	
494.0	.0	494.0	.0	.0	119.0	.0	4.9	1.8	136.36	
.12	.00	4.15	.00	.000	.030	.000	.000	130.36	32.37	
.001992	100.	100.	100.	0	0	0	.00	45.26	77.63	

THIS RUN EXECUTED 19AUG91 7:27:58

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 EC-2 WATER SURFACE PROFILES  
 version 4.6.0; February 1991  
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TE- ASTERISK (\*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

LISTING CHANNEL PROFILE

Summary PRINTOUT TABLE 150

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	EG	10*KS	VCH	AREA	.01K
1000.000	.00	.00	.00	126.90	494.00	131.30	.00	131.58	19.30	4.28	115.44	112.46
1036.000	36.00	.00	.00	127.08	494.00	131.34	.00	131.60	2.21	4.15	119.16	332.18
1396.000	360.00	136.00	133.44	127.44	494.00	131.67	.00	131.94	4.60	4.17	118.50	230.39
1401.000	5.00	.00	.00	127.45	494.00	131.88	.00	131.95	1.42	2.11	234.26	413.88
1406.000	5.00	.00	.00	127.50	494.00	131.88	.00	131.95	1.14	2.13	238.32	461.79
1440.000	48.00	.00	.00	128.00	494.00	131.83	.00	131.99	11.29	3.18	155.45	147.05
1475.000	35.00	.00	.00	128.10	494.00	131.80	.00	132.07	16.28	4.70	129.25	122.44
1659.000	184.00	.00	.00	127.80	494.00	132.14	.00	132.34	13.28	3.59	138.60	135.58
1764.000	105.00	.00	.00	128.00	494.00	132.28	.00	132.50	14.75	3.78	132.71	128.64
1874.000	110.00	.00	.00	128.60	494.00	132.43	.00	132.70	21.11	4.17	119.52	107.52
1982.000	108.00	.00	.00	128.80	494.00	132.65	.00	132.93	19.91	4.27	118.21	110.71
2094.000	112.00	.00	.00	129.30	494.00	132.87	.00	133.16	20.91	4.36	117.98	108.04
2237.000	143.00	.00	.00	129.70	494.00	133.20	.00	133.43	16.70	3.90	130.37	120.89
2319.000	88.00	.00	.00	129.80	494.00	133.33	.00	133.58	16.36	4.12	127.55	122.13
2369.000	50.00	.00	.00	129.87	494.00	133.19	.00	133.85	61.24	6.53	75.71	63.13
2419.000	50.00	.00	.00	129.94	494.00	133.76	.00	134.07	26.37	4.52	109.31	96.20
2519.000	100.00	.00	.00	130.08	494.00	134.01	.00	134.33	25.21	4.53	109.13	98.38

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRIWS	EG	10*KS	UCH	AREA	.01K
2619.000	100.00	.00	.00	130.22	494.00	134.28	.00	134.57	22.26	4.32	114.25	104.70
2719.000	100.00	.00	.00	130.36	494.00	134.52	.00	134.78	19.92	4.15	119.04	110.69

## LISTING CHANNEL PROFILE

## SUMMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
1000.000	494.00	131.30	.00	.00	.00	40.47	.00
1036.000	494.00	131.34	.00	.04	.00	28.00	36.00
1396.000	494.00	131.67	.00	.33	.00	28.00	360.00
1401.000	494.00	131.88	.00	.21	.00	61.79	5.00
1406.000	494.00	131.88	.00	.00	.00	56.22	5.00
1440.000	494.00	131.83	.00	-.05	.00	58.06	48.00
1475.000	494.00	131.80	.00	-.03	.00	53.45	35.00
1659.000	494.00	132.14	.00	.34	.00	51.85	184.00
1764.000	494.00	132.28	.00	.13	.00	51.78	105.00
1874.000	494.00	132.43	.00	.16	.00	50.48	110.00
1982.000	494.00	132.65	.00	.21	.00	49.16	108.00
2094.000	494.00	132.87	.00	.22	.00	51.89	112.00
2237.000	494.00	133.20	.00	.33	.00	54.64	143.00
2319.000	494.00	133.33	.00	.13	.00	53.25	88.00
2369.000	494.00	133.19	.00	-.14	.00	33.59	50.00
2419.000	494.00	133.76	.00	.57	.00	45.30	50.00
2519.000	494.00	134.01	.00	.26	.00	43.47	100.00
2619.000	494.00	134.28	.00	.27	.00	44.41	100.00
2719.000	494.00	134.52	.00	.24	.00	45.26	100.00

SUMMARY OF ERRORS AND SPECIAL NOTES

RNING SECNO= 1036.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE  
RNING SECNO= 1396.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE  
RNING SECNO= 1401.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE  
RNING SECNO= 1440.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE  
RNING SECNO= 2369.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE  
RNING SECNO= 2419.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

ormal program termination

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HEC-2 WATER SURFACE PROFILES *
*
Version 4.6.0; February 1991 / *
*
RUN DATE 19AUG91 TIME 7:16:29 *
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* U.S. ARMY CORPS OF ENGINEERS *
* HYDROLOGIC ENGINEERING CENTER *
* 609 SECOND STREET, SUITE D *
* DAVIS, CALIFORNIA 95616-4687 *
* (916) 756-1104 *
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: FULL MICRO-COMPUTER IMPLEMENTATION :
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HAESTAD METHODS
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37 Brookside Road \* Waterbury, Connecticut 06708 \* (203) 755-1666

# EXHIBIT B

THIS RUN EXECUTED 19AUG91 7:16:30

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HEC-2 WATER SURFACE PROFILES

Version 4.6.0; February 1991  
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T1 CHANNEL ANALYSIS FOR DUGAN TRIBUTARY FROM RIDGE RCBC TO NORTH OF  
T2 PROPOSED BOX LOCATION AT TAFT AVENUE WITH NEW BOX CROSSING TAFT STREET  
T3 PROFILE W/ NEW TAFT BOX

J1	ICHECK	INQ	NINQ	IDIR	STRT	METRIC	HVINS	Q	WSEL	FQ
	0	2	0	0	0	0	0	0	131.30	0
J2	NPROF	IPL0T	PRFVS	XSECU	XSECH	FN	ALLDC	IBW	CHNIM	ITRACE
	-1	0	-1	0	0	0	0	0	0	0

T3 VARIABLE CODES FOR SUMMARY PRINTOUT

	150	0	0	0	0	0	0	0	0	0
NC	0.03	0.03	0.03	0.1	0.3					
BT	1	494								
K1	1000	6	30	75	0.	0	0	0	0	0
SR	136.5	15	132	30	126.9	50	126.9	62	132	75
SR	136.5	91								
NC				.03	0.5					
NH	3	0.03	41	0.014	69	.03	120			
K1	1036	6	41	69	36	36	36			
K3	10							135.6	135.6	
SR	133.8	0	133.8	14	127.08	41	127.08	69	133.8	96
SR	133.8	120								
NH	3	0.03	41	0.02	69	0.03	120			
SC	3.013	0.4	3	0	6	9	360	8.1	127.44	127.08
K1	1396	6	41	69	360	360	360			
K2			2	133.44	136.0					
K3	10							135.6	135.6	
SR	133.8	0	133.8	14	127.44	41	127.44	69	133.8	96
SR	133.8	120								
NC	0.03	0.03	0.02							
K1	1401	5	24.5	94	5	5	5			
SR	133.8	14	133.8	24.5	127.45	38.8	127.45	82.8	133.8	94

NC	0.03	0.03	0.02							
X1	1406	11	38	90.6	5	5	5			
GR	137	2.1	136	8.9	135	15.3	134	22.2	133	35.9
GR	127.5	38	127.5	90.6	132	92.6	133	94	134	98.5
GR	135	102.7								
NC	0.03	0.03	0.03	0.1	0.3					
X1	1440	18	15.6	98.6	21	34	48			
GR	137	0	136	3.6	135	9.2	134	15.6	133	21
GR	132	27.5	131	30	130	33.9	129	37.5	128	48.7
GR	128	66.4	129	71.2	130	76	131	81	132	87
GR	133	93	134	98.6	135	104.5				
X1	1475	4	45.2	63.3	35	35	35			
GR	136.8	10.9	128.3	45.2	128.1	63.3	135.8	107.4		
X1	1659	6	29.5	77.5	184	184	184			
GR	136.2	14.5	132	29.5	128.2	46.6	127.8	60.2	131.2	77.5
GR	136	94.5								
X1	1764	6	31.7	77.6	105	105	105			
GR	136.2	16.5	131.7	31.7	128	52.4	128.5	64.1	131.2	77.6
GR	135.9	94.8								
X1	1874	6	30.1	77.3	110	110	110			
GR	136.5	15.7	132.5	30.1	128.6	50.7	128.6	61.6	131.5	77.3
GR	135.8	94.2								
X1	1982	6	33.4	75.6	108	108	108			
GR	136.7	16.1	131.8	33.4	128.8	52.5	128.9	61.7	131.4	75.6
GR	137	93.4								
X1	2101	6	34.2	74.9	119	119	119			
GR	137.1	15.2	131.7	34.2	129.6	50.2	129.3	61.6	131.2	74.9
GR	135.1	91.3								
X1	2125	6	34.2	74.9	24	24	24			
GR	137.1	15.2	131.7	34.2	129.45	50.2	129.45	61.6	131.2	74.9
GR	135.1	91.3								
NC				0.3	0.5					
NH	3	0.03	41	0.014	69	0.03	93			
X1	2149	4	41	69	24	24	24			
X3	10							133.3	133.3	
GR	135.3	17	129.3	41	129.3	69	135.3	93		
NH	3	0.03	41	0.02	69	0.03	93			
SC	3.013	0.4	3	0	4	9	70	8.1	129.50	129.30
X1	2219	4	41	69	70	70	70			
X2			2	133.5	133.5					
X3	10							133.5	133.5	
GR	135.5	17	129.5	41	129.5	69	135.5	93		



SECNO	DEPTH	CWSEL	CRIS	WSELK	EG	HU	HL	OLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	UROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA	
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST	

\*PROF 1

CCHU= .100 CEHU= .300  
 \*SECNO 1000.000

1000.000	4.40	131.30	.00	131.30	131.58	.28	.00	.00	132.00
494.0	.0	494.0	.0	.0	115.4	.0	.0	.0	132.00
.00	.00	4.28	.00	.000	.030	.000	.000	126.90	32.75
.001930	0.	0.	0.	0	0	0	.00	40.47	73.22

CCHU= .030 CEHU= .500  
 1490 NH CARD USED  
 \*SECNO 1036.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.95

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 135.60 ELREA= 135.60

1036.000	4.26	131.34	.00	.00	131.60	.27	.02	.00	127.08
494.0	.0	494.0	.0	.0	119.2	.0	.1	.0	127.08
.00	.00	4.15	.00	.000	.014	.000	.000	127.08	41.00
.000221	36.	36.	36.	2	0	0	.00	28.00	69.00

1490 NH CARD USED

SPECIAL CULVERT

SC	CUNO	CUNV	ENTLC	COFB	RDLEN	RISE	SPAN	CULVLN	CHRT	SCL	ELCHU	ELCHD
	3	.013	.40	3.00	.00	6.00	9.00	360.00	8	1	127.44	127.08

CHART 8 - BOX CULVERT WITH FLARED WINGWALLS; NO INLET TOP EDGE BEVEL  
 SCALE 1 - WINGWALLS FLARED 30 TO 75 DEGREES

\*SECNO 1396.000

SPECIAL CULVERT OUTLET CONTROL

GIC = 130.905 EGOE = 131.941 PCWSE= 131.336 ELTRD= 136.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .69

SECNO Q TIME SLOPE	DEPTH GLOB ULOB XLOBL	CWSEL QCH UCH XLCH	CRIS QROB UROB XLOBR	WSELK ALOB XNL ITRIAL	EG ACH XNCH IDC	HV AROB XNR ICONT	HL VOL WTN CORAR	LOSS TWA ELMIN TOPWID	L-BANK R-BANK SSTA ENDST	ELEV
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SPECIAL CULVERT

EGIC	EGOC	H4	QWEIR	QCULV	UCH	ACULV	ELTRD	WEIRLN
130.90	131.94	.34	0.	494.	4.169	162.0	136.00	0.

3495 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 135.60 ELREA= 135.60

1396.000	4.23	131.67	.00	.00	131.94	.27	.34	.00	127.44
494.0	.0	494.0	.0	.0	118.5	.0	1.1	.3	127.44
.03	.00	4.17	.00	.000	.020	.000	.000	127.44	41.00
.000460	360.	360.	360.	2	0	0	.00	28.00	69.00

\*SECNO 1401.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.80

1401.000	4.43	131.88	.00	.00	131.95	.07	.00	.01	133.80
494.0	.0	494.0	.0	.0	234.3	.0	1.1	.3	133.80
.03	.00	2.11	.00	.000	.020	.000	.000	127.45	28.83
.000142	5.	5.	5.	2	0	0	.00	61.79	90.61

\*SECNO 1406.000

1406.000	4.38	131.88	.00	.00	131.95	.07	.00	.00	127.50
494.0	1.6	490.3	2.1	3.7	230.4	4.3	1.1	.3	127.50
.03	.45	2.13	.49	.030	.020	.030	.000	127.50	36.33
.000114	5.	5.	5.	0	0	0	.00	56.22	92.55

CHU= .100 CEHU= .300  
\*SECNO 1440.000

3302 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .32

1440.000	3.83	131.83	.00	.00	131.99	.16	.01	.03	134.00
494.0	.0	494.0	.0	.0	155.4	.0	1.3	.3	134.00
.03	.00	3.18	.00	.000	.030	.000	.000	128.00	27.92
.001129	21.	48.	34.	2	0	0	.00	58.06	85.98

SECNO Q TIME SLOPE	DEPTH QLOB VLOB XLOBL	CWSEL QCH UCH XLCH	CRIWS QROB UROB XLOBR	WSELK ALOB XNL ITRIAL	EG ACH XNCH IDC	HV AROB XNR ICONT	HL VOL WTN CORAR	OLOSS TWA ELMIN TOPWID	L-BANK ELEV R-BANK ELEV SSTA ENDST
SECNO 1475.000									
1475.000	3.70	131.80	.00	.00	132.07	.26	.05	.03	128.30
494.0	70.5	306.3	117.2	24.8	65.2	39.3	1.5	.4	128.10
.03	2.85	4.70	2.98	.030	.030	.030	.000	128.10	31.06
.001628	35.	35.	35.	2	0	0	.00	53.45	84.51
SECNO 1659.000									
1659.000	4.34	132.14	.00	.00	132.34	.20	.27	.01	132.00
494.0	.0	492.3	1.7	.0	137.0	1.6	2.0	.6	131.20
.05	.02	3.59	1.07	.030	.030	.030	.000	127.80	28.99
.001328	184.	184.	184.	2	0	0	.00	51.85	80.84
SECNO 1764.000									
1764.000	4.28	132.28	.00	.00	132.50	.22	.15	.01	131.70
494.0	.5	491.0	2.6	.6	130.0	2.1	2.3	.7	131.20
.06	.81	3.78	1.23	.030	.030	.030	.000	128.00	29.76
.001475	105.	105.	105.	2	0	0	.00	51.78	81.54
SECNO 1874.000									
1874.000	3.83	132.43	.00	.00	132.70	.27	.19	.01	132.50
494.0	.0	491.7	2.3	.0	117.8	1.7	2.7	.9	131.50
.06	.00	4.17	1.34	.000	.030	.030	.000	128.60	30.47
.002111	110.	110.	110.	0	0	0	.00	50.48	80.95
SECNO 1982.000									
1982.000	3.85	132.65	.00	.00	132.93	.28	.22	.00	131.80
494.0	1.5	488.6	3.9	1.3	114.5	2.5	3.0	1.0	131.40
.07	1.21	4.27	1.56	.030	.030	.030	.000	128.80	30.41
.001991	108.	108.	108.	2	0	0	.00	49.16	79.56
SECNO 2101.000									
2101.000	3.58	132.88	.00	.00	133.17	.28	.24	.00	131.70
494.0	3.9	478.3	11.8	2.5	110.2	6.0	3.3	1.1	131.20
.08	1.55	4.34	1.97	.030	.030	.030	.000	129.30	30.01
.002052	119.	119.	119.	0	0	0	.00	52.00	82.01

SECNO	DEPTH	CWSEL	CRIWS	WSELK	EG	HV	HL	OLOSS	L-BANK	ELEV
Q	QLOB	QCH	QROB	ALOB	ACH	AROB	VOL	TWA	R-BANK	ELEV
TIME	VLOB	VCH	VROB	XNL	XNCH	XNR	WTN	ELMIN	SSTA	
SLOPE	XLOBL	XLCH	XLOBR	ITRIAL	IDC	ICONT	CORAR	TOPWID	ENDST	

SECNO 2125.000  
 2125.000 3.49 132.94 .00 .00 133.22 .27 .05 .00 131.70  
 494.0 4.1 477.5 12.3 2.7 112.3 6.4 3.4 1.1 131.20  
 .08 1.54 4.25 1.94 .030 .030 .000 129.45 29.84  
 .001919 24. 24. 24. 1 0 0 .00 52.37 82.21

HV= .300 CEHV= .500  
 190 NH CARD USED  
 SECNO 2149.000

02 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 2.24

95 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 133.30 ELREA= 133.30

2149.000 3.61 132.91 .00 .00 133.28 .37 .02 .05 129.30  
 494.0 .0 494.0 .0 .0 101.2 .0 3.4 1.2 129.30  
 .08 .00 4.88 .00 .000 .014 .000 .000 129.30 41.00  
 .000381 24. 24. 24. 2 0 0 .00 28.00 69.00

90 NH CARD USED

ECTIAL CULVERT

CUND	CUNV	ENTLC	COFQ	RDLEN	RISE	SPAN	CULVLN	CHRT	SCL	ELCHU	ELCHD
3	.013	.40	3.00	.00	4.00	9.00	70.00	8	1	129.50	129.30

RT 8 - BOX CULVERT WITH FLARED WINGWALLS; NO INLET TOP EDGE BEVEL  
 LE 1 - WINGWALLS FLARED 30 TO 75 DEGREES

SECNO 2219.000  
 ECTIAL CULVERT

EGIC	EGOC	H4	QWEIR	QCULV	VCH	ACULV	ELTRD	WEIRLN
133.01	133.55	.26	0.	491.	4.790	108.0	133.50	0.

5 OVERBANK AREA ASSUMED NON-EFFECTIVE, ELLEA= 133.50 ELREA= 133.50

219.000 3.68 133.18 .00 .00 133.54 .36 .26 .00 129.50  
 494.0 .0 494.0 .0 .0 103.1 .0 3.6 1.2 129.50  
 .09 .00 4.79 .00 .000 .020 .000 .000 129.50 41.00  
 .000730 70. 70. 70. 5 0 0 .00 28.00 69.00

SECNO Q TIME SLOPE	DEPTH GLOB VLOB XLOBL	CWSEL QCH VCH XLCH	CRIS QROB UROB XLOBR	WSELK ALOB XNL ITRIAL	EG ACH XNCH IDC	HV AROB XNR ICONT	HL VOL WTN CORAR	OLOSS TWA ELMIN TOPWID	L-BANK R-BANK SSTA ENDST	ELEV ELEV
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CNO 2231.000  
 2231.000 3.70 133.40 .00 .00 133.60 .20 .01 .05 132.00  
 494.0 4.3 480.5 9.2 3.1 133.3 5.4 3.6 1.2 131.40  
 .09 1.36 3.60 1.71 .030 .030 .030 .000 129.70 28.52  
 .001289 12. 12. 12. 2 0 0 .00 55.86 84.38

IV= .100 CEHV= .300  
 CNO 2319.000  
 2319.000 3.70 133.50 .00 .00 133.72 .22 .12 .01 131.50  
 494.0 15.1 464.1 14.8 8.5 119.7 8.1 3.9 1.3 131.40  
 .09 1.78 3.88 1.83 .030 .030 .030 .000 129.80 29.18  
 .001349 88. 88. 88. 0 0 0 .00 54.55 83.72

CNO 2369.000  
 2 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = .53  
 2369.000 3.51 133.38 .00 .00 133.94 .56 .12 .10 135.87  
 494.0 .0 494.0 .0 .0 82.3 .0 4.0 1.4 135.87  
 .10 .00 6.00 .00 .000 .030 .000 .000 129.87 35.36  
 .004871 50. 50. 50. 2 0 0 .00 34.84 70.20

CNO 2419.000  
 2 WARNING: CONVEYANCE CHANGE OUTSIDE OF ACCEPTABLE RANGE, KRATIO = 1.43  
 2419.000 3.90 133.84 .00 .00 134.13 .29 .17 .03 135.44  
 494.0 .0 494.0 .0 .0 113.4 .0 4.1 1.4 135.44  
 .10 .00 4.36 .00 .000 .030 .000 .000 129.94 31.96  
 .002387 50. 50. 50. 2 0 0 .00 46.08 78.04

CNO 2519.000  
 2519.000 3.99 134.07 .00 .00 134.37 .31 .24 .00 136.08  
 494.0 .0 494.0 .0 .0 111.3 .0 4.4 1.5 136.08  
 .10 .00 4.44 .00 .000 .030 .000 .000 130.08 33.06  
 .002388 100. 100. 100. 2 0 0 .00 43.88 76.94

SECNO Q TIME SLOPE	DEPTH GLOB VLOB XLOBL	CWSEL QCH VCH XLCH	CRIS QROB UROB XLOBR	WSELK ALOB XNL ITRIAL	EG ACH XNCH IDC	HV AROB XNR ICONT	HL VOL WTN CORAR	OLOSS TWA ELMIN TOPWID	L-BANK R-BANK SSTA ENDST	ELEV ELEV
CNO 2619.000										
519.000	4.10	134.32	.00	.00	134.60	.28	.23	.00	136.22	
494.0	.0	494.0	.0	.0	116.2	.0	4.6	1.6	136.22	
.11	.00	4.25	.00	.000	.030	.000	.000	130.22	32.63	
.002129	100.	100.	100.	1	0	0	.00	44.75	77.37	
CNO 2719.000										
19.000	4.18	134.54	.00	.00	134.81	.26	.20	.00	136.36	
494.0	.0	494.0	.0	.0	120.4	.0	4.9	1.7	136.36	
.12	.00	4.10	.00	.000	.030	.000	.000	130.36	32.25	
.001933	100.	100.	100.	0	0	0	.00	45.49	77.75	

THIS RUN EXECUTED 19AUG91 7:16:35

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 C-2 WATER SURFACE PROFILES  
 Version 4.6.0; February 1991  
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E- ASTERISK (\*) AT LEFT OF CROSS-SECTION NUMBER INDICATES MESSAGE IN SUMMARY OF ERRORS LIST

FILE W/ NEW TAFT BOX  
 MARY PRINTOUT TABLE 150

SECHD	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	EG	10*KS	VCH	AREA	.01K
1000.000	.00	.00	.00	126.90	494.00	131.30	.00	131.58	19.30	4.28	115.44	112.46
1036.000	36.00	.00	.00	127.08	494.00	131.34	.00	131.60	2.21	4.15	119.16	332.18
1396.000	360.00	136.00	133.44	127.44	494.00	131.67	.00	131.94	4.60	4.17	118.50	230.39
1401.000	5.00	.00	.00	127.45	494.00	131.88	.00	131.95	1.42	2.11	234.26	413.88
1406.000	5.00	.00	.00	127.50	494.00	131.88	.00	131.95	1.14	2.13	238.32	461.79
1440.000	48.00	.00	.00	128.00	494.00	131.83	.00	131.99	11.29	3.18	155.45	147.05
1475.000	35.00	.00	.00	128.10	494.00	131.80	.00	132.07	16.28	4.70	129.25	122.44
1659.000	184.00	.00	.00	127.80	494.00	132.14	.00	132.34	13.28	3.59	138.60	135.58
1764.000	105.00	.00	.00	128.00	494.00	132.28	.00	132.50	14.75	3.78	132.71	128.64
1874.000	110.00	.00	.00	128.50	494.00	132.43	.00	132.70	21.11	4.17	119.52	107.52
1982.000	108.00	.00	.00	128.80	494.00	132.65	.00	132.93	19.91	4.27	118.21	110.71
2101.000	119.00	.00	.00	129.30	494.00	132.88	.00	133.17	20.52	4.34	118.73	109.06
2125.000	24.00	.00	.00	129.45	494.00	132.94	.00	133.22	19.19	4.25	121.39	112.77
2149.000	24.00	.00	.00	129.30	494.00	132.91	.00	133.28	3.81	4.88	101.20	252.97
2219.000	70.00	133.50	133.50	129.50	494.00	133.18	.00	133.54	7.30	4.79	103.14	182.78
2231.000	12.00	.00	.00	129.70	494.00	133.40	.00	133.60	12.89	3.60	141.86	137.58
2319.000	88.00	.00	.00	129.80	494.00	133.50	.00	133.72	13.49	3.88	136.29	134.48

SECNO	XLCH	ELTRD	ELLC	ELMIN	Q	CWSEL	CRWS	EG	10*KS	VCH	AREA	.01K
2369.000	50.00	.00	.00	129.87	494.00	133.38	.00	133.94	48.71	6.00	82.30	70.78
2419.000	50.00	.00	.00	129.94	494.00	133.84	.00	134.13	23.87	4.36	113.40	101.10
2519.000	100.00	.00	.00	130.08	494.00	134.07	.00	134.37	23.88	4.44	111.34	101.10
2619.000	100.00	.00	.00	130.22	494.00	134.32	.00	134.60	21.29	4.25	116.16	107.08
2719.000	100.00	.00	.00	130.36	494.00	134.54	.00	134.81	19.33	4.10	120.36	112.35

ROFILE W/ NEW TAFT BOX

MMARY PRINTOUT TABLE 150

SECNO	Q	CWSEL	DIFWSP	DIFWSX	DIFKWS	TOPWID	XLCH
1000.000	494.00	131.30	.00	.00	.00	40.47	.00
1036.000	494.00	131.34	.00	.04	.00	28.00	36.00
1396.000	494.00	131.67	.00	.33	.00	28.00	360.00
1401.000	494.00	131.88	.00	.21	.00	61.79	5.00
1406.000	494.00	131.88	.00	.00	.00	56.22	5.00
1440.000	494.00	131.83	.00	-.05	.00	58.06	48.00
1475.000	494.00	131.80	.00	-.03	.00	53.45	35.00
1659.000	494.00	132.14	.00	.34	.00	51.85	184.00
1764.000	494.00	132.28	.00	.13	.00	51.78	105.00
1874.000	494.00	132.43	.00	.16	.00	50.48	110.00
1982.000	494.00	132.65	.00	.21	.00	49.16	108.00
2101.000	494.00	132.88	.00	.24	.00	52.00	119.00
2125.000	494.00	132.94	.00	.06	.00	52.37	24.00
2149.000	494.00	132.91	.00	-.03	.00	28.00	24.00
2219.000	494.00	133.18	.00	.27	.00	28.00	70.00
2231.000	494.00	133.40	.00	.22	.00	55.86	12.00
2319.000	494.00	133.50	.00	.10	.00	54.55	88.00
2369.000	494.00	133.38	.00	-.12	.00	34.84	50.00
2419.000	494.00	133.84	.00	.46	.00	46.08	50.00
2519.000	494.00	134.07	.00	.23	.00	43.88	100.00
2619.000	494.00	134.32	.00	.25	.00	44.75	100.00
2719.000	494.00	134.54	.00	.22	.00	45.49	100.00

SUMMARY OF ERRORS AND SPECIAL NOTES

WARNING SECNO= 1036.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE  
WARNING SECNO= 1396.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE  
WARNING SECNO= 1401.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE  
WARNING SECNO= 1440.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE  
WARNING SECNO= 2149.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE  
WARNING SECNO= 2369.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE  
WARNING SECNO= 2419.000 PROFILE= 1 CONVEYANCE CHANGE OUTSIDE ACCEPTABLE RANGE

Normal program termination