ANALYSIS OF OCTOBER 1986 FLOOD IN CANEY RIVER AT U. S. 75

APPENDICES A THROUGH K
VOLUME II

by

A. K. TYAGI
PRINCIPAL INVESTIGATOR

Report No. 88-3
Water Resources Engineering
School of Civil Engineering

Oklahoma State University
Stillwater, Oklahoma 74078
September, 1988

ANALYSIS OF OCTOBER 1986 FLOOD IN CANEY RIVER AT U.S. 75 BARTLESVILLE, OKLAHOMA

APPENDICES A THROUGH K

Volume II

Submitted to

Oklahoma Department of Transportation

Oklahoma City, Oklahoma 73105

and

Federal Highway Administration

Oklahoma City, Oklahoma 73102

by

A. K. Tyagi, Ph.D., P.E.

Principal Investigator

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Peak Discharges on the Caney River near

Ochelata and Ramona, Oklahoma

TECHNICAL REPORT STANDARD TITLE PAGE

1. REPORT NO.	2. GOVERNMENT ACCESSION NO.	3. RECIPIENT'S CATALOG NO.
FHWA/OK 89(04) Vol. II		

4. TITLE AND SUBTITLE	5. REPORT DATE
Analysis of October 1986 Flood in Caney River at U.S. 75, Bartlesville, Oklahoma	September, 1988
	6. PERFORMING ORGANIZATION CODE
7. AUTHOR(S)	8. PERFORMING ORGANIZATION REPORT
A. K. Tyagi	88-3
	10. WORK UNIT NO.
9. PERFORMING ORGANIZATION AND ADDRESS	11. CONTRACT OR GRANT NO.
School of Civil Engineering Oklahoma State University Stillwater, OK 74078	2150
	13. TYPE OF REPORT AND PERIOD COVERED
12. SPONSORING AGENCY NAME AND ADDRESS	Interim Report: May 1987 - September 1988
Oklahoma Department of Transportation Research and Development Division 200 NE 21st Street Oklahoma City, OK 73105	14. SPONSORING AGENCY CODE Item 2150

15. SUPPLEMENTARY NOTES

Conducted in cooperation with the U.S. Department of Transportation, Federal Highway Administration

16. ABSTRACT

Hurricane Paine, extending across the Central Plains of the United States, caused flooding of unprecedented proportions in the Caney River. This storm produced a rainfall varying from 20 to 30 inches in Oklahoma during September 29 through October 4, 1986.

Because of the severity of this extreme event, local residents questioned the adequacy of the bridges on the Caney River at U.S. 75. As a result, the Oklahoma Department of Transportation (ODOT) initiated this research investigation as an objective study of the hydraulic capacity of the bridges to convey floodwaters and the policies and procedures used in the design. This report presents hydrologic data, flood analysis, water surface profiles for 50-, 100-year, and the 1986 Flood due to the old bridge and new bridge, and hydraulic damage analysis.

Computer analysis indicates that the construction of the new bridge causes backwater effect in the range of 1 to 2 feet and maximum velocity between 6 to 8 feet per second for 50- and 100- year floods. The computer analysis further indicates that construction of the new bridge has resulted in lowering the water surface elevation by 2 to 3 feet when compared to the old bridge without Hulah and Copan Lakes, a condition that existed in 1930 at the time of construction of the old bridge. In addition, a review of policies and procedures of ODOT and the new bridge design on U.S. 75 on the Caney River shows that the design is within the guidelines. A second report, Volume I, containing hydrologic and computer analyses accompanies this report.

17. KEY WORDS	18. DISTRIBUTION STATEMENT
WSPRO Model, backwater effect, bridge Flood Plain, discharges	No restrictions

19. SECURITY CLASSIF. (OF THIS REPORT)	20. SECURITY CLASSIF. (OF THIS PAGE)	21. NO. OF PAGES	22. PRICE
None	None	136	

ARKANSAS RIVER BASIN

07175500 CANEY RIVER NEAR RAMONA, OKLA.

LOCATION.--Lat 36°30'31", long 95°50'36", in NE 1/4 NW 1/4 sec.5, T.23 N., R.14 E., Washington County, near left bank on downstream side of pier of county road bridge, 1 mile upstream from Buck Creek, 2.2 miles downstream from Double Creek, 4.5 miles southeast of Ramona, and at mile 32.0.

GAGE.--Water-stage recorder. Datum of gage is 586.43 ft above mean sea level. Prior to Feb. 28, 1939, nonrecording gage at site 16.2 miles downstream at datum 21.41 ft lower. Prior to Feb. 15, 1946, nonrecording gage at present site and datum.

HISTORICAL DATA.--Data for peaks prior to 1935 and for 1943 and 1945 are from files of the Corps of Engineers.

REMARKS.--Some regulation since February 1950 by Hulah Lake 64.2 miles upstream (capacity, 295,100 acre-ft). Only annual peaks are shown prior to 1937. Records since 1948 furnished by Corps of Engineers and reviewed by Geological Survey. Base for partial-duration series, 7,500 cfs.

BASIN CHARACTERISTICS

Drainage Area (sq mi)		
Total	=	1,955
Noncontributing	=	0
Contributing	=	1,955
Channel slope (ft/mi)	=	***
Annual precip. (in)	=	***
Bankful stage (ft)	=	28

LOG-PEARSON TYPE III FLOOD-FREQUENCY DATA (CFS)

Q_2	=	***
Q_5	=	***
Q_{10}	=	***
Q_{25}	=	***
Q_{50}	=	***
Q_{100}	=	***

LOG-PEARSON TYPE III STATISTICS (LOG UNITS)

Mean	=	***
Standard deviation	=	***
Skew	=	***

Peak stages and discharges

Water year	Date	Gage height (feet)	Discharge (cfs)
1927	Oct.	39.0	-
1929	Apr. 24	33.4	-
1930	May 4,5	32.7	-
1931	Jul. 21	20.4	5,000
1932	Nov. 27	30.6	-
1935	Jun.	33.5	29,000
1936	Jun. 8	27.85	10,200
1937	Oct. 13	32.05	18,000
	Jun. 12	26.24	8,800
1938	Apr. 2	31.27	13,100
	May 25	30.0	11,400
	Jun. 14	26.06	8,250
1943	May 21	39.8	-
1945	Oct. 7	28.88	15,600
	Mar. 16	28.14	9,850
	Mar. 28	28.45	11,400
	Apr. 19	29.28	21,600
	Jul. 3	28.50	11,700
1946	Oct. 3	30.12	38,500
	Jan. 6	27.07	8,850
1947	Apr. 18	29.06	17,600
	Apr. 27	26.41	8,390
	May 20	27.82	9,410
1948	Apr. 27	26.02	8,150
	May 13	24.90	7,520
	Jun. 26	29.30	19,900
	Jul. 13	26.65	8,520
	Jul. 21	28.94	14,800
	Aug. 17	28.44	11,300
1949	Jan. 27	27.79	9,740
	Feb. 16	26.50	8,690
	May 22	28.00	10,100
1950	May 11	27.80	9,300
	Jun. 6	27.37	10,100
	Jul. 23	29.42	21,800
	Aug. 4	29.10	16,700
	Aug. 20	26.85	8,870
1951	Jul. 5	29.02	15,700
1952	Nov. 12	26.13	8,810
	Mar. 11	24.00	7,610
1953	May 12	22.28	7,050
1954	May 3	26.69	9,340
1955	May 29	25.50	8,650
1956	Oct. 8	11.54	2,570
1957	May 2	26.70	9,730
	May 18	29.20	14,600
	May 27	29.17	14,400
	Jun. 3	28.90	12,600
	Jun. 12	29.69	36,700
	Jun. 20	28.07	11,500
	Jun. 25	29.11	16,000
1958	Apr. 7	22.65	7,250
1959	May 19	25.12	8,500
	Jul. 18	29.16	13,300
	Jul. 24	29.76	22,300
1960	Oct. 6	29.46	16,200
	Oct. 14	25.77	8,850
	Oct. 25	23.26	7,600
	Apr. 15	24.52	8,200
	May 6	25.42	8,650
1961	Apr. 22	24.10	8,590
	May 10	29.52	23,400
	Jun. 3	24.54	8,790
	Jul. 15	26.25	9,640
	Aug. 14	28.46	12,000
	Sep. 5	28.13	11,000
	Sep. 15	29.32	15,500
1962	Nov. 3	26.21	9,540
	Nov. 16	25.17	8,940
	Nov. 22	25.17	8,940
	Sep. 16	26.62	9,780
1963	Jan. 5	13.55	3,710
1964	Apr. 5	25.40	9,140
	Aug. 29	23.05	7,870
1965	Apr. 6	28.62	13,800
	Apr. 15	23.62	9,130
	Sep. 21	23.54	9,060
1966	Jun. 12	17.79	5,820
1967	Jul. 26	24.74	9,880
1968	Mar. 20	27.90	12,600
	Apr. 4	21.84	8,040
1969	Mar. 25	26.56	11,300
	Apr. 18	21.60	7,930
	Jun. 2	24.31	9,600
	Jun. 9	22.82	8,630
	Jun. 15	21.88	8,100
	Jun. 27	29.51	15,900
1970	Oct. 13	27.70	11,700
	Apr. 2	21.64	7,950
	May 2	29.16	14,900
	Jun. 3	26.87	11,600
1971	Oct. 9	18.84	5,060

APPENDIX B

Data on Hulah and Copan Lakes

HULAH

Hulah Dam

BASIN—Arkansas River-Caney River

LOCATION OF DAM—On Caney River at mile 96.2, Lat. 36°55'44", Long. 96°05'18" in Sec. 2, T28N, R11E in Osage County about 2 miles west of the former town of Hulah and about 15 miles northwest of Bartlesville.

CONSTRUCTION STATUS—Constructed by Corps of Engineers—Construction was started in May 1946 and completed February 1951. Project was put into full flood control operation in September 1951. Total cost of the project was $11,120,000.

PURPOSE/AUTHORIZATION—Flood control, water supply, low flow regulation, and other conservation purposes. Authorized by the Flood Control Act approved June 22, 1936. Project Document HD 308, 74th Congress, 1st Session, Public Law 843, 84th Congress, 2nd Session, approved July 30, 1956.

COST OF WATER—Tentative cost of water is about 0.7 cents per 1,000 gallons for a dependable yield of 12.4 mgd based on use-of-facilities cost allocation using 1962 cost data.

STRUCTURE DATA—The dam is a rolled impervious earthfill structure with a total length of 5,200 feet and a maximum height of 94 feet above the streambed. The gate-controlled spillway has a total width of 472 feet and consists of ten 40 × 25 foot tainter gates. The spillway capacity is 266,200 cfs at maximum pool elevation.

HYDROLOGIC DATA—Contents records of gage 07172500 show that the lake ranged from maximum content of 293,400 acre-feet on June 23, 1957, to the minimum, since conservation pool first filled, of 11,250 acre-feet. Discharges immediately downstream of the dam were recorded by gage 07173000 whose 44-year record is from 1937 to 1981. Prior to regulation by Hulah Dam the average discharge for the 13-year period 1938 to 1950 was 51,000 cfs on April 10, 1944. Since regulation, the 31-year record between 1950 and 1981 shows an average discharge of 234,000 acre-feet. The maximum discharge for the entire period of record was 51,000 cfs on April 10, 1944. There has been no flow at times in 1939, 1940, 1946 and 1962. Peak flow into the reservoir was 70,100 cfs on March 10, 1974. Maximum volume of inflow occurred during the period of May 16 to June 26, 1957, and amounted to 351,400 acre-feet or 9.00 inches of runoff.

SHORELINE—62 miles

DRAINAGE AREA—732 square miles

SHORELINE DEVELOPMENT—7.4

VOLUME DEVELOPMENT—.61

DEPTH—Mean 9.64 ft., Max. 47.5 ft., (Top of Cons. Pool)

WATER QUALITY—Fair to good. "Oil field operations and waste discharges of industries and cities must be kept under close surveillance to prevent damage to water supplies." (AWR Report, Part II, Section 8, 1955.) Total dissolved solids 318 ppm, chlorides 40 ppm, and hardness 150 ppm. Fish samples analyzed from Hulah Lake in the toxics monitoring survey included composites of white bass, channel catfish, carp and river carpsucker. Residues of aldrin, heptachlor and toxaphene were not detected in any fish species analyzed. Chlordane, DDT and PCBs were detected at low levels in some species but all were well below the Concern Level. Hulah Reservoir does not appear to have a problem with toxic organic residues in fish.

MAJOR CONTRIBUTING STREAMS—Caney River, Hickory Creek.

PROJECT ACCOMPLISHMENTS—Estimated monetary benefits attributed to Hulah Lake operations for prevention of flood damages total $67,872,000 to September 30, 1983.

AREA ENVIRONMENT

AIR TEMPERATURE—Mean Annual, 58°; High +115°, Low −21° (1948–82); Average no. of days per year: 32° or below, 113; 90° or above, 64 (1948–82)

PREVAILING WINDS—10 to 12 mph southerly

AVERAGE RELATIVE HUMIDITY—Summer 55%, Winter 60%

PRECIPITATION—Mean Annual, 33 inches (1948–82); Maximum Yearly, 49 inches (1973); Minimum Yearly, 19 inches (1956)

AVERAGE ANNUAL LAKE EVAPORATION—53 inches (1946–55)

AVERAGE ANNUAL RUNOFF—7.0 inches (1970–79)

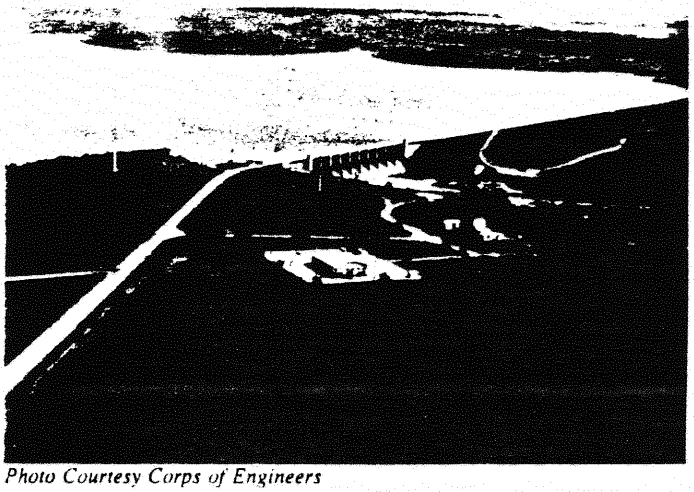


Photo Courtesy Corps of Engineers

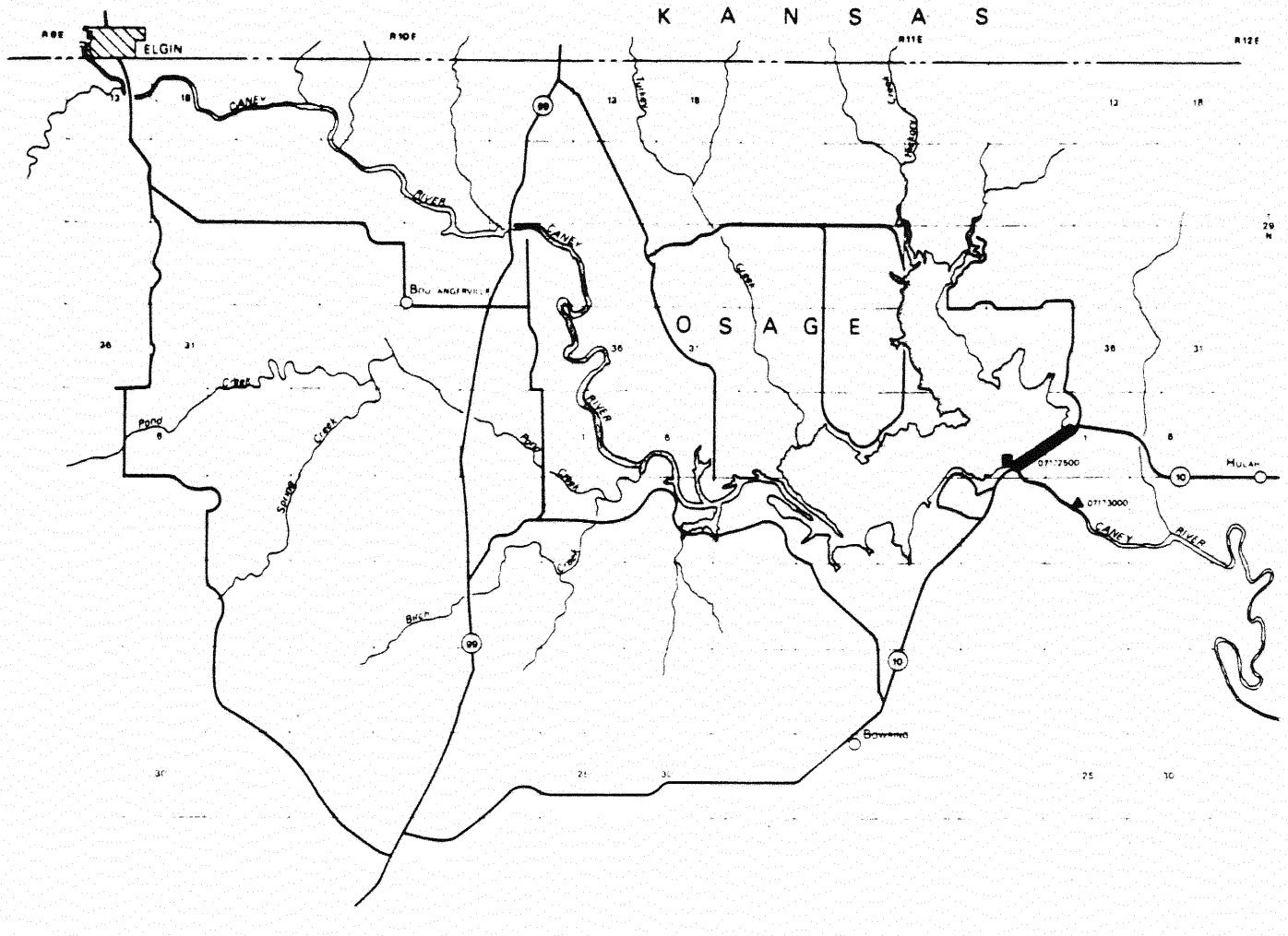
LAKE DATA

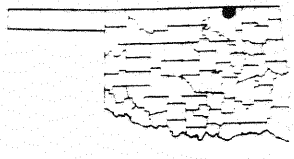
Feature	Elevation (NGVD)	Area (Acres)	Capacity (Acre-Feet)	Equivalent Runoff[1] (Inches)
Top of dam	779.5	–	–	–
Top of flood control pool	765.0	13,000	289,000	7.40
Crest of spillway	740.0	5,160	61,400	1.57
Top of conservation pool	733.0	3,570	31,100	0.80
Top of inactive pool	710.0	–	–	–
Conservation storage	710.0–733.0	–	31,100[2]	0.78
Flood control storage	733.0–765.0	–	257,900[3]	6.61

[1] From 732 square miles of drainage area above the site.

[2] Includes 19,800 acre-feet for water supply (12.4 mgd yield), 7,100 acre-feet (4.5 mgd yield) for water quality control, and 6,500 acre-feet for sediment reserve.

[3] Includes 5,000 acre-feet for sediment reserve.





Mapping—Oklahoma Water Resources Board

COPAN

Copan Dam

BASIN—Arkansas River-Caney River

LOCATION OF DAM—On Little Caney River at mile 7.4, a tributary of Caney River, Lat. 36°53'03" Long. 95°57'51" in Sec. 30, T28N, R13E in Washington County about 2 miles west of the town of Copan and about 9 miles north of Bartlesville.

CONSTRUCTION STATUS—Constructed by Corps of Engineers—Construction began in November 1972 and was placed in useful operation on April 1, 1983. Estimated cost of the project is $86,300,000.

PURPOSE/AUTHORIZATION—Flood control, water supply, water quality, fish and wildlife and recreation. Authorized by the Flood Control Act approved October 23, 1962. Project Document HD 563, 87th Congress, 2nd Session.

COST OF WATER—Tentative cost of water is about 32.5 cents per 1,000 gallons for a dependable yield of 3 mgd based on final cost allocation submitted in June 1981.

ASSURANCES—The Oklahoma Water Resources Board adopted a resolution for including water supply space on August 10, 1965. City of Copan adopted an assurance resolution for 1 mgd on March 10, 1964. Oklahoma Water Resources Board adopted an expanded assurance on May 11, 1971. On October 5, 1972, the Secretary of the Army approved an agreement with the Oklahoma Conservation Storage Commission providing non-federal cooperation for the project as required by Section 211 of the Flood Control Act of 1970 (PL91-611).

STRUCTURE DATA—The rolled earthfill dam has a top width of 32 feet and a length of 7,730 feet and rises 70 feet above the streambed. The spillway, controlled by four 50 × 35.5 foot tainter gates, is 495 feet long and has a maximum discharge of 199,070 cfs.

HYDROLOGIC DATA—The maximum flood of record occurred in April 1944 with a peak discharge of 36,400 cfs and a 6-day volume of 115,200 acre-feet, which is equivalent to 4.31 inches of runoff from the drainage area above the damsite. The largest volume of record occurred in the May 1943 flood which had 147,000 acre-feet equivalent to 5.50 inches of runoff from the drainage area above the damsite.

SHORELINE—30 miles

DRAINAGE AREA—505 square miles

SHORELINE DEVELOPMENT—3.1

VOLUME DEVELOPMENT—.77

DEPTH—Mean 8.95 ft., Max. 35 ft., (Top of Cons. Pool)

WATER QUALITY—The surface water of Little Caney River above the Copan damsite is subject to some man-made pollution from oil producing areas and municipal wastes. The concentrations of chlorides and dissolved solids are relatively high, but are below the limiting concentrations of the US Public Health Service Drinking Water Standards. Kansas and Oklahoma have active pollution abatement programs, so the quality of surface flows will continue to improve. Water from Copan Lake is expected to be of suitable quality for municipal and industrial use after treatment.

PROJECT ACCOMPLISHMENTS—Estimated monetary benefits attributed to Copan Lake operations for the prevention of flood damages total $4,962,000 to September 30, 1983.

AREA ENVIRONMENT

AIR TEMPERATURE—Mean Annual, 59°, High +115°, Low −15° (1948–82); Average no. of days per year: 32° or below, 99, 90° or above, 73 (1948–82)

PREVAILING WINDS—10 to 12 mph southerly

AVERAGE RELATIVE HUMIDITY—Summer, 55%, Winter 80%

PRECIPITATION—Average Annual, 34 inches (1948–82); Maximum Yearly, 52 inches (1957); Minimum Yearly, 20 inches (1963)

AVERAGE ANNUAL LAKE EVAPORATION—53 inches (1946–55)

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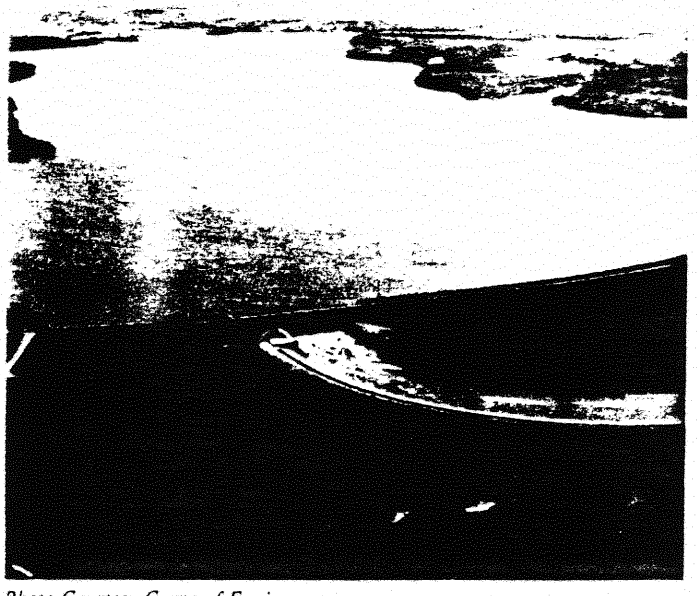


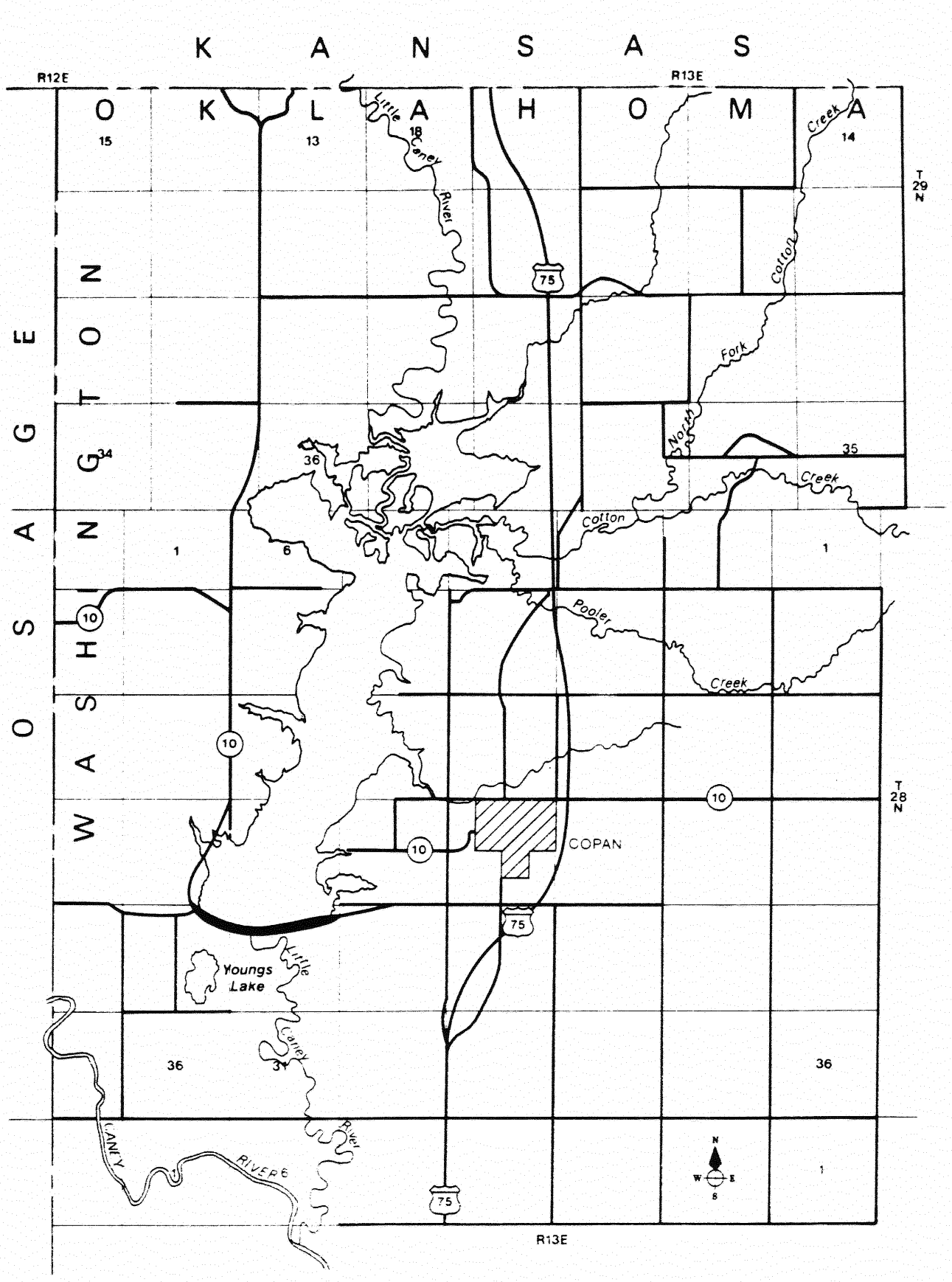
Photo Courtesy Corps of Engineers

LAKE DATA

Feature	Elevation (NGVD)	Area (Acres)	Capacity (Acre-Feet)	Equivalent Runoff[1] (Inches)
Top of dam	745.0	–	–	–
Maximum pool	739.1	17,850	338,500	12.57
Top of flood control pool	732.0	13,380	227,700	8.45
Top of conservation pool	710.0	4,850	43,400	1.61
Top of inactive pool	687.5	110	600	0.02
Spillway crest	696.5	1,080	4,700	0.17
Flood control storage	710.0–732.0	–	184,300	6.84
Conservation storage	687.5–710.0	–	42,800[2]	1.59
50-year pool	732.9	13,920	240,300	8.92

[1] Drainage area is 505 square miles.

[2] Includes 7,500 acre-feet for water supply (3.0 mgd yield) and 26,100 acre-feet (16 mgd yield) for water quality control and 9,200 acre-feet for sediment.



Mapping—Oklahoma Water Resources Board

APPENDIX C

Peak Flows and their Frequencies for the

Caney River near Ramona, Oklahoma

O DOT PROJECT

DISCHARGE DATA FOR CANEY RIVER RAMONA, OKLAHOMA.

SOURCE :-

LOCATION :- Lat 36 30 30 Long 95 50 30 in NE 1/4 NW 1/4 sec. T.23 N.,R.14 E. near left bank on down stream side of pier o bridge on county road.

WATER YEAR	DATE	GAUGE HEIGHT (ft)	DISCHARGE in (cfs)
1935	JUN	33.500	29000
1936	JUN 8	27.850	10200
1937	OCT 13	32.050	18000
1938	APR 2	31.270	13100
1945	APR 19	29.280	21600
1946	OCT 3	30.120	38500
1947	APR 18	29.060	17600
1948	JUN 26	29.300	19000
1949	MAY 22	28.000	10100
1950	JUL 23	29.420	21800
1951	JUL 5	29.020	15700
1952	NOV 12	26.130	8810
1953	MAY 12	22.280	7050
1954	MAY 3	26.690	9340
1955	MAY 29	25.500	8650
1956	OCT 8	11.540	2570
1957	JUN 12	29.690	36700
1958	APR 7	22.650	7250
1959	JUL 24	29.760	22300
1960	OCT 6	29.460	16200
1961	MAY 10	29.520	23400
1962	NOV 3	26.210	9540
1963	JAN 5	13.550	3710
1964	APR 5	25.400	9140
1965	APR 6	28.620	13800
1966	JUN 12	17.790	5820
1967	JUL 26	24.740	9880
1968	MAR 20	27.900	12600
1969	JUN 27	29.510	15900
1970	MAY 2	29.160	14900
1971	OCT 9	18.840	5060
1972	DEC 16	28.750	11800
1973	MAR 12	28.870	12100
1974	MAR 11	30.120	38400
1975	NOV 4	29.850	28600
1976	JUL 5	27.840	11500
1977	MAY 22	23.720	7870
1978	NOV 10	26.120	9280

1979 MAR 19	25.230	9210
1980 NOV 23	27.410	11500
1981 JUN 15	22.730	8520
1982 MAY 26	26.130	9630
1983 APR 23	26.860	11400
1985 FEB 23	29.790	28000
1986 OCT 5	31.080	90222

FLOOD PROBABILITY FOR CANEY RIVER NEAR RAMONA
(1935 - 1981)

n = 41

WATER YEAR	DISCHARGE (cfs)	m	P=m/n+1 = m/45	T= 1/P	Log Q X	LogQ-AvgQ (X-AvgX)	(X-AvgX)^3
1946	38500	1	0.023809	42	4.585460	0.489060	0.116973
1974	38400	2	0.047619	21	4.584331	0.487930	0.116164
1957	36700	3	0.071428	14	4.564666	0.468265	0.102677
1935	29000	4	0.095238	10.5	4.462397	0.365997	0.049026
1975	28600	5	0.119047	8.4	4.456366	0.359965	0.046642
1961	23400	6	0.142857	7	4.369215	0.272815	0.020305
1959	22300	7	0.166666	6	4.348304	0.251904	0.015984
1950	21800	8	0.190476	5.25	4.338456	0.242056	0.014182
1945	21600	9	0.214285	4.666666	4.334453	0.238053	0.013490
1948	19000	10	0.238095	4.2	4.278753	0.182353	0.006063
1937	18000	11	0.261904	3.818181	4.255272	0.158872	0.004009
1947	17600	12	0.285714	3.5	4.245512	0.149112	0.003315
1960	16200	13	0.309523	3.230769	4.209515	0.113114	0.001447
1969	15900	14	0.333333	3	4.201397	0.104996	0.001157
1951	15700	15	0.357142	2.8	4.195899	0.099499	0.000985
1970	14900	16	0.380952	2.625	4.173186	0.076785	0.000452
1965	13800	17	0.404761	2.470588	4.139879	0.043478	0.000082
1938	13100	18	0.428571	2.333333	4.117271	0.020870	0.000009
1968	12600	19	0.452380	2.210526	4.100370	0.003970	0.000000
1973	12100	20	0.476190	2.1	4.082785	-0.01361	-0.00000
1972	11800	21	0.5	2	4.071882	-0.02451	-0.00001
1976	11500	22	0.523809	1.909090	4.060697	-0.03570	-0.00004
1980	11500	23	0.547619	1.826086	4.060697	-0.03570	-0.00004
1936	10200	24	0.571428	1.75	4.008600	-0.08780	-0.00067
1949	10100	25	0.595238	1.68	4.004321	-0.09207	-0.00078
1967	9880	26	0.619047	1.615384	3.994756	-0.10164	-0.00105
1962	9540	27	0.642857	1.555555	3.979548	-0.11685	-0.00159
1954	9340	28	0.666666	1.5	3.970346	-0.12605	-0.00200
1978	9280	29	0.690476	1.448275	3.967547	-0.12885	-0.00213
1979	9210	30	0.714285	1.4	3.964259	-0.13214	-0.00230
1964	9140	31	0.738095	1.354838	3.960946	-0.13545	-0.00248
1952	8810	32	0.761904	1.3125	3.944975	-0.15142	-0.00347
1955	8650	33	0.785714	1.272727	3.937016	-0.15938	-0.00404
1981	8520	34	0.809523	1.235294	3.930439	-0.16596	-0.00457
1977	7870	35	0.833333	1.2	3.895974	-0.20042	-0.00805
1958	7250	36	0.857142	1.166666	3.860338	-0.23606	-0.01315
1953	7050	37	0.880952	1.135135	3.848189	-0.24821	-0.01529
1966	5820	38	0.904761	1.105263	3.764922	-0.33147	-0.03642
1971	5060	39	0.928571	1.076923	3.704150	-0.39224	-0.06035
1963	3710	40	0.952380	1.05	3.569373	-0.52702	-0.14638
1956	2570	41	0.976190	1.024390	3.409933	-0.68646	-0.32348

AVG Q 14780.48 0 AVG Log Q4.096400 SUM = -0.11541
STD Q 8899.539 STD Log Q0.256325 G = -0.18010
Log Q104.419470 Q 10 = 26270.61 K10 = 1.26039
Log Q504.597731 Q 50 = 39603.33 K50 = 1.95584
Log Q104.658452 Q100 = 45546.25 K100 = 2.19273

flow 1935-1981

BASED ON 41 OBSERVATIONS

ORIGINAL DATA

MEAN	14780.49
VARIANCE	8.118185E+07
STD DEV	9010.097
COEF VAR	.609594
SKEW COEF	1.309225

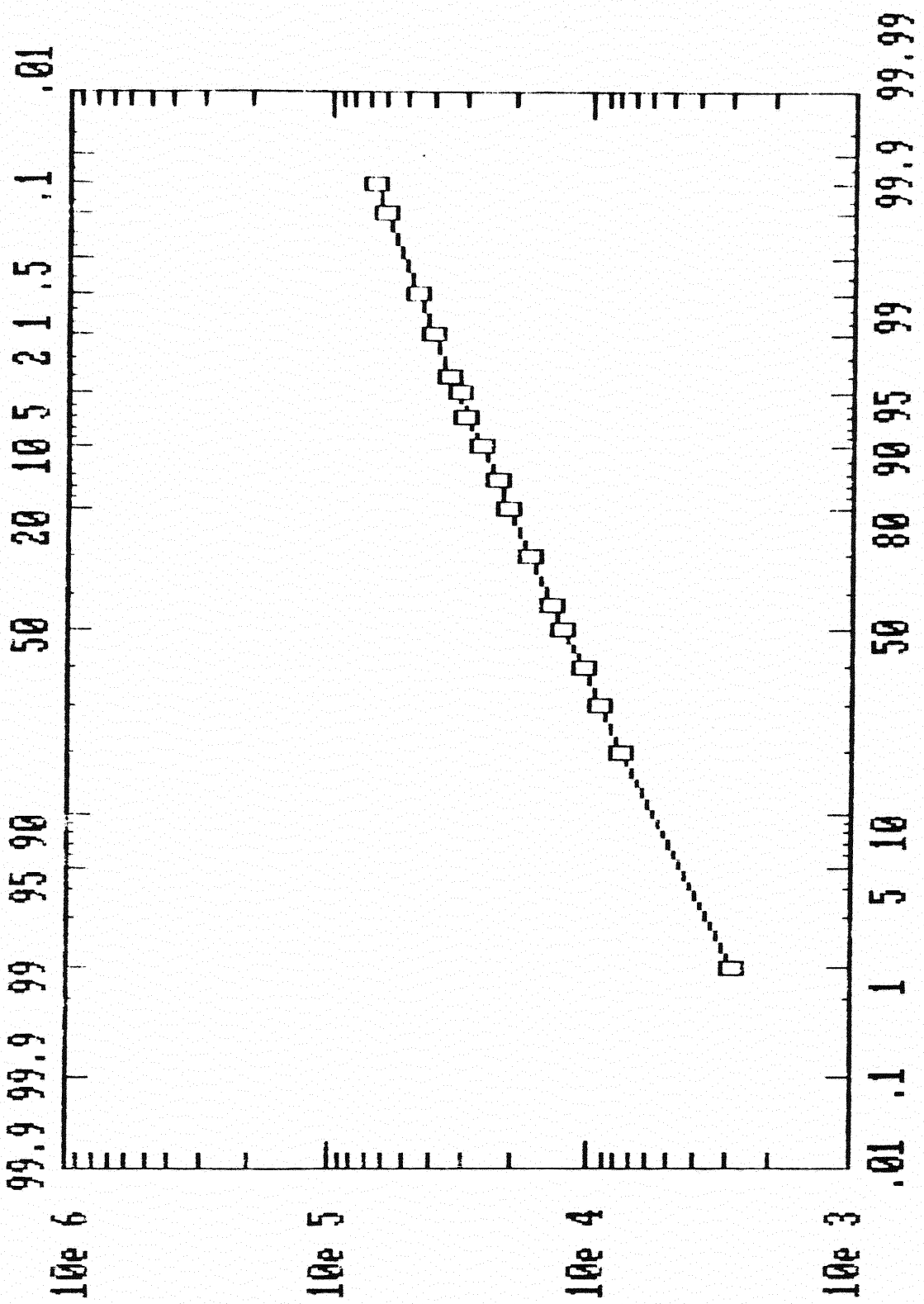
LOGS OF DATA

MEAN	9.43231
VARIANCE	.3570618
STD DEV	.5975465
COEF VAR	6.335102E-02
SKEW COEF	-.1741097

flow

**** VALUES OBTAINED FOR LOG PEARSON III DISTRIBUTION *****

RET PERIOD	PROBABILITY	VALUE
1.01	99	2880.03
1.25	80	7602.38
1.42	70	9214.9
1.66	60	10734.76
2	50	12703.53
2.32	43	14135.6
3.33	30	17243.23
5	20	20714.81
6.66	15	22931.32
10	10	26507.23
14.28	7	29912.45
20	5	32364.21
25	4	34249.29
50	2	40182.19
100	1	46447.79
500	.2	61572.88
1000	.1	68355.06


99.9 99.9 99 95 90 50 20 10 5 2 1 .5 .1 .01
.01 .1 1 5 10 50 80 90 95 99 99.9 99.99
10e 6
10e 5
10e 4
10e 3

APPENDIX D

FIS Peak Flows for 50- and 100-year Frequency

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (sq. miles)	PEAK DISCHARGES (cfs) 10-YEAR	50-YEAR	100-YEAR	500-YEAR
CANEY RIVER					
At Cross Section A	1,737	26,500*	42,800*	51,400*	82,200*
At Cross Section P	1,718	29,300	48,000	57,800	98,000*
At Tuxedo Boulevard	1,469	19,400	32,000	38,700	96,500*
At Cross Section AU	1,356	15,000	25,000	38,400	137,500
RICE CREEK					
At Mouth	6.6	4,470	7,610	9,060	13,200
At Cross Section A	5.3	3,800	6,490	7,720	11,300
At Cross Section D	3.8	3,520	5,950	7,050	10,200
At Cross Section J	3.0	3,090	5,330	6,360	9,300
At Cross Section M	1.9	2,010	3,390	4,030	5,800
At Cross Section P	1.0	1,210	2,050	2,430	3,600
RICE CREEK TRIBUTARY					
At Rice Creek Road	1.4	1,020	1,930	2,320	3,500
At Silver Lake Road	1.3	910	1,680	2,010	3,100
SAND CREEK					
At Atchison, Topeka & Santa Fe Railroad	240.0	22,600	35,200	40,800	54,500
ELIZA CREEK					
At Missouri, Kansas & Texas Railroad	5.0	2,920	4,980	5,950	8,500
At Cross Section B	3.8	2,180	3,740	4,480	6,500
At Cross Section G	2.8	2,080	3,530	4,200	6,100
At Cross Section J	1.2	1,000	1,690	2,010	2,900
TURKEY CREEK					
Stream Distance 5,000	6.9	3,160	5,590	6,660	10,000
Stream Distance 11,800	5.6	2,830	4,770	5,650	7,830
Stream Distance 14,780	4.3	1,380	2,340	2,780	4,840
Stream Distance 20,640	3.0	380	640	750	3,810
Stream Distance 24,650	2.7	230	390	460	3,770
TURKEY CREEK TRIBUTARY					
At Confluence	1.1	1,490	2,500	2,920	4,300
Stream Distance 2,040	1.0	1,280	2,150	2,560	3,700
Stream Distance 2,720	0.7	940	1,580	1,870	2,700

*Peak discharges decrease downstream because of overbank storage.

APPENDIX E

100-year Peak Flows at Frank Phillips Bridge Modified

by Lake Hulah and by Lakes Hulah and Copan

CPT RAINBOLT/mlt/7211

SWTED-HE

14 December 1976

L.P. 14 Dec
POPE

Honorable Keith Carter
Mayor of Bartlesville
Bartlesville, OK 74003

L.P.
for HUDSON

12/14
C. SCOGGINS

Dear Mayor Carter:

The hydrology for the main stem of the Caney River has been completed. The following discharges, valid at Frank Phillips Bridge, are provided for your information.

ENDACOTT

100-Year (modified by Hulah Lake)	64,300 c.f.s.
100-Year (modified by Hulah and Copan Lakes)	33,000 c.f.s.

We will continue to coordinate closely with you on the progress of the Flood Insurance Study.

GAMEL

Sincerely yours,

LTC MATTES

ANTHONY A. SMITH
Colonel, CE
District Engineer

COL SMITH

Copies furnished:
Oklahoma State Highway Department
Federal Highway Administration
Mr. George Downs
Mr. Dell Greer
Ch, FPMS

Return to Eng Br

APPENDIX F

Case I - Profiles for New Bridge

(50-year, 100-year, and 1986 Flood)

*** RUN DATE & TIME: 05-13-88 15:48

```
  T1       MULTIPLE BRIDGE OPENING RUN                    HY7CASE1.DAT
  T2       CANEY RIVER BRIDGE AT US-75    ** NEW BRIDGE **     CASE 1
  T3       FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
  *
  Q        108000 51400 42800
*** Q-DATA FOR SEC-ID, ISEQ =          1
  SK       .0004 .0004 .0004
  *
```

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

*** START PROCESSING CROSS SECTION - "EXIT "

```
 XS   EXIT  0 * * *
 GR        0 670 60 652 100 650 160 640 200 617 230 614
 GR        270 617 290 635 400 639 500 651 1600 645 3047 644
 GR        5313 644 8282 650 10625 660 11250 670
 SA        0 500
 N         .048 .06 .048
 *
```

*** FINISH PROCESSING CROSS SECTION - "EXIT "
*** CROSS SECTION "EXIT " ADDED TO DAF, RECORD NO. = 1, IXTYPE = 1

--- DATA SUMMARY FOR SECID "EXIT " AT SRD = 0. ERR-CODE = 0

SKEW	IHFNO	VSLOPE	EK	CK
.0	0.	.0000	.50	.00

X-Y COORDINATE PAIRS (NGP = 16):

X	Y	X	Y	X	Y	X	Y
.0	670.00	60.0	652.00	100.0	650.00	160.0	640.00
200.0	617.00	230.0	614.00	270.0	617.00	290.0	635.00
400.0	639.00	500.0	651.00	1600.0	645.00	3047.0	644.00
5313.0	644.00	8282.0	650.00	10625.0	660.00	11250.0	670.00

X-Y MAX-MIN POINTS:

XMIN	Y	X	YMIN	XMAX	Y	X	YMAX
.0	670.00	230.0	614.00	11250.0	670.00	.0	670.00

SUBAREA BREAKPOINTS (NSA = 3):
0. 500.

ROUGHNESS COEFFICIENTS (NSA = 3):
.048 .060 .048

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

*** START PROCESSING CROSS SECTION - "FULLV"

```
 XS   FULLV       542
 GR       0 672.99 70 665.46 80 618 125 617.170 618 190 625 218.4 627
 GR       245 637.6 395.72 639.24 540.13 650 550.16 649.23 3099 642.6
 GR       3345 639.52 3430 640.22 4857.5 643.64 5457 639.82 9315 648.23
 GR       10765 681.41
 SA       0 540.13
```

*** FINISH PROCESSING CROSS SECTION - "FULLV"
*** CROSS SECTION "FULLV" ADDED TO DAF, RECORD NO. = 2, IXTYPE = 1

--- DATA SUMMARY FOR SECID "FULLV" AT SRD = 542. ERR-CODE = 0

SKEW	IHFNO	VSLOPE	EK	CK
.0	0.	.0000	.50	.00

X-Y COORDINATE PAIRS (NGP = 18):

X	Y	X	Y	X	Y	X	Y
.0	672.99	70.0	665.46	80.0	618.00	125.0	617.00
170.0	618.00	190.0	625.00	218.4	627.00	245.0	637.60
395.7	639.24	540.1	650.00	550.2	649.23	3099.0	642.60
3345.0	639.52	3430.0	640.22	4857.5	643.64	5457.0	639.82
9315.0	648.23	10765.0	681.41				

X-Y MAX-MIN POINTS:

XMIN	Y	X	YMIN	XMAX	Y	X	YMAX
.0	672.99	125.0	617.00	10765.0	681.41	10765.0	681.41

SUBAREA BREAKPOINTS (NSA = 3):
0. 540.

ROUGHNESS COEFFICIENTS (NSA = 3):
.048 .060 .048

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

```
*** START PROCESSING CROSS SECTION - "BRDGE"
 BR   BRDGE   542
 GR        17.3 668.23 44.17 668.23 81.25 618 156 618 217 635.8 477.8 640.91
 GR        534.8 650 556.7 660 17.3 668.23
 SA        17.3 556.7
 CD        3 134 2 665
 PW        621 4.3 624 4.3 624 8.6 636 8.6 636 12.9 637 12.9 637 17.2
 PW        640 17.2 640 21.5
 KD        44.17 534.8 160 44.17 534.8 160
 *

*** FINISH PROCESSING CROSS SECTION - "BRDGE"
*** CROSS SECTION "BRDGE" ADDED TO DAF, RECORD NO. =    3, IXTYPE =    2

--- DATA SUMMARY FOR SECID "BRDGE" AT SRD =    542.  ERR-CODE =      0

    SKEW     IHFNO    VSLOPE        EK        CK
      .0        0.     .0000       .50       .00

X-Y COORDINATE PAIRS  (NGP =   9):
      X      Y          X      Y          X      Y          X      Y
   17.3  668.23       44.2  668.23       81.3  618.00      156.0  618.00
  217.0  635.80      477.8  640.91      534.8  650.00      556.7  660.00
   17.3  668.23

 X-Y MAX-MIN POINTS:
    XMIN      Y          X    YMIN       XMAX      Y          X    YMAX
   17.3  668.23       81.3  618.00      556.7  660.00       17.3  668.23

SUBAREA BREAKPOINTS (NSA =  3):
        17.    557.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  ABSLPL  ABSLPR
    3     134.0 ******** *******   2.00   665.00 ******* *******

PIER DATA:  NPW =  9   PCODE = 0.
     PELV  PWDTH      PELV  PWDTH      PELV  PWDTH      PELV  PWDTH
   621.00   4.3     624.00   4.3     624.00   8.6     636.00   8.6
   636.00  12.9     637.00  12.9     637.00  17.2     640.00  17.2
   640.00  21.5
```

```
       MULTIPLE BRIDGE OPENING RUN                        HY7CASE1.DAT
       CANEY RIVER BRIDGE AT US-75    ** NEW BRIDGE **     CASE 1
       FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
          *** RUN DATE & TIME: 05-13-88  15:48

*** START PROCESSING CROSS SECTION - "OFBR1"
  BR   OFBR1   542
  GR        3300 656 3333.73 642 3415.21 642 3450.5 656.47 3300 656
  CD        3 134 2 659
  PW        642 2.2
  KD        3300 3450.5 3375.25 3300 3448.63 3374
  *

*** FINISH PROCESSING CROSS SECTION - "OFBR1"
*** CROSS SECTION "OFBR1" ADDED TO DAF, RECORD NO. =    4, IXTYPE =    2

--- DATA SUMMARY FOR SECID "OFBR1" AT SRD =    542.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE        EK         CK
       .0         0.      .0000       .50        .00

X-Y COORDINATE PAIRS  (NGP =   5):
       X      Y          X      Y          X      Y          X      Y
   3300.0  656.00    3333.7  642.00    3415.2  642.00    3450.5  656.47
   3300.0  656.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
   3300.0  656.00    3333.7  642.00    3450.5  656.47    3450.5  656.47

SUBAREA BREAKPOINTS (NSA =  3):
         0.    540.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  ABSLPL  ABSLPR
    3     134.0 ******** *******   2.00   659.00 ******* *******

PIER DATA:  NPW =  1   PCODE = 0.
     PELV  PWDTH      PELV  PWDTH      PELV  PWDTH      PELV  PWDTH
   642.00   2.2
```

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

*** START PROCESSING CROSS SECTION - "OFBR2"

```
 BR   OFBR2  542
 GR        5370 660 5404.34 642 5513 642 5550.5 661 5370 660
 CD        3 134 2 663
 PW        643 3.3
 KD        5370 5550.5 5460.25 5370 5550.5 5460.25
 *
```

*** FINISH PROCESSING CROSS SECTION - "OFBR2"
*** CROSS SECTION "OFBR2" ADDED TO DAF, RECORD NO. = 5, IXTYPE = 2

--- DATA SUMMARY FOR SECID "OFBR2" AT SRD = 542. ERR-CODE = 0

SKEW	IHFNO	VSLOPE	EK	CK
.0	0.	.0000	.50	.00

X-Y COORDINATE PAIRS (NGP = 5):

X	Y	X	Y	X	Y	X	Y
5370.0	660.00	5404.3	642.00	5513.0	642.00	5550.5	661.00
5370.0	660.00						

X-Y MAX-MIN POINTS:

XMIN	Y	X	YMIN	XMAX	Y	X	YMAX
5370.0	660.00	5404.3	642.00	5550.5	661.00	5550.5	661.00

SUBAREA BREAKPOINTS (NSA = 3):
0. 540.

ROUGHNESS COEFFICIENTS (NSA = 3):
.048 .060 .048

BRIDGE PARAMETERS:

BRTYPE	BRWDTH	LSEL	USERCD	EMBSS	EMBELV	ABSLPL	ABSLPR
3	134.0	********	*******	2.00	663.00	*******	*******

PIER DATA: NPW = 1 PCODE = 0.

PELV	PWDTH	PELV	PWDTH	PELV	PWDTH	PELV	PWDTH
643.00	3.3						

```
WSPRO        FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186          MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

       MULTIPLE BRIDGE OPENING RUN                        HY7CASE1.DAT
       CANEY RIVER BRIDGE AT US-75    ** NEW BRIDGE **     CASE 1
       FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
          *** RUN DATE & TIME: 05-13-88  15:48

*** START PROCESSING CROSS SECTION - "APRCH"
  AS   APRCH   1218
  GR        0 671 16 665.7 70 638 200 638 230 618 275 617 320 618
  GR        350 638 353 636.17 365 638.99 589 639.5 626 643.65 1491.8 647.9
  GR        3381 638.9 4810 642.54 5468 641.67 9308 646 9873 654 11629 662
  GR        15883 738
  SA        16 589
  EX

*** FINISH PROCESSING CROSS SECTION - "APRCH"
*** CROSS SECTION "APRCH" ADDED TO DAF, RECORD NO. =    6, IXTYPE =    5

--- DATA SUMMARY FOR SECID "APRCH" AT SRD =   1218.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE         EK         CK
       .0         0.      .0000        .50        .00

X-Y COORDINATE PAIRS  (NGP =  20):
       X      Y          X      Y          X      Y          X      Y
      .0  671.00       16.0  665.70      70.0  638.00     200.0  638.00
    230.0  618.00      275.0  617.00     320.0  618.00     350.0  638.00
    353.0  636.17      365.0  638.99     589.0  639.50     626.0  643.65
   1491.8  647.90     3381.0  638.90    4810.0  642.54    5468.0  641.67
   9308.0  646.00     9873.0  654.00   11629.0  662.00   15883.0  738.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
       .0  671.00      275.0  617.00    15883.0  738.00    15883.0  738.00

SUBAREA BREAKPOINTS (NSA =  3):
         16.     589.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .048    .060    .048

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                        ******* ******* ******* *******

 NPROF, NQV  =      3     6


+++ BEGINNING PROFILE CALCULATIONS --      3
```

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
EXIT :XS	******	68.	51872.	.07	*****	651.65	646.88	108000.	651.58
0.	******	8652.	5397969.	1.10	*****	*******	.16	2.08	

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"FULLV" KRATIO = 1.77

FULLV:FV	542.	73.	76660.	.03	.12	651.77	*******	108000.	651.74
542.	542.	9469.	9573515.	1.03	.00	.00	.09	1.41	

<<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

APRCH:AS	676.	43.	85193.	.03	.07	651.85	*******	108000.	651.82
1218.	676.	9719.	********	1.03	.00	.00	.08	1.27	

<<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

A3 ---	8311.	1024.	1243.
QS ---	84856.	10454.	12690.
BOLEW ---	56.	3310.	5386.
BOREW ---	539.	3439.	5532.
STAGLT ---	********	3006.	4318.
STAGRT ---	3006.	4318.********	
AS ---	26554.	15503.	43137. 85193.
KS ---	3503337.	2496326.	5350272.********
CA3 ---	6315.	881.	1055. 8252.
CJ ---	.760	.861	.849
CDF ---	2.545	.440	.249
CRF ---	2.298	2.390	2.270
QS ---	82433.	11965.	13602.
CDF ---	2.473	.504	.267

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                          HY7CASE1.DAT
        CANEY RIVER BRIDGE AT US-75     ** NEW BRIDGE **      CASE 1
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-13-88  15:48

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW      AREA   VHD    HF      EGL     CRWS       Q    WSEL
       SRD   FLEN    REW         K  ALPH    HO      ERR      FR#     VEL

BRDGE:BR     539.    56.     8314.  2.74  1.13   654.49   643.92   82433.  651.75
      542.   539.   539.  1339741.  1.79  1.35     -.01      .56     9.91

     TYPE PPCD FLOW      C     P/A    LSEL    BLEN    XLAB    XRAB
       3.   0.   1.   .747    .052 ******* ******* ******* *******

 XSID:CODE   SRDL    LEW      AREA   VHD    HF      EGL     CRWS       Q    WSEL
       SRD   FLEN    REW         K  ALPH    HO      ERR      FR#     VEL

SLICE:AS     539.    36.    36940.   .08   .33   655.40   643.22   82433.  655.32
     1215.   962.  3006. ********  1.03   .58     -.02      .11     2.23

       M(G)   M(K)       KQ    XLKQ    XRKQ     OTEL
       .834   .663  4932140.     44.    535.   655.31

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW      AREA   VHD    HF      EGL     CRWS       Q    WSEL
       SRD   FLEN    REW         K  ALPH    HO      ERR      FR#     VEL

OFBR1:BR     151.  3311.      980.  3.32   .15   654.72   650.17   11965.  651.40
      542.   151.  3438.   116532.  1.43  2.80      .00      .93     12.21

     TYPE PPCD FLOW      C     P/A    LSEL    BLEN    XLAB    XRAB
       3.   0.   1.   .836    .021 ******* ******* ******* *******

 XSID:CODE   SRDL    LEW      AREA   VHD    HF      EGL     CRWS       Q    WSEL
       SRD   FLEN    REW         K  ALPH    HO      ERR      FR#     VEL

SLICE:AS     151.  3006.    21414.   .00   .15   656.33   639.10   11965.  656.33
      827.   260.  4318.  2154231.  1.00  1.47      .01      .02      .56

       M(G)   M(K)       KQ    XLKQ    XRKQ     OTEL
       .885   .875   268332.    3300.   3449.   656.32

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                          "APRCH"     KRATIO =  1.99

 XSID:CODE   SRDL    LEW      AREA   VHD    HF      EGL     CRWS       Q    WSEL
       SRD   FLEN    REW         K  ALPH    HO      ERR      FR#     VEL

APRCH:XS     392.  3006.    21422.   .00   .01   656.34 *******   11965.  656.33
     1218.   392.  4318.  4279535.  1.00   .00      .00      .02      .56
```

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	181.	5386.	1227.	2.77	.13	654.40	649.62	13602.	651.63
542.	181.	5532.	154125.	1.45	2.51	-.02	.81	11.09	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.831	.023	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	181.	4318.	65473.	.00	.27	655.81	649.62	13602.	655.81
857.	488.	10270.	2685794.	1.00	1.15	-.01	.01	.21	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.967	.954	123083.	5370.	5551.	655.80

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = 3.74

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	362.	4318.	65488.	.00	.00	655.81	*******	13602.	655.81
1218.	362.	10271.	********	1.00	.00	.00	.01	.21	
APRCH:XS	******	36.	122886.	.01	*****	655.65	*******	108000.	655.64
1218.	******	10234.	********	1.01	*****	3.82	.04	.88	

STAGLT --- ******** 3019. 4303.

STAGRT --- 3019. 4303.********

AS --- 38074. 20110. 64702. 122886.

KS --- 6186180.3906715.9879898.********

CA3 --- 6207. 819. 1020. 8046.

CJ --- .747 .836 .831

CDF --- 2.473 .504 .267

CRF --- 2.302 2.385 2.274

QS --- 83140. 11368. 13492.

CDF --- 2.485 .538 .253

XSID:CODE	SRDL	CEW	AREA	VHD	AF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR	539.	56.	8313.	2.79	1.14	654.54	644.00	83140.	651.75
542.	539.	539.	1339359.	1.80	1.38	-.01	.57	10.00	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.746	.052	*******	******	******	******

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186           MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                          HY7CASE1.DAT
        CANEY RIVER BRIDGE AT US-75     ** NEW BRIDGE **      CASE 1
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-13-88  15:48

 XSID:CODE   SRDL     LEW      AREA    VHD     HF      EGL     CRWS        Q     WSEL
       SRD   FLEN     REW         K   ALPH     HO      ERR      FR#      VEL

SLICE:AS      539.     36.    37299.    .08    .33   655.46   643.22   83140.   655.38
     1215.    966.   3019.  ********  1.03    .59     -.02      .11    2.23

       M(G)   M(K)        KQ    XLKQ    XRKQ     OTEL
       .835   .666   4979862.     44.    535.   655.37

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

          <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL     LEW      AREA    VHD     HF      EGL     CRWS        Q     WSEL
       SRD   FLEN     REW         K   ALPH     HO      ERR      FR#      VEL

OFBR1:BR      151.   3311.     984.    2.95    .14   654.38   649.91   11368.   651.43
      542.    151.   3438.  117200.    1.42   2.48      .00      .87   11.55

     TYPE PPCD FLOW       C     P/A     LSEL    BLEN    XLAB    XRAB
        3.   0.   1.    .839    .021 ******* ****** ****** ******

 XSID:CODE   SRDL     LEW      AREA    VHD     HF      EGL     CRWS        Q     WSEL
       SRD   FLEN     REW         K   ALPH     HO      ERR      FR#      VEL

SLICE:AS      151.   3019.    20351.    .00    .13   655.84   639.10   11368.   655.83
      827.    259.   4303.  2144500.    1.00   1.32      .00      .02     .56

       M(G)   M(K)        KQ    XLKQ    XRKQ     OTEL
       .883   .873    273103.    3300.   3449.   655.83

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                          "APRCH"     KRATIO =  1.86

 XSID:CODE   SRDL     LEW      AREA    VHD     HF      EGL     CRWS        Q     WSEL
       SRD   FLEN     REW         K   ALPH     HO      ERR      FR#      VEL

APRCH:XS      392.   3019.    20358.    .00    .01   655.84  *******   11368.   655.84
     1218.    392.   4303.  3987435.    1.00    .00      .00      .02     .56

          <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL     LEW      AREA    VHD     HF      EGL     CRWS        Q     WSEL
       SRD   FLEN     REW         K   ALPH     HO      ERR      FR#      VEL

OFBR2:BR      181.   5386.    1228.    2.71    .14   654.36   649.59   13492.   651.64
      542.    181.   5532.  154414.    1.45   2.46     -.02      .80   10.98

     TYPE PPCD FLOW       C     P/A     LSEL    BLEN    XLAB    XRAB
        3.   0.   1.    .831    .023 ******* ****** ****** ******
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WSPRO        FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186          MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

       MULTIPLE BRIDGE OPENING RUN                        HY7CASE1.DAT
       CANEY RIVER BRIDGE AT US-75    ** NEW BRIDGE **     CASE 1
       FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
          *** RUN DATE & TIME: 05-13-88  15:48

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
      SRD    FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

SLICE:AS     181.   4303.   65485.   .00   .30  655.78  649.59  13492.  655.77
     857.    488.  10263. 2537394.  1.00  1.13    -.02     .01     .21

      M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
      .967   .954  115967.  5370.  5551.   655.77

                <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                          "APRCH"     KRATIO =  3.96

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
      SRD    FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

APRCH:XS     362.   4303.   65501.   .00   .00  655.78 *******  13492.  655.78
    1218.    362.  10263. ******** 1.00   .00     .00     .01     .21

APRCH:XS   ******    36.   122272.   .01 *****  655.59 *******  108000.  655.58
    1218. ******  10220. ******** 1.01 *****    -.06     .05     .88

STAGLT --- ********   3018.   4304.

STAGRT ---    3018.   4304.********

AS ---   37877.  20068.  64326. 122272.

KS --- 6136012.3888309.9800412.********

CA3 ---    6203.    825.   1021.   8050.

CJ ---      .746    .839    .831

CDF ---    2.485    .538    .253

CRF ---    2.302   2.385   2.274

QS ---   83048.  11446.  13507.

CDF ---    2.484    .540    .253

          <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
      SRD    FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

BRDGE:BR     539.    56.    8313.  2.79  1.14  654.53  643.98  83048.  651.75
     542.    539.   539. 1339396.  1.80  1.38    -.01     .57    9.99

    TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
      3.   0.   1.   .746   .052 ******* ****** ****** ******
```

SLICE:AS	539.	36.	37259.	.08	.33	655.45	643.22	83048.	655.38
	1215.	966.	3018.	********	1.03	.59	-.02	.11	2.23

M(G)	M(K)	KQ	XLKQ	XRKQ	QTEL
.835	.666	4974901.	44.	535.	655.36

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

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WSPRO       FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186          MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                          HY7CASE1.DAT
        CANEY RIVER BRIDGE AT US-75    ** NEW BRIDGE **      CASE 1
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
          *** RUN DATE & TIME: 05-13-88  15:48

           <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW      AREA   VHD    HF      EGL     CRWS       Q    WSEL
      SRD    FLEN    REW         K  ALPH    HO      ERR      FR#     VEL

OFBR1:BR      151.  3311.      984.  3.00   .14   654.42   649.94  11446.  651.43
     542.     151.  3438.   117109.  1.42  2.52     .00      .88   11.64

     TYPE PPCD FLOW      C     P/A    LSEL   BLEN   XLAB   XRAB
      3.   0.   1.    .838    .021 ******* ****** ****** ******

 XSID:CODE   SRDL    LEW      AREA   VHD    HF      EGL     CRWS       Q    WSEL
      SRD    FLEN    REW         K  ALPH    HO      ERR      FR#     VEL

SLICE:AS      151.  3018.    20465.   .00   .13   655.90   639.10  11446.  655.89
     827.     259.  4304.  2170764.  1.00  1.34     .00      .02    .56

      M(G)   M(K)        KQ   XLKQ   XRKQ    OTEL
      .883   .873   275868.  3300.  3449.   655.89

                <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                          "APRCH"     KRATIO =  1.85

 XSID:CODE   SRDL    LEW      AREA   VHD    HF      EGL     CRWS       Q    WSEL
      SRD    FLEN    REW         K  ALPH    HO      ERR      FR#     VEL

APRCH:XS      392.  3018.    20473.   .00   .01   655.90 *******  11446.  655.90
    1218.     392.  4304.  4019916.  1.00   .00      .00      .02    .56

           <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW      AREA   VHD    HF      EGL     CRWS       Q    WSEL
      SRD    FLEN    REW         K  ALPH    HO      ERR      FR#     VEL

OFBR2:BR      181.  5386.     1228.  2.72   .14   654.36   649.59  13507.  651.64
     542.     181.  5532.   154397.  1.45  2.47     -.02      .80   11.00

     TYPE PPCD FLOW      C     P/A    LSEL   BLEN   XLAB   XRAB
      3.   0.   1.    .831    .023 ******* ****** ****** ******

 XSID:CODE   SRDL    LEW      AREA   VHD    HF      EGL     CRWS       Q    WSEL
      SRD    FLEN    REW         K  ALPH    HO      ERR      FR#     VEL

SLICE:AS      181.  4304.    65511.   .00   .30   655.78   649.59  13507.  655.78
     857.     488. 10264.  2543351.  1.00  1.13     -.02      .01    .21

      M(G)   M(K)        KQ   XLKQ   XRKQ    OTEL
      .967   .954   116268.  5370.  5551.   655.78

                <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
```

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

XSID:	CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
	SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:	XS	362.	4304.	65527.	.00	.00	655.79	*******	13507.	655.78
	1218.	362.	10265.	********	1.00	.00	.00	.01	.21	
APRCH:	XS	******	36.	122349.	.01	*****	655.60	*******	108000.	655.59
	1218.	******	10222.	********	1.01	*****	.01	.05	.88	

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	X	ALPH	HO	ERR	FR#	VEL	
EXIT :XS	******	107.	29837.	.06	*****	648.89	639.74	51400.	648.83
0.	******	7701.	2569841.	1.39	*****	*******	.18	1.72	

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"FULLV" KRATIO = 1.96

FULLV:FV	542.	73.	50926.	.02	.11	649.00	*******	51400.	648.98
542.	542.	9348.	5029602.	1.12	.00	.00	.08	1.01	

<<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

APRCH:AS	676.	48.	58605.	.01	.06	649.06	*******	51400.	649.05
1218.	676.	9523.	6168473.	1.08	.00	.00	.06	.88	

<<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

A3 --- 6994. 687. 853.

QS --- 42121. 4139. 5140.

BOLEW --- 58. 3317. 5391.

BOREW --- 528. 3432. 5527.

STAGLT --- ******** 3067. 4306.

STAGRT --- 3067. 4306.********

AS --- 18854. 11243. 28509. 58605.

KS --- 2079514.1518604.2745471.6343588.

CA3 --- 5483. 601. 735. 6818.

CJ --- .784 .874 .861

CDF --- 2.500 .336 .231

CRF --- 2.311 2.404 2.249

QS --- 41305. 4706. 5389.

CDF --- 2.451 .382 .242

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                          HY7CASE1.DAT
        CANEY RIVER BRIDGE AT US-75    ** NEW BRIDGE **      CASE 1
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-13-88  15:48

             <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS       Q     WSEL
      SRD    FLEN     REW         K  ALPH     HO      ERR      FR#     VEL

BRDGE:BR      539.     58.     7100.   .90    .62   650.11   638.57  41305.  649.21
      542.    539.    530.  1047117.  1.70    .20      .00      .34    5.82

     TYPE PPCD FLOW      C     P/A    LSEL    BLEN    XLAB    XRAB
       3.   0.   1.   .766    .053 ******* ****** ****** ******

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS       Q     WSEL
      SRD    FLEN     REW         K  ALPH     HO      ERR      FR#     VEL

SLICE:AS      539.     46.    23309.   .06    .22   650.58   634.58  41305.  650.52
     1215.    929.   3067.  6955173.  1.15    .25      .00      .12    1.77

       M(G)   M(K)        KQ    XLKQ    XRKQ     OTEL
       .837   .538   3215480.     44.    535.   650.50

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

             <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS       Q     WSEL
      SRD    FLEN     REW         K  ALPH     HO      ERR      FR#     VEL

OFBR1:BR      151.   3317.     678.  1.00    .09   649.90   646.57   4706.  648.90
      542.    151.   3432.   67577.  1.33    .82      .00      .58    6.95

     TYPE PPCD FLOW      C     P/A    LSEL    BLEN    XLAB    XRAB
       3.   0.   1.   .867    .022 ******* ****** ****** ******

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS       Q     WSEL
      SRD    FLEN     REW         K  ALPH     HO      ERR      FR#     VEL

SLICE:AS      151.   3067.    13334.   .00    .11   650.74   639.10   4706.  650.73
      827.    257.   4306.   771894.  1.00    .73      .01      .02    .35

       M(G)   M(K)        KQ    XLKQ    XRKQ     OTEL
       .878   .862    106051.   3300.   3449.   650.73

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                          "APRCH"     KRATIO =  2.62

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS       Q     WSEL
      SRD    FLEN     REW         K  ALPH     HO      ERR      FR#     VEL

APRCH:XS      392.   3067.    13341.   .00    .01   650.74 *******   4706.  650.74
     1218.    392.   4306.  2019835.  1.00    .00      .00      .02    .35
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MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	181.	5391.	857.	.84	.13	649.85	646.19	5389.	649.01
542.	181.	5527.	89407.	1.37	.73	.00	.52	6.28	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.854	.023	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	181.	4306.	37103.	.00	.25	650.68	646.19	5389.	650.68
857.	450.	9638.	1016853.	1.00	.58	.00	.01	.15	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.965	.949	52397.	5370.	5551.	650.67

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = 4.13

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	362.	4306.	37116.	.00	.00	650.68	*******	5389.	650.68
1218.	362.	9638.	4200189.	1.00	.00	.00	.01	.15	
APRCH:XS	******	45.	73462.	.01	*****	650.61	*******	51400.	650.60
1218.	******	9633.	8825612.	1.04	*****	1.56	.05	.70	

STAGLT --- ******** 3074. 4297.

STAGRT --- 3074. 4297.********

AS --- 23632. 13017. 36813. 73462.

KS --- 2892825.1955609.4141076.8989510.

CA3 --- 5440. 587. 732. 6760.

CJ --- .766 .867 .854

CDF --- 2.451 .382 .242

CRF --- 2.303 2.397 2.264

QS --- 41294. 4641. 5465.

CDF --- 2.497 .415 .231

	SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR		539.	58.	7100.	.90	.62	650.11	638.57	41294.	649.21
	542.	539.	530.	1046976.	1.70	.31	.00	.34	5.82	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.766	.053	*******	******	******	******

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	539.	46.	23364.	.06	.21	650.57	634.60	41294.	650.52
1215.	931.	3074.	7098842.	1.15	.25	.00	.12	1.77	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.838	.539	3273098.	44.	535.	650.50

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	151.	3317.	678.	.97	.09	649.87	646.52	4641.	648.90
542.	151.	3432.	67603.	1.33	.79	.00	.57	6.85	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.867	.022	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	151.	3074.	13106.	.00	.10	650.68	639.10	4641.	650.68
827.	256.	4297.	820986.	1.00	.71	.01	.02	.35	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.877	.861	114141.	3300.	3449.	650.67

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = 2.41

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	392.	3074.	13112.	.00	.01	650.69	*******	4641.	650.68
1218.	392.	4297.	1979638.	1.00	.00	.00	.02	.35	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	181.	5391.	858.	.87	.14	649.88	646.24	5465.	649.02
542.	181.	5527.	89526.	1.37	.76	.00	.52	6.37	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.854	.023	*******	******	******	******

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	181.	4297.	37550.	.00	.27	650.74	646.24	5465.	650.74
857.	451.	9643.	986736.	1.00	.59	-.01	.01	.15	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.965	.949	50565.	5370.	5551.	650.74

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = 4.33

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	362.	4297.	37563.	.00	.00	650.75	*******	5465.	650.75
1218.	362.	9643.	4277371.	1.00	.00	.00	.01	.15	
APRCH:XS	******	45.	73554.	.01	*****	650.62	*******	51400.	650.61
1218.	******	9634.	8843202.	1.04	*****	.01	.05	.70	

```
WSPRO         FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                        HY7CASE1.DAT
        CANEY RIVER BRIDGE AT US-75    ** NEW BRIDGE **     CASE 1
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-13-88  15:48

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW        K  ALPH    HO     ERR     FR#     VEL

EXIT :XS   ******   111.   25741.   .06 *****  648.30  637.60  42800.  648.24
        0. ******  7410. 2139542.  1.50 ***** *******     .18    1.66

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                           "FULLV"     KRATIO =  2.01

FULLV:FV     542.    74.   45616.   .02   .11  648.41 *******  42800.  648.40
      542.   542.  9322. 4302251.  1.15   .00     .00     .08     .94
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

APRCH:AS     676.    50.   53014.   .01   .05  648.47 *******  42800.  648.45
     1218.   676.  9481. 5270039.  1.11   .00     .00     .06     .81
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

A3 ---    6718.    620.    774.

QS ---   35443.   3272.   4085.

BOLEW ---      59.   3318.   5392.

BOREW ---     525.   3431.   5526.

STAGLT --- ********   3082.   4303.

STAGRT ---    3082.   4303.********

AS ---   17188.  10370.  25456.  53014.

KS --- 1822827.1340000.2284551.5447378.

CA3 ---    5346.    543.    669.   6558.

CJ ---     .796    .876    .864

CDF ---    2.475    .311    .228

CRF ---    2.317   2.408   2.240

QS ---   34892.   3686.   4222.

CDF ---    2.436    .350    .235
```

```
WSPRO         FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                          HY7CASE1.DAT
        CANEY RIVER BRIDGE AT US-75     ** NEW BRIDGE **       CASE 1
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-13-88  15:48

             <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS       Q    WSEL
       SRD   FLEN     REW         K  ALPH     HO      ERR      FR#     VEL

BRDGE:BR      539.     59.    6829.   .68    .53   649.31   634.73   34892.  648.63
      542.    539.    526.  987075.  1.68    .20      .00      .31    5.11

     TYPE PPCD FLOW      C     P/A    LSEL    BLEN    XLAB    XRAB
      3.   0.   1.    .772    .054 ******* ****** ****** ******

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS       Q    WSEL
       SRD   FLEN     REW         K  ALPH     HO      ERR      FR#     VEL

SLICE:AS      539.     47.   20844.   .05    .19   649.71   632.93   34892.  649.66
     1215.    921.   3082. 5838227.  1.20    .21      .00      .12    1.67

       M(G)    M(K)       KQ    XLKQ    XRKQ    OTEL
       .838    .497  2935143.     44.    535.  649.64

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

             <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS       Q    WSEL
       SRD   FLEN     REW         K  ALPH     HO      ERR      FR#     VEL

OFBR1:BR      151.   3318.     614.   .74    .08   649.08   645.90    3686.  648.34
      542.    151.   3431.   58333.  1.32    .60      .00      .52    6.00

     TYPE PPCD FLOW      C     P/A    LSEL    BLEN    XLAB    XRAB
      3.   0.   1.    .871    .023 ******* ****** ****** ******

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS       Q    WSEL
       SRD   FLEN     REW         K  ALPH     HO      ERR      FR#     VEL

SLICE:AS      151.   3082.    11996.   .00    .10   649.79   639.10    3686.  649.79
      827.    255.   4303.   598050.  1.00    .61      .00      .02     .31

       M(G)    M(K)       KQ    XLKQ    XRKQ    OTEL
       .877    .859    84424.  3300.   3449.  649.78

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                          "APRCH"     KRATIO =  2.86

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS       Q    WSEL
       SRD   FLEN     REW         K  ALPH     HO      ERR      FR#     VEL

APRCH:XS      392.   3082.    12002.   .00    .01   649.79 *******    3686.  649.79
     1218.    392.   4303. 1709657.  1.00    .00      .00      .02     .31
```

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	181.	5392.	781.	.62	.13	649.06	645.58	4222.	648.44
542.	181.	5526.	77365.	1.36	.53	.00	.46	5.41	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.858	.023	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	181.	4303.	32322.	.00	.23	649.77	645.58	4222.	649.77
857.	439.	9574.	790568.	1.00	.48	.00	.01	.13	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.965	.946	42578.	5370.	5551.	649.76

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = 4.25

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	362.	4303.	32335.	.00	.00	649.77	*******	4222.	649.77
1218.	362.	9574.	3363484.	1.00	.00	.00	.01	.13	
APRCH:XS	******	47.	64957.	.01	*****	649.72	*******	42800.	649.71
1218.	******	9570.	7258111.	1.06	*****	1.26	.05	.66	

STAGLT --- ******** 3088. 4294.

STAGRT --- 3088. 4294.********

AS --- 21066. 11779. 32112. 64957.

KS --- 2431165.1670443.3322877.7424485.

CA3 --- 5275. 535. 670. 6480.

CJ --- .772 .871 .858

CDF --- 2.436 .350 .235

CRF --- 2.307 2.402 2.257

QS --- 34803. 3673. 4324.

CDF --- 2.483 .381 .226

	SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR		539.	59.	6828.	.68	.53	649.31	634.71	34803.	648.63
	542.	539.	526.	986850.	1.68	.20	.00	.30	5.10	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.772	.054	*******	******	******	******

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	539.	47.	20871.	.05	.19	649.70	632.90	34803.	649.65
1215.	927.	3088.	5955429.	1.20	.20	.00	.12	1.67	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.839	.498	2989040.	44.	535.	649.63

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	151.	3318.	614.	.73	.08	649.07	645.89	3673.	648.34
542.	151.	3431.	58331.	1.32	.59	.00	.52	5.98	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.871	.023	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	151.	3088.	11844.	.00	.09	649.77	639.10	3673.	649.77
827.	255.	4294.	643095.	1.00	.60	.00	.02	.31	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.875	.857	91720.	3300.	3449.	649.76

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = 2.62

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	392.	3088.	11850.	.00	.00	649.78	*******	3673.	649.77
1218.	392.	4294.	1687305.	1.00	.00	.00	.02	.31	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	181.	5392.	781.	.65	.14	649.09	645.62	4324.	648.45
542.	181.	5526.	77475.	1.36	.56	.00	.47	5.53	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.858	.023	*******	******	******	******

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	181.	4294.	32814.	.00	.25	649.85	645.62	4324.	649.85
857.	440.	9580.	776621.	1.00	.50	.00	.01	.13	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.965	.947	41541.	5370.	5551.	649.84

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" XRATIO = 4.43

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	362.	4294.	32827.	.00	.00	649.85	*******	4324.	649.85
1218.	362.	9580.	3443032.	1.00	.00	.00	.01	.13	
APRCH:XS	******	47.	65115.	.01	*****	649.74	*******	42800.	649.73
1218.	******	9572.	7286032.	1.06	*****	.02	.05	.66	

STAGLT --- ******** 3088. 4294.

STAGRT --- 3088. 4294.********

AS --- 21116. 11796. 32203. 65115.

KS --- 2439662.1674698.3337931.7452290.

CA3 --- 5273. 535. 670. 6478.

CJ --- .772 .871 .858

CDF --- 2.483 .381 .226

CRF --- 2.307 2.402 2.257

QS --- 34798. 3675. 4328.

CDF --- 2.484 .382 .226

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR	539.	59.	6828.	.68	.53	649.31	634.69	34798.	648.63
542.	539.	526.	986844.	1.68	.20	.00	.30	5.10	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.772	.054	*******	******	******	******

SLICE:AS	539.	47.	20870.	.05	.19	649.70	632.90	34798.	649.65
	1215.	927.	3088.	5955462.	1.20	.20	.00	.12	1.67

M(G)	M(K)	KQ	XLKQ	XRKQ	QTEL
.839	.498	2989217.	44.	535.	649.63

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	151.	3318.	614.	.73	.08	649.08	645.89	3675.	648.34
542.	151.	3431.	58330.	1.32	.59	.00	.52	5.98	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.871	.023	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	151.	3088.	11842.	.00	.09	649.77	639.10	3675.	649.77
827.	255.	4294.	644026.	1.00	.60	.01	.02	.31	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.875	.857	91876.	3300.	3449.	649.77

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = 2.62

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	392.	3088.	11848.	.00	.00	649.78	*******	3675.	649.77
1218.	392.	4294.	1687099.	1.00	.00	.00	.02	.31	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	181.	5392.	781.	.65	.14	649.10	645.62	4328.	648.45
542.	181.	5526.	77475.	1.36	.56	.00	.47	5.54	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.858	.023	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	181.	4294.	32830.	.00	.25	649.85	645.62	4328.	649.85
857.	440.	9580.	777293.	1.00	.50	.00	.01	.13	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.965	.947	41565.	5370.	5551.	649.84

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.

MULTIPLE BRIDGE OPENING RUN HY7CASE1.DAT
CANEY RIVER BRIDGE AT US-75 ** NEW BRIDGE ** CASE 1
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-13-88 15:48

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	362.	4294.	32843.	.00	.00	649.85	*******	4328.	649.85
1218.	362.	9580.	3445544.	1.00	.00	.00	.01	.13	
APRCH:XS	******	47.	65122.	.01	*****	649.74	*******	42800.	649.73
1218.	******	9572.	7287270.	1.06	*****	.00	.05	.66	

ER

APPENDIX G

Case II - Profiles for Old Bridge

(50-year, 100-year, and 1986 Flood)

*** RUN DATE & TIME: 05-14-88 15:57

```
 T1       MULTIPLE BRIDGE OPENING RUN                      HY7CASE2.DAT
 T2       CANEY RIVER BRIDGE AT US-75      * OLD BRIDGE **   CASE 2
 T3       FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
 *
 Q        108000 51400 42800
*** Q-DATA FOR SEC-ID, ISEQ =          1
 SK       .0004 .0004 .0004
 *
```

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

```
*** START PROCESSING CROSS SECTION - "EXIT "
  XS   EXIT  0 * * *
  GR        0 670 60 652 100 650 160 640 200 617 230 614
  GR        270 617 290 635 400 639 500 651 1600 645 3047 644
  GR        5313 644 8282 650 10625 660 11250 670
  SA        0 500
  N         .048 .06 .048
  *

*** FINISH PROCESSING CROSS SECTION - "EXIT "
*** CROSS SECTION "EXIT " ADDED TO DAF, RECORD NO. =    1, IXTYPE =    1

--- DATA SUMMARY FOR SECID "EXIT " AT SRD =      0.  ERR-CODE =      0

     SKEW      IHFNO    VSLOPE        EK        CK
       .0         0.     .0000       .50       .00

X-Y COORDINATE PAIRS  (NGP =  16):
       X      Y          X      Y          X      Y          X      Y
      .0  670.00       60.0  652.00     100.0  650.00     160.0  640.00
    200.0  617.00      230.0  614.00     270.0  617.00     290.0  635.00
    400.0  639.00      500.0  651.00    1600.0  645.00    3047.0  644.00
   5313.0  644.00     8282.0  650.00   10625.0  660.00   11250.0  670.00

 X-Y MAX-MIN POINTS:
    XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
      .0  670.00      230.0  614.00    11250.0  670.00         .0  670.00

SUBAREA BREAKPOINTS (NSA =  3):
         0.    500.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048
```

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

```
*** START PROCESSING CROSS SECTION - "FULLV"
 XS   FULLV       560
 GR       0 672.99 70 665.46 80 618 125 617 170 618 190 625 218.4 627
 GR       245 637.6 395.72 639.24 540.13 650 550.16 649.23 3099 642.6
 GR       3345 639.52 3430 640.22 4857.5 643.64 5457 639.82 9315 648.23
 GR       10765 681.41
 SA       0 540.13

*** FINISH PROCESSING CROSS SECTION - "FULLV"
*** CROSS SECTION "FULLV" ADDED TO DAF, RECORD NO. =    2, IXTYPE =    1

--- DATA SUMMARY FOR SECID "FULLV" AT SRD =    560.  ERR-CODE =      0

    SKEW     IHFNO    VSLOPE       EK        CK
      .0        0.     .0000      .50       .00

X-Y COORDINATE PAIRS  (NGP =  18):
      X      Y          X      Y          X      Y          X      Y
     .0  672.99       70.0  665.46       80.0  618.00      125.0  617.00
   170.0  618.00      190.0  625.00      218.4  627.00      245.0  637.60
   395.7  639.24      540.1  650.00      550.2  649.23     3099.0  642.60
  3345.0  639.52     3430.0  640.22     4857.5  643.64     5457.0  639.82
  9315.0  648.23    10765.0  681.41

 X-Y MAX-MIN POINTS:
    XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
      .0  672.99       125.0  617.00    10765.0  681.41    10765.0  681.41

SUBAREA BREAKPOINTS (NSA =  3):
         0.    540.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048
```

```
       MULTIPLE BRIDGE OPENING RUN                        HY7CASE2.DAT
       CANEY RIVER BRIDGE AT US-75      * OLD BRIDGE **   CASE 2
       FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
          *** RUN DATE & TIME: 05-14-88  15:57

*** START PROCESSING CROSS SECTION - "BRDGE"
  BR   BRDGE   560
  GR        30 666 40 648 95 618 165 618 180 634 280 650
  GR        500 650 530 659 30 666
  SA        30 560
  CD        3 31 2 662
  PW        640 4.8 650 4.8 650 14.4
  KD        41.2 522.3 150 41.2 522.3 150
  *

*** FINISH PROCESSING CROSS SECTION - "BRDGE"
*** CROSS SECTION "BRDGE" ADDED TO DAF, RECORD NO. =    3, IXTYPE =    2

--- DATA SUMMARY FOR SECID "BRDGE" AT SRD =    560.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
       .0        0.     .0000       .50       .00

X-Y COORDINATE PAIRS  (NGP =   9):
       X      Y          X      Y          X      Y          X      Y
    30.0  666.00      40.0  648.00      95.0  618.00     165.0  618.00
   180.0  634.00     280.0  650.00     500.0  650.00     530.0  659.00
    30.0  666.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
    30.0  666.00      95.0  618.00     530.0  659.00      30.0  666.00

SUBAREA BREAKPOINTS (NSA =  3):
        30.    560.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  ABSLPL  ABSLPR
    3     31.0 ******** *******   2.00   662.00 ******* *******

PIER DATA:  NPW =  3   PCODE = 0.
     PELV  PWDTH      PELV  PWDTH      PELV  PWDTH      PELV  PWDTH
   640.00   4.8     650.00   4.8     650.00  14.4
```

```
       MULTIPLE BRIDGE OPENING RUN                          HY7CASE2.DAT
       CANEY RIVER BRIDGE AT US-75      * OLD BRIDGE **   CASE 2
       FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
          *** RUN DATE & TIME: 05-14-88  15:57

*** START PROCESSING CROSS SECTION - "OFBR1"
  BR   OFBR1   560
  GR        3100 657 3141 638 3581 638 3622 657 3100 657
  CD        3 31 2 657
  PW        638 15
  KD        3100 3622 3361 3100 3622 3361
  *

*** FINISH PROCESSING CROSS SECTION - "OFBR1"
*** CROSS SECTION "OFBR1" ADDED TO DAF, RECORD NO. =    4, IXTYPE =    2

--- DATA SUMMARY FOR SECID "OFBR1" AT SRD =    560.  ERR-CODE =      0

     SKEW      IHFNO    VSLOPE        EK        CK
       .0         0.     .0000       .50       .00

X-Y COORDINATE PAIRS  (NGP =   5):
       X      Y          X      Y          X      Y          X      Y
   3100.0  657.00    3141.0  638.00    3581.0  638.00    3622.0  657.00
   3100.0  657.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
   3100.0  657.00    3141.0  638.00    3622.0  657.00    3100.0  657.00

SUBAREA BREAKPOINTS (NSA =  3):
         0.    540.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  ABSLPL  ABSLPR
    3      31.0 ******** ********   2.00   657.00 ******* *******

PIER DATA:  NPW =  1   PCODE = 0.
     PELV  PWDTH      PELV  PWDTH      PELV  PWDTH      PELV  PWDTH
   638.00  15.0
```

```
       MULTIPLE BRIDGE OPENING RUN                          HY7CASE2.DAT
       CANEY RIVER BRIDGE AT US-75      * OLD BRIDGE **   CASE 2
       FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
          *** RUN DATE & TIME: 05-14-88  15:57

*** START PROCESSING CROSS SECTION - "OFBR2"
 BR   OFBR2  560
 GR        5400 657 5420 642 5940 642 5960 657 5400 657
 CD        3 31 2 657
 PW        643 17.5
 KD        5400 5960 5680 5400 5960 5680
 *

*** FINISH PROCESSING CROSS SECTION - "OFBR2"
*** CROSS SECTION "OFBR2" ADDED TO DAF, RECORD NO. =    5, IXTYPE =    2

--- DATA SUMMARY FOR SECID "OFBR2" AT SRD =    560.  ERR-CODE =      0

    SKEW     IHFNO    VSLOPE        EK        CK
      .0        0.     .0000       .50       .00

X-Y COORDINATE PAIRS  (NGP =   5):
      X      Y          X      Y          X      Y          X      Y
  5400.0  657.00    5420.0  642.00    5940.0  642.00    5960.0  657.00
  5400.0  657.00

 X-Y MAX-MIN POINTS:
    XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
  5400.0  657.00    5420.0  642.00    5960.0  657.00    5400.0  657.00

SUBAREA BREAKPOINTS (NSA =  3):
         0.    540.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  ABSLPL  ABSLPR
    3     31.0 ******** *******   2.00   657.00 ******* *******

PIER DATA:  NPW =  1   PCODE = 0.
    PELV  PWDTH      PELV  PWDTH      PELV  PWDTH      PELV  PWDTH
  643.00  17.5
```

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

*** START PROCESSING CROSS SECTION - "APRCH"

```
AS   APRCH   1151
GR        0 671 16 665.7 70 638 200 638 230 618 275 617 320 618
GR        350 638 353 636.17 365 638.99 589 639.5 626 643.65 1491.8 647.9
GR        3381 638.9 4810 642.54 5468 641.67 9308 646 9873 654 11629 662
GR        15883 738
SA        16 589
EX
```

*** FINISH PROCESSING CROSS SECTION - "APRCH"
*** CROSS SECTION "APRCH" ADDED TO DAF, RECORD NO. = 6, IXTYPE = 5

--- DATA SUMMARY FOR SECID "APRCH" AT SRD = 1151. ERR-CODE = 0

SKEW	IHFNO	VSLOPE	EK	CK
.0	0.	.0000	.50	.00

X-Y COORDINATE PAIRS (NGP = 20):

X	Y	X	Y	X	Y	X	Y
.0	671.00	16.0	665.70	70.0	638.00	200.0	638.00
230.0	618.00	275.0	617.00	320.0	618.00	350.0	638.00
353.0	636.17	365.0	638.99	589.0	639.50	626.0	643.65
1491.8	647.90	3381.0	638.90	4810.0	642.54	5468.0	641.67
9308.0	646.00	9873.0	654.00	11629.0	662.00	15883.0	738.00

X-Y MAX-MIN POINTS:

XMIN	Y	X	YMIN	YMAX	Y	X	YMAX
.0	671.00	275.0	617.00	15883.0	738.00	15883.0	738.00

SUBAREA BREAKPOINTS (NSA = 3):
16. 589.

ROUGHNESS COEFFICIENTS (NSA = 3):
.048 .060 .048

BRIDGE PROJECTION DATA: XREFLT XREFRT FDSTLT FDSTRT
******* ******* ******* *******

NPROF, NQV = 3 6

+++ BEGINNING PROFILE CALCULATIONS -- 3

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WSPRO         FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186           MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                        HY7CASE2.DAT
        CANEY RIVER BRIDGE AT US-75       * OLD BRIDGE **  CASE 2
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-14-88  15:57

 XSID:CODE   SRDL    LEW      AREA   VHD     HF      EGL     CRWS       Q     WSEL
      SRD    FLEN    REW         K  ALPH     HO      ERR      FR#     VEL

EXIT :XS    ******    68.    51872.   .07 *****  651.65  646.88 108000.  651.58
       0. ******  8652. 5397969.  1.10 ***** *******     .16    2.08

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                           "FULLV"     KRATIO =  1.77

FULLV:FV      560.    73.   76697.   .03   .13  651.78 ******* 108000.  651.75
      560.   560.  9469. 9581143.  1.03   .00     .00     .09    1.41
        <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

APRCH:AS      591.    43.   85141.   .03   .06  651.84 ******* 108000.  651.82
     1151.   591.  9719. ******** 1.03   .00     .00     .08    1.27
        <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

A3 ---    5148.   6456.   5195.

QS ---   33093.  41508.  33399.

BOLEW ---      38.   3111.   5407.

BOREW ---     506.   3611.   5953.

STAGLT --- ********   1662.   4606.

STAGRT ---    1662.   4606.********

AS ---   15876.  29082.  40183.  85141.

KS --- 2205981.4155625.4930777.********

CA3 ---    4063.   4581.   3668.  12312.

CJ ---      .789    .710    .706

CDF ---    1.569   1.044    .708

CRF ---    2.324   2.337   2.267

QS ---   35831.  40620.  31548.

CDF ---    1.698   1.022    .669
```

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR	500.	38.	5245.	1.22	.74	653.18	636.16	35831.	651.96
560.	500.	507.	635101.	1.68	.49	.00	.47	6.83	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.771	.015	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	500.	40.	18661.	.06	.27	653.60	633.17	35831.	653.54
1091.	633.	1662.	4763323.	1.09	.15	.00	.10	1.92	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.703	.396	2876298.	41.	522.	653.51

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = .59

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	60.	40.	18673.	.06	.01	653.61	*******	35831.	653.54
1151.	60.	1662.	2807285.	1.09	.00	.00	.10	1.92	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	522.	3112.	6404.	1.25	.30	652.89	644.50	40620.	651.64
560.	522.	3610.	1081158.	2.00	.79	.00	.44	6.34	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.707	.032	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	522.	1662.	32910.	.02	.19	653.14	640.47	40620.	653.12
1113.	665.	4606.	5219516.	1.00	.05	.00	.07	1.23	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.823	.751	1301983.	3100.	3622.	653.09

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	38.	1662.	32919.	.02	.00	653.14	*******	40620.	653.12
1151.	38.	4606.	5109088.	1.00	.00	.00	.07	1.23	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	560.	5407.	5179.	1.16	.50	652.88	646.92	31548.	651.72
560.	560.	5953.	714777.	2.01	.76	.00	.49	6.09	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.705	.029	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	560.	4606.	47528.	.01	.29	653.25	646.92	31548.	653.24
1151.	843.	9819.	4307367.	1.00	.07	-.01	.04	.66	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.890	.846	664391.	5400.	5960.	653.21

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	******	40.	99172.	.02	*****	653.28	*******	108000.	653.26
1151.	******	9821.	********	1.01	*****	1.44	.06	1.09	

STAGLT --- ******** 1679. 4604.

STAGRT --- 1679. 4604.********

AS --- 18323. 33192. 47658. 99172.

KS --- 2714773.5203688.6464711.********

CA3 --- 4042. 4529. 3649. 12220.

CJ --- .771 .707 .705

CDF --- 1.698 1.022 .669

CRF --- 2.312 2.338 2.272

QS --- 35759. 40524. 31718.

CDF --- 1.754 1.037 .653

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

	SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR		500.	38.	5242.	1.22	.73	653.17	636.12	35759.	651.95
	560.	500.	506.	634559.	1.69	.50	.00	.47	6.82	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.770	.015	*******	******	******	******

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	500.	40.	18749.	.06	.26	653.58	633.15	35759.	653.52
1091.	633.	1679.	4930258.	1.09	.15	.00	.10	1.91	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.706	.398	2966617.	41.	522.	653.49

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = .57

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	60.	40.	18760.	.06	.01	653.59	*******	35759.	653.53
1151.	60.	1679.	2813079.	1.09	.00	.00	.10	1.91	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	522.	3112.	6404.	1.24	.30	652.89	644.50	40524.	651.64
560.	522.	3610.	1081215.	2.00	.78	.00	.44	6.33	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.707	.032	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	522.	1679.	32751.	.02	.19	653.13	640.45	40524.	653.11
1113.	667.	4604.	5277839.	1.00	.05	.00	.07	1.24	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.821	.750	1319737.	3100.	3622.	653.08

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	38.	1679.	32759.	.02	.00	653.14	*******	40524.	653.11
1151.	38.	4604.	5091039.	1.00	.00	.00	.07	1.24	

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	560.	5407.	5185.	1.17	.51	652.90	646.93	31718.	651.73
560.	560.	5953.	716110.	2.01	.77	.00	.50	6.12	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.705	.029	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	560.	4604.	47742.	.01	.31	653.28	646.93	31718.	653.28
1151.	846.	9822.	4235967.	1.00	.08	-.01	.04	.66	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.891	.846	652422.	5400.	5960.	653.24

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	******	40.	99224.	.02	*****	653.28	*******	108000.	653.27
1151.	******	9821.	********	1.01	*****	.01	.06	1.09	

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WSPRO         FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                          HY7CASE2.DAT
        CANEY RIVER BRIDGE AT US-75       * OLD BRIDGE **   CASE 2
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-14-88  15:57

 XSID:CODE   SRDL    LEW      AREA   VHD    HF      EGL     CRWS       Q    WSEL
       SRD   FLEN    REW         K  ALPH    HO      ERR      FR#     VEL

EXIT :XS   ******   107.    29837.   .06 *****  648.89  639.74  51400.  648.83
        0. ******  7701. 2569841.  1.39 ***** *******     .18    1.72

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                           "FULLV"     KRATIO =  1.96

FULLV:FV     560.    73.   50960.   .02   .11  649.00 *******  51400.  648.99
      560.   560.  9348. 5034312.  1.12   .00     .00     .08    1.01
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

APRCH:AS     591.    48.   58570.   .01   .05  649.06 *******  51400.  649.04
     1151.   591.  9523. 6162624.  1.08   .00     .00     .06     .88
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

A3 ---    4095.   5095.   3698.

QS ---   16332.  20318.  14749.

BOLEW ---      39.   3117.   5411.

BOREW ---     274.   3605.   5949.

STAGLT --- ********   1541.   4651.

STAGRT ---    1541.   4651.********

AS ---   11191.  21425.  25954.  58570.

KS --- 1399913.2407802.2457438.6265153.

CA3 ---    3533.   3645.   2621.   9799.

CJ ---     .863    .715    .709

CDF ---    1.422   1.029    .732

CRF ---    2.375   2.325   2.246

QS ---   18951.  19147.  13301.

CDF ---    1.650    .969    .660
```

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR	500.	39.	4119.	.46	.31	649.55	630.10	18951.	649.09
560.	500.	274.	660008.	1.40	.11	-.01	.23	4.60	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.844	.011	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	500.	47.	12134.	.05	.12	649.72	628.07	18951.	649.67
1091.	585.	1541.	2568211.	1.20	.05	.00	.11	1.56	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.678	.233	1970155.	41.	522.	649.65

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = .61

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	60.	47.	12143.	.05	.01	649.73	*******	18951.	649.68
1151.	60.	1541.	1558100.	1.19	.00	.00	.11	1.56	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	522.	3117.	5113.	.43	.20	649.45	641.96	19147.	649.03
560.	522.	3605.	755480.	1.96	.24	.00	.29	3.74	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.714	.032	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	522.	1541.	23141.	.01	.12	649.60	639.10	19147.	649.59
1113.	666.	4651.	2653641.	1.00	.03	.00	.05	.83	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.832	.716	751921.	3100.	3622.	649.57

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186              MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                          HY7CASE2.DAT
        CANEY RIVER BRIDGE AT US-75       + OLD BRIDGE **    CASE 2
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-14-88  15:57

 XSID:CODE   SRDL    LEW      AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW         K  ALPH    HO     ERR     FR#     VEL

APRCH:XS      38.  1541.    23148.   .01   .00  649.61 *******  19147.  649.60
     1151.    38.  4651.  2739051.  1.00   .00     .00     .05     .83

          <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW      AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW         K  ALPH    HO     ERR     FR#     VEL

OFBR2:BR      560.  5410.     3787.   .38   .49  649.54  644.76  13301.  649.15
      560.    560.  5950.   428762.  1.99   .19    -.01     .33    3.51

     TYPE PPCD FLOW      C    P/A    LSEL   BLEN   XLAB   XRAB
       3.   0.   1.   .708   .028 ******* ****** ****** ******

 XSID:CODE   SRDL    LEW      AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW         K  ALPH    HO     ERR     FR#     VEL

SLICE:AS      560.  4651.    29527.   .00   .20  649.78  644.76  13301.  649.77
     1151.    796.  9574.  1996147.  1.00   .04    -.01     .03     .45

       M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
       .885   .822   356811.  5400.  5960.   649.75

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 XSID:CODE   SRDL    LEW      AREA   VHD    HF     EGL    CRWS       Q    WSEL
       SRD   FLEN    REW         K  ALPH    HO     ERR     FR#     VEL

APRCH:XS    ******    47.    64558.   .01 *****  649.68 *******  51400.  649.67
     1151. ******  9567.  7187433.  1.06 *****     .63     .06     .80

STAGLT --- ********   1543.   4642.

STAGRT ---    1543.   4642.********

AS ---   12136.  23315.  29107.  64558.

KS --- 1556260.2778452.2953388.7288099.

CA3 ---    3478.   3652.   2682.   9811.

CJ ---      .844    .714    .708

CDF ---    1.650    .969    .660

CRF ---    2.361   2.327   2.253

QS ---   18550.  19199.  13651.

CDF ---    1.690    .980    .655

          /////RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>
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	SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR		500.	39.	4118.	.44	.30	649.53	629.94	18550.	649.08
	560.	500.	274.	659814.	1.40	.10	-.01	.22	4.50	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.845	.011	*******	******	******	******

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	500.	47.	12090.	.04	.12	649.69	627.94	18550.	649.64
1091.	585.	1543.	2617034.	1.20	.04	.00	.10	1.53	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.678	.232	2011457.	41.	522.	649.62

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = .59

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	60.	47.	12099.	.04	.01	649.69	*******	18550.	649.65
1151.	60.	1543.	1550023.	1.20	.00	.00	.10	1.53	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	522.	3117.	5113.	.43	.20	649.45	641.96	19199.	649.02
560.	522.	3605.	755438.	1.96	.24	.00	.29	3.75	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.714	.032	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	522.	1543.	23073.	.01	.12	649.61	639.10	19199.	649.59
1113.	665.	4642.	2675270.	1.00	.03	.00	.05	.83	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.832	.716	760343.	3100.	3622.	649.57

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	38.	1543.	23080.	.01	.00	649.61	*******	19199.	649.60
1151.	38.	4642.	2731905.	1.00	.00	.00	.05	.83	

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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                          HY7CASE2.DAT
        CANEY RIVER BRIDGE AT US-75       * OLD BRIDGE **    CASE 2
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-14-88  15:57

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW      AREA   VHD    HF     EGL     CRWS       Q     WSEL
       SRD   FLEN    REW         K  ALPH    HO     ERR      FR#     VEL

OF8R2:BR      560.  5410.    3795.   .40   .51  649.57  644.81  13651.  649.17
      560.    560.  5950.  430142.  1.99   .20    -.01     .34    3.60

     TYPE PPCD FLOW      C     P/A    LSEL   BLEN   XLAB   XRAB
       3.   0.   1.   .708    .028 ******* ****** ****** ******

 XSID:CODE   SRDL    LEW      AREA   VHD    HF     EGL     CRWS       Q     WSEL
       SRD   FLEN    REW         K  ALPH    HO     ERR      FR#     VEL

SLICE:AS      560.  4642.   29806.   .00   .21  649.82  644.81  13651.  649.81
     1151.    796.  9577. 2010922.  1.00   .05    -.02     .03     .46

       M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
       .885   .823   357839.  5400.  5960.   649.79

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 XSID:CODE   SRDL    LEW      AREA   VHD    HF     EGL     CRWS       Q     WSEL
       SRD   FLEN    REW         K  ALPH    HO     ERR      FR#     VEL

APRCH:XS    ******    47.    64618.   .01 *****  649.69 *******  51400.  649.68
     1151. ******  9568. 7198098.  1.06 *****     .01     .06     .80

STAGLT --- ********   1543.   4641.

STAGRT ---    1543.   4641.********

AS ---   12145.  23328.  29145.  64618.

KS --- 1557880.2781534.2959284.7298697.

CA3 ---    3481.   3652.   2687.   9819.

CJ ---      .845    .714    .708

CDF ---    1.690    .980    .655

CRF ---    2.361   2.327   2.254

QS ---   18551.  19183.  13666.

CDF ---    1.691    .979    .656

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW      AREA   VHD    HF     EGL     CRWS       Q     WSEL
       SRD   FLEN    REW         K  ALPH    HO     ERR      FR#     VEL

BRDGE:BR      500.    39.    4118.   .44   .30  649.53  629.94  18551.  649.08
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      3.   0.   1.   .845   .011 ******* ****** ****** ******

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL     CRWS       Q    WSEL
      SRD    FLEN    REW        K  ALPH    HO     ERR      FR#     VEL

SLICE:AS      500.    47.   12090.   .04   .12  649.69  627.94  18551.  649.64
     1091.    585.  1543. 2618129.  1.20   .04     .00     .10    1.53

       M(G)   M(K)        KQ   XLKQ   XRKQ    OTEL
       .678   .232  2012334.    41.   522.   649.62

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                            "APRCH"     KRATIO =   .59
```

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	60.	47.	12099.	.04	.01	649.69	*******	18551.	649.65
1151.	60.	1543.	1550015.	1.20	.00	.00	.10	1.53	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	522.	3117.	5113.	.43	.20	649.45	641.96	19183.	649.02
560.	522.	3605.	755431.	1.96	.24	.00	.29	3.75	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.714	.032	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	522.	1543.	23064.	.01	.12	649.60	639.10	19183.	649.59
1113.	664.	4641.	2672704.	1.00	.03	.00	.05	.83	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.832	.716	759882.	3100.	3622.	649.57

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	38.	1543.	23070.	.01	.00	649.61	*******	19183.	649.60
1151.	38.	4641.	2730532.	1.00	.00	.00	.05	.83	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	560.	5410.	3795.	.40	.51	649.57	644.81	13666.	649.17
560.	560.	5950.	430148.	1.99	.20	-.01	.34	3.60	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.708	.028	*******	******	******	******

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WSPRO         FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

       MULTIPLE BRIDGE OPENING RUN                          HY7CASE2.DAT
       CANEY RIVER BRIDGE AT US-75       * OLD BRIDGE **    CASE 2
       FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
          *** RUN DATE & TIME: 05-14-88  15:57

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS        Q    WSEL
      SRD    FLEN     REW         K  ALPH     HO      ERR      FR#      VEL

SLICE:AS      560.   4641.    29818.   .00    .21   649.82   644.81   13866.  649.82
     1151.    796.   9577.  2013188.  1.00    .05     -.02      .03      .46

      M(G)    M(K)       KQ    XLKQ    XRKQ     OTEL
      .885    .823   358130.   5400.   5960.   649.79

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS        Q    WSEL
      SRD    FLEN     REW         K  ALPH     HO      ERR      FR#      VEL

APRCH:XS    ******     47.    64618.   .01  *****   649.69  *******   51400.  649.68
     1151.  ******   9568.  7198098.  1.06  *****      .00      .06      .80
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WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                          HY7CASE2.DAT
        CANEY RIVER BRIDGE AT US-75       * OLD BRIDGE **    CASE 2
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-14-88  15:57

 XSID:CODE   SRDL     LEW      AREA   VHD     HF      EGL     CRWS       Q     WSEL
       SRD   FLEN     REW         K  ALPH     HO      ERR      FR#     VEL

EXIT :XS    ******   111.    25741.   .06 *****  648.30  637.60  42800.  648.24
        0. ******  7410. 2139542.  1.50 ***** *******     .18    1.66

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                             "FULLV"     KRATIO =  2.01

FULLV:FV      560.    74.   45647.   .02   .11  648.41 *******  42800.  648.40
      560.   560.  9322. 4306381.  1.15   .00     .00     .08     .94
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

APRCH:AS      591.    50.   52981.   .01   .05  648.46 *******  42800.  648.45
     1151.   591.  9481. 5264939.  1.11   .00     .00     .06     .81
         <<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

A3 ---    3959.   4809.   3382.

QS ---   13946.  16940.  11914.

BOLEW ---      40.   3119.   5411.

BOREW ---     270.   3603.   5949.

STAGLT --- ********   1556.   4665.

STAGRT ---    1556.   4665.********

AS ---   10321.  19661.  22999.  52981.

KS --- 1263014.2087193.2024479.5374686.

CA3 ---    3494.   3448.   2398.   9340.

CJ ---     .883    .717    .709

CDF ---    1.387   1.019    .739

CRF ---    2.389   2.323   2.237

QS ---   16445.  15783.  10572.

CDF ---    1.635    .950    .656
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WSPRO         FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186           MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                          HY7CASE2.DAT
        CANEY RIVER BRIDGE AT US-75       * OLD BRIDGE **   CASE 2
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-14-88  15:57

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL     CRWS       Q    WSEL
      SRD    FLEN    REW        K  ALPH    HO     ERR      FR#     VEL

BRDGE:BR      500.    40.    3983.   .35   .26  648.86  629.08  16445.  648.50
     560.    500.   271.  631342.  1.33   .07    -.01     .20    4.13

    TYPE PPCD FLOW      C     P/A    LSEL   BLEN   XLAB   XRAB
       3.   0.   1.   .867   .010 ******* ****** ****** ******

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL     CRWS       Q    WSEL
      SRD    FLEN    REW        K  ALPH    HO     ERR      FR#     VEL

SLICE:AS      500.    49.   11090.   .04   .11  649.00  627.18  16445.  648.96
     1091.   576.  1556. 2257550.  1.22   .04     .00     .11    1.48

       M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
       .681   .197 1815139.    41.    522.   648.94

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

 ===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                          "APRCH"     XRATIO =   .61

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL     CRWS       Q    WSEL
      SRD    FLEN    REW        K  ALPH    HO     ERR      FR#     VEL

APRCH:XS       60.    49.   11100.   .04   .01  649.01 *******  16445.  648.97
     1151.    60.  1556. 1382253.  1.22   .00     .00     .11    1.48

            <<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL     CRWS       Q    WSEL
      SRD    FLEN    REW        K  ALPH    HO     ERR      FR#     VEL

OFBR1:BR      522.  3118.    4840.   .32   .19  648.79  641.49  15783.  648.46
     560.    522.  3604.  691891.  1.95   .17     .00     .25    3.26

    TYPE PPCD FLOW      C     P/A    LSEL   BLEN   XLAB   XRAB
       3.   0.   1.   .716   .032 ******* ****** ****** ******

 XSID:CODE   SRDL    LEW     AREA   VHD    HF     EGL     CRWS       Q    WSEL
      SRD    FLEN    REW        K  ALPH    HO     ERR      FR#     VEL

SLICE:AS      522.  1556.   21105.   .01   .11  648.92  639.10  15783.  648.92
     1113.   668.  4665. 2230550.  1.00   .02     .00     .05     .75

       M(G)   M(K)       KQ   XLKQ   XRKQ    OTEL
       .832   .705  656783.  3100.  3622.   648.89

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>
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MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	38.	1556.	21112.	.01	.00	648.93	*******	15783.	648.92
1151.	38.	4665.	2350108.	1.00	.00	.00	.05	.75	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	560.	5411.	3487.	.28	.48	648.88	644.37	10572.	648.59
560.	560.	5949.	374449.	1.99	.12	-.01	.30	3.03	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.709	.028	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	560.	4665.	26079.	.00	.17	649.09	644.37	10572.	649.09
1151.	777.	9526.	1626889.	1.00	.04	-.01	.03	.41	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.884	.813	304662.	5400.	5960.	649.06

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	******	49.	58001.	.01	*****	648.99	*******	42800.	648.98
1151.	******	9519.	6068603.	1.09	*****	.53	.05	.74	

STAGLT --- ******** 1556. 4654.

STAGRT --- 1556. 4654.********

AS --- 11122. 21239. 25640. 58001.

KS --- 1385687.2379272.2410523.6175482.

CA3 --- 3452. 3464. 2471. 9388.

CJ --- .867 .716 .709

CDF --- 1.635 .950 .656

CRF --- 2.375 2.326 2.245

QS --- 16093. 15817. 10891.

CDF --- 1.676 .959 .652

XSID:CODE	SRDL	CEW	AREA	VHD	HF	EGL	LRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR	500.	40.	3982.	.34	.25	648.84	628.95	16093.	648.50
560.	500.	271.	631145.	1.33	.07	-.01	.20	4.04	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.868	.010	*******	******	******	******

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	500.	49.	11051.	.04	.10	648.98	627.03	16093.	648.94
1091.	576.	1556.	2303172.	1.22	.04	.00	.10	1.46	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.681	.195	1855038.	41.	522.	648.91

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = .60

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	60.	49.	11060.	.04	.00	648.98	*******	16093.	648.94
1151.	60.	1556.	1375910.	1.22	.00	.00	.10	1.46	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	522.	3118.	4839.	.32	.19	648.79	641.49	15817.	648.46
560.	522.	3604.	691755.	1.95	.17	.00	.25	3.27	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.716	.032	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	522.	1556.	21029.	.01	.11	648.92	639.10	15817.	648.91
1113.	668.	4654.	2244532.	1.00	.02	.00	.05	.75	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.832	.704	663261.	3100.	3622.	648.89

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	38.	1556.	21035.	.01	.00	648.93	*******	15817.	648.92
1151.	38.	4654.	2341266.	1.00	.00	.00	.05	.75	

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	560.	5411.	3496.	.30	.51	648.91	644.40	10891.	648.61
560.	560.	5949.	376016.	1.99	.13	-.01	.30	3.12	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.709	.028	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	560.	4654.	26358.	.00	.18	649.13	644.40	10891.	649.13
1151.	777.	9529.	1643110.	1.00	.04	-.01	.03	.41	

M(G)	M(K)	KQ	(LKQ	XRKQ	OTEL
.884	.815	306009.	5400.	5960.	649.11

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	******	49.	58056.	.01	*****	649.00	*******	42800.	648.99
1151.	******	9519.	6077748.	1.09	*****	.01	.05	.74	

STAGLT --- ******** 1556. 4653.

STAGRT --- 1556. 4653.********

AS --- 11131. 21249. 25676. 58056.

KS --- 1387084.2381734.2415737.6184556.

CA3 --- 3455. 3464. 2477. 9397.

CJ --- .868 .716 .709

CDF --- 1.676 .959 .652

CRF --- 2.375 2.326 2.245

QS --- 16090. 15802. 10909.

CDF --- 1.676 .959 .653

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR	500.	40.	3982.	.34	.25	648.84	628.93	16090.	648.50

```
      3.   0.   1.   .868   .010 ******* ****** ****** ******

XSID:CODE   SRDL    LEW      AREA   VHD     HF      EGL     CRWS        Q     WSEL
     SRD    FLEN    REW         K   ALPH    HO      ERR      FR#      VEL

SLICE:AS     500.    49.    11050.   .04    .10   648.98   627.03   16090.   648.93
    1091.    576.  1556.  2303687.  1.22    .04      .00      .10    1.46

     M(G)    M(K)       KQ   XLKQ   XRKQ    OTEL
     .681    .195  1855485.    41.    522.  648.91

                  <<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
                          "APRCH"     KRATIO =   .60
```

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	60.	49.	11059.	.04	.00	648.98	*******	16090.	648.94
1151.	60.	1556.	1375851.	1.22	.00	.00	.10	1.45	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	522.	3118.	4840.	.32	.19	648.79	641.49	15802.	648.46
560.	522.	3604.	691762.	1.95	.17	.00	.25	3.27	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.716	.032	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	522.	1556.	21019.	.01	.11	648.92	639.10	15802.	648.91
1113.	667.	4653.	2242211.	1.00	.02	.00	.05	.75	

M(G)	M(K)	KQ	XLKQ	XRKQ	QTEL
.831	.704	662855.	3100.	3622.	648.89

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	38.	1556.	21025.	.01	.00	648.92	*******	15802.	648.92
1151.	38.	4653.	2340002.	1.00	.00	.00	.05	.75	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	560.	5411.	3496.	.30	.51	648.91	644.40	10909.	648.61
560.	560.	5949.	376033.	1.99	.13	-.01	.30	3.12	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.709	.028	*******	******	******	******

MULTIPLE BRIDGE OPENING RUN HY7CASE2.DAT
CANEY RIVER BRIDGE AT US-75 * OLD BRIDGE ** CASE 2
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 15:57

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	560.	4653.	26373.	.00	.18	649.13	644.40	10909.	649.13
1151.	777.	9529.	1645912.	1.00	.04	-.01	.03	.41	

M(G)	M(K)	KQ	XLKQ	XRKQ	QTEL
.884	.815	306396.	5400.	5960.	649.11

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	******	49.	58058.	.01	*****	649.00	*******	42800.	648.99
1151.	******	9519.	6078034.	1.09	*****	.00	.05	.74	

ER

APPENDIX H

Case III - Profiles without Embankment

(50-year, 100-year, and 1986 Flood)

*** RUN DATE & TIME: 05-14-88 16:20

```
 T1       MULTIPLE BRIDGE OPENING RUN                          HY7CAS3.DAT
 T2       CANEY RIVER BRIDGE AT US-75  ** WITHOUT BRIDGES **   CASE 3
 T3       FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
 *
 Q        108000 51400 42800
*** Q-DATA FOR SEC-ID, ISEQ =          1
 SK       .0004 .0004 .0004
 *
```

MULTIPLE BRIDGE OPENING RUN HY7CAS3.DAT
CANEY RIVER BRIDGE AT US-75 ** WITHOUT BRIDGES ** CASE 3
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 16:20

*** START PROCESSING CROSS SECTION - "EXIT "

```
XS   EXIT  0 * * *
GR         0 670 60 652 100 650 160 640 200 617 230 614
GR         270 617 290 635 400 639 500 651 1600 645 3047 644
GR         5313 644 8282 650 10625 660 11250 670
SA         0 500
N          .048 .06 .048
*
```

*** FINISH PROCESSING CROSS SECTION - "EXIT "
*** CROSS SECTION "EXIT " ADDED TO DAF, RECORD NO. = 1, IXTYPE = 1

--- DATA SUMMARY FOR SECID "EXIT " AT SRD = 0. ERR-CODE = 0

SKEW	IHFNO	VSLOPE	EK	CK
.0	0.	.0000	.50	.00

X-Y COORDINATE PAIRS (NGP = 16):

X	Y	X	Y	X	Y	X	Y
.0	670.00	60.0	652.00	100.0	650.00	160.0	640.00
200.0	617.00	230.0	614.00	270.0	617.00	290.0	635.00
400.0	639.00	500.0	651.00	1600.0	645.00	3047.0	644.00
5313.0	644.00	8282.0	650.00	10625.0	660.00	11250.0	670.00

X-Y MAX-MIN POINTS:

XMIN	Y	X	YMIN	XMAX	Y	X	YMAX
.0	670.00	230.0	614.00	11250.0	670.00	.0	670.00

SUBAREA BREAKPOINTS (NSA = 3):
0. 500.

ROUGHNESS COEFFICIENTS (NSA = 3):
.048 .060 .048

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                              HY7CAS3.DAT
        CANEY RIVER BRIDGE AT US-75  ** WITHOUT BRIDGES **   CASE 3
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-14-88  16:20

*** START PROCESSING CROSS SECTION - "FULLV"
  XS   FULLV        542
  GR         0 672.99 70 665.46 80 618 125 617 170 618 190 625 218.4 627
  GR         245 637.6 395.72 639.24 540.13 650 550.16 649.23 3099 642.6
  GR         3345 639.52 3430 640.22 4857.5 643.64 5457 639.82 9315 648.23
  GR         10765 681.41
  SA         0 540.13
  *

*** FINISH PROCESSING CROSS SECTION - "FULLV"
*** CROSS SECTION "FULLV" ADDED TO DAF, RECORD NO. =    2, IXTYPE =    1

--- DATA SUMMARY FOR SECID "FULLV" AT SRD =    542.  ERR-CODE =      0

     SKEW      IHFNO    VSLOPE        EK        CK
       .0         0.     .0000       .50       .00

X-Y COORDINATE PAIRS  (NGP =  18):
       X      Y          X      Y          X      Y          X      Y
      .0  672.99       70.0  665.46      80.0  618.00     125.0  617.00
   170.0  618.00      190.0  625.00      219.4  627.00     245.0  637.60
   395.7  639.24      540.1  650.00      550.2  649.23    3099.0  642.60
  3345.0  639.52     3430.0  640.22     4857.5  643.64    5457.0  639.82
  9315.0  648.23    10765.0  681.41

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
       .0  672.99      125.0  617.00    10765.0  681.41    10765.0  681.41

SUBAREA BREAKPOINTS (NSA =  3):
          0.    540.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .048    .060    .048
```

MULTIPLE BRIDGE OPENING RUN HY7CAS3.DAT
CANEY RIVER BRIDGE AT US-75 ** WITHOUT BRIDGES ** CASE 3
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 16:20

*** START PROCESSING CROSS SECTION - "FULV2"
XS FULV2 560
*

*** FINISH PROCESSING CROSS SECTION - "FULV2"
*** CROSS SECTION "FULV2" ADDED TO DAF, RECORD NO. = 3, IXTYPE = 1

--- DATA SUMMARY FOR SECID "FULV2" AT SRD = 560. ERR-CODE = 0

SKEW	IHFNO	VSLOPE	EK	CK
.0	0.	.0000	.50	.00

X-Y COORDINATE PAIRS (NGP = 18):

X	Y	X	Y	X	Y	X	Y
.0	672.99	70.0	665.46	80.0	618.00	125.0	617.00
170.0	618.00	190.0	625.00	218.4	627.00	245.0	637.60
395.7	639.24	540.1	650.00	550.2	649.23	3099.0	642.60
3345.0	639.52	3430.0	640.22	4857.5	643.64	5457.0	639.82
9315.0	648.23	10765.0	681.41				

X-Y MAX-MIN POINTS:

XMIN	Y	X	YMIN	XMAX	Y	X	YMAX
.0	672.99	125.0	617.00	10765.0	681.41	10765.0	681.41

SUBAREA BREAKPOINTS (NSA = 3):
0. 540.

ROUGHNESS COEFFICIENTS (NSA = 3):
.048 .060 .048

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                              HY7CAS3.DAT
        CANEY RIVER BRIDGE AT US-75  ** WITHOUT BRIDGES **   CASE 3
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
          *** RUN DATE & TIME: 05-14-88  16:20

*** START PROCESSING CROSS SECTION - "APRCH"
  XS   APRCH   1151
  GR        0 671 16 665.7 70 638 200 638 230 618 275 617 320 618
  GR        350 638 353 636.17 365 638.99 589 639.5 626 643.65 1491.8 647.9
  GR        3381 638.9 4810 642.54 5468 641.67 9308 646 9873 654 11629 662
  GR        15883 738
  SA        16 589
  *

*** FINISH PROCESSING CROSS SECTION - "APRCH"
*** CROSS SECTION "APRCH" ADDED TO DAF, RECORD NO. =    4, IXTYPE =    1

--- DATA SUMMARY FOR SECID "APRCH" AT SRD =   1151.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE         EK         CX
       .0         0.      .0000        .50        .00

X-Y COORDINATE PAIRS  (NGP =  20):
       X       Y          X       Y          X       Y          X       Y
      .0  671.00       16.0  665.70       70.0  638.00      200.0  638.00
    230.0  618.00      275.0  617.00      320.0  618.00      350.0  638.00
    353.0  636.17      365.0  638.99      589.0  639.50      626.0  643.65
   1491.8  647.90     3381.0  638.90     4810.0  642.54     5468.0  641.67
   9308.0  646.00     9873.0  654.00    11629.0  662.00    15883.0  738.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
      .0  671.00       275.0  617.00    15883.0  738.00    15883.0  738.00

SUBAREA BREAKPOINTS (NSA =  3):
        16.     589.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048
```

```
WSPRO          FEDERAL HIGHWAY ADMINISTRATION - U. S. GEOLOGICAL SURVEY
P123186            MODEL  FOR  WATER-SURFACE  PROFILE  COMPUTATIONS

        MULTIPLE BRIDGE OPENING RUN                          HY7CAS3.DAT
        CANEY RIVER BRIDGE AT US-75  ** WITHOUT BRIDGES **   CASE 3
        FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
           *** RUN DATE & TIME: 05-14-88  16:20

*** START PROCESSING CROSS SECTION - "APRC2"
  XS   APRC2   1218
  *
  EX

*** FINISH PROCESSING CROSS SECTION - "APRC2"
*** CROSS SECTION "APRC2" ADDED TO DAF, RECORD NO. =    5, IXTYPE =    1

--- DATA SUMMARY FOR SECID "APRC2" AT SRD =   1218.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE        EK        CK
       .0         0.      .0000       .50       .00

X-Y COORDINATE PAIRS  (NGP =  20):
       X      Y          X      Y          X      Y          X      Y
      .0  671.00       16.0  665.70       70.0  638.00      200.0  638.00
    230.0  618.00      275.0  617.00      320.0  618.00      350.0  638.00
    353.0  636.17      365.0  638.99      589.0  639.50      626.0  643.65
   1491.8  647.90     3381.0  638.90     4810.0  642.54     5468.0  641.67
   9308.0  646.00     9873.0  654.00    11629.0  662.00    15883.0  738.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
       .0  671.00      275.0  617.00    15883.0  738.00    15883.0  738.00

SUBAREA BREAKPOINTS (NSA =  3):
         16.    589.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .048    .060    .048

 NPROF, NQV  =      3      6


+++ BEGINNING PROFILE CALCULATIONS --      3
```

MULTIPLE BRIDGE OPENING RUN HY7CAS3.DAT
CANEY RIVER BRIDGE AT US-75 ** WITHOUT BRIDGES ** CASE 3
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 16:20

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
EXIT :XS	******	68.	51872.	.07	*****	651.65	646.88	108000.	651.58
0.	******	8652.	5397969.	1.10	*****	*******	.16	2.08	
===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS. "FULLV" KRATIO = 1.77									
FULLV:XS	542.	73.	76660.	.03	.12	651.77	*******	108000.	651.74
542.	542.	9469.	9573515.	1.03	.00	.00	.09	1.41	
FULV2:XS	18.	73.	76688.	.03	.00	651.78	*******	108000.	651.75
560.	18.	9469.	9579293.	1.03	.00	.00	.09	1.41	
APRCH:XS	591.	43.	85132.	.03	.06	651.84	*******	108000.	651.82
1151.	591.	9719.	********	1.03	.00	.00	.08	1.27	
APRC2:XS	67.	43.	85199.	.03	.01	651.85	*******	108000.	651.82
1218.	67.	9719.	********	1.03	.00	.00	.08	1.27	

MULTIPLE BRIDGE OPENING RUN HY7CAS3.DAT
CANEY RIVER BRIDGE AT US-75 ** WITHOUT BRIDGES ** CASE 3.
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 16:20

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
EXIT :XS	******	107.	29837.	.06	*****	648.89	639.74	51400.	648.83
0.	******	7701.	2569841.	1.39	*****	*******	.18	1.72	

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"FULLV" KRATIO = 1.96

FULLV:XS	542.	73.	50926.	.02	.11	649.00	*******	51400.	648.98
542.	542.	9348.	5029602.	1.12	.00	.00	.08	1.01	
FULV2:XS	18.	73.	50948.	.02	.00	649.00	*******	51400.	648.99
560.	18.	9348.	5032741.	1.12	.00	.00	.08	1.01	
APRCH:XS	591.	48.	58559.	.01	.05	649.05	*******	51400.	649.04
1151.	591.	9523.	6160803.	1.08	.00	.00	.06	.88	
APRC2:XS	67.	48.	58607.	.01	.00	649.06	*******	51400.	649.05
1218.	67.	9523.	6168761.	1.08	.00	.00	.06	.88	

MULTIPLE BRIDGE OPENING RUN HY7CAS3.DAT
CANEY RIVER BRIDGE AT US-75 ** WITHOUT BRIDGES ** CASE 3
FLOOD FLOW OF 1986, 100 YRS, & 50 YRS RECURRENCE INTERVAL
*** RUN DATE & TIME: 05-14-88 16:20

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
EXIT :XS	******	111.	25741.	.06	*****	648.30	637.60	42800.	648.24
0.	******	7410.	2139542.	1.50	*****	*******	.18	1.66	
===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS. "FULLV" KRATIO = 2.01									
FULLV:XS	542.	74.	45616.	.02	.11	648.41	*******	42800.	648.40
542.	542.	9322.	4302251.	1.15	.00	.00	.08	.94	
FULV2:XS	18.	74.	45636.	.02	.00	648.41	*******	42800.	648.40
560.	18.	9322.	4305004.	1.15	.00	.00	.08	.94	
APRCH:XS	591.	50.	52970.	.01	.05	648.46	*******	42800.	648.45
1151.	591.	9481.	5263239.	1.11	.00	.00	.06	.81	
APRC2:XS	67.	50.	53016.	.01	.00	648.47	*******	42800.	648.45
1218.	67.	9481.	5270308.	1.11	.00	.00	.06	.81	

ER

APPENDIX I

Case IV - Profiles for Old Bridge without Lakes

(50-year and 100-year Flood)

*** RUN DATE & TIME: 09-30-88 17:08

```
  T1        MULTIPLE BRIDGE OPENING RUN                                HY7CAS4C.DAT
  T2        CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES**   CASE 4
  T3        FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
  *         BARTESVILLE SITE - 100 YRS & 50 YRS REC. INTERVAL
  Q          115697 91011
*** Q-DATA FOR SEC-ID, ISEQ =           1   .
  SK        .0004  .0004
  *
```

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

```
*** START PROCESSING CROSS SECTION - "EXIT "
 XS   EXIT  0 * * *
 GR        0 670 60 652 100 650 160 640 200 617 230 614
 GR        270 617 290 635 400 639 500 651 1600 645 3047 644
 GR        5313 644 8282 650 10625 660 11250 670
 SA        0 500
 N         .048 .06 .048
 *

*** FINISH PROCESSING CROSS SECTION - "EXIT "
*** CROSS SECTION "EXIT " ADDED TO DAF, RECORD NO. =    1, IXTYPE =    1

--- DATA SUMMARY FOR SECID "EXIT " AT SRD =      0.  ERR-CODE =      0

    SKEW     IHFNO    VSLOPE        EK        CK
      .0        0.     .0000       .50       .00

X-Y COORDINATE PAIRS  (NGP =  16):
      X      Y          X      Y          X      Y          X      Y
     .0  670.00       60.0  652.00     100.0  650.00     160.0  640.00
   200.0  617.00      230.0  614.00     270.0  617.00     290.0  635.00
   400.0  639.00      500.0  651.00    1600.0  645.00    3047.0  644.00
  5313.0  644.00     8282.0  650.00   10625.0  660.00   11250.0  670.00

 X-Y MAX-MIN POINTS:
    XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
      .0  670.00      230.0  614.00   11250.0  670.00        .0  670.00

SUBAREA BREAKPOINTS (NSA =  3):
         0.    500.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048
```

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

```
*** START PROCESSING CROSS SECTION - "FULLV"
  XS   FULLV     560
  GR         0 672.99 70 665.46 80 618 125 617 170 618 190 625 218.4 627
  GR         245 637.6 395.72 639.24 540.13 650 550.16 649.23 3099 642.6
  GR         3345 639.52 3430 640.22 4857.5 643.64 5457 639.82 9315 648.23
  GR         10765 681.41
  SA         0 540.13

*** FINISH PROCESSING CROSS SECTION - "FULLV"
*** CROSS SECTION "FULLV" ADDED TO DAF, RECORD NO. =    2, IXTYPE =    1

--- DATA SUMMARY FOR SECID "FULLV" AT SRD =    560.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE         EK         CK
       .0         0.      .0000        .50        .00

X-Y COORDINATE PAIRS  (NGP =  18):
       X      Y          X      Y          X      Y          X      Y
      .0  672.99       70.0  665.46      80.0  618.00     125.0  617.00
   170.0  618.00      190.0  625.00     218.4  627.00     245.0  637.60
   395.7  639.24      540.1  650.00     550.2  649.23    3099.0  642.60
  3345.0  639.52     3430.0  640.22    4857.5  643.64    5457.0  639.82
  9315.0  648.23    10765.0  681.41

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
       .0  672.99      125.0  617.00    10765.0  681.41    10765.0  681.41

SUBAREA BREAKPOINTS (NSA =  3):
          0.     540.

ROUGHNESS COEFFICIENTS (NSA =  3):
         .048     .060     .048
```

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

```
*** START PROCESSING CROSS SECTION - "BRDGE"
 BR   BRDGE   560
 GR        30 666 40 648 95 618 165 618 180 634 280 650
 GR        500 650 530 659 30 666
 SA        30 560
 CD        3 31 2 662
 PW        640 4.8 650 4.8 650 14.4
 KD        41.2 522.3 150 41.2 522.3 150
 *

*** FINISH PROCESSING CROSS SECTION - "BRDGE"
*** CROSS SECTION "BRDGE" ADDED TO DAF, RECORD NO. =    3, IXTYPE =    2

--- DATA SUMMARY FOR SECID "BRDGE" AT SRD =    560.  ERR-CODE =      0

    SKEW     IHFNO    VSLOPE        EK        CK
      .0        0.     .0000       .50       .00

X-Y COORDINATE PAIRS  (NGP =   9):
      X      Y          X      Y          X      Y          X      Y
    30.0  666.00      40.0  648.00      95.0  618.00     165.0  618.00
   180.0  634.00     280.0  650.00     500.0  650.00     530.0  659.00
    30.0  666.00

 X-Y MAX-MIN POINTS:
    XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
    30.0  666.00      95.0  618.00     530.0  659.00      30.0  666.00

SUBAREA BREAKPOINTS (NSA =  3):
        30.    560.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  ABSLPL  ABSLPR
    3      31.0 ******** *******   2.00   662.00 ******* *******

PIER DATA:  NPW =  3   PCODE = 0.
     PELV  PWDTH      PELV  PWDTH      PELV  PWDTH      PELV  PWDTH
   640.00   4.8     650.00   4.8     650.00  14.4
```

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

```
*** START PROCESSING CROSS SECTION - "OFBR1"
 BR   OFBR1   560
 GR        3100 657 3141 638 3581 638 3622 657 3100 657
 CD        3 31 2 657
 PW        638 15
 KD        3100 3622 3361 3100 3622 3361
 *

*** FINISH PROCESSING CROSS SECTION - "OFBR1"
*** CROSS SECTION "OFBR1" ADDED TO DAF, RECORD NO. =    4, IXTYPE =    2

--- DATA SUMMARY FOR SECID "OFBR1" AT SRD =    560.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
       .0        0.     .0000       .50       .00

X-Y COORDINATE PAIRS  (NGP =   5):
       X      Y          X      Y          X      Y          X      Y
   3100.0  657.00    3141.0  638.00    3581.0  638.00    3622.0  657.00
   3100.0  657.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
   3100.0  657.00    3141.0  638.00    3622.0  657.00    3100.0  657.00

SUBAREA BREAKPOINTS (NSA =  3):
         0.    540.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  ABSLPL  ABSLPR
    3      31.0 ******** *******   2.00   657.00 ******* *******

PIER DATA:  NPW =  1   PCODE = 0.
     PELV  PWDTH      PELV  PWDTH      PELV  PWDTH      PELV  PWDTH
   638.00  15.0
```

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

```
*** START PROCESSING CROSS SECTION - "OFBR2"
 BR   OFBR2  560
 GR        5400 657 5420 642 5940 642 5960 657 5400 657
 CD        3 31 2 657
 PW        643 17.5
 KD        5400 5960 5680 5400 5960 5680
 *

*** FINISH PROCESSING CROSS SECTION - "OFBR2"
*** CROSS SECTION "OFBR2" ADDED TO DAF, RECORD NO. =    5, IXTYPE =    2

--- DATA SUMMARY FOR SECID "OFBR2" AT SRD =    560.  ERR-CODE =      0

     SKEW     IHFNO    VSLOPE        EK        CK
       .0        0.     .0000       .50       .00

X-Y COORDINATE PAIRS  (NGP =   5):
       X      Y          X      Y          X      Y          X      Y
   5400.0  657.00    5420.0  642.00    5940.0  642.00    5960.0  657.00
   5400.0  657.00

 X-Y MAX-MIN POINTS:
    XMIN       Y          X    YMIN      XMAX       Y          X    YMAX
   5400.0  657.00    5420.0  642.00    5960.0  657.00    5400.0  657.00

SUBAREA BREAKPOINTS (NSA =  3):
         0.    540.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048

BRIDGE PARAMETERS:
 BRTYPE  BRWDTH     LSEL  USERCD  EMBSS   EMBELV  ABSLPL  ABSLPR
    3     31.0 ******** *******   2.00   657.00 ******* *******

PIER DATA:  NPW =  1   PCODE = 0.
     PELV  PWDTH      PELV  PWDTH      PELV  PWDTH      PELV  PWDTH
   643.00  17.5
```

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** . CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

```
*** START PROCESSING CROSS SECTION - "APRCH"
  AS   APRCH   1151
  GR        0 671 16 665.7 70 638 200 638 230 618 275 617 320 618
  GR        350 638 353 636.17 365 638.99 589 639.5 626 643.65 1491.8 647.9
  GR        3381 638.9 4810 642.54 5468 641.67 9308 646 9873 654 11629 662
  GR        15883 738
  SA        16 589
  *

*** FINISH PROCESSING CROSS SECTION - "APRCH"
*** CROSS SECTION "APRCH" ADDED TO DAF, RECORD NO. =    6, IXTYPE =    5

--- DATA SUMMARY FOR SECID "APRCH" AT SRD =   1151.  ERR-CODE =      0

     SKEW      IHFNO     VSLOPE        EK        CK
       .0         0.      .0000       .50       .00

X-Y COORDINATE PAIRS  (NGP =  20):
       X      Y          X      Y          X      Y          X      Y
      .0  671.00       16.0  665.70       70.0  638.00      200.0  638.00
   230.0  618.00      275.0  617.00      320.0  618.00      350.0  638.00
   353.0  636.17      365.0  638.99      589.0  639.50      626.0  643.65
  1491.8  647.90     3381.0  638.90     4810.0  642.54     5468.0  641.67
  9308.0  646.00     9873.0  654.00    11629.0  662.00    15883.0  738.00

 X-Y MAX-MIN POINTS:
     XMIN       Y          X    YMIN       XMAX       Y          X    YMAX
      .0  671.00       275.0  617.00    15883.0  738.00    15883.0  738.00

SUBAREA BREAKPOINTS (NSA =  3):
        16.    589.

ROUGHNESS COEFFICIENTS (NSA =  3):
        .048    .060    .048

BRIDGE PROJECTION DATA:  XREFLT  XREFRT  FDSTLT  FDSTRT
                         ******* ******* ******* *******
```

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

*** START PROCESSING CROSS SECTION - "APRC2"
XS APRC2 1236
*
EX

*** FINISH PROCESSING CROSS SECTION - "APRC2"
*** CROSS SECTION "APRC2" ADDED TO DAF, RECORD NO. = 7, IXTYPE = 1

--- DATA SUMMARY FOR SECID "APRC2" AT SRD = 1236. ERR-CODE = 0

SKEW	IHFNO	VSLOPE	EK	CK
.0	0.	.0000	.50	.00

X-Y COORDINATE PAIRS (NGP = 20):

X	Y	X	Y	X	Y	X	Y
.0	671.00	16.0	665.70	70.0	638.00	200.0	638.00
230.0	618.00	275.0	617.00	320.0	618.00	350.0	638.00
353.0	636.17	365.0	638.99	589.0	639.50	626.0	643.65
1491.8	647.90	3381.0	638.90	4810.0	642.54	5468.0	641.67
9308.0	646.00	9873.0	654.00	11629.0	662.00	15883.0	738.00

X-Y MAX-MIN POINTS:

XMIN	Y	X	YMIN	XMAX	Y	X	YMAX
.0	671.00	275.0	617.00	15883.0	738.00	15883.0	738.00

SUBAREA BREAKPOINTS (NSA = 3):
16. 589.

ROUGHNESS COEFFICIENTS (NSA = 3):
.048 .060 .048

NPROF, NQV = 2 5

+++ BEGINNING PROFILE CALCULATIONS -- 2

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
	SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL
EXIT :XS	******	63.	54361.	.08	*****	651.94	647.02	115697.	651.87
	0.	******	8719.	5784274.	1.08	*****	*******	.16	2.13
FULLV:FV	560.	73.	79428.	.03	.13	652.07	*******	115697.	652.04
	560.	560.	9481.	********	1.03	.00	.00	.09	1.46
APRCH:AS	591.	42.	87974.	.03	.07	652.14	*******	115697.	652.11
	1151.	591.	9740.	********	1.02	.00	.00	.08	1.32

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"FULLV" XRATIO = 1.75

<<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

<<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

A3 --- 5284. 6602. 5354.

QS --- 35460. 44306. 35931.

BOLEW --- 38. 3111. 5407.

BOREW --- 507. 3611. 5953.

STAGLT --- ******** 1664. 4603.

STAGRT --- 1664. 4603.********

AS --- 16363. 29895. 41717. 87974.

XS --- 2303822.4357141.5231894.********

CA3 --- 4150. 4680. 3778. 12608.

CJ --- .785 .709 .706

CDF --- 1.582 1.045 .706

CRF --- 2.321 2.337 2.268

QS --- 38244. 43431. 34022.

CDF --- 1.706 1.025 .668

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR	500.	38.	5373.	1.34	.77	653.57	636.94	38244.	652.23
560.	500.	507.	659946.	1.70	.55	.00	.48	7.12	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.766	.015	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	500.	39.	19337.	.07	.28	654.01	633.80	38244.	653.94
1091.	637.	1664.	5047964.	1.08	.16	.00	.11	1.98	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.703	.408	2988939.	41.	522.	653.91

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = .59

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	60.	39.	19348.	.07	.01	654.01	*******	38244.	653.95
1151.	60.	1664.	2961014.	1.08	.00	.00	.11	1.98	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	522.	3111.	6538.	1.37	.31	653.28	644.80	43431.	651.91
560.	522.	3611.	1117180.	2.00	.88	.00	.46	6.64	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.707	.032	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	522.	1664.	34035.	.03	.20	653.54	640.80	43431.	653.52
1113.	668.	4603.	5541942.	1.00	.06	.00	.07	1.28	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.822	.753	1369184.	3100.	3622.	653.49

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	38.	1664.	34044.	.03	.00	653.55	*******	43431.	653.52
1151.	38.	4603.	5410987.	1.00	.00	.00	.07	1.28	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	560.	5407.	5324.	1.28	.50	653.26	647.18	34022.	651.98
560.	560.	5953.	747575.	2.02	.85	.00	.51	6.39	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.704	.030	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	560.	4603.	49634.	.01	.30	653.64	647.18	34022.	653.64
1151.	846.	9347.	4607765.	1.00	.08	-.01	.04	.69	

M(G)	M(K)	KQ	XLKQ	XRKQ	QTEL
.891	.848	702905.	5400.	5960.	653.60

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	******	39.	103088.	.02	*****	653.68	*******	115697.	653.66
1151.	******	9849.	********	1.01	*****	1.55	.06	1.12	

STAGLT --- ******** 1682. 4601.

STAGRT --- 1682. 4601.********

AS --- 18995. 34309. 49783. 103088.

KS --- 2864733.5505846.6924832.********

CA3 --- 4118. 4620. 3749. 12486.

CJ --- .766 .707 .704

CDF --- 1.706 1.025 .668

CRF --- 2.310 2.339 2.273

QS --- 38165. 43347. 34186.

CDF --- 1.761 1.041 .653

	SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR		500.	38.	5370.	1.34	.77	653.56	636.92	38165.	652.22
	560.	500.	507.	659390.	1.71	.56	.00	.48	7.11	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.766	.015	*******	******	******	******

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	500.	39.	19428.	.07	.27	653.99	633.80	38165.	653.92
1091.	637.	1682.	5221813.	1.08	.16	.00	.10	1.96	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.707	.410	3080518.	41.	522.	653.90

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = .57

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	60.	39.	19440.	.06	.01	654.00	*******	38165.	653.93
1151.	60.	1682.	2967532.	1.08	.00	.00	.10	1.96	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	522.	3111.	6538.	1.37	.31	653.28	644.78	43347.	651.91
560.	522.	3611.	1117221.	2.00	.87	.00	.46	6.63	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.707	.032	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	522.	1682.	33875.	.03	.20	653.54	640.78	43347.	653.51
1113.	669.	4601.	5609966.	1.00	.06	.00	.07	1.28	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.821	.752	1389333.	3100.	3622.	653.48

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	38.	1682.	33883.	.03	.00	653.54	*******	43347.	653.51
1151.	38.	4601.	5392201.	1.00	.00	.00	.07	1.28	

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	560.	5407.	5330.	1.29	.51	653.28	647.18	34186.	651.99
560.	560.	5953.	748948.	2.02	.26	.00	.51	6.41	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.704	.030	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	560.	4601.	49839.	.01	.32	653.68	647.18	34186.	653.67
1151.	846.	9850.	4527457.	1.00	.08	-.01	.04	.69	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.891	.848	689787.	5400.	5960.	653.64

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	******	39.	103136.	.02	*****	653.68	*******	115697.	653.66
1151.	******	9849.	********	1.01	*****	.00	.06	1.12	

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRC2" XRATIO = 3.36

APRC2:XS	85.	39.	103198.	.02	.01	653.69	*******	115697.	653.67
1236.	85.	9850.	********	1.01	.01	.00	.06	1.12	

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
	SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL
EXIT :XS	******	82.	46113.	.07	*****	650.97	646.55	91011.	650.90
	0.	******	8493.	4548978.	1.14	*****	*******	.16	1.97

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"FULLV" KRATIO = 1.83

FULLV:FV	560.	73.	70303.	.03	.12	651.09	*******	91011.	651.07
	560.	560.	9439.	8327102.	1.04	.00	.00	.08	1.29

<<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

APRCH:AS	591.	44.	78513.	.02	.06	651.15	*******	91011.	651.13
	1151.	591.	9670.	9812760.	1.03	.00	.00	.07	1.16

<<<<<THE ABOVE RESULTS REFLECT "NORMAL" (UNCONSTRICTED) FLOW>>>>>

A3 ---	4829.	6117.	4823.
QS ---	27872.	35302.	27837.
BOLEW ---	38.	3113.	5408.
BOREW ---	504.	3609.	5952.
STAGLT ---	********	1655.	4615.
STAGRT ---	1655.	4615.	********

AS ---	14737.	27167.	36609.	78513.
KS ---	1985840.	3696694.	4253426.	9935960.
CA3 ---	3860.	4348.	3409.	11616.
CJ ---	.799	.711	.707	
CDF ---	1.532	1.043	.714	
CRF ---	2.331	2.336	2.263	
QS ---	30481.	34400.	26131.	
CDF ---	1.676	1.016	.671	

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR	500.	38.	4941.	.97	.67	652.27	634.19	30481.	651.30
560.	500.	504.	577250.	1.64	.36	.00	.43	6.17	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.781	.014	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	500.	42.	17105.	.06	.24	652.66	631.72	30481.	652.60
1091.	621.	1655.	4131961.	1.12	.14	.00	.10	1.78	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.701	.366	2619389.	41.	522.	652.57

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" KRATIO = .60

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	60.	42.	17116.	.06	.01	652.66	*******	30481.	652.61
1151.	60.	1655.	2468110.	1.12	.00	.00	.10	1.78	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	522.	3113.	6088.	.99	.27	652.00	643.84	34400.	651.01
560.	522.	3609.	997773.	1.99	.61	.00	.40	5.65	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.709	.032	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	522.	1655.	30327.	.02	.17	652.22	639.10	34400.	652.20
1113.	664.	4615.	4511250.	1.00	.05	-.01	.06	1.13	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.824	.745	1153317.	3100.	3622.	652.17

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** . CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	38.	1655.	30334.	.02	.00	652.22	*******	34400.	652.20
1151.	38.	4615.	4442490.	1.00	.00	.00	.06	1.13	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	560.	5408.	4838.	.91	.49	652.00	646.32	26131.	651.09
560.	560.	5952.	639695.	2.01	.57	.00	.45	5.40	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.706	.029	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	560.	4615.	42742.	.01	.27	652.34	646.32	26131.	652.33
1151.	837.	9755.	3652304.	1.00	.07	-.01	.04	.61	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.889	.841	579607.	5400.	5960.	652.31

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	******	42.	90222.	.02	*****	652.36	*******	91011.	652.34
1151.	******	9756.	********	1.02	*****	1.21	.06	1.01	

STAGLT --- ******** 1673. 4611.

STAGRT --- 1673. 4611.********

AS --- 16784. 30620. 42818. 90222.

KS --- 2386145.4534630.5458770.********

CA3 --- 3859. 4315. 3413. 11588.

CJ --- .781 .709 .706

CDF --- 1.676 1.016 .671

CRF --- 2.319 2.338 2.269

QS --- 30412. 34283. 26316.

CDF --- 1.734 1.028 .656

	SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
BRDGE:BR		500.	38.	4938.	.97	.66	652.27	634.17	30412.	651.30
	560.	500.	504.	576766.	1.64	.36	.00	.43	6.16	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.781	.014	*******	******	******	******

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	500.	42.	17179.	.05	.23	652.64	631.68	30412.	652.58
1091.	620.	1673.	4281287.	1.12	.14	.00	.10	1.77	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.705	.368	2706144.	41.	522.	652.56

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRCH" XRATIO = .58

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	60.	42.	17189.	.05	.01	652.64	*******	30412.	652.59
1151.	60.	1673.	2471779.	1.12	.00	.00	.10	1.77	

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR1:BR	522.	3113.	6088.	.98	.27	651.99	643.80	34283.	651.01
560.	522.	3609.	997836.	1.99	.61	.00	.40	5.63	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.709	.032	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	522.	1673.	30171.	.02	.17	652.21	639.10	34283.	652.19
1113.	665.	4611.	4549740.	1.00	.05	-.01	.06	1.14	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.822	.744	1166017.	3100.	3622.	652.16

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	38.	1673.	30179.	.02	.09	652.21	*******	34283.	652.19
1151.	38.	4611.	4426169.	1.00	.03	.00	.06	1.14	

MULTIPLE BRIDGE OPENING RUN HY7CAS4C.DAT
CANEY RIVER BRIDGE AT US-75 ** OLD BRIDGE WITHOUT LAKES** CASE 4
FLOOD FLOW ESTIMATED FROM REGRESSION EQUATION - USGS WRI 77-54
*** RUN DATE & TIME: 09-30-88 17:08

<<<<<RESULTS REFLECTING THE CONSTRICTED FLOW FOLLOW>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
OFBR2:BR	560.	5408.	4844.	.92	.51	652.03	646.35	26316.	651.10
560.	560.	5952.	640999.	2.01	.58	.00	.46	5.43	

TYPE	PPCD	FLOW	C	P/A	LSEL	BLEN	XLAB	XRAB
3.	0.	1.	.705	.029	*******	******	******	******

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
SLICE:AS	560.	4611.	42958.	.01	.28	652.37	646.35	26316.	652.37
1151.	837.	9758.	3598240.	1.00	.07	-.01	.04	.61	

M(G)	M(K)	KQ	XLKQ	XRKQ	OTEL
.889	.842	569924.	5400.	5950.	652.34

<<<<<END OF BRIDGE COMPUTATIONS>>>>>

XSID:CODE	SRDL	LEW	AREA	VHD	HF	EGL	CRWS	Q	WSEL
SRD	FLEN	REW	K	ALPH	HO	ERR	FR#	VEL	
APRCH:XS	******	42.	90265.	.02	*****	652.36	*******	91011.	652.35
1151.	******	9756.	********	1.02	*****	.00	.06	1.01	

===135 CONVEYANCE RATIO OUTSIDE OF RECOMMENDED LIMITS.
"APRC2" KRATIO = 3.42

APRC2:XS	85.	42.	90501.	.02	.01	652.39	*******	91011.	652.37
1236.	85.	9758.	********	1.02	.01	.00	.06	1.01	

ER

APPENDIX J

Policies and Procedures of Bridge Design

Oklahoma Department of Transportation

April 1969
November 1975
November 1984

5.3.3 HYDRAULIC DESIGN FOR BRIDGE WATERWAYS.

5.3.3.1 Procedure. For programming purposes a very preliminary hydraulic study is made of the stream crossings to determine approximate length or size of the structures to be submitted to the Bridge Program Estimator. A representative of the Hydraulics Branch accompanies the Roadway Design Division and Survey Division on preliminary line studies whenever a major stream crossing or complicated drainage situation is involved. After the survey has been completed, and plan and profile sheets have been submitted to the Hydraulics Branch, a comprehensive hydraulic study is then made. Size of opening, maximum high-water, and minimum finish grade elevation will be determined for each bridge drainage structure included. At the time of plan-in-hand a representative of the Hydraulics Branch will accompany the project engineers to bridge sites on which field information is required to complete the hydraulic evaluation and on streams and rivers as required on Federal projects, at which time the structure sites will be re-examined and any necessary revisions of the hydraulics study will be noted. After the plan-in-hand, the final hydraulic review will be made and submitted to the bridge project engineer.

5.3.3.2 Policies.

(See IP-2-69 in Sec 9) (See IP-10-69)

5.3.3.2.1 Design frequency is the frequency of the design discharge, and is usually fixed by design policy based on judgment and practical experience. However, the engineer, in selecting the frequency of the discharge, should bear in mind the adverse effects on public safety and damage to property if a flood of higher frequency exceeds the capacity of the structure. The following design frequencies are to be used in design of drainage structures of bridge classification. Any deviation shall be approved by the Bridge Engineer.

DESIGN FREQUENCIES

Type of Structures	Interstate Highways	Primary and Secondary Trunk Highways	Farm-to-Market Roads with Fuseplugs
Bridge Structures	50	50	25
Bridge Box Structures	50	50	25

5.3.3.2.2 Fuseplugs. On Farm-to-Market roads, where the bridge is designed to carry a 25-year flood, it shall be the policy to provide overflow sections, termed "fuseplugs", in the roadway to carry the excess of flood waters, thereby preventing the undersized structure or the adjacent roadway fills from being washed out. The area in the overflow section or sections shall be sufficient in size that when added to the area of the bridge shall equal the estimated area required for 50-year flood. The average elevation of the overflow section shall be generally several feet or more below the maximum elevation at highwater for which the structure is being designed.

5.3.3.2.3 Freeboard is the vertical distance between the shoulder edge and the channel water surface. The designer should provide sufficient freeboard for the passing of drift and for a factor of safety for extreme highwater above those of record.

ALLOWABLE FREEBOARD (BRIDGE STRUCTURES)
FREEBOARD BETWEEN HIGHWATER AND LOW BEAM

Type of Crossing	Interstate and Primary Highways	Secondary Highways	
		Over 400 VPD	Under 400 VPD
Rivers	5	5	5
Large streams	5	4	4
*Small streams	4	3.5	3
Overflow structures	3	3	3

*Small streams (D.A. less than 100 sq. miles)

ALLOWABLE FREEBOARD (BRIDGE BOX STRUCTURES)
FREEBOARD BETWEEN HIGHWATER AND SHOULDER EDGE

Type of Crossing	Interstate	Primary and Secondary	
		Over 400 VPD	Under 400 VPD
Small streams	4	3	2.5

5.3.3.2.4 Effective Area. In computing the effective area of a bridge, the designer shall keep in mind that the effective area is the area under the stream water-surface (computed highwater), with deductions made for abutment fills, rip-rap and piers. On skewed bridges, the effective area is the area normal to the channel.

5.3.3.2.5 Allowable Velocities. High velocities are most damaging just downstream from the drainage structure outlet and the erosion potential at this point is a feature to be considered in the design.

ALLOWABLE VELOCITIES

Bridges	Maximum Velocities 6 to 8 ft. per sec.
Bridge Boxes (Dirt Bottom)	Maximum 12 ft. per second
Bridge Boxes (Rock Bottom)	Maximum 15 ft. per second

5.3.3.2.6 Allowable Headwater. The amount of flooding or ponding within reasonable damage limits at a culvert entrance determines the permissible headwater. In general, the designer should compare the alignment sheets, the profile sheets, and the cross-sections when selecting the allowable headwater for a drainage crossing.

5.3.3.3 Preparation of the Hydraulics Report. The design of drainage structures requires an investigation to determine the expected discharge from the basin to be drained. The extent of this investigation is determined by the importance of the structure, cost, and the consequences of under-design. Report of Hydraulic studies of bridge site should include applicable parts of the following outline:

5.3.3.3.1 Site Data.

(1) Maps, aerial photos, stream cross-sections, flowline, profile.

(2) History of existing bridges at bridge site or sufficiently near bridge site to be of value in design with dates of construction, past flood performance, etc.[1]

(3) Available highwater marks with date of occurrence.

(4) Description of stream bed and bank stability.

(5) Characteristics of the watershed, upstream and downstream which may affect water stages such as constriction, reservoirs, flood control projects, highwater from other streams, and future land use.

5.3.3.3.2 Hydrologic Analysis.

(1) Determine drainage area.

(2) Complete compilation of all available and flood history for bridge site.[2]

(3) Plot flood flow frequency curve for bridge site.[3]

(4) Determine design discharge, distribution of flow, and velocities for natural stream (without proposed bridge construction).[4]

5.3.3.3.3 Hydraulic Analysis.

(1) Determine backwater and mean velocities for various lengths and/or types of bridges.[4]

(2) Evaluate and make recommendations concerning bank protection, spur dykes, scour and channel treatment.[5]

5.3.3.3.4 Conclusions. Bridge design has suffered because of the lack of reliable hydraulic and hydrologic information on the waterway. Research continues and progress is being made, but the determination of adequate floodways still more a matter of engineering judgment than of science. It should be emphasized, however, that with the present state of knowledge, all methods of computing drainage structure sizes are only an approximation, and the above outlines should be used as a guideline to assist engineering judgment.

5.3.3.3.5 References.

1. Bridge Maintenance File, Bridge Division, State Highway Department.
2. Floods in Oklahoma, Magnitude and Frequency State of Oklahoma Department of Highways, Bridge Division.
3. Refer to prepared flood frequency analysis for stream under study is available.
4. U. S. Bureau of Public Roads, "Hydraulics of Bridge Waterways", J. N. Bradley, Washington, D. C., Supt. of Documents, Government Printing Office, 1960.

5.3.3.3.5 References (continued)

5. Iowa Highway Research Board, "Scour of Bridge Crossings", Bul. 8, dated 1958 and "Scour Around Bridge Piers and Abutments", Bul. 4, dated 1956, Iowa City, Iowa, Institute of Hydraulic Research, Iowa State University.

5.3.4 SHOP DETAILS AND SHOP BILLS. In accordance with the plans and specifications, the contractor is required to have his aluminum, structural steel, or prestressed concrete fabricator furnish the Bridge Division with shop drawings to be checked in detail for compliance with the plans and specifications. The following procedure should be followed to process the shop drawings as quickly as possible so as to not delay construction.

5.3.4.1 Highway Over Railroad, Stream, or Grade Separation. The fabricator submits two sets of shop drawings to the Bridge Division to the attention of the Assistant Bridge Engineer for Design. If the fabricator deviates from the plans, permission should be requested in writing. The Assistant Bridge Engineer then turns the preliminary shop drawings over to the Shop Detail Supervisor for checking. In case the Shop Detail Section is overloaded, the Assistant Bridge Engineer may elect to assign the shop drawings to the Project Engineer for checking who was responsible for preparing the bridge plans. All details are checked for compliance with the plans and specifications. Upon completion of checking, one set shall be marked in colored pencil and returned to the fabricator for revision and one corrected set shall be kept by the checker. When the fabricator has completed the corrections, he will resubmit the requested number of sets of shop drawings (usually five or six) to the Bridge Division for final check and distribution. The Assistant Bridge Engineer for Design will again turn them over to the Shop Detail Supervisor or Project Engineer for back-checking. The Shop Detail Section keeps a log on all shop drawings, i.e., Project Number, Structure Number, Station, Sheet Nos. included, date received, checker's name, date returned for corrections, date final sets received for distribution and date of final approval and distribution. The final check is made by the original checker. If the drawings comply with all the corrections that were noted and the construction Work Order has been issued, each sheet is stamped "Approved" and a letter of transmittal is written to the Resident Engineer with copies of the letter and "Approved" sets of drawings distributed as follows:

Resident Engineer: Original letter, one set approved drawings.
Contractor: Copy of letter, one set approved drawings.
Fabricator: Copy of letter, one set approved drawings.
Testing Laboratory: Copy of letter, one set approved drawings.
Highway Materials Division: Copy of letter, one set of approved drawings on structural steel jobs.
Field Division: Copy of letter.

5.3.4.2 Shop Drawings - Railroad Structure Over Highway. The fabricator submits four sets of shop drawings to the Bridge Division to the attention of the Assistant Bridge Engineer for Design. If the fabricator deviates from the plans, permission for such deviation should be requested in writing. The Assistant Bridge Engineer for Design then turns two sets of drawings over to the Shop Detail Supervisor or Project Engineer for checking. He also provides the Railroad Negotiations Branch with two sets to be submitted to the Railroad

5.3.3 BRIDGE HYDRAULICS

5.3.3.1 Procedure.

Preliminary Estimate: For programming purposes a very preliminary hydraulic study is made of the stream crossings to determine approximate length or size of the structures.

Line Inspection: A representative of the Bridge Division accompanies the Roadway Design Division and Survey Division on preliminary line studies whenever a major stream crossing or complicated drainage situation is involved. During this inspection, it may be determined that there is a need for additional survey information for a channel change or bank protection.

Preliminary Structure Size Study: After the survey has been completed, and plan and profile sheets have been submitted to the Hydraulics Branch, a comprehensive hydraulics study is then made. Size of opening, design highwater, and minimum finish grade elevation will be determined for each bridge drainage structure included.

Plan-in-hand Site Inspection: At the time of plan-in-hand, a representative of the Hydraulics Branch will accompany the project engineers to bridge sites at which time the structure sites will be re-examined and any necessary revisions of the hydraulics study will be noted.

Final Hydraulics Study: After the plan-in-hand, the final hydraulic review will be made and submitted to the Bridge Project Engineer.

5.3.3.2 Policies.

5.3.3.2.1 Flood Frequency.

By definition, flood frequency is per cent chance of occurence of a flood of any magnitude that can happen in any year. For example: A 100-year flood is a flood that would have a one per cent chance of occurring in any year, a 50-year flood would have 2 per cent, and a 25-year flood would have a 4 per cent chance.

Design frequency is the frequency of the design discharge, and is usually fixed by design policy.

Check frequency is a flood frequency to be used by the engineer to evaluate the damage if a higher run-off should occur. The roads should not be inundated (Interstate and Primary), nor should extensive property damage occur with the check frequency.

Values for flood frequency for the various highway classes are indicated in the table below, and are to be used in design of drainage structures of bridge classification. Any deviation shall be approved by the Bridge Engineer.

Type of Structures	Interstate Highways		Primary & Secondary Trunk Highways		F/M Roads with Fuseplugs	
	D. Freq.	Ck. Freq.	D. Freq.	Ck. Freq.	D. Freq.	Ck. Freq.
Bridge Type	50*	100	50	100	25	100
Bridge Box	50*	100	50	100	25**	100

* Or the greatest flood of record, whichever is greater

** 10 year flood frequency, for traffic less than 750 ADT.

5.3.3.2.2 Fuseplugs.

On Farm-to-Market roads, where the bridge is designed to carry a 25-year flood, it shall be the policy to provide overflow sections, termed "fuseplugs", in the roadway to carry the excess of flood waters, thereby preventing the undersized structure or the adjacent roadway fills from being washed out. The area in the overflow section shall be sufficient in size, that when added to the area of the bridge, it shall equal the estimated area required for the 50-year flood. The average elevation of the overflow section shall be generally several feet below the maximum elevation of the highwater for which the structure is being designed.

5.3.3.2.3 Freeboard.

The Engineer should provide sufficient freeboard for the passing of drift and for a factor of safety for extreme highwater above those of record.

Freeboard on a bridge structure is the vertical distance between low chord and the design frequency flood highwater.

Freeboard on a box structure is the vertical distance between shoulder edge and the design frequency flood highwater.

Freeboard for various stream crossings are obtained by the method outlined below and are to be used in design of drainage structures of bridge classification. On occasion, the Bridge Engineer may determine that special structure site location or conditions warrant a freeboard other than that indicated in the tables.

A. Freeboard for bridges.

Freeboard for bridges = Drift factor + size factor + Δ (100-yr. H.W. — 50-yr. H.W.)

Drift factor = 2.0 ft. High drift

= 1.0 ft. Med. drift

= 0.5 ft. Low drift

Size factor (Main Str.) = 1.50 ft. Bridge length 300 ft. and up

" = 1.00 ft. " " 150 ft. to 300 ft.

" = 0.50 ft. " " Up to 150 ft.

(Overflow) = 0.50 ft. all sizes

Δ (100-yr. H.W. Elev. - 50-yr. H.W. Elev.) obtained from design computation

B. Freeboard for bridge box culverts.

Interstate	Primary and Secondary		
	Over 1200 ADT	650 to 1200 ADT	650 ADT and lower
3.0 ft.	2.0 ft.	1.0 ft.	0.0

C. Freeboard for approach roadway. Same as for bridge boxes, except when used as fuseplug.

D. Freeboard in reservoir area. See 5.3.3.2.7.

5.3.3.2.4 Effective Area.

Effective area of a box structure is the normal cross sectional area of flow at the outlet and shall be determined by analysis of outlet conditions. Effective area of a bridge is the cross sectional area of flow below normal depth with deductions for abutment fills, rip-rap, and piers. Normal depth is the depth of flow of the design discharge without the structure and roadway embankment and shall be determined by analysis as outlined in Federal Highway Administration publication "Hydraulics of Bridge Waterways"4. On skewed bridges, the effective area is the area normal to the channel.

5.3.3.2.5 Allowable Velocities.

High velocities are most damaging just downstream from the drainage structure outlet and the erosion potential at this point is a feature to be considered in the design. Velocity is computed by dividing design discharge by the effective area.

ALLOWABLE VELOCITIES

Bridges	Maximum Velocities 6 to 8 ft. per sec.
Bridge Boxes (Dirt or Gravel Bottom)	Maximum 12 ft. per second
Bridge Boxes (Rock Bottom)	Maximum 15 ft. per second

5.3.3.2.6 Allowable Headwater.

Bridge Box Culverts: The amount of flooding or ponding within reasonable damage limits at a culvert entrance determines the permissable headwater. In general, the Engineer should compare the alignment sheets, the profile sheets and the cross-sections when selecting the allowable headwater for a drainage crossing. In most cases, the headwater depth should not exceed 1.2.D. where D is the culvert opening height.

Bridge Structures: Backwater for bridges is the difference between the computed highwater and the "normal depth," as defined above in "Effective Area", for the design discharge. Allowable backwater should be between 1 and 2 feet and will usually be limited within that range by the previously defined allowable velocity. When determining allowable backwater, proper consideration shall be given to the structure contributing to flooding upstream.

5.3.3.2.7 Reservoir Crossings.

The following is policy and procedure for determining size of structure, and establishing minimum finish grade elevations for roadway embankment and bridges and also determining top of rip-rap elevations when a highway crosses, or borders a reservoir.

The reservoir engineers are required to furnish the water surface elevations at the various affected highways.

Bridge Length: A minimum structure length shall be established that will accommodate a 50 year design discharge, and maximum permissable velocity based on the natural conditions. The side slopes (slope walls) then extended to the required elevation.

Minimum Low Superstructure Elevation: The minimum low superstructure elevation shall be no lower than 50 year flood pool elevation plus wave height plus a minimum freeboard of 3 feet.

Minimum Top of Rip-Rap Elevation: Minimum top of rip-rap elevation shall be set no lower than the 50 year flood pool elevation plus wave height plus a minimum freeboard of 3 feet. The 50 year flood pool elevation will be requested from the reservoir engineer and shall be used upon an inflow hydrograph having a peak rate of inflow approximately equal to the 50 year discharge. The reservoir shall be at conservation pool elevation when the 50 year flood begins.

Determining wave height: See Section 6.4.8.2.1

Rip-rap thickness: See Section 6.4.8.2.1

5.3.3.3 Preparation of the Hydraulic Report.

Reports should include hydrologic and hydraulic investigation and design computations. It should also include the analysis of the highways effect on stream stability and on stream environment.

Copies of these reports shall accompany Consultant Engineers' plans when submitted for plan-in-hand review. The reports and design computations shall be retained in the Bridge Division permanent design files.

All highway plans shall show the magnitude, frequency, velocity and pertinent water surface elevations for the design flood and 100 year flood and, if available, data for the maximum flood of record for all structures and roadway embankments that cross flood plains or encroach on rivers and streams consistent with design criteria.

Outline of the report is as follows:

5.3.3.3.1 Site Data.

(1) Maps, aerial photos, stream cross-sections, including cross sections upstream, at crossing and downstream, and flowline profile.

(2) History of existing bridges at or near bridge site, with dates of construction, past flood performance, etc.[1]

(3) Available highwater marks with date of occurrence.

(4) Description of stream bed and bank stability.

(5) Characteristics of the watershed, upstream and downstream which may affect water stages such as constriction, reservoirs, flood control projects, highwater from other streams, present and future land use.

5.3.3.3.2 Hydrologic Analysis.

(1) Determine drainage area.

(2) List all available flood records.

(3) Determine design discharge. For large streams, use reference No.[3] (2). For small watershed up to five square miles, use rational method.[3]

(4) Evaluate potential for changes in watershed characteristics, twenty years in future, which would change magnitude of flood peaks; e.g., urbanization, channelization, and flood control projects.

(5) Determine distribution of flow and velocities for several discharges or stages in the natural channel for existing conditions.[4]

(6) Plot stage - discharge - frequency curve.[4]

5.3.3.3.3 Hydraulic Analysis.

(1) Determine backwater and mean velocities for various lengths and/or types of bridges.[4]

(2) Evaluate and make recommendations concerning bank protection, spur dykes, scour and channel treatment.[4]

(3) For design of culverts, use procedure as outlined in reference (5).

5.3.3.3.4 Flood Hazards Evaluation.

In planning the location of a highway, serious consideration should be given to locations that avoid areas subject to flooding. If an encroachment of a flood plain is necessary, an evaluation should be made of the flood potential, the effect of the flood potential on the highway and the effect of the proposed highway on the flood hazard. Such evaluations should assure that any highway structure, roadway embankment or bridge that encroaches on or crosses the flood plain of a drainage course will not cause a significant adverse effect to developments in the flood plain and will be capable of withstanding the flood flow with minimum damage.

5.3.3.3.5 Conclusions.

It should be emphasized that development in the fields of hydrology and hydraulic design practice continues to advance. Therefore, current methods of computing drainage structure sizes and the above outlines should be used as a guideline to complement engineering judgment.

5.3.3.3.6 References.

1. Bridge Maintenance File, Bridge Division, State Highway Department.

2. Flood Characteristics of Oklahoma Streams, U.S.G.S. Water Resources Investigation 52-73, Obtain from Department of Highways, Bridge Division.

3. Highway Department Technical Manual.

4. U. S. Department of Transportation, "Hydraulics of Bridge Waterways", J. N. Bradley, Washington, D. C., Supt. of Documents, Government Printing Office, 1970.

5. U. S. Department of Transportation, "Hydraulic Design of Improved Inlets for Culverts", circular No. 13.

OKLAHOMA DEPARTMENT OF TRANSPORTATION

November 16, 1984

To: Users of the New ODOT Design Standards

From: Monty C. Murphy

Subject: Rural Design Standard Correction

It has been brought to our attention that footnote (Q) did not print on the standards which were recently distributed. Please add the following to the Rural Highway Design Standards footnotes:

(Q) With Guardrail

Copy - P.E.'s
McCollum
Oats
Fisher
KDJ

OKLAHOMA DEPARTMENT OF TRANSPORTATION

RURAL & URBAN DESIGN STANDARDS
For The
OKLAHOMA STATE HIGHWAY SYSTEM

NOVEMBER 5, 1984

OKLAHOMA DEPARTMENT OF TRANSPORTATION
RURAL & URBAN DESIGN STANDARDS

This publication contains State Highway Design Standards approved by the Transportation Commission, November 5, 1984. All design criteria meet or exceed recommended AASHTO Design Guidelines. Subsequent to the approval date, these standards shall apply to the design of all construction projects involving the Official Numbered State Highway System as defined under Commission Policy Article V-A, Sections 1 & 2.

Exception: *Utilization of these standards is not required on State Highway Projects where Federal-aid 3R or 4R Funding is involved. The design of Federal-aid 3R and 4R projects is developed by individual project evaluation using approved AASHTO guidelines and safety as primary considerations.*

These standards provide for different levels of service by functionally classified system. The level of service provided is reflected through differing design capacity requirements, design speeds and related geometrics, surface and shoulder width and type requirements, etc.

Standards for the Functionally Classified Principal Arterial System, which includes the Interstate System and other major rural and urban routes, provide the highest level of service. The higher level of service is reflected through the requirement for earlier multilaneing, wide paved shoulders, faster design speed controls, heavier bridge load capacities, etc.

The level of service decreases through the minor arterial system to the collector system which provides the lowest level. The collector system allows more traffic volume before four lanes are required, lower design speeds, intermediate type surfaces and sod shoulders on rural facilities.

Functional classification of the State Highway System is established by the Planning Division under criteria set forth in "Volume 20, Appendix 12, Highway Functional Classification", U.S. Department of Transportation, FHWA, July, 1974, as required by Article V-5, Section 8, "Oklahoma Transportation Commission Rules, Regulations, Policies and Procedures." The Oklahoma State Highway System was classified using this criteria during the National Functional Classification of 1976 and is maintained in a current classified status according to applicable federal requirements.

Rural functional classifications apply to highways outside any approved Urban Area Boundary of an urban city or urbanized area. Urban cities are defined as any city having a population of 5,000 or more and urbanized areas as any city having a population of 50,000 or more according to the latest decennial census.

The Urban Area Boundaries are established by the Planning Division in cooperation with local city and federal officials. All boundary and functional classification revisions require approval of the FHWA.

Rural Functional Classifications normally apply outside of any Urban Area Boundary and include mileage located inside municipal limits of any city having less than 5,000 population.

Rural Functional Classifications are as follows:

1. Principal Arterials
2. Minor Arterials
3. State Major Collectors

Urban Functional Classifications normally apply to highways inside any approved Urban Area Boundary.

Urban Functional Classifications are as follows:

1. Urban Principal Arterials
2. Urban Minor Arterials
3. Urban Collectors

Normally a project's Rural or Urban Funtional Classification will establish which of the two sets of standards apply. However, the standards do allow, dependent on an area's type of development, for substitute application and use. (See Standard Notes (A).) Substitution of standards will usually involve the application of an Urban Standard to a project having a Rural Funtional Classification. This provides for an urban type design on a project located inside a municipality of less than 5,000 population . The substitute application of a Rural Standard to a project having an Urban Functional Classification will usually occur within an Urbanized Area where development is not expected within the design period. In either case the basic functional classification of the facility (Principal Arterial, Minor Arterial or Collector) shall carry through to the substitute standard.

OKLAHOMA DEPARTMENT OF TRANSPORTATION
RURAL HIGHWAY DESIGN STANDARDS (A)

ROADWAY DATA	Functional Classification (B)		PRINCIPAL ARTERIALS			MINOR ARTERIALS			STATE MAJOR COLLECTORS									
	Volume/Capacity Service Level		C			C			C									
	Design Forecast Period (Yrs)		20			20			20									
	State Description		Interstate & Expressway		Other	Other Major Highways			Minor State Highways						Rec'l / Impl'l (C)	Local Service State Highways (D)		
	Standard Number		1	2 (O)	3	4 (O)	5	6	7 (O)	8	9	10			11	12		
	Minimum Design Year ADT		Over 30 000	5 000-30 000	0-5 000	Over 7 200	2 500-7 200	0-2 500	Over 8 000	2 500-8 000	1 200-2 500	0-1 200			All	Over 2 500	0-2 500	
	Design Wheel Load		9000 + 2/3 S F		9000 + 1/3 S F	9000 + 1/3 S F		9,000	9 000			7 000			5 000	7 000		
	Minimum Design Speed (E)		55	55	55	55	55	55	50	50	45	45			40	50	45	
	Maximum Percent Grade (J) (L)	Flat	3	3	3	3	3	3	6	6	6	6			7	6	6	
		Rolling	4	4	4	4	4	4	7	7	7	7			8	7	7	
		Mountainous	5	5	5	6	6	6	9	9	9	9			10	9	9	
	Maximum Degree Curvature (G) (J)		4	4	4	5	5	5	8	8	10	10			13	10	13	
	Number of Lanes		6 Min	2 or 4 (K)	2	2 or 4 (K)	2	2	4 Min	2	2	2			2	2	2	
	Surface Type (F)		High	High	High	High	High	High (Stage)	High	High	High (Stage)	High (Stage)			Inter	Inter	Inter	
	Surface Width		72' Min	48'	24'	48'	24'	24' (N)	48'	24'	22' (N)	22'			24'	24'	22'	
	Shoulder Type		Paved	Paved	Paved	Paved	Paved	2' Pvd/6' Sod	Paved	Paved	2' Pvd/4' Sod	Sod			Sod	Sod	Sod	
	Shoulder Width		10' & 10'	10' & 4'	8'	8' & 4'	8'	8'	8 & 4	8'	6'	4			4	6	4'	
	Minimum Median Width		40'	40'	None	16'	None	None	16'	None	None	None			None	None	None	
	Minimum Right-of-Way Width		200'	160'	80'	150'	90'	80	130'	80'	66'	66'			66' (H)	As Required		
	Access Control		Transportation Commission Policy			Transportation Commission Policy			As Req'd by Current AASHTO Guidelines		Transportation Commission Policy							
	Min Lateral Clearance to Obstacle	Fed Aid Projects (I)	As Req'd by Current AASHTO Guidelines			As Req'd by Current AASHTO Guidelines			As Req'd by Current AASHTO Guidelines		As Req'd by Current AASHTO Guidelines							
		SAP Projects (O)	Outside Edge Shoulder + 3'			Outside Edge Shoulder + 3'			Outside Edge Shoulder + 3'									
	Max Slope from Clear Zone or Back of Grdr.	Fill Slope or Backslope	0-4' 6:1, 4-10' 4:1, 10'-15' 3:1 Over 15' 2:1 Rockcut 1:4:1			0-10' 4:1, 10'-15' 3:1 Over 15' 2:1 Rockcut 1:4:1			0-10' 4:1, 10'-15' 3:1 Over 15' 2:1 Rockcut 1:4:1		0-4' 4:1 Over 4' 2:1 Rockcut 1:4:1							
	Min Ditch Bottom Width	Fed Aid Projects (I)	4' Rounded			4' Rounded			2' Rounded							V Bottom		
		SAP Projects	4' Rounded			2' Rounded			2' Rounded									
BRIDGE DATA	Hydraulic Design		Based on Risk & Cost Analysis			Based on Risk & Cost Analysis			Based on Risk & Cost Analysis									
	Grade Separations & Interchanges		Initial	None Initial Des	None	None	None	None	None	None	None	None	None	None	None	None	None	
	Railroad Grade Separations		All	All		4-Lane Divided, Principal Arterial across 1st Class R R or where Current ADT exceeds 10,000												
	Design Loading		HS 20 & Alternate Military Loading			HS 20			HS 20						HS 20			
	Box Bridge (Roadway Width)	Fed Aid Projects (I)	Shoulder Width + 6' to Headwall			Shoulder Width + 6' to Headwall												
		SAP Projects (M)	Full Shoulder			Full Shoulder			Full Shoulder		32'	32'	26'	32'	26'			
	Other (P) Bridges (Min Roadway Width)	Fed Aid Projects (I)	Full Shoulder			Full Shoulder			Full Shoulder		32'	32'	26'	32'	26'			
		SAP Projects (M)	Full Shoulder	32'		Full Shoulder	32'		Full Shoulder		32'	32'	26'	32'	26'			
	Vertical Clearance		R R /HWY 16'6" — HWY/HWY 16'6" — HWY/R R 23'0" (Includes 6" for Ballast)						R R HWY 16'6" — HWY/HWY 16'6" — HWY R R 23'0" (Includes 6" for Ballast)									

Notations

(A) The Rural Design Standards shall apply in rural areas. They may be applied inside urban or municipal limits of a city or town if it is determined that the land use adjacent to the project's right-of-way will not likely be developed as urban type development within the forecast period. Urban type development is defined as strip commercial or residential lot type development of 0.5 acre or less where at grade access is to be allowed to the facility.

(B) Functional classification and state designation shall be established by the Planning Division.

(C) Recreational and Institutional Highways are those facilities presently on or to become a part of the State Highway System whose primary function is to provide access from a State Highway to a State Park or Institution. Their design shall be such that the environment surrounding the facility is disturbed as little as possible. The Planning Division shall be responsible for designation. Note: This class does not include those roads normally referred to as lake access roads, industrial access roads or airport roads which are financed as special legislative categories.

(D) Local Service State Highways are those facilities presently a part of the State Highway System whose primary function is to provide service of local rather than statewide significance and would logically fit under local rather than state jurisdiction.

(E) Standard criteria for stopping sight distance and grades may be based on a design speed of 40 mph when an improvement is to be made on existing alignment providing the facility is signed in accordance with Section 2D-40 of the Manual on Uniform Traffic Control Devices.

(F) High Type is PC Concrete or Asphaltic Concrete. High Type (Stage) is approximately one-half the Ultimate Asphaltic Concrete surface thickness.

(G) Maximum curve data based upon 10% rate of superelevation. See Design Policy for related curve data for good design practice.

(H) Additional right-of-way may be purchased to protect aesthetic, scenic or public use areas.

(I) Does not include 3R or 4R Federal Aid Projects.

(J) Grades and curvature in excess of those required for minimum design shall be justified where excessive excavation, fill or right-of-way will be required to accomplish the excess in design.

(K) Where the 10-year projected ADT is less than 5,000 on non-Interstate Principal Arterials or less than 7,200 on Minor Arterials, 2-lanes initial on 4-lane R/W shall be considered. Where multi-lane R/W is purchased with ultimate full control necessary, R/W for interchanges shall be purchased initially. When 2-lane initial is constructed, shoulders shall be full width, shoulder each side.

(L) One-way down grades may be exceeded by 1%.

(M) Structurally sound bridges with clear roadway width equal to or greater than the approach surface width may be left in place without improvement where justified.

(N) Design Class 6 shall be a 28' surface striped 24' (12' 12' lanes) with 2' paved shoulders. Design Class 9 shall be a 26' surface striped 22' (2' 11' lanes) with 2' paved shoulders.

(O) Where parallel construction is to be the method of improvement, initial improvement of existing lanes is not required.

(P) Existing bridges may be left in place as follows: For Design Classes 9 thru 13 those bridges in good condition with 24' or more clear roadway and an H15 or greater load rating. For non-Interstate bridges in Design Classes 2 thru 8 those with a 28' or more clear roadway and a load rating of H28 or greater may be left in place with no improvement.

(Q) With Guardrail

OKLAHOMA DEPARTMENT OF TRANSPORTATION

URBAN OR MUNICIPAL HIGHWAY DESIGN STANDARDS (A)

ROADWAY DATA	Functional Classification (B)		PRINCIPAL ARTERIALS								MINOR ARTERIALS & COLLECTORS		
	Volume/Capacity Service Level (C)		C			D					E		
	Design Forecast Period (Yrs)		20			20					20		
	Functional Sub-Classification		Interstate & Freeways			Expressways		Other			Minors & Collectors		
	Standard Number		20	21	22	23	24	25	26	27	28	29	30
	Design ADT Range (D)		Over 65,000	42,000-78,000	0-50,000	Over 19,400	0-23,000	Over 7,200	Over 7,200	0-8,200	Over 7,200	2,500-8,700	0-2,500
	Maximum Design Hour Volumes One-way Passenger Car Eqvint's		Over 5,100	3,300-5,100	0-3,300	Over 1,400	600-1,400	Over 600	Over 600	0-600	Over 600	180-600	0-180
	Area Type (E)		Any	Any	Any	Any	Any	Strip Comm	Urban Type	Urban Type	Urban Type	Urban Type	Urban Type
	Min Design Speed		50	50	50	40	40	40	40	40	40	30	30
	Max Percent Grade		4	4	4	6	6	6	6	6	8	9	9
	Max Degree Curvature (G)		8	8	8	13	13	13	13	13	13	25	25
	Number Through Lanes		8	6	4	6	4	4 w/ L Turn Ln	4	2	4	2	2
	Surface Type (M)		High	High	High	High	High	High	High	High	High	High	Inter
	Surface Width (F)		98'	72'	48'	72'	48' (N)	60'	48'	40'	48'	22' Min 40' Des (J)	22' Min 40' Des (J)
	Access Control		Full			Transportation Commission Policy							
	Edge Treatment	Developed Frontage	Pvd Shldr 10'R 10'L	Pvd Shldr 10'R 10'L	Pvd Shldr 10'R 10'L	Curbs	Curbs	Curbs	Curbs	Curbs	Curbs	Curbs	Curbs
		Undeveloped Frontage	Pvd Shldr 10'R 10'L	Pvd Shldr 10'R 10'L	Pvd Shldr 10'R 4'L	Pvd Shldr 10'R 4'L	Pvd Flush 10'R 4'L	Curbs	Curbs	Curbs	Curbs	Curbs	Curbs
	Median Type (H)		Barrier	Barrier	Barrier	Pvd Flush	Pvd Flush	None	None	None	None	None	None
	Minimum Median Width (H)		26'	22' (L)	16' (L)	4'	4'	--	--	--	--	--	--
	Minimum Right-of-Way Width	Developed Area	200'	180'	160'	100'	80'	80'	66' (K)	56' (K)	66' (K)	Surf Width +4'	Surf Width +4'
		Undeveloped Area	200'	200'	200'	150'	130'	100'	80'	80'	80'	80'	80'
	Minimum Lateral Clearance to Obstacle	Open Section (O)	Outside Edge Shldr	Outside Edge Shldr	Outside Edge Shldr	Outside Edge Shldr	Outside Edge Shldr	--	--	--	--	--	--
		Curbed Section (I) (O)	--	--	--	6'	6'	6'	6'	6'	6'	2' Min 6' Des	2' Min 6' Des
BRIDGE DATA	Railroad Grade Separations		Multi-lane Divided Principal Arterials across 1st Class R R or where ADT exceeds 20,000 current										
	Grade Separations & Interchanges		All			None							
	Design Loading		HS 20 & Alternate Military Loading			HS 20							
	Width		Full Shoulder			Roadway Width							
	Vertical Clearance		R R /HWY - HWY/HWY 16' 6", HWY/R R 23' 0"			R R /HWY - HWY/HWY 16' 6", HWY/R R 23' 0" (Includes 6" for Bellast)							

Notations:

(A) The Urban or Municipal Standards shall apply to all facilities having an Urban Functional Classification and to any facility having a Rural Functional Classification where the Rural Design Standards will not apply (Primarily inside municipalities of less than 5,000 population.)

(B) Functional Classification shall be established by the Planning Division

(C) As defined in the 1965 Highway Capacity Manual

(D) The projected ADT for the facility must be within this range regardless of the one-way DHV expressed in Passenger Car Equivalents

(E) Urban Type area is defined as an area currently developed or having probable future development (within the forecast period) as strip commercial or lot development of 0.5 acre or less & at grade access is allowed

(F) On open type sections Surface Width is from inside edge to inside edge of shoulder ; on curbed sections add 4' face to face of curbs, i.e., width shown plus 2' curb and gutter section on each side

(G) Maximum Degree Curvature data based upon 10% Superelevation (e). See Design Policy for related curve data for good design practice

(H) Median Width, measured edge to edge of driving lane, is for median type shown

(I) Lateral Clearance on curbed section measured from face of curb

(J) Minimum width should be used only in restricted Right-of-Way situations

(K) Purchase of extra Right-of-Way to allow left-turn bays at major intersections may be necessary

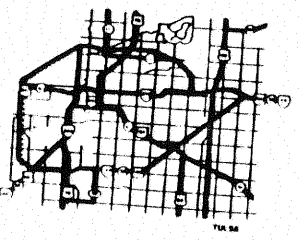
(L) In undeveloped areas median should be widened to allow for future additional lanes

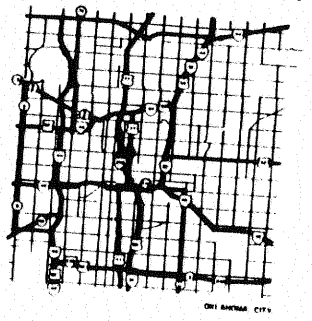
(M) On Design Classes 20 thru 24 P.C. concrete surfacing should be used where surface maintenance will cause severe traffic problems and in areas that are difficult to access for maintenance purposes

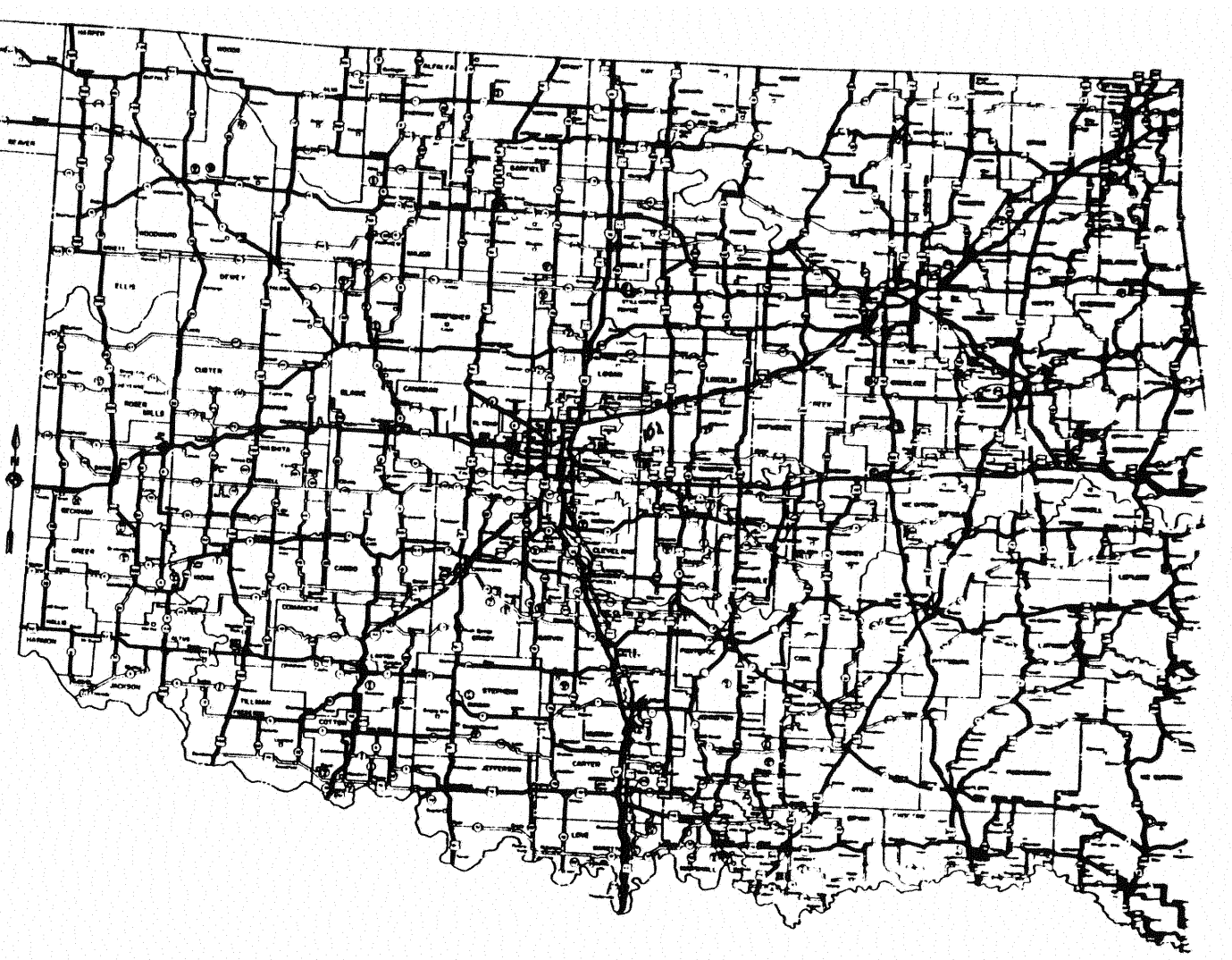
(N) In undeveloped areas parallel construction without initial improvement to the existing facility is acceptable

(O) Minimum Lateral Clearance as required by current AASHTO Guidelines on Federal Aid Projects. Clearance shown for Interstate & Freeways is for depressed design only

1985 MAP OF OKLAHOMA'S STATE HIGHWAY SYSTEM FUNCTIONAL CLASSIFICATION







LEGEND

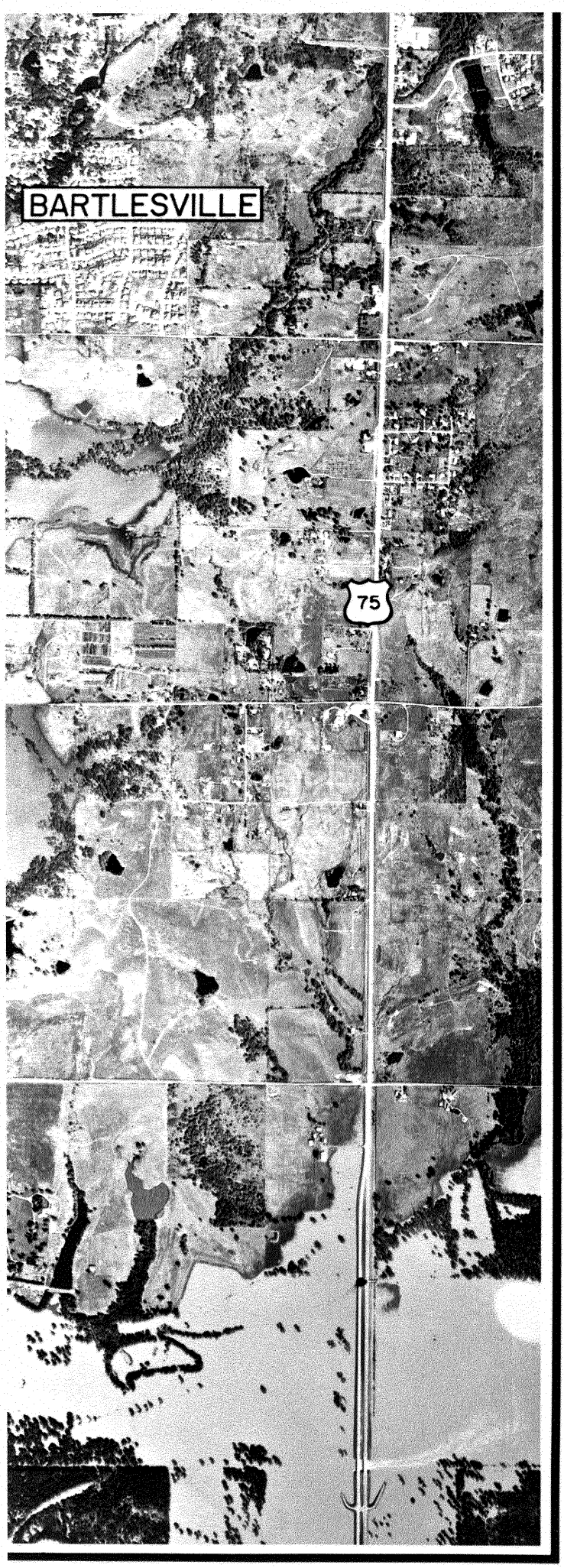
- INTERSTATE
- PRINCIPAL ARTERIALS
- MINOR ARTERIALS
- MAJOR COLLECTORS

NOTE : DUE TO FREQUENT REVISIONS IN URBAN AREAS ALL FUNCTIONAL CLASSIFICATIONS MUST BE VERIFIED BY THE PLANNING DIVISION BEFORE ESTABLISHING APPLICABLE DESIGN STANDARDS

APPENDIX K

Aerial Photograph of U.S. 75

1986 Flood.



Time of Photo - 11:00 a.m., 10/6/86
Flow at Time of Photo - 33,000 cfs
Maximum Flow During Flood - 108,000 cfs (10/4/86)
cfs = cubic feet per second

0 1000 2000 3000 4000

SCALE IN FEET

U.S. ARMY CORPS OF ENGINEERS
TULSA DISTRICT

FLOODED AREAS
OCTOBER 1986

CANEY RIVER
BARTLESVILLE AREA

WATER MANAGEMENT ANALYSIS REPORT
AUGUST 1987